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REGISTER YOUR DESIGN RESOURCE MANUAL

You don’t want to be the stuck with old news, do you?

We are committed to always providing you with up-to-date information and cutting-edge engineering. By registering your manual, you will ensure your access to the newest technical updates as they become available.

Register at redi-rock.com/register
Meet the Family

With close to 80 blocks in the system, the Redi-Rock family of blocks is extensive. And, unlike some families, they all work together!

When optimizing your wall design, you can mix and match exactly the blocks you need from the Redi-Rock system. Try combinations of Gravity blocks, Positive Connection blocks for MSE walls, or the latest additions to the family of hollow-core products—Redi-Rock XL Hollow-Core Retaining blocks and Magic blocks.

With the integrated Redi-Rock system, finding solutions for tall walls isn’t such a tall task.
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Hello!

When Redi-Rock launched in 2000, the introduction of large, wetcast blocks changed the retaining wall industry. Nineteen years later as we publish our latest version of the Design Resource Manual, we’re aiming to change more than an industry—we’re aiming to reinforce the ways that we, together, are changing the world in concrete ways.

We know that the work you do makes an impact in your community, and we’re honored each time you choose Redi-Rock to solve problems and improve people’s lives. In recognition of that, we’ll continue to strive to be a leader in the industry, providing the design tools and engineering resources you need to do that valuable work.

Within this manual, you’ll see the latest innovation of the Redi-Rock system in Redi-Rock XL Hollow-Core Retaining blocks. Standing 36 inches (914 millimeters) tall and available in 52, 72, and 96-inch (1,320, 1,830, and 2,440-millimeter) widths, Redi-Rock XL blocks integrate with the rest of the proven system—including Magic, Positive Connection, Freestanding, and our standard Gravity blocks—helping you optimize taller walls in tighter spaces.

Also within these pages, you’ll find answers to frequently asked questions, case studies, a detailed library of products, preliminary height guides, detailed design information, specifications, installation instructions, typical details, and much more. The information in this publication is intended to supplement even more information available anytime on our website at redi-rock.com.

If you’re not finding what you’re looking for or if there is anything we can do for you, please let us know how we can help.

Sincerely,

Jamie Johnson, PE
Director of Engineering and Operations
Redi-Rock International
engineering@redi-rock.com
(866) 222-8400 ext. 3010
WHAT IS REDI-ROCK?
Redi-Rock is a line of precast products made from durable, first-purpose, air-entrained, wet-cast concrete. The most common Redi-Rock products are large retaining wall blocks.

Often referred to as one-ton Lego blocks, Redi-Rock blocks vary in width from 28 inches (710 millimeters) to 96 inches (2.44 meters) and in weight from 1,200 pounds (544 kilograms) to 3,500 pounds (1,588 kilograms). In many instances, the Redi-Rock retaining wall blocks are big enough that they can be simply stacked on top of each other to construct a “gravity” wall. For even taller and/or more heavily loaded retaining walls, the Redi-Rock Positive Connection (PC) System can be used to construct a Mechanically Stabilized Earth (MSE) wall.

However, Redi-Rock is much more than simply large retaining wall blocks. Redi-Rock freestanding blocks have the same great look as the retaining blocks, with texture on two or more sides. These freestanding blocks are perfect for perimeter walls, entrance monuments, or parapet walls. Redi-Rock accessory products include column blocks, steps, and caps. These accessories are perfect for completing your project. We even have products like Pole Base® concrete foundations for light poles, driveway monuments, and signs.

WHO MAKES REDI-ROCK PRODUCTS?
Redi-Rock products are produced by over 130 independently-owned manufacturers located all over the globe. Contact information for the Redi-Rock manufacturer in your area is available anytime at redi-rock.com.

WHO DESIGNS REDI-ROCK RETAINING WALLS?
The answer to this question depends on what you are trying to accomplish. If you want to get a good idea of how Redi-Rock products can work for your project, the preliminary height guides in this Design Resource Manual are a great place to start. These guides show Redi-Rock wall sections in different assumed soil and loading conditions, and they can quickly help you determine what sections will likely work for your particular project.

When you want to build a wall, there simply is no substitute for detailed plans prepared by a licensed engineer who routinely designs retaining walls. Licensed professionals have proven themselves with years of study and practice, and they are uniquely qualified to create an optimal design for the specific conditions of your project. In addition, a seal of the calculations and design drawings by a “Design Professional of Responsible Charge” is generally required by the International Building Code (Section 105.2) for all walls over four feet (1.219 millimeters) in height.

WHO INSTALLS REDI-ROCK RETAINING WALLS?
Redi-Rock walls are typically constructed by earth excavating contractors or landscaping contractors using large pieces of earth-moving equipment. General contractors that have experience building Redi-Rock walls can be excellent resources for your project. Your local Redi-Rock manufacturer will often have close working relationships with the wall installers in your area and can be a great source of information.

Wondering how to install Redi-Rock? We can help there, too. Redi-Rock has a detailed Installation Manual that covers the basic installation steps. We also have several typical construction details showing how to build common things like 90-degree corners, curves, barriers, or other features in your wall. These resources are available in this Design Resource Manual and online at redi-rock.com.

HOW MUCH DO REDI-ROCK WALLS COST?
Since every project is different, there is no single price for a Redi-Rock wall. Several things must be accounted for, including material, labor, and shipping costs. Materials include Redi-Rock blocks, drainage aggregates, geotextiles, drain pipes, and possibly even select fill; however, project costs are much more than just the sum of material costs. Although Redi-Rock blocks may have a higher price per unit than smaller, dry-cast retaining wall products or blocks made from inferior materials like return concrete, they provide significant savings due to installation speed and product longevity.

The true cost of a Redi-Rock wall must be evaluated on the cost per area of wall face (dollars per square foot or square meter) of the completed structure over the full life of the structure. For taller mechanically stabilized earth walls, part of the cost per square unit area of the retaining wall includes the factory cut geogrid strips that are used with the PC blocks. These strips are specifically manufactured and certified for width and strength, providing construction efficiencies and design reliability that add value to your project.

The real value in Redi-Rock retaining walls comes from superior engineering, high-quality products, and unbeatable face textures that lead to extremely robust and attractive structures that will last for a lifetime. It is because of the intricacies and complexities of each unique project that the best source for pricing is typically from the Redi-Rock manufacturer located closest to your project site. Find the closest manufacturer at redi-rock.com.

WILL REDI-ROCK WORK FOR MY PROJECT?
Redi-Rock has been used with outstanding success on a myriad of different retaining wall applications. Some examples are retaining walls in water applications (seawalls, bank stabilization, channelization, and detention ponds), bridge abutments, parks, residential projects, commercial projects, highway walls, GRS-IBS structures, and even rail applications. Chances are, someone has already figured out a way to use Redi-Rock on a project just like yours. There are hundreds of case studies available at redi-rock.com that will help you visualize how Redi-Rock can be used to make your project a reality.

I HAVE MORE QUESTIONS... WHAT SHOULD I DO?
Quite simply, ask. Your local Redi-Rock manufacturer is a great place to start. Often they have working relationships with wall design engineers and local installers. You can also contact Redi-Rock International, either through your local manufacturer or directly by calling (866) 222-8400 or by email at engineering@redi-rock.com. We have engineers on staff who can help answer general design questions, provide specific information about our products, and point you in the right direction to successfully design and install your own outstanding Redi-Rock retaining wall.
Changing the World in Concrete Ways

On the pages to follow, you’ll find a few case studies outlining how the Redi-Rock system is used to solve various retaining wall challenges. We hope they, along with the myriad of others found online at redi-rock.com, provide the confidence and context you need to design and install Redi-Rock.

We also hope they provide a spark of inspiration about how the work you do can change the lives around you. If you have a story to share about how a Redi-Rock project you were involved with is changing the world in concrete ways—like providing a recreational connection for two mountain towns or protecting residents of a seaside community from 100-year storms—we want to hear it.

Nominate projects that are improving lives at redi-rock.com/nominate.
THE CHALLENGE

In the spring of 2012, a massive construction project to transform Rhyl’s riverfront area broke ground. Rhyl, located in North Wales on the Irish Sea at the mouth of the River Clwyd, is part of the Wales Coast Path which follows the entire coastline of Wales.

The goal of the project was to increase tourism and boost the local economy, as well as deepen the river channel, enlarge the marina, and provide coastal erosion and flood protection. To accomplish this, the site required a retaining wall solution that could meet the complex structural requirements of the site—including significant tidal fluctuations—while providing a scenic park route for pedestrians and cyclists.

THE SOLUTION

Designers for the project chose Redi-Rock Positive Connection (PC) blocks to create the harbor wall that stands 24.3 feet (7.4 meters) high and stretches 617 feet (188 lineal meters). Produced locally by Redi-Rock manufacturer CPM Group, the Redi-Rock PC walls were able to meet the structural requirements of the site as well as provide an aesthetic Limestone finish at a lower cost than other options.

“The Redi-Rock product is very simple but massively effective,” said Jamie Turner, site agent for general contractor Dawnus Construction. “It is easy to install and the end product looks fantastic, I would definitely use this product again.”

THE OUTCOME

During the 2013-2014 winter season, the new harbor sea wall was put to the test. For days, a storm battered the United Kingdom and caused a 60-year high tidal surge. January wave heights were close to the 100-year level.

While this massive storm caused damage to many other structures in the area, designers were happy to see that the harbor wall performed exactly as engineered. The city was so impressed with how the Redi-Rock wall performed during the storm, they replaced 3,280 feet (1 kilometer) of other nearby walls with Redi-Rock.

WATER APPLICATION:

Ocean Marina Wall Weathers Massive Storms

Project: Foryd Harbour Enhancement Project #160
Project Management: Denbighshire County Council Wall Design: CPM Group and Groundsolve Ltd Geotechnical Consultants General Contractor: Dawnus Construction Manufacturer: CPM Group Location: Rhyl, North Wales, United Kingdom Completed: 2012-2013
THE CHALLENGE
Creating a 21-mile (33.8-kilometer) long park system that encompasses more than 3,800 acres (1,538 hectares) is no small task, but it’s what 21st Century Parks set out to do by linking four major parks with a park drive and trail network.

Due to the diverse topography of the Louisville, Kentucky, area, 21st Century Parks needed a flexible retaining wall solution that would meet the needs across multiple phases of construction.

THE SOLUTION
For their solution, they turned to Redi-Rock of K.I.T.

“[Redi-Rock] was chosen for a couple reasons,” said Joe Daley, architect and project manager for 21st Century Parks. “One, was the aesthetics—this is a park project, not a highway project. It had to fit in with the stone and other materials being used in the park...Also, the cost and the time frame were big considerations.”

The first phase of the project had both gravity and reinforced Positive Connection (PC) walls, and the next phase of the project included creating an overpass for Interstate 64 where a 1,200-square-foot (111-square-meter) gravity headwall was used.

An additional phase of the Parklands project required three separate walls, totaling 21,000 square feet (1,950 square meters) of Redi-Rock to handle the significant grade changes. One of those walls was a 41-foot (12.5-meter) tall PC wall—the tallest Redi-Rock wall at the time of construction.

“The high efficiency of the PC system really made it possible to design tiered walls with those loads at that height,” said design engineer Clint Hines, PE. “It would be hard to make it work with anything else.”

THE OUTCOME
“I think everyone is really happy with the way it looks,” Daley said.

The Redi-Rock retaining walls throughout the Parklands fulfilled the technical demands and the aesthetic desire for the project, which garnered accolades from entities like the National Park Service and the American Society of Landscape Architects.
UNIVERSITY APPLICATION: Creating Space on Campus with Redi-Rock

THE CHALLENGE

Worcester State University (WSU) started as a teacher training school in 1874, transitioned to a liberal arts and sciences school in 1963, and became a state university in 2010. As the university grew, it acquired more students but struggled to find space for additional housing. "WSU, along with the rest of Worcester, is nothing but hills," said Casey Scavone of Redi-Rock Walls of New England.

THE SOLUTION

WSU chose Redi-Rock Walls of New England to help expand the buildable area for a new residence hall, student union, and dining commons overlooking the sports fields. The site included a moderate slope and global stability issues, so design engineer Eric Merluzzi, PE, had to incorporate geogrid reinforcement into the lower wall; but, he was able to optimize the design by using the gravity blocks for the top tier of the wall.

The project also incorporated many curving walls, which Merluzzi said were simple to achieve because of the tapered block shape.

"There's no cutting, no trimming -- the blocks fit nice and neat," he said. "It works well."

Aesthetics were also very important to the university. Thousands of students and visitors will view the wall each year, due to its close proximity to Coughlin Field, the main athletic field on campus.

"They wanted something that looked natural and something that would really stick out, so New England Ledgestone was a great fit," said Scavone.

THE OUTCOME

Despite New England winter weather conditions, installers from Ernest Guigli & Sons, Inc. were able to install the walls in a three month period. The majority of the 1,200 blocks for the project were retaining blocks, though the wall was topped with freestanding blocks and caps to provide a finished appearance.

"This was a great project for us," said Scavone. "With all the people that are going to pass this area over the years here at WSU, it's a fantastic project. The install was beautiful—everything came out perfect."
THE CHALLENGE
In 2011, the Canadian National (CN) Railway and the Montreal Metro began construction to eliminate an at-grade crossing where the CN Rail line crossed over the Société de Transport de Montréal (STM) light commuter Metro line.

These two lines ran through a narrow corridor with several sections of track overlapping. To completely separate the tracks, plans were made to elevate the CN Rail line on a bridge structure and excavate to relocate the Metro underground. To elevate the CN Rail line, designers needed to build a gradual, walled slope leading up to a massive concrete bridge structure and then down the other side.

THE SOLUTION
Back-to-back poured-in-place concrete walls were an option for creating the ramps, but when CN Rail geotechnical engineers saw the Redi-Rock Positive Connection (PC) blocks at the Transportation Research Board (TRB) meeting in early 2011, they began incorporating Redi-Rock PC walls from local manufacturer Graymont Materials into the design.

“The PC system is the only block with this type of connection which allowed it to handle the loads,” said David Chartier, junior engineer with V. Fournier & Associés. “When you have massive loads so near the block facing, it’s hard to make a wall that will work. The walls are very high and the load is very close, but the civil engineering of this block made it a good fit.”

To install the geogrid for a PC wall, a 12-inch (305 millimeter) wide strip of geogrid was wrapped through each retaining wall block, tying the Redi-Rock facing blocks to the reinforced soil mass with a weight independent positive connection.

THE OUTCOME
In total, the project required 7,800 Redi-Rock blocks in the Cobblestone texture—equaling 44,850 square feet (4167 square meters). Trains made their first run on the line in late 2013, and the project has been performing exactly as engineered.

“It’s looking beautiful, that’s for sure. The city is very happy,” said Charles Poulin, ing. of CRT Construction.
MUNICIPAL APPLICATION:
Recreational Path Connects Two Colorado Mountain Towns

THE CHALLENGE
All great visions have to start somewhere. This one began with over three miles of paved multi-purpose trail winding through scenic Clear Creek Canyon.

This was no easy task, as the terrain includes steep slopes, flooding issues along the river, active landslide problems and limited space. In addition, protecting the natural habitat of endangered species was a must.

Project engineer Matt Andrews from Muller Engineering Co. said, “One of the main objectives of this project was to create a trail and retaining walls that would blend so seamlessly with the canyon that users would think it had always been there.”

THE SOLUTION
The engineers carved out the best route in the narrow canyon to create a 10-foot (3-meter) wide trail, using many miles of Redi-Rock retaining walls above and below the trail line.

“The Redi-Rock gravity system was the perfect solution for the constricted space because it doesn’t require reinforcements,” said Seth Clark from Signature Stone, the local Redi-Rock manufacturer. “In addition, Redi-Rock products allowed the walls to blend beautifully into the landscape because each block is cast in a mold taken from real natural stone—the Ledgestone texture perfectly matched the natural rock in the area.”

THE OUTCOME
“Due to the size of the blocks, along with the Ledgestone texture, we were able to design the wall to follow the grade rather than have steps in the wall,” added Clark. “This concept worked very well, and the subtle changes in the wall profile adds another level of beauty to the project.”

On July 29, 2016, the Clear Creek segment of the trail was ceremoniously opened for people to enjoy this picturesque canyon. From families out for a casual hike or bike ride, to experienced outdoor adventurists, this trail offers something for everyone.
THE CHALLENGE
Mark Hattenburg wanted to add a terrace and pool to the backyard of his home near Spokane, Washington. He knew he would need to do something about the 8-foot (2.4-meter) grade change on the property, and he really wanted something that would look good.

But, he had no design plan and wasn’t quite sure where to begin.

THE SOLUTION
While driving down Little Spokane Drive one day, Rick Lindberg from local Redi-Rock manufacturer Wilbert Precast noticed an excavator in the field behind Hattenburg’s house. Curious about the project and knowing it would require a retaining wall, he spoke to Hattenburg about his plans.

“He knew he needed a wall, but he just didn’t know what he was going to do,” said Lindberg. Lindberg’s background is in landscape design, so he offered to help Hattenburg by designing the backyard landscape using Redi-Rock.

Hattenburg owns a construction company called Hattenburg Excavation. Having installed Redi-Rock walls in the past, he knew Redi-Rock would be a good fit on this project, too.

The Hattenburgs were happy with the design which included Redi-Rock gravity retaining and freestanding walls, plus coordinating columns, steps, and caps, all in the Cobblestone texture. A waterfall feature was incorporated into the design to conceal the utilities for the pool.

Because of his professional experience with Redi-Rock, Hattenburg installed the walls himself explaining, “It was pretty straight forward; we didn’t really have a whole lot of challenges once we got the plans set.”

THE OUTCOME
Over 500 Redi-Rock blocks were used to complete the beautiful yard and pool area with walls that went up to 10 feet (3 meters) high at the tallest point.

Hattenburg and his family are very pleased with how their backyard turned out.

“They all like it...we’re always in the backyard in the pool,” Hattenburg said. In fact, they are now using Redi-Rock for more property updates.

“We’re working on designing his entry now,” said Lindberg.
REDI-ROCK XL APPLICATION

XL Hollow-Core Retaining Blocks Optimize Gravity Wall at Airport

THE CHALLENGE
When the excavation for a cut wall at John C. Tune Airport in Nashville, Tennessee, unearthed a geotechnical can of worms, it was time to go back to the drawing board to design a taller wall.

Civil Constructors unearthed that an unstable fill material had been used on the development of the adjacent property, which created an issue with the crest slope of the wall. There were also buried boulders instead of solid rock in some locations, and the limestone rock cut wasn’t as tall as originally anticipated.

THE SOLUTION
After exploring several alternatives, wall design engineer Clint Hines, P.E., was able to keep the wall a Redi-Rock gravity wall by using the newest innovation in the Redi-Rock system—Redi-Rock XL Hollow-core Retaining blocks.

“The only way we could get up and down at the heights that were now required was really going to be with the XL units,” said Hines. Three new block sizes round out the Redi-Rock system to help build taller walls in tight spaces while using less concrete.

For this wall in particular, Hines was able to reach a maximum height of 25.5 feet (7.8 meters), using 806 XL blocks of various widths, then transitioning to standard Redi-Rock blocks at the top of the wall to optimize the design.

He worked closely with the project geotechnical engineer to gather new, accurate data, and then used the Redi-Rock Wall Professional software program to design, analyze, and optimize the wall.

THE OUTCOME
While the hangar isn’t slated to finish until 2019, Redi-Rock of K.I.T. manufactured and installed the wall, and Hines attributed the success of the redesign process to two things.

“Having that whole system of products available and then having the Redi-Rock software that you could model such an intricate geotechnical model to make sure that you had everything covered, it was really the marriage of the two—the software and the product,” he said.
One System, Four Textures, Endless Solutions

The Redi-Rock system is robust, and each of the components can be seamlessly integrated into a cohesive retaining wall design. With the ability to get any block in the Redi-Rock arsenal in four, natural stone textures, it means that technical agility comes with just the right aesthetic touch.

Each local manufacturer produces Redi-Rock in colors that match their natural terrain using molds crafted from real stone and first-use, architectural-grade, precast concrete. That means Redi-Rock walls have detail, durability, and design power—a combination that’s hard to come by.

Check out the faces of Redi-Rock’s endless solutions: LEDGESTONE, COBBLESTONE, LIMESTONE, AND KINGSTONE.
LEDGESTONE
The rugged relief of Ledgestone blocks give projects a random, stacked stone appearance. With up to 115 square feet (10.5 square meters) of non-repeating texture, it'll be tough to tell all that large block power is behind that pretty face. It's a win-win.

COBBLESTONE
When it comes to classic good looks, Cobblestone is where it’s at. Each one-ton block features the appearance of six smaller blocks, creating a timeless aesthetic. Sometimes, the linear appeal of a smaller stacked stone provides the enduring impact you’re looking for in a wall.

LIMESTONE
The six square feet (0.5 square meters) of face per Limestone block leaves a large, lasting impression. Crafted from real split limestone, the quarried stone texture means there's no need to sacrifice on style for function—you can get both at a grand scale!

KINGSTONE
Striking a balance between the grandiose scale of Limestone and rugged relief of Ledgestone, Kingstone appears weathered by water and time like the crown of a natural stone outcropping. With each Redi-Rock block looking like a large, quarried stone, Kingstone will transform retaining walls into castle-worthy walls.
RETAIING BLOCKS (FINISHED TEXTURE ON ONE FACE)

The Redi-Rock Retaining wall blocks come in multiple widths and configurations. The defining characteristic is that Retaining blocks have an aesthetic texture cast into only ONE face, and the textured face is the only side exposed to view in the finished wall. These blocks are machine-placed, wet-cast, precast modular block units manufactured from first purpose, non-reconstituted concrete and intended for constructing dry-stacked modular retaining wall systems. The block units are manufactured from structural-grade concrete mixes in accordance with ASTM C394 or ASTM C685 that produce a finished unit with excellent resistance to freeze-thaw, deicing chemical exposure, and submerged conditions in both fresh water and salt water applications. All Redi-Rock blocks are manufactured and distributed through an international network of individually-owned, licensed precast concrete manufacturers.

CONCRETE MIX PROPERTIES

| FLY ASH OR OTHER POZZOLANS PER ASTM C618 | 25 | TOTAL ASH, POZZOLANS, SLAG, AND SILICA FUME | 50 |
| SLAG CONFORMING TO ASTM C699 | 50 | TOTAL ASH, POZZOLANS, AND SILICA FUME | 35 |
| SILICA FUME CONFORMING TO ASTM C1240 | 10 | ALKALI-AGGREGATE REACTIVITY MITIGATION PER ACI 217 |

REFERENCE DIMENSIONS:
HEIGHT = VERTICAL DIMENSION OF TEXTURED FACE
LENGTH = HORIZONTAL DIMENSION PARALLEL TO TEXTURED FACE
WIDTH = HORIZONTAL DIMENSION PERPENDICULAR TO TEXTURED FACE

DIMENSIONAL TOLERANCES (11)(12)

| FACE TEXTURE VARIES |
| CENTER OF GRAVITY |
| BLOCK VOLUME |
| BLOCK WEIGHT |

(1) Concrete mix properties are in general accordance with ACI 318 durability requirements. Research has shown that concrete manufactured to these standards demonstrates good durability and performance. When these requirements are followed, specific freeze-thaw testing of the concrete is typically NOT required.

(2) Exposure class is as described in ACI 318.

(3) Test method ASTM C231.

(4) Defined in ASTM C1218 at age between 28 and 42 days.

(5) Where used in high suitable environments or where alkali-silica reaction is a factor, water soluble chloride shall be limited to no more than trace amounts (form impurities in concrete-making component, not intended constituents.)

(6) The total cementitious material also includes ASTM C190, C555, C644, and C1117 cement. The maximum percent shall include:

(a) Fly ash or pozzolances in type IP, blended cement, ASTM C699, or ASTM C1117.

(b) Slag used in the manufacture of an SI blended cement, ASTM C699, or ASTM C1117.

(c) Fly ash, ASTM C1240, present in a blended cement.

(d) Fly ash or other pozzolances and silica fume shall constitute no more than 25 and 10 percent, respectively, of the total weight of the cementitious materials.

(e) Prescriptive limits shown may be waived for concrete mixes that demonstrate excellent freeze-thaw durability in a district and current loading program.

(f) Center of gravity is measured from the back of block.

(11) All dimensions are shown in units of inches (mm). Permissible defects: Chips smaller than 1.5" (38mm) in the largest dimension and cracks not wider than 0.012" (0.32mm) and not longer than 25% of the nominal height of the block; bug holes in the architectural face smaller than 0.75" (19mm); and bug holes, water marks, and color variation on non-architectural faces.

(12) Reference dimensions: length of machine-placed, wet-cast, precast modular block units manufactured from first purpose, non-reconstituted concrete and intended for constructing dry-stacked modular retaining wall systems. The block units are manufactured from structural-grade concrete mixes in accordance with ASTM C394 or ASTM C685 that produce a finished unit with excellent resistance to freeze-thaw, deicing chemical exposure, and submerged conditions in both fresh water and salt water applications. All Redi-Rock blocks are manufactured and distributed through an international network of individually-owned, licensed precast concrete manufacturers.

CONCRETE MIX PROPERTIES

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| CENTER OF GRAVITY |
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(1) Concrete mix properties are in general accordance with ACI 318 durability requirements. Research has shown that concrete manufactured to these standards demonstrates good durability and performance. When these requirements are followed, specific freeze-thaw testing of the concrete is typically NOT required.

(2) Exposure class is as described in ACI 318.

(3) Test method ASTM C231.

(4) Defined in ASTM C1218 at age between 28 and 42 days.

(5) Where used in high suitable environments or where alkali-silica reaction is a factor, water soluble chloride shall be limited to no more than trace amounts (form impurities in concrete-making component, not intended constituents.)

(6) The total cementitious material also includes ASTM C190, C555, C644, and C1117 cement. The maximum percent shall include:

(a) Fly ash or other pozzolances in type IP, blended cement, ASTM C699, or ASTM C1117.

(b) Slag used in the manufacture of an SI blended cement, ASTM C699, or ASTM C1117.

(c) Fly ash, ASTM C1240, present in a blended cement.

(d) Fly ash or other pozzolances and silica fume shall constitute no more than 25 and 10 percent, respectively, of the total weight of the cementitious materials.

(e) Prescriptive limits shown may be waived for concrete mixes that demonstrate excellent freeze-thaw durability in a district and current loading program.

(f) Center of gravity is measured from the back of block.

(11) All dimensions are shown in units of inches (mm). Permissible defects: Chips smaller than 1.5" (38mm) in the largest dimension and cracks not wider than 0.012" (0.32mm) and not longer than 25% of the nominal height of the block; bug holes in the architectural face smaller than 0.75" (19mm); and bug holes, water marks, and color variation on non-architectural faces.

(12) Reference dimensions: length of machine-placed, wet-cast, precast modular block units manufactured from first purpose, non-reconstituted concrete and intended for constructing dry-stacked modular retaining wall systems. The block units are manufactured from structural-grade concrete mixes in accordance with ASTM C394 or ASTM C685 that produce a finished unit with excellent resistance to freeze-thaw, deicing chemical exposure, and submerged conditions in both fresh water and salt water applications. All Redi-Rock blocks are manufactured and distributed through an international network of individually-owned, licensed precast concrete manufacturers.

RETAIING BLOCKS (FINISHED TEXTURE ON ONE FACE)

The Redi-Rock Retaining wall blocks come in multiple widths and configurations. The defining characteristic is that Retaining blocks have an aesthetic texture cast into only ONE face, and the textured face is the only side exposed to view in the finished wall. These blocks are machine-placed, wet-cast, precast modular block units manufactured from first purpose, non-reconstituted concrete and intended for constructing dry-stacked modular retaining wall systems. The block units are manufactured from structural-grade concrete mixes in accordance with ASTM C394 or ASTM C685 that produce a finished unit with excellent resistance to freeze-thaw, deicing chemical exposure, and submerged conditions in both fresh water and salt water applications. All Redi-Rock blocks are manufactured and distributed through an international network of individually-owned, licensed precast concrete manufacturers.
### RETAINING BLOCKS

#### Block Library

**R-41T 41” (1030mm) TOP */

- **Face Texture:** Cobble / Limestone
- **Kingstone / Ledgestone
- **Block Weight:** 1750 lb (790 kg)
- **Block Volume:** 16.83 ft³ (0.47 m³)
- **Center of Gravity:** 21.31" (540 mm)

**R-41HT 41” (1030mm) HALF TOP */

- **Face Texture:** Cobble / Limestone
- **Kingstone / Ledgestone
- **Block Weight:** 1790 lb (800 kg)
- **Block Volume:** 17.93 ft³ (0.51 m³)
- **Center of Gravity:** 22.14" (568 mm)

**R-41M 41” (1030mm) MIDDLE

- **Face Texture:** Cobble / Limestone
- **Kingstone / Ledgestone
- **Block Weight:** 2340 lb (1060 kg)
- **Block Volume:** 21.6" (543 mm)

**R-41HM 41” (1030mm) HALF MIDDLE

- **Face Texture:** Cobble / Limestone
- **Kingstone / Ledgestone
- **Block Weight:** 2240 lb (1020 kg)
- **Block Volume:** 21.3" (538 mm)

**R-41B 41” (1030mm) BOTTOM

- **Face Texture:** Cobble / Limestone
- **Kingstone / Ledgestone
- **Block Weight:** 2440 lb (1110 kg)
- **Block Volume:** 20.7" (527 mm)

**R-41HB 41” (1030mm) HALF BOTTOM

- **Face Texture:** Cobble / Limestone
- **Kingstone / Ledgestone
- **Block Weight:** 1605 lb (725 kg)
- **Block Volume:** 21.7" (551 mm)

---

1. Units for dimensions are inches (mm), typical unless noted otherwise.
2. Block production varies with each licensed Redi-Rock manufacturer. Confirm availability before specifying or ordering.
3. Center of Gravity is measured from the back of block.
4. Actual block volumes and weights may vary.

---

**Face Texture:** Cobble / Limestone
**Kingstone / Ledgestone
**Block Weight:** 2310 lb (1050 kg)
**Block Volume:** 16.14 ft³ (0.457 m³)
**Center of Gravity:** 20.4" (518 mm)

**Face Texture:** Cobble / Limestone
**Kingstone / Ledgestone
**Block Weight:** 1020 lb (460 kg)
**Block Volume:** 7.14 ft³ (0.20 m³)
**Center of Gravity:** 21.4" (543 mm)

**Face Texture:** Cobble / Limestone
**Kingstone / Ledgestone
**Block Weight:** 2330 lb (1050 kg)
**Block Volume:** 22.0" (560 mm)
**Center of Gravity:** 21.5" (540 mm)

---

<table>
<thead>
<tr>
<th>Block Type</th>
<th>Face Texture</th>
<th>Kingstone / Ledgestone</th>
<th>Block Weight</th>
<th>Block Volume</th>
<th>Center of Gravity</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-41T</td>
<td>Cobble / Limestone</td>
<td></td>
<td>1750 lb (790 kg)</td>
<td>16.83 ft³ (0.47 m³)</td>
<td>21.31&quot; (540 mm)</td>
</tr>
<tr>
<td>R-41HT</td>
<td>Cobble / Limestone</td>
<td></td>
<td>1790 lb (800 kg)</td>
<td>17.93 ft³ (0.51 m³)</td>
<td>22.14&quot; (568 mm)</td>
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<tr>
<td>R-41M</td>
<td>Cobble / Limestone</td>
<td></td>
<td>2340 lb (1060 kg)</td>
<td>21.6&quot; (543 mm)</td>
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<tr>
<td>R-41HM</td>
<td>Cobble / Limestone</td>
<td></td>
<td>2240 lb (1020 kg)</td>
<td>21.3&quot; (538 mm)</td>
<td></td>
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<tr>
<td>R-41B</td>
<td>Cobble / Limestone</td>
<td></td>
<td>2440 lb (1110 kg)</td>
<td>20.7&quot; (527 mm)</td>
<td></td>
</tr>
<tr>
<td>R-41HB</td>
<td>Cobble / Limestone</td>
<td></td>
<td>1605 lb (725 kg)</td>
<td>21.7&quot; (551 mm)</td>
<td></td>
</tr>
</tbody>
</table>
### Block Library

#### RETAINING BLOCKS

**R-609M**
- **60” (1520mm) MIDDLE 9” (230mm) SETBACK**
  - **Face Texture:** Cobble / Limestone, Kingstone / Ledgestone
  - **Block Weight:** 3300 lb (1500 kg), 3230 lb (1460 kg)
  - **Block Volume:** 23.97 ft³ (0.68 m³), 22.56 ft³ (0.64 m³)
  - **Center of Gravity:** 30.9” (786 mm), 30.3” (770 mm)

**R-609HM**
- **Face Texture:** Cobble / Limestone, Kingstone / Ledgestone
  - **Block Weight:** 1340 lb (610 kg), 1310 lb (590 kg)
  - **Block Volume:** 9.37 ft³ (0.26 m³), 9.12 ft³ (0.26 m³)
  - **Center of Gravity:** 33.6” (855 mm), 33.0” (830 mm)

#### R-609B
- **60” (1520mm) BOTTOM 9” (230mm) SETBACK**
  - **Face Texture:** Cobble / Limestone, Kingstone / Ledgestone
  - **Block Weight:** 3340 lb (1550 kg), 3300 lb (1520 kg)
  - **Block Volume:** 23.47 ft³ (0.66 m³), 22.16 ft³ (0.64 m³)
  - **Center of Gravity:** 31.5” (800 mm), 30.9” (786 mm)

**R-609HB**
- **Face Texture:** Cobble / Limestone, Kingstone / Ledgestone
  - **Block Weight:** 1400 lb (640 kg), 1370 lb (620 kg)
  - **Block Volume:** 9.80 ft³ (0.28 m³), 9.55 ft³ (0.27 m³)
  - **Center of Gravity:** 34.2” (869 mm), 33.6” (855 mm)

### SHEAR KNOBS
- @ 23 (584) OC, TYP.

#### Interface Shear knobs are typically 10” (254mm) diameter by 4” (102 mm) tall.

1. Units for dimensions are inches (mm), typical unless noted otherwise.
2. Block production varies with each licensed Redi-Rock manufacturer. Confirm availability before specifying or ordering.
3. Center of Gravity is measured from the back of block.
4. Actual block volumes and weights may vary.
5. Weights are based upon a concrete density of 143 lb/ft³ (2291 kg/m³).
6. Half blocks contain a fork slot on only one side of the block.
7. Interface Shear knobs are typically 10” (254mm) diameter by 4” (102 mm) tall. Smaller knob diameters are available.

---

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**RETAINING BLOCKS**

**Block Library**

**R-41PL 41” (1033mm) PLANTER**
- **Face Texture:** Cobble / Limestone
- **Block Weight:** 14.02 lb (6.36 kg)
- **Block Volume:** 5.89 ft³ (0.17 m³)
- **Center of Gravity:** 19.5” (495mm)

**R-41HPL 41” (1033mm) HALF PLANTER**
- **Face Texture:** Cobble / Limestone
- **Block Weight:** 880 lb (399 kg)
- **Block Volume:** 13.53 ft³ (0.40 m³)
- **Center of Gravity:** 20.2” (513mm)

**R-MT MODIFIED TOP**
- **Face Texture:** Cobble / Limestone
- **Block Weight:** 1200 lb (544 kg)
- **Block Volume:** 8.38 ft³ (0.24 m³)
- **Center of Gravity:** 17.9” (455mm)

**R-MHT MODIFIED HALF TOP**
- **Face Texture:** Cobble / Limestone
- **Block Weight:** 710 lb (320 kg)
- **Block Volume:** 4.95 ft³ (0.14 m³)
- **Center of Gravity:** 20.7” (527mm)

**SPECIALITY BLOCK**

1. Units for dimensions are inches (mm), typical unless noted otherwise.
2. Block production varies with each licensed Redi-Rock manufacturer. Confirm availability before specifying or ordering.
3. Center of Gravity is measured from the back of block.
4. Actual block volumes and weights may vary.

5. Face Texture may vary.

6. Half blocks contain a fork slot on only one side of the block.
7. Interface Shear knobs are typically 10” (254mm) diameter by 4” (102 mm) tall.
8. 36” (914) wide blocks contain a fork slot on both sides of the block.

**RETAILING BLOCKS**

**Block Library**

**R-AB ANCHOR BOTTOM**
- **Face Texture:** Cobble / Limestone
- **Block Weight:** 2370 lb (1070 kg)
- **Block Volume:** 16.04 ft³ (0.45 m³)
- **Center of Gravity:** 21.0” (533mm)

**R-AM ANCHOR MIDDLE**
- **Face Texture:** Cobble / Limestone
- **Block Weight:** 2240 lb (1018 kg)
- **Block Volume:** 15.63 ft³ (0.44 m³)
- **Center of Gravity:** 20.6” (523mm)

**R-SM SHORT MIDDLE**
- **Face Texture:** Cobble / Limestone
- **Block Weight:** 14.95 ft³ (0.42 m³)
- **Block Volume:** 7.77 ft³ (0.22 m³)
- **Center of Gravity:** 13.7” (349mm)

**R-ST SHORT TOP**
- **Face Texture:** Cobble / Limestone
- **Block Weight:** 1110 lb (500 kg)
- **Block Volume:** 7.33 ft³ (0.21 m³)
- **Center of Gravity:** 13.2” (336mm)

**R-419SM 9” (233mm) SETBACK SHORT MID**
- **Face Texture:** Cobble / Limestone
- **Block Weight:** 1280 lb (580 kg)
- **Block Volume:** 8.96 ft³ (0.25 m³)
- **Center of Gravity:** 20.0” (507mm)

**R-419ST 9” (233mm) SETBACK SHORT TOP**
- **Face Texture:** Cobble / Limestone
- **Block Weight:** 710 lb (320 kg)
- **Block Volume:** 4.94 ft³ (0.14 m³)
- **Center of Gravity:** 13.9” (352mm)

1. Units for dimensions are inches (mm), typical unless noted otherwise.
2. Block production varies with each licensed Redi-Rock manufacturer. Confirm availability before specifying or ordering.
3. Center of Gravity is measured from the back of block.
4. Actual block volumes and weights may vary.

5. Weights are based upon a concrete density of 143 lb/ft³ (2291 kg/m³).
6. 27” (685) wide blocks contain a fork slot on only one side of the block. These are specialty blocks and may have limited availability and is only used in double 90-degree corner applications.
7. Interface Shear knobs are typically 10” (254mm) diameter by 4” (102 mm) tall. Smaller knob diameters are available.
# Block Library

## RETAINING BLOCKS

<table>
<thead>
<tr>
<th>Block Library</th>
<th>9” (230 mm) STEPDOWN TOP</th>
<th>R-41SDT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>R-28SDT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Face Texture</td>
<td>Cobble / Limestone</td>
<td>Cobble / Limestone</td>
</tr>
<tr>
<td>Block Weight</td>
<td>600 lb (270 kg)</td>
<td>840 lb (380 kg)</td>
</tr>
<tr>
<td>Block Volume</td>
<td>4.2 ft³ (0.12 m³)</td>
<td>5.9 ft³ (0.17 m³)</td>
</tr>
<tr>
<td><strong>R-41SDT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Face Texture</td>
<td>Cobble / Limestone</td>
<td>Cobble / Limestone</td>
</tr>
<tr>
<td>Block Weight</td>
<td>840 lb (380 kg)</td>
<td>940 lb (430 kg)</td>
</tr>
<tr>
<td>Block Volume</td>
<td>5.9 ft³ (0.17 m³)</td>
<td>5.1 ft³ (0.14 m³)</td>
</tr>
</tbody>
</table>

1. Units for dimensions are inches (mm), typical unless noted otherwise.
2. Block production varies with each licensed Redi-Rock manufacturer.
   Confirm availability before specifying or ordering.
3. Architectural faces on the blocks have varying texture.
4. Actual block volumes and weights may vary.
5. Weights are based upon a concrete density of 143 lb/ft³ (2291 kg/m³).

---

**Project:** Walgreens Parking Lot  
**Block Manufacturer:** Redi-Wall  
**Installer:** Leavitt, LLC  
**Location:** Okemos, Michigan  
**Completed:** 2011
CONCRETE MIX PROPERTIES

<table>
<thead>
<tr>
<th>FREEZE THAW EXPOSURE CLASS (1)</th>
<th>MINIMUM 28 DAY COMPRESSIVE STRENGTH (2)</th>
<th>MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl-) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT (6,7)</th>
<th>EXPOSURE CLASS (2)</th>
<th>MAXIMUM PERCENTAGE OF TOTAL CEMENTITIOUS MATERIALS BY WEIGHT (8,10) (VERY SEVERE EXPOSURE CLASS ONLY)</th>
<th>MAXIMUM CHLORIDE AS % CONCENTRATION IN MIXING WATER, PARTS PER MILLION</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODERATE</td>
<td>4,000 psi (27.6 MPA)</td>
<td>0.45</td>
<td>1.0 (25)</td>
<td>5M</td>
<td>4.5% ± 1.5%</td>
</tr>
<tr>
<td>SEVERE</td>
<td>4,000 psi (27.6 MPA)</td>
<td>0.45</td>
<td>1.0 (25)</td>
<td>3S</td>
<td>6.0% ± 1.5%</td>
</tr>
<tr>
<td>VERY SEVERE</td>
<td>4,500 psi (30.0 MPA)</td>
<td>0.40</td>
<td>1.0 (25)</td>
<td>4S</td>
<td>6.0% ± 1.5%</td>
</tr>
</tbody>
</table>

REFERENCE DIMENSIONS:

- **HEIGHT** = VERTICAL DIMENSION OF TEXTURED FACE
- **LENGTH** = LONGER HORIZONTAL DIMENSION PARALLEL TO TEXTURED FACES
- **WIDTH** = HORIZONTAL DIMENSION PERPENDICULAR TO LONGER TEXTURED FACES

**DIMENSIONAL TOLERANCES** (11) (12)

<table>
<thead>
<tr>
<th>HEIGHT</th>
<th>ALL BLOCKS</th>
<th>16 ± 5/8&quot; (41 ± 16 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH</td>
<td>FULL BLOCKS</td>
<td>46 ± 5/16&quot; (1172 ± 13 mm)</td>
</tr>
<tr>
<td>WIDTH</td>
<td>HALF BLOCKS</td>
<td>23 5/8 ± 3/16&quot; (597 ± 13 mm)</td>
</tr>
</tbody>
</table>

Block Library

**F-SM STRAIGHT MIDDLE**

- Face Texture: Cobble / Limestone
- Block Weight: 1416 lb (640 kg)
- Block Volume: 9.84 ft³ (0.279 m³)

**F-SG STRAIGHT GARDEN TOP**

- Face Texture: Cobble / Limestone
- Block Weight: 1050 lb (480 kg)
- Block Volume: 7.35 ft³ (0.208 m³)

**F-SB STRAIGHT BOTTOM**

- Face Texture: Cobble / Limestone
- Block Weight: 1520 lb (690 kg)
- Block Volume: 10.65 ft³ (0.302 m³)

**F-S1 STRAIGHT TOP**

- Face Texture: Cobble / Limestone
- Block Weight: 1380 lb (620 kg)
- Block Volume: 9.61 ft³ (0.272 m³)

1. Units for dimensions are inches (mm), typical unless noted otherwise.
2. Knobs are typically 10" (254mm) diameter by 4" (102 mm) tall. Smaller knobs are available.
3. Archiectureal faces on the blocks have varying texture.
4. Actual block volumes and weights may vary.
5. Weights are based upon a concrete density of 143 lb/ft³ (2291 kg/m³).
6. 6" (152 mm) diameter vertical semi-cylindrical voids at the ends of the block for mechanical tie-down are available, refer to Force Protection blocks for additional information.
7. Knobs are typically 10" (254mm) diameter by 4" (102 mm) tall. Smaller knobs are available.
### FREESTANDING BLOCKS

#### Block Library

<table>
<thead>
<tr>
<th>Block Library</th>
<th>Block Library</th>
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</thead>
<tbody>
<tr>
<td><strong>F-VM VARIABLE RADIUS MIDDLE</strong></td>
<td><strong>F-VG VARIABLE RADIUS GARDEN TOP</strong></td>
</tr>
<tr>
<td><strong>F-VB VARIABLE RADIUS BOTTOM</strong></td>
<td><strong>F-VT VARIABLE RADIUS TOP</strong></td>
</tr>
<tr>
<td><strong>F-FB FORCE PROTECTION BOTTOM</strong></td>
<td><strong>F-FT FORCE PROTECTION TOP</strong></td>
</tr>
<tr>
<td><strong>F-BB BARRIER BLOCK</strong></td>
<td><strong>F-FM FORCE PROTECTION MIDDLE</strong></td>
</tr>
</tbody>
</table>

1. Units for dimensions are inches (mm), typical unless noted otherwise.
2. Block production varies with each licensed Redi-Rock manufacturer. Confirm availability before specifying or ordering.
3. Variable radius feature can be cast on only one end, coordinate.
4. Architectural faces on the blocks have varying texture.
5. Actual block volumes and weights may vary.
6. Knobs are typically 10" (254 mm) diameter by 4" (102 mm) tall. Smaller knobs are available.
7. Weights are based upon a concrete density of 143 lb/ft³ (2291 kg/m³). Knobs are typically 10" (254 mm) diameter by 4" (102 mm) tall. Smaller knobs are available.
8. Actual block volumes and weights may vary.
9. Architectural faces on the blocks have varying texture.
10. Units for dimensions are inches (mm), typical unless noted otherwise.

---

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### Freestanding Blocks

#### Block Library

<table>
<thead>
<tr>
<th>Freestanding Blocks</th>
<th>Corner Middle</th>
<th>Corner Garden Top</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F-CM</strong></td>
<td>Cobble / Limestone</td>
<td>Kingstone / Ledgestone</td>
</tr>
<tr>
<td>Block Weight</td>
<td>1370 lb (620 kg)</td>
<td>1360 lb (620 kg)</td>
</tr>
<tr>
<td>Block Volume</td>
<td>9.6 ft³ (0.27 m³)</td>
<td>9.5 ft³ (0.27 m³)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Freestanding Blocks</th>
<th>Corner Bottom</th>
<th>Corner Top</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F-CB</strong></td>
<td>Cobble / Limestone</td>
<td>Kingstone / Ledgestone</td>
</tr>
<tr>
<td>Block Weight</td>
<td>1490 lb (690 kg)</td>
<td>1480 lb (670 kg)</td>
</tr>
<tr>
<td>Block Volume</td>
<td>10.4 ft³ (0.30 m³)</td>
<td>10.3 ft³ (0.29 m³)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Freestanding Blocks</th>
<th>Corner Garden Top</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F-CT</strong></td>
<td>Cobble / Limestone</td>
</tr>
<tr>
<td>Block Weight</td>
<td>1340 lb (610 kg)</td>
</tr>
<tr>
<td>Block Volume</td>
<td>9.4 ft³ (0.26 m³)</td>
</tr>
</tbody>
</table>

#### Half Corner Middle

<table>
<thead>
<tr>
<th>Freestanding Blocks</th>
<th>Corner Middle</th>
<th>Corner Garden Top</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F-HCM</strong></td>
<td>Cobble / Limestone</td>
<td>Kingstone / Ledgestone</td>
</tr>
<tr>
<td>Block Weight</td>
<td>665 lb (300 kg)</td>
<td>655 lb (300 kg)</td>
</tr>
<tr>
<td>Block Volume</td>
<td>4.6 ft³ (0.13 m³)</td>
<td>4.6 ft³ (0.13 m³)</td>
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</table>

<table>
<thead>
<tr>
<th>Freestanding Blocks</th>
<th>Corner Bottom</th>
<th>Corner Top</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F-HCB</strong></td>
<td>Cobble / Limestone</td>
<td>Kingstone / Ledgestone</td>
</tr>
<tr>
<td>Block Weight</td>
<td>710 lb (320 kg)</td>
<td>700 lb (320 kg)</td>
</tr>
<tr>
<td>Block Volume</td>
<td>5.0 ft³ (0.14 m³)</td>
<td>4.9 ft³ (0.14 m³)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Freestanding Blocks</th>
<th>Corner Garden Top</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F-HCT</strong></td>
<td>Cobble / Limestone</td>
</tr>
<tr>
<td>Block Weight</td>
<td>640 lb (290 kg)</td>
</tr>
<tr>
<td>Block Volume</td>
<td>4.5 ft³ (0.13 m³)</td>
</tr>
</tbody>
</table>

1. Units for dimensions are inches (mm), typical unless noted otherwise.
2. Block production varies with each licensed Redi-Rock manufacturer.
3. Architectural faces on the blocks have varying texture.
4. Actual block volumes and weights may vary.
5. Weights are based upon a concrete density of 143 lbs/ft³ (2291 kg/m³).
6. Knots are typically 10" (254mm) diameter by 4" (102 mm) tall. Smaller knobs are available.

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### Block Library

#### Freestanding Blocks

<table>
<thead>
<tr>
<th>Block Type</th>
<th>Face Texture</th>
<th>Block Volume</th>
<th>Block Weight</th>
<th>Infill Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-HC HOLLOW-CORE</td>
<td>Cobble / Limestone</td>
<td>9.10 ft³ (0.26m³)</td>
<td>910 lb (410 kg)</td>
<td>3.19 ft³ (0.090 m³)</td>
</tr>
<tr>
<td></td>
<td>Cobble / Limestone</td>
<td>7.01 ft³ (0.20m³)</td>
<td>970 lb (440 kg)</td>
<td>2.04 ft³ (0.058 m³)</td>
</tr>
<tr>
<td>F-HCHC CORNER HOLLOW-CORE</td>
<td>Cobble / Limestone</td>
<td>9.2 ft³ (0.26m³)</td>
<td>1330 lb (600 kg)</td>
<td>3.53 ft³ (0.100 m³)</td>
</tr>
<tr>
<td></td>
<td>Cobble / Limestone</td>
<td>5.20 ft³ (0.15m³)</td>
<td>550 lb (250 kg)</td>
<td>1.31 ft³ (0.037 m³)</td>
</tr>
<tr>
<td>F-JHC HALF HOLLOW-CORE</td>
<td>Cobble / Limestone</td>
<td>9.10 ft³ (0.26m³)</td>
<td>910 lb (410 kg)</td>
<td>3.19 ft³ (0.090 m³)</td>
</tr>
<tr>
<td></td>
<td>Cobble / Limestone</td>
<td>7.01 ft³ (0.20m³)</td>
<td>970 lb (440 kg)</td>
<td>2.04 ft³ (0.058 m³)</td>
</tr>
<tr>
<td>F-JHGC HALF CORNER HOLLOW-CORE</td>
<td>Cobble / Limestone</td>
<td>9.2 ft³ (0.26m³)</td>
<td>1330 lb (600 kg)</td>
<td>3.53 ft³ (0.100 m³)</td>
</tr>
<tr>
<td></td>
<td>Cobble / Limestone</td>
<td>5.20 ft³ (0.15m³)</td>
<td>550 lb (250 kg)</td>
<td>1.31 ft³ (0.037 m³)</td>
</tr>
</tbody>
</table>

1. Units for dimensions are inches (mm), typical unless noted otherwise.
2. Confirm block production with licensed Redi-Rock manufacturer.
3. Architectural faces on the blocks have varying texture.
4. Average block weights shown. Actual block volumes and weights may vary.
5. Weights are based upon a concrete density of 143 lb/ft³ (2291 kg/m³).

---

### Block Library

#### Freestanding Blocks

<table>
<thead>
<tr>
<th>Block Type</th>
<th>Face Texture</th>
<th>Block Volume</th>
<th>Block Weight</th>
<th>Infill Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-9C 9” (230) STEPDOWN CORNER</td>
<td>Cobble / Limestone</td>
<td>9.3 ft³ (0.26m³)</td>
<td>1330 lb (600 kg)</td>
<td>3.30 ft³ (0.093 m³)</td>
</tr>
<tr>
<td></td>
<td>Cobble / Limestone</td>
<td>5.17 ft³ (0.146 m³)</td>
<td>740 lb (340 kg)</td>
<td>2.04 ft³ (0.058 m³)</td>
</tr>
<tr>
<td>F-9SG 9” (230) STEPDOWN GARDEN</td>
<td>Cobble / Limestone</td>
<td>9.3 ft³ (0.26m³)</td>
<td>1330 lb (600 kg)</td>
<td>3.30 ft³ (0.093 m³)</td>
</tr>
<tr>
<td></td>
<td>Cobble / Limestone</td>
<td>5.17 ft³ (0.146 m³)</td>
<td>740 lb (340 kg)</td>
<td>2.04 ft³ (0.058 m³)</td>
</tr>
</tbody>
</table>

1. Units for dimensions are inches (mm), typical unless noted otherwise.
2. Block production varies with each licensed Redi-Rock manufacturer.
3. Architectural faces on the blocks have varying texture.
4. Actual block volumes and weights may vary.
5. Weights are based upon a concrete density of 143 lb/ft³ (2291 kg/m³).
### ACCESSORY BLOCKS
**COLUMNS, STEPS, AND CAPS**

The Redi-Rock Column and Accessory blocks come in multiple widths and configurations. The defining characteristic is that these blocks have an aesthetic texture cast into two or more faces, and create columns, caps, and steps that complement both Retaining and Freestanding blocks. These blocks are machine-placed, wet-cast, precut modular block units manufactured from first purpose, non-reconstituted concrete and intended for constructing dry-stacked modular features that coordinate with retaining walls. The block units are manufactured from structural-grade concrete mixes in accordance with ASTM C84 or ASTM C685 that produce a finished unit with excellent resistance to freeze-thaw, deicing chemical exposure, and submerged conditions in both fresh water and salt water applications. All Redi-Rock blocks are manufactured and distributed through an international network of individually-owned, licensed precast concrete manufacturers.

### CONCRETE MIX PROPERTIES

<table>
<thead>
<tr>
<th>Exposure Class</th>
<th>Minimum 28 Day Compressive Strength</th>
<th>Maximum Water Cement Ratio</th>
<th>Nominal Maximum Aggregate Size</th>
<th>Aggregate Class Designation</th>
<th>Air Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODERATE</td>
<td>4,000 psi (27.8 MPa)</td>
<td>0.45</td>
<td>1.0 (25)</td>
<td>S1</td>
<td>3M</td>
</tr>
<tr>
<td>SEVERE</td>
<td>4,000 psi (27.8 MPa)</td>
<td>0.45</td>
<td>1.0 (25)</td>
<td>S3</td>
<td>6.0% ± 1.5%</td>
</tr>
<tr>
<td>VERY SEVERE</td>
<td>4,500 psi (30.0 MPa)</td>
<td>0.40</td>
<td>1.0 (25)</td>
<td>S4</td>
<td>6.0% ± 1.5%</td>
</tr>
</tbody>
</table>

### MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl-) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT (4, 6, 7)

<table>
<thead>
<tr>
<th>Exposure Class</th>
<th>Maximum Chloride as Cl- Concentration in Mixing Water, Parts per Million</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODERATE</td>
<td>0.15</td>
</tr>
<tr>
<td>SEVERE</td>
<td>0.30</td>
</tr>
<tr>
<td>VERY SEVERE</td>
<td>0.50</td>
</tr>
</tbody>
</table>

### REFERENCE DIMENSIONS

\[
\text{HEIGHT} = \text{VERTICAL DIMENSION OF TEXTURED FACE} \\
\text{LENGTH} = \text{LONGER HORIZONTAL DIMENSION OF TEXTURED FACE} \\
\text{WIDTH} = \text{SHORTER HORIZONTAL DIMENSION}
\]

### COLUMN BLOCKS

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Column Blocks</th>
<th>Cap/Step Blocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEIGHT</td>
<td>18 ± 1/2 (457 ± 5)</td>
<td>8 ± 1/2 (152 ± 5)</td>
</tr>
<tr>
<td>LENGTH</td>
<td>24 ± 3/4 (610 ± 13)</td>
<td>Varies ± 3/4 (Varies ± 13)</td>
</tr>
<tr>
<td>WIDTH</td>
<td>24 ± 3/4 (610 ± 13)</td>
<td>Varies ± 3/4 (Varies ± 13)</td>
</tr>
</tbody>
</table>

### ACCESSORY BLOCKS

- **COLUMNS, STEPS, AND CAPS**
- **REFERENCE DIMENSIONS**
  - **HEIGHT** = VERTICAL DIMENSION OF TEXTURED FACE
  - **LENGTH** = LONGER HORIZONTAL DIMENSION OF TEXTURED FACE
  - **WIDTH** = SHORTER HORIZONTAL DIMENSION
- **DIMENSIONAL TOLERANCES**
  - **COLUMN BLOCKS**
    - HEIGHT: 18 ± 1/2 (457 ± 5)
    - LENGTH: 24 ± 3/4 (610 ± 13)
    - WIDTH: 24 ± 3/4 (610 ± 13)
  - **CAP/STEP BLOCK**
    - HEIGHT: 8 ± 1/2 (152 ± 5)
    - LENGTH: Varies ± 3/4 (Varies ± 13)
    - WIDTH: Varies ± 3/4 (Varies ± 13)

### Table Notes:
- (1) Concrete mix properties are in general accordance with ACI 318 durability requirements. Research has shown that concrete manufactured to these standards demonstrates good durability and performance. When these requirements are followed, specific freeze-thaw testing of the concrete is typically NOT required.
- (2) Exposure class is as described in ACI 318.
- (3) Test method ASTM C33.
- (4) Defined in ACI C31.3 Table 3 Limits for Deleterious Substances and Physical Property Requirements of Coarse Aggregate for Concrete.
- (5) Test method ASTM C231.
- (6) Test method ASTM C1218 at age between 28 and 42 days.
- (7) Where used in high-sulfate environments or where alkali-silica reactivity is an issue, water-soluble chloride shall be limited to no more than trace amounts (from impurities in concrete-making components, not intended constituents.)
- (8) The total cementitious material also includes ASTM C150, C595, C845, and C1157 cement. The maximum percentages shall include:
  - Fly ash or other pozzolans in type IP, blended cement, ASTM C595, or ASTM C1157.
  - Slag used in the manufacture of an IS blended cement, ASTM C595, or ASTM C1157.
- (9) Silica fume, ASTM C1240, present in a blended cement.
- (10) Fly ash or other pozzolans and silica fume shall constitute no more than 25 and 10 percent, respectively, of the total weight of the cementitious materials.
- (11) Prescriptive limits shown may be waived for concrete mixes that demonstrate excellent freeze-thaw durability in a detailed and current testing program.
- (12) All dimensions are shown in units of inches (mm).
- (13) Permissible defects: Chips smaller than 1.5" (38mm) in its largest dimension and cracks not wider than 0.012" (0.305mm) and not longer than 25% of the nominal height of the block; bug holes in the architectural face smaller than 0.75" (19mm); and bug holes, water marks, and color variation on non-architectural faces.
- (14) COLUMNS, STEPS, AND CAPS have a smooth troweled finish on horizontal faces.
### Block Library

#### ACCESSORIES (CAP AND STEP BLOCKS)

<table>
<thead>
<tr>
<th>Block Library</th>
<th>A-2SC</th>
<th>A-4SC</th>
<th>A-3SC72</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWO-SIDED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block Weight</td>
<td>630 lb (290 kg)</td>
<td>670 lb (300 kg)</td>
<td>1040 lb (470 kg)</td>
</tr>
<tr>
<td>Block Volume</td>
<td>4.42 ft³ (0.125 m³)</td>
<td>4.66 ft³ (0.132 m³)</td>
<td>7.3 ft³ (0.21 m³)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BLOCK LIBRARY</th>
<th>A-4SC</th>
<th>A-3SC72</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOUR-SIDED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block Weight</td>
<td>670 lb (300 kg)</td>
<td>1040 lb (470 kg)</td>
</tr>
<tr>
<td>Block Volume</td>
<td>4.66 ft³ (0.132 m³)</td>
<td>7.3 ft³ (0.21 m³)</td>
</tr>
</tbody>
</table>

#### ACCESSORIES (COLUMN BLOCKS)

<table>
<thead>
<tr>
<th>Block Library</th>
<th>A-COL8</th>
<th>A-COL4</th>
</tr>
</thead>
<tbody>
<tr>
<td>COLUMN - 8&quot; (203mm) CORE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block Weight</td>
<td>730 lb (330 kg)</td>
<td>810 lb (370 kg)</td>
</tr>
<tr>
<td>Block Volume</td>
<td>5.1 ft³ (0.14 m³)</td>
<td>5.6 ft³ (0.16 m³)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BLOCK LIBRARY</th>
<th>A-COLS</th>
<th>A-CC</th>
</tr>
</thead>
<tbody>
<tr>
<td>COLUMN - SOLID CORE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block Weight</td>
<td>830 lb (380 kg)</td>
<td>390 lb (180 kg)</td>
</tr>
<tr>
<td>Block Volume</td>
<td>2.7 ft³ (0.08 m³)</td>
<td>2.5 ft³ (0.07 m³)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BLOCK LIBRARY</th>
<th>A-COL8</th>
<th>A-COL4</th>
</tr>
</thead>
<tbody>
<tr>
<td>COLUMN - 4” (102mm) CORE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block Weight</td>
<td>810 lb (370 kg)</td>
<td>810 lb (370 kg)</td>
</tr>
<tr>
<td>Block Volume</td>
<td>5.6 ft³ (0.16 m³)</td>
<td>5.6 ft³ (0.16 m³)</td>
</tr>
</tbody>
</table>

1. Units for dimensions are inches (mm), typical unless noted otherwise.
2. Block production varies with each licensed Redi-Rock manufacturer. Confirm availability before Specifying or Ordering.
3. Actual block volumes and weights may vary.
4. Weights are based upon a concrete density of 143 lb/ft³ (2291 kg/m³).
5. Weight and volume ranges represent the blocks with the maximum hole size shown and with no hole.
6. Optional fence rail pockets available upon request. Typical pocket size is: 2 (50) wide x 5 (130) deep x 9 (230) tall.
Project: Spokane Residence  
Block Manufacturer: Wilbert Precast  
Engineer: John McKervey, P.E. of JM Engineering  
Contractor: Ben Jeffers  
Location: Spokane, Washington  
Completed: 2014

CONCRETE
Design Unit Weight = 143 pcf (2291 kg/m³)
LIMESTONE AND COBBLESTONE FACE TEXTURE
Average Volume (Vc) 11.28 ft³ (0.32 m³) (From CAD Model)
Concrete Block Weight (Wc) Wc = 11.28 ft³ x 143 pcf = 1,613 lbs (732 kg)
KINGSTONE AND LEDGESTONE FACE TEXTURE
Average Volume (Vc) 10.78 ft³ (0.31 m³) (From CAD Model)
Concrete Block Weight (Wc) Wc = 10.78 ft³ x 143 pcf = 1,542 lbs (699 kg)
Average Center of Gravity (COGc) 13.9 in (353 mm) (From CAD Model)

INFILL SOIL
Design Unit Weight = 100 pcf (1602 kg/m³)
Soil considered as infill includes the soil between adjacent blocks and at the ends of the bottom groove in the block.
Volume (Vs) 1.05 ft³ (0.03 m³) (From CAD Model)
Infill Soil Weight (Ws) Ws = 1.05 ft³ x 100 pcf = 105 lbs (47.7 kg)
Center of Gravity (COGs) 13.6 in (345 mm) (Data from CAD Model)

DETAILED CALCULATIONS

INFILLED UNIT WEIGHT CALCULATIONS

**CONCRETE**

LIMESTONE AND COBBLESTONE FACE TEXTURE

\[ \text{INFILL} = \frac{1,613 \text{ lb} + 105 \text{ lb}}{13.45 \text{ ft}^3} = 127.7 \text{ pcf} \]

KINGSTONE AND LEDGESTONE FACE TEXTURE

\[ \text{INFILL} = \frac{1,542 \text{ lb} + 105 \text{ lb}}{13.45 \text{ ft}^3} = 122.4 \text{ pcf} \]

NOTE: The infilled unit weights shown here are reference values. Several factors can cause the unit weights of both concrete and infill soil to vary. The designer should use sound engineering judgement when assigning an infilled unit weight value for analysis.

DESIGN VOLUME

28 in x 46.125 in x 18 in = 13.45 ft³ (0.711 m x 1.172 m x 0.457 m = 0.38 m³)

INFILLED UNIT WEIGHT

LIMESTONE AND COBBLESTONE FACE TEXTURE

\[ \text{INFILL} = \frac{1,613 \text{ lb} + 105 \text{ lb}}{13.45 \text{ ft}^3} = 127.7 \text{ pcf} \]

KINGSTONE AND LEDGESTONE FACE TEXTURE

\[ \text{INFILL} = \frac{1,542 \text{ lb} + 105 \text{ lb}}{13.45 \text{ ft}^3} = 122.4 \text{ pcf} \]

NOTE: The infilled unit weights shown here are reference values. Several factors can cause the unit weights of both concrete and infill soil to vary. The designer should use sound engineering judgement when assigning an infilled unit weight value for analysis.
Infill Weight Calculations

R-28PCM 28” (710 mm) POSITIVE CONNECTION (PC) MIDDLE BLOCK WITH SOIL INFILL

DESIGN VOLUME
28 in x 46.125 in x 18 in = 23,247 in³ = 13.45 cft
(0.711 m x 1.172 m x 0.457 m = 0.38 m³)

INFILLED UNIT WEIGHT
LIMESTONE AND COBBLESTONE FACE TEXTURE
INFILL = (1,519 lb + 173 lb) / 13.45 cft = 125.8 pcf
((690 kg + 79 kg) / 0.381 m³ = 2015 kg/m³)

KINGSTONE AND LEDGESTONE FACE TEXTURE
INFILL = (1,447 lb + 173 lb) / 13.45 cft = 120.4 pcf
((658 kg + 79 kg) / 0.381 m³ = 1629 kg/m³)

NOTE: The infilled unit weights shown here are reference values. Several factors can cause the unit weights of both concrete and infill soil to vary. The designer should use sound engineering judgment when assigning an infilled unit weight value for analysis.

INFILLED UNIT WEIGHT CALCULATIONS
CONCRETE
Design Unit Weight = 143 pcf (2291 kg/m³)
LIMESTONE AND COBBLESTONE FACE TEXTURE
Average Volume (Vc) 10.62 cft (0.30 m³) (From CAD Model)
Concrete Block Weight (Wc) Wc = 10.62 cft x 143 pcf = 1,519 lbs (690 kg)
Average Center of Gravity (COGc) 14.0 in (356 mm) (From CAD Model)
INFILL SOIL
Design Unit Weight = 100 pcf (1602 kg/m³)
Soil considered as infill includes the soil between adjacent blocks, in the geogrid slot, and at the ends of the bottom groove in the block.
Volume (Vs) 1.73 cft (0.05 m³) (From CAD Model)
Infill Soil Weight (Ws) Ws = 1.73 cft x 100 pcf = 173 lbs (79 kg)
Center of Gravity (COGs) 9.9 in (251 mm) (Data from CAD Model)

R-41M 41” (1030 mm) MIDDLE BLOCK WITH SOIL INFILL

DESIGN VOLUME
40.5 in x 46.125 in x 18 in = 19.46 cft
(1.03 m x 1.172 m x 0.457 m = 0.55 m³)

INFILLED UNIT WEIGHT
LIMESTONE AND COBBLESTONE FACE TEXTURE
INFILL = (2,308 lb + 218 lb) / 19.46 cft = 129.8 pcf
((1049 kg + 99 kg) / 0.551 m³ = 2079 kg/m³)

KINGSTONE AND LEDGESTONE FACE TEXTURE
INFILL = (2,238 lb + 218 lb) / 19.46 cft = 126.2 pcf
((1017 kg + 99 kg) / 0.551 m³ = 2021 kg/m³)

NOTE: The infilled unit weights shown here are reference values. Several factors can cause the unit weights of both concrete and infill soil to vary. The designer should use sound engineering judgment when assigning an infilled unit weight value for analysis.
**Infill Weight Calculations**

**R-41PCM 41” (1030 mm) POSITIVE CONNECTION (PC) MIDDLE BLOCK WITH SOIL INFILL**

<table>
<thead>
<tr>
<th>Concrete Type</th>
<th>Design Unit Weight</th>
<th>Average Volume (Vc)</th>
<th>Concrete Block Weight (Wc)</th>
<th>Average Center of Gravity (COGc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limestone and Cobblestone Face Texture</td>
<td>143 pcf (2291 kg/m³)</td>
<td>15.19 cft (0.43 m³)</td>
<td>2172 lbs (987 kg)</td>
<td>20.4 in (518 mm)</td>
</tr>
<tr>
<td>Kingstone and Ledgestone Face Texture</td>
<td>143 pcf (2291 kg/m³)</td>
<td>14.69 cft (0.42 m³)</td>
<td>2101 lbs (955 kg)</td>
<td>31.1 in (789 mm)</td>
</tr>
</tbody>
</table>

**INFILL SOIL**

Design Unit Weight = 100 pcf (1602 kg/m³)

Soil considered as infill includes the soil between adjacent blocks, in the geogrid slot, and at the ends of the bottom groove in the block.

Volume (Vs) = 2.92 cft (0.08 m³)

Infill weight calculations:

**INFILLED UNIT WEIGHT CALCULATIONS**

<table>
<thead>
<tr>
<th>Concrete Type</th>
<th>Design Unit Weight</th>
<th>Average Volume (Vc)</th>
<th>Concrete Block Weight (Wc)</th>
<th>Average Center of Gravity (COGc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limestone and Cobblestone Face Texture</td>
<td>143 pcf (2291 kg/m³)</td>
<td>23.00 cft (0.66 m³)</td>
<td>3288 lbs (1495 kg)</td>
<td>31.1 in (789 mm)</td>
</tr>
<tr>
<td>Kingstone and Ledgestone Face Texture</td>
<td>143 pcf (2291 kg/m³)</td>
<td>22.49 cft (0.64 m³)</td>
<td>3216 lbs (1462 kg)</td>
<td>31.1 in (789 mm)</td>
</tr>
</tbody>
</table>

**R-60M 60” (1520 mm) MIDDLE BLOCK WITH SOIL INFILL**

<table>
<thead>
<tr>
<th>Concrete Type</th>
<th>Design Unit Weight</th>
<th>Average Volume (Vc)</th>
<th>Concrete Block Weight (Wc)</th>
<th>Average Center of Gravity (COGc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limestone and Cobblestone Face Texture</td>
<td>143 pcf (2291 kg/m³)</td>
<td>23.00 cft (0.66 m³)</td>
<td>3288 lbs (1495 kg)</td>
<td>31.1 in (789 mm)</td>
</tr>
<tr>
<td>Kingstone and Ledgestone Face Texture</td>
<td>143 pcf (2291 kg/m³)</td>
<td>22.49 cft (0.64 m³)</td>
<td>3216 lbs (1462 kg)</td>
<td>31.1 in (789 mm)</td>
</tr>
</tbody>
</table>

**INFILL SOIL**

Design Unit Weight = 100 pcf (1602 kg/m³)

Soil considered as infill includes the soil between adjacent blocks.

Volume (Vs) = 4.70 cft (0.13 m³)

Infill weight calculations:

**INFILLED UNIT WEIGHT CALCULATIONS**

<table>
<thead>
<tr>
<th>Concrete Type</th>
<th>Design Unit Weight</th>
<th>Average Volume (Vc)</th>
<th>Concrete Block Weight (Wc)</th>
<th>Average Center of Gravity (COGc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limestone and Cobblestone Face Texture</td>
<td>143 pcf (2291 kg/m³)</td>
<td>23.00 cft (0.66 m³)</td>
<td>3288 lbs (1495 kg)</td>
<td>31.1 in (789 mm)</td>
</tr>
<tr>
<td>Kingstone and Ledgestone Face Texture</td>
<td>143 pcf (2291 kg/m³)</td>
<td>22.49 cft (0.64 m³)</td>
<td>3216 lbs (1462 kg)</td>
<td>31.1 in (789 mm)</td>
</tr>
</tbody>
</table>

**NOTE:** The infilled unit weights shown here are reference values. Several factors can cause the unit weights of both concrete and infill soil to vary. The designer should use sound engineering judgement when assigning an infilled unit weight value for analysis.
**CONCRETE**

Design Unit Weight = 143 pcf (2,291 kg/m³)

**LIMESTONE AND COBBLESTONE FACE TEXTURE**

Average Volume (Vc) = 23.00 cft (0.677 m³) (From CAD Model)

Concrete Block Weight (Wc) = 23.00 cft x 143 pcf = 3,418 lbs

Average Center of Gravity (COGc) = 31.6 in from Back of Block (From CAD Model)

**INFILL SOIL**

Design Unit Weight = 100 pcf (1,602 kg/m³)

Material considered as infill includes the crushed stone between adjacent blocks and in the hollow cores within the blocks.

Volume (Vs) = 22.88 cft (0.65 m³) (From CAD Model)

Infill Soil Weight (Ws) = 22.88 cft x 100 pcf = 2,288 lbs

Center of Gravity (COGs) = 20.0 in (507 mm) (From CAD Model)

**DESIGN VOLUME & CENTER OF GRAVITY**

52 in x 46.125 in x 36 in = 49.97 cft

\[ \text{COG} = \frac{29.0 \text{ in} (3,331 \text{ lbs}) + 20.0 \text{ in} (2,288 \text{ lbs})}{3,331 \text{ lbs} + 2,288 \text{ lbs}} = 25.34 \text{ in} \]

**INFILLED UNIT WEIGHT CALCULATIONS**

**CONCRETE**

Design Unit Weight = 143 pcf (2,291 kg/m³)

**LEDGESTONE FACE TEXTURE**

Average Volume (Vc) = 23.29 cft (0.66 m³) (From CAD Model)

Concrete Block Weight (Wc) = 23.29 cft x 143 pcf = 3,331 lbs

Average Center of Gravity (COGc) = 29.0 in (737 mm) (From CAD Model)

**INFILL**

Design Unit Weight = 100 pcf (1,602 kg/m³)

Material considered as infill includes the crushed stone between adjacent blocks and in the hollow cores within the blocks.

Volume (Vs) = 22.88 cft (0.65 m³) (From CAD Model)

Infill Soil Weight (Ws) = 22.88 cft x 100 pcf = 2,288 lbs

Center of Gravity (COGs) = 20.0 in (507 mm) (From CAD Model)

**INFILLED UNIT WEIGHT**

\[ \text{INFILL} = \frac{3,331 \text{ lbs} + 2,288 \text{ lbs}}{49.97 \text{ cft}} = 112.4 \text{ pcf} \]

\[ ((1,511 \text{ kg} + 1,038 \text{ kg}) / 1.415 \text{ m}^3 = 1,801 \text{ kg/m}^3) \]

**NOTE:** The infilled unit weights shown here are reference values. Several factors can cause the unit weights of both concrete and infill soil to vary. The designer should use sound engineering judgement when assigning an infilled unit weight value for analysis.

**R-5236HC 52” (1,320 mm) XL HOLLOW-CORE RETAINING BLOCK WITH SOIL INFILL**

Infill Weight Calculations

R-60B 60” (1520 mm) BOTTOM BLOCK WITH SOIL INFILL

Infill Weight Calculations

R-5236HC 52” (1,320 mm) XL HOLLOW-CORE RETAINING BLOCK WITH SOIL INFILL

Infill Weight Calculations

R-60B 60” (1520 mm) BOTTOM BLOCK WITH SOIL INFILL

Infill Weight Calculations

R-5236HC 52” (1,320 mm) XL HOLLOW-CORE RETAINING BLOCK WITH SOIL INFILL

Infill Weight Calculations

R-60B 60” (1520 mm) BOTTOM BLOCK WITH SOIL INFILL

Infill Weight Calculations

R-5236HC 52” (1,320 mm) XL HOLLOW-CORE RETAINING BLOCK WITH SOIL INFILL

Infill Weight Calculations

R-60B 60” (1520 mm) BOTTOM BLOCK WITH SOIL INFILL

Infill Weight Calculations

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Infill Weight Calculations

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Infill Weight Calculations

R-60B 60” (1520 mm) BOTTOM BLOCK WITH SOIL INFILL

Infill Weight Calculations

R-5236HC 52” (1,320 mm) XL HOLLOW-CORE RETAINING BLOCK WITH SOIL INFILL

Infill Weight Calculations
**Infill Weight Calculations**

**R-7236HC 72” (1,830 mm) XL HOLLOW-CORE RETAINING BLOCK WITH SOIL INFILL**

**CONCRETE**
- Design Unit Weight = 143 pcf (2,291 kg/m³)

**LEDGESTONE FACE TEXTURE**
- Average Volume (Vc) = 33.83 cft (0.96 m³) (From CAD Model)
- Concrete Block Weight (Wc) = 33.83 cft x 143 pcf = 4,837 lbs (2,194 kg)
- Average Center of Gravity (COGc) = 55.3 in (1,405 mm) (From CAD Model)

**INFILL**
- Design Unit Weight = 100 pcf (1,602 kg/m³)

**INFILLED UNIT WEIGHT CALCULATIONS**
- Volume (Vs) = 54.63 cft (1.55 m³) (From CAD Model)
- Infill Soil Weight (Ws) = 54.63 cft x 100 pcf = 5,463 lbs (2,478 kg)
- Center of Gravity (COGs) = 40.7 in (1,034 mm) (From CAD Model)

**DESIGN VOLUME & CENTER OF GRAVITY**
- 96 in x 46.125 in x 36 in = 92.25 cft (2.438 m x 1.172 m x 0.914 m = 2.612 m³)
- COG = (55.3 in (4,837 lbs) + 40.7 in (5,463 lbs)) / (4,837 lbs + 5,463 lbs) = 47.57 in (1,208 mm)

**INFILLED UNIT WEIGHT**
- INFILL = (4,837 lb + 5,463 lb) / 92.25 cft = 111.7 pcf ((2,194 kg + 2,478 kg) / 2.612 m³ = 1,789 kg/m³)

**NOTE:** The infilled unit weights shown here are reference values. Several factors can cause the unit weights of both concrete and infill soil to vary. The designer should use sound engineering judgement when assigning an infilled unit weight value for analysis. For overturning analyses, AASHTO recommends limiting the infill soil weight to 80% of its theoretical maximum for units without a solid bottom (11.11.4).
The block-to-block setback available with Redi-Rock is controlled by the size and location of the shear knobs (domes) cast into the blocks. While the 10" (254 mm) diameter knob and the 1 5/8" (41 mm) setback position is the most common configuration, Redi-Rock has three different knob sizes and three different locations available.

**Five degree (5°) setback**  
**(Standard)**

- 10" (254 mm) diameter knob
- Setback = 1 5/8" (41 mm)  
  (5° batter angle on wall)

Available with:
- 28" (710 mm) blocks, 41" (1030 mm) blocks, and 60" (1520 mm) blocks
- 28" (710 mm) PC blocks (shown here) and 41" (1030 mm) PC blocks

**One degree (1°) setback**  
**(Specialty)**

- 7 1/2" (190 mm) diameter knob
- Setback = 3/8" (10 mm)  
  (1° batter angle on wall)

Available with:
- 28" (710 mm) blocks, 41" (1030 mm) blocks, and 60" (1520 mm) blocks
- 28" (710 mm) PC blocks (shown here) and 41" (1030 mm) PC blocks

**Zero (0°) setback**  
**(Specialty)**

- 6 3/4" (171 mm) diameter knob
- Setback = 0" (0 mm)  
  (0° batter angle on wall)

Available with:
- 28" (710 mm) blocks, 41" (1030 mm) blocks, and 60" (1520 mm) blocks
- 28" (710 mm) PC blocks (shown here) and 41" (1030 mm) PC blocks
Redi-Rock has two options for large batter retaining walls. Both options are created by relocating the knob so that it is further back in the Redi-Rock blocks compared to our smaller batter walls (5° and less). There are two knob locations further back in the block which create the 9° (230 mm) setback block and the planter block. Blocks made with knobs in either of these locations almost exclusively use 10” (254 mm) diameter knobs.

### 9” (230 mm) Setback Blocks

- **Setback Blocks**
  - **Setback = 9 3/8” (238 mm)**
  - **27.5° batter angle on wall**

<table>
<thead>
<tr>
<th>Block Width</th>
<th>Setback</th>
</tr>
</thead>
<tbody>
<tr>
<td>4” (102 mm)</td>
<td>7 3/4” (198 mm)</td>
</tr>
<tr>
<td>4 3/4” (114 mm)</td>
<td>7 5/8” (197 mm)</td>
</tr>
</tbody>
</table>

**Available with:**
- 41” (1030 mm) blocks (shown here) and 60” (1520 mm) blocks
- Not available in PC blocks

**Planter Blocks**

- **Setback = 16 5/8” (422 mm)**

<table>
<thead>
<tr>
<th>Block Width</th>
<th>Setback</th>
</tr>
</thead>
<tbody>
<tr>
<td>4” (102 mm)</td>
<td>13 3/8” (340 mm)</td>
</tr>
<tr>
<td>4 3/4” (114 mm)</td>
<td>13 5/8” (343 mm)</td>
</tr>
</tbody>
</table>

**Available with:**
- 41” (1030 mm) blocks (shown here) and 60” (1520 mm) blocks
- Not available in PC blocks

---

### Block Setback

The block-to-block setback available with 36” (914 mm) high Redi-Rock XL hollow-core retaining blocks is controlled by the location of the shear knobs cast into the blocks. The 3 1/4” (83 mm) setback between courses creates a 5° batter angle on the back of the wall which is consistent with the batter angle created by 18” (457 mm) high Redi-Rock blocks with 10” (254 mm) shear knobs.

**36” (914 mm) High XL Hollow-Core Retaining Blocks**

- **Setback = 3 1/4” (83 mm)**
- **5° Batter Angle on Wall**

**Available with:**
- 52” (1320 mm), 72” (1830 mm), and 96” (2440 mm) XL hollow-core retaining blocks.

---

**18” (457 mm) OUTDOOR BLOCKS**

- **Setback = 3 1/4” (83 mm)**
- **5° Batter Angle on Wall**

**Available with:**
- 36” (914 mm) hollow-core retaining blocks.
Interface Shear Report 6.75” (171 mm)

Test Methods: ASTM D6916 & NCMA SRWU-2
Test Facility: Bathurst, Clarabut Geotechnical Testing, Inc.
Block Type: 28” (710 mm) Positive Connection (PC) Block
Test Dates: 10/21/2011 - 6.75” (171 mm) Shear Knob Test

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>522 (7.618)</td>
<td>838 (12.230)</td>
<td>1,124 (16.168)</td>
<td>Test Stopped</td>
</tr>
<tr>
<td>2</td>
<td>10,209 (145.9)</td>
<td>11,324 (165.261)</td>
<td>11,324 (165.261)</td>
<td>Test Stopped</td>
</tr>
<tr>
<td>3</td>
<td>16,323 (237.324)</td>
<td>11,252 (164.211)</td>
<td>11,252 (164.211)</td>
<td>Test Stopped</td>
</tr>
<tr>
<td>4</td>
<td>13,612 (198.853)</td>
<td>11,096 (161.058)</td>
<td>11,096 (161.058)</td>
<td>Test Stopped</td>
</tr>
<tr>
<td>5</td>
<td>11,076 (161.627)</td>
<td>10,462 (152.681)</td>
<td>10,462 (152.681)</td>
<td>Test Stopped</td>
</tr>
<tr>
<td>6</td>
<td>11,074 (161.613)</td>
<td>11,060 (161.409)</td>
<td>11,252 (164.211)</td>
<td>Knob Shear</td>
</tr>
<tr>
<td>7</td>
<td>12,041 (177.115)</td>
<td>10,408 (151.803)</td>
<td>11,043 (163.510)</td>
<td>Test Stopped</td>
</tr>
<tr>
<td>8</td>
<td>5,854 (85.433)</td>
<td>8,327 (121.669)</td>
<td>9,095 (144.590)</td>
<td>Test Stopped</td>
</tr>
<tr>
<td>9</td>
<td>3,077 (44.920)</td>
<td>5,722 (83.506)</td>
<td>6,103 (90.706)</td>
<td>Knob Shear</td>
</tr>
<tr>
<td>10</td>
<td>10,981 (160.295)</td>
<td>10,821 (157.902)</td>
<td>11,252 (164.211)</td>
<td>Knob Shear</td>
</tr>
</tbody>
</table>

Peak Shear[4]: \( S_p = 1,178 + N \tan 54^\circ \leq 10,970 \text{ lb/ft (kN/m)} \)

Service State Shear[4]: \( S_{ss} = 166 + N \tan 54^\circ \leq 10,970 \text{ lb/ft (kN/m)} \)

The information contained in this report has final determination of the suitability of any design information and the appropriateness of the foregoing laboratory test results. Issue date: January 26, 2015.

Interface Shear Report 10” (254 mm)

Test Methods: ASTM D6916 & NCMA SRWU-2
Test Facility: Bathurst, Clarabut Geotechnical Testing, Inc.
Block Type: 28” (710 mm) Positive Connection (PC) Block
Test Dates: 10/14/2011 - 10” (254 mm) Shear Knob Test

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>19,819 (286.318)</td>
<td>11,300 (164.911)</td>
<td>11,300 (164.911)</td>
<td>Test Stopped</td>
</tr>
<tr>
<td>2</td>
<td>16,087 (233.605)</td>
<td>11,300 (164.911)</td>
<td>11,300 (164.911)</td>
<td>Test Stopped</td>
</tr>
<tr>
<td>3</td>
<td>13,546 (197.689)</td>
<td>11,371 (165.947)</td>
<td>11,371 (165.947)</td>
<td>Test Stopped</td>
</tr>
<tr>
<td>4</td>
<td>11,042 (161.148)</td>
<td>11,371 (165.947)</td>
<td>11,371 (165.947)</td>
<td>Test Stopped</td>
</tr>
<tr>
<td>5</td>
<td>8,400 (122.589)</td>
<td>11,204 (163.510)</td>
<td>11,204 (163.510)</td>
<td>Test Stopped</td>
</tr>
<tr>
<td>6</td>
<td>10,889 (160.295)</td>
<td>11,252 (164.211)</td>
<td>11,252 (164.211)</td>
<td>Test Stopped</td>
</tr>
<tr>
<td>7</td>
<td>7,985 (119.440)</td>
<td>10,414 (151.981)</td>
<td>11,156 (162.810)</td>
<td>Test Stopped</td>
</tr>
<tr>
<td>8</td>
<td>3,137 (45.781)</td>
<td>7,449 (110.003)</td>
<td>10,174 (148.478)</td>
<td>Test Stopped</td>
</tr>
<tr>
<td>9</td>
<td>522 (7.608)</td>
<td>3,926 (57.290)</td>
<td>6,023 (88.045)</td>
<td>Test Stopped</td>
</tr>
</tbody>
</table>

Service State Shear[4]: \( S_{ss} = 3,390 + N \tan 51^\circ \leq 11,276 \text{ lb/ft (kN/m)} \)

Peak Shear[4]: \( S_p = 6,061 + N \tan 44^\circ \leq 11,276 \text{ lb/ft (kN/m)} \)

The information contained in this report has final determination of the suitability of any design information and the appropriateness of the foregoing laboratory test results. Issue date: January 26, 2015.
**Inflection Points:**

- Peak Shear Envelope:
  - $S_p = 8488 + N \tan 22^\circ$ (7017 lb/ft $\leq N < 16,118$ lb/ft)
  - $N_2 = 7017$ lb/ft
  - $S_2 = 11,323$ lb/ft

**Test Methods:** ASTM D6916 & NCMA SRWU-2

**Block Type:** R-5236 52" Hollow-Core Retaining Block

**Design Information:**

- Tested By: TRI Environmental | Dec. 10-21, 2017
- Tested By: Redi-Rock International | Mar. 14-23, 2018

**Interface Shear Data**

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Normal Load (lb/ft)</th>
<th>Peak Shear (lb/ft)</th>
<th>Observed Failure</th>
<th>Test No.</th>
<th>Normal Load (lb/ft)</th>
<th>Peak Shear (lb/ft)</th>
<th>Observed Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>872 (12.719)</td>
<td>3,812 (55.630)</td>
<td>Test stopped - uplift</td>
<td>1</td>
<td>7,759 (113.240)</td>
<td>15,635 (228.175)</td>
<td>Test stopped - back cracked</td>
</tr>
<tr>
<td>2</td>
<td>5,025 (73.352)</td>
<td>11,503 (167.877)</td>
<td>Knob/face shear</td>
<td>2</td>
<td>7,840 (114.409)</td>
<td>15,843 (231.212)</td>
<td>Test stopped - back cracked</td>
</tr>
<tr>
<td>3</td>
<td>872 (12.719)</td>
<td>3,383 (49.376)</td>
<td>Test stopped - uplift</td>
<td>3</td>
<td>7,761 (113.270)</td>
<td>13,859 (202.255)</td>
<td>Knob/face shear</td>
</tr>
<tr>
<td>4</td>
<td>16,562 (241.704)</td>
<td>10,062 (147.257)</td>
<td>Test stopped - capacity</td>
<td>4</td>
<td>16,617 (242.502)</td>
<td>17,070 (249.119)</td>
<td>Test stopped - back cracked</td>
</tr>
<tr>
<td>5</td>
<td>2,062 (30.098)</td>
<td>9,070 (131.714)</td>
<td>Test stopped - uplift</td>
<td>5</td>
<td>12,588 (183.705)</td>
<td>17,305 (252.543)</td>
<td>Knob/face shear</td>
</tr>
<tr>
<td>6</td>
<td>3,539 (51.842)</td>
<td>9,857 (143.848)</td>
<td>Test stopped - uplift</td>
<td>6</td>
<td>942 (12.294)</td>
<td>8,643 (126.951)</td>
<td>Knob/face shear</td>
</tr>
<tr>
<td>7</td>
<td>7,773 (113.442)</td>
<td>11,210 (163.998)</td>
<td>Knob/face shear</td>
<td>7</td>
<td>858 (12.522)</td>
<td>8,708 (127.900)</td>
<td>Knob/face shear</td>
</tr>
<tr>
<td>8</td>
<td>7,765 (113.318)</td>
<td>10,601 (154.710)</td>
<td>Test stopped - back cracked</td>
<td>8</td>
<td>2,324 (33.910)</td>
<td>9,102 (132.827)</td>
<td>Test stopped - back cracked</td>
</tr>
<tr>
<td>9</td>
<td>7,656 (111.733)</td>
<td>12,405 (181.044)</td>
<td>Test stopped - back cracked</td>
<td>9</td>
<td>3,609 (52.666)</td>
<td>11,747 (171.436)</td>
<td>Test stopped - back cracked</td>
</tr>
<tr>
<td>10</td>
<td>6,541 (95.458)</td>
<td>12,712 (185.763)</td>
<td>Test stopped - back cracked</td>
<td>10</td>
<td>5,060 (73.848)</td>
<td>10,943 (159.697)</td>
<td>Test stopped - back cracked</td>
</tr>
<tr>
<td>11</td>
<td>12,496 (182.360)</td>
<td>13,962 (203.757)</td>
<td>Test stopped - back cracked</td>
<td>11</td>
<td>6,512 (95.458)</td>
<td>12,978 (189.395)</td>
<td>Test stopped - back cracked</td>
</tr>
</tbody>
</table>

**Peak Shear Envelope:**

- $S_p = 4547 + N \tan 44^\circ$ (N $< 7,017$ lb/ft)
- $S_p = 8488 + N \tan 22^\circ$ (7017 lb/ft $\leq N < 16,118$ lb/ft)
- $S_p = 15,000$ lb/ft (N $\geq 16,118$ lb/ft)

**Normal Load, lb/ft**

- $N_1 = 0$ lb/ft
- $N_2 = 7017$ lb/ft
- $N_3 = 16,118$ lb/ft

**Peak Shear, lb/ft**

- $S_1 = 4547$ lb/ft
- $S_2 = 11,323$ lb/ft
- $S_3 = 15,000$ lb/ft

**Design Information:**

- The average compressive strength at the time of testing of all concrete blocks tested in the hollow-core retaining block test series was 5,350 psi.
- In many cases, the test was stopped before peak shear load occurred because of significant uplift of upper block, damage to the back of upper block where horizontal load was applied, or maximum capacity of test apparatus was reached.
- Design shear capacity inferred from the test data reported herein should be lowered when test failure results from block rupture or knob shear if the horizontal load was applied, or maximum capacity of test apparatus was reached.

**Notes:**

- The equations for peak shear conditions have been modified to reflect the interface shear performance of concrete with a minimum 28-day compressive strength of 4,000 psi. No further adjustments have been made.
- Appropriate factors of safety for design should be included.

The information contained in this report has been compiled by Redi-Rock International, LLC, as a compilation of peak interface shear capacity for hollow-core retaining blocks. No warranty of performance is expressed or implied by the publishing of the foregoing laboratory test results.
### Geogrid Connection Design Parameters—Miragrid 5XT

**Test Methods:** ASTM D6638 & NCMA SRWU-1  
**Test Facility:** Bathurst, Clarabut Geotechnical Testing, Inc.  
**Test Date:** February 17, 2011

**Block Type:** Positive Connection (PC) Block

#### CONNECTION STRENGTH TEST DATA

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Normal Load (lb/ft)</th>
<th>Peak Connection (lb/ft)</th>
<th>Observed Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2,236 (32.6)</td>
<td>5,040 (73.6)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>2</td>
<td>775 (11.3)</td>
<td>4,860 (70.9)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>3</td>
<td>5,165 (74.8)</td>
<td>4,444 (65.0)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>4</td>
<td>2,242 (32.7)</td>
<td>4,343 (63.0)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>5</td>
<td>1,649 (24.1)</td>
<td>4,658 (68.0)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>6</td>
<td>3,123 (45.6)</td>
<td>4,680 (68.3)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>7</td>
<td>2,236 (32.6)</td>
<td>4,838 (70.6)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>8</td>
<td>3,991 (58.2)</td>
<td>4,444 (65.1)</td>
<td>Grid Rupture</td>
</tr>
</tbody>
</table>

#### CONNECTION DESIGN DATA

**Miragrid 5XT Ultimate Tensile Strength (MARV) $T_u = 4,700$ lb/ft (68.1 kN/m)**

- **Ultimate Tensile Strength of Geosynthetic Test Sample $T_{Test} = 5,334$ lb/ft (77.8 kN/m)**
- **Connection Strength / Sample Strength $T_{ultconn}/T_{lot} = 0.84$**
- **Short-term Ultimate Connection Strength Reduction Factor $CR_u = 0.84$**
- **Creep Reduction Factor**
  - **75-Year Design $RF_{creep} = 1.56$**
  - **100-Year Design $RF_{creep} = 1.58$**
- **Durability Reduction Factor $RF_{dur} = 1.15$**
- **Long-term Connection Strength Reduction Factor**
  - **75-Year Design $CR_{dur} = 0.54$**
  - **100-Year Design $CR_{dur} = 0.53$**

#### CONNECTION PERFORMANCE DATA

- **Nominal Long-term Geosynthetic Connection Strength**
  - **75-Year Design $T_{ultconn} = 2,201$ lb/ft (32.1 kN/m)**
  - **100-Year Design $T_{ultconn} = 2,173$ lb/ft (31.7 kN/m)**

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### Geogrid Connection Design Parameters—Miragrid 8XT

**Test Methods:** ASTM D6638 & NCMA SRWU-1  
**Test Facility:** Bathurst, Clarabut Geotechnical Testing, Inc.  
**Test Date:** December 16, 2011

**Block Type:** Positive Connection (PC) Block

#### CONNECTION STRENGTH TEST DATA

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Normal Load (lb/ft)</th>
<th>Peak Connection (lb/ft)</th>
<th>Observed Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1,060 (28.6)</td>
<td>7,995 (116.7)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>2</td>
<td>241 (3.5)</td>
<td>7,949 (116.0)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>3</td>
<td>1,252 (16.9)</td>
<td>7,964 (115.9)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>4</td>
<td>2,028 (29.7)</td>
<td>7,949 (116.0)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>5</td>
<td>2,914 (42.5)</td>
<td>8,269 (120.7)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>6</td>
<td>3,751 (40.4)</td>
<td>7,995 (116.5)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>7</td>
<td>1,000 (14.4)</td>
<td>8,452 (123.3)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>4,551 (66.5)</td>
<td>8,269 (120.7)</td>
<td>Grid Rupture</td>
</tr>
</tbody>
</table>

#### CONNECTION DESIGN DATA

**Miragrid 8XT Ultimate Tensile Strength (MARV) $T_u = 7,400$ lb/ft (108.0 kN/m)**

- **Ultimate Tensile Strength of Geosynthetic Test Sample $T_{Test} = 7,928$ lb/ft (115.7 kN/m)**
- **Connection Strength / Sample Strength $T_{ultconn}/T_{lot} = 0.98$**
- **Short-term Ultimate Connection Strength Reduction Factor $CR_u = 0.84$**
- **Creep Reduction Factor**
  - **75-Year Design $RF_{creep} = 1.55$**
  - **100-Year Design $RF_{creep} = 1.58$**
- **Durability Reduction Factor $RF_{dur} = 1.15$**
- **Long-term Connection Strength Reduction Factor**
  - **75-Year Design $CR_{dur} = 0.54$**
  - **100-Year Design $CR_{dur} = 0.53$**

#### CONNECTION PERFORMANCE DATA

- **Nominal Long-term Geosynthetic Connection Strength**
  - **75-Year Design $T_{ultconn} = 3,465$ lb/ft (50.6 kN/m)**
  - **100-Year Design $T_{ultconn} = 3,421$ lb/ft (49.9 kN/m)**

---
### Geogrid Connection Design Parameters—Miragrid 10XT

#### Test Methods: ASTM D6638 & NCMA SRWU-1

**Test Facility:** Bathurst, Clarabut Geotechnical Testing, Inc.

**Test Geogrid Type:** Miragrid 10XT

**Test Date:** November 28, 2011

**Block Type:** Positive Connection (PC) Block

#### CONNECTION STRENGTH TEST DATA

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Normal Load (lb/ft)</th>
<th>Peak Connection (lb/ft)</th>
<th>Observed Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2,688 (38.1)</td>
<td>13,797 (201.4)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>2</td>
<td>2,521 (35.9)</td>
<td>14,299 (208.7)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>3</td>
<td>1,654 (23.1)</td>
<td>13,934 (203.4)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>4</td>
<td>2,573 (37.1)</td>
<td>14,245 (209.3)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>5</td>
<td>2,065 (29.2)</td>
<td>10,000 (155.3)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>6</td>
<td>3,779 (54.0)</td>
<td>12,837 (187.3)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>7</td>
<td>2,918 (40.6)</td>
<td>14,345 (209.3)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>8</td>
<td>4,707 (67.7)</td>
<td>9,046 (132.0)</td>
<td>Grid Rupture</td>
</tr>
</tbody>
</table>

**Peak Connection\(\text{average}\) = 13,837 lb/ft (201.9 kN/m)

**Peak Connection\(\text{ultimate}\) = 14,477 lb/ft (196.2 kN/m)

### CONNECTION DESIGN DATA

<table>
<thead>
<tr>
<th>Duration</th>
<th>Design Factor</th>
<th>Design Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>75-Year</td>
<td>CR(\text{design}) = 1.56</td>
<td>13,797 lb/ft (201.4 kN/m)</td>
</tr>
<tr>
<td>100-Year</td>
<td>CR(\text{design}) = 1.58</td>
<td>14,345 lb/ft (209.3 kN/m)</td>
</tr>
</tbody>
</table>

**Creep Reduction Factor**

- **Short-term Ultimate Connection Strength Reduction Factor** CR\(\text{ult}\) = 0.82
- **Long-term Connection Strength Reduction Factor** CR\(\text{lot}\) = 0.82

---

### Geogrid Connection Design Parameters—Miragrid 20XT

#### Test Methods: ASTM D6638 & NCMA SRWU-1

**Test Facility:** Bathurst, Clarabut Geotechnical Testing, Inc.

**Test Geogrid Type:** Miragrid 20XT

**Test Date:** December 16, 2011

**Block Type:** Positive Connection (PC) Block

#### CONNECTION STRENGTH TEST DATA

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Normal Load (lb/ft)</th>
<th>Peak Connection (lb/ft)</th>
<th>Observed Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2,808 (38.1)</td>
<td>13,797 (201.4)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>2</td>
<td>802 (117)</td>
<td>13,980 (204.3)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>3</td>
<td>1,654 (24.1)</td>
<td>13,954 (203.4)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>4</td>
<td>2,521 (35.9)</td>
<td>14,299 (208.7)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>5</td>
<td>3,527 (51.5)</td>
<td>12,837 (187.3)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>6</td>
<td>4,302 (62.8)</td>
<td>13,197 (201.4)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>7</td>
<td>2,573 (37.1)</td>
<td>14,245 (209.3)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>8</td>
<td>5,196 (75.8)</td>
<td>13,706 (202.0)</td>
<td>Grid Rupture</td>
</tr>
</tbody>
</table>

**Peak Connection\(\text{average}\) = 13,837 lb/ft (201.9 kN/m)

**Peak Connection\(\text{ultimate}\) = 14,477 lb/ft (196.2 kN/m)

### CONNECTION DESIGN DATA

<table>
<thead>
<tr>
<th>Duration</th>
<th>Design Factor</th>
<th>Design Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>75-Year</td>
<td>CR(\text{design}) = 1.56</td>
<td>13,797 lb/ft (201.4 kN/m)</td>
</tr>
<tr>
<td>100-Year</td>
<td>CR(\text{design}) = 1.58</td>
<td>14,345 lb/ft (209.3 kN/m)</td>
</tr>
</tbody>
</table>

**Creep Reduction Factor**

- **Short-term Ultimate Connection Strength Reduction Factor** CR\(\text{ult}\) = 0.80
- **Long-term Connection Strength Reduction Factor** CR\(\text{lot}\) = 0.85

---

### Notes

- **Tested with 3/4 in. (19 mm) clear crown stone lightly compacted in the vertical core in accordance with Redi-Rock International’s standard laboratory recommendations.**

- **Because the geogrid connection is not normal load dependent and an expression of peak connection for use in design cannot be reliably determined through linear regression, the peak connection results are analyzed as continuous random variables. The average value or sample mean is reported for the test sample as well as a reduction based upon a 95% confidence interval calculated from the Student’s t-test for n-1 degrees of freedom.**

- **Recommended CR\text{ult} for design is based on a statistical best-fit analysis of T\text{ultconn} values across all geogrid types tested.**

- **Recommended value for Ad = 4.5, p = 0.6, Rf = 1.3 recommended for 4.5 ≤ pH ≤ 5 and 8 ≤ pH ≤ 9.**

- **The information contained in this report has been carefully compiled by Redi-Rock international, LLC as a recommendation of peak connection capacity. It is accurate to the best of our knowledge as of the date of its issue. However, final determination of the suitability of any design information and the appropriateness of peak-load dependent and an expression of peak connection for use in design cannot be reliably determined through linear regression, the peak connection results are analyzed as continuous random variables. The average value or sample mean is reported for the test sample as well as a reduction based upon a 95% confidence interval calculated from the Student’s t-test for n-1 degrees of freedom.**

- **Recommended CR\text{ult} for design is based on a statistical best-fit analysis of T\text{ultconn} values across all geogrid types tested.**

- **Recommended value for Ad = 4.5, p = 0.6, Rf = 1.3 recommended for 4.5 ≤ pH ≤ 5 and 8 ≤ pH ≤ 9.**

- **The information contained in this report has been carefully compiled by Redi-Rock International, LLC as a recommendation of peak connection capacity. It is accurate to the best of our knowledge as of the date of its issue. However, final determination of the suitability of any design information and the appropriateness of peak-load dependent and an expression of peak connection for use in design cannot be reliably determined through linear regression, the peak connection results are analyzed as continuous random variables. The average value or sample mean is reported for the test sample as well as a reduction based upon a 95% confidence interval calculated from the Student’s t-test for n-1 degrees of freedom.**

- **Recommended CR\text{ult} for design is based on a statistical best-fit analysis of T\text{ultconn} values across all geogrid types tested.**

- **Recommended value for Ad = 4.5, p = 0.6, Rf = 1.3 recommended for 4.5 ≤ pH ≤ 5 and 8 ≤ pH ≤ 9.**

- **The information contained in this report has been carefully compiled by Redi-Rock International, LLC as a recommendation of peak connection capacity. It is accurate to the best of our knowledge as of the date of its issue. However, final determination of the suitability of any design information and the appropriateness of peak-load dependent and an expression of peak connection for use in design cannot be reliably determined through linear regression, the peak connection results are analyzed as continuous random variables. The average value or sample mean is reported for the test sample as well as a reduction based upon a 95% confidence interval calculated from the Student’s t-test for n-1 degrees of freedom.**
GeoGrid Connection Design Parameters—Miragrid 24XT

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Geogrid Type: Miragrid 24XT</td>
<td>Date Tested: February 29, 2012</td>
</tr>
<tr>
<td>Block Type: Positive Connection (PC) Block</td>
<td></td>
</tr>
</tbody>
</table>

**CONNECTION STRENGTH TEST DATA**

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Normal Load (lb/ft)</th>
<th>Peak Connection Capacity (lb/ft)</th>
<th>Observed Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4,046 (59.0)</td>
<td>20,375 (297.4)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>2</td>
<td>4,362 (63.7)</td>
<td>22,020 (321.4)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>3</td>
<td>655 (9.7)</td>
<td>22,168 (329.4)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>4</td>
<td>2,538 (37.0)</td>
<td>20,852 (304.5)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>5</td>
<td>1,713 (25.0)</td>
<td>21,746 (317.4)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>6</td>
<td>5,248 (76.1)</td>
<td>21,837 (318.7)</td>
<td>Block &amp; Grid</td>
</tr>
<tr>
<td>7</td>
<td>2,539 (37.1)</td>
<td>19,914 (290.6)</td>
<td>Grid Rupture</td>
</tr>
<tr>
<td>8</td>
<td>4,063 (59.3)</td>
<td>21,015 (305.7)</td>
<td>Block Rupture</td>
</tr>
</tbody>
</table>

Peak Connection Capacity = 21,288 lb/ft (310.7 kN/m)

Peak Connection Capacity = 20,535 lb/ft (299.7 kN/m)

**CONNECTION DESIGN DATA**

Peak Connection Capacity, lb/ft (kN/m)

<table>
<thead>
<tr>
<th>Block Type</th>
<th>Geogrid Type</th>
<th>Test Date</th>
<th>Test Methods</th>
<th>Test Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive Connection (PC)</td>
<td>Miragrid 24XT</td>
<td>2012</td>
<td>ASTM D6638 &amp; NCMA SRWU-1</td>
<td>Bathurst, Clarabut Geotechnical Testing, Inc.</td>
</tr>
</tbody>
</table>

**CONNECTION STRENGTH**

- **Normal Load Peak Load**
  - ac(75) = 10,773 lb/ft (157.2 kN/m)
  - ac(100) = 10,636 lb/ft (155.2 kN/m)

- **Ultimate Tensile Strength of Geosynthetic Test Sample**
  - Tult = 27,415 lb/ft (400.1 kN/m)
  - Tlot = 29,130 lb/ft (425.1 kN/m)

- **Peak Connection (average)**
  - 21,288 lb/ft (310.7 kN/m)

**Durability Reduction Factor (d) RFD = 1.15**

**Connection Strength / Sample Strength T**

- **Short-term Ultimate Connection Strength Reduction Factor (c) CRu = 0.70**

- **Creep Reduction Factor**
  - 75-Year Design CRf = 0.56
  - 100-Year Design CRf = 0.58

- **Long-term Connection Strength Reduction Factor**
  - 75-Year Design CRdiff = 0.45
  - 100-Year Design CRdiff = 0.45

- **Nominal Long-term Geosynthetic Connection Strength**
  - 75-Year Design T = 10,773 lb/ft (157.2 kN/m)
  - 100-Year Design T = 10,636 lb/ft (155.2 kN/m)

- **Geogrid Connection Design Parameters—Miragrid 24XT**
  - Peak Connection (average) = 21,288 lb/ft (310.7 kN/m)
  - Nominal Long-term Geosynthetic Connection Strength
  - 100-Year Design T = 10,636 lb/ft (155.2 kN/m)

**Geogrid Packaging, Ordering, and Delivery**

- **Geogrid for Redi-Rock Positive Connection (PC) System retaining walls is provided in 12 inch (305 millimeter) wide strips in 200 feet (61 meters) long rolls.**
  - Long rolls are more reliably determined through linear regression, an expression of peak connection for use in design cannot be factory cut to width and are certified for width and strength by TenCate Mirafi.
  - Other geogrid products or strips that are field cut to width from larger rolls are not allowed.

- **Geogrid Strips are available exclusively through the Redi-Rock network of independently-owned and operated, licensed manufacturers.**
  - Contact information for the Redi-Rock manufacturer in your area is available at redivider.com.

**Geogrid Estimating**

- **Typically, the geogrid strips are ordered by the pallet.**
  - If your project doesn’t require a full pallet of geogrid strips, smaller tube quantities may be available from your Redi-Rock manufacturer.

**Geogrid Strips are available exclusively through the Redi-Rock network of independently-owned and operated, licensed manufacturers.**

**Contribution Estimating**

**The preliminary charts list an approximate length of geogrid for estimating purposes.**

**In this example, the geogrid required to build a 100 foot (30.5 meter) long section of wall (26 blocks long) is: 100 x 0.26 = 26 rolls of 5XT 100 x 0.30 = 30 rolls of 10XT**

- **(This information is included with each cross section in the Preliminary Reinforcement Schedule in the MSE Wall section of the DRM.)**

**Additionaly, custom roll lengths between 150 feet (45 meters) and 250 feet (76 meters) are available in quantities greater than 48 pallets of the same geogrid type. Plan ahead because a minimum 10 week lead time is required for custom lengths.**
Minimum Turning Radius

Convex curves can easily be incorporated into a Redi-Rock wall. Redi-Rock blocks are tapered 7½° on each side. The smallest radius that can be made with Redi-Rock blocks (without cutting the blocks) occurs when the blocks are placed together with their sides touching. This minimum radius for full size blocks is 14 feet - 6 inches (4.42 m) from the face of the blocks.

Block to block setback will cause the radius for each succeeding row to be smaller than the row below. To ensure the minimum radius for the top row of blocks in a wall, start with the minimum radius and then add 2” (51 mm) per course for each standard setback block 18-inch high block, 10” (254 mm) per course for each 9” (230 mm) setback block, and 17” (432 mm) per course for each planter block in the wall below the top row of blocks. For 36-inch high XL blocks, add 4” (101.6 mm) per row.

### MINIMUM RADIUS FOR BOTTOM ROW OF BLOCKS

<table>
<thead>
<tr>
<th>Height of Wall</th>
<th>18-INCH (457 mm) HIGH BLOCKS</th>
<th>36-INCH (914 mm) HIGH XL BLOCKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1'-6&quot; (0.46 m)</td>
<td>14'-6&quot; (4.42 m)</td>
<td></td>
</tr>
<tr>
<td>3'-0&quot; (0.91 m)</td>
<td>14'-8&quot; (4.47 m)</td>
<td></td>
</tr>
<tr>
<td>4'-6&quot; (1.37 m)</td>
<td>14'-10&quot; (4.52 m)</td>
<td></td>
</tr>
<tr>
<td>6'-0&quot; (1.83 m)</td>
<td>15'-0&quot; (4.57 m)</td>
<td>15'-0&quot; (4.57 m)</td>
</tr>
<tr>
<td>7'-6&quot; (2.29 m)</td>
<td>15'-2&quot; (4.62 m)</td>
<td>15'-2&quot; (4.62 m)</td>
</tr>
<tr>
<td>9'-0&quot; (2.74 m)</td>
<td>15'-4&quot; (4.67 m)</td>
<td>15'-4&quot; (4.67 m)</td>
</tr>
<tr>
<td>10'-6&quot; (3.20 m)</td>
<td>15'-6&quot; (4.72 m)</td>
<td>15'-6&quot; (4.72 m)</td>
</tr>
<tr>
<td>12'-0&quot; (3.66 m)</td>
<td>15'-8&quot; (4.78 m)</td>
<td>15'-8&quot; (4.78 m)</td>
</tr>
<tr>
<td>13'-6&quot; (4.11 m)</td>
<td>15'-10&quot; (4.83 m)</td>
<td>15'-10&quot; (4.83 m)</td>
</tr>
<tr>
<td>15'-0&quot; (4.57 m)</td>
<td>16'-0&quot; (4.88 m)</td>
<td>16'-0&quot; (4.88 m)</td>
</tr>
<tr>
<td>16'-6&quot; (5.03 m)</td>
<td>16'-8&quot; (5.08 m)</td>
<td>16'-8&quot; (5.08 m)</td>
</tr>
<tr>
<td>18'-0&quot; (5.49 m)</td>
<td>16'-8&quot; (5.08 m)</td>
<td></td>
</tr>
<tr>
<td>19'-6&quot; (5.94 m)</td>
<td>16'-8&quot; (5.08 m)</td>
<td></td>
</tr>
<tr>
<td>21'-0&quot; (6.4 m)</td>
<td>16'-8&quot; (5.08 m)</td>
<td></td>
</tr>
</tbody>
</table>

Concave curves may be installed at varying radii. The blocks should be placed tight together to make a smooth curve. Although there is no fixed minimum radius, smaller radii lengths of less than 14’-0” (4.42 m) will result in exploring more of the untextured top face of the blocks in the underlying layer.
Redi-Rock publishes a great resource created especially for engineers who are considering, designing, or reviewing a mechanically stabilized earth wall utilizing the Redi-Rock PC System. Inside the PC System Design Guide you will find an overview of the system, sample projects, components, MSEW inputs, and an example problem. This 30 page document is available for immediate download at redi-rock.com.

## Positive Connection (PC) Design Guide

IN THE PC DESIGN GUIDE, YOU’LL FIND:

- System overview
- Case Studies
- Description of system components
- Recommended connection design parameters
- Recommended MSEW input parameters
- Example problem

## Redi-Rock Wall Freeware & Professional

THE software tools to optimize your Redi-Rock designs

As a retaining wall engineer, you don’t want to be kept up at night wondering about a wall failure. The Redi-Rock system comes with two robust design software packages to provide the peace of mind you need.

Developed by FINE Software, the geotechnical experts that developed the full suite of GEO5 programs, both versions of Redi-Rock Wall provide an amazing amount of control over every aspect of your design, allowing you to optimize your wall from top to bottom.

**REDI-ROCK WALL FREeware**

- Design and analyze gravity walls
- Bearing capacity and slope stability modules
- ASD or LRFD calculation capacity
- 3D visualization

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**REDI-ROCK WALL PROfessional**

- Design and analyze gravity walls and MSE walls using Positive Connection (PC) blocks
- Includes full GEO5 Settlement, Slope Stability, and Spread Footing modules
- ASD or LRFD calculation capacity
- 3D visualization

Upgrade to Redi-Rock Wall Professional to take your designs to new heights. Lease, buy, or demo the software at redi-rock.com/pro.
IMPORTANT NOTICE

The design specifications for Redi-Rock® blocks suggest maximum installation heights under certain assumed conditions. These wall heights were calculated using the assumed material properties and loading conditions in the Design Resource Manual and will vary from location to location depending on the soil properties and terrain. Since soil conditions and topography vary greatly from site to site, an engineering analysis must be performed for each wall installation.

Because Redi-Rock International does not build the blocks or install the system, Redi-Rock International does not assume any responsibility regarding structural stability of any particular block or particular wall system. In addition, introducing Redi-Rock International assumes no responsibility in connection with any injury, death, or property damage claim whatsoever whether asserted against a Leases, Leasor, Purchaser or others, arising out of or attributable to the operation of or products produced with Redi-Rock International equipment.

STANDARD BATTER GRAVITY WALLS

34° | DENSE WELL-GRADED SAND or SAND AND GRAVEL .......................86
30° | FINE TO MEDIUM SAND or SILTY SAND .................................................91
28° | SILTY SAND or CLAYEY SAND .................................................................95
40° OVER 26° | CRUSHED STONE BACKFILL REPLACING SILTY OR CLAYEY SAND ......................99

Notes:

This preliminary guide has been prepared for three different soil types, three different load conditions, and with three different wall blocks to give an indication of the performance of Redi-Rock walls. A batter of 5° was used for this preliminary guide. Redi-Rock walls are not limited to these conditions. Specific wall sections can incorporate different block setbacks and can be designed for different soil and loading conditions.

Unit weight of soil is assumed to be 120 lb/ft³ (19.85 kN/m³) or 130 lb/ft³ (20.4 kN/m³) as noted for each section of this preliminary guide. Minimum factors of safety are 1.5 for sliding, 1.5 for overturning, 2.2 for bearing capacity, and 1.3 for global stability. Other factors of safety will result in changes from the wall heights and block selections shown in this guide.

No soils or hydrostatic loads were included in this preliminary guide.

Leaguestone texture PC blocks were used to prepare this preliminary guide. Wall heights and block selections for other textures and blocks may vary.

A soil block without the vertical core slot was used for the bottom block on all wall sections shown.

Independent batter design at the top of the wall must be performed for site-specific conditions. Support requirements may result in changes to available wall heights and block selections from those shown in this guide.

Wall stability must be verified in the final design for all site-specific conditions.

The wall design shall address both internal and external drainage and shall be evaluated by the Professional Engineer who is responsible for the final wall design.

Block material is to be comprised of 90% aggregate material as specified by the Professional Engineer (ASTM D4567).

Gypsum backfill is not recommended for use in Redi-Rock walls.

All Redi-Rock International Hall System Specifications and Installation specifications should be followed.

Construction oversight should be provided on all walls to ensure proper construction according to your detailed design drawings.

Not tall enough? Greater wall heights are achievable with less fill. Please consult Redi-Rock International to determine what products are available for your job.

These block selection and height guides were prepared by Redi-Rock International for estimating and conceptual design purposes only. All information is believed to be true and accurate; however, Redi-Rock International assumes no responsibility for the use of these preliminary guides for actual construction. Determination of the suitability of each preliminary guide is the sole responsibility of the user. Final designs for construction purposes must be performed by a registered Professional Engineer, using the actual conditions of the proposed site.
**Preliminary Height Guide**

**φ = 34° | DENSE WELL-GRADED SAND or SAND AND GRAVEL**

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>STANDARD BATTER GRAVITY WALLS</td>
</tr>
<tr>
<td>2</td>
<td>ALLOWABLE STRESS DESIGN</td>
</tr>
</tbody>
</table>

### LOAD CONDITION A
- NO LIVE LOAD SURFACE, NO BACK SLOPE, NO TOE SLOPE
- 87 blocks

### LOAD CONDITION B
- 250 lb/ft² (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE
- 89 blocks

### LOAD CONDITION C
- 1:2.5 BACK SLOPE, NO TOE SLOPE, NO LIVE LOAD SURCHARGE
- 90 blocks

---

See notes and recommended details at start of preliminary height guide.
Preliminary Height Guide

**Standard Batter Gravity Walls**

**Allowable Stress Design**

**Load Condition A**  
No live load surcharge, no back slope, no toe slope

10 Block High Section
- (3) 28" (710 mm) Blocks
- (4) 41" (1030 mm) Blocks
- (3) 60" (1520 mm) Blocks

\[ \phi = 34^\circ \]

---

**Standard Batter Gravity Walls**

**Dense Well-Graded Sand or Sand and Gravel**

**Allowable Stress Design**

**Load Condition B**  
260 lb/ft\(^2\) (12 kPa) live load surcharge, no back slope, no toe slope

2 Block High Section
- (1) 28" (710 mm) Block
- (1) 41" (1030 mm) Blocks

3 Block High Section
- (1) 28" (710 mm) Block
- (2) 41" (1030 mm) Blocks

4 Block High Section
- (3) 28" (710 mm) Blocks
- (3) 41" (1030 mm) Blocks

5 Block High Section
- (1) 28" (710 mm) Block
- (4) 41" (1030 mm) Blocks

6 Block High Section
- (4) 28" (710 mm) Blocks
- (1) 41" (1030 mm) Block
- (1) 60" (1520 mm) Block

7 Block High Section
- (1) 28" (710 mm) Block
- (2) 41" (1030 mm) Blocks
- (2) 60" (1520 mm) Blocks

8 Block High Section
- (1) 28" (710 mm) Block
- (4) 41" (1030 mm) Blocks
- (3) 60" (1520 mm) Blocks

---

Legend:
- 28" (710 mm) BLOCK
- 41" (1030 mm) BLOCK
- 60" (1520 mm) BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIMINARY HEIGHT GUIDE.
Preliminary Height Guide

LOAD CONDITION A
NO LIVE LOAD SURFACE, NO BACK SLOPE, NO TOE SLOPE

LOAD CONDITION B
250 lb/ft² (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE

LOAD CONDITION C
1:2.5 BACK SLOPE, NO TOE SLOPE, NO LIVE LOAD SURCHARGE

Legend:
- 28" (710 mm) BLOCK
- 41" (1030 mm) BLOCK
- 60" (1520 mm) BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIMINARY HEIGHT GUIDE.
Preliminary Height Guide

**LOAD CONDITION A**
- NO LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE

<table>
<thead>
<tr>
<th>Section</th>
<th>Blocks</th>
<th>Height</th>
<th>φ</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 BLOCK HIGH SECTION</td>
<td>(2) 28&quot; (710 mm) Blocks</td>
<td>4’-6” (1.37 m)</td>
<td>30°</td>
</tr>
<tr>
<td>3 BLOCK HIGH SECTION</td>
<td>(3) 28&quot; (710 mm) Blocks</td>
<td>4’-1’’ (1.22 m)</td>
<td>30°</td>
</tr>
<tr>
<td>4 BLOCK HIGH SECTION</td>
<td>(4) 28” (710 mm) Blocks</td>
<td>9’-4” (2.84 m)</td>
<td>30°</td>
</tr>
<tr>
<td>5 BLOCK HIGH SECTION</td>
<td>(5) 28” (710 mm) Blocks</td>
<td>7’-2” (2.19 m)</td>
<td>30°</td>
</tr>
<tr>
<td>6 BLOCK HIGH SECTION</td>
<td>(4) 28” (710 mm) Blocks</td>
<td>4”-6” (1.22 m)</td>
<td>30°</td>
</tr>
<tr>
<td>7 BLOCK HIGH SECTION</td>
<td>(3) 28” (710 mm) Blocks</td>
<td>9’-6” (2.91 m)</td>
<td>30°</td>
</tr>
<tr>
<td>8 BLOCK HIGH SECTION</td>
<td>(3) 28” (710 mm) Blocks</td>
<td>11’-2” (3.38 m)</td>
<td>30°</td>
</tr>
<tr>
<td>9 BLOCK HIGH SECTION</td>
<td>(3) 28” (710 mm) Blocks</td>
<td>12’-4” (3.74 m)</td>
<td>30°</td>
</tr>
</tbody>
</table>

**LOAD CONDITION B**
- 250 lb/ft² (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE

<table>
<thead>
<tr>
<th>Section</th>
<th>Blocks</th>
<th>Height</th>
<th>φ</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 BLOCK HIGH SECTION</td>
<td>(1) 28” (710 mm) Block</td>
<td>4’-6” (1.37 m)</td>
<td>30°</td>
</tr>
<tr>
<td>3 BLOCK HIGH SECTION</td>
<td>(2) 41” (1030 mm) Blocks</td>
<td>9’-4” (2.84 m)</td>
<td>30°</td>
</tr>
<tr>
<td>4 BLOCK HIGH SECTION</td>
<td>(1) 28” (710 mm) Block</td>
<td>7’-2” (2.19 m)</td>
<td>30°</td>
</tr>
<tr>
<td>5 BLOCK HIGH SECTION</td>
<td>(2) 41” (1030 mm) Blocks</td>
<td>9’-6” (2.91 m)</td>
<td>30°</td>
</tr>
<tr>
<td>6 BLOCK HIGH SECTION</td>
<td>(2) 60” (1520 mm) Blocks</td>
<td>11’-2” (3.38 m)</td>
<td>30°</td>
</tr>
<tr>
<td>7 BLOCK HIGH SECTION</td>
<td>(2) 60” (1520 mm) Blocks</td>
<td>12’-4” (3.74 m)</td>
<td>30°</td>
</tr>
</tbody>
</table>

**Legend:**
- 28” (710 mm) BLOCK
- 41” (1030 mm) BLOCK
- 60” (1520 mm) BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIMINARY HEIGHT GUIDE.
Preliminary Height Guide

**ϕ = 30°**  |  **FINE TO MEDIUM SAND or SILTY SAND**

**LOAD CONDITION C**  |  **1:2.5 BACK SLOPE, NO TOE SLOPE, NO LIVE LOAD SURCHARGE**

2 BLOCK HIGH SECTION  
(2) 28" (710 mm) Blocks
(1) 41" (1030 mm) Block

3 BLOCK HIGH SECTION  
(2) 28" (710 mm) Blocks
(1) 41" (1030 mm) Block

4 BLOCK HIGH SECTION  
(2) 28" (710 mm) Blocks
(1) 60" (1520 mm) Block

5 BLOCK HIGH SECTION  
(2) 28" (710 mm) Blocks
(1) 41" (1030 mm) Block
(1) 60" (1520 mm) Block

**ϕ = 28°**  |  **SILTY SAND or CLAYEY SAND**

Standard batter gravity walls  
SECTION 3 OF 4

Assumed retained and foundation soils for this Section  
SM, SC

Internal angle of friction  
ϕ = 28°

Unit weight  
γ = 120 lb/ft³ (18.8 kN/m³)

Cohesion  
c = 0 lb/ft² (0 kPa)

**LOAD CONDITION A**  |  NO LIVE LOAD SURFACE, NO BACK SLOPE, NO TOE SLOPE ...........................................96
**LOAD CONDITION B**  |  250 lb/ft² (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE .........................97
**LOAD CONDITION C**  |  1:2.5 BACK SLOPE, NO TOE SLOPE, NO LIVE LOAD SURCHARGE .............................................98

Legend:

- 28" (710 mm) BLOCK
- 41" (1030 mm) BLOCK
- 60" (1520 mm) BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIMINARY HEIGHT GUIDE.
STANDARD BATTER GRAVITY WALLS

Preliminary Height Guide

LOAD CONDITION A

NO LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE

**ϕ = 28°**

<table>
<thead>
<tr>
<th>SILTY SAND or CLAYEY SAND</th>
</tr>
</thead>
</table>

2 BLOCK HIGH SECTION

(2) 28" (710 mm) Blocks

- 0-4" (102 mm)
- 0-4" (102 mm)

ϕ = 28°

3 BLOCK HIGH SECTION

(3) 28" (710 mm) Blocks

- 4-2" (102 mm)
- 0-4" (102 mm)
- 0-4" (102 mm)

ϕ = 28°

4 BLOCK HIGH SECTION

(3) 28" (710 mm) Blocks

1-0" (305 mm)

ϕ = 28°

5 BLOCK HIGH SECTION

(3) 28" (710 mm) Blocks

- 2-6" (660 mm)
- 0-4" (102 mm)
- 0-4" (102 mm)

ϕ = 28°

6 BLOCK HIGH SECTION

(3) 28" (710 mm) Blocks

- 4-4" (102 mm)
- 1-0" (305 mm)

ϕ = 28°

7 BLOCK HIGH SECTION

(3) 28" (710 mm) Blocks

- 9-5" (240 mm)
- 1-4" (305 mm)
- 1-4" (305 mm)

ϕ = 28°

Legend:

- 28" (710mm) BLOCK
- 41" (1030 mm) BLOCK
- 60" (1520 mm) BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIMINARY HEIGHT GUIDE.

LOAD CONDITION B

200 lb/ft² (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE

**ϕ = 28°**

<table>
<thead>
<tr>
<th>SILTY SAND or CLAYEY SAND</th>
</tr>
</thead>
</table>

2 BLOCK HIGH SECTION

(1) 28" (710 mm) Block

- 0-4" (102 mm)

ϕ = 28°

3 BLOCK HIGH SECTION

(2) 41" (1030 mm) Blocks

- 2-6" (660 mm)
- 0-4" (102 mm)
- 0-4" (102 mm)

ϕ = 28°

4 BLOCK HIGH SECTION

(1) 28" (710 mm) Block

- 4-2" (102 mm)

ϕ = 28°

5 BLOCK HIGH SECTION

(2) 41" (1030 mm) Blocks

- 7-0" (178 mm)

ϕ = 28°

6 BLOCK HIGH SECTION

(2) 41" (1030 mm) Blocks

- 2-6" (660 mm)

ϕ = 28°

7 BLOCK HIGH SECTION

(2) 41" (1030 mm) Blocks

- 9-5" (240 mm)

ϕ = 28°

Legend:

- 28" (710mm) BLOCK
- 41" (1030 mm) BLOCK
- 60" (1520 mm) BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIMINARY HEIGHT GUIDE.
### Preliminary Height Guide

**ϕ = 28° | Silty Sand or Clayey Sand**

**LOAD CONDITION C | 1 : 2.5 Back Slope, No Toe Slope, No Live Load Surcharge**

- **2 BLOCK HIGH SECTION**
  - (1) 28" (710 mm) Block
  - (1) 41" (1030 mm) Block
  - 0'-6" (183 mm)
  - 0'-0" (0 mm)
  - 2'-4" (0.73 m)

- **3 BLOCK HIGH SECTION**
  - (1) 28" (710 mm) Block
  - (1) 41" (1030 mm) Block
  - (1) 60" (1520 mm) Block
  - 0'-6" (183 mm)
  - 0'-0" (0 mm)
  - 4'-0" (1.22 m)

- **4 BLOCK HIGH SECTION**
  - (1) 28" (710 mm) Blocks
  - (1) 41" (1030 mm) Block
  - (2) 60" (1520 mm) Blocks
  - 0'-6" (183 mm)
  - 0'-0" (0 mm)
  - 9'-4" (2.84 m)

**ϕ = 40° over 26° | Crushed Stone Backfill Replacing Silty or Clayey Sand**

<table>
<thead>
<tr>
<th>Standard batter gravity walls</th>
<th>SECTION 4 OF 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assumed select backfill / retained soil for this Section *</td>
<td>GW, GP</td>
</tr>
<tr>
<td>Internal angle of friction</td>
<td>ϕ = 45°</td>
</tr>
<tr>
<td>Unit weight</td>
<td>γ = 130 lb / ft³ (20.4 kN / m³)</td>
</tr>
<tr>
<td>Cohesion</td>
<td>c = 0 lb / ft² (0 kPa)</td>
</tr>
<tr>
<td>Assumed native / foundation soil for this Section</td>
<td>SM, SC</td>
</tr>
<tr>
<td>Internal angle of friction</td>
<td>ϕ = 26°</td>
</tr>
<tr>
<td>Unit weight</td>
<td>γ = 120 lb / ft³ (18.8 kN / m³)</td>
</tr>
<tr>
<td>Cohesion</td>
<td>c = 0 lb / ft² (0 kPa)</td>
</tr>
</tbody>
</table>

* This analysis assumes native material is removed to a 1 on 1 slope or flatter from the back of the proposed retaining wall blocks and replaced with compacted crushed stone.

**LOAD CONDITION A | No Live Load Surface, No Back Slope, No Toe Slope**

**LOAD CONDITION B | 250 lb/ft² (12 kPa) Live Load Surcharge, No Back Slope, No Toe Slope**

**LOAD CONDITION C | 1 : 2.5 Back Slope, No Toe Slope, No Live Load Surcharge**

---

**Legend:**
- 28" (710mm) BLOCK
- 41" (1030 mm) BLOCK
- 60" (1520 mm) BLOCK

See notes and recommended details at start of preliminary height guide.
Preliminary Height Guide

**Standard Batter Gravity Walls**

\( \phi = 40^\circ \) over 26° | Crushed Stone, Backfill-Replacing Silty or Clayey Sand

**Load Condition A** | No Live Load Surcharge, No Back Slope, No Toe Slope

### 2 Block High Section
- (2) 28” (710 mm) Blocks
- \( \phi = 40^\circ \)
- \( \theta = 26^\circ \)

### 4 Block High Section
- (4) 28” (710 mm) Blocks
- \( \phi = 40^\circ \)
- \( \theta = 26^\circ \)

### 6 Block High Section
- (4) 28” (710 mm) Blocks
- (2) 41” (1030 mm) Blocks
- \( \phi = 40^\circ \)
- \( \theta = 26^\circ \)

### 8 Block High Section
- (4) 28” (710 mm) Blocks
- (2) 41” (1030 mm) Blocks
- (2) 60” (1520 mm) Blocks
- \( \phi = 40^\circ \)
- \( \theta = 26^\circ \)

### 3 Block High Section
- (3) 28” (710 mm) Blocks
- \( \phi = 40^\circ \)
- \( \theta = 26^\circ \)

### 5 Block High Section
- (4) 28” (710 mm) Blocks
- (1) 41” (1030 mm) Block
- \( \phi = 40^\circ \)
- \( \theta = 26^\circ \)

### 7 Block High Section
- (4) 28” (710 mm) Blocks
- (2) 41” (1030 mm) Blocks
- (1) 60” (1520 mm) Block
- \( \phi = 40^\circ \)
- \( \theta = 26^\circ \)

### 9 Block High Section
- (3) 28” (710 mm) Blocks
- (2) 41” (1030 mm) Blocks
- (3) 60” (1520 mm) Blocks
- \( \phi = 40^\circ \)
- \( \theta = 26^\circ \)

### 10 Block High Section
- (3) 28” (710 mm) Blocks
- (5) 41” (1030 mm) Blocks
- (5) 60” (1520 mm) Blocks
- \( \phi = 40^\circ \)
- \( \theta = 26^\circ \)

### 11 Block High Section
- (2) 28” (710 mm) Blocks
- (4) 41” (1030 mm) Blocks
- (3) 60” (1520 mm) Blocks
- \( \phi = 40^\circ \)
- \( \theta = 26^\circ \)

### 12 Block High Section
- (2) 28” (710 mm) Blocks
- (4) 41” (1030 mm) Blocks
- (6) 60” (1520 mm) Blocks
- \( \phi = 40^\circ \)
- \( \theta = 26^\circ \)

**Legend:**
- 28” (710mm) BLOCK
- 41” (1030mm) BLOCK
- 60” (1520mm) BLOCK

See notes and recommended details at start of preliminary height guide.
XL HOLLOW-CORE RETAINING BLOCK Gravity WALLS

Preliminary Height Guide

This preliminary height guide has been prepared showing Redi-Rock walls in a variety of assumed conditions. It is intended to give the specifier an idea of what block types are required and what heights are achievable with Redi-Rock in different applications. A combination of 520 (1320 mm), 730 (1830 mm), and 960 (2440 mm) XL blocks combined with 10” (457 mm) high Redi-Rock 28” (716 mm), 41” (1000 mm), and 59” (1520 mm) wide blocks are used to provide the most efficient cross-section available in the different conditions.

Several assumptions have been made in preparation of the guide. They are listed in the notes below. If these assumptions do not match the wall section under consideration, block selections and achievable heights may vary from the sections shown in this guide.

All wall sections for construction must be designed by a registered Professional Engineer using the actual conditions of the site, including:

- Top down view of water flow to establish water flow away from wall
- Cements and mortars recommended for use with Redi-Rock blocks
- Cements and mortars should be specified by Engineer
- Concrete block tiebacks should be specified by Engineer
- Redi-Rock blocks should be specified by Engineer
- Seamless joint requirements
- Structural engineering
- Fire resistance

Notes:

This preliminary guide has been prepared for four different soil types. These different load conditions, and with six different blocks to give an indication of the performance of Redi-Rock walls. Redi-Rock walls are not limited to these conditions. Specific wall sections can be designed for different soil and loading conditions.

Unit weight of soil is assumed to be 120 lb/ft³ (19.56 kN/m³) or 120 lb/ft³ (20.4 kN/m³) as noted for each section of this preliminary guide. Minimum factors of safety are 1.5 for sliding, 1.5 for overturning, 2.0 for bearing capacity, and 1.5 for global stability. Other factors of safety will result in changes from the wall heights and block selections shown in this guide.

No seismic or hydraulic loads were included in this preliminary guide.

Leigastone texture blocks were used to prepare this preliminary guide. Wall heights and block selections for other textures and block types may vary. Independent barrier design at the top of the wall must be performed for site-specific conditions. Barrier requirements may result in changes to available wall heights and block selections from those shown in this guide.

Wall stability needs to be verified in the final design for site-specific conditions.

The wall design shall address both internal and external drainage, as well as global stability, and shall be evaluated by the Professional Engineer who is responsible for the final wall design. Backfill material should be compacted to 90% of its maximum dry density (ASTM D1557).

At Redi-Rock International Wall System Specifications and Installation Recommendations should be followed.

Construction oversight should be provided on all walls to ensure proper construction according to your detailed design drawings.

Not tall enough? Greater wall heights are achievable with select backfill, increased wall better, and/or mechanically stabilized earth (MSE) Redi-Rock walls.

Redi-Rock products are manufactured by independently owned, licensed manufacturers. Product offerings will vary between manufacturers. Contact your local manufacturer to determine what products are available for your job.

These block selection and height guides were prepared by Redi-Rock International for estimating and conceptual design purposes only. All information is believed to be true and accurate; however, Redi-Rock International assumes no responsibility for the use of these preliminary guides for actual construction. Determination of the suitability of each preliminary guide is the sole responsibility of the user. Final designs for construction purposes must be performed by a registered Professional Engineer, using the actual conditions of the proposed site.

ϕ = 34°

DENSE WELL-GRADED SAND or SAND AND GRAVEL

XL hollow-core retaining block gravity walls

<table>
<thead>
<tr>
<th>SECTION 1 OF 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assumed retained and foundation soils for this Section</td>
</tr>
<tr>
<td>SW, GW</td>
</tr>
<tr>
<td>Internal angle of friction</td>
</tr>
<tr>
<td>ϕ = 34°</td>
</tr>
<tr>
<td>Weight unit</td>
</tr>
<tr>
<td>γ = 130 lb/ft³ (20.4 kN/m³)</td>
</tr>
<tr>
<td>Cohesion</td>
</tr>
<tr>
<td>c = 0 lb/ft² (0 kPa)</td>
</tr>
</tbody>
</table>
XL HOLLOW-CORE RETAINING BLOCK GRAVITY WALLS

PRELIMINARY HEIGHT GUIDE

LOAD CONDITION A | NO LIVE LOAD SURFACE, NO BACK SLOPE, NO Toe SLOPE

**DENISE WELL-GRADED SAND or SAND AND GRAVEL**

### 10.5-FOOT (3.20 m) HIGH SECTION
- 3 blocks: 2" (70 mm) blocks
- 1 block: 2' (150 mm) block

### 12.5-FOOT (3.81 m) HIGH SECTION
- 3 blocks: 2" (70 mm) blocks
- 1 block: 2' (150 mm) block

### 13.5-FOOT (4.11 m) HIGH SECTION
- 3 blocks: 2" (70 mm) blocks
- 2 blocks: 2' (150 mm) blocks
- 1 block: 2' (150 mm) block

### 15.0-FOOT (4.57 m) HIGH SECTION
- 3 blocks: 2" (70 mm) blocks
- 2 blocks: 2' (150 mm) blocks
- 1 block: 2' (150 mm) block

### 18.0-FOOT (5.49 m) HIGH SECTION
- 3 blocks: 2" (70 mm) blocks
- 2 blocks: 2' (150 mm) blocks
- 1 block: 2' (150 mm) block

### 18.5-FOOT (5.53 m) HIGH SECTION
- 3 blocks: 2" (70 mm) blocks
- 2 blocks: 2' (150 mm) blocks
- 1 block: 2' (150 mm) block

### 21.6-FOOT (6.54 m) HIGH SECTION
- 3 blocks: 2" (70 mm) blocks
- 2 blocks: 2' (150 mm) blocks
- 1 block: 2' (150 mm) block

**Legend:**
- = 2' (150 mm) BLOCK
- = 2" (100 mm) BLOCK
- = 1' (300 mm) BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIMINARY HEIGHT GUIDE.
**XL HOLLOW-CORE RETAINING BLOCK GRAVITY WALLS**

**PRELIMINARY HEIGHT GUIDE**

**LOAD CONDITION B**

21.0' FOOT (6.40 m) HIGH SECTION

- 3' 26' (710 mm) Blocks
- 1' 52' (1220 mm) XL Block
- 2' 7' (1600 mm) XL Blocks
- 2' 9' (2440 mm) XL Block

\[ \phi = 34° \]

**LOAD CONDITION C**

9.0' FOOT (2.74 m) HIGH SECTION

- 2' 26' (710 mm) Blocks
- 1' 52' (1220 mm) XL Block
- 1' 7' (1600 mm) XL Block
- 1' 9' (2440 mm) XL Block

\[ \phi = 34° \]

**Legend:**

- **26' (710 mm) BLOCK**
- **41' (1000 mm) BLOCK**
- **52' (1220 mm) XL BLOCK**
- **72' (1830 mm) XL BLOCK**
- **90' (2440 mm) XL BLOCK**

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIMINARY HEIGHT GUIDE.
Preliminary Height Guide

**LOAD CONDITION C**

18.5-FOOT (5.65 m) HIGH SECTION

(5) 24” (610 mm) Blocks
(1) 22” (559 mm) XL Block
(1) 72” (1830 mm) XL Block
(1) 90” (2440 mm) XL Block

**ϕ = 34°**

DENSE WELL-GRADED SAND or SAND AND GRAVEL

**ϕ = 30°**

FINE TO MEDIUM SAND or SILTY SAND

**XL hollow-core retaining block gravity walls**

Assumed retained and foundation soils for this Section

SW, SP, SM

Internal angle of friction

ϕ = 30°

Unit weight

γ = 120 lb / ft³ (18.8 kN / m³)

Cohesion

c = 0 lb / ft² (0 kPa)

---

Legend:

- 24” (610 mm) BLOCK
- 41” (1036 mm) BLOCK
- 62” (1320 mm) XL BLOCK
- 72” (1830 mm) XL BLOCK
- 90” (2440 mm) XL BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIMINARY HEIGHT GUIDE.
XL HOLLOW-CORE RETAINING BLOCK GRAVITY WALLS

Preliminary Height Guide

ϕ = 30°  |  FINE TO MEDIUM SAND or SILTY SAND

LOAD CONDITION A  |  NO LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE

11.5-FOOT (3.50 m) HIGH SECTION
(3) 28" (710 mm) Blocks
(2) 41" (1040 mm) Blocks
(1) 62" (1520 mm) XL Block

ϕ = 30°

11-4" (290 mm)  
1-2" (35 mm)

12.5-FOOT (3.81 m) HIGH SECTION
(3) 28" (710 mm) Blocks
(2) 41" (1040 mm) Blocks
(1) 62" (1520 mm) XL Block

ϕ = 30°

12-4" (310 mm)  
1-2" (35 mm)

13.5-FOOT (4.11 m) HIGH SECTION
(3) 28" (710 mm) Blocks
(2) 41" (1040 mm) Blocks
(1) 62" (1520 mm) XL Block
(1) 72" (1830 mm) XL Block

ϕ = 30°

12-4" (310 mm)  
1-2" (35 mm)

14-7" (370 mm)  
1-2" (35 mm)

14.5-FOOT (4.44 m) HIGH SECTION
(3) 28" (710 mm) Blocks
(2) 41" (1040 mm) Blocks
(1) 62" (1520 mm) XL Block
(1) 72" (1830 mm) XL Block

ϕ = 30°

12-4" (310 mm)  
1-2" (35 mm)

15-4" (390 mm)  
1-2" (35 mm)

15.5-FOOT (4.74 m) HIGH SECTION
(3) 28" (710 mm) Blocks
(2) 41" (1040 mm) Blocks
(1) 62" (1520 mm) XL Block
(1) 72" (1830 mm) XL Block
(1) 90" (2440 mm) XL Block

ϕ = 30°

12-4" (310 mm)  
1-2" (35 mm)

15-4" (390 mm)  
1-2" (35 mm)

16.5-FOOT (5.03 m) HIGH SECTION
(3) 28" (710 mm) Blocks
(2) 41" (1040 mm) Blocks
(1) 62" (1520 mm) XL Block
(1) 72" (1830 mm) XL Block
(1) 90" (2440 mm) XL Block

ϕ = 30°

12-4" (310 mm)  
1-2" (35 mm)

15-4" (390 mm)  
1-2" (35 mm)

17-4" (440 mm)  
1-2" (35 mm)

Legend:

= 28" (710 mm) BLOCK
= 41" (1040 mm) BLOCK
= 60" (1520 mm) BLOCK
= 62" (1320 mm) XL BLOCK
= 72" (1830 mm) XL BLOCK
= 90" (2440 mm) XL BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIMINARY HEIGHT GUIDE.
XL HOLLOW-CORE RETAINING BLOCK GRAVITY WALLS

PRELIMINARY HEIGHT GUIDE

LOAD CONDITION B | 250 lb/ft² (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE

φ = 30° | FINE TO MEDIUM SAND OR SILTY SAND

6.0-FOOT (1.83 m) HIGH SECTION
(2) 28" (710 mm) Blocks
(1) 52" (1320 mm) XL Block

7.5-FOOT (2.29 m) HIGH SECTION
(3) 28" (710 mm) Blocks
(1) 52" (1320 mm) XL Block

10.5-FOOT (3.20 m) HIGH SECTION
(3) 28" (710 mm) Blocks
(2) 41" (1050 mm) Blocks
(1) 72" (1830 mm) XL Block

15.5-FOOT (4.67 m) HIGH SECTION
(3) 28" (710 mm) Blocks
(1) 52" (1320 mm) Block

18.5-FOOT (5.49 m) HIGH SECTION
(3) 28" (710 mm) Blocks
(1) 41" (1050 mm) Block

Legend:

= 28" (710 mm) BLOCK
= 41" (1050 mm) BLOCK
= 52" (1320 mm) XL BLOCK
= 72" (1830 mm) XL BLOCK
= 96" (2440 mm) XL BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIMINARY HEIGHT GUIDE.
RETAILING WALLS GRAVITY

Preliminary Height Guide

ϕ = 30° | FINE TO MEDIUM SAND or SILTY SAND

LOAD CONDITION C | 1:2.5 BACK SLOPE, NO TOE SLOPE, NO LIVE LOAD SURCHARGE

6.0-Foot (1.83 m) HIGH SECTION
(2) 28” (710 mm) Blocks
(1) 52” (1320 mm) XL Block

ϕ = 30°

7.5-Foot (2.29 m) HIGH SECTION
(2) 28” (710 mm) Blocks
(1) 72” (1830 mm) XL Block

ϕ = 30°

5.0-Foot (1.52 m) HIGH SECTION
(2) 28” (710 mm) Blocks
(1) 72” (1830 mm) XL Block

ϕ = 30°

10.5-Foot (3.20 m) HIGH SECTION
(2) 28” (710 mm) Blocks
(1) 72” (1830 mm) XL Block

ϕ = 30°

12.0-Foot (3.66 m) HIGH SECTION
(2) 28” (710 mm) Blocks
(1) 72” (1830 mm) XL Block

ϕ = 30°

Legend:

= 28” (710 mm) BLOCK
= 52” (1320 mm) XL BLOCK
= 72” (1830 mm) XL BLOCK
= 96” (2440 mm) XL BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIMINARY HEIGHT GUIDE.

ϕ = 28° | SILTY SAND or CLAYEY SAND

XL hollow-core retaining block gravity walls

Assumed retained and foundation soils for this Section

SECTION 3 OF 4

SM, SC

Internal angle of friction

ϕ = 28°

Unit weight

γ = 120 lb/ft³ (18.8 kN/m³)

Cohesion

c = 0 lb/ft² (0 kPa)
XL HOLLOW-CORE RETAINING BLOCK GRAVITY WALLS

Preliminary Height Guide

LOAD CONDITION A | NO LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE

<table>
<thead>
<tr>
<th>Height</th>
<th>Blocks</th>
<th>Block Sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.5'-0&quot;</td>
<td>6</td>
<td>28&quot; (710 mm) X 4' (1220 mm) X 24&quot; (610 mm)</td>
</tr>
<tr>
<td>13.5'-0&quot;</td>
<td>6</td>
<td>28&quot; (710 mm) X 4' (1220 mm) X 24&quot; (610 mm)</td>
</tr>
<tr>
<td>16.5'-0&quot;</td>
<td>6</td>
<td>28&quot; (710 mm) X 4' (1220 mm) X 24&quot; (610 mm)</td>
</tr>
<tr>
<td>19.5'-0&quot;</td>
<td>6</td>
<td>28&quot; (710 mm) X 4' (1220 mm) X 24&quot; (610 mm)</td>
</tr>
</tbody>
</table>

Legend:
- = 28" (710 mm) BLOCK
- = 41" (1040 mm) BLOCK
- = 60" (1520 mm) BLOCK
- = 52" (1320 mm) X BLOCK
- = 72" (1830 mm) X BLOCK
- = 96" (2440 mm) X BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIMINARY HEIGHT GUIDE.
**Preliminary Height Guide**

**XL HOLLOW-CORE RETAINING BLOCK GRAVITY WALLS**

**ALLOWABLE STRESS DESIGN**

**LOAD CONDITION B**

**φ = 28° | SILT SAND or CLAYEY SAND**

1. **6,0-FOOT (1,83 m) HIGH SECTION**
   - 250 lb/ft² (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE
   - Blocks: 0-6" [152 mm] - 1-0" [305 mm]
   - Height: 6" [152 mm] - 1-0" [305 mm]

2. **7,5-FOOT (2,29 m) HIGH SECTION**
   - Blocks: 0-6" [152 mm] - 1-0" [305 mm]
   - Height: 7" [178 mm] - 2-0" [508 mm]

3. **9,0-FOOT (2,74 m) HIGH SECTION**
   - Blocks: 0-6" [152 mm] - 1-0" [305 mm]
   - Height: 9" [229 mm] - 2-0" [508 mm]

4. **10,5-FOOT (3,20 m) HIGH SECTION**
   - Blocks: 0-6" [152 mm] - 1-0" [305 mm]
   - Height: 10" [254 mm] - 2-0" [508 mm]

5. **12,0-FOOT (3,66 m) HIGH SECTION**
   - Blocks: 0-6" [152 mm] - 1-0" [305 mm]
   - Height: 12" [305 mm] - 2-0" [508 mm]

6. **13,5-FOOT (4,11 m) HIGH SECTION**
   - Blocks: 0-6" [152 mm] - 1-0" [305 mm]
   - Height: 13" [330 mm] - 2-0" [508 mm]

**Legend:**

- 28" (710 mm) BLOCK
- 41" (1040 mm) BLOCK
- 52" (1320 mm) XL BLOCK
- 72" (1830 mm) XL BLOCK
- 96" (2440 mm) XL BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIMINARY HEIGHT GUIDE.
## Preliminary Height Guide

### phi = 28° | Silty Sand or Clayey Sand

**Load Condition C** | 1 : 2.5 Back Slope, No Toe Slope, No Live Load Surcharge

#### 4.5-Foot (1.37 m) High Section
- (1) 28° (710 mm) Block
- (1) 60° (1320 mm) XL Block

#### 6.0-Foot (1.83 m) High Section
- (1) 28° (710 mm) Block
- (1) 60° (1320 mm) XL Block

#### 7.5-Foot (2.29 m) High Section
- (1) 28° (710 mm) Block
- (1) 41° (1020 mm) Block
- (1) 60° (1320 mm) Block
- (1) 90° (2440 mm) XL Block

#### 9.0-Foot (2.74 m) High Section
- (1) 28° (710 mm) Block
- (1) 41° (1020 mm) Block
- (1) 72° (1830 mm) XL Block
- (1) 90° (2440 mm) XL Block

---

### phi = 40° over 26° | Crushed Stone Backfill Replacing Silty or Clayey Sand

- XL hollow-core retaining block gravity walls
- Assumed select backfill / retained soil for this Section *
- Internal angle of friction
  - phi = 40°
- Unit weight
  - gamma = 130 lb / ft³ (20.4 kN / m³)
- Cohesion
  - c = 0 lb / ft² (0 kPa)

- Assumed native / foundation soil for this Section
  - SM, SC

- Internal angle of friction
  - phi = 26°
- Unit weight
  - gamma = 120 lb / ft³ (18.8 kN / m³)
- Cohesion
  - c = 0 lb / ft² (0 kPa)

* This analysis assumes native material is removed to a 1 on 1 slope or flatter from the back of the proposed retaining wall blocks and replaced with compacted crushed stone.

---

**Legend:**
- 28° (710 mm) BLOCK
- 41° (1020 mm) BLOCK
- 60° (1320 mm) XL BLOCK
- 72° (1830 mm) XL BLOCK
- 90° (2440 mm) XL BLOCK

---

**See Notes and Recommended Details at Start of Preliminary Height Guide.**
XL Hollow-Core Retaining Block Gravity Walls

Preliminary Height Guide

\[ \phi = 40^\circ \] over \[ 26^\circ \]

**CRUSHED STONE BACKFILL REPLACING SILTY or CLAYEY SAND**

**LOAD CONDITION C**
1: 2.5 BACK SLOPE, NO TOE SLOPE, NO LIVE LOAD SURCHARGE

---

**Project:**
- **Friday Harbour Project #206**
- **Owner:** Geranium, et al
- **Engineer:** SCS Consultants, et al
- **Installer:** Rocky River Construction, et al

**Manufacturer:** The Sarjeant Co.

**Location:** Innisfil, Ontario, Canada

**Completed:** 2017

---

**Legend:**
- \( = 26^\circ \) (710 mm) BLOCK
- \( = 41^\circ \) (1030 mm) BLOCK
- \( = 62^\circ \) (1320 mm) XL BLOCK
- \( = 72^\circ \) (1830 mm) XL BLOCK
- \( = 96^\circ \) (2440 mm) XL BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIMINARY HEIGHT GUIDE.
LARGE BATTER WALLS
IMPORTANT NOTICE

The design specifications for Redi-Rock® blocks suggest maximum installation heights under certain assumed conditions. These wall heights were calculated using the assumed material properties and loading conditions in the Design Resource Manual and will vary from location to location depending on the soil properties and terrain. Since soil conditions and topography vary greatly from site to site, an engineering analysis must be performed for each wall installation.

Because Redi-Rock International does not build the blocks or install the wall system, Redi-Rock International does not assume any responsibility regarding structural stability of any particular block or particular wall system. In addition, Redi-Rock International assumes no responsibility in connection with any injury, death, or property damage claim whatsoever whether asserted against a Leasee, Leasor, Purchaser or others, arising out of or attributable to the operation of or products produced with Redi-Rock International equipment.

9" (230 MM) SETBACK WALLS

34° | DENSE WELL-GRADED SAND or SAND AND GRAVEL ......................108
30° | FINE TO MEDIUM SAND or SILTY SAND ...........................................116
28° | SILTY SAND or CLAYEY SAND ...........................................................121

Preliminary Height Guide

This preliminary height guide has been prepared showing Redi-Rock walls in a variety of assumed conditions. It is intended to give the specifier an idea of what block types are required and what heights are achievable with Redi-Rock in different applications. A combination of Redi-Rock 28° (170 mm), 30° (170 mm), and 34° (230 mm) wide blocks with knolls in the 9" (230 mm) setback position are used to provide the most efficient cross-section available in the different conditions.

Several assumptions have been made in preparation of the guide. They are listed in the notes below. If these assumptions do not match the wall section under consideration, block selections and achievable heights may vary from the sections shown in this guide.

All wall sections for construction must be designed by a registered Professional Engineer using the actual conditions of the site.

Notes:

- This preliminary guide has been prepared for three different soil types and three different load conditions to give an indication of the performance of Redi-Rock walls. Redi-Rock walls are not limited to these conditions. Specific wall sections can be designed for different soil and loading conditions.
- Unit weight of soil is assumed to be 120 lb/ft³ (1865.0 kN/m³) or 150 lb/ft³ (234.4 kN/m³) as noted for each section of this preliminary guide. Minimum factors of safety are 1.5 for stability, 1.5 for overturning, 2.5 for bearing capacity, and 1.3 for global stability. Other factors of safety will result in changes from the wall heights and block selections shown in this guide.
- No seismic or hydrostatic loads were included in this preliminary guide.
- Ledgestone texture blocks were used to prepare this preliminary guide. Achievable wall heights and block selections for other textures may vary.
- Independent barrier design at the top of the wall must be performed for all specific conditions. Barrier requirements may result in changes to available wall heights and block selections from those shown in this guide.
- Wall stability needs to be verified in the final design for site specific conditions.
- The wall design shall address both internal and external drainage and shall be evaluated by the Professional Engineer who is responsible for the final wall design.
- Backfill material to be compacted to 95% maximum dry density (ASTM D1557).

All Redi-Rock International Wall System Specifications and installation recommendations should be consulted. Construction oversight should be provided on all walls to ensure proper construction according to your detailed design drawings. Field conditions vary greatly from site to site; therefore, Redi-Rock products are manufactured by independently owned, licensed manufacturers. Product offerings vary between manufacturers. Contact your local manufacturer to determine what products are available for your job.
PRELIMINARY HEIGHT GUIDE

**φ = 34° | DENSE WELL-GRADED SAND or SAND AND GRAVEL**

Large batter gravity walls
Assumed retained and foundation soils for this Section
Internal angle of friction
Unit weight
Cohesion

LOAD CONDITION A | NO LIVE LOAD SURFACE, NO BACK SLOPE, NO TOE SLOPE
LOAD CONDITION B | 250 lb/ft² (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE
LOAD CONDITION C | 1:2.5 BACK SLOPE, NO TOE SLOPE, NO LIVE LOAD SURCHARGE

9° (230 mm) SETBACK WALLS

**ALLOWABLE STRESS DESIGN**

**LOAD CONDITION A**

2 BLOCK HIGH SECTION
(1) 28” (710 mm) Top Block
(2) 41” (1030 mm) Blocks

3 BLOCK HIGH SECTION
(1) 28” (710 mm) Top Block
(2) 41” (1030 mm) Blocks

4 BLOCK HIGH SECTION
(1) 28” (710 mm) Top Block
(2) 41” (1030 mm) Blocks

5 BLOCK HIGH SECTION
(1) 28” (710 mm) Top Block
(2) 41” (1030 mm) Blocks

6 BLOCK HIGH SECTION
(1) 28” (710 mm) Top Block
(2) 41” (1030 mm) Blocks

7 BLOCK HIGH SECTION
(1) 28” (710 mm) Top Block
(2) 41” (1030 mm) Blocks

8 BLOCK HIGH SECTION
(1) 28” (710 mm) Top Block
(2) 41” (1030 mm) Blocks

9 BLOCK HIGH SECTION
(1) 28” (710 mm) Top Block
(2) 41” (1030 mm) Blocks

Legend:

- 28” (710 mm) BLOCK
- 41” (1030 mm) BLOCK
- 46” (1067 mm) BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIMINARY HEIGHT GUIDE.
Preliminary Height Guide

LOAD CONDITION A | NO LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE

**DENSE WELL-GRADED SAND or SAND AND GRAVEL**

### 10 BLOCK HIGH SECTION
- (1) 28” (710 mm) Top Block
- (9) 41” (1030 mm) Blocks

### 12 BLOCK HIGH SECTION
- (1) 28” (710 mm) Top Block
- (11) 41” (1030 mm) Blocks

### 14 BLOCK HIGH SECTION
- (1) 28” (710 mm) Top Block
- (13) 41” (1030 mm) Blocks

### 16 BLOCK HIGH SECTION
- (1) 28” (710 mm) Top Block
- (9) 41” (1030 mm) Blocks
- (7) 60” (1520 mm) Blocks

### 18 BLOCK HIGH SECTION
- (1) 28” (710 mm) Top Block
- (9) 41” (1030 mm) Blocks
- (7) 60” (1520 mm) Blocks

### 20 BLOCK HIGH SECTION
- (1) 28” (710 mm) Top Block
- (9) 41” (1030 mm) Blocks
- (7) 60” (1520 mm) Blocks

**Legend:**
- 28” (710 mm) BLOCK
- 41” (1030 mm) BLOCK
- 60” (1520 mm) BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIMINARY HEIGHT GUIDE.
### Preliminary Height Guide

#### Allowable Stress Design

**Load Condition B**
- 250 lb/ft² (12 kPa) Live Load Surcharge, No Back Slope, No Toe Slope

#### Retaining Walls Large Batter Walls

**9" (230 mm) Setback Walls**

<table>
<thead>
<tr>
<th>Section</th>
<th>Block Details</th>
<th>Height</th>
<th>Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Block High Section</td>
<td>(1) 28” (710 mm) Top Block</td>
<td>4'</td>
<td>250 lb/ft² (12 kPa)</td>
</tr>
<tr>
<td>3 Block High Section</td>
<td>(1) 28” (710 mm) Top Block (2) 41” (1050 mm) Blocks</td>
<td>4'</td>
<td>250 lb/ft² (12 kPa)</td>
</tr>
<tr>
<td>4 Block High Section</td>
<td>(1) 28” (710 mm) Top Block (3) 41” (1050 mm) Blocks</td>
<td>4'</td>
<td>250 lb/ft² (12 kPa)</td>
</tr>
<tr>
<td>5 Block High Section</td>
<td>(1) 28” (710 mm) Top Block (4) 41” (1050 mm) Blocks</td>
<td>7'</td>
<td>250 lb/ft² (12 kPa)</td>
</tr>
<tr>
<td>6 Block High Section</td>
<td>(1) 28” (710 mm) Top Block (5) 41” (1050 mm) Blocks</td>
<td>8'</td>
<td>250 lb/ft² (12 kPa)</td>
</tr>
<tr>
<td>7 Block High Section</td>
<td>(1) 28” (710 mm) Top Block (6) 41” (1050 mm) Blocks</td>
<td>10’</td>
<td>250 lb/ft² (12 kPa)</td>
</tr>
<tr>
<td>8 Block High Section</td>
<td>(1) 28” (710 mm) Top Block (7) 41” (1050 mm) Blocks</td>
<td>12’</td>
<td>250 lb/ft² (12 kPa)</td>
</tr>
<tr>
<td>9 Block High Section</td>
<td>(1) 28” (710 mm) Top Block (8) 41” (1050 mm) Blocks</td>
<td>15’</td>
<td>250 lb/ft² (12 kPa)</td>
</tr>
</tbody>
</table>

#### Legend:

- 28” (710 mm) Block
- 41” (1050 mm) Block
- 60” (1520 mm) Block

**See Notes and Recommended Details at Start of Preliminary Height Guide.**
**9" (230 mm) SETBACK WALLS**

### PRELIMINARY HEIGHT GUIDE

<table>
<thead>
<tr>
<th>Condition</th>
<th>Height</th>
<th>Block Size</th>
<th>Load Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>2.5</td>
<td>1:2.5</td>
<td>Back, No Toe, No Live Load Surcharge</td>
</tr>
</tbody>
</table>

### BLOCK HIGH SECTION

1. **2 BLOCK HIGH SECTION**
   - (1) 2" (71 mm) Top Block
   - (1) 4" (102 mm) Block
   - Height = 11" (280 mm)

2. **4 BLOCK HIGH SECTION**
   - (1) 2" (71 mm) Top Block
   - (1) 4" (102 mm) Block
   - Height = 22" (559 mm)

3. **6 BLOCK HIGH SECTION**
   - (1) 2" (71 mm) Top Block
   - (1) 4" (102 mm) Block
   - Height = 33" (840 mm)

4. **8 BLOCK HIGH SECTION**
   - (1) 2" (71 mm) Top Block
   - (1) 4" (102 mm) Block
   - Height = 44" (1118 mm)

5. **10 BLOCK HIGH SECTION**
   - (1) 2" (71 mm) Top Block
   - (1) 4" (102 mm) Block
   - Height = 55" (1397 mm)

### LEGEND

- ± 28" (710 mm) BLOCK
- ± 41" (1030 mm) BLOCK
- ± 60" (1520 mm) BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIMINARY HEIGHT GUIDE.
9" (230 mm) SETBACK WALLS

Preliminary Height Guide

ALLOWABLE STRESS DESIGN

φ = 30° | FINE TO MEDIUM SAND or SILTY SAND

Large batter gravity walls
Assumed retained and foundation soils for this Section
Internal angle of friction
Unit weight
Cohesion

LOAD CONDITION A | NO LIVE LOAD SURFACE, NO BACK SLOPE, NO TOE SLOPE
LOAD CONDITION B | 250 lb/ft² (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE
LOAD CONDITION C | 1 : 2.5 BACK SLOPE, NO TOE SLOPE, NO LIVE LOAD SURCHARGE

LOAD CONDITION A | NO LIVE LOAD SURFACE, NO BACK SLOPE, NO TOE SLOPE
117
LOAD CONDITION B | 250 lb/ft² (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE
119
LOAD CONDITION C | 1 : 2.5 BACK SLOPE, NO TOE SLOPE, NO LIVE LOAD SURCHARGE
120

Legend:
- φ = 28° (710 mm) BLOCK
- φ = 41° (1000 mm) BLOCK
- φ = 60° (1020 mm) BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIMINARY HEIGHT GUIDE.
**Preliminary Height Guide**

### 9” (230 mm) SETBACK WALLS

<table>
<thead>
<tr>
<th>LOAD CONDITION A</th>
<th>NO LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE</th>
</tr>
</thead>
</table>
| **10 BLOCK HIGH SECTION** | ...(Diagram of wall sections and calculations)...
| **11 BLOCK HIGH SECTION** | ...(Diagram of wall sections and calculations)...
| **12 BLOCK HIGH SECTION** | ...(Diagram of wall sections and calculations)...

### 9” (230 mm) SETBACK WALLS

<table>
<thead>
<tr>
<th>LOAD CONDITION B</th>
<th>250 lb/ft² (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE</th>
</tr>
</thead>
</table>
| **2 BLOCK HIGH SECTION** | ...(Diagram of wall sections and calculations)...
| **3 BLOCK HIGH SECTION** | ...(Diagram of wall sections and calculations)...
| **4 BLOCK HIGH SECTION** | ...(Diagram of wall sections and calculations)...
| **5 BLOCK HIGH SECTION** | ...(Diagram of wall sections and calculations)...
| **6 BLOCK HIGH SECTION** | ...(Diagram of wall sections and calculations)...
| **7 BLOCK HIGH SECTION** | ...(Diagram of wall sections and calculations)...
| **8 BLOCK HIGH SECTION** | ...(Diagram of wall sections and calculations)...

**Legend:**
- 30° = 28” (710 mm) BLOCK
- 41° (1030 mm) BLOCK
- 60° (1520 mm) BLOCK

See notes and recommended details at start of Preliminary Height Guide.
### Preliminary Height Guide

#### 9" (230 mm) SETBACK WALLS

**Preliminary Height Guide**

### ALLOWABLE STRESS DESIGN

#### 

**ϕ = 30°**

**FINE TO MEDIUM SAND or SILTY SAND**

<table>
<thead>
<tr>
<th>LOAD CONDITION C</th>
<th>1 : 2.5 BACK SLOPE, NO TOE SLOPE, NO LIVE LOAD SURCHARGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 BLOCK HIGH SECTION</td>
<td></td>
</tr>
<tr>
<td>(1) 28&quot; (710 mm) Top Block</td>
<td></td>
</tr>
<tr>
<td>(2) 41&quot; (1050 mm) Blocks</td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>= 30°</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LOAD CONDITION C</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 BLOCK HIGH SECTION</td>
</tr>
<tr>
<td>(1) 28&quot; (710 mm) Top Block</td>
</tr>
<tr>
<td>(2) 41&quot; (1050 mm) Blocks</td>
</tr>
<tr>
<td>2.5</td>
</tr>
<tr>
<td>= 30°</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LOAD CONDITION C</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 BLOCK HIGH SECTION</td>
</tr>
<tr>
<td>(1) 28&quot; (710 mm) Top Block</td>
</tr>
<tr>
<td>(2) 41&quot; (1050 mm) Blocks</td>
</tr>
<tr>
<td>2.5</td>
</tr>
<tr>
<td>= 30°</td>
</tr>
</tbody>
</table>

#### 

**ϕ = 28°**

**SILTY SAND or CLAYEY SAND**

<table>
<thead>
<tr>
<th>LOAD CONDITION A</th>
</tr>
</thead>
<tbody>
<tr>
<td>250 lb/ft² (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE</td>
</tr>
<tr>
<td>2.5</td>
</tr>
<tr>
<td>= 30°</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LOAD CONDITION B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 : 2.5 BACK SLOPE, NO TOE SLOPE, NO LIVE LOAD SURCHARGE</td>
</tr>
<tr>
<td>2.5</td>
</tr>
<tr>
<td>= 30°</td>
</tr>
</tbody>
</table>

### Legend:

- 28" (710 mm) BLOCK
- 41" (1050 mm) BLOCK
- 60" (1520 mm) BLOCK

### See Notes and Recommended Details at Start of Preliminary Height Guide.
9" (230 mm) SETBACK WALLS

Preliminary Height Guide

ϕ = 28° | SILTY SAND or CLAYEY SAND

LOAD CONDITION A | NO LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE

2 BLOCK HIGH SECTION
(1) 2'8" (710 mm) Top Block
(1) 4'1" (1230 mm) Block

ϕ = 28°

3 BLOCK HIGH SECTION
(1) 2'8" (710 mm) Top Block
(2) 4'1" (1230 mm) Blocks

ϕ = 28°

4 BLOCK HIGH SECTION
(1) 2'8" (710 mm) Top Block
(3) 4'1" (1230 mm) Blocks

ϕ = 28°

5 BLOCK HIGH SECTION
(1) 2'8" (710 mm) Top Block
(4) 4'1" (1230 mm) Blocks

ϕ = 28°

6 BLOCK HIGH SECTION
(1) 2'8" (710 mm) Top Block
(5) 4'1" (1230 mm) Blocks

ϕ = 28°

7 BLOCK HIGH SECTION
(1) 2'8" (710 mm) Top Block
(6) 4'1" (1230 mm) Blocks

ϕ = 28°

8 BLOCK HIGH SECTION
(1) 2'8" (710 mm) Top Block
(7) 4'1" (1230 mm) Blocks

ϕ = 28°

9 BLOCK HIGH SECTION
(1) 2'8" (710 mm) Top Block
(8) 4'1" (1230 mm) Blocks

ϕ = 28°

Legend:

ϕ = 28° (710 mm) BLOCK
ϕ = 4'1" (1230 mm) BLOCK
ϕ = 6'0" (1820 mm) BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIMINARY HEIGHT GUIDE.
PROJECT: Residential Erosion Protection
Block Manufacturer: MDC Contracting, LLC
Engineer: Benchmark Engineering
Installer: Harbor Springs Excavating
Location: Harbor Springs, Michigan
Completed: 2008

RETAINING WALLS

Preliminary Height Guide

<table>
<thead>
<tr>
<th>Height (mm)</th>
<th>Block Configuration</th>
<th>Load Condition C</th>
<th>Back Slope</th>
<th>No Live Load Surcharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Block High Section</td>
<td>(1) 28&quot; (710 mm) Top Block, (1) 41&quot; (1050 mm) Block</td>
<td>1:2.5</td>
<td>Back Slope</td>
<td>No Live Load Surcharge</td>
</tr>
<tr>
<td>4 Block High Section</td>
<td>(1) 28&quot; (710 mm) Top Block, (2) 41&quot; (1050 mm) Blocks</td>
<td>1:2.5</td>
<td>Back Slope</td>
<td>No Live Load Surcharge</td>
</tr>
</tbody>
</table>

Legend:
- 28" (710 mm) BLOCK
- 41" (1050 mm) BLOCK
- 69" (1600 mm) BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIMINARY HEIGHT GUIDE.
REDI-ROCK SUCCESS PROFILE

MSE WALLS
IMPORTANT NOTICE

The design specifications for Redi-Rock® blocks suggest maximum installation heights under certain assumed conditions. These wall heights were calculated using the assumed material properties and loading conditions in the Design Resource Manual and will vary from location to location depending on the soil properties and terrain. Since soil conditions and topography vary greatly from site to site, an engineering analysis must be performed for each wall installation.

Because Redi-Rock International does not build the blocks or install the wall system, Redi-Rock International does not assume any responsibility regarding structural stability of any particular block or particular wall system. In addition, Redi-Rock International assumes no responsibility in connection with any injury, death, or property damage claim whatsoever whether asserted against a Lessee, Leasor, Purchaser or others, arising out of or attributable to the operation of or products produced with Redi-Rock International equipment.

POSITIVE CONNECTION SYSTEM WALLS

34° | DENSE WELL-GRADED SAND or SAND AND GRAVEL ...........................................130
30° | FINE TO MEDIUM SAND or SILTY SAND ............................................................158
28° | SILTY SAND or CLAYEY SAND ........................................................................188

POSITIVE CONNECTION SYSTEM WALLS

34° | DENSE WELL-GRADED SAND or SAND AND GRAVEL ...........................................130
30° | FINE TO MEDIUM SAND or SILTY SAND ............................................................158
28° | SILTY SAND or CLAYEY SAND ........................................................................188

AASHTO LOAD RESISTANCE FACTOR DESIGN

Preliminary Reinforcement Schedule

This preliminary reinforcement schedule has been prepared showing Redi-Rock Mechanically Stabilized Earth (MSE) walls in a variety of assumed conditions. It is intended to give the specifier an idea of what types and lengths of geogrid reinforcement are required to achieve various wall heights in different applications. Redi-Rock 28° (110 mm) Wide Positive Connection (PC) System blocks and 12° (305 mm) strips of M10 Geogrid are used.

Several assumptions have been made in preparation of the guide. They are listed in the notes below. If these assumptions do not match the wall section under consideration, types and lengths of geogrid reinforcement will vary from what is shown in this guide. All wall sections for construction must be designed by a registered Professional Engineer using the actual conditions of the site.

Notes:

This preliminary reinforcement schedule demonstrates general requirements for the stiff soils as shown. Some agencies may require specific beam material for use in the reinforced soil zone that differ from the material assumed in this guide. Actual geometric requirements for construction may vary from those shown in this guide depending on local-specific soil parameters. No analysis or hydraulic calculations were included in this preliminary guide.

Independent barrier design at the top of the wall must be performed for stiff specific conditions. Barrier requirements may result in changes to the geogrid reinforcement types and lengths from those shown in this guide. Wall stability needs to be verified in the final design for site-specific conditions.

These block selection and height guides were prepared by Redi-Rock International for estimating and conceptual design purposes only. All information is believed to be true and accurate; however, Redi-Rock International assumes no responsibility for the use of these preliminary guides for actual construction. Determination of the suitability of each preliminary guide is the sole responsibility of the user. Final designs for construction purposes must be performed by a registered Professional Engineer, using the actual conditions of the proposed site.

The wall shall be limited to any integral and external drains and shall be evaluated by the Professional Engineer who is responsible for the final design wall.

Backfill material shall be compacted to 90% modified proctor density (ASTM D1557).

All Redi-Rock International Wall System Specifications may be found in the Redi-Rock International Wall System Specifications manual. Installation recommendations should be followed. This preliminary guide should be provided on all walls to ensure proper construction according to your local design drawings.

Redi-Rock products are manufactured by Independently owned, licensed manufacturers. Product offerings will vary between manufacturers. Contact your local manufacturer to determine what products are available for your job.
**Preliminary Reinforcement Schedule**

### LOAD CONDITION A
- **NO LIVE LOAD SURFACE, NO BACK SLOPE, NO TOE SLOPE**

### LOAD CONDITION B
- **250 lb/ft² (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE**

### LOAD CONDITION CR
- **1:2 CREST SLOPE, 10' (3.0 m) HIGH, 250 lb/ft² (12 kPa) LIVE LOAD SURCHARGE AT CREST, NO TOE SLOPE**
POSITIVE CONNECTION SYSTEM WALLS

LOAD CONDITION A | NO LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE

Retaining Walls MSE Walls

AASHTO Load Resistance Factor Design

Positive Connection System Walls

Dense Well-Graded Sand or Sand and Gravel

\[ \phi = 34^\circ \]

Preliminary Reinforcement Schedule

16 Block Section

(16) 28" (710 mm) Blocks

Geogrid Slots Required per Wall Length

Type | Wall Slope | Wall Length | Wall Slope

<table>
<thead>
<tr>
<th>Type</th>
<th>Block/Unit</th>
<th>Wall Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXT</td>
<td>4.02</td>
<td>1.26</td>
</tr>
<tr>
<td>INT</td>
<td>3.60</td>
<td>1.57</td>
</tr>
</tbody>
</table>

17 Block Section

(17) 28" (710 mm) Blocks

Geogrid Slots Required per Wall Length

Type | Wall Slope | Wall Length | Wall Slope

<table>
<thead>
<tr>
<th>Type</th>
<th>Block/Unit</th>
<th>Wall Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXT</td>
<td>4.02</td>
<td>1.26</td>
</tr>
<tr>
<td>INT</td>
<td>3.60</td>
<td>1.57</td>
</tr>
</tbody>
</table>

18 Block Section

(18) 28" (710 mm) Blocks

Geogrid Slots Required per Wall Length

Type | Wall Slope | Wall Length | Wall Slope

<table>
<thead>
<tr>
<th>Type</th>
<th>Block/Unit</th>
<th>Wall Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXT</td>
<td>4.02</td>
<td>1.26</td>
</tr>
<tr>
<td>INT</td>
<td>3.60</td>
<td>1.57</td>
</tr>
</tbody>
</table>

Legend:

- 28" (710 mm) BLOCK
- 41" (1050 mm) BLOCK

Geogrid shall be 12" (300 mm) wide slots of 12# steel, gauge type as noted. Geogrid shall be factory cut and certified for width and strength by TenCate M Flint.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
POSITIVE CONNECTION SYSTEM WALLS

AASHTO LOAD RESISTANCE FACTOR DESIGN

Preliminary Reinforcement Schedule

ϕ = 34°

DENSE WELL-GRADED SAND or SAND AND GRAVEL

LOAD CONDITION A

NO LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE

19 BLOCK SECTION
(19) 28" (710 mm) Blocks

27'-0" (8.23 m)

12'-0" (3.66 m)

20'-0" (6.09 m)

Legend:
• 28" (710 mm) BLOCK
• 41" (1030 mm) BLOCK

Geogrid shall be 12" (305 mm) wide strips of #2 geogrid, type as noted. Geogrid shall be factory cut and certified for width and strength by Ten-Cate Minitex.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.

20 BLOCK SECTION
(20) 28" (710 mm) Blocks

28'-6" (8.69 m)

12'-0" (3.66 m)

20'-0" (6.09 m)

Legend:
• 28" (710 mm) BLOCK
• 41" (1030 mm) BLOCK

Geogrid shall be 12" (305 mm) wide strips of #2 geogrid, type as noted. Geogrid shall be factory cut and certified for width and strength by Ten-Cate Minitex.

* Not tall enough? You can build significantly taller walls with the Redi-Rock PC System...we just had to stop the preliminary sections somewhere. Talk to your Engineer or give us a call for more info.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
## Preliminary Reinforcement Schedule

### LOAD CONDITION B | 260 lb/ft² (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE

<table>
<thead>
<tr>
<th>Block Section</th>
<th>Retaining Wall Layout</th>
<th>Geogrid Roll Required per Wall Length</th>
<th>Type of Roll/Anchorage</th>
<th>Geogrid Roll Anchorage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Block Section</td>
<td>12&quot; (305 mm) Block</td>
<td>250 lb/ft² (12 kPa)</td>
<td>12&quot; (305 mm) Block</td>
<td>12&quot; (305 mm) Block</td>
</tr>
<tr>
<td>3 Block Section</td>
<td>12&quot; (305 mm) Block</td>
<td>250 lb/ft² (12 kPa)</td>
<td>12&quot; (305 mm) Block</td>
<td>12&quot; (305 mm) Block</td>
</tr>
<tr>
<td>4 Block Section</td>
<td>12&quot; (305 mm) Block</td>
<td>250 lb/ft² (12 kPa)</td>
<td>12&quot; (305 mm) Block</td>
<td>12&quot; (305 mm) Block</td>
</tr>
<tr>
<td>5 Block Section</td>
<td>12&quot; (305 mm) Block</td>
<td>250 lb/ft² (12 kPa)</td>
<td>12&quot; (305 mm) Block</td>
<td>12&quot; (305 mm) Block</td>
</tr>
<tr>
<td>6 Block Section</td>
<td>12&quot; (305 mm) Block</td>
<td>250 lb/ft² (12 kPa)</td>
<td>12&quot; (305 mm) Block</td>
<td>12&quot; (305 mm) Block</td>
</tr>
<tr>
<td>7 Block Section</td>
<td>12&quot; (305 mm) Block</td>
<td>250 lb/ft² (12 kPa)</td>
<td>12&quot; (305 mm) Block</td>
<td>12&quot; (305 mm) Block</td>
</tr>
<tr>
<td>8 Block Section</td>
<td>12&quot; (305 mm) Block</td>
<td>250 lb/ft² (12 kPa)</td>
<td>12&quot; (305 mm) Block</td>
<td>12&quot; (305 mm) Block</td>
</tr>
<tr>
<td>9 Block Section</td>
<td>12&quot; (305 mm) Block</td>
<td>250 lb/ft² (12 kPa)</td>
<td>12&quot; (305 mm) Block</td>
<td>12&quot; (305 mm) Block</td>
</tr>
</tbody>
</table>

### Legend:
- **28" (710 mm) Block**
- **41" (1050 mm) Block**

### Geogrid Specification:
- Geogrid shall be 12" (305 mm) wide, with rolls of 50 ft (15 m) per packet, type as noted.
- Geogrid shall be factory cut and certified for width and strength by TenCate Geosynthetics.

### See Notes and Recommended Details at Start of Prelim. Reinforcement Schedule.
POSITIVE CONNECTION SYSTEM WALLS
AASHTO LOAD RESISTANCE FACTOR DESIGN

Preliminary Reinforcement Schedule

\[ \phi = 34^\circ \]

**DENSO WELL-GRATED SAND OR SAND AND GRAVEL**

**LOAD CONDITION B)** 260 lb/ft^2 (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE

---

20 BLOCK SECTION *

(20) 28" (710 mm) Blocks

<table>
<thead>
<tr>
<th>Geogrid Rods Required per Wall Length</th>
<th>Type</th>
<th>Blocks/Viewer</th>
<th>Rods/Viewer</th>
</tr>
</thead>
<tbody>
<tr>
<td>292'' (736 mm)</td>
<td>4 XT</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>249'' (632 mm)</td>
<td>4 XT</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>206'' (523 mm)</td>
<td>4 XT</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>163'' (414 mm)</td>
<td>4 XT</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>120'' (305 mm)</td>
<td>4 XT</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>77'' (195 mm)</td>
<td>4 XT</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>44'' (111 mm)</td>
<td>4 XT</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>14'' (360 mm)</td>
<td>10 XT</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>10'' (254 mm)</td>
<td>10 XT</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>6'' (152 mm)</td>
<td>10 XT</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>2'' (51 mm)</td>
<td>10 XT</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>4'' (101 mm)</td>
<td>20 XT</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>2'' (51 mm)</td>
<td>20 XT</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>4'' (101 mm)</td>
<td>30 XT</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>2'' (51 mm)</td>
<td>30 XT</td>
<td>3</td>
<td>30</td>
</tr>
</tbody>
</table>

Legend:

- 28" (710 mm) BLOCK
- 41" (1092 mm) BLOCK

* Not tall enough? You can build significantly taller walls with the Redi-Rock PC System...we just had to stop the preliminary sections somewhere. Talk to your Engineer or give us a call for more info.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.

---

2 BLOCK HIGH SECTION

(2) 28" (710 mm) Blocks

<table>
<thead>
<tr>
<th>Geogrid Rods Required per Wall Length</th>
<th>Type</th>
<th>Blocks/Viewer</th>
<th>Rods/Viewer</th>
</tr>
</thead>
<tbody>
<tr>
<td>11'' (280 mm)</td>
<td>4 XT</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>9'' (230 mm)</td>
<td>4 XT</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Legend:

- 1 28" (710 mm) BLOCK
- 41" (1092 mm) BLOCK

* Geogrid length primarily controlled by global stability. Length will change with crest height.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
POSITIVE CONNECTION SYSTEM WALLS

AASHTO LOAD RESISTANCE FACTOR DESIGN

Preliminary Reinforcement Schedule

\[ \phi = 34^\circ \]

**DENSE WELL-GRADED SAND OR SAND AND GRAVEL**

**LOAD CONDITION CR**
1:2 CREST SLOPE, 10' (3.0 m) HIGH, 250 kPa (12 kPa) SURCHARGE AT CREST, NO TOE SLOPE

**5 BLOCK HIGH SECTION**
(5) 28' (710 mm) Blocks

Legend:
- ± 28' (710mm) BLOCK
- ± 41' (1200 mm) BLOCK
- Geogrid Cut Length = \(2 \pi L \) + 3' (0.9 m)
- Geogrid shall be 12' (365 mm) wide strips of Welded Geogrid, type as noted, Geogrid shall be factory cut and certified for width and strength by TenCate Geosynthetics

**6 BLOCK HIGH SECTION**
(6) 28' (710 mm) Blocks

Legend:
- ± 28' (710mm) BLOCK
- ± 41' (1200 mm) BLOCK
- Geogrid Cut Length = \(2 \pi L \) + 3' (0.9 m)
- Geogrid shall be 12' (365 mm) wide strips of Welded Geogrid, type as noted, Geogrid shall be factory cut and certified for width and strength by TenCate Geosynthetics

**7 BLOCK HIGH SECTION**
(7) 28' (710 mm) Blocks

Legend:
- ± 28' (710mm) BLOCK
- ± 41' (1200 mm) BLOCK
- Geogrid Cut Length = \(2 \pi L \) + 3' (0.9 m)
- Geogrid shall be 12' (365 mm) wide strips of Welded Geogrid, type as noted, Geogrid shall be factory cut and certified for width and strength by TenCate Geosynthetics

**8 BLOCK HIGH SECTION**
(8) 28' (710 mm) Blocks

Legend:
- ± 28' (710mm) BLOCK
- ± 41' (1200 mm) BLOCK
- Geogrid Cut Length = \(2 \pi L \) + 3' (0.9 m)
- Geogrid shall be 12' (365 mm) wide strips of Welded Geogrid, type as noted, Geogrid shall be factory cut and certified for width and strength by TenCate Geosynthetics

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
# Preliminary Reinforcement Schedule

## Positive Connection System Walls

### Dense Well-Graded Sand or Sand and Gravel

<table>
<thead>
<tr>
<th>LOAD CONDITION CR</th>
<th>1:1 CRESCENT SLOPE, 15 ft/100 ft (1.5 m)</th>
<th>HIGH: 250 kN/m² (12 kPa) Surcharge at Crest, NO Toe Slope</th>
</tr>
</thead>
</table>

### Geogrid Steel Required per Wall Length

<table>
<thead>
<tr>
<th>Type</th>
<th>Blocks/Row</th>
<th>Wall/Row</th>
<th>Length (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SXT</td>
<td>≥ 240</td>
<td>≥ 120</td>
<td>≥ 240</td>
</tr>
<tr>
<td>XXT</td>
<td>≥ 240</td>
<td>≥ 120</td>
<td>≥ 240</td>
</tr>
<tr>
<td>ZXT</td>
<td>≥ 240</td>
<td>≥ 120</td>
<td>≥ 240</td>
</tr>
</tbody>
</table>

### Notes

- Geogrid shall be 12” (305 mm) wide strips of welded geogrid, type as noted, Geogrid shall be factory cut and certified for wall strength by Tensile Test.

---

## AASHTO Load Resistance Factor Design

### Positive Connection System Walls

### Dense Well-Graded Sand or Sand and Gravel

<table>
<thead>
<tr>
<th>LOAD CONDITION CR</th>
<th>1:1 CRESCENT SLOPE, 15 ft/100 ft (1.5 m)</th>
<th>HIGH: 250 kN/m² (12 kPa) Surcharge at Crest, NO Toe Slope</th>
</tr>
</thead>
</table>

### Geogrid Steel Required per Wall Length

<table>
<thead>
<tr>
<th>Type</th>
<th>Blocks/Row</th>
<th>Wall/Row</th>
<th>Length (L)</th>
</tr>
</thead>
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<tr>
<td>SXT</td>
<td>≥ 240</td>
<td>≥ 120</td>
<td>≥ 240</td>
</tr>
<tr>
<td>XXT</td>
<td>≥ 240</td>
<td>≥ 120</td>
<td>≥ 240</td>
</tr>
<tr>
<td>ZXT</td>
<td>≥ 240</td>
<td>≥ 120</td>
<td>≥ 240</td>
</tr>
</tbody>
</table>

### Notes

- Geogrid shall be 12” (305 mm) wide strips of welded geogrid, type as noted, Geogrid shall be factory cut and certified for wall strength by Tensile Test.

---

*Geogrid length primarily controlled by global stability. Length will change with crest height.*

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
Preliminary Reinforcement Schedule

\[ \phi = 34^\circ \]

**DEN HED WELL-GRAD ED SAND OR SAND AND GRAVEL**

**LOAD CONDITION CR**

13 BLOCK HIGH SECTION

- 295 lb/ft^2 (12 kPa) Surch.<br>
- 1:1 CREST SLOPE, 10 (3.0 m) HIGH, 250 lb/ft^2 (12 kPa) SURCHARGE AT CREST, NO TOE SLOPE

Legend:

- 28" (710 mm) BLOCK
- 41" (1020 mm) BLOCK
- Geogrid shall be 12" (305 mm) wide strips of high geotextile material, type as noted. Geogrid shall be factory cut and certified for load and strength by TanCo, Inc.
- Geogrid Cut Length = \(2L + 3 \times 3\) (9.1 m)

* Geogrid length primarily controlled by global stability. Length will change with crest height.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
## Preliminary Reinforcement Schedule

### Positive Connection System Walls

### Dense Well-Graded Sand or Sand and Gravel

<table>
<thead>
<tr>
<th>Load Condition Cr</th>
<th>AASHTO Load Resistance Factor Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:2 Crest Slope, 10 (3.0 m) High, 250 kPa (12 kPa) Surcharge at Crest, No Toe Slope</td>
<td></td>
</tr>
</tbody>
</table>

### Geogrid选址

<table>
<thead>
<tr>
<th>Geogrid Type</th>
<th>Material</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEDOR (Continuous Silt)</td>
<td>12&quot; (366 mm) wide strips of geotextile geogrid, type A, factory cut and certified for width and strength by TanCote MFab.</td>
<td></td>
</tr>
</tbody>
</table>

### Notes

- Geogrid length primarily controlled by global stability. Length will change with crest height.

---

### See Notes and Recommended Details at Start of Prelim. Reinforcement Schedule.
PRELIMINARY REINFORCEMENT SCHEDULE

**LOAD CONDITION CR**

17 BLOCK HIGH SECTION

*(17)* 28” (710 mm) Blocks

250 lb / ft² (12 kPa)

<table>
<thead>
<tr>
<th>Type</th>
<th>Blocks Required per WA/Length</th>
<th>Blocks Required per WA/Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>12”</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>20”</td>
<td>0.50</td>
<td>0.50</td>
</tr>
</tbody>
</table>

*Geogrid length primarily controlled by global stability. Length will change with crest height.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
Preliminary Reinforcement Schedule

**AASHTO Load Resistance Factor Design**

### Load Condition CR

1:2 Crest Slope, 10' (3.0 m) High, 250 ksf (12 kPa) Surcharges at Crest, No Toeslope

<table>
<thead>
<tr>
<th>Type</th>
<th>Blocks/Lineal Foot</th>
<th>Blocks/Cubic Yd</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVST</td>
<td>2.23</td>
<td>7.21</td>
</tr>
<tr>
<td>LVST</td>
<td>2.23</td>
<td>7.21</td>
</tr>
<tr>
<td>HVST</td>
<td>2.23</td>
<td>7.21</td>
</tr>
</tbody>
</table>

**Legend:**
- ▼ 28" (710 mm) BLOCK
- ▼ 41" (1040 mm) BLOCK
- GEOGRID (Continuous Biaxial) Geogrid Cut Length = 2' + 3' (3.6 m)
- Geogrid shall be 12" (305 mm) with strips of 4½" (115 mm) wide geogrid, type as noted. Geogrid shall be factory cut and certified for width and strength by TanCate Mesh.

* Geogrid length primarily controlled by global stability. Length will change with crest height.

**Not tall enough? You can build significantly taller walls with the Redi-Rock PC system...we just had to stop the preliminary sections somewhere. Talk to your engineer or give us a call for more info.**

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
**Preliminary Reinforcement Schedule**

### \( \phi = 30^\circ \) | FINE TO MEDIUM SAND OR SILTY SAND

<table>
<thead>
<tr>
<th>Positive Connection System MSE Walls</th>
<th>AASHTO Load Resistance Factor Design</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LOAD CONDITION A</strong></td>
<td>NO LIVE LOAD SURFACE, NO BACK SLOPE, NO TOE SLOPE</td>
</tr>
<tr>
<td><strong>LOAD CONDITION B</strong></td>
<td>250 lb/ft(^2) (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE</td>
</tr>
<tr>
<td><strong>LOAD CONDITION CR</strong></td>
<td>1:2 CREST SLOPE, 10' (3.0 m) HIGH, 250 lb/ft(^2) (12 kPa) LIVE LOAD SURCHARGE AT CREST, NO TOE SLOPE</td>
</tr>
</tbody>
</table>

[Diagram of MSE wall with reinforcement details]
Positive Connection System Walls

Preliminary Reinforcement Schedule

$\theta = 30^\circ$  
Fine to Medium Sand or Silty Sand

**Load Condition A**  
No live load surcharge, no back slope, no toe slope

### 8 Block Section
- Width: 28" (710 mm)
- Blocks: 5 XT

### 9 Block Section
- Width: 28" (710 mm)
- Blocks: 6 XT

### 10 Block Section
- Width: 30" (762 mm)
- Blocks: 8 XT

### 11 Block Section
- Width: 30" (762 mm)
- Blocks: 8 XT

### 12 Block Section
- Width: 30" (762 mm)
- Blocks: 10 XT

### 13 Block Section
- Width: 30" (762 mm)
- Blocks: 10 XT

Legend:
- Width: 28" (710 mm) Block
- Width: 41" (1050 mm) Block

**See notes and recommended details at start of prelim. reinforcement schedule.**

---

MSE Walls

AASHTO Load Resistance Factor Design

Preliminary Reinforcement Schedule

$\theta = 30^\circ$  
Fine to Medium Sand or Silty Sand

**Load Condition A**  
No live load surcharge, no back slope, no toe slope

### 12 Block Section
- Width: 28" (710 mm)
- Blocks: 5 XT

### 13 Block Section
- Width: 28" (710 mm)
- Blocks: 5 XT

### 14 Block Section
- Width: 30" (762 mm)
- Blocks: 8 XT

### 15 Block Section
- Width: 30" (762 mm)
- Blocks: 10 XT

Legend:
- Width: 28" (710 mm) Block
- Width: 41" (1050 mm) Block

**See notes and recommended details at start of prelim. reinforcement schedule.**
Preliminary Reinforcement Schedule

**LOAD CONDITION A** | NO LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE

### FINE TO MEDIUM SAND or SILTY SAND

#### 19 BLOCK SECTION

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Required per-Wall Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5F</td>
<td>0.25</td>
</tr>
<tr>
<td>1.0F</td>
<td>0.50</td>
</tr>
<tr>
<td>2.0F</td>
<td>2.05</td>
</tr>
</tbody>
</table>

#### 20 BLOCK SECTION

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Required per-Wall Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5F</td>
<td>0.25</td>
</tr>
<tr>
<td>1.0F</td>
<td>0.50</td>
</tr>
<tr>
<td>2.0F</td>
<td>2.05</td>
</tr>
</tbody>
</table>

### Legend:

- **28” (710mm) BLOCK**
- **41” (1030mm) BLOCK**
- **GEOGRID (Continuous Strip)**
- **Geogrid Cut Length** = L + 3 \( (0.3 \text{ m}) \)

- Geogrid shall be 12” (305 mm) wide strips of kraft paper geogrid, type as noted. Geogrid shall be factory cut and certified for width and strength by TenGate-Mint.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
### Preliminary Reinforcement Schedule

**LOAD CONDITION B** | 260 lb/ft² (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE

<table>
<thead>
<tr>
<th>2 BLOCK SECTION</th>
<th>(1) 28&quot; (711 mm) Block</th>
<th>3 BLOCK SECTION</th>
<th>(3) 28&quot; (711 mm) Blocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geogrid Rocks Required per Wall</td>
<td></td>
<td>Geogrid Rocks Required per Wall Length</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Block/Linear ft</td>
<td>Rocks/Linear ft</td>
<td>m</td>
</tr>
<tr>
<td>Rock</td>
<td>0.15</td>
<td>0.45</td>
<td>1.80</td>
</tr>
<tr>
<td>20&quot; (510 mm)</td>
<td>1.0</td>
<td>0.3</td>
<td>0.90</td>
</tr>
<tr>
<td>3.0&quot; (76 mm)</td>
<td>20.0</td>
<td>6.0</td>
<td>180</td>
</tr>
<tr>
<td>4.0&quot; (102 mm)</td>
<td>28.0</td>
<td>8.4</td>
<td>252</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4 BLOCK SECTION</th>
<th>(4) 28&quot; (711 mm) Blocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geogrid Rocks Required per Wall Length</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Rock/Linear ft</td>
</tr>
<tr>
<td>Rock</td>
<td>0.15</td>
</tr>
<tr>
<td>20&quot; (510 mm)</td>
<td>1.0</td>
</tr>
<tr>
<td>3.0&quot; (76 mm)</td>
<td>20.0</td>
</tr>
<tr>
<td>4.0&quot; (102 mm)</td>
<td>28.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5 BLOCK SECTION</th>
<th>(5) 28&quot; (711 mm) Blocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geogrid Rocks Required per Wall Length</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Rock/Linear ft</td>
</tr>
<tr>
<td>Rock</td>
<td>0.15</td>
</tr>
<tr>
<td>20&quot; (510 mm)</td>
<td>1.0</td>
</tr>
<tr>
<td>3.0&quot; (76 mm)</td>
<td>20.0</td>
</tr>
<tr>
<td>4.0&quot; (102 mm)</td>
<td>28.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6 BLOCK SECTION</th>
<th>(6) 28&quot; (711 mm) Blocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geogrid Rocks Required per Wall Length</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Rock/Linear ft</td>
</tr>
<tr>
<td>Rock</td>
<td>0.15</td>
</tr>
<tr>
<td>20&quot; (510 mm)</td>
<td>1.0</td>
</tr>
<tr>
<td>3.0&quot; (76 mm)</td>
<td>20.0</td>
</tr>
<tr>
<td>4.0&quot; (102 mm)</td>
<td>28.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7 BLOCK SECTION</th>
<th>(7) 28&quot; (711 mm) Blocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geogrid Rocks Required per Wall Length</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Rock/Linear ft</td>
</tr>
<tr>
<td>Rock</td>
<td>0.15</td>
</tr>
<tr>
<td>20&quot; (510 mm)</td>
<td>1.0</td>
</tr>
<tr>
<td>3.0&quot; (76 mm)</td>
<td>20.0</td>
</tr>
<tr>
<td>4.0&quot; (102 mm)</td>
<td>28.0</td>
</tr>
</tbody>
</table>

### Notes and Recommended Details

- **SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.**
POSITIVE CONNECTION SYSTEM WALLS

AASHTO LOAD RESISTANCE FACTOR DESIGN

Preliminary Reinforcement Schedule

\( \phi = 30^\circ \)  
FINE TO MEDIUM SAND OR SILTY SAND

LOAD CONDITION B  
260 lb/ft\(^2\) (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE

### 12 BLOCK SECTION

(12) 28" (710 mm) Blocks

#### Geogrid Stats Required per Wall Length

<table>
<thead>
<tr>
<th>Type</th>
<th>Width/Depth</th>
<th>Width/Depth/m</th>
<th>Width/Depth/kN/m</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT</td>
<td>0.32</td>
<td>0.91</td>
<td>2.75</td>
</tr>
</tbody>
</table>

#### Geogrid Cut Length

2" x 3" x 3.0 (50.8 mm)

Legend:
- 28" (710 mm) BLOCK
- 41" (1030 mm) BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.

---

### 14 BLOCK SECTION

(14) 28" (710 mm) Blocks

#### Geogrid Stats Required per Wall Length

<table>
<thead>
<tr>
<th>Type</th>
<th>Width/Depth</th>
<th>Width/Depth/m</th>
<th>Width/Depth/kN/m</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT</td>
<td>0.32</td>
<td>0.91</td>
<td>2.75</td>
</tr>
</tbody>
</table>

#### Geogrid Cut Length

2" x 3" x 3.0 (50.8 mm)

Legend:
- 28" (710 mm) BLOCK
- 41" (1030 mm) BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.

---

### 13 BLOCK SECTION

(13) 28" (710 mm) Blocks

#### Geogrid Stats Required per Wall Length

<table>
<thead>
<tr>
<th>Type</th>
<th>Width/Depth</th>
<th>Width/Depth/m</th>
<th>Width/Depth/kN/m</th>
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</thead>
<tbody>
<tr>
<td>LT</td>
<td>0.32</td>
<td>0.91</td>
<td>2.75</td>
</tr>
</tbody>
</table>

#### Geogrid Cut Length

2" x 3" x 3.0 (50.8 mm)

Legend:
- 28" (710 mm) BLOCK
- 41" (1030 mm) BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.

---

### 15 BLOCK SECTION

(15) 28" (710 mm) Blocks

#### Geogrid Stats Required per Wall Length

<table>
<thead>
<tr>
<th>Type</th>
<th>Width/Depth</th>
<th>Width/Depth/m</th>
<th>Width/Depth/kN/m</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT</td>
<td>0.32</td>
<td>0.91</td>
<td>2.75</td>
</tr>
</tbody>
</table>

#### Geogrid Cut Length

2" x 3" x 3.0 (50.8 mm)

Legend:
- 28" (710 mm) BLOCK
- 41" (1030 mm) BLOCK

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
### POSITIVE CONNECTION SYSTEM WALLS

#### MSE WALLS

#### Preliminary Reinforcement Schedule

**θ = 30°** | FINE TO MEDIUM SAND = SILTY SAND

**LOAD CONDITION B** | 260 lb/ft² (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE

<table>
<thead>
<tr>
<th>16 BLOCK SECTION</th>
<th>(16) 28&quot; (710 mm) Blocks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Legend:**
- **28” (710 mm) BLOCK**
- **41” (1050 mm) BLOCK**

**GEORGRID (Continuous SiltS)**

Geogrid shall be 12" (305 mm) wide strips of shall, type as noted. Geogrid shall be factory cut and certified for width and strength by TenGate MintL.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
**Preliminary Reinforcement Schedule**

<table>
<thead>
<tr>
<th>LOAD CONDITION</th>
<th>TYPE</th>
<th>D = 30°</th>
<th>FINE TO MEDIUM SAND or SILTY SAND</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLOCK HIGH SECTION</td>
<td>2</td>
<td>250 lb/ft^2 (12 kPa) LIVE LOAD</td>
<td>G斶9</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>250 lb/ft^2 (12 kPa) LIVE LOAD</td>
<td>G辩9</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>250 lb/ft^2 (12 kPa) LIVE LOAD</td>
<td>G辩9</td>
</tr>
</tbody>
</table>

**Legend:**
- 28” (710 mm) BLOCK
- 4’1” (1030 mm) BLOCK
- Geogrid shall be 12” (305 mm) wide strips of fiberglass geogrid, type as noted. Geogrid shall be factory cut and certified for width and strength by TerraGrid Inc.

* Not tall enough? You can build significantly taller walls with the Redi-Rock PC System... we just had to stop the preliminary sections somewhere. Talk to your Engineer or give us a call for more info.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.

---

**Preliminary Reinforcement Schedule**

<table>
<thead>
<tr>
<th>LOAD CONDITION</th>
<th>TYPE</th>
<th>D = 30°</th>
<th>FINE TO MEDIUM SAND or SILTY SAND</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLOCK HIGH SECTION</td>
<td>2</td>
<td>250 lb/ft^2 (12 kPa) LIVE LOAD</td>
<td>G辩9</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>250 lb/ft^2 (12 kPa) LIVE LOAD</td>
<td>G辩9</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>250 lb/ft^2 (12 kPa) LIVE LOAD</td>
<td>G辩9</td>
</tr>
</tbody>
</table>

**Legend:**
- 28” (710 mm) BLOCK
- 4’1” (1030 mm) BLOCK
- Geogrid shall be 12” (305 mm) wide strips of fiberglass geogrid, type as noted. Geogrid shall be factory cut and certified for width and strength by TerraGrid Inc.

* Geogrid length primarily controlled by global stability. Length will change with crest height.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
**POSITIVE CONNECTION SYSTEM WALLS**

**AASHTO LOAD RESISTANCE FACTOR DESIGN**

**Preliminary Reinforcement Schedule**

\[ \phi = 30^\circ \]  
**FINE TO MEDIUM SAND or SILTY SAND**

**LOAD CONDITION CR**  
1:2 CREST SLOPE, 16’ (4.9 m) HIGH, 250 kN/m² (12 kPa) SURCHARGE AT CREST, NO TOE SLOPE

**5 BLOCK HIGH SECTION**

(5) 28’ (710 mm) Blocks

\[ 250 \text{ kN/m}²(12 \text{ kPa}) \]

<table>
<thead>
<tr>
<th>Geogrid Wall Required per Wall Length</th>
<th>Type</th>
<th>R/W (Center)</th>
<th>R/W (Center)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFT 2 33\text{m} 30\text{m}</td>
<td>SFT 2</td>
<td>SFT 2</td>
<td>SFT 2</td>
</tr>
</tbody>
</table>

**6 BLOCK HIGH SECTION**

(6) 28’ (710 mm) Blocks

\[ 250 \text{ kN/m}²(12 \text{ kPa}) \]

<table>
<thead>
<tr>
<th>Geogrid Wall Required per Wall Length</th>
<th>Type</th>
<th>R/W (Center)</th>
<th>R/W (Center)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFT 2 33\text{m} 30\text{m}</td>
<td>SFT 2</td>
<td>SFT 2</td>
<td>SFT 2</td>
</tr>
</tbody>
</table>

**Legend:**

- \[ \pm 28’ (710\text{mm}) \text{ BLOCK} \]
- \[ \pm 41’ (1030\text{mm}) \text{ BLOCK} \]

Geogrid shall be 12’ (385 mm) wide strips of welded geogrid, type as noted. Geogrid shall be factory cut and certified for wash and strength by Tan-Cast Mfg.

* Geogrid length primarily controlled by global stability. Length will change with crest height.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.

---

**7 BLOCK HIGH SECTION**

(7) 28’ (710 mm) Blocks

\[ 250 \text{ kN/m}²(12 \text{ kPa}) \]

<table>
<thead>
<tr>
<th>Geogrid Wall Required per Wall Length</th>
<th>Type</th>
<th>R/W (Center)</th>
<th>R/W (Center)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFT 2 33\text{m} 30\text{m}</td>
<td>SFT 2</td>
<td>SFT 2</td>
<td>SFT 2</td>
</tr>
</tbody>
</table>

**8 BLOCK HIGH SECTION**

(8) 28’ (710 mm) Blocks

\[ 250 \text{ kN/m}²(12 \text{ kPa}) \]

<table>
<thead>
<tr>
<th>Geogrid Wall Required per Wall Length</th>
<th>Type</th>
<th>R/W (Center)</th>
<th>R/W (Center)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFT 2 33\text{m} 30\text{m}</td>
<td>SFT 2</td>
<td>SFT 2</td>
<td>SFT 2</td>
</tr>
</tbody>
</table>

**Legend:**

- \[ \pm 28’ (710\text{mm}) \text{ BLOCK} \]
- \[ \pm 41’ (1030\text{mm}) \text{ BLOCK} \]

Geogrid shall be 12’ (385 mm) wide strips of welded geogrid, type as noted. Geogrid shall be factory cut and certified for wash and strength by Tan-Cast Mfg.

* Geogrid length primarily controlled by global stability. Length will change with crest height.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
POSITIVE CONNECTION SYSTEM WALLS  

AASHTO LOAD RESISTANCE FACTOR DESIGN

Preliminary Reinforcement Schedule

ϕ = 30°  
FINE TO MEDIUM SAND or SILTY SAND

LOAD CONDITION CR  
1:2 CREST SLOPE, 10' (3.0 m) HIGH, 260 kN/m² (12 kPa) SURCHARGE AT CREST, NO TOE SLOPE

5 BLOCK HIGH SECTION  
(9) 28' (710 mm) Blocks

11 BLOCK HIGH SECTION  
(11) 28' (710 mm) Blocks

10 BLOCK HIGH SECTION  
(10) 28' (710 mm) Blocks

12 BLOCK HIGH SECTION  
(12) 28' (710 mm) Blocks

Legend:

* Geogrid length primarily controlled by global stability. Length will change with crest height.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
POSITIVE CONNECTION SYSTEM WALLS

AASHTO LOAD RESISTANCE FACTOR DESIGN

Preliminary Reinforcement Schedule

\( \phi = 30^\circ \) - FINE TO MEDIUM SAND or SILTY SAND

LOAD CONDITION CR

1:2 CREST SLOPE, 10' (3.0 m) HIGH, 250 kips \((12 \text{ kPa})\) SURCHARGE AT CREST, NO TOE SLOPE

13 BLOCK HIGH SECTION (13) 28” \((710 \text{ mm})\) Blocks

STEM BLOCKS REQUIRED PER AREA \( \times \) LENGTH

<table>
<thead>
<tr>
<th>Type</th>
<th>Width (in.)</th>
<th>Geogrid Qty.</th>
<th>C/S</th>
<th>Cut Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 XT</td>
<td>250 ft/3’</td>
<td>3</td>
<td>2’ 1”</td>
<td>0’ 9’ 0”</td>
</tr>
<tr>
<td>5 XT</td>
<td>250 ft/3’</td>
<td>3</td>
<td>2’ 1”</td>
<td>0’ 9’ 0”</td>
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<tr>
<td>5 XT</td>
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<td>0’ 9’ 0”</td>
</tr>
<tr>
<td>10 XT</td>
<td>250 ft/3’</td>
<td>3</td>
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<td>250 ft/3’</td>
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<tr>
<td>10 XT</td>
<td>250 ft/3’</td>
<td>3</td>
<td>2’ 1”</td>
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</tr>
<tr>
<td>20 XT</td>
<td>250 ft/3’</td>
<td>3</td>
<td>2’ 1”</td>
<td>0’ 9’ 0”</td>
</tr>
<tr>
<td>20 XT</td>
<td>250 ft/3’</td>
<td>3</td>
<td>2’ 1”</td>
<td>0’ 9’ 0”</td>
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<tr>
<td>20 XT</td>
<td>250 ft/3’</td>
<td>3</td>
<td>2’ 1”</td>
<td>0’ 9’ 0”</td>
</tr>
</tbody>
</table>

Legend:

- 28” \((710 \text{ mm})\) BLOCK
- 41” \((1030 \text{ mm})\) BLOCK
- GEOGRID (Continuous Silt)
- Geogrid shall be 12” \((305 \text{ mm})\) wide strips of multi-layer geogrid, type as noted, GEOGRID shall be factory cut and certified for width and strength by TanCata Ltd.

* Geogrid length primarily controlled by global stability. Length will change with crest height.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.

---

POSITIVE CONNECTION SYSTEM WALLS

AASHTO LOAD RESISTANCE FACTOR DESIGN

Preliminary Reinforcement Schedule

\( \phi = 30^\circ \) - FINE TO MEDIUM SAND or SILTY SAND

LOAD CONDITION CR

1:2 CREST SLOPE, 10’ \((3.0 \text{ m})\) HIGH, 250 kips \((12 \text{ kPa})\) SURCHARGE AT CREST, NO TOE SLOPE

14 BLOCK HIGH SECTION (14) 28” \((710 \text{ mm})\) Blocks

STEM BLOCKS REQUIRED PER AREA \( \times \) LENGTH

<table>
<thead>
<tr>
<th>Type</th>
<th>Width (in.)</th>
<th>Geogrid Qty.</th>
<th>C/S</th>
<th>Cut Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 XT</td>
<td>250 ft/3’</td>
<td>3</td>
<td>2’ 1”</td>
<td>0’ 9’ 0”</td>
</tr>
<tr>
<td>5 XT</td>
<td>250 ft/3’</td>
<td>3</td>
<td>2’ 1”</td>
<td>0’ 9’ 0”</td>
</tr>
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</tr>
<tr>
<td>10 XT</td>
<td>250 ft/3’</td>
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<td>2’ 1”</td>
<td>0’ 9’ 0”</td>
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<td>2’ 1”</td>
<td>0’ 9’ 0”</td>
</tr>
<tr>
<td>20 XT</td>
<td>250 ft/3’</td>
<td>3</td>
<td>2’ 1”</td>
<td>0’ 9’ 0”</td>
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<tr>
<td>20 XT</td>
<td>250 ft/3’</td>
<td>3</td>
<td>2’ 1”</td>
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<tr>
<td>20 XT</td>
<td>250 ft/3’</td>
<td>3</td>
<td>2’ 1”</td>
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</tr>
</tbody>
</table>

Legend:

- 28” \((710 \text{ mm})\) BLOCK
- 41” \((1030 \text{ mm})\) BLOCK
- GEOGRID (Continuous Silt)
- Geogrid shall be 12” \((305 \text{ mm})\) wide strips of multi-layer geogrid, type as noted, GEOGRID shall be factory cut and certified for width and strength by TanCata Ltd.

* Geogrid length primarily controlled by global stability. Length will change with crest height.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
Preliminary Reinforcement Schedule

**Positive Connection System Walls**

<table>
<thead>
<tr>
<th>Load Condition CR</th>
<th>1:2 Crest Slope, 10' (3.0 m) Height, 250 kPa (12 kPa) Surcharge at Crest, No Toe Slope</th>
</tr>
</thead>
</table>

15 Block High Section (16) 28" (710 mm) Blocks

**Angle**: $\phi = 30^\circ$

Fine to Medium Sand or Silty Sand

**Geogrid Shear 12" (305 mm) wire strips of Geogrid, type as noted, Geogrid shall be factory cut and certified for wall strength by TanCave® Mesh**

### Geogrid Information

- **Type**: Blocks/Strips
- **Location**: Wall/Global

### Geogrid Details

- **SR**: 250 kPa (12 kPa)
- **SRU**: 2.36
- **SRU**: 1.84
- **SRU**: 0.10

**Legend**

- **30°**: 28" (710 mm) BLOCK
- **45°**: 100 mm BLOCK

*Geogrid length primarily controlled by global stability. Length will change with crest height.*

### Notes

See notes and recommended details at start of PRELIM. reinforcement schedule.
**Preliminary Reinforcement Schedule**

### φ = 30° | Fine to Medium Sand or Silty Sand

**Load Condition CR**

1:2 Crest Slope, 10’ (3.0 m) High, 260 b/h² (12 kPa) Surcharge at CREST, No Tie Slope

**17 Block High Section**

- (17) 28” (710 mm) Blocks
- 250 lb / ft² (12 kPa)

<table>
<thead>
<tr>
<th>Block</th>
<th>Geogrid</th>
<th>Length (L)</th>
<th>Length (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 XT</td>
<td>9 XT</td>
<td>10 XT</td>
<td>12 XT</td>
</tr>
<tr>
<td>14” (360 mm)</td>
<td>24” (610 mm)</td>
<td>29” (740 mm)</td>
<td>38” (965 mm)</td>
</tr>
<tr>
<td>20 XT</td>
<td>22 XT</td>
<td>25 XT</td>
<td>30 XT</td>
</tr>
</tbody>
</table>

**Legend:**

- ≤ 28” (710 mm) BLOCK
- ≥ 41” (1030 mm) BLOCK
- Geogrid shall be 12” (305 mm) wide strips of steel geogrid, type as noted, Geogrid shall be factory cut and certified for wash and strength by Tan-Cast Mesh.

* Geogrid length primarily controlled by global stability. Length will change with crest height.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
POSITIVE CONNECTION SYSTEM WALLS  AASHTO LOAD RESISTANCE FACTOR DESIGN

PRELIMINARY REINFORCEMENT SCHEDULE

\( \phi = 30^\circ \quad \text{FINE TO MEDIUM SAND or SILTY SAND} \)

LOAD CONDITION CR  
1:2 CREST SLOPE, 10' (3.0 m) HIGH, 250 kN/m² (12 kPa) SURCHARGE AT CREST, NO TOE SLOPE

19 BLOCK HIGH SECTION  
(19) 28' (8.5 m) Blocks

250 kN/m² (12 kPa)

Geogrid Silted Required per Aisle Length

<table>
<thead>
<tr>
<th>Type</th>
<th>Blocks / Aisle</th>
<th>Width (m)</th>
<th>Length (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L26</td>
<td>2.55</td>
<td>1.94</td>
<td></td>
</tr>
<tr>
<td>L26T</td>
<td>2.56</td>
<td>2.19</td>
<td></td>
</tr>
<tr>
<td>L26T</td>
<td>3.06</td>
<td>2.19</td>
<td></td>
</tr>
</tbody>
</table>

Legend:

- 28' (8.5 m) BLOCK
- 41' (12.5 m) BLOCK
- GEOGRID (Continuous Silted)
- Geogrid shall be loaded with strips of material, type as noted, Geogrid shall be factory cut and certified for width and strength by TanCate MFG.

* Geogrid length primarily controlled by global stability. Length will change with crest height.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.

\( \phi = 30^\circ \quad \text{FINE TO MEDIUM SAND or SILTY SAND} \)

LOAD CONDITION CR  
1:2 CREST SLOPE, 10' (3.0 m) HIGH, 250 kN/m² (12 kPa) SURCHARGE AT CREST, NO TOE SLOPE

20 BLOCK HIGH SECTION  
(20) 28' (8.5 m) Blocks

250 kN/m² (12 kPa)

Geogrid Silted Required per Aisle Length

<table>
<thead>
<tr>
<th>Type</th>
<th>Blocks / Aisle</th>
<th>Width (m)</th>
<th>Length (m)</th>
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</thead>
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<tr>
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<tr>
<td>L26T</td>
<td>3.06</td>
<td>2.19</td>
<td></td>
</tr>
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Legend:

- 28' (8.5 m) BLOCK
- 41' (12.5 m) BLOCK
- GEOGRID (Continuous Silted)
- Geogrid shall be loaded with strips of material, type as noted, Geogrid shall be factory cut and certified for width and strength by TanCate MFG.

* Geogrid length primarily controlled by global stability. Length will change with crest height.

** Not tall enough? You can build significantly taller walls with the Redi-Rock PC System...we just had to stop the preliminary sections somewhere. Talk to your Engineer or give us a call for more info.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
**Preliminary Reinforcement Schedule**

### LOAD CONDITION A
- **NO LIVE LOAD SURFACE, NO BACK SLOPE, NO TOE SLOPE**

### LOAD CONDITION B
- **250 lb/ft² (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE**

### LOAD CONDITION CR
- **1 : 2 CREST SLOPE, 10' (3.0 m) HIGH, 250 lb/ft² (12 kPa) LIVE LOAD SURCHARGE AT CREST, NO TOE SLOPE**

---

**Legend:**
- **Geogrid shall be 12" (305 mm) wide strips of 0.5mil (13 μm) geogrid, type as noted. Geogrid shall be factory cut and certified for width and strength by TenCate Geosynthetics.**

---

**See notes and recommended details at start of Prelim. Reinforcement Schedule.**
## Preliminary Reinforcement Schedule

### Load Condition A

**NO LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE**

### Block Section 8

**6 XT**

<table>
<thead>
<tr>
<th>Type</th>
<th>Rock</th>
<th>#/W</th>
<th>Rock</th>
<th>#/W</th>
</tr>
</thead>
<tbody>
<tr>
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<td>0.94</td>
<td>Rock</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Rock</th>
<th>#/W</th>
<th>Rock</th>
<th>#/W</th>
</tr>
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<tbody>
<tr>
<td>Rock</td>
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<td>0.94</td>
<td>Rock</td>
<td>2</td>
</tr>
</tbody>
</table>

### Block Section 9

<table>
<thead>
<tr>
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<th>Rock</th>
<th>#/W</th>
<th>Rock</th>
<th>#/W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rock</td>
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### Block Section 10

**6 XT**

<table>
<thead>
<tr>
<th>Type</th>
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<th>Rock</th>
<th>#/W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rock</td>
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<td>Rock</td>
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### Block Section 11

<table>
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<th>Rock</th>
<th>#/W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rock</td>
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<td>Rock</td>
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### Block Section 12

**6 XT**

<table>
<thead>
<tr>
<th>Type</th>
<th>Rock</th>
<th>#/W</th>
<th>Rock</th>
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<tr>
<td>Rock</td>
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<td>0.94</td>
<td>Rock</td>
<td>2</td>
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</tbody>
</table>

### Block Section 13

<table>
<thead>
<tr>
<th>Type</th>
<th>Rock</th>
<th>#/W</th>
<th>Rock</th>
<th>#/W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rock</td>
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<td>Rock</td>
<td>2</td>
</tr>
</tbody>
</table>

### Block Section 14

**6 XT**

<table>
<thead>
<tr>
<th>Type</th>
<th>Rock</th>
<th>#/W</th>
<th>Rock</th>
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<tr>
<td>Rock</td>
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<td>0.94</td>
<td>Rock</td>
<td>2</td>
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</tbody>
</table>

### Block Section 15

<table>
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<th>Type</th>
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<th>Rock</th>
<th>#/W</th>
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</thead>
<tbody>
<tr>
<td>Rock</td>
<td>2</td>
<td>0.94</td>
<td>Rock</td>
<td>2</td>
</tr>
</tbody>
</table>

---

**Legend:**

- **28° (10°m) BLOCK**
- **41° (10°m) BLOCK**

### Geogrid

- Geogrid shall be 12" (305 mm) wide strips of steel reinforcement cut and certified for width and strength by TemGale Mfg.

---

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
### Preliminary Reinforcement Schedule

#### Positive Connection System Walls

**AASHTO Load Resistance Factor Design**

<table>
<thead>
<tr>
<th>φ = 28°</th>
<th>Silty Sand or Clayey Sand</th>
</tr>
</thead>
</table>

**Load Condition A**

- No Live Load Surcharge, No Back Slope, No Toe Slope

**16 Block Section**

- (16) 28" (710 mm) Blocks

<table>
<thead>
<tr>
<th>Type</th>
<th>Blocks/Row</th>
<th>Block/Row Width (in)</th>
<th>Block/Row Length (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16XT</td>
<td>2</td>
<td>6</td>
<td>22-4&quot; (568 mm)</td>
</tr>
<tr>
<td>16XT</td>
<td>2</td>
<td>6</td>
<td>19-4&quot; (553 mm)</td>
</tr>
<tr>
<td>10XT</td>
<td>2</td>
<td>6</td>
<td>24-0&quot; (609 mm)</td>
</tr>
<tr>
<td>10XT</td>
<td>2</td>
<td>6</td>
<td>20-0&quot; (508 mm)</td>
</tr>
</tbody>
</table>

**17 Block Section**

- (17) 28" (710 mm) Blocks

<table>
<thead>
<tr>
<th>Type</th>
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<th>Block/Row Width (in)</th>
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<tr>
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</tr>
<tr>
<td>17XT</td>
<td>2</td>
<td>6</td>
<td>20-0&quot; (508 mm)</td>
</tr>
</tbody>
</table>

**Legend:**

- 28" (710 mm) BLOCK
- 41" (1050 mm) BLOCK
- GEOGRID (Continuous Silt)
- Geogrid Cut Length = 2″ x L = 3 (3.3 m)

**Note:** See notes and recommended details at start of Prelim. Reinforcement Schedule.

### Preliminary Reinforcement Schedule

#### Positive Connection System Walls

**AASHTO Load Resistance Factor Design**

<table>
<thead>
<tr>
<th>φ = 28°</th>
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**Load Condition A**

- No Live Load Surcharge, No Back Slope, No Toe Slope

**17 Block Section**

- (17) 28" (710 mm) Blocks

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<th>Blocks/Row</th>
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<tr>
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</tr>
<tr>
<td>17XT</td>
<td>2</td>
<td>6</td>
<td>20-0&quot; (508 mm)</td>
</tr>
</tbody>
</table>

**Legend:**

- 28" (710 mm) BLOCK
- 41" (1050 mm) BLOCK
- GEOGRID (Continuous Silt)
- Geogrid Cut Length = 2″ x L = 3 (3.3 m)

**Note:** See notes and recommended details at start of Prelim. Reinforcement Schedule.
**Preliminary Reinforcement Schedule**

### **LOAD CONDITION A**
- **NO LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE**

**20 BLOCK SECTION**
- 12' (3.66 m) Blocks

**Legend:**
- 28° (710 mm) BLOCK
- 41" (1030 mm) BLOCK

*Not tall enough? You can build significantly taller walls with the Redi-Rock PC system...we just had to stop the preliminary sections somewhere. Talk to your Engineer or give us a call for more info.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
POSITIVE CONNECTION SYSTEM WALLS

Preliminary Reinforcement Schedule

\[ \phi = 28^\circ \quad \text{Silty Sand or Clayey Sand} \]

LOAD CONDITION B

260 lb/ft\(^2\) (12 kPa) Live Load Surcharge, No Back Slope, No Toe Slope

8 BLOCK SECTION
(8) 28" (710 mm) Blocks

10 BLOCK SECTION
(10) 28" (710 mm) Blocks

9 BLOCK SECTION
(9) 28" (710 mm) Blocks

11 BLOCK SECTION
(11) 28" (710 mm) Blocks

12 BLOCK SECTION
(12) 28" (710 mm) Blocks

Legend:
- 28" (710 mm) BLOCK
- 41" (1030 mm) BLOCK
- GEOTEXTILE (Continuous Silt)
- Geotextile Cut Length = 2'L + 3'L (3.3 m)

See Notes and Recommended Details at Start of Prelim. Reinforcement Schedule.
POSITIVE CONNECTION SYSTEM WALLS
AASHTO LOAD RESISTANCE FACTOR DESIGN

Preliminary Reinforcement Schedule

\[ \theta = 28^\circ \]

**LOAD CONDITION B**
260 lb/ft\(^2\) (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE

**SILTY SAND + CLAYEY SAND**

13 BLOCK SECTION
(13) 28" (710 mm) Blocks

<table>
<thead>
<tr>
<th>Geogrid Strips Required per Alt. Length</th>
<th>Type</th>
<th>Width (inches)</th>
<th>Width (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SXT</td>
<td>2.95</td>
<td>7.49</td>
<td>70.6</td>
</tr>
<tr>
<td>SXT</td>
<td>2.93</td>
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<td>70.2</td>
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<td>SXT</td>
<td>2.91</td>
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<td>69.8</td>
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<tr>
<td>SXT</td>
<td>2.89</td>
<td>7.36</td>
<td>69.4</td>
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<tr>
<td>SXT</td>
<td>2.87</td>
<td>7.32</td>
<td>69.0</td>
</tr>
<tr>
<td>SXT</td>
<td>2.85</td>
<td>7.28</td>
<td>68.6</td>
</tr>
<tr>
<td>SXT</td>
<td>2.83</td>
<td>7.24</td>
<td>68.2</td>
</tr>
<tr>
<td>SXT</td>
<td>2.81</td>
<td>7.20</td>
<td>67.8</td>
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<tr>
<td>SXT</td>
<td>2.79</td>
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<tr>
<td>SXT</td>
<td>2.77</td>
<td>7.12</td>
<td>67.0</td>
</tr>
</tbody>
</table>

Legend:
- 28" (710 mm) BLOCK
- 41" (1050 mm) BLOCK

**SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.**

14 BLOCK SECTION
(14) 28" (710 mm) Blocks

<table>
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<tr>
<td>SXT</td>
<td>2.95</td>
<td>7.49</td>
<td>70.6</td>
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<tr>
<td>SXT</td>
<td>2.93</td>
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<td>7.16</td>
<td>67.4</td>
</tr>
<tr>
<td>SXT</td>
<td>2.77</td>
<td>7.12</td>
<td>67.0</td>
</tr>
</tbody>
</table>

Legend:
- 28" (710 mm) BLOCK
- 41" (1050 mm) BLOCK

**SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.**
**Positive Connection System Walls**

### Preliminary Reinforcement Schedule

<table>
<thead>
<tr>
<th>Load Condition B</th>
<th>260 lb/ft² (12 kPa) Live Load Surcharge, No Back Slope, No Toe Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Block Section</strong></td>
<td>(16) 28&quot; (710 mm) Blocks</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Legend:**
- 28" (710 mm) BLOCK
- 41" (1050 mm) BLOCK
- Geogrid shall be 12" (305 mm) wide strips of steel woven fabric, type as noted. Geogrid shall be factory cut and certified for width and strength by TenGate Midwest.

**Notes:** See notes and recommended details at start of Preliminary Reinforcement Schedule.

---

**Positive Connection System Walls**

### Preliminary Reinforcement Schedule

<table>
<thead>
<tr>
<th>Load Condition B</th>
<th>260 lb/ft² (12 kPa) Live Load Surcharge, No Back Slope, No Toe Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Block Section</strong></td>
<td>(17) 28&quot; (710 mm) Blocks</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Legend:**
- 28" (710 mm) BLOCK
- 41" (1050 mm) BLOCK
- Geogrid shall be 12" (305 mm) wide strips of steel woven fabric, type as noted. Geogrid shall be factory cut and certified for width and strength by TenGate Midwest.

**Notes:** See notes and recommended details at start of Preliminary Reinforcement Schedule.
POSITIVE CONNECTION SYSTEM WALLS

AASHTO LOAD RESISTANCE FACTOR DESIGN

Preliminary Reinforcement Schedule

θ = 28°  |  SILTY SAND or CLAYEY SAND

LOAD CONDITION B  |  260 lb/ft² (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE

18 BLOCK SECTION
(18) 28" (710 mm) Blocks

Legend:
- 28" (710 mm) BLOCK
- 61" (1550 mm) BLOCK
- 61" (1550 mm) BLOCK

LENGTH (L)

Geogrid shall be 12" (305 mm) wide strips of Shell geogrid, type as noted. Geogrid shall be factory cut and certified for width and strength by TenCate Geogrid.

Geogrid Cut Length = 2" L + 3" (33 mm)

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
POSITIVE CONNECTION SYSTEM WALLS

PRELIMINARY REINFORCEMENT SCHEDULE

\( \phi = 28^\circ \)/SILTY SAND + CLAYEY SAND

LOAD CONDITION B

260 lb/ft^2 (12 kPa) LIVE LOAD SURCHARGE, NO BACK SLOPE, NO TOE SLOPE

20 BLOCK SECTION

(20) 28" (710 mm) Blocks

Legend:

* Not tall enough? You can build significantly taller walls with the Redi-Rock PC System...we just had to stop the preliminary sections somewhere. Talk to your Engineer or give us a call for more info.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
# Preliminary Connection System Walls

## AASHTO Load Resistance Factor Design

### RETAINING WALLS

#### MSE WALLS

### Preliminary Reinforcement Schedule

<table>
<thead>
<tr>
<th>φ = 28°</th>
<th>SILTY SAND or CLAYEY SAND</th>
</tr>
</thead>
</table>

#### LOAD CONDITION CR

1. **Crest Slope, 10° (0.17 m) H/|V|, 250 kN/m² (12 kPa) Surcharge at Crest, 90° Trench Slope**

### 5 BLOCK HIGH SECTION

(5) 28° (710 mm) Blocks

- **250 kN/m² (12 kPa)**
- **Geogrid Wall Thickness per Wall Length**
  - 0.25
  - 0.25
  - 0.25

### 6 BLOCK HIGH SECTION

(6) 28° (710 mm) Blocks

- **250 kN/m² (12 kPa)**
- **Geogrid Wall Thickness per Wall Length**
  - 0.25
  - 0.25
  - 0.25

### 7 BLOCK HIGH SECTION

(7) 28° (710 mm) Blocks

- **250 kN/m² (12 kPa)**
- **Geogrid Wall Thickness per Wall Length**
  - 0.25
  - 0.25
  - 0.25

### 8 BLOCK HIGH SECTION

(8) 28° (710 mm) Blocks

- **250 kN/m² (12 kPa)**
- **Geogrid Wall Thickness per Wall Length**
  - 0.25
  - 0.25
  - 0.25

### Legend:

- 28° (710mm) BLOCK
- 41° (1030mm) BLOCK

* Geogrid length primarily controlled by global stability. Length will change with crest height.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
**Preliminary Reinforcement Schedule**

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**POSITIVE CONNECTION SYSTEM WALLS**

**AASHTO LOAD RESISTANCE FACTOR DESIGN**

**φ = 28°**  
**SILTY SAND + CLAYEY SAND**

**LOAD CONDITION CR**  
1: 2 CREST SLOPE, 10' (3.0 m) HIGH, 250 kN/m² (12 kPa) SURCHARGE AT CREST, NO TOE SLOPE

---

**5 BLOCK HIGH SECTION**  
(9) 28' (710 mm) Blocks

<table>
<thead>
<tr>
<th>Type</th>
<th>Width</th>
<th>Geogrid Stiffness Required per Wall Length</th>
<th>∆x</th>
<th>∆y</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.35</td>
<td>2.07</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.36</td>
<td>2.08</td>
</tr>
</tbody>
</table>

**10 BLOCK HIGH SECTION**  
(16) 28' (710 mm) Blocks

<table>
<thead>
<tr>
<th>Type</th>
<th>Width</th>
<th>Geogrid Stiffness Required per Wall Length</th>
<th>∆x</th>
<th>∆y</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.35</td>
<td>2.07</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.36</td>
<td>2.08</td>
</tr>
</tbody>
</table>

---

**11 BLOCK HIGH SECTION**  
(11) 28' (710 mm) Blocks

<table>
<thead>
<tr>
<th>Type</th>
<th>Width</th>
<th>Geogrid Stiffness Required per Wall Length</th>
<th>∆x</th>
<th>∆y</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.35</td>
<td>2.07</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.36</td>
<td>2.08</td>
</tr>
</tbody>
</table>

---

**12 BLOCK HIGH SECTION**  
(12) 28' (710 mm) Blocks

<table>
<thead>
<tr>
<th>Type</th>
<th>Width</th>
<th>Geogrid Stiffness Required per Wall Length</th>
<th>∆x</th>
<th>∆y</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.35</td>
<td>2.07</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.36</td>
<td>2.08</td>
</tr>
</tbody>
</table>

---

**Legend:**

- **≥ 28’ (710mm) BLOCK**
- **≥ 41’ (1000 mm) BLOCK**
- **Geogrid shall be factory cut and certified for wall and stability by Tencate Mark**

* Geogrid length primarily controlled by global stability. Length will change with crest height.

**SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.**
POSITIVE CONNECTION SYSTEM WALLS  
AASHTO LOAD RESISTANCE FACTOR DESIGN

Preliminary Reinforcement Schedule

\( \theta = 28^\circ \)  | Silt Sand | Clayey Sand

LOAD CONDITION CR  | 1:2 CREST SLOPE, 10' (3.0 m) HIGH, 250 kPa (12 kPa) SURCHARGE AT CREST, NO TOE SLOPE

13 BLOCK HIGH SECTION  
(13) 28' (8.5 m) Blocks

<table>
<thead>
<tr>
<th>Geogrid - Required per Alt. Length</th>
<th>Type</th>
<th>Blocks/Run</th>
<th>Over/Run</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>5 KT</td>
<td>2</td>
<td>2.23</td>
</tr>
<tr>
<td>Mid</td>
<td>5 KT</td>
<td>2</td>
<td>2.23</td>
</tr>
<tr>
<td>High</td>
<td>5 KT</td>
<td>2</td>
<td>2.23</td>
</tr>
</tbody>
</table>

250 lb/ft (12 kPa)

Legend:
- \( \theta = 28^\circ \) (7.6 mm) BLOCK
- \( \theta = 41^\circ \) (100 mm) BLOCK

Geogrid shall be 12’ (365 mm) wide strips of WebNet geogrid, type as noted; Geogrid shall be factory cut and certified for tensile and strength by TenCate Made.

* Geogrid length primarily controlled by global stability. Length will change with crest height.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.

Legend:
- \( \theta = 28^\circ \) (7.6 mm) BLOCK
- \( \theta = 41^\circ \) (100 mm) BLOCK

Geogrid shall be 12’ (365 mm) wide strips of WebNet geogrid, type as noted; Geogrid shall be factory cut and certified for tensile and strength by TenCate Made.

* Geogrid length primarily controlled by global stability. Length will change with crest height.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
**POSITIVE CONNECTION SYSTEM WALLS**

**AASHTO LOAD RESISTANCE FACTOR DESIGN**

**PRELIMINARY REINFORCEMENT SCHEDULE**

<table>
<thead>
<tr>
<th>φ = 28°</th>
<th>SILTY SAND or CLAYEY SAND</th>
</tr>
</thead>
</table>

**LOAD CONDITION CR**

1:2 CREST SLOPE, 10' (3.0 m) HIGH, 250 kbf/ft² (12 kPa) SURCHARGE AT CREST, NO TOE SLOPE

---

### 15 BLOCK HIGH SECTION

(16) 28' (710 mm) Blocks

*Geogrid length primarily controlled by global stability. Length will change with crest height.*

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
Preliminary Reinforcement Schedule

**Load Condition CR**
1:2 Crest Slope, 10' (3.0 m) High, 250 kN/m² (12 kPa) Surcharge at Crest, No Toe Slope

### 19 Block High Section

19 (28' x 7'10" mm) Blocks

<table>
<thead>
<tr>
<th>Type</th>
<th>Width (in.)</th>
<th>Height (in.)</th>
<th>Weight (lbs.)</th>
<th>20E</th>
<th>20ST</th>
<th>20XT</th>
<th>24XT</th>
</tr>
</thead>
<tbody>
<tr>
<td>20E</td>
<td>2.25</td>
<td>1.75</td>
<td>2.25</td>
<td>0.26</td>
<td>0.26</td>
<td>0.26</td>
<td></td>
</tr>
<tr>
<td>20ST</td>
<td>2.50</td>
<td>2.00</td>
<td>2.50</td>
<td>0.33</td>
<td>0.33</td>
<td>0.33</td>
<td>0.17</td>
</tr>
<tr>
<td>20XT</td>
<td>2.75</td>
<td>2.25</td>
<td>2.75</td>
<td></td>
<td></td>
<td>0.75</td>
<td>0.97</td>
</tr>
<tr>
<td>24XT</td>
<td>3.00</td>
<td>2.50</td>
<td>3.00</td>
<td></td>
<td></td>
<td>1.00</td>
<td>1.07</td>
</tr>
</tbody>
</table>

### 20 Block High Section

20 (28' x 7'10" mm) Blocks

<table>
<thead>
<tr>
<th>Type</th>
<th>Width (in.)</th>
<th>Height (in.)</th>
<th>Weight (lbs.)</th>
<th>20E</th>
<th>20ST</th>
<th>20XT</th>
<th>24XT</th>
</tr>
</thead>
<tbody>
<tr>
<td>20E</td>
<td>2.50</td>
<td>2.00</td>
<td>2.50</td>
<td>0.50</td>
<td>0.50</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>20ST</td>
<td>2.75</td>
<td>2.25</td>
<td>2.75</td>
<td>0.60</td>
<td>0.60</td>
<td>0.60</td>
<td>0.85</td>
</tr>
<tr>
<td>20XT</td>
<td>3.00</td>
<td>2.50</td>
<td>3.00</td>
<td></td>
<td></td>
<td>1.00</td>
<td>1.10</td>
</tr>
<tr>
<td>24XT</td>
<td>3.25</td>
<td>2.75</td>
<td>3.25</td>
<td></td>
<td></td>
<td>1.25</td>
<td>1.35</td>
</tr>
</tbody>
</table>

**Legend:**
- 28' (7'10" mm) BLOCK
- 61" (1000 mm) BLOCK

Geogrid shall be 12" (305 mm) wide strips of kN/m² weight, type as noted. Geogrid shall be factory cut and certified for width and strength by TanCate Mills.

* Geogrid length primarily controlled by global stability. Length will change with crest height.

**Not tall enough? You can build significantly taller walls with the Redi-Rock PC System—we just had to stop the preliminary sections somewhere. Talk to your Engineer or give us a call for more info.

SEE NOTES AND RECOMMENDED DETAILS AT START OF PRELIM. REINFORCEMENT SCHEDULE.
### Redi-Rock 28" (710 mm) Retaining Blocks

The Redi-Rock 28" (710mm) Retaining wall blocks are machine-placed, wet-cast, precast modular block units manufactured from first-priority, non-reconstituted concrete and intended for use in the construction of dry-stacked modular retaining wall systems. The block units are manufactured from structural-grade concrete mixes in accordance with ASTM C36 or ASTM C855 that produce a finished unit with excellent resistance to freeze-thaw, deicing chemical exposure, and submerged conditions in both fresh water and salt water applications. All Redi-Rock Retaining wall products are manufactured and distributed through an international network of individually-owned, licensed precast concrete manufacturers.

### PRODUCT DATA SHEETS

#### DIMENSIONAL PROPERTIES

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>TOP</th>
<th>MIDDLE</th>
<th>BOTTOM</th>
<th>HALF TOP</th>
<th>HALF MIDDLE</th>
<th>HALF BOTTOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (Front of Block)</td>
<td>16 ± 3() (475 ± 5)</td>
<td>16 ± 3() (475 ± 5)</td>
<td>16 ± 3() (475 ± 5)</td>
<td>16 ± 3() (475 ± 5)</td>
<td>16 ± 3() (475 ± 5)</td>
<td>16 ± 3() (475 ± 5)</td>
</tr>
<tr>
<td>Height (Back of Block)</td>
<td>13 ± 3 (330 ± 5)</td>
<td>16 ± 3 (475 ± 5)</td>
<td>16 ± 3 (475 ± 5)</td>
<td>16 ± 3 (475 ± 5)</td>
<td>16 ± 3 (475 ± 5)</td>
<td>16 ± 3 (475 ± 5)</td>
</tr>
<tr>
<td>Length (Front of Block)</td>
<td>46 ± 3 (1172 ± 15)</td>
<td>46 ± 3 (1172 ± 15)</td>
<td>46 ± 3 (1172 ± 15)</td>
<td>46 ± 3 (1172 ± 15)</td>
<td>46 ± 3 (1172 ± 15)</td>
<td>46 ± 3 (1172 ± 15)</td>
</tr>
<tr>
<td>Width</td>
<td>22 ± 3 (557 ± 13)</td>
<td>Form-line to back of block AND () ± 5() (127 ± 3) Face Texture</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### CONCRETE MIX PROPERTIES

FLY ASH OR OTHER PozZolANS CONFORMING TO ASTM C618

- MINIMUM 28 DAY COMPRESSIVE STRENGTH: 4,000 psi (27.6 MPa)
- MAXIMUM WATER CEMENT RATIO: 0.45
- NOMINAL MAXIMUM AGGREGATE SIZE: 1 inch (25 mm)
- AIR CONTENT: 0.45 ± 1.5%
- Aggregate class designation: 3M

### DESIGN PROPERTIES

#### HorizONTal Setback / Wall Face BAttion options

- **BLOCK TO BLOCK INTERFACE SHEAR**:
  - 1\(\frac{1}{2}\) inch (12.7 mm) Knobs: \(V = 6,281 + N \tan 44° \leq 11,276 \text{ lb/ft} (84.4 + N \tan 44° \leq 165.4 \text{ kN/m})\)
  - 1 inch (25.4 mm) Knobs: \(V = 7,178 + N \tan 54° \leq 10,970 \text{ lb/ft} (77.2 + N \tan 54° \leq 160.1 \text{ kN/m})\)

#### Infilled Unit Weight for Wall Stability Calculations

- LeadStone/Cobblestone blocks: 127 \(\frac{lb}{ft^3}\) (208 \(kN/m^3\))
- Ledgestone blocks: 122 \(\frac{lb}{ft^3}\) (1954 \(kN/m^3\))

### Minimum Construction Radius

- Architectural rounding is applicable to both concave and convex curved retaining wall sections. Increases to this minimum radius are required to account for wall batter. Special consideration should be given to block selection, facing batter, and wall height when selecting the minimum radius for the final wall alignment.

---

(1) All dimensions are in inches (mm).  
(2) Weight shown is based on an assumed concrete unit weight of 143 \(\frac{lb}{ft^3}\) (2291 \(kN/m^3\)). Actual weights will vary.  
(3) Concrete mix properties are in general accordance with ACI 318 durability requirements. Research has shown that concrete manufactured to these standards demonstrates good durability and performance. When these requirements are followed, specific freeze-thaw testing of the concrete is typically NOT required.  
(4) Exposure class is as described in ACI 318.  "MODERATE" describes concrete that is exposed to freezing and thawing cycles and occasional exposure to moisture and exposed to deicing chemicals.  Exposure class should be assigned by the designer.  "SEVERE" describes concrete that is exposed to freezing and thawing cycles and in continuous contact with moisture and exposed to deicing chemicals.  Exposure class should be assigned by the designer.  "VERY SEVERE" describes concrete that is exposed to freezing and thawing cycles and in continuous contact with moisture and exposed to deicing chemicals.  Exposure class should be assigned by the designer.  
(5) Test method ASTM C39.  
(6) Test method ASTM C618.  
(7) Test method ASTM C231.  
(8) Test method ASTM C1157.  
(9) Test method ASTM C595.  
(10) Test method ASTM C150.  
(11) Test method ASTM C1157.  
(12) Test method ASTM C1240.  
(13) Test method ASTM C155.  
(14) Test method ASTM C95.  
(15) Test method ASTM C1340.  
(16) Test method ASTM C1218.  
(17) Special consideration should be given to the design of vertical retaining walls subject to active lateral earth pressure.  
(18) Values based on full scale testing performed in October 2011.  Copies of the full test reports are available at www.redi-rock.com.  
(19) The infilled unit weights shown here are based on an assumed concrete unit weight of 143 \(\frac{lb}{ft^3}\) (2293 \(kN/m^3\)) and an assumed soil unit weight of 100 \(\frac{lb}{ft^3}\) (1602 \(kN/m^3\)).  They are reference values.  Several factors can cause the unit weights of both concrete and soil to vary.  The designer should use sound engineering judgement when assigning an infilled unit weight value for analysis.  
(20) The minimum construction radius stated is applicable to both concave and convex curved retaining wall sections. Increases to this minimum radius are required to account for wall batter. Special consideration should be given to block selection, facing batter, and wall height when selecting the minimum radius for the final wall alignment.  

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Redi-Rock Design Resource Manual V20


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redi-rock.com

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Redi-Rock 41" (1030 mm) Retaining Blocks

**PRODUCT DATA SHEETS**

**DIMENSIONAL PROPERTIES**

- **HEIGHT (FRONT OF BLOCK):** 18 ± 0.45 (457 ± 5)
- **HEIGHT (BACK OF BLOCK):** 25 ± 0.45 (635 ± 5)
- **LENGTH (FRONT OF BLOCK):** 46 ± 0.45 (1172 ± 15)
- **LENGTH (BACK OF BLOCK):** 56 ± 0.45 (1422 ± 15)
- **WIDTH:** 35 ± 0.1 (889 ± 3 mm) FORM LINE TO BACK OF BLOCK AND ± 5 (12.7 mm) FACE TEXTURE
- **CONCRETE VOLUME:** 3 (0.443 m³)
- **MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl-) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT:** (8,9)
  - **MODERATE:** 4.5% ± 1.5%
  - **SEVERE:** 6.0% ± 1.5%
- **MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl-) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT:** (10,12) (VERY SEVERE EXPOSURE CLASS ONLY)
  - **MODERATE:** 3.0% ± 1.5%
  - **SEVERE:** 4.0% ± 1.5%
  - **VERY SEVERE:** 5.0% ± 1.5%
- **MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl-) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT:** (13)
  - **MODERATE:** 3%
  - **SEVERE:** 4%
  - **VERY SEVERE:** 5%
- **MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl-) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT:** (14)
  - **MODERATE:** 1.0%
  - **SEVERE:** 1.5%
  - **VERY SEVERE:** 2.0%

**CONCRETE MIX PROPERTIES**

- **CONCRETE VOLUME:** 3 (0.443 m³)
- **MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl-) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT:** (8,9)
  - **MODERATE:** 4.5% ± 1.5%
  - **SEVERE:** 6.0% ± 1.5%
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  - **MODERATE:** 3.0% ± 1.5%
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  - **MODERATE:** 3%
  - **SEVERE:** 4%
  - **VERY SEVERE:** 5%
- **MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl-) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT:** (14)
  - **MODERATE:** 1.0%
  - **SEVERE:** 1.5%
  - **VERY SEVERE:** 2.0%

**CONCRETE MIX PROPERTIES**

- **CONCRETE VOLUME:** 3 (0.443 m³)
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  - **VERY SEVERE:** 5%
- **MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl-) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT:** (14)
  - **MODERATE:** 1.0%
  - **SEVERE:** 1.5%
  - **VERY SEVERE:** 2.0%

**CONCRETE MIX PROPERTIES**

- **CONCRETE VOLUME:** 3 (0.443 m³)
- **MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl-) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT:** (8,9)
  - **MODERATE:** 4.5% ± 1.5%
  - **SEVERE:** 6.0% ± 1.5%
- **MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl-) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT:** (10,12) (VERY SEVERE EXPOSURE CLASS ONLY)
  - **MODERATE:** 3.0% ± 1.5%
  - **SEVERE:** 4.0% ± 1.5%
  - **VERY SEVERE:** 5.0% ± 1.5%
- **MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl-) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT:** (13)
  - **MODERATE:** 3%
  - **SEVERE:** 4%
  - **VERY SEVERE:** 5%
- **MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl-) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT:** (14)
  - **MODERATE:** 1.0%
  - **SEVERE:** 1.5%
  - **VERY SEVERE:** 2.0%

**CONCRETE MIX PROPERTIES**

- **CONCRETE VOLUME:** 3 (0.443 m³)
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**CONCRETE MIX PROPERTIES**

- **CONCRETE VOLUME:** 3 (0.443 m³)
- **MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl-) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT:** (8,9)
  - **MODERATE:** 4.5% ± 1.5%
  - **SEVERE:** 6.0% ± 1.5%
- **MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl-) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT:** (10,12) (VERY SEVERE EXPOSURE CLASS ONLY)
  - **MODERATE:** 3.0% ± 1.5%
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  - **VERY SEVERE:** 5.0% ± 1.5%
- **MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl-) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT:** (13)
  - **MODERATE:** 3%
  - **SEVERE:** 4%
  - **VERY SEVERE:** 5%
- **MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl-) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT:** (14)
  - **MODERATE:** 1.0%
  - **SEVERE:** 1.5%
  - **VERY SEVERE:** 2.0%
Redi-Rock 60" (1520 mm) Retaining Blocks

The Redi-Rock 60" (1520mm) Retaining wall blocks are machine-placed, wet-cast, precast modular block units manufactured from first-principle, non-reconstituted concrete and intended for constructing dry-stacked modular retaining wall systems. The block units are manufactured from structural-grade concrete mixes in accordance with ASTM C94 or ASTM C685 that produce a finished unit with excellent resistance to freeze-thaw, deicing chemical exposure, and submerged conditions in both fresh water and salt water applications. All Redi-Rock Retaining wall products are manufactured and distributed through an international network of individually-owned, licensed precast concrete manufacturers.

**PRODUCT DATA SHEETS**

<table>
<thead>
<tr>
<th>DIMENSIONAL PROPERTIES</th>
<th>MIDDLE</th>
<th>BOTTOM</th>
<th>HALF MIDDLE</th>
<th>HALF BOTTOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEIGHT (FRONT OF BLOCK)</td>
<td>16 ± 4 (457 ± 5)</td>
<td>16 ± 4 (457 ± 5)</td>
<td>16 ± 4 (457 ± 5)</td>
<td>16 ± 4 (457 ± 5)</td>
</tr>
<tr>
<td>HEIGHT (BACK OF BLOCK)</td>
<td>16 ± 4 (457 ± 5)</td>
<td>16 ± 4 (457 ± 5)</td>
<td>16 ± 4 (457 ± 5)</td>
<td>16 ± 4 (457 ± 5)</td>
</tr>
<tr>
<td>LENGTH (FRONT OF BLOCK)</td>
<td>45.7 ± 11.72 (1112 ± 3)</td>
<td>45.7 ± 11.72 (1112 ± 3)</td>
<td>45.7 ± 11.72 (1112 ± 3)</td>
<td>45.7 ± 11.72 (1112 ± 3)</td>
</tr>
<tr>
<td>LENGTH (BACK OF BLOCK)</td>
<td>31.5 ± 7.97 (199 ± 13)</td>
<td>31.5 ± 7.97 (199 ± 13)</td>
<td>31.5 ± 7.97 (199 ± 13)</td>
<td>31.5 ± 7.97 (199 ± 13)</td>
</tr>
<tr>
<td>WIDTH</td>
<td>54.5 ± 13.87 (1387 ± 13) PLUS ± 1/2 (153) FACE TEXTURE</td>
<td>54.5 ± 13.87 (1387 ± 13) PLUS ± 1/2 (153) FACE TEXTURE</td>
<td>54.5 ± 13.87 (1387 ± 13) PLUS ± 1/2 (153) FACE TEXTURE</td>
<td>54.5 ± 13.87 (1387 ± 13) PLUS ± 1/2 (153) FACE TEXTURE</td>
</tr>
<tr>
<td>CONCRETE VOLUME</td>
<td>3 (0.264 m3)</td>
<td>3 (0.264 m3)</td>
<td>3 (0.264 m3)</td>
<td>3 (0.264 m3)</td>
</tr>
<tr>
<td>LIMESTONE/Cobblestone FACE</td>
<td>± 1.83 (46.9 ± 5)</td>
<td>± 1.83 (46.9 ± 5)</td>
<td>± 1.83 (46.9 ± 5)</td>
<td>± 1.83 (46.9 ± 5)</td>
</tr>
<tr>
<td>LEDGESTONE FACE</td>
<td>± 22.49 (573 ± 6.9)</td>
<td>± 22.49 (573 ± 6.9)</td>
<td>± 22.49 (573 ± 6.9)</td>
<td>± 22.49 (573 ± 6.9)</td>
</tr>
<tr>
<td>WEIGHT</td>
<td>143 lb/ft3 (2291 kg/m3)</td>
<td>143 lb/ft3 (2291 kg/m3)</td>
<td>143 lb/ft3 (2291 kg/m3)</td>
<td>143 lb/ft3 (2291 kg/m3)</td>
</tr>
<tr>
<td>MINIMUM CONSTRUCTION RADIUS</td>
<td>6 3 (157)</td>
<td>6 3 (157)</td>
<td>6 3 (157)</td>
<td>6 3 (157)</td>
</tr>
<tr>
<td>AIR CONTENT</td>
<td>0.3% ± 0.15%</td>
<td>0.3% ± 0.15%</td>
<td>0.3% ± 0.15%</td>
<td>0.3% ± 0.15%</td>
</tr>
<tr>
<td>FREEZE-THAW RESISTANCE</td>
<td>MODERATE</td>
<td>MODERATE</td>
<td>MODERATE</td>
<td>MODERATE</td>
</tr>
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</table>

**CONCRETE MIX PROPERTIES**

<table>
<thead>
<tr>
<th>EXPOSURE CLASS</th>
<th>COMPR. STRENGTH MODERATE</th>
<th>COMPR. STRENGTH SEVERE</th>
<th>MIN. CEMENT RATIO</th>
<th>MAX. AGGREGATE</th>
<th>P.C. CAI</th>
<th>AIR CONTENT</th>
<th>FREEZE-THAW RESISTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODERATE</td>
<td>4000 psi (27.6 MPa)</td>
<td>6000 psi (41.3 MPa)</td>
<td>0.45</td>
<td>1 in (25 mm)</td>
<td>3M</td>
<td>4.5% ± 1.5%</td>
<td>MODERATE</td>
</tr>
<tr>
<td>SEVERE</td>
<td>4000 psi (27.6 MPa)</td>
<td>6000 psi (41.3 MPa)</td>
<td>0.40</td>
<td>1 in (25 mm)</td>
<td>35</td>
<td>4.0% ± 1.5%</td>
<td>SEVERE</td>
</tr>
<tr>
<td>VERY SEVERE</td>
<td>4500 psi (30.0 MPa)</td>
<td>6500 psi (44.7 MPa)</td>
<td>0.40</td>
<td>1 in (25 mm)</td>
<td>45</td>
<td>4.0% ± 1.5%</td>
<td>VERY SEVERE</td>
</tr>
<tr>
<td>M.S.-C.H. (C2)</td>
<td>0.15</td>
<td>0.15</td>
<td>0.15</td>
<td>0.15</td>
<td>0.15</td>
<td>0.15</td>
<td>M.S.-C.H. (C2)</td>
</tr>
<tr>
<td>M.C. (N)</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>M.C. (N)</td>
</tr>
<tr>
<td>M.P. (C)</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>M.P. (C)</td>
</tr>
<tr>
<td>M.F. (C1)</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>M.F. (C1)</td>
</tr>
</tbody>
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**PRODUCT DATA SHEETS**

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Height</th>
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<th>Depth</th>
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<tr>
<td>60&quot; (1520)</td>
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<td>60&quot;</td>
<td>60&quot;</td>
<td>60&quot;</td>
<td>60&quot;</td>
</tr>
</tbody>
</table>
The Redi-Rock 52” (1,320 mm) XL retaining wall blocks are machine-placed, wet-cast, precast modular block units manufactured from first-pressure, non-reconstituted concrete and intended for use in the construction of dry-stacked modular retaining wall systems. The block units are manufactured from structural-grade concrete mixes in accordance with ASTM C94 or ASTM C685 that produce a finished unit with excellent resistance to freeze-thaw, deicing chemical exposure, and submerged conditions in both fresh water and salt water applications. All Redi-Rock retaining wall products are manufactured and distributed through an international network of individually-owned, licensed precast concrete manufacturers.

**PRODUCT DATA SHEETS**

**PRODUCT DATA SHEETS**

**CONCRETE MIX PROPERTIES**

Concrete mix properties are in general accordance with ACI 318 durability requirements. Research has shown that concrete manufactured to these standards demonstrates good durability and performance. When these requirements are followed, specific freeze-thaw testing of the concrete is typically NOT required.

**CONCRETE MIX PROPERTIES**

- **FREEZE THAW EXPOSURE CLASS**: All dimensions are inches (mm)
- **MINIMUM 28 DAY COMpressive STRENGTH**: Weight shown is based on an assumed concrete unit weight of 143 lb/ft³ (2291 kg/m³). Actual weights will vary.
- **MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl-) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT**: (10) The total cementitious material also includes ASTM C150, C595, C845, and C1157 cement. The maximum percentages shall include:
  - ASTM C150: 10%
  - ASTM C595: 10%
  - ASTM C845: 10%
  - ASTM C1157: 10%

**MINIMUM CONSTRUCTION RADIUS**: They are reference values. Several factors can cause the unit weights of both concrete and infill soil to vary. The designer should use sound engineering judgment when assigning an infill unit weight value for analysis.

**SPACIAL CURVE**: The minimum construction radius stated is applicable to both concave and convex curved retaining wall sections. Increases to this minimum radius are required to account for wall batter. Special consideration should be given to block selection, facing batter, and wall height when selecting the minimum radius for the final wall alignment.

**DESIGN PROPERTIES**

**HORIZONTAL SETBACK/VALL FACE BATTER**: For N = 5077 lb/ft (N = 102.4 kN/m):

- **Sp(1)**: N = 5077 lb/ft (N = 102.4 kN/m)

- **Sp(2)**: N = 10118 lb/ft (N = 205.8 kN/m)

For N = 16,118 lb/ft (N = 335.2 kN/m):

- **Sp(1)**: N = 10,071 lb/ft (N = 202.4 kN/m)

- **Sp(2)**: N = 16,118 lb/ft (N = 335.2 kN/m)

**MINIMUM CONSTRUCTION RADIUS**: They are reference values. Several factors can cause the unit weights of both concrete and infill soil to vary. The designer should use sound engineering judgment when assigning an infill unit weight value for analysis.

**SPACIAL CURVE**: The minimum construction radius stated is applicable to both concave and convex curved retaining wall sections. Increases to this minimum radius are required to account for wall batter. Special consideration should be given to block selection, facing batter, and wall height when selecting the minimum radius for the final wall alignment.

**CONCRETE MIX PROPERTIES**

**FREEZE THAW EXPOSURE CLASS**: All dimensions are inches (mm)

- **MINIMUM 28 DAY COMpressive STRENGTH**: Weight shown is based on an assumed concrete unit weight of 143 lb/ft³ (2291 kg/m³). Actual weights will vary.

**MINIMUM CONSTRUCTION RADIUS**: They are reference values. Several factors can cause the unit weights of both concrete and infill soil to vary. The designer should use sound engineering judgment when assigning an infill unit weight value for analysis.

**SPACIAL CURVE**: The minimum construction radius stated is applicable to both concave and convex curved retaining wall sections. Increases to this minimum radius are required to account for wall batter. Special consideration should be given to block selection, facing batter, and wall height when selecting the minimum radius for the final wall alignment.

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**HORIZONTAL SETBACK/VALL FACE BATTER**: For N = 5077 lb/ft (N = 102.4 kN/m):

- **Sp(1)**: N = 5077 lb/ft (N = 102.4 kN/m)

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- **Sp(1)**: N = 10,071 lb/ft (N = 202.4 kN/m)

- **Sp(2)**: N = 16,118 lb/ft (N = 335.2 kN/m)

**MINIMUM CONSTRUCTION RADIUS**: They are reference values. Several factors can cause the unit weights of both concrete and infill soil to vary. The designer should use sound engineering judgment when assigning an infill unit weight value for analysis.

**SPACIAL CURVE**: The minimum construction radius stated is applicable to both concave and convex curved retaining wall sections. Increases to this minimum radius are required to account for wall batter. Special consideration should be given to block selection, facing batter, and wall height when selecting the minimum radius for the final wall alignment.
**PRODUCT DATA SHEETS**

**R-7236HC 72” (1,830 mm) Hollow-Core Retaining Blocks**

The Redi-Rock 72” (1,830 mm) XL retaining wall blocks are machine-placed, wet-cast, precast modular block units manufactured from first-pour, non-reconstituted concrete and intended for use in the construction of dry-packed modular retaining wall systems. The block units are manufactured from structural-grade concrete mixes in accordance with ASTM C94 or ASTM C685 that produce a finished unit with excellent resistance to freeze-thaw, deicing chemical exposure, and submerged conditions in both fresh water and salt water applications. All Redi-Rock retaining wall products are manufactured and distributed through an international network of individually-owned, licensed precast concrete manufacturers.

### DIMENSIONAL PROPERTIES

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>FULL BLOCK</th>
<th>HALF BLOCK</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HEIGHT (FRONT OF BLOCK):</strong></td>
<td>38 ± 5 × (1,894 ± 13)</td>
<td>19 ± 5 × (1,894 ± 13)</td>
</tr>
<tr>
<td><strong>LENGTH (FRONT OF BLOCK):</strong></td>
<td>23 ± 5 × (1,574 ± 13)</td>
<td>12 ± 5 × (1,574 ± 13)</td>
</tr>
<tr>
<td><strong>WIDTH:</strong></td>
<td>8 ± 5 × (1,184 ± 13)</td>
<td>4 ± 5 × (1,184 ± 13)</td>
</tr>
<tr>
<td><strong>SHIPPING/HANDLING WEIGHT:</strong></td>
<td>4160 lb (1890 kg)</td>
<td>2080 lb (1040 kg)</td>
</tr>
</tbody>
</table>

(All dimensions are inches (mm).)

**Concrete Mix Properties (3)**

- **Freeze Thaw Exposure Class (1):**
  - **Minimum 28 Day Compressive Strength:**
    - **Moderate:** 4,000 psi (28.6 kPa)
    - **Severe:** 4,500 psi (30.0 kPa)
  - **Nominal Maximum Water/Cement Ratio:**
    - 0.45
  - **Aggregates Class Designation:**
    - 3M

- **Air Content:**
  - 0.15

- **Maximum Chloride as C in Concrete:**
  - 0.06%

- **Minimum Concrete Unit Weight:**
  - 143 lb/ft³ (2291 kg/m³)

- **Concrete Mix Properties:**
  - “Severe” describes concrete that is exposed to freezing and thawing cycles and occasional exposure to moisture. “Very Severe” describes concrete that is in continuous continuous contact with moisture and exposure to deicing chemicals.

(3) Concrete mix properties are in general accordance with ACI 318 durability requirements. Research has shown that concrete manufactured to these standards demonstrates good durability and performance. When these requirements are followed, specific freeze-thaw testing of the concrete is typically NOT required.

- **Maximum Water-Soluble Chloride Ion (Cl⁻) Content in Concrete:**
  - 0.06%

### DESIGN PROPERTIES

**HORIZONTAL SETBACK WALL FACE BATTER**

<table>
<thead>
<tr>
<th>BLOCK TO BLOCK INTERFACE SHEAR (12)</th>
<th>(b) Shear knobs @ 23 (584) OC, TYP.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sp(max) = 15,000 lb/ft (218.9 kN/m)</td>
<td>≤ 16,118 lb/ft (102.4 kN/m)</td>
</tr>
<tr>
<td>S₃₃ = 8400 lb/ft (N/lin 22) (12.9 kWh/m² N/lin 22)</td>
<td>for N ≥ 7017 lb/ft (102.4 kN/m)</td>
</tr>
<tr>
<td>(5.2” BATTER)</td>
<td>for N = 7017 lb/ft (102.4 kN/m)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INFILLED UNIT WEIGHT FOR WALL STABILITY CALCULATIONS (12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>112 lb/ft² (1604 kN/m²)</td>
</tr>
</tbody>
</table>

| Ledgesonate Face | 112 lb/ft² (1604 kN/m²) |

<table>
<thead>
<tr>
<th>Minimum Construction Radius (14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 ft - 6 in (4.42 m)</td>
</tr>
</tbody>
</table>

| Concave Curve | 14 ft - 6 in (4.42 m) |

| Convex Curve | 14 ft - 6 in (4.42 m) |

<table>
<thead>
<tr>
<th>(3) Values based on full scale testing performed in 2017 and 2018. Copies of the full test reports are available at <a href="http://www.redi-rock.com">www.redi-rock.com</a>.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(4) The infilled unit weights shown here are based on an assumed concrete unit weight of 143 lb/ft³ (2291 kg/m³) and an assumed net unit weight of 100 lb/ft³ (1602 kN/m³). They are reference values. Several factors can cause the unit weights of both concrete and infill to vary. The designer should use sound engineering judgment when assigning an infill unit weight value for analysis.</td>
</tr>
<tr>
<td>(5) The H2O/S concrete mix is applicable to both concave and convex curved retaining wall sections. Increases to this minimum radius are required to account for wall batter. Special consideration should be given to block selection, facing batter, and wall height when selecting the minimum radius for the final wall alignment.</td>
</tr>
</tbody>
</table>

**CONCRETE MIX PROPERTIES**

- **Concrete Mix Properties:**
  - “Severe” describes concrete that is exposed to freezing and thawing cycles and occasional exposure to moisture. “Very Severe” describes concrete that is in continuous contact with moisture and exposure to deicing chemicals.

(3) Concrete mix properties are in general accordance with ACI 318 durability requirements. Research has shown that concrete manufactured to these standards demonstrates good durability and performance. When these requirements are followed, specific freeze-thaw testing of the concrete is typically NOT required.

- **Maximum Water/Soluble Chloride Ion (Cl⁻) Content in Concrete:**
  - 0.06%

- **Concrete Mix Properties:**
  - “Severe” describes concrete that is exposed to freezing and thawing cycles and occasional exposure to moisture. “Very Severe” describes concrete that is in continuous contact with moisture and exposure to deicing chemicals.

(3) Concrete mix properties are in general accordance with ACI 318 durability requirements. Research has shown that concrete manufactured to these standards demonstrates good durability and performance. When these requirements are followed, specific freeze-thaw testing of the concrete is typically NOT required.

- **Maximum Water/Soluble Chloride Ion (Cl⁻) Content in Concrete:**
  - 0.06%
The Redi-Rock 96” (2,440 mm) XL retaining wall blocks are machine-placed, wet-cast, precast modular block units manufactured from first-pour, non-reconstituted concrete and intended for use in the construction of dry-stack modular retaining wall systems. The block units are manufactured from structural-grade concrete mixes in accordance with ASTM C94 or ASTM C855 that produce a finished unit with excellent resistance to freeze-thaw, deicing chemical exposure, and submerged conditions in both fresh water and salt water applications. All Redi-Rock retaining wall products are manufactured and distributed through an international network of individually-owned, licensed precast concrete manufacturers.

**DIMENSIONAL PROPERTIES**

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>FULL BLOCK</th>
<th>HALF BLOCK</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIDTH</td>
<td>90 x 5 x (2302 ± 13) FORM LINE TO BACK OF BLOCK</td>
<td>45 x 2.5 x (1152 ± 13)</td>
</tr>
<tr>
<td>CONCRETE VOLUME</td>
<td>FULL BLOCK</td>
<td>HALF BLOCK</td>
</tr>
<tr>
<td>LEDGESTONE FACE</td>
<td>33.83 ft³ (606 m³)</td>
<td>16.91 ft³ (283 m³)</td>
</tr>
<tr>
<td>SHIP/PACKING AND HANDLING WEIGHT</td>
<td>FULL BLOCK</td>
<td>HALF BLOCK</td>
</tr>
</tbody>
</table>

**CONCRETE MIX PROPERTIES**

<table>
<thead>
<tr>
<th>FREEZE THAW EXPOSURE CLASS</th>
<th>MINIMUM 28 DAY COMPRESSIVE STRENGTH</th>
<th>MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl⁻) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT</th>
<th>AGGREGATE DESIGNATION</th>
<th>AIR CONTENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODERATE</td>
<td>4,000 psi (27.6 MPa)</td>
<td>0.45</td>
<td>1 inch (25 mm)</td>
<td>3M</td>
</tr>
<tr>
<td>SEVERE</td>
<td>4,000 psi (27.6 MPa)</td>
<td>0.45</td>
<td>1 inch (25 mm)</td>
<td>3S</td>
</tr>
<tr>
<td>VERY SEVERE</td>
<td>4,500 psi (30.0 MPa)</td>
<td>0.40</td>
<td>1 inch (25 mm)</td>
<td>3S</td>
</tr>
<tr>
<td>MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl⁻) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT</td>
<td>0.15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAXIMUM CHLORIDE AS Cl⁻ CONCENTRATION IN MIXING WATER, PARTS PER MILLION</td>
<td>1000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAXIMUM PERCENTAGE OF TOTAL CEMENTOUS MATERIALS BY WEIGHT</td>
<td>(VERY SEVERE EXPOSURE CLASS ONLY)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLY ASH OR OTHER POZZOLANS</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SILICA FUME</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL OF FLY ASH OR OTHER POZZOLANS</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DESIGN PROPERTIES**

**HORIZONTAL SETBACK / WALL FACE BATTERY**

<table>
<thead>
<tr>
<th>WALL TO BLOCK INTERFACE SHEAR</th>
<th>( S_{\text{IF}} = \frac{3447 \text{ lb/ft} \times \text{N (front 4R)} \times \text{N (front 4R)}}{2540 \text{ lb/ft} \times \text{N (front 4R)}} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( N = 9707 \text{ lb/ft} \times 21.23 \text{ kN/m} )</td>
<td>( S_{\text{IF}} = 3447 \text{ lb/ft} \times \text{N (front 4R)} \times \text{N (front 4R)} )</td>
</tr>
</tbody>
</table>

**MINIMUM CONSTRUCTION RADIUS**

| WALL FACE BATTERY | 112 lb/ft² (160 kN/m²) |

**SHEAR KNOBS @ 23" (584 mm)**

| WALL FACE BATTERY | 8488 lb/ft + N × tan 22° |

**MINIMUM CONSTRUCTION RADIUS**

<table>
<thead>
<tr>
<th>WALL FACE BATTERY</th>
<th>14 ft - 6 in (4.42 m)</th>
</tr>
</thead>
</table>

© 2020 Redi-Rock International, LLC
Redi-Rock 41” (1030 mm) wide, 9” (230 mm) Setback Retaining Blocks

The Redi-Rock 9” (230mm) Setback Retaining wall blocks are machine-placed, wet-cast, precast modular block units manufactured from first-purpose, non-reconstituted concrete and intended for use in the construction of dry-stacked modular retaining wall systems. The block units are manufactured from structural-grade concrete mixes in accordance with ASTM C39 or ASTM C665 that produce a finished unit with excellent resistance to freeze-thaw, decaying chemical exposure, and submerged conditions in both fresh water and salt water applications. All Redi-Rock Retaining wall products are manufactured and distributed through an international network of individually-owned, licensed precast concrete manufacturers.

### DIMENSIONAL PROPERTIES

<table>
<thead>
<tr>
<th>CLASSIFICATION</th>
<th>MIDDLE</th>
<th>BOTTOM</th>
<th>HALF MIDDLE</th>
<th>HALF BOTTOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEIGHT (FRONT OF BLOCK)</td>
<td>18 ± 0.5 (45 ± 5)</td>
<td>18 ± 0.5 (45 ± 5)</td>
<td>18 ± 0.5 (45 ± 5)</td>
<td>18 ± 0.5 (45 ± 5)</td>
</tr>
<tr>
<td>HEIGHT (BACK OF BLOCK)</td>
<td>18 ± 0.5 (45 ± 5)</td>
<td>18 ± 0.5 (45 ± 5)</td>
<td>18 ± 0.5 (45 ± 5)</td>
<td>18 ± 0.5 (45 ± 5)</td>
</tr>
<tr>
<td>LENGTH (FRONT OF BLOCK)</td>
<td>46.‌5 ± 0.5 (1172 ± 13)</td>
<td>22.75 ± 0.5 (579 ± 6)</td>
<td>22.75 ± 0.5 (579 ± 6)</td>
<td>22.75 ± 0.5 (579 ± 6)</td>
</tr>
<tr>
<td>WIDTH</td>
<td>35 ± 1 (900 ± 13)</td>
<td>15 ± 0.5 (344 ± 6)</td>
<td>15 ± 0.5 (344 ± 6)</td>
<td>15 ± 0.5 (344 ± 6)</td>
</tr>
<tr>
<td>DIMENSIONS</td>
<td>35 ± 1 (900 ± 13)</td>
<td>35 ± 1 (900 ± 13)</td>
<td>35 ± 1 (900 ± 13)</td>
<td>35 ± 1 (900 ± 13)</td>
</tr>
</tbody>
</table>

### DESIGN PROPERTIES

<table>
<thead>
<tr>
<th>DESIGN PROPERTY</th>
<th>MIDDLE</th>
<th>BOTTOM</th>
<th>HALF MIDDLE</th>
<th>HALF BOTTOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>V = 1,178 + N tan 54° ≤ 10,970 lb/ft (17.2 + N tan 54° ≤ 160.1 kN/m)</td>
<td>4,000 psi (27.6 MPa)</td>
<td>4,000 psi (27.6 MPa)</td>
<td>4,000 psi (27.6 MPa)</td>
<td>4,000 psi (27.6 MPa)</td>
</tr>
<tr>
<td>V = 6,061 + N tan 44° ≤ 11,276 lb/ft (88.4 + N tan 44° ≤ 164.5 kN/m)</td>
<td>128 lb/cu ft (2029 kg/m³)</td>
<td>128 lb/cu ft (2029 kg/m³)</td>
<td>128 lb/cu ft (2029 kg/m³)</td>
<td>128 lb/cu ft (2029 kg/m³)</td>
</tr>
</tbody>
</table>

### FREEZE-THAW RESISTANCE TESTS

<table>
<thead>
<tr>
<th>EXPOSURE CLASS</th>
<th>0.5%</th>
<th>1%</th>
<th>2%</th>
<th>4%</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODERATE</td>
<td>14 ft 6 in (4.42 m)</td>
<td>14 ft 6 in (4.42 m)</td>
<td>14 ft 6 in (4.42 m)</td>
<td>14 ft 6 in (4.42 m)</td>
</tr>
<tr>
<td>SEVERE</td>
<td>12 ft 0 in (3.66 m)</td>
<td>12 ft 0 in (3.66 m)</td>
<td>12 ft 0 in (3.66 m)</td>
<td>12 ft 0 in (3.66 m)</td>
</tr>
</tbody>
</table>

### CONCRETE MIX PROPERTIES

<table>
<thead>
<tr>
<th>CONCRETE MIX</th>
<th>CEMENT RATIO</th>
<th>MINIMUM WATER</th>
<th>MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl-) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODERATE</td>
<td>0.45</td>
<td>0.45</td>
<td>≤ 0.45%</td>
</tr>
<tr>
<td>SEVERE</td>
<td>0.45</td>
<td>0.45</td>
<td>≤ 0.45%</td>
</tr>
</tbody>
</table>

### ALKALI-AGGREGATE REACTIVITY MITIGATION PER ACI 201

- **FLY ASH OR OTHER POZZOLANS CONFORMING TO ASTM C618**: 25
- **SLAG OR OTHER POZZOLANS CONFORMING TO ASTM C1240**: 10
- **TOTAL OF FLY ASH OR OTHER POZZOLANS, SLAG, AND SILICA FUME**: 50
- **TOTAL OF FLY ASH OR OTHER POZZOLANS, SLAG, AND SILICA FUME**: 50
- **ALKALI-AGGREGATE REACTIVITY MITIGATION PER ACI 201**: 36

### CONVECTION CURVE

- **19.8 in (0.42 m)**

**Note:** Special consideration should be given to the design of vertical retaining walls subject to active lateral earth pressure. Values based on full scale testing performed in October 2011. Copies of the full test reports are available at www.redi-rock.com. The infilled unit weights shown here are based on an assumed concrete unit weight of 143 lb/ft³ (2291 kg/m³), and an assumed soil unit weight of 100 lb/ft³ (1602 kg/m³). They are reference values. Several factors can cause the unit weights of both concrete and infill soil to vary. The designer should use sound engineering judgment when assigning an infilled unit weight value for analysis. The minimum construction radius stated is applicable to both concave and convex curved retaining wall sections. Increases to this minimum radius are required for account for wall batter. Special consideration should be given to block selection, facing batter, and wall height when selecting the minimum radius for the final wall alignment.
**PRODUCT DATA SHEETS**

**Redi-Rock 60” (1520 mm) wide, 9” (230 mm) Setback Retaining Blocks**

The Redi-Rock 60” (1520 mm) Retaining wall blocks are machine-placed, wet-cast, precast modular block units manufactured from first-purpose, non-concrete or non-concrete and intended for constructing dry-packed modular retaining wall systems. The block units are manufactured from structural-grade concrete mixes in accordance with ASTM C94 or ASTM C685 that produce a finished unit with excellent resistance to freeze-thaw, deicing chemical exposure, and submerged conditions in both fresh water and salt water applications. All Redi-Rock Retaining wall products are manufactured and distributed through an international network of individually-owned, licensed precast concrete manufacturers.

**DIMENSIONAL PROPERTIES**

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>MIDDLE</th>
<th>BOTTOM</th>
<th>HALF MIDDLE</th>
<th>HALF BOTTOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEIGHT (FRONT OF BLOCK)</td>
<td>18 ± 5/8 (457 ± 5)</td>
<td>18 ± 5/8 (457 ± 5)</td>
<td>18 ± 5/8 (457 ± 5)</td>
<td>18 ± 5/8 (457 ± 5)</td>
</tr>
<tr>
<td>HEIGHT (BACK OF BLOCK)</td>
<td>18 ± 5/8 (457 ± 5)</td>
<td>18 ± 5/8 (457 ± 5)</td>
<td>18 ± 5/8 (457 ± 5)</td>
<td>18 ± 5/8 (457 ± 5)</td>
</tr>
<tr>
<td>LENGTH (FRONT OF BLOCK)</td>
<td>40 ± 5/8 (1016 ± 5)</td>
<td>225/8 ± 5/8 (578 ± 6)</td>
<td>225/8 ± 5/8 (578 ± 6)</td>
<td>225/8 ± 5/8 (578 ± 6)</td>
</tr>
<tr>
<td>LENGTH (BACK OF BLOCK)</td>
<td>315/8 ± 5/8 (797 ± 13)</td>
<td>R5 ± 5/8 (221 ± 6)</td>
<td>R5 ± 5/8 (221 ± 6)</td>
<td>R5 ± 5/8 (221 ± 6)</td>
</tr>
<tr>
<td>WIDTH</td>
<td>54 ± 5/8 (1387 ± 13)</td>
<td>PLUS ± 5/8 (1387) FACE TEXTURE</td>
<td>54 ± 5/8 (1387 ± 13)</td>
<td>PLUS ± 5/8 (1387) FACE TEXTURE</td>
</tr>
</tbody>
</table>

**CONCRETE MIX PROPERTIES**

- **FLY ASH OR OTHER POZZOLANS CONFORMING TO ASTM C618**
- **SLAG CONFORMING TO ASTM C989**
- **TOTAL OF FLY ASH OR OTHER POZZOLANS AND SILICA FUME**

**COMPRESSIVE STRENGTH (5)**

- **MINIMUM 28 DAY**
- **MAXIMUM WATER-SOLUBLE CHLORIDE ION (Cl-) CONTENT IN CONCRETE, PERCENT BY WEIGHT OF CEMENT (8,9)**
- **MAXIMUM PERCENTAGE OF TOTAL CEMENTITIOUS MATERIALS BY WEIGHT (10,12) (VERY SEVERE EXPOSURE CLASS ONLY)**
- **LEDESTONE / COBBLESTONE BLOCKS**
- **LEDGESTONE BLOCKS**

**INFILLED UNIT WEIGHT FOR WALL STABILITY CALCULATIONS (11)**

<table>
<thead>
<tr>
<th>CONCRETE UNIT</th>
<th>INFILLED UNIT WEIGHT</th>
<th>WALL STABILITY</th>
<th>DESIGN CONCRETE</th>
<th>CONCRETE UNIT</th>
<th>INFILLED UNIT WEIGHT</th>
<th>WALL STABILITY</th>
<th>DESIGN CONCRETE</th>
</tr>
</thead>
<tbody>
<tr>
<td>60” (1520) BOTTOM RETAINING UNIT</td>
<td>132 lb/ft³ (2146 kg/m³)</td>
<td>132 lb/ft³ (2142 kg/m³)</td>
<td>132 lb/ft³ (2142 kg/m³)</td>
<td>60” (1520) MIDDLE RETAINING UNIT</td>
<td>128 lb/ft³ (2050 kg/m³)</td>
<td>128 lb/ft³ (2050 kg/m³)</td>
<td>128 lb/ft³ (2050 kg/m³)</td>
</tr>
</tbody>
</table>

**MINIMUM CONSTRUCTION RADIUS (14)**

<table>
<thead>
<tr>
<th>CONCAVE CURVE</th>
<th>INFILLED UNIT WEIGHT</th>
<th>WALL STABILITY</th>
<th>DESIGN CONCRETE</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.8 ft (4.52 m)</td>
<td>14.8 ft (4.52 m)</td>
<td>14.8 ft (4.52 m)</td>
<td>14.8 ft (4.52 m)</td>
</tr>
</tbody>
</table>

**CONCRETE MIX PROPERTIES**

- **FREIGHT THAN 28 DAY COMPRESSIVE STRENGTH (15)**
- **MINIMUM CEMENT RATIO**
- **MAXIMUM AGGREGATE SIZE**
- **AGGREGATE CLASS DESIGNATION**
- **AIR CONTENT (10)**

**FLY ASH OR OTHER POZZOLANS CONFORMING TO ASTM C818**

- **SLAG CONFORMING TO ASTM C1240**

**TOTAL OF FLY ASH OR OTHER POZZOLANS, SLAG, AND SILICA FUME**

<table>
<thead>
<tr>
<th>CONCRETE UNIT</th>
<th>INFILLED UNIT WEIGHT</th>
<th>WALL STABILITY</th>
<th>DESIGN CONCRETE</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>10</td>
<td>50</td>
<td>35</td>
</tr>
</tbody>
</table>

**ALKALI-AGGREGATE REACTIVITY MITIGATION PER ACI 201**

- **Concrete mix properties are in general accordance with ACI 318 durability requirements. Research has shown that concrete manufactured to these standards demonstrates good durability and performance.**
- **These requirements are followed, specific features for testing of the concrete are**
- **Concrete exposure class is described in ACI 318. “MODERATE” describes concrete that is exposed to freezing and thawing cycles and occasional exposure to moisture. “SEVERE” describes concrete that is exposed to freezing and thawing cycles and in continuous contact with moisture and exposed to deicing chemicals. Exposure class should be specified by owner/purchaser prior to order placement. Longer lead times may be required for block units manufactured for “severe” and “very severe” exposure classes.**
- **Test method ASTM C39.**
- **Test method ASTM C3121.**
- **Test method ASTM C1284 at age between 28 and 42 days.**

**REFERENCES**

(1) Weight shown is based on an assumed concrete unit weight of 143 lb/ft³ (2291 kg/m³). Actual weights will vary.

(2) All dimensions are inch (mm).

(3) Weight shown is based on an assumed concrete unit weight of 143 lb/ft³ (2291 kg/m³). Actual weights will vary.

(4) E:

(5) Compressive strength is specified by owner/purchaser prior to order placement. Longer lead times may be required for block units manufactured for “severe” and “very severe” exposure classes.

(6) Weight shown is based on an assumed concrete unit weight of 143 lb/ft³ (2291 kg/m³). Actual weights will vary.

(7) The total cementitious materials also includes ASTM C150, C595, C645, and C1157 cement. The maximum percentages shall include:

- (a) Fly ash or other pozzolanes in type IP, blended cement, ASTM C595, or ASTM C1157.
- (b) Slag used in the manufacture of an IS blended cement, ASTM C595, or ASTM C1157.


(9) The total cementitious materials also includes ASTM C150, C595, C645, and C1157 cement. The maximum percentages shall include:

- (a) Fly ash or other pozzolanes in type IP, blended cement, ASTM C595, or ASTM C1157.
- (b) Slag used in the manufacture of an IS blended cement, ASTM C595, or ASTM C1157.

(10) Special consideration should be given to the design of vertical retaining walls subject to active lateral earth pressure.

(11) Fly ash or other pozzolanes and silica fume shall constitute no more than 25 and 10 percent, respectively, of the total weight of the cementitious materials.

(12) Comprehensive mix proportions are in general accordance with ACI 318 durability requirements. Research has shown that concrete manufactured to these standards demonstrates good durability and performance. When these requirements are followed, specific features for testing of the concrete are

(13) The infilled unit weights shown here are based on full width units and an assumed concrete unit weight of 143 lb/ft³ (2291 kg/m³) and an assumed soil unit weight of 100 lb/ft³ (1602 kg/m³).

(14) The minimum construction radius stated is applicable to both concave and convex curved retaining wall sections. Increases to this minimum radius are required to account for wall batter. Special consideration should be given to block selection, facing batter, and wall height when selecting the minimum radius for the final wall alignment.

(15) The infilled unit weights shown here are based on full width units and an assumed concrete unit weight of 143 lb/ft³ (2291 kg/m³) and an assumed soil unit weight of 100 lb/ft³ (1602 kg/m³).

(16) The total cementitious materials also includes ASTM C150, C595, C645, and C1157 cement. The maximum percentages shall include:

- (a) Fly ash or other pozzolanes in type IP, blended cement, ASTM C595, or ASTM C1157.
- (b) Slag used in the manufacture of an IS blended cement, ASTM C595, or ASTM C1157.

(17) Microtopping is a decorative cementitious material that can be applied to a variety of surfaces to create a textured finish. It is typically used as a topping for concrete or masonry surfaces to enhance their appearance and durability.

(18) The infilled unit weights shown here are based on full width units and an assumed concrete unit weight of 143 lb/ft³ (2291 kg/m³) and an assumed soil unit weight of 100 lb/ft³ (1602 kg/m³).

(19) The total cementitious materials also includes ASTM C150, C595, C645, and C1157 cement. The maximum percentages shall include:

- (a) Fly ash or other pozzolanes in type IP, blended cement, ASTM C595, or ASTM C1157.
- (b) Slag used in the manufacture of an IS blended cement, ASTM C595, or ASTM C1157.

(20) Microtopping is a decorative cementitious material that can be applied to a variety of surfaces to create a textured finish. It is typically used as a topping for concrete or masonry surfaces to enhance their appearance and durability.
Redi-Rock 28" (710 mm) & 41" (1030 mm) Positive Connection (PC) Retaining Blocks

The Redi-Rock 28" (710 mm) & 41" (1030 mm) Positive Connection retaining wall blocks are machine-placed, wet-cast, precast modular block units manufactured from first-purpose, non-reconstituted concrete and intended for constructing dry-stacked modular retaining wall systems. The block units are manufactured from structural-grade concrete mixes in accordance with ASTM C94 or ASTM C685 that produce a finished unit with excellent resistance to freeze-thaw, deicing chemical exposure, and submerged conditions in both fresh water and salt water applications. All Redi-Rock Retaining Wall blocks are manufactured and distributed through an international network of individually-owned, licensed precast concrete manufacturers.

**DIMENSIONAL PROPERTIES**

- **HEIGHT (FRONT OF BLOCK):** 8 in (203 mm)
- **HEIGHT (BACK OF BLOCK):** 8 in (203 mm)
- **LENGTH (FRONT) & (BACK):** 28 in (710 mm)
- **WIDTH (FACE TEXTURE):** 22 in (559 mm)
- **WIDTH (FORM LINE TO BACK):** 24 in (609 mm)

**CONCRETE MIX PROPERTIES**

- **Weight shown is based on an assumed concrete unit weight of 143 lb/ft³ (2291 kg/m³). Actual weights will vary.**
- **Concrete mix properties are in general accordance with ACI 318 durability requirements. Research has shown that concrete manufactured to these standards demonstrates good durability and performance. When these requirements are followed, specific freeze-thaw testing of the concrete is typically NOT required.**
- **Fly ash or other pozzolans in type IP, blended cement, ASTM C595, or ASTM C1157.**
- **Silica fume, ASTM C1240, present in a blended cement.**

**INFILLED UNIT WEIGHT FOR WALL STABILITY CALCULATIONS**

| Weight shown here are based on an assumed concrete unit weight of 143 lb/ft³ (2291 kg/m³) and an assumed soil unit weight of 100 lb/ft³ (1602 kg/m³). They are reference values. Several factors can cause the unit weights of both concrete and infill soil to vary. The designer should use sound engineering judgement when assigning an infill unit weight value for analysis. The infilled unit weights stated is applicable to both concrete and convex curved retaining wall sections. Increases to this minimum radius are required to account for wall batter. Special consideration should be given to block selection, facing batter, and wall height when selecting the minimum radius for the final wall alignment.**

**CONCRETE MIX PROPERTIES**

- **MINIMUM CONSTRUCTION RADIUS**
- **CONCAVE CURVE**
- **CONVEX CURVE**

**AGGREGATE CLASS**

- **AGGREGATE SIZE**
- **MAXIMUM PORE VOLUME**
- **SKELETAL DENSITY**

**FLY ASH OR OTHER POZZOLANS CONFORMING TO ASTM C618:**

- **very severe exposure class only, 0.15**

**Alkali-aggregate reaction mitigation per ACI 201**

- **Concrete mix properties are in general accordance with ACI 318 durability requirements. Research has shown that concrete manufactured to these standards demonstrates good durability and performance.**
- **When these requirements are followed, specific freeze-thaw testing of the concrete is typically NOT required.**
- **Exposure class is as described in ACI 318. "Moderate" describes concrete that is exposed to freezing and thawing cycles and occasional exposure to moisture. "Severe" describes concrete that is exposed to freezing and thawing cycles and in continuous contact with moisture. "Very severe" describes concrete that is exposed to freezing and thawing cycles and in continuous contact with moisture and exposed to deicing chemicals. Exposure class should be specified by owner/purchaser prior to order placement. Longer lead times may be required for block units manufactured for "severe" and "very severe" exposure classes.**
- **Test method ASTM C31.**
- **Test method ASTM C712 at age between 28 and 42 days.**
- **Where used in high sulfite environments or where alkali-silica reactivity is an issue, water soluble chloride shall be limited to no more than trace amounts from impurities in concrete-making components, not intended constituents.**

**The total cementitious material also includes ASTM C150, C595, C845, and C1157 cement. The maximum percentages shall include:**

- **Fly ash or other pozzolans in type I, blended cement, ASTM C595, or ASTM C1157.**
- **Fly ash or other pozzolans and silica fume shall constitute no more than 25 and 10 percent, respectively, of the total weight of the cementitious materials.**
- **Prescriptive limits shown may be waived for concrete mixes that demonstrate excellent freeze/thaw durability in a detailed and current testing program.**

**PRODUCT DATA SHEETS**

- **FLY ASH OR OTHER POZZOLANS CONFORMING TO ASTM C618 50
- **SLICA FUME CONFORMING TO ASTM C1240 36
- **TOTAL OF FLY ASH OR OTHER POZZOLANS, SILICA FUME & ALKALI-AGGREGATE REACTIVITY MITIGATION PER ACI 201 1000**
- **Revised 1/05/08**

**Product Specifications**

- **Redi-Rock 28" (710 mm) & 41" (1030 mm) Positive Connection (PC) Retaining Blocks**

**PRODUCT DESIGN SHEETS**

- **Block to Block Interface Shear**
- **Infilled Unit Weight for Wall Stabilization Calculations**
- **Concrete Curve**

**Redi-Rock Design Resource Manual V20 | 277**

Redi-Rock International, LLC
Redi-Rock Freestanding Straight Blocks

The Redi-Rock Freestanding wall units are machine-placed, wet-cast, precast modular block units manufactured from first-purpose, non-reconstituted concrete and intended to be used exclusively or in combination with dry-stacked modular retaining wall blocks. These units are manufactured from structural-grade concrete mixes in accordance with ASTM C94 or ASTM C685 that produce a finished unit with excellent resistance to freeze-thaw, deicing chemical exposure, and submerged conditions in both fresh water and salt water applications. All Redi-Rock products are manufactured and distributed through an international network of individually-owned, licensed precast concrete manufacturers.

**DIMENSIONAL PROPERTIES**

<table>
<thead>
<tr>
<th>CONCRETE DATA SHEETS</th>
<th>0.40 1 inch (25 mm) 4S</th>
<th>0.45 1 inch (25 mm)</th>
<th>0.40 1 inch (25 mm) 4S</th>
<th>0.45 1 inch (25 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONCRETE MIX PROPERTIES (3)</td>
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<tr>
<td>FREEZE THAW EXPOSURE CLASS</td>
<td>MINIMUM 28 DAY COMPRRESSIVE STRENGTH (MPa)</td>
<td>MAXIMUM WATER-SOLUBLE CHLORIDE CONTENT (CONCRETE, PERCENT BY WEIGHT OF CEMENT)</td>
<td>AGGREGATE CLASS DESIGNATION (6)</td>
<td>AIR CONTENT (1)</td>
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<tr>
<td>MODERATE</td>
<td>4.00 psi (27.6 kPa)</td>
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<tr>
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<tr>
<td>SLAG CONFORMING TO ASTM C618</td>
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</tr>
<tr>
<td>SILICA FUME CONFORMING TO ASTM C1240</td>
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<tr>
<td>TOTAL OF FLY ASH OR OTHER POZZOLANS AND SILICA FUME</td>
<td>55</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

(1) All dimensions are inches (mm).
(2) Weight is based on an assumed concrete unit weight of 143 lb/ft³ (2291 kg/m³). Actual weights will vary.
(3) Concretes mix properties are in general accordance with ACI 318 durability requirements. Research has shown that concrete manufactured to these standards demonstrates good durability and performance. When these requirements are followed, specific freeze-thaw testing of the concrete is typically NOT required. Exposure class is not as described in ACI 318. MODERATE describes concrete that is exposed to freezing and thawing cycles and occasional exposure to moisture. SEVERE describes concrete that is exposed to freezing and thawing cycles and in continuous contact with moisture. VERY SEVERE describes concrete that is exposed to freezing and thawing cycles and in continuous contact with moisture and exposed to deicing chemicals. Exposure class should be specified by owner/purchaser prior to order placement. Longer lead times may be required for block units manufactured for “severe” and “very severe” exposure classes.
(4) Test method ASTM C39.
(5) Defined in ASTM C33 Table 3 Limits for Deliberate Substances and Physical Property Requirements of Coarse Aggregate for Concrete. (6) Test method ASTM C221.
(7) Test method ASTM C128 at age between 28 and 42 days.
(8) Where used in high sulfide environments or where alkali-silica reactivity is an issue, water soluble chloride shall be limited to no more than three parts per million (from impurities in concrete-making components, not intended constituents.)
(9) The maximum cementitious material also includes ASTM C510, C559, C645, and C1157 cement. The maximum percentages shall include: (a) Fly ash or other pozzolans in type IP, blended cement, ASTM C595, or ASTM C1157. (b) Silica fume, ASTM C1240, present in a blended cement. (c) Fly ash or other pozzolans and silica fume shall constitute no more than 25 and 10 percent, respectively, of the total weight of the cementitious materials. Prescriptive limits may be waived for concrete mixes that demonstrate excellent freeze/thaw durability in a calibrated and current testing program. (10) The total cementitious materials also includes ASTM C150, C595, C645, and C1157 cement. The maximum percentages shall include: (a) Fly ash or other pozzolans in type IP, blended cement, ASTM C595, or ASTM C1157. (b) Silica fume, ASTM C1240, present in a blended cement. (c) Fly ash or other pozzolans and silica fume shall constitute no more than 25 and 10 percent, respectively, of the total weight of the cementitious materials. Revised 110518

Redi-Rock Hollow-Core Freestanding Blocks

The Redi-Rock Hollow-Core Freestanding wall units are machine-placed, wet-cast, precast modular block units manufactured from first-purpose, non-reconstituted concrete and intended to be used exclusively or in combination with dry-stacked modular retaining wall blocks. These units are manufactured from structural-grade concrete mixes in accordance with ASTM C94 or ASTM C685 that produce a finished unit with excellent resistance to freeze-thaw, deicing chemical exposure, and submerged conditions in both fresh water and salt water applications. All Redi-Rock products are manufactured and distributed through an international network of individually-owned, licensed precast concrete manufacturers.

**DIMENSIONAL PROPERTIES**

<table>
<thead>
<tr>
<th>CONCRETE DATA SHEETS</th>
<th>0.40 1 inch (25 mm) 4S</th>
<th>0.45 1 inch (25 mm)</th>
<th>0.40 1 inch (25 mm) 4S</th>
<th>0.45 1 inch (25 mm)</th>
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<tbody>
<tr>
<td>CONCRETE MIX PROPERTIES (2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FREEZE THAW EXPOSURE CLASS</td>
<td>MINIMUM 28 DAY COMPRRESSIVE STRENGTH (MPa)</td>
<td>MAXIMUM WATER-SOLUBLE CHLORIDE CONTENT (CONCRETE, PERCENT BY WEIGHT OF CEMENT)</td>
<td>AGGREGATE CLASS DESIGNATION (6)</td>
<td>AIR CONTENT (1)</td>
</tr>
<tr>
<td>MODERATE</td>
<td>4.00 psi (27.6 kPa)</td>
<td>0.45</td>
<td>1 inch (25 mm)</td>
<td>3M</td>
</tr>
<tr>
<td>SEVERE</td>
<td>6.00 psi (41.4 kPa)</td>
<td>0.45</td>
<td>1 inch (25 mm)</td>
<td>3M</td>
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<tr>
<td>VERY SEVERE</td>
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</tr>
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<td>MAXIMUM WATER-SOLUBLE CHLORIDE CONCENTRATION IN MIXING WATER, PARTS PER MILLION</td>
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<td></td>
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<tr>
<td>MAXIMUM PERCENTAGE OF TOTAL CEMENTOUS MATERIALS BY WEIGHT (2) (VERY SEVERE EXPOSURE CLASS)</td>
<td>FLY ASH OR OTHER POZZOLANS CONFORMING TO ASTM C618</td>
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<tr>
<td>SLAG CONFORMING TO ASTM C618</td>
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<td></td>
</tr>
<tr>
<td>SILICA FUME CONFORMING TO ASTM C1240</td>
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<td>TOTAL OF FLY ASH OR OTHER POZZOLANS, SLAG, AND SILICA FUME (11)</td>
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Precast Modular Block Retaining Wall Specification

CSI Format

02/01/19

The following specification addresses PMB walls designed as unreinforced gravity structures or reinforced with geosynthetic reinforcement. This document is a guide specification and should be modified as necessary for your particular project. An editable version of this document is available for download at redi-rock.com.
PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes furnishing all materials and labor required for the design and construction of a precast concrete modular block (PMB) retaining wall with or without geosynthetic reinforcement. Precast modular block retaining wall blocks under this section shall be cast utilizing a wet-cast concrete mix and exhibit a final handling weight in excess of 1,000 pounds (450 kg) per unit.

B. Scope of Work: The work shall consist of furnishing materials, labor, equipment and supervision for the construction of a precast modular block (PMB) retaining wall structure in accordance with the requirements of this section and in acceptable conformity with the lines, grades, design and dimensions shown in the project site plans.

C. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 31, Division 32 and Division 33 also apply to this Section.

1.02 PRICE AND PAYMENT PROCEDURES

A. Allowances. No allowance shall be made in the price of the retaining wall for excavation beyond the limits required for retaining wall construction as shown on the project plans. The cost of excavation for the purposes of site access shall be the responsibility of the General Contractor. Removal of unsuitable soils and replacement with select fill shall be as directed and approved in writing by the Owner or Owner’s representative and shall be paid under separate pay items.

B. Unit Prices. In addition to a lump sum price pursuant to completion of the scope of work described in Part 1.01 of this Section, the General Contractor shall provide a unit price per square foot of vertical wall face that shall be the basis of compensation for up to a ten (10) percent increase or reduction in the overall scope of the retaining wall work.

C. Measurement and Payment.

1. The unit of measurement for furnishing the precast modular block retaining wall system shall be the vertical area of the wall face surface as measured from the top of the leveling pad to the top of the wall including coping. The final measured quantity shall include supply of all material components and the installation of the precast modular block system.

2. The final accepted quantities of the precast modular block retaining wall system will be compensated per the vertical face area as described above. The quantities of the precast modular block retaining wall as shown on the plans and as approved by the Owner shall be the basis for determination of the final payment quantity. Payment shall be made per square foot of vertical wall face.

1.03 REFERENCES

A. Where the specification and reference documents conflict, the Owner’s designated representative will make the final determination of the applicable document.

B. Definitions:


2. Geotextile – a geosynthetic fabric manufactured for use as a separation and filtration medium between dissimilar soil materials.

3. Geogrid – a geosynthetic material comprised of a regular network of tensile elements manufactured in a mesh-like configuration of consistent aperture openings. When connected to the PMB facing units and placed in horizontal layers in compacted fill, the geogrid prevents lateral deformation of the retaining wall face and provides effective tensile reinforcement to the contiguous reinforced fill material.

4. Drainage Aggregate – clean, crushed stone placed within and immediately behind the precast modular block units to facilitate drainage and reduce compaction requirements immediately adjacent to and behind the precast modular block units.

5. Unit Core Fill – clean, crushed stone placed within the hollow vertical core of a precast modular block unit. Typically, the same material used for drainage aggregate as defined above.

6. Foundation Zone – soil zone immediately beneath the leveling pad and the reinforced zone.

7. Retained Zone – soil zone immediately behind the drainage aggregate and wall infill for wall sections designed as modular gravity structures. Alternatively, in the case of wall sections designed with geosynthetic soil reinforcement, the retained zone is the soil zone immediately behind the reinforced zone.

8. Reinforced Zone – structural fill zone within which successive horizontal layers of geogrid soil reinforcement have been placed to provide stability for the retaining wall face. The reinforced zone exists only for retaining wall sections that utilize geosynthetic soil reinforcement for stability.

9. Reinforced Fill – structural fill placed within the reinforced zone.

10. Leveling Pad – hard, flat surface upon which the bottom course of precast modular blocks are placed. The leveling pad may be constructed with crushed stone or cast-in-place concrete. A leveling pad is not a structural footing.

11. Wall Infill – the fill material placed and compacted between the drainage aggregate and the excavated soil face in retaining wall sections designed as modular gravity structures.

C. Reference Standards

1. Design


d. FHWA-NHI-10-024 Volume I and GEC 11 Design of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes.

e. FHWA-NHI-10-025 Volume II and GEC 11 Design of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes.

2. Precast Modular Block Units

a. ACI 201 – Guide to Durable Concrete
b. ACI 318 – Building Code Requirements for Structural Concrete

c. ASTM C33 – Standard Specification for Concrete Aggregates

d. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens


h. ASTM C150 – Standard Specification for Portland Cement

i. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.


m. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.


t. ASTM C1218 - Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.


w. ASTM C1776 – Standard Specification for Wet-Cast Precast Modular Retaining Wall Units.

x. ASTM C6638 – Standard Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units (Modular Concrete Blocks).

y. ASTM D6916 – Standard Test Method for Determining Shear Strength Between Segmental Concrete Units (Modular Concrete Blocks).

3. Geosynthetics


e. ASTM D448 – Standard Classification for Sizes of Aggregates for Road and Bridge Construction.


1.04 ADMINISTRATIVE REQUIREMENTS

A. Preconstruction Meeting. As directed by the Owner, the General Contractor shall schedule a preconstruction meeting at the project site prior to commencement of retaining wall construction. Participation in the preconstruction meeting shall be required of the General Contractor, Retaining Wall Design Engineer, Retaining Wall Installation Contractor, Grading Contractor and Inspection Engineer. The General Contractor shall provide notification to all parties at least 10 calendar days prior to the meeting.

1. Preconstruction Meeting Agenda:
   a. The Retaining Wall Design Engineer shall explain all aspects of the retaining wall construction drawings.
   b. The Retaining Wall Design Engineer shall explain the required bearing capacity of soil below the retaining wall structure and the shear strength of in-situ soils assumed in the retaining wall design to the Inspection Engineer.
   c. The Retaining Wall Design Engineer shall explain the required shear strength of fill soil in the reinforced, retained and foundation zones of the retaining wall to the Inspection Engineer.
   d. The Retaining Wall Design Engineer shall explain any measures required for coordination of the installation of utilities or other obstructions in the reinforced or retained fill zones of the retaining wall.
   e. The Retaining Wall Installation Contractor shall explain all excavation needs, site access and material staging area requirements to the General Contractor and Grading Contractor.

1.05 SUBMITTALS

A. Product Data. At least 14 days prior to construction, the General Contractor shall submit a minimum of six (6) copies of the retaining wall product submittal package to the Owner’s Representative for review and approval. The submittal package shall include technical specifications and product data from the manufacturer for the following:
   1. Precast Modular Block System brochure
   2. Precast Modular Block concrete test results specified in paragraph 2.01, subparagraph B of this section as follows:
      a. 28-day compressive strength
      b. Air content
      c. Slump or Slump Flow (as applicable)
   3. Drainage Pipe

B. Installer Qualification Data. At least 14 days prior to construction, the General Contractor shall submit the qualifications of the business entity responsible for installation of the retaining wall, the Retaining Wall Installation Contractor, per paragraph 1.07, subparagraph A of this section.

C. Retaining Wall Design Calculations and Construction Shop Drawings. At least 14 days prior to construction, the General Contractor shall furnish six (6) sets of construction shop drawings and six (6) copies of the supporting structural calculations report to the Owner for review and approval. This submittal shall include the following:
   1. Signed, sealed and dated drawings and engineering calculations prepared in accordance with the specifications.
   2. Qualifications Statement of Experience of the Retaining Wall Design Engineer as specified in paragraph 1.07, subparagraph B of this section.
   3. Certificate of Insurance of the Retaining Wall Design Engineer as specified in paragraph 1.06, subparagraph B of this section.

1.06 CONSTRUCTION SHOP DRAWING PREPARATION

A. The Retaining Wall Design Engineer shall coordinate the retaining wall construction shop drawing preparation with the project Civil Engineer, project Geotechnical Engineer and Owner’s Representatives. The General Contractor shall furnish the Retaining Wall Design Engineer the following project information required to prepare the construction shop drawings:
   1. Current versions of the site, grading, drainage, utility, erosion control, landscape, and irrigation plans;
   2. electronic CAD file of the civil site plans listed in (1);
   3. report of geotechnical investigation and all addenda and supplemental reports;
   4. recommendations of the project Geotechnical Engineer regarding effective stress shear strength and total stress shear strength (when applicable) parameters for in-situ soils in the vicinity of the proposed retaining wall(s) and for any fill soil that may potentially be used as backfill in retained and/or foundation zones of the retaining wall.

B. The Retaining Wall Design Engineer shall provide the Owner with a certificate of professional liability insurance verifying the minimum coverage limits of $1 million per claim and $1 million aggregate.

C. Design of the precast modular block retaining wall shall satisfy the requirements of this section. Where local design or building code requirements exceed these specifications, the local requirements shall also be satisfied.

D. The Retaining Wall Design Engineer shall note any exceptions to the requirements of this section by listing them at the bottom right comer of the first page of the construction shop drawings.
E. Approval or rejection of the exceptions taken by the Retaining Wall Engineer will be made in writing as directed by the Owner.

F. The precast modular block design, except as noted herein, shall be based upon AASHTO Load and Resistance Factor Design (LRFD) methodology as referenced in paragraph 1.03, subparagraph C.1.

G. In the event that a conflict is discovered between these specifications and a reasonable interpretation of the design specifications and methods referenced in paragraph F above, these specifications shall prevail. If a reasonable interpretation is not possible, the conflict shall be resolved per the requirements in paragraph 1.03, subparagraph A of this section.

H. Soil Shear Parameters. The Retaining Wall Design Engineer shall prepare the construction shop drawings based upon soil shear strength parameters from the available project data and the recommendations of the project Geotechnical Engineer. If insufficient data exists to develop the retaining wall design, the Retaining Wall Design Engineer shall communicate the specific deficiency of the project information or data to the Owner in writing.

I. Allowable bearing pressure requirements for each retaining wall shall be clearly shown on the construction drawings.

J. Global Stability. Overall (global) stability shall be evaluated in accordance with the principals of limit equilibrium analysis as set forth in FHWA-NHI-10-024 Volume I and FHWA-NHI-10-025 Volume II GEC 11 Design of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes as referenced in paragraph 1.03, subparagraph C.1. The minimum factors of safety shall be as follows:

- Normal Service (Static): 1.4
- Seismic: 1.1
- Rapid Drawdown (if applicable): 1.2

K. Seismic Stability. Seismic loading shall be evaluated in accordance with AASHTO Load and Resistance Factor Design (LRFD) methodology as referenced in paragraph 1.03, subparagraph C.1.

1.07 QUALITY ASSURANCE

A. Retaining Wall Installation Contractor Qualifications. In order to demonstrate basic competence in the construction of precast modular block walls, the Retaining Wall Installation Contractor shall document compliance with the following:

1. Experience.
   a. Construction experience with a minimum of 30,000 square feet (2,800 square meters) of the proposed precast modular block retaining wall system.
   b. Construction of at least ten (10) precast modular block (large block) retaining wall structures within the past three (3) years.
   c. Construction of at least 50,000 square feet (4,650 square meters) of precast modular block (large block) retaining walls within the past three (3) years.

2. Retaining Wall Installation Contractor experience documentation for each qualifying project shall include:
   a. Project name and location

b. Date (month and year) of construction completion

C. The Owner reserves the right to reject the design services of any engineer or engineering firm who, in the sole opinion of the Owner, does not possess the requisite experience or qualifications.

1.08 QUALITY CONTROL

A. The Owner’s Representative shall review all submittals for materials, design, Retaining Wall Design Engineer qualifications and the Retaining Wall Installation Contractor qualifications.

B. The General Contractor shall retain the services of an Inspection Engineer who is experienced with the construction of precast modular block retaining wall structures to perform inspection and testing. The cost of inspection shall be the responsibility of the General Contractor. Inspection shall be continuous throughout the construction of the retaining walls.

C. The Inspection Engineer shall perform the following duties:

1. Inspect the construction of the precast modular block structure for conformance with construction shop drawings and the requirements of this specification.
2. Verify that soil or aggregate fill placed and compacted in the reinforced, retained and foundation zones of the retaining wall conforms with paragraphs 2.04 and 2.05 of this section and exhibits the shear strength parameters specified by the Retaining Wall Design Engineer.
3. Verify that the shear strength of the in-situ soil assumed by the Retaining Wall Design Engineer is appropriate.

4. Inspect and document soil compaction in accordance with these specifications:
   a. Required dry unit weight
   b. Actual dry unit weight
   c. Allowable moisture content
   d. Actual moisture content
   e. Pass/fail assessment
   f. Test location – wall station number
   g. Test elevation
   h. Distance of test location behind the wall face

5. Verify that all excavated slopes in the vicinity of the retaining wall are bench-cut as directed by the project Geotechnical Engineer.

6. Notify the Retaining Wall Installation Contractor of any deficiencies in the retaining wall construction and provide the Retaining Wall Installation Contractor a reasonable opportunity to correct the deficiency.

7. Notify the General Contractor, Owner and Retaining Wall Design Engineer of any construction deficiencies that have not been corrected timely.

8. Document all inspection results.

9. Test compacted density and moisture content of the retained backfill with the following frequency:
   a. At least once every 1,000 square feet (90 square meters) (in plan) per 9-inch (230 mm) vertical lift, and
   b. At least once per every 18 inches (460 mm) of vertical wall construction.

D. The General Contractor’s engagement of the Inspection Engineer does not relieve the Retaining Wall Installation Contractor of responsibility to construct the proposed retaining wall in accordance with the approved construction shop drawings and these specifications.

E. The Retaining Wall Installation Contractor shall inspect the on-site grades and excavations prior to construction and notify the Retaining Wall Design Engineer and General Contractor if on-site conditions differ from the elevations and grading conditions depicted in the retaining wall construction shop drawings.

1.09 DELIVERY, STORAGE AND HANDLING

A. The Retaining Wall Installation Contractor shall inspect the materials upon delivery to ensure that the proper type, grade and color of materials have been delivered.

B. The Retaining Wall Installation Contractor shall store and handle all materials in accordance with the manufacturer’s recommendations as specified herein and in a manner that prevents deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, UV exposure or other causes. Damaged materials shall not be incorporated into the work.

C. Geosynthetics
   1. All geosynthetic materials shall be handled in accordance with ASTM D4873. The materials should be stored off the ground and protected from precipitation, sunlight, dirt and physical damage.

D. Precast Modular Blocks
   1. Precast modular blocks shall be stored in an area with positive drainage away from the blocks. Be careful to protect the block from mud and excessive chipping and breakage. Precast modular blocks shall not be stacked more than three (3) units high in the storage area.

E. Drainage Aggregate and Backfill Stockpiles
   1. Drainage aggregate or backfill material shall not be piled over unstable slopes or areas of the project site with buried utilities.
   2. Drainage aggregate and/or reinforced fill material shall not be staged where it may become mixed with or contaminated by poor draining fine-grained soils such as clay or silt.

PART 2 – MATERIALS

2.01 PRECAST MODULAR BLOCK RETAINING WALL UNITS

A. All units shall be wet-cast precast modular retaining wall units conforming to ASTM C1776.

B. All units for the project shall be obtained from the same manufacturer. The manufacturer shall be licensed and authorized to produce the retaining wall units by the precast modular block system patent holder/licensor and shall document compliance with the published quality control standards of the proprietary precast modular block system licensor for the previous three (3) years or the total time the manufacturer has been licensed, whichever is less.

C. Concrete used in the production of the precast modular block units shall be first-purpose, fresh concrete. It shall not consist of returned, reconstituted, surplus or waste concrete. It shall be an original production mix meeting the requirements of ASTM C94 and exhibit the properties as shown in the following table:
Concrete Mix Properties

<table>
<thead>
<tr>
<th>Freeze Thaw Exposure Class(1)</th>
<th>Minimum 28-Day Compressive Strength(2)</th>
<th>Maximum Water Cement Ratio</th>
<th>Nominal Maximum Aggregate Size</th>
<th>Aggregate Class Designation(3)</th>
<th>Air Content(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>4,000 psi (27.6 MPa)</td>
<td>0.45</td>
<td>1 inch (25 mm)</td>
<td>3M</td>
<td>4.5% +/- 1.5%</td>
</tr>
<tr>
<td>Severe</td>
<td>4,000 psi (27.6 MPa)</td>
<td>0.45</td>
<td>1 inch (25 mm)</td>
<td>3S</td>
<td>6.0% +/- 1.5%</td>
</tr>
<tr>
<td>Very Severe</td>
<td>4,500 psi (30.0 MPa)</td>
<td>0.40</td>
<td>1 inch (25 mm)</td>
<td>4S</td>
<td>6.0% +/- 1.5%</td>
</tr>
</tbody>
</table>

Maximum Water-Soluble Chloride Ion (Cl-) Concentration in Concrete, Percent by Weight of Cement(5,6)

- Very Severe: 4,500 psi (30.0 MPa) Maximum Chloride as Cl- Concentration in Mixing Water, Parts Per Million
- Moderate: 4,000 psi (27.6 MPa)
- Very Severe: 4,500 psi (30.0 MPa)

Maximum Chloride as Cl- Concentration in Mixing Water: 4.500 psi (30.0 MPa) Maximum Water-Soluble Chloride Ion (Cl-) Content in Concrete, Percent by Weight of Cement(5,6)

- Very Severe: 4,500 psi (30.0 MPa) Maximum Chloride as Cl- Concentration in Mixing Water, Parts Per Million
- Moderate: 4,000 psi (27.6 MPa)
- Very Severe: 4,500 psi (30.0 MPa)

Alkali-Aggregate Reactivity Mitigation per ACI 201(10)

<table>
<thead>
<tr>
<th>Slump (Conventional Concrete) per ASTM C143(1)</th>
<th>Slump Flow (Self-Consolidating Concrete) per ASTM C1611</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 inches +/- 1½ inches (125 mm +/- 40 mm)</td>
<td>5 inches – 32 inches (455 mm – 800 mm)</td>
</tr>
</tbody>
</table>

(1) Exposure class is as described in ACI 318. "Moderate" describes concrete that is exposed to freezing and thawing cycles and occasional exposure to moisture. "Severe" describes concrete that is exposed to freezing and thawing cycles and in continuous contact with moisture. "Very Severe" describes concrete that is exposed to freezing and thawing cycles and moisture. (2) Exposed concrete is as described by ACI 318. (3) Describes concrete that is exposed to freezing and thawing cycles and continuous contact with moisture and exposed to deicing chemicals. Exposure class should be specified by owner/purchaser prior to order placement. (4) The total cementitious material also includes ASTM C150, C595, C845, C1157 cement. The maximum percentages shall include:
- Fly Ash or other pozzolans in type IP, blended cement, ASTM C595, or ASTM C1157.
- Slag used in the manufacture of an IS blended cement, ASTM C595, or ASTM C1157.
- Silica fume, ASTM C1124, present in a blended cement. (5) Fly ash or other pozzolans and silica fume shall constitute no more than 25 and 10 percent, respectively, of the total weight of the cementitious materials. (6) Prescriptive limits shown may be waived for concrete mixes that demonstrate excellent freeze/thaw durability in a detailed and current testing program. (7) Slump may be increased by a high-range water-reducing admixture.

D. Each concrete block shall be cast in a single continuous pour without cold joints. With the exception of half-block units, corner units and other special application units, the precast modular block units shall conform to the nominal dimensions listed in the table below and be produced to the dimensional tolerances shown.

E. Individual block units shall have a nominal height of 18 inches (457 mm).

F. With the exception of half-block units, corner units and other special application units, the precast modular block units shall have two (2) circular dome shear knobs that are 10 inches (254 mm), 7.5 inches (190 mm), or 6.75 inches (171 mm) in diameter and 4 inches (102 mm) or 2 inches (51 mm) in height. The shear knobs shall fully index into a continuous semi-cylindrical shear channel in the bottom of the block course above. The peak interlock shear between any two (2) vertically stacked precast modular block units, with 10 inch (254 mm) diameter shear knobs, measured in accordance with ASTM D6916 shall exceed 6,500 lb/ft (95 kN/m) at a minimum normal load of 500 lb/ft (7kN/m), as well as an ultimate peak interface shear capacity in excess of 11,000 lb/ft (160 kN/m). The peak interlock shear between any two (2) vertically stacked precast modular block units, with 7.5 inch (190 mm) or 6.75 inch (171 mm) diameter shear knobs, measured in accordance with ASTM D6916 shall exceed 1,850 lb/ft (27 kN/m) at a minimum normal load of 500 lb/ft (7kN/m) as well as an ultimate peak interface shear capacity in excess of 10,000 lb/ft (146 kN/m). Test specimen blocks tested under ASTM D6916 shall be actual, full-scale production blocks of known compressive strength. The interface shear capacity reported shall be corrected for a 4,000 psi (27.6 MPa) concrete compressive strength. Regardless of precast modular block configuration, interface shear testing shall be completed without the inclusion of unit core infill aggregate.

G. The 28” (710 mm) and 41” (1030 mm) precast modular block units shall be cast with a 13” (330 mm) wide, continuous vertical core slot that will permit the insertion of a 12” (305 mm) inch wide strip of geogrid reinforcement to pass completely through the block. When installed in this manner, the geogrid reinforcement shall form a non-normal load dependent, positive connection between the block unit and the reinforcement strip. The use of steel for the purposes of creating the geogrid to the block system shall be available in the four (4) standard horizontal set-back facing batter options listed below.

H. Without field cutting or special modification, the precast modular block units shall be capable of achieving a minimum radius of 14 ft 6 in (4.42 m).

I. The precast modular block units shall be manufactured with an integrally cast shear knobs that establishes a standard horizontal set-back for subsequent block courses. The precast modular block system shall be available in the four (4) standard horizontal set-back facing batter options listed below:

<table>
<thead>
<tr>
<th>Horizontal Set-Back/Bik. Course</th>
<th>Max. Facing Batter</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8” (10 mm)</td>
<td>1.2</td>
</tr>
</tbody>
</table>
The precast modular block units shall be furnished with the required shear knobs that provide the facing batter required in the construction shop drawings.

J. The precast modular block unit face texture shall be selected by the owner from the available range of textures available from the precast modular block manufacturer. Each textured block facing unit shall be a minimum of 5.76 square feet (0.54 square meters) with a unique texture pattern that repeats with a maximum frequency of once in any 15 square feet (1.4 square meters) of wall face.

K. The block color shall be selected by the owner from the available range of colors available from the precast modular block manufacturer.

L. All precast modular block units shall be sound and free of cracks or other defects that would interfere with the proper installation of the unit, impair the strength or performance of the constructed wall. PMB units to be used in exposed wall construction shall not exhibit chips or cracks in the exposed face or faces of the unit that are not otherwise permitted. Chips smaller than 1.5” (38 mm) in its largest dimension and cracks not wider than 0.012” (0.3 mm) and not longer than 25% of the nominal height of the PMB unit shall be permitted. PMB units with bug holes in the exposed architectural face smaller than 0.75” (19 mm) in its largest dimension shall be permitted. Bug holes, water marks, and color variation on non-architectural faces are acceptable. PMB units that exhibit cracks that are continuous through any solid element of the PMB unit shall not be incorporated in the work regardless of the width or length of the crack.

M. Preapproved Manufacturers.

N. Substitutions. Technical information demonstrating conformance with the requirements of this specification for an alternative precast modular block retaining wall system must be submitted for preapproval at least 14 calendar days prior to the bid date. Acceptable alternative PMB retaining wall systems, otherwise found to be in conformance with this specification, shall be approved in writing by the owner 7 days prior to the bid date. The Owner’s Representative reserves the right to disallow a substitution of block retaining wall systems that are determined to be unacceptable to the owner.

O. Value Engineering Alternatives. The owner may evaluate and accept systems that meet the requirements and constructability requirements.

2.02 GEOGRID REINFORCEMENT

A. Geogrid reinforcement shall be a woven or knitted PVC coated geogrid manufactured from high tenacity PET polyester fiber with an average molecular weight greater than 25,000 (Mw > 25,000) and a carboxyl end group less than 30 (CEG < 30). The geogrid shall be furnished in prefabricated roll widths of certified tensile strength by the manufacturer. The prefabricated roll width of the geogrid shall be 12” (300 mm) +/- 1/2” (13 mm). No cutting of geogrid reinforcement down to the 12” (300 mm) roll width from a larger commercial roll width will be allowed under any circumstances.

B. The ultimate tensile strength (Teul) of the geogrid reinforcement shall be measured in accordance with ASTM D6637.

C. Geogrid – Soil Friction Properties
1. Friction factor, F’, shall be equal to 2/3 Tan ɸ, where ɸ is the effective angle of internal friction of the reinforced fill soil.
2. Linear Scale Correction Factor, α, shall equal 0.8.

D. Long-Term Tensile Strength (Tal) of the geogrid reinforcement shall be calculated in accordance with Section 3.5.2 of FHWA-NHI-10-024 and as provided in this specification.
1. The creep reduction factor (RFcr) shall be determined in accordance with Appendix D of FHWA-NHI-10-025 for a minimum 75 year design life.
2. Minimum installation damage reduction factor (RFID) shall be 1.25. The value of RFID shall be based upon documented full-scale tests in a soil that is comparable to the material proposed for use as reinforced backfill in accordance with ASTM D5518.
3. Minimum durability reduction factor (RFd) shall be 1.3 for a soil pH range of 3 to 9.

E. Connection between the PMB retaining wall unit and the geogrid reinforcement shall be determined from short-term testing per the requirements of FHWA NHI-10-025, Appendix B for a minimum 75-year design life.

F. The minimum value of Td for geogrid used in design of a reinforced precast modular block retaining wall shall be 2,000 lb/ft (29 kN/m) or greater.

G. The minimum length of geogrid reinforcement shall be the greater of the following:
1. 0.7 times the wall design height, H.
2. 6 feet (1.83 m).
3. The length required by design to meet internal stability requirements, soil bearing pressure requirements and constructability requirements.

H. Constructability Requirements. Geogrid design embedment length shall be measured from the back of the precast modular block facing unit and shall be consistent for the entire height of a given retaining wall section.

I. Geogrid shall be positively connected to every precast modular block unit. Design coverage ratio, Rc, as calculated in accordance with AASHTO LRFD Bridge Design Specifications Figure 11.10.6.4.1-2 shall not exceed 0.50.

J. Preapproved Geogrid Reinforcement Products.
1. Miragrid XT Geogrids as manufactured by TenCate Geosynthetics of Pendergrass, Georgia USA and distributed by Manufacturers of the Redi-Rock Retaining Wall System.

K. Substitutions. No substitutions of geogrid reinforcement products shall be allowed.
A. Nonwoven geotextile fabric shall be placed as indicated on the retaining wall construction shop drawings. Additionally, the nonwoven geotextile fabric shall be placed in the v-shaped joint between adjacent block units on the same course. The nonwoven geotextile fabric shall meet the requirements Class 3 construction survivability in accordance with AASHTO M 288.

B. Preapproved Nonwoven Geotextile Products
1. Mirafi 140N
2. Propex Geotex 451
3. Skaps GT-142
4. Thrace-Linq 140EX
5. Carthage Mills FX-40HS
6. Stratatex ST 142

2.04 DRAINAGE AGGREGATE AND WALL INFILL
A. Drainage aggregate (and wall infill for retaining walls designed as modular gravity structures) shall be a durable crushed stone conforming to No. 57 size per ASTM C33 with the following particle-size distribution requirements per ASTM D422:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-½&quot; (38 mm)</td>
<td>100</td>
</tr>
<tr>
<td>1&quot; (25 mm)</td>
<td>95-100</td>
</tr>
<tr>
<td>½&quot; (13 mm)</td>
<td>25-60</td>
</tr>
<tr>
<td>No. 4 (4.76 mm)</td>
<td>0-10</td>
</tr>
<tr>
<td>No. 8 (2.38 mm)</td>
<td>0-5</td>
</tr>
</tbody>
</table>

2.05 REINFORCED FILL
A. Material used as reinforced backfill material in the reinforced zone (if applicable) shall be a granular fill material meeting the requirements of USCS soil type GW, GP, SW or SP per ASTM D2467 or alternatively by AASHTO Group Classification A-1-a or A-3 per AASHTO M 145. The backfill shall exhibit a minimum effective internal angle of friction, \( \phi = 34 \) degrees at a maximum 2% shear strain and meet the following particle-size distribution requirements per ASTM D422:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4&quot; (19 mm)</td>
<td>100</td>
</tr>
<tr>
<td>No. 4 (4.76 mm)</td>
<td>0-100</td>
</tr>
<tr>
<td>No. 40 (0.42 mm)</td>
<td>0-60</td>
</tr>
<tr>
<td>No. 200 (0.07 mm)</td>
<td>0-15</td>
</tr>
</tbody>
</table>

B. The reinforced backfill material shall be free of sod, peat, roots or other organic or deleterious matter including, but not limited to, ice, snow or frozen soils. Materials passing the No. 40 (0.42 mm) sieve shall have a liquid limit less than 25 and plasticity index less than 6 per ASTM D4318. Organic content in the backfill material shall be less than 1% per AASHTO T-267 and the pH of the backfill material shall be between 5 and 8.

C. Soundness. The reinforced backfill material shall exhibit a magnesium sulfate soundness loss of less than 30% after four (4) cycles, or sodium sulfate soundness loss of less than 15% after five (5) cycles as measured in accordance with AASHTO T-104.

D. Reinforced backfill shall not be comprised of crushed or recycled concrete, recycled asphalt, bottom ash, shale or any other material that may degrade, creep or experience a loss in shear strength or a change in pH over time.

2.06 LEVELING PAD
A. The precast modular block units shall be placed on a leveling pad constructed from crushed stone or unreinforced concrete. The leveling pad shall be constructed to the dimensions and limits shown on the retaining wall design drawings prepared by the Retaining Wall Design Engineer.

B. Crushed stone used for construction of a granular leveling pad shall meet the requirements of the drainage aggregate and wall infill in section 2.04 or a preapproved alternate material.

C. Concrete used for construction of an unreinforced concrete leveling pad shall satisfy the criteria for AASHTO Class B. The concrete should be cured a minimum of 12 hours prior to placement of the precast modular block wall retaining units and exhibit a minimum 28-day compressive strength of 2,500 psi (17.2 MPa).

2.07 DRAINAGE
A. Drainage Pipe
1. Drainage collection pipe shall be a 4" (100 mm) diameter, 3-hole perforated, HDPE pipe with a minimum pipe stiffness of 22 psi (152 kPa) per ASTM D2412.
2. The drainage pipe shall be manufactured in accordance with ASTM D1248 for HDPE pipe and fittings.

B. Preapproved Drainage Pipe Products
1. ADS 3000 Triple Wall pipe as manufactured by Advanced Drainage Systems.

PART 3 – EXECUTION
3.01 GENERAL
A. All work shall be performed in accordance with OSHA safety standards, state and local building codes and manufacturer’s requirements.

B. The General Contractor is responsible for the location and protection of all existing underground utilities. Any new utilities proposed for installation in the vicinity of the retaining wall, shall be installed concurrent with retaining wall construction. The General Contractor shall coordinate the work of subcontractors affected by this requirement.

C. New utilities installed below the retaining wall shall be backfilled and compacted to a minimum of 98% maximum dry density per ASTM D698 standard proctor.
3.02 EXAMINATION

A. Prior to construction, the General Contractor, Grading Contractor, Retaining Wall Installation Contractor and Inspection Engineer shall examine the areas in which the retaining wall will be constructed to evaluate compliance with the requirements for installation tolerances, worker safety and any site conditions affecting performance of the completed structure. Installation shall proceed only after unsatisfactory conditions have been corrected.

B. Excavation.

1. The Grading Contractor shall excavate to the lines and grades required for construction of the precast modular block retaining wall as shown on the construction drawings. The Grading Contractor shall minimize over-excavation. Excavation support, if required, shall be the responsibility of the Grading Contractor.

2. Over-excavated soil shall be replaced with compacted fill in conformance with the specifications of the Retaining Wall Design Engineer and "Division 31, Section 31 20 00 – Earthmoving" of these project specifications.

3. Embankment excavations shall be bench cut as directed by the project Geotechnical Engineer and inspected by the Inspection Engineer for compliance.

C. Foundation Preparation.

1. Prior to construction of the precast modular block retaining wall, the leveling pad area and undercut zone (if applicable) shall be cleared and grubbed. All topsoil, brush, frozen soil and organic material shall be removed. Additional foundation soils found to be unsatisfactory beyond the specified undercut limits shall be undercut and replaced with approved fill as directed by the project Geotechnical Engineer. The Inspection Engineer shall ensure that the undercut limits are consistent with the requirements of the project Geotechnical Engineer and that all soil fill material is properly compacted according project specifications. The Inspection Engineer shall document the volume of undercut and replacement.

2. Following excavation for the leveling pad and undercut zone (if applicable), the Inspection Engineer shall evaluate the in-situ soil in the foundation and retained soil zones.

a. The Inspection Engineer shall verify that the shear strength of the in-situ soil assumed by the Retaining Wall Design Engineer is appropriate. The Inspection Engineer shall immediately stop work and notify the Owner if the in-situ shear strength is found to be inconsistent with the retaining wall design assumptions.

3. Embankment excavations shall be bench cut as directed by the project Geotechnical Engineer and inspected by the Inspection Engineer for compliance.

D. Leveling Pad.

1. The leveling pad shall be constructed to provide a level, hard surface on which to place the first course of precast modular block units. The leveling pad shall be placed in the dimensions shown on the retaining wall construction drawings and extend to the limits indicated.

2. Crushed Stone Leveling Pad. Crushed stone shall be placed in uniform maximum lifts of 6" (150 mm). The crushed stone shall be compacted by a minimum of 3 passes of a vibratory compactor capable of exerting 2,000 lb (8.9 kN) of centrifugal force and to the satisfaction of the Inspection Engineer.

3. Unreinforced Concrete Leveling Pad. The concrete shall be placed in the same dimensions as those required for the crushed stone leveling pad. The Retaining Wall Installation Contractor shall erect proper forms as required to ensure the accurate placement of the concrete leveling pad according to the retaining wall construction drawings.

3.03 PREPARATION

A. Fill Soil.

1. The Inspection Engineer shall verify that reinforced backfill placed in the reinforced soil zone satisfies the criteria of this section.

2. The Inspection Engineer shall verify that any fill soil installed in the foundation and retained soil zones of the retaining wall satisfies the specification of the Retaining Wall Design Engineer as shown on the construction drawings.

B. Drainage components. Pipe, geotextile and drainage aggregate shall be installed as shown on the construction drawings.

3. Unreinforced Concrete Leveling Pad. The concrete shall be placed in the same dimensions as those required for the crushed stone leveling pad. The Retaining Wall Installation Contractor shall erect proper forms as required to ensure the accurate placement of the concrete leveling pad according to the retaining wall construction drawings.

3.04 PRECAST MODULAR BLOCK WALL SYSTEM INSTALLATION

A. The precast modular block structure shall be constructed in accordance with the construction drawings, these specifications and the recommendations of the retaining wall system component manufacturers. Where conflicts exist between the manufacturer's recommendations and these specifications, these specifications shall prevail.

B. Precast Modular Block Installation

1. The first course of block units shall be placed with the front face edges tightly abutted together on the prepared leveling pad at the locations and elevations shown on the construction drawings. The Retaining Wall Installation Contractor shall take special care to ensure that the bottom course of block units are in full contact with the leveling pad, are set level and true and are properly aligned according to the locations shown on the construction drawings.

2. Backfill shall be placed in front of the bottom course of blocks prior to placement of subsequent block courses. Nonwoven geotextile fabric shall be placed in the V-shaped joints between adjacent blocks. Drainage aggregate shall be placed in the V-shaped joints between adjacent blocks to a minimum distance of 12” (300 mm) behind the block unit.

3. Drainage aggregate shall be placed in 9 inch maximum lifts and compacted by a minimum of three (3) passes of a vibratory plate compactor capable exerting a minimum of 2,000 lb (8.9 kN) of centrifugal force.

4. Unit core fill shall be placed in the precast modular block unit vertical core slot. The core fill shall completely fill the slot to the level of the top of the block unit. The top of the block unit shall be broom-cleaned prior to placement of subsequent block courses. No additional courses of precast modular blocks may be stacked before the unit core fill is installed in the blocks on the course below.

5. Base course blocks for gravity wall designs (without geosynthetic soil reinforcement) may be furnished without vertical core slots. If so, disregard item 4 above, for the base course blocks in this application.
D. Geogrid Reinforcement Installation (if required)

1. Geogrid reinforcement shall be installed at the locations and elevations shown on the construction drawings on level fill compacted to the requirements of this specification.

2. Continuous 12" (300 mm) wide strips of geogrid reinforcement shall be passed completely through the vertical core slot of the precast modular block unit and extended to the embedment length shown on the construction plans. The strips shall be staked or anchored as necessary to maintain a taut condition.

3. Reinforcement length (L) of the geogrid reinforcement is measured from the back of the precast modular block unit. The cut length (Lc) is two times the reinforcement length plus additional length through the block facing unit. The cut length is calculated as follows:

   \[ L_c = 2L + 3\text{ ft} \quad (2L + 1.5\text{ m}) \quad (28" \quad (710\text{ mm}) \quad \text{block unit}) \]

   \[ L_c = 2L + 5\text{ ft} \quad (2L + 1.5\text{ m}) \quad (41" \quad (1030\text{ mm}) \quad \text{block unit}) \]

4. The geogrid strip shall be continuous throughout its entire length and may not be spliced. The geogrid shall be furnished in nominal, prefabricated roll widths of 12" (300 mm) +/- ½" (13 mm). No field modification of the geogrid roll width shall be permitted.

5. Neither rubber tire nor track vehicles may operate directly on the geogrid. Construction vehicle traffic in the reinforced zone shall be limited to speeds of less than 5 mph (8 km/hr) once a minimum of 9 inches (230 mm) of compacted fill has been placed over the geogrid reinforcement. Sudden braking and turning of construction vehicles in the reinforced zone shall be avoided.

E. Construction Tolerance. Allowable construction tolerance of the retaining wall shall be as follows:

1. Deviation from the design batter and horizontal alignment, when measured along a 10' (3 m) straight wall section, shall not exceed 3/4" (19 mm).

2. Deviation from the overall design batter shall not exceed 1/2" (13 mm) per 10' (3 m) of wall height.

3. The maximum allowable offset (horizontal bulge) of the face in any precast modular block joint shall be 1/2" (13 mm).

4. The base of the precast modular block wall excavation shall be within 2" (50 mm) of the staked elevations, unless otherwise approved by the Inspection Engineer.

5. Differential vertical settlement of the face shall not exceed 1" (300 mm) along any 200' (61 m) of wall length.

F. The maximum allowable vertical displacement of the face in any precast modular block joint shall be 1/2" (13 mm).

7. The wall face shall be placed within 2" (50 mm) of the horizontal location staked.

3.05 WALL INFILL AND REINFORCED BACKFILL PLACEMENT

A. Backfill material placed immediately behind the drainage aggregate shall be compacted as follows:

1. 98% of maximum dry density at ± 2% optimum moisture content per ASTM D698 standard proctor or 85% relative density per ASTM D4254.

B. Compactive effort within 3' (0.9 m) of the back of the precast modular blocks should be accomplished with walk-behind compactors. Compaction in this zone shall be within 95% of maximum dry density as measured in accordance with ASTM D698 standard proctor or 80% relative density per ASTM D4254. Heavy equipment should not be operated within 3' (0.9 m) of the back of the precast modular blocks.

C. Backfill material shall be installed in lifts that do not exceed a compacted thickness of 9" (230 mm).

D. At the end of each work day, the Retaining Wall Installation Contractor shall grade the surface of the last lift of the granular wall infill to a 3% ± 1% slope away from the precast modular block wall face and compact it.

E. The General Contractor shall direct the Grading Contractor to protect the precast modular block wall structure against surface water runoff at all times through the use of berms, diversion ditches, silt fence, temporary drains and/or any other necessary measures to prevent soil staining of the wall face, scour of the retaining wall foundation or erosion of the reinforced backfill or wall infill.

3.06 OBSTRUCTIONS IN THE INFILL AND REINFORCED FILL ZONE

A. The Retaining Wall Installation Contractor shall make all required allowances for obstructions behind and through the wall face in accordance with the approved construction shop drawings.

B. Should unplanned obstructions become apparent for which the approved construction shop drawings do not account, the affected portion of the wall shall not be constructed until the Retaining Wall Design Engineer can appropriately address the required procedures for construction of the wall section in question.

3.07 COMPLETION

A. For walls supporting unpaved areas, a minimum of 12" (300 mm) of compacted, low-permeability fill shall be placed over the granular wall infill zone of the precast modular block retaining wall structure. The adjacent retained soil shall be graded to prevent ponding of water behind the completed retaining wall.

B. For retaining walls with crest slopes of 5H:1V or steeper, silt fence shall be installed along the wall crest immediately following construction. The silt fence shall be located 3' to 4' (0.9 m to 1.2 m) behind the uppermost precast modular block unit. The crest slope above the wall shall be immediately seeded to establish vegetation. The General Contractor shall ensure that the seeded slope receives adequate irrigation and erosion protection to support germination and growth.
C. The General Contractor shall confirm that the as-built precast modular block wall geometries conform to the requirements of this section. The General Contractor shall notify the Owner of any deviations.

END OF SECTION 32 32 16
1. PURPOSE
This manual is intended to serve as a guide for the proper installation and construction of a Redi-Rock® retaining wall. The recommendations and guidelines presented here are intended to supplement detailed construction documents, plans, and specifications for the project.

2. RESPONSIBILITIES
Redi-Rock supports a Total Quality Management approach to Quality Assurance and Quality Control (QA/QC) in the planning, design, manufacture, installation, and final acceptance of a Redi-Rock wall. This approach requires the responsible party at each stage of the project ensure that proper procedures are followed for their portion of the work. The responsible parties during the construction phase of a Redi-Rock wall include the Contractor, Engineer or Owner’s Representative, and Redi-Rock licensed manufacturer. Their specific responsibilities for compliance are as follows:

CONTRACTOR
The Contractor is responsible for providing construction according to the contract documents, plans, and specifications for the project. The Contractor shall ensure that employees engaged in construction of the Redi-Rock wall understand and follow the project plans and specifications, are familiar with construction methods required, and have adequate safety training.

ENGINEER OR OWNER’S REPRESENTATIVE
The Engineer or Owner’s Representative is responsible for construction review to assure that the project is being constructed according to the contract documents (plans and specifications). The representative shall fully understand the project plans and specifications and shall perform adequate field verification checks to ensure construction is in conformance with the project requirements. The presence of the Engineer or Owner’s representative does not relieve the Contractor of their responsibilities for compliance with the project plans and specifications.

RETI-Rock LICENSED MANUFACTURER
Redi-Rock blocks are produced by independently-owned licensed manufacturers. The manufacturer is responsible for the production and delivery of Redi-Rock units to the job site in accordance with published material quality, size tolerances, construction documents, plans, and specifications. The licensed manufacturer is responsible for adherence to any project specific QA/QC requirements for the production of precast concrete retaining wall units. Often, additional services—such as installation training classes—are available through the Redi-Rock manufacturer.

3. PRE-CONSTRUCTION CHECKLIST
Before you start construction of a Redi-Rock wall, take the time to complete necessary planning and preparation. This process will help ensure a safe, efficient, and quality installation. It will also help avoid costly mistakes.

SAFETY
Safety is of primary concern to Redi-Rock International. Redi-Rock walls must be installed in a safe manner. All local, state, and federal safety regulations must be followed. In addition, Redi-Rock International greatly encourages installers to set up company programs to help their people stay safe at work. These programs should address items such as: personal protective equipment, maintaining safe slopes and excavations, fall protection, rigging and lifting, and other safety precautions. Safety-training materials specific to your company can be found at www.osha.gov, by calling 1-800-321-OSHA (6742), or from your local government safety office.

ENGINEERING AND PERMITS
Obtain necessary engineering and permits for your project. Your local building department is an excellent resource to help determine the requirements for your project.

This installation guide is intended to supplement a detailed, site-specific wall design prepared for your project by a Professional Engineer. The construction documents for your project supersede any recommendations presented here.

REVIEW THE PROJECT PLANS
Take the time to review and understand the project plans and specifications. Make sure that the plans take into account current site, soil, and water conditions. Pay close attention to silty or clayey soils and ground water or surface water on the site as these can significantly increase the forces on the wall. A pre-construction meeting with the wall design engineer, construction inspector, wall contractor, and owner or representative is recommended.

CONSTRUCTION PLANNING
Develop a plan to coordinate construction activities on your site. Make sure your plan specifically addresses how to control surface water during construction.

UTILITY LOCATION
Make sure to have underground utilities located and marked on the ground before starting any construction. Call 8-1-1, go online to www.call811.com, or contact your local utility company to schedule utility marking for your project site.
MATERIAL STAGING

Store Redi-Rock blocks in a location close to the proposed wall. Blocks should be kept clean and mud free. Blocks should also be stored in a location which will minimize the amount of handling on the project site.

Store geogrid in a clean, dry location close to the proposed wall. Keep the geogrid covered and avoid exposure to direct sunlight.

Be careful where you stockpile excavation and backfill material. Do not stockpile material over buried utility pipes, cables, or near basement walls which could be damaged by the extra weight.

MATERIAL VERIFICATION

Material planned for use as drainage aggregate between and behind Redi-Rock blocks and structural backfill material proposed for use in the reinforced soil zone of mechanically stabilized earth walls must be inspected and verified to comply with requirements of the construction documents, plans, and specifications.

EQUIPMENT

Make sure you have the proper equipment to handle Redi-Rock blocks and install the wall. Redi-Rock blocks are quite large and heavy. Make sure excavators and other construction equipment are properly sized to handle the blocks safely. (Figure 1)

Hand-operated equipment should include, at a minimum: shovels, 2-foot (0.6-meter) level, 4-foot (1.2-meter) level, broom, hammer, tape measure, string, spray paint, laser level, pry or Burke bar, walk-behind vibratory plate compactor (capable of delivering a minimum of 2000 lb (8.9 kN) centrifugal force), and a 16-inch (406-millimeter) concrete cut-off saw. (Figure 2)

Personal protective equipment should include, at a minimum: appropriate clothing, steel toe boots with metatarsal protection, eye protection, hard hat, gloves, hearing protection, fall protection rigging, and other items as necessary to ensure a safe working environment.

4. SUBGRADE SOILS

Proper base preparation is a critical element in the construction of your retaining wall. Not only is it important to provide a stable foundation for the wall, but a properly prepared base will greatly increase the speed and efficiency of your wall installation. Proper base preparation starts with the subgrade soils.

Existing soils must be removed to the bottom of the leveling pad elevation for the retaining wall. The base and back of excavation should expose fresh, undisturbed soil or rock. Remove all organic, unsuitable, and disturbed soils that “fall-in” along the base of the wall or the back of the excavation. Always provide safe excavations in accordance with OSHA requirements.

The subgrade soil (below the leveling pad) should be evaluated by the Engineer or Owner’s Representative to verify that it meets the design requirements and to determine its adequacy to support the retaining wall. Any unsuitable material shall be excavated and replaced as directed by the on-site representative and per the requirements of the contract drawings, plans, and specifications.

Subgrade soils must be compacted to a density as specified in the contract documents, plans, and specifications but not less than 90% maximum density at ± 2% optimum moisture content as determined by a modified proctor test (ASTM D1557). (Figures 3 and 4)
5. LEVELING PAD

Base preparation continues with proper leveling pad construction. Redi-Rock retaining walls can be designed with an open-graded crushed stone, dense-graded crushed stone (GAB), or concrete leveling pad which supports the bottom row of blocks. The choice of which type of leveling pad to use is made by the wall design engineer and depends on several factors including the bearing capacity of the native soil, location of the drain outlet, and conditions at the base of the wall.

Open-graded crushed stone is typically used in cases where the wall drain can outlet to daylight (by gravity) somewhere below the elevation of the bottom of the leveling pad. (Figure 6A) The material should be 1-inch (25-millimeter) diameter and smaller stone. A crushed stone meeting the gradation requirements of ASTM No. 57 with no material passing the No. 200 (74 μm) sieve is preferred. The leveling pad thickness shall be as designed by the wall design engineer. A minimum thickness of 6 inches (152 millimeters) or 12 inches (305 millimeters) is common. The leveling pad should extend at least 6 inches (152 millimeter) in front and 12 inches (305 millimeters) behind the bottom block. Make sure to check your construction documents for details.

Dense-graded crushed stone or graded aggregate base (GAB) material is typically used in cases where the wall drain can only outlet to daylight somewhere above the bottom of the leveling pad. (Figure 6B) The material should be dense-graded crushed stone with between 8 and 20% “fines” which will pass through a No. 200 (74 μm) sieve. The leveling pad thickness shall be as designed by the wall design engineer. Minimum dimensions are the same as those for an open-graded crushed stone leveling pad.

The leveling pad material should be placed and compacted to provide a uniform, level pad on which to construct the retaining wall. (Figure 5) Proper elevation can be established with a laser level or transit. You can also set two 20’ (6 m) long grade (screed) pipes to the desired grade and screed the crushed stone material between the pipes.

Place the stone leveling pad in uniform loose lifts a maximum of 6 inches (152 millimeter) thick. Consolidate the stone with a minimum of three passes with a 24-inch (610-millimeter) wide walk-behind vibrating plate compactor capable of delivering at least 2000 pounds (8.9 kN) of centrifugal force. This should achieve 85% relative density of the stone determined in accordance with ASTM D-4253 and D-4254. In place density of the stone fill should be confirmed using ASTM D-6938. If you don't achieve a minimum of 85% relative density, place the stone in smaller lifts or apply more compaction effort until you do achieve desired density of the stone.

Unless specifically included in the design calculations, do NOT place a thin layer of sand between the leveling pad and bottom block. This layer will reduce the sliding resistance between the leveling pad and bottom block.

In some cases, the wall design requires the construction of a concrete leveling pad. (Figures 6C and 6D) Construct the leveling pad according to the detailed plans for your project. Some designs require a shear key in the bottom of the footing and/or a lip in front of the Redi-Rock blocks. These items would be shown in the project plans.

If steel rebar is to be placed in the footing, secure the bars together with wire ties in the pattern shown in the construction documents. Use rebar supports to hold the rebar structure in the proper position in the footing.

Place wood formwork at the front and back of the concrete leveling pad or footing. The top of the formwork should be placed at the elevation of the top of the concrete footing so you can screed the top smooth in preparation for block placement. It is important that the top surface be smooth and level for full contact of the retaining wall blocks. Place concrete as specified in the wall design. Once the concrete has been allowed to cure to the minimum specified strength, place the bottom blocks and continue construction of the retaining wall.
6. SETTING THE BOTTOM ROW OF WALL BLOCKS

Redi-Rock blocks are typically delivered to the construction site using a flatbed trailer or boom truck. (Figure 7) Rubber tired backhoes, loaders, skid steers, or excavators are used to set the retaining wall blocks. (Figure 8) Make sure to use the proper sized equipment to handle the large blocks. All lifting chains, rigging, or slings must be OSHA compliant and safety rated for proper working loads.

Properly mark the location of the retaining wall. A string line or offset stakes are typically used to establish horizontal and vertical alignment. If offset stakes are used, the stakes should be placed at least 5 feet (1.5 meters) but no more than 10 feet (3 meters) in front of the face of the retaining wall. A stake should be provided at every elevation change and at a maximum of 50 feet (15 meters) apart.

Wall construction should start at a fixed point such as a building wall, 90° corner, or at the lowest elevation of the wall.

Place the blocks on the prepared leveling pad. Blocks shall be placed in full contact with the leveling pad and other immediately adjacent block units. (Figure 9) Block alignment should be established by lining up the “form line” where the face texture meets the steel form finished area at the top of the block, approximately 5 inches (127 millimeters) back from the front face. (Figure 10)

Check all blocks for level and alignment as they are placed. Small adjustments to the block location can be made with a large pry or Burke bar. Proper installation of the bottom block course is critical to maintaining the proper installation of all subsequent block courses within acceptable construction tolerance. It also makes installation of the upper rows of blocks much easier and more efficient.

Place and compact backfill in front of the bottom block course prior to placement of subsequent block courses or backfill. This will keep the blocks in place as drainage aggregate and backfill are placed and compacted.

Place an 18 inch x 12 inch (457 millimeter x 305 millimeter) piece of non-woven geotextile fabric in the vertical joint between the blocks to prevent the drainage aggregate and backfill material from migrating through the vertical joints between blocks. (Figure 11)

Place washed drainstone or open-graded crushed stone backfill between blocks and at least 12 inch (305 millimeter) behind the wall. A stone meeting the gradation requirements of ASTM No. 57 with no material passing the No. 200 (74 μm) sieve is preferred. Place the stone in uniform loose lifts a maximum of 6 inches (157 millimeter) thick. Consolidate the stone with a minimum of three passes with a 24-inch (610 millimeter) wide, walk-behind, vibrating plate compactor capable of delivering at least 2000 lb (8.9 kN) of centrifugal force. (Figure 12) This should achieve 85% relative density of the stone determined in accordance with ASTM D-4253 and D-4254. In place density of the stone fill should be confirmed using ASTM D-6938. If you don’t achieve a minimum of 85% relative density, place the stone in smaller lifts or apply more compaction effort until you do achieve desired density of the stone.

Place non-woven geotextile fabric between the drainstone and the remaining backfill material if specified.

Backfill behind the drainage aggregate with material as specified in the project construction documents. Place the lifts as specified, but not to exceed 9 inches (229 millimeter) maximum. Granular backfill shall be compacted to a minimum of 90% maximum density at ± 2% optimum moisture content as determined by a modified proctor test (ASTM D1557). Use proper equipment to insure complete compaction of the backfill material. It may be necessary to wet or dry the backfill material, place the material in smaller lifts, and/or apply more compaction effort to reach 90% maximum density. Do not use any organic, topsoil, frozen, soft, wet, or loose soils when backfilling the wall.

Re-check all units for level and alignment and sweep the top of each course of blocks clean before starting construction of the next course.
7. INSTALLING THE WALL DRAIN

A drain is placed behind the Redi-Rock wall blocks at the lowest elevation where the pipe can safely outlet to daylight. Drainage aggregate should be placed to the bottom of the drain as shown in the construction documents. A 4-inch (102 millimeter) perforated sock drain is commonly used for the drain pipe. Often the drain is encapsulated with drainage aggregate and wrapped with a non-woven geotextile fabric. The drain should run the entire length of the wall and needs to have proper outlets on the ends and at regularly spaced points along the wall. Solid pipe should be used for weep hole outlets through the face or under the retaining wall. (Figure 13)

Care needs to be taken during installation to avoid crushing or damaging the drain pipe or outlets.

8. SETTING UPPER ROWS OF WALL BLOCKS

Once the backfill is fully placed and compacted for the block course below, place the next row of blocks in a running bond configuration with the vertical joint of the lower block units centered under the mid-point of the block units above. If needed, a half block can be used at the end of every other row to maintain a running bond. (Figure 14)

Push the Redi-Rock blocks forward until the groove on the bottom of the block comes in full contact with the knobs on the blocks below. Adjacent blocks shall be placed with their front edges tightly abutted together.

Place non-woven geotextile fabric in the vertical joint between the blocks, and place and compact the drainage aggregate and backfill material the same way you did for the bottom row.

Never install more than one course of blocks without placing and compacting drainage aggregate and backfill to the full height of the block units. Placing multiple courses of blocks without backfill will prevent the proper placement and consolidation of the drainage aggregate between the blocks.

9. INSTALLING GEOGRID FOR MECHANICALLY STABILIZED EARTH WALLS

Redi-Rock blocks are designed to allow you to build relatively tall non-reinforced (or gravity) walls which use the weight of the blocks to provide stability. However, for some projects you may need to build even taller walls. In these cases, mechanically stabilized earth (MSE) retaining walls can be built with the Redi-Rock Positive Connection (PC) System.

The geogrid used in Redi-Rock PC System walls are 12-inch (305-millimeter) wide strips of PVC coated polyester geogrid that wrap through a vertical core slot cast into the block and extend full length into the reinforced soil zone on both the top and bottom of the block.

It is critical that you only use factory cut strips of Mirafi geogrid that are certified by TenCate Mirafi for width and strength. Field cutting strips of geogrid from larger rolls can significantly degrade the capacity of the wall system and is not allowed. Geogrid strips are only available through a Redi-Rock Manufacturer. (Figure 15)

Verify that you have the correct geogrid material and then cut the individual strips to the required length. The distance a geogrid strip must extend into the reinforced soil zone (design length) is measured from the back of the block to the end of the geogrid. Since the geogrid wraps through the block, the actual cut length of a given geogrid strip is two (2) times the design length plus enough additional geogrid to wrap though the block. For the Redi-Rock 28-inch (710-millimeter) PC blocks, the cut length is two (2) times the design length plus 3 feet (0.9 meters).

Inspect the Redi-Rock PC blocks for any concrete flashing or sharp edges in the slot and groove through the block. Remove any flashing and grind smooth any sharp edges which could damage the geogrid reinforcement.

Place the geogrid strip in the vertical core slot from the bottom of the block and pull approximately half of the length of the strip up through the core slot. Measure from the back of the block unit to the required design length and pin the bottom leg of the geogrid strip with staples, stakes, or other appropriate methods. Pull the geogrid strip tight to remove any slack, wrinkles, or folds. Secure the geogrid firmly in place by putting a pin through the geogrid and the steel lifting insert which is located in the recessed area on the top of the PC block (Figure 16) or placing drainage aggregate in the vertical core slot.
Place drainage aggregate between and behind the blocks. (Figure 17) Place the stone in uniform loose lifts as required in the project plans and specifications. Consolidate the stone between the blocks by hand tamping. Make sure to tamp stone into the ends of the groove on the bottom of the Redi-Rock PC blocks. Consolidate the stone behind the blocks with a minimum of three passes with a 24-inch (610-millimeter) wide walk-behind vibrating plate compactor capable of delivering at least 2000 lb (8.9 kN) of centrifugal force. Provide further compaction if needed to meet the density specified in the contract documents, but not less than 85% relative density of the stone determined in accordance with ASTM D-4253 and D-4254.

Place a strip of non-woven geotextile fabric between the drainage aggregate and the reinforced soil zone if specified. Place the reinforced soil zone material in uniform loose lifts as required in the project plans and specifications. Reinforced soil zone material must be compacted to a density as specified in the contract documents, plans, and specifications but not less than 90% maximum density as determined by a modified proctor test (ASTM D1557). Begin compaction at the back of the wall blocks and proceed to the embedded end of the geogrid strip using care to maintain the reinforcement strip in a level, taut condition oriented perpendicular to the back of the block unit to which it is attached.

Use hand operated compaction equipment within 3 feet (1 meter) of the back of the PC blocks. Heavier equipment can be used beyond 3 feet (1 meter) away from the PC blocks. Tracked construction equipment must not be operated directly on the geogrid strip reinforcement. A minimum fill thickness of 6 inches (150 millimeter) is required for the operation of tracked vehicles over the geogrid strips. Turning of tracked vehicles should be kept to a minimum to prevent displacement of the fill and the geogrid strips. Rubber-tired vehicles may pass over the geogrid strips at a slow speed of less than 5 mph (8 km/hr). Sudden breaking and sharp turning should be avoided.

After placing and properly compacting backfill to the elevation of the geogrid strip at the top of the block, extend the top leg of the geogrid strip to the design length required. Pull the geogrid strip tight to remove any slack, wrinkles, or folds. (Figure 18) Pin the top leg of the geogrid strip with staples, stakes, or other appropriate methods to hold it in place and keep the geogrid strip taut.

Fill the center slot in the PC blocks with drainage aggregate. Be careful to keep the grid flat against the back of the slot in the PC block and prevent any stone from lodging between the geogrid and the concrete block. Fill the vertical core slot completely with drainage aggregate. Consolidate the drainage aggregate by hand tamping. Use a broom to sweep clean the top of the blocks. Do not operate a walk behind vibratory plate compactor on top of the Redi-Rock PC blocks.

Place retained soil immediately between the end of the reinforced soil zone (identified as the embedded end of the geogrid reinforcement strips) and the back of the excavation. Compact retained soil to a density as specified in the contract documents, plans, and specifications but not less than 90% maximum density at ± 2% optimum moisture content as determined by a modified proctor test (ASTM D1557). Maximum differential elevation between the reinforced fill and the retained soil fill should never exceed 18 inches (457 millimeters).

Continue construction in a similar fashion to the top of the wall. (Figure 19)
10. XL HOLLOW-CORE RETAINING BLOCKS

The greater width of XL blocks allows gravity walls to be built to greater height, while the greater individual block heights means that each block creates more area of wall face. XL block retaining wall installation generally follows the procedures of other Redi-Rock products, with a few differences.

Following the general procedures of sections 1 to 9, prepare the subgrade soils and place the leveling pad. The required leveling pad thickness will depend on the design by the wall design engineer, but will generally be a minimum of 12 inches (305 mm) thick.

Use appropriately-rated rigging fastened to the three lift hooks (one in the middle and two in the back of the blocks) and suitable heavy equipment to lift blocks into place. Place the first row of blocks to the correct line and grade. Just as with other Redi-Rock products, extra attention to ensure the first row of blocks is level and installed to the correct line and grade will save effort later as the installation proceeds.

Place two 18-inch (457 mm) by 18-inch (457 mm) pieces of non-woven geotextile fabric in each vertical joint between blocks – one on the upper half of the joint and one in the lower, wedge-shaped portion of the joint - to prevent the drainage aggregate and backfill material from migrating through the vertical joints at the blocks’ face. Place washed drainstone or open-graded crushed stone backfill into the hollow cores of the blocks and between blocks in lifts of no more than 9 inches (230 mm) deep. Compact each lift by tamping until no further consolidation occurs with a soil tamper or other similar method. Strike off the top and sweep the upper surface of the blocks so the next row will sit cleanly on the lower row.

Due to the high percentage of open-graded stone within and between blocks, a drainage course behind the blocks is not required, but may be desirable to ease compaction of backfill and improve drainage. Place a layer of nonwoven geotextile fabric between the back of blocks (or drainstone layer, if used) and retained backfill.

Place and compact backfill as described above and repeat as necessary to reach the required height. Finish the top of wall with one or more rows of 18-inch (457 mm) high retaining blocks or freestanding blocks.
11. SPECIAL FEATURES

Some walls require special features such as curves, corners, top of wall details, details for elevated groundwater applications, and other details. Refer to the construction documents, plans, and specifications for details to construct these features. Additional general reference construction details are available on the Redi-Rock website, redi-rock.com.

12. IMPORTANT NOTES

Best practice dictates that wall construction should continue without interruption or delays. This will help expedite construction and minimize the time the excavation is open.

The construction site should be graded and maintained to direct surface water runoff away from the retaining wall throughout the entire construction process.

Do not exceed the allowable construction tolerances specified in the contract documents, plans, and specifications. At no time should tolerances at the wall face exceed 1° vertically and 1” in 10’ (1:120) horizontally.

Immediately report the following site conditions, if encountered, to the Engineer or Owner’s representative to determine the corrective action needed:

- Any observed groundwater seepage.
- Surface water run-off directed toward the retaining wall during construction.
- Erosion or scour of material near the wall.
- Ponded water near the wall.
- Wet, soft, or easily compressible soils in the foundation zone.
- Existing rock that differs in location from that shown on the project plans or rock located above the elevation of the bottom of the leveling pad.
- Existing or proposed toe or crest slopes that differ from typical cross-sections shown in the project plans.
- Any other items not specifically mentioned which raise questions or cause concerns during wall construction.

Immediately implement any corrective action before resuming wall construction.
13. FREESTANDING WALLS

Redi-Rock freestanding wall blocks have facing texture on two or three sides. They are used in applications where two or three sides of the wall are visible. Freestanding blocks can be installed as “stand alone” walls, such as perimeter walls or fences. They can also be designed and installed as the finishing top courses on a Redi-Rock retaining wall.

Freestanding wall installation is similar to that for Redi-Rock retaining walls. The main exception is that there is typically no backfill material behind the freestanding walls. Even though there is no backfill acting on the walls, freestanding walls need to be properly engineered. They require adequate stability at the base of the wall and they need to resist any applied forces such as wind loads or forces from railings or fences.

If you are building a “stand alone” freestanding wall, prepare the subgrade soils and leveling pad as described previously. Place bottom blocks on the leveling pad. A 6 inch (152 millimeter) minimum bury on the bottom block is typical. Extra bury may be required for some projects. Middle and top blocks are placed directly on top of the bottom blocks with no batter.

If you are building a freestanding wall on the top of a Redi-Rock retaining wall, end the last row of retaining wall blocks with a middle block. The size of the knob on top of the last row of retaining wall blocks will establish the setback for the first row of freestanding blocks. Retaining blocks with a 10-inch (254-millimeter) diameter knob will produce a 2 7/8 inch (73 millimeter) setback between the retaining block and the first freestanding block. If the retaining blocks have a 7 ½ inch (190 millimeter) diameter knob, the setback between the retaining block and the first freestanding block will be 1 5/8 inches (41 millimeters). Be sure to contact your local Redi-Rock manufacturer to determine availability of blocks with different knob sizes.

Begin and end freestanding walls with full or half Corner blocks. Freestanding walls are installed plumb with no batter.

Variable radius freestanding blocks with a 4 inch x 12 inch (102 millimeter x 305 millimeter) pocket in one or two ends of the block are used to make curved walls. Field cut the relatively thin face texture on the ends of the variable radius blocks as needed to make the desired radius for your wall. (Figure 24)

Colored foam “Backer Rod” can be used to fill any small gaps which may occur between the blocks when installing walls. Backer rods can be purchased from concrete supply centers. Call your local Redi-Rock manufacturer for help locating foam backer rods for your project.

14. MAGIC BLOCK HOLLOW-CORE FREESTANDING WALLS

Redi-Rock Magic Block freestanding hollow-core units are stacked, similar to other Redi-Rock freestanding blocks, but then filled with concrete. Freestanding Hollow-Core Blocks work well for freestanding barriers, and can also be utilized for cantilever retaining walls.

CANTILEVERED WALLS

For many applications, the Freestanding Hollow-Core Blocks will be supported by a reinforced concrete footing. Prior to placing the footing, layout the wall to determine the locations of the open cores in the staggered rows of hollow-core units. This will help determine where rebar should be placed in the footing. When determining vertical rebar placement, consider the equipment that will be used to set the block to help avoid conflicts. Number and size of rebar will depend upon the engineer’s structural design.

Construct the footing on a competent subgrade per the design drawings. Once the footing has cured, use a stringline to mark the alignment of the blocks (usually the inside of the block). Begin setting blocks. A scissors-type clamp works well. (Figure 25) Alternatively, straps looped around the interior ribs can be used, as well.
Corners can be constructed in the wall using hollow-core corner blocks. These blocks have texture on three sides. For a tight fit between blocks, the texture on the corner block can be trimmed by 2 or 3 inches where it abuts the adjacent block. If the design requires continuous rebar, cut a section out of the side of the corner block aligned with the hollow core of the adjacent block. *(Figure 26)*

Place horizontal rebar in the blocks, supported in the grooves on the interior structural ribs. Place the vertical rebar, lapping and tying, as required.

Stack the next row of block, making sure to carefully align the blocks and staggering the joints to create a running bond. We recommend stacking no more than three courses of block without filling the core.

Prior to infilling the wall, we suggest grouting the joints between blocks with non-shrink standard grout. This helps prevent leakage during infilling, and provides an aesthetic element.

Infill the hollow core of the wall with ready-mix concrete meeting the requirements of the design. Place the concrete carefully to prevent misalignment of the rebar. While filling, use an internal concrete vibrator to ensure consolidation and eliminate voids.

**COPING**

Magic Block Freestanding Hollow-Core Blocks can be placed on Redi-Rock PC-series walls to create a freestanding coping. The connection uses a No. 3 rebar hook to tie the coping to the upper PC blocks.

Install a No. 3 rebar hook through the lifting hook in each PC block and let the hook lay on the shear knob.

Install PC geogrid strips, if required. Fill the PC core with stone to the recess area. Place plastic sheeting over the geogrid exposed in the PC core.

Set the Freestanding Hollow-Core Blocks in place on the PC blocks.

Install the horizontal and vertical reinforcing steel, as required by the design. Pull the rebar hooks up into the Freestanding Hollow-Core Blocks core and engage with the horizontal rebar. Fill the hollow cores with concrete. *(Figures 27 & 28)*
WATER CONTROL APPLICATIONS

A few additional details can be incorporated into Freestanding Hollow-Core walls to improve their water-tightness for flood control and other water-related applications. (Figure 29)

Prior to constructing the footing, perform any subgrade preparation, soil improvements, and/or drainage installation as required by the design.

Install an appropriate waterstop at the joint between the footing and the bottom of the wall, following the waterstop manufacturer’s recommendations.

When using a ribbed center bulb strip, install it prior to pouring concrete for the footing such that it will be half embedded in the footing. Commonly, it will require attaching to the footing rebar with wire ties.

A bentonite/butyl rubber expandable waterstop can be installed on top of the footing prior to installing the first row of blocks. Be sure to protect the strip from damage and keep it clean.

A keyway can be cast into the footing if required by the design.

Avoid block-to-block joints where structural ribs from adjacent blocks will be in contact, as this will result in a joint with little, if any, cast-in-place concrete available to resist water flow. If necessary, remove one of the offending ribs with a concrete saw.

When placing concrete, extra care should be taken to fully consolidate the concrete to eliminate voids which could become conduits for water. Integral crystalline waterproofing admixtures are available that can reduce permeability and seal small cracks. Additional measures, such as sealing exposed joints with non-shrink grout and/or mastic and casting a slab against the wall can also be used to reduce water penetration. Foundation waterproofing experts should be consulted to select and assist with the installation of any performance improvement measures.

15. CAP INSTALLATION

Cap or step blocks are commonly used on top of freestanding walls to provide a finished look. (Figure 30)

Mark the center of the freestanding blocks to monitor the correct running bond spacing.

Secure the cap with construction adhesive, polyurethane sealant, or mortar. If construction adhesive is used, it should meet the requirements of ASTM D3498 and C557 and HUD/FHA Use of Materials Bulletin #60. Two examples are Titebond Heavy Duty Construction Adhesive by Franklin International or PL Premium Construction Adhesive. If polyurethane sealant is used, it should be one-component, highly-flexible, non-priming, gun-grade, high-performance elastomeric polyurethane sealant with movement of ± 25% per ASTM C719, tensile strength greater than 200 psi (1.4 MPa) per ASTM D412, and adhesion to peel on concrete greater than 20 PLI per ASTM C794.

Adhesive or sealants should be applied in 1.5 inch (38 millimeter) diameter round “Hershey Kiss” shaped dollops located in two rows at the top of the freestanding blocks at 8 inches (203 millimeter) on center.

Caps can be cut as needed for proper alignment. If desired, grout the joints between cap blocks after installation with a non-shrink grout.
16. FORCE PROTECTION WALLS

Install a threaded termination end on the end of the cable. Electroline M Series terminations manufactured by Esmet, Inc. work well.

Thread cable with a termination end through all the blocks. It is important that the cable is placed in each course of blocks prior to placing the next course.

Pull the cable through the block on the far end of the wall until approximately 2 inches (51 millimeters) of threads protrude beyond the end of the blocks. The exposed threads will provide room to place for a 5/8 inch x 6 inch x 9 inch (16 millimeter x 152 millimeter x 229 millimeter) steel plate over the exposed threads and start the nut.

Mark and cut the cable at the starting end of the wall so that 4 inches (102 millimeter) of cable protrudes beyond the block, providing room a 5/8 inch x 6 inch x 9 inch (16 millimeter x 152 millimeter x 229 millimeter) steel plate and ferrule termination fitting.

After the cable has been cut, slide the entire cable several feet (meters) towards the ferrule end so that you will have room to work. Install a steel plate and ferrule termination end on the cable.

Pull the cable snug so that the ferrule is against the steel plate. There will be 2 inches (51 millimeters) of thread exposed at the far end of the wall which has the termination end on the cable.

Place the steel plate over the threads and start the nut. The nut can be tightened to the desired tension.
Force Protection Coping With J-Bolts

- This label can be installed with either a single or multiple rows of Force Protection blocks.
- J-bolts and clips are used to connect the top row of retaining blocks and all Force Protection blocks together.
- J-Bolt installation is not intended for traffic impact loads.
- Force Protection blocks can be attached to retaining wall blocks or ground anchors.

**J-BOLT INSTALLATION**

J-Bolts can be used to secure force protection walls to the top row of retaining wall blocks (when used on the top of a Redi-Rock wall) or to concrete anchors set in the ground (for a stand alone wall).

Set force protection blocks with the ends centered on ground anchors or the center of Redi-Rock middle retaining wall blocks immediately below.

Place a clip between blocks in hooks provided in the middle of the block on each end.

Place a J-bolt through center of the clip, thread a nut on the J-bolt, and tighten.

Repeat for all remaining courses of force protection blocks.

17. REDI-ROCK COLUMNS

Redi-Rock column blocks are available to complement Redi-Rock walls. Columns can be installed by themselves or with fences or gates.

Column blocks can be placed on properly prepared aggregate or concrete leveling pads or directly on Redi-Rock retaining wall blocks, depending on the specific design for your project.

Column blocks can be manufactured with pockets for concrete or split wood fence rails.

Concrete adhesive or polyurethane sealant can be used between stacked column blocks.

Install a cap on the top of a column. Adjust the cap position until all sides are equidistant and square to the column. Secure the column cap with construction adhesive or polyurethane sealant.

Special inserts are available for mounting gates or similar features to Redi-Rock columns.

Column blocks are available with 4 inch (102 millimeter) or tapered 8 inch (203 millimeter) diameter cores which can be filled with stone or concrete and steel rebar reinforcement.

A conduit can be left through the core if needed for lighting or other features.
Typical Gravity Wall Section

- **Leveling pad (As specified by Engineer)**
- **Drain (As specified by Engineer)**
- **Drainstone (AASHTO No. 57 or equivalent)**
- **Non-woven geotextile fabric** (if specified by Engineer based on site soil conditions)
- **Fill wedge between adjacent blocks with drainstone (all blocks)**
- **Fill vertical core slot with drainstone (PC blocks)**
- **Middle block (Typical)**
- **Solid bottom block**
- **Solid bottom block**
- **Top block**
- **Exposed wall (Height varies with design)**
- **Bury depth**
- **Setback = 1 3/8” (41 mm) 5° batter angle on wall**
- **Grade to drain surface water away from wall**

This drawing is for reference only. Determination of the suitability and/or manner of use of any details contained in this document is the sole responsibility of the design engineer of record. Final project designs, including all construction details, shall be prepared by a licensed professional engineer using the actual conditions of the proposed site.
TYPICAL CONSTRUCTION DETAILS

Exposed wall (Height varies with design)

Setback = 1 in (41 mm)

Standard blocks

(1° Wall Batter Angle)

Top block

Gravity to drain surface water away from wall

Retained Soil

Redi-Rock standard blocks

(Block widths vary with design)

Drainstone (AASHTO No. 57 or equivalent) to extend at least 12 inches (305 mm) behind standard blocks

Move blocks forward during installation to engage shear knobs (Typical)

Redi-Rock XL Blocks

(Block widths vary with design)

Non-woven geotextile fabric at back of XL blocks and between drainstone and retained soil (if specified by Engineer based on site soil conditions)

Non-woven geotextile fabric between adjacent blocks at face (required)

Fill all void spaces in and between blocks with drainstone (AASHTO No. 57 or equivalent)

Grade to drain surface water away from wall

Gravity drain to outlet

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Typical XL Gravity Wall Section

Large Batter Wall Section

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**Typical Construction Details**

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**Alternating Planter & Standard Batter Wall Section**

The Redi-Rock retaining blocks are available with multiple shear knob size and location options, to permit wall batter design flexibility. This detail depicts alternating 16 5/8" (422 mm) Planter and 1 5/8" (41 mm) Standard setback blocks, however designs are possible using more than one Standard setback block between Planter blocks. The regular repetition of combinations of different setback blocks within a wall profile can have structural and aesthetic significance. Abrupt changes in wall batter that carry over multiple blocks are not recommended.

- **Min. Bury Depth**: 28" (710 mm)
- **Effective Wall Setback**: Varies, Depending Upon Combination of Blocks Used to Construct Wall.
- **Top Block**: Non-Woven Geotextile Fabric (If Specified by Engineer based on Site Soil Conditions)
- **Infill Stone**: No. 57 or Equivalent
- **Fill Between Adjacent Blocks and at least 12" (305 mm) Behind Blocks**: Perforated Sock Drain (As specified by Engineer)
- **Leveling Pad**: (As specified by Engineer)
- **Drain (As specified by Engineer)**
- **Exposed Wall**: (Height varies with design)
- **Exposed Wall Height**: Move blocks forward during installation to engage shear knobs (Typical)

**Typical Reinforced Wall Section**

- **Setback = 1 5/8" (41 mm)** (5° batter angle on wall)
- **12" (305 mm) wide strip of geogrid wrapped through block and extending full length (L) back into reinforced fill zone (Typical)**
- **Non-woven geotextile fabric**: Grade to drain surface water away from wall
- **Reinforced Soil**: Drainage aggregate
- **Filled vertical core slot and wedge between adjacent blocks with drainage aggregate (Typical)**
- **Drain**: (As specified by Engineer)
- **Leveling Pad**: (As specified by Engineer)
- **Bury depth**: Only use strips of Mirafi geogrid that have been factory cut and are certified for width and strength by TenCate Mirafi.

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TYPICAL CONSTRUCTION DETAILS

Conceptual Seawall Detail

- Grade to drain surface water away from wall
- Armor stone as specified by local Professional Engineer
- Blocks to extend below long term scour depth determined by local Professional Engineer based on site-specific conditions

Notes:
- Use ASTM No. 57 stone (or as specified by local Professional Engineer) to infill between blocks.
- Preliminary wall height charts do not apply and should not be used for walls in water applications due to the variety of site-specific variables.
- Contact your local Professional Engineer for specific details and final design.
- Walls may require geogrid reinforcement.
- Refer to final engineering plans.

Conceptual Sheetpile Protected Seawall Detail

- Grade to drain surface water away from wall
- Armor Stone (Elevation Varies)
- Blocks to extend below long term scour depth determined by local Professional Engineer based on site-specific conditions
- Steel Sheet Pile (Design as Required for Long Term Scour Depth and Global Stability)

Notes:
- Use ASTM No. 57 stone (or as specified by local Professional Engineer) to infill between blocks.
- Maximum wall height charts are not provided for walls in water applications due to the variety of site-specific variables. Contact your local Professional Engineer for specific details and final design.
- Walls may require geogrid reinforcement. Refer to final engineering plans.
- Seawalls could be constructed with filled trough Planter Blocks using a 165° setback per course.

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**TYPICAL CONSTRUCTION DETAILS**

**Internal Drainage Options**

- **Typical Section - Option 1**
  - Drain pipe (As specified)
  - Drainage aggregate (in wedge between blocks, in vertical core slot, and 12" (305 mm) behind blocks)
  - Non-woven geotextile fabric (AASHTO M288 Survivability Class 3)

- **Typical Section - Option 2**
  - Drain pipe (As specified)
  - Drainage aggregate (in wedge between blocks and in vertical core slot)
  - Non-woven geotextile fabric (AASHTO M288 Survivability Class 3)

**Blanket and Chimney Drain Section**

- Intended for poor-draining retained soils and/or areas with potential groundwater impact

**Typical Drainage Detail - Cross Section**

- Grade to drain surface water away from wall

**Alternate Detail for Concrete or Impervious Leveling Pad**

- Crushed stone leveling pad
- Perforated pipe, gravity drain to outlet (as specified by Engineer)
- Drainstone (AASHTO No. 57 or equivalent) to extend at least 12 inches (305 mm) behind 18-inch high Redi-Rock blocks
- Non-woven geotextile fabric at back of XL blocks and between drainstone and retained soil (if specified by Engineer based on site soil conditions)
- Fill all void spaces in and between blocks with drainstone (AASHTO No. 57 or equivalent)
- Non-woven geotextile fabric between adjacent blocks at face (required)

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Typical Drainage Detail - Isometric View

- Grade to drain surface water away from wall
- Extend geotextile over drainstone and below surface materials
- Drainstone (AASHTO No. 57 or equivalent) to extend at least 12 inches (305 mm) behind 18-inch high Redi-Rock blocks
- Non-woven geotextile fabric at back of XL blocks and between drainstone and retained soil (if specified by Engineer based on site soil conditions. Shown cut away.)
- Fill all void spaces in and between blocks with drainstone (AASHTO No. 57 or equivalent)
- Crushed stone leveling pad
- Perforated pipe, gravity drain to outlet (as specified by Engineer)

Wall Drain Weep Hole Options

- Solid PVC or HDPE drain pipe cast into block
  - Diameter = 3" (76 mm) or 4" (102 mm) as specified on plans
- Pipe to extend 6" (152 mm) to 8" (203 mm) from back of block for connection to perforated wall drain

Custom Pipe Cast into Block

- Notch ± 2.5" x 5" (64 mm x 127 mm) hole in side of a Redi-Rock block
- Place Solid PVC or HDPE drain pipe through notched hole and grout pipe in place

Field Installed Pipe

- Connect to perforated wall drain

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90° Outside Corner

Isometric View of Corner

The top row of blocks in this diagram are shown in red. They have been cut out in line with their bottom grooves to show how they fit with the knobs on the bottom row of blocks.

10” (254 mm) knob is fully engaged

Non-woven geotextile fabric in all joints between blocks (Typical)

90 Degree Corner block

Top View of Bottom Two Rows

Steps Through Wall

Retaining Wall Blocks (Per Design)

Freestand Blocks or Retaining Blocks (Per Design)

Step Blocks Placed Tight Against Wall Return Wall. Field Cut Step Blocks to Fit When Return Wall Has Batter

12” min.

Step Blocks

Slope 1%-2% for Drainage

Approach Grade

6” TYP

6” Compacted Granular Base Below Steps

Stair Section

6” TYP

6” Compacted Granular Base Below Steps

Freestand Blocks or Retaining Blocks (Per Design)

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Flush End to 90° Corner

Notes:
- Wall is flush with building.
- Rows 2, 4, 6, and 8 require approximately 1/8" (3 mm) gaps between blocks for length of wall given.
- Solution shown based on a 24" (610 mm) wide corner block.

Double 90° Outside Corner - Short Block Solution

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One knob on each block must be removed from the planter blocks at the transition into and out of planters. Planter transitions will alter the bond (vertical joint) alignment from course to course.

**Transitions Into Planters**

- Untextured top of block and stone infill between adjacent blocks will be visible (Typical)
- Grade to wrap along wall return as needed if heights of wall sections differ
- Blocks to extend into the retained soil as needed
- Recess pocket and lifting insert may be visible
  - Options: Fill with tinted mortar or use custom blocks without top lifter if desired (Typical)

**Transition From 5° Batter to 9" (230 mm) Setback**

- Full and half blocks used to abut 9" (230 mm) setback 90° corner

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**TYPICAL CONSTRUCTION DETAILS**

**90° Outside Corner for 9” (230 mm) Setback Walls**

- Recess pocket and lifting insert may be visible
- Options: Fill with tinted mortar or use custom blocks without top lifter if desired (Typical)
- Special 9” (230 mm) Setback Block with 7 1/2” (190 mm) diameter knobs (Typical)

**Freestanding Corner Top Block (Typical)**

**Multiple Row Installation**

- Untextured top of block and stone infill between adjacent blocks will be visible (Typical)
- The top row of blocks in this diagram have been cutout in line with their bottom grooves to show how they fit with the knobs on the bottom row of blocks.
- 10” (254 mm) knob fully engaged with the groove on the block above (Typical)
- 7 1/2” (190 mm) knobs do not interfere with the groove on the block above (Typical)
- Special 9” (230 mm) setback block with 7 1/2” (190 mm) knobs (Typical)

**Top View of Bottom Two Rows**

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**Double 90° Outside Corner for 9” (230 mm) Setback Walls**

- Short Block Requirements
  1. 9” (230 mm) Setback Short block on the 2nd row
  2. 9” (230 mm) Setback Short block on the 3rd row
  3. 9” (230 mm) Setback Short block on the 4th row
  4. Additional 9” (230 mm) Setback Short block for every additional row to the top of the wall

**Freestanding Corner Top Block (Typical)**

**1st Row Installation**

- 9” (230 mm) Setback 27 3/8” (695 mm) Short block (Typical)

**2nd Row Installation**

- Recess pocket and lifting insert may be visible
- Options: Fill with tinted mortar or use custom blocks without top lifter if desired (Typical)
- Untextured top of block and stone infill between adjacent blocks will be visible (Typical)
- 9” (230 mm) Setback block with 7 1/2” (190 mm) diameter knobs (Typical)

**3rd Row Installation**

- Stagger Short block spacing as needed to help maintain running bond installation pattern as close as possible

**4th Row Installation**

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This drawing shows typical installation details required for setback walls with the bottom of the wall aligned. Specific block placement will vary depending on site grades.

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**Freestanding and Cap Block Coping**

Secure cap block to freestanding block with polyurethane sealant. Optional shear lugs cast into cap block or rebar ties that can be embedded in site-cast concrete (with garden block) are also available.

Setback = 0” (8 mm) on Freestanding blocks

Setback = 2 7/8” (73 mm) when 10” (254 mm) knob used

Setback = 1 5/8” (41 mm) when 7 1/2” (190 mm) knob used

Setback = 0” (0 mm) on Freestanding blocks

Varies

**Drainage Swale Options**

- **Grass Swale**
  - 3'-0” (0.9 m) Minimum
  - 2'-10” (0.86 m) Minimum
  - 8” (203 mm)

  Varieties with slope

- **Concrete Swale**
  - 3'-10” (1.17 m) Minimum
  - 24” (610 mm)
  - 8” (203 mm)

- **30 mil PVC or EPDM geomembrane (Textured on both sides)**

  Non-woven geotextile fabric (AASHTO M288 Survivability Class 2) between geomembrane and soil

**Concrete 6” (152 mm) thick (Minimum)**

**Drainage Swale Behind Wall**

- Grade swale cross-slope to provide 1% to 2% (minimum) fall parallel to wall

- Grade swale around blocks in step down areas

- Rock check dams as required

**Drainage Swale Options**

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One-component, highly flexible, non-priming, gun grade, high performance elastomeric polyurethane sealant shall have movement of plus or minus 25% per ASTM C719, tensile strength greater than 200 psi (1.4 MPa) per ASTM D412, and adhesion to peel on concrete greater than 20 PLI per ASTM C794. Apply sealant in one and one half-inch (1.5”) (38 mm) diameter round “hersey kiss” shaped dollops located in two rows at the top of the Freestanding blocks at 8” (203 mm) on center.

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Top Block Coping Option

- Stack bricks under back corner of Corner Garden block to keep block supported prior to backfilling.
- Grade drops along back and end of Corner Garden block.

Grade Change on Top of Wall Using 9" (230 mm) Stepdown Blocks

- Freestanding block or Top Retaining block (Typical).
- Freestanding Corner block (Typical).
- 9" (230 mm) Stepdown block (Garden insert optional).
- Typically, Secured to Retaining Block with Polyurethane Sealant or Segmental Retaining Wall Adhesive.
- Sawcut and remove inside edge of Corner Garden block and fill with topsoil (Optional).
- Field cut stepdown block to length (if needed).
- Middle Block with no knobs (Typical).
- Retaining blocks (Typical).

Sealant Adhesive: One-component, highly flexible, non-priming, gun grade, high performance elastomeric polyurethane sealant shall have movement of plus or minus 25% per ASTM C719, tensile strength greater than 200 psi (1.4 MPa) per ASTM D412, and adhesion to peel on concrete greater than 20 PLI per ASTM C794. Apply sealant in one and one half-inch (1.5") (38 mm) diameter round “hersey kiss” shaped dollops located in two rows at 8" (203 mm) on center, immediately below the 9” (230mm) Stepdown Block.

Alternate Garden Block Placement

- Sawcut and remove inside edge of Corner Garden block and fill with topsoil (Recommended).
- Grade drops along side of Corner Garden block.

Note: Corner Garden Blocks are shown, Half Corner Garden Blocks are optional as grading permits.
Geogrid Layout for Convex Curves and Radial Corners

- Geogrid strips may be overlapped directly.
- Reinforcement effective unit perimeter for pullout calculations, C = 1.5 (1 side full contact with soil, 1 side partial contact with soil).

Minimum radius for bottom row

<table>
<thead>
<tr>
<th>Number of courses</th>
<th>Height of wall</th>
<th>Radius from face of block</th>
<th>Distance between blocks*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1'-6&quot; (0.46 m)</td>
<td>14'-6&quot; (4.42 m)</td>
<td>0.13&quot; (3 mm)</td>
</tr>
<tr>
<td>2</td>
<td>2'-0&quot; (0.61 m)</td>
<td>14'-6&quot; (4.42 m)</td>
<td>0.21&quot; (5 mm)</td>
</tr>
<tr>
<td>3</td>
<td>4'-6&quot; (1.37 m)</td>
<td>14'-10&quot; (4.42 m)</td>
<td>0.29&quot; (7 mm)</td>
</tr>
<tr>
<td>4</td>
<td>6'-0&quot; (1.83 m)</td>
<td>16'-0&quot; (4.88 m)</td>
<td>0.36&quot; (9 mm)</td>
</tr>
<tr>
<td>5</td>
<td>7'-6&quot; (2.30 m)</td>
<td>16'-2&quot; (4.88 m)</td>
<td>0.43&quot; (11 mm)</td>
</tr>
<tr>
<td>6</td>
<td>9'-6&quot; (2.87 m)</td>
<td>18'-4&quot; (5.53 m)</td>
<td>0.50&quot; (13 mm)</td>
</tr>
<tr>
<td>7</td>
<td>12'-0&quot; (3.66 m)</td>
<td>18'-8&quot; (5.71 m)</td>
<td>0.57&quot; (15 mm)</td>
</tr>
<tr>
<td>8</td>
<td>13'-12&quot; (4.11 m)</td>
<td>18'-10&quot; (5.71 m)</td>
<td>0.63&quot; (16 mm)</td>
</tr>
<tr>
<td>9</td>
<td>15'-0&quot; (4.57 m)</td>
<td>19'-4&quot; (5.90 m)</td>
<td>0.70&quot; (18 mm)</td>
</tr>
<tr>
<td>10</td>
<td>15'-6&quot; (4.75 m)</td>
<td>19'-6&quot; (5.97 m)</td>
<td>0.77&quot; (19 mm)</td>
</tr>
<tr>
<td>11</td>
<td>18'-0&quot; (5.49 m)</td>
<td>19'-8&quot; (5.97 m)</td>
<td>0.84&quot; (21 mm)</td>
</tr>
<tr>
<td>12</td>
<td>18'-6&quot; (5.69 m)</td>
<td>20'-0&quot; (6.09 m)</td>
<td>0.91&quot; (23 mm)</td>
</tr>
<tr>
<td>13</td>
<td>21'-0&quot; (6.40 m)</td>
<td>20'-2&quot; (6.10 m)</td>
<td>0.98&quot; (25 mm)</td>
</tr>
<tr>
<td>14</td>
<td>21'-6&quot; (6.56 m)</td>
<td>20'-4&quot; (6.10 m)</td>
<td>1.05&quot; (27 mm)</td>
</tr>
</tbody>
</table>

14'-6" (4.42 m) is the minimum radius for Redi-Rock blocks. It occurs when all the blocks are placed tight together. A larger radius is required on the bottom row of a Redi-Rock wall to account for the batter between courses of blocks and still provide enough space to construct the top row of blocks.

When blocks become too closely spaced, place fabric across joint at back of blocks.

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Geogrid Layout for Concave Curves and Radial Corners

Geogrid strips (for blocks one layer down)

- Place stone in joint between adjacent blocks
- Place 18" (457 mm) high piece of non-woven geotextile fabric (AASHTO M288 Survivability Class 3) in joint between blocks (Typical)

* Distance between blocks

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Geogrid Layout for 90° Inside Corner

- Geogrid strips (for blocks on current layer)
- Geogrid strips (for blocks one layer down)

Top View

Block placement - First row
- Set the first block in back row of blocks tight against the end block in the 90° wall
- Set the middle of the first block in 90° wall ± 4" (102 mm) past the end of the block in the row below to align back of knobs on the back row

Block placement - Second row
- Set back row of blocks first
- Set 90° wall ± 4" (102 mm) from the middle of the end block to align back of knobs on the 90° wall

Geogrid Layout for 90° Outside Corner

- Geogrid strips (for blocks on current layer)
- Geogrid strips (for blocks one layer down)
- Geogrid strips may be overlapped directly
- Reinforcement effective unit perimeter for pullout calculations, C = 1.5 (1 side full contact with soil, 1 side 50% contact with soil)

Top View

Block Layout for 90° Outside Corner

- Geogrid strips are not connected to freestanding corner block. Interface shear transfer between PC and Corner blocks secure corner block in place.
- Reinforcement coverage = 25% at corner block.

The top row of blocks are shown in red. They have been cutout in line with their bottom grooves to show how they fit with the knobs on the bottom row of block. The geogrid strips are not shown for clarity.

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TYPICAL CONSTRUCTION DETAILS

This drawing is for reference only.
* Final design must address both internal and external drainage and shall be evaluated by the Professional Engineer who is responsible for the wall design.

LEGEND:
- BLOCK SERIES (RETAINING, FREESTANDING ACCESSORY)
- BLOCK TYPE (BOTTOM, MIDDLE, TOP OR CORNER GARDEN)
- GRADE DROPS ALONG EXPOSED TEXTURED SIDE OF CORNER GARDEN BLOCK (TYPICAL)
- PROPOSED FINISH GRADE AT TOE OF WALL
- WALL ALIGNMENT CONTROL LINE

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Light Pole Base or Concrete Pile in Reinforced Soil Zone

- Light pole base or concrete pile
- Maximum diameter = 32" (0.81 m)
- Spacing = 46 3/8" (1.17 m) centers

- Geogrid strips installed every other row of blocks
- (25% coverage ratio)

Manhole or Large Obstruction in Reinforced Soil Zone

- Threaded rod cast into block (Typical)
- Structural beam (2 steel channels shown)

- Hooked rod with threaded end cast into block (Typical)
- Manhole or other large obstruction

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Utilities in the Reinforced Soil Zone

Storm or Sanitary Sewer Pipe

Wrap pipe joints with non-woven geotextile fabric (AASHTO M288 Survivability Class 2)

AASHTO No. 57 stone (or equivalent)

6" (152 mm) minimum around pipe

Storm drain or sanitary sewer pipe installed parallel to wall

Wrap pipe joints with non-woven geotextile fabric (AASHTO M288 Survivability Class 2)

AASHTO No. 57 stone (or equivalent)

6" (152 mm) minimum around pipe

Storm drain or sanitary sewer pipe installed parallel to wall

Install geogrid strips above and below pipe

Maintain 3" (76 mm) minimum between geogrid and pipe

Keep sufficient separation to meet max geogrid slope and clearance requirements

"Dry" Utilities (Electric, Gas, Telecommunications)

Redi-Rock International follows the recommendations of FHWA GEC 011 and discourages placing pipes or other horizontal obstructions behind the wall in the reinforced soil zone. Placing pipes in this zone could lead to maintenance problems and potential wall failure.

Pipes Installed Through Wall - Perpendicular

Pipe protruding through wall (48" (1.22 m) diameter concrete pipe shown)

Use adequate measures to address scour, runoff, and other issues at base of wall

Leveling pad or lower courses of Redi-Rock blocks

Concrete collar (Cast-in-place around pipe)

Control joint (if needed)

Non-woven geotextile fabric (AASHTO M288 Survivability Class 1)

360° around pipe and behind collar
These generic pedestrian guard and fence details show a few potential options for their installation on the top of a Redi-Rock retaining wall. It is the design engineer’s responsibility to fully design and detail the connection of the guard posts to the retaining wall blocks and assure acceptable resistance to the applied forces. Redi-Rock blocks are plain concrete, without steel reinforcement.

**Grouted Connection (1 Block)**
- Field core into block in second course
- Grout fence or railing post in place

**Grouted Connection (2 Blocks)**
- Field core into block in second course
- Grout fence or railing post in place

**Flange Bolted Connection**
- Flange base plate attached to top block with adhesive set anchor bolts

**Moment Slab Connection**
- Reinforced concrete sidewalk

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Sealant Adhesive: One-component, highly flexible, non-priming, gun grade, high performance elastomeric polyurethane sealant shall have movement of plus or minus 25% per ASTM C719, tensile strength greater than 200 psi (1.4 MPa) per ASTM D412, and adhesion to peel on concrete greater than 20 PLI per ASTM C794. Apply sealant in one and one half-inch (1.5") (38 mm) diameter round "hersey kiss" shaped dollops located in two rows at the top of the Freestanding blocks at 8" (203 mm) on center.

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TRIM TEXTURE AS REQUIRED FOR GOOD FIT BETWEEN BLOCKS
CUT CORNER BLOCK TO ALLOW FOR CONTINUATION OF REBAR

ABOVE B-TO-RIB JOINTS, POSITION BLOCKS OR CUT RIBS AS REQUIRED

F-CHC CORNER HOLLOW CORE FREESTANDING BLOCK
F-HC HOLLOW CORE FREESTANDING BLOCKS

ATTACH FLANGE MOUNTED FENCE POSTS TO CAP UNIT WITH CONCRETE ANCHOR BOLTS (RED HED TRU-BOLT WEDGE ANCHORS OR EQUAL)
SET CAP BLOCK ON TOP F-HC UNIT AND EMBED STEEL REINFORCEMENT IMMEDIATELY AFTER PLACEMENT OF CAST-IN-PLACE CONCRETE

CAST-IN-PLACE CONCRETE IN HOLLOW CORE OF F-HC UNITS AND IN TOP HALF OF VERTICAL CORE SLOT IN PC BLOCKS IMMEDIATELY BELOW F-HC BLOCKS, MINIMUM 28 DAY COMPRESSIVE STRENGTH = 4,000 psi

No. 6 HORIZONTAL BARS, CONTINUOUS, 24" OVERLAP ON ENDS TYPICAL, BOTH SIDES OF CENTER CORE
No. 6 VERTICAL BARS, 11 ½" O.C. TYPICAL, BOTH SIDES OF CENTER CORE
No. 3 BAR HOOK - WRAP AROUND LIFTING INSERT IN TOP OF BLOCK AND EXTEND INTO HOLLOW CORE AREA OF F-HC BLOCK
RECESSED LIFTING HOOK AREA FILLED WITH CAST-IN-PLACE CONCRETE (WHEN FREESTANDING BLOCKS ARE FILLED)
COVER TOP OF RETAINING BLOCKS AND ALL EXPOSED GEOGRID WITH 6 mil VISQUEEN PLASTIC LAYER
NO. 57 STONE INFILL IN VERTICAL CORE SLOT, BETWEEN ADJACENT BLOCKS, AND 12" BEHIND BACK OF BLOCKS.
FILL BOTTOM HALF OF VERTICAL CORE SLOT FOR PC BLOCKS IMMEDIATELY BELOW FREESTANDING BLOCKS.
ALL REINFORCING STEEL TO CONFORM TO ASTM A616 OR AASHTO M31 GRADE 60.
Freestanding Block Coping with Fence Attachment

ALL REINFORCING STEEL TO CONFORM TO ASTM A706 OR AASHTO M31 GRADE 60.

- No. 4 BARS, 40" LONG (TIE TO EMBEDDED HOOKS)
- (2) REDI-ROCK R ANCHORS (11 ½" FROM EACH END)

END VIEW
CAP BLOCK CAST WITH R-ANCHORS (SPECIALTY BLOCK)

ATTACH FLANGE MOUNTED FENCE POSTS TO CAP UNIT WITH CONCRETE ANCHOR BOLTS (RED HED TRU-BOLT WEDGE ANCHORS OR EQUAL).

CAST-IN-PLACE CONCRETE IN HOLLOW CORE OF F-HC UNITS AND IN TOP HALF OF VERTICAL CORE SLOT IN PC BLOCKS IMMEDIATELY BELOW F-HC BLOCKS. MINIMUM 28 DAY COMPRESSION STRENGTH = 4,000 psi.

- No. 6 VERTICAL BARS, 11 ½" O.C.
- TYPICAL, BOTH SIDES OF CENTER CORE
- No. 6 HORIZONTAL BARS, CONTINUOUS, 24" OVERLAP ON ENDS TYPICAL, BOTH SIDES OF CENTER CORE
- No. 3 BAR HOOK - WRAP AROUND LIFTING INSERT IN TOP OF BLOCK AND EXTEND INTO HOLLOW CORE AREA OF F-HC BLOCK

BEND DETAIL
CAP BLOCK CAST WITH R-ANCHORS (SPECIALTY BLOCK)

ATTACH FLANGE MOUNTED FENCE POSTS TO CAP UNIT WITH CONCRETE ANCHOR BOLTS (RED HED TRU-BOLT WEDGE ANCHORS OR EQUAL).

CAST-IN-PLACE CONCRETE IN HOLLOW CORE OF F-HC UNITS AND IN TOP HALF OF VERTICAL CORE SLOT IN PC BLOCKS IMMEDIATELY BELOW F-HC BLOCKS. MINIMUM 28 DAY COMPRESSION STRENGTH = 4,000 psi.

- No. 6 VERTICAL BARS, 11 ½" O.C.
- TYPICAL, BOTH SIDES OF CENTER CORE
- No. 6 HORIZONTAL BARS, CONTINUOUS, 24" OVERLAP ON ENDS TYPICAL, BOTH SIDES OF CENTER CORE
- No. 3 BAR HOOK - WRAP AROUND LIFTING INSERT IN TOP OF BLOCK AND EXTEND INTO HOLLOW CORE AREA OF F-HC BLOCK

COVER TOP OF RETAINING BLOCKS AND ALL EXPOSED GEOGRID WITH 6 mil VISQUEEN PLASTIC LAYER.

NO. 57 STONE INFILL IN VERTICAL CORE SLOT, BETWEEN ADJACENT BLOCKS, AND 12" BEHIND BACK OF BLOCKS. FILL BOTTOM HALF OF VERTICAL CORE SLOT FOR PC BLOCKS IMMEDIATELY FREESTANDING BLOCKS.

Post and Beam Guardrail

- Install 12" (305 mm) diameter corrugated hose sleeve during wall construction.
- Install guardrail posts in sleeve and grout (min. 4,000 psi (27.6 mpa) compressive strength) in place after wall construction.

- Wrap geogrid strips around sleeve as needed

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**TYPICAL CONSTRUCTION DETAILS**

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**C.I.P. Level-up**

1'-0” (305 mm)

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**Conditions of the Proposed Site.**

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**Concrete for cast-in-place barrier and moment slab shall be dot standard structure mix. Minimum 28 day compressive strength shall be 3,500 psi (24.1 MPa) or higher as specified. Reinforcing steel shall conform to ASTM A706 or AASHTO M31 Grade 60 (420 MPa).**

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**Steel ties per traffic barrier design #4 (#13) bars at 6” (152 mm) O.C. minimum.**

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**Formed joint with low modulus, hot-poured, rubber-asphalt joint sealing compound.**

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**Sawed joint with hot-poured, rubber-asphalt sealant.**

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**Provide grease or sleeve bond breaker on one side.**

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**Contraction joints shall be provided in moment slab every 30'-0” (9.1 m) between expansion joints. Contraction joint shall be dot standard detail. Typical features shown for reference.**

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**Design**

Moment slab shown is dimensioned based on an equivalent static load of 10,000 lbs (44.5 kN) per NCHRP Report 663. Moment slab reinforcement shown is based on AASHTO LRFD Bridge Design Specifications, 5th edition, 2010, TL-4 loading detailed in Table A13.2.1.

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**The selection and use of this detail, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the licensed professional engineer in charge of the project.**

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**Cast-in-Place Moment Slab Traffic Barrier - Flat Grade Installation**

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**Cast-in-Place Moment Slab Traffic Barrier - Sloping Installation**

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**FINAL DESIGN MUST ADDRESS SITE DRAINAGE**

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**CONTRACTION JOINT**

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**EXPANSION JOINT**

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**EXPANSION JOINT**

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**Materials**

Concrete for cast-in-place barrier and moment slab shall be dot standard structure mix. Minimum 28 day compressive strength shall be 4,000 psi (27.6 mpa) or higher as specified. Reinforcing steel shall conform to ASTM A706 or AASHTO M31 Grade 60 (420 MPa).

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**Design**

Moment slab shown is dimensioned based on an equivalent static load of 10,000 lbs (44.5 kN) per NCHRP Report 663. Moment slab reinforcement shown is based on AASHTO LRFD Bridge Design Specifications, 5th edition, 2010, TL-4 loading detailed in Table A13.2.1.

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**The selection and use of this detail, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the licensed professional engineer in charge of the project.**

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**TYPICAL CONSTRUCTION DETAILS**

**Precast Barrier Block**

Design of reinforced concrete moment slab by local engineer to meet project requirements.

Rebar shown in barrier block meets AASHTO TL-3 loading requirements. Rebar design in barrier block is intended to be modified as necessary to meet other loading conditions. All reinforcing steel shall be grade 60 (414 MPa) deformed rebar. All concrete shall have a minimum 28 day compressive strength of 4000 psi (27.6 MPa).

- **Top View**
  - 7'-8" (2.34 m)
  - 1'-6" (0.46 m)
  - 11" (280 mm)
  - 7'-4" (2.24 m)
  - 2'-0" (0.61 m)
  - 3'-0" (0.91 m)
  - 4'-2" (1.27 m)
  - 4'-6" (1.37 m)
  - 4 1/2" (114 mm)
  - 4 1/2" (114 mm)
  - 5" (127 mm)
  - 5" (127 mm)
  - 3 1/2" (89 mm)

- **Side View**
  - 2 1/2" (64 mm)
  - 3" (76 mm)
  - 5 1/2" (140 mm)
  - 5" (127 mm)
  - 5 1/2" (140 mm)

- **Back View**
  - 2 1/2" (64 mm)
  - 3" (76 mm)
  - 5" (127 mm)

- **View Port**
  - 2 1/2" (64 mm)
  - 3" (76 mm)
  - 5" (127 mm)

- **Isometric View**
  - #6 (#19) bent bar @ 9" (229 mm) O.C. (10 each)
  - #5 (#16) Straight Bar @ 8" (203 mm) O.C. (11 Each)

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