FREESTANDING WALL SERIES

Check with your local authorized Redi-Rock® Manufacturer for Product Availability

Every Redi-Rock distributor/manufacturer is independently owned and operated. Patents pending on various design criteria. We reserve the right to modify design or specifications without incurring obligation.
FREESTANDING SERIES BLOCKS
(FINISHED ON TWO SIDES)

Straight Top
(Smooth or Textured)
Full Block (46 3/8")
Volume = 10.46 cft
Weight = ±1496 lbs
Half Block (23 3/16")
Volume = 5.22 cft
Weight = ±747 lbs

Curved Top
(Smooth or Textured)
Volume = 10.03 cft
Weight = ±1434 lbs

Straight Top Garden
Full Block (46 3/8")
Volume = 7.98 cft
Weight = ±1141 lbs
Half Block (23 3/16")
Volume = 3.97 cft
Weight = ±567 lbs

Curved Top Garden
Volume = 7.65 cft
Weight = ±1093 lbs

Straight Middle
Full Block (46 3/8")
Volume = 10.68 cft
Weight = ±1527 lbs
Half Block (23 3/16")
Volume = 5.33 cft
Weight = ±782 lbs

Curved Middle
Volume = 10.24 cft
Weight = ±1465 lbs

Straight Bottom
Full Block (46 3/8")
Volume = 11.53 cft
Weight = ±1649 lbs
Half Block (23 3/16")
Volume = 5.74 cft
Weight = ±821 lbs

Curved Bottom
Volume = 11.10 cft
Weight = ±1588 lbs

Force Protection
Straight blocks can be manufactured with a 3” horizontal tube for post-tensioned cable installation. Straight and curved blocks can be manufactured with 6” vertical tubes for mechanical tie-down bolt installation.

Variable Radius Walls
Straight block styles can be manufactured with the end block insert to allow the blocks to be used in a variable radius wall.

NOTES:
Architectural faces on the blocks have varying texture.
Volumes are based on the blocks as shown.
Actual weights and volumes may vary.
Weight shown is based on 143 pcf concrete.

Redi-Rock® International, LLC

June 2011
### Freestanding Series Corners

**Top Corner**
*(Smooth or Textured)*
- **Volume:** 10.44 cft
- **Weight:** ±1493 lbs

**Half Top Corner**
*(Smooth or Textured)*
- **Volume:** 5.18 cft
- **Weight:** ±741 lbs

**Garden Corner**
- **Volume:** 8.26 cft
- **Weight:** ±1182 lbs

**Half Garden Corner**
- **Volume:** 4.25 cft
- **Weight:** ±607 lbs

**Middle Corner**
- **Volume:** 10.73 cft
- **Weight:** ±1534 lbs

*Bottom Corner Block does not have groove*

**Half Middle Corner**
- **Volume:** 5.28 cft
- **Weight:** ±755 lbs

*Half Bottom Corner Block does not have groove*

### Notes:
- Architectural faces on the blocks have varying texture.
- Volumes are based on the blocks as shown.
- Actual weights and volumes may vary.
- Weight shown is based on 143 pcf concrete.
# 6" CAP BLOCKS

## Two-Sided Cap
- Volume: 4.50 cft
- Weight: ±644 lbs

## Two-Sided Curve Cap
- Volume: 4.25 cft
- Weight: ±608 lbs

## Three-Sided Cap
- Volume: 4.68 cft
- Weight: ±669 lbs

## Four-Sided Cap
- Volume: 4.81 cft
- Weight: ±688 lbs

## Two-Sided Half
- Volume: 2.25 cft
- Weight: ±322 lbs

## Three-Sided Half
- Volume: 2.43 cft
- Weight: ±347 lbs

### NOTES:
- Volume based on blocks as shown.
- Actual weights and volumes may vary.
- Weight shown is based on 143 pcf concrete.

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Redi-Rock International, LLC

J. JOHNSON 11/20/13

PS Series Cap Blocks 112013.dwg

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612.0x792.0
Perimeter Freestanding Wall

Footings bearing material shall be granular and compacted to 95% of standard proctor, 90% of the modified proctor or in-situ compacted and tested to ensure adequate bearing capacity.
Note: Computer simulations can be found on the following pages. Full-scale crash tests have not been performed, thus the system is not rated to any testing standard.

Redi-Rock International
05481 US 31 South
Charlevoix, MI 49720
866-222-8400
info@redi-rock.com
www.redi-rock.com

Every Redi-Rock distributor/manufacturer is independently owned and operated. Patents pending on various design criteria. We reserve the right to modify design or specifications without incurring obligation.
POURED-IN-PLACE CONCRETE BEAM SIMULATION:
90° IMPACT (15 mph)

Full-scale crash tests have not been performed, thus the system is not rated to any testing standard.

Vehicle Used: 8,000 lb vehicle traveling at 15 mph
Impact Angle between wall & vehicle: 90 degrees

Wall Used in Model:
- Wall consisted of three rows of retaining wall blocks under two rows of free-standing blocks and one row of cap blocks. The lowest row of retaining wall blocks was buried six inches. The total wall length was 49’-10” with a height of 94”.
- The top-most row of free-standing blocks consisted of pre-cast garden blocks with a groove running the full length of the block. After construction of the wall, a poured-in-place concrete beam reinforced with two strands of rebar was positioned inside the groove.

Results:
- The maximum wall deformation was 6.1 inches.
- Considering the height of the wall and a displacement of 6.1 inches, the maximum tilt of the wall reached 3.7 degrees before rebounding somewhat.
- The caps on the top of the wall remained attached to the blocks below.
- The only mechanical factors available for absorbing the initial kinetic energy were the concrete blocks, the deformable truck, and the frictional losses due to contact. Comparitively speaking, the energies absorbed for the wall, truck, and friction were roughly 27%, 59%, and 11% respectively, totaling 97%, the remaining 3% attributed to miscellaneous.

Conclusion:
“Any head-on collision with a vehicle weighing 8,000lbs or less, and traveling 15mph or less, should not cause the wall to fall over, or the caps to act like projectiles...Comparison between the force-protection design and the poured-in-place beam design results indicates an overall stiffer design in the latter...As a broad assessment, it is reasonable to conclude that the poured-in-place concrete beam design is a more appropriate choice for low speed impacts because stopping the impact will be governed by wall “stiffness”.

For complete test results, please call Redi-Rock International at 866-222-8400.

For computer simulations, visit www.redi-rock.com
25° GUARDRAIL SIMULATION (31 mph)

Full-scale crash tests have not been performed, thus the system is not rated to any testing standard.

Simulation Agency: MDG Solutions, Inc. Pittsburg, PA 412-492-8220

Vehicle Used: 4,400 lb vehicle traveling at 31 mph
Impact Angle between wall & vehicle: 25 degrees
Wall Used in Model:
- Two courses high by ten courses long retaining wall, with each block weighing 2,500 lb.
- Above retaining courses, two courses high by ten courses long free-standing wall, with each block weighing 1,300 lb.
- Above free-standing courses, finishing cap weighing 450 lb., adhesively bonded to block it sat upon.
- The mechanical links embedded inside the wall were ¾” heavy-duty J-bolts placed between the two courses of free-standing wall, and one row of these J-bolts connecting the bottom course of free-standing blocks with the top course of retaining wall blocks. Only gravity and friction joined the two rows of retaining wall blocks.

Results:
- Vehicle trajectory stayed on course through the first 0.122 seconds.
- After 0.122 seconds the trajectory and acceleration of the vehicle CG showed signs of changing direction and slowing, respectively. The movement of the undercarriage indicated a tendency for the truck to swerve in away from the wall. The truck also tended to “bend” about the cabin.
- Wheel snagging was evident. The results of this study are strong indicators that allow us to draw the conclusion that vehicles impacting a Redi-Rock wall system will experience wheel snag almost always due to the inflexibility of the wall and the large interface friction that catches and holds the rubber tire against the concrete block.
- The caps that positioned on the top of the wall remained attached to the blocks below.
- This computer model included 3/4” J-bolts. Four of the twenty-two J-bolts developed the greatest amount of stress and deformation. According to the manufacturer, the J-bolt maximum allowable tensile stress is 44,000psi. Failure is at approximately 60,000psi. During the test, the maximum amount of tensile stress developed in the J-bolt shafts was 52,000psi.
- The model also included ½” diameter #4 rebar hooks that the J-Bolts attached to. The yield stress of #4 rebar is 60,000psi, the ultimate stress is roughly 90,000psi. During the test, the maximum tensile stress for the exposed rebar hooks was roughly 80,000psi.

Conclusion:
“The 25 Degree angle crash analysis results appear ‘successful’ when measured against the criterion of the wall must not topple over during the impact event.”

For computer simulations, visit www.redi-rock.com
J-Bolt / J-Clip Connection

<table>
<thead>
<tr>
<th>Plain Steel</th>
<th>Size</th>
<th>Dia. (in.)</th>
<th>Cross Sectional area (in.^2)</th>
<th>Allowable Tensile Stress (lb)</th>
<th>Meets Exceeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM A325</td>
<td>Heavy Duty Bolt/ Clip</td>
<td>3/4&quot;</td>
<td>0.750</td>
<td>0.4418</td>
<td>44.0</td>
</tr>
</tbody>
</table>

Note: J-Clips to be manufactured of same material and thickness as bolt diameter.

Re-Bar Hooks Cast Integral w/Redi-Rock Block

<table>
<thead>
<tr>
<th>Bar Size</th>
<th>Dia. (in.)</th>
<th>Cross Sectional area (in.^2)</th>
<th>Weight (lb/ft)</th>
<th>Yield Strength (lb/sq in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Duty</td>
<td># 4</td>
<td>0.500</td>
<td>0.20</td>
<td>0.668</td>
</tr>
<tr>
<td>Heavy Duty</td>
<td># 5</td>
<td>0.625</td>
<td>0.31</td>
<td>1.043</td>
</tr>
</tbody>
</table>

Reinforcing steel per ACI 318 for development length and minimum bend diameters.

Ignoring any shear plane contribution from concrete, \( V_n = 0.8 \times A_f \times f_y \)

Ground Anchors

Type used to be determined by project and anchor systems locally available.

Holding capacity will vary depending upon soil properties. *

Pre-construction field testing is highly recommended.

Cost each will depend on quantity and site/soil conditions.

Possible Options:

- Install 12" Diameter x 3' deep concrete ground anchor with appropriate standard or heavy duty reinforcing steel.
90° GUARDRAIL SIMULATION (15 mph)

Full-scale crash tests have not been performed, thus the system is not rated to any testing standard.

Simulation Agency: MDG Solutions, Inc.  Pittsburg, PA 412-492-8220

Vehicle Used: 4,400 lb vehicle traveling at 15 mph
Impact Angle between wall & vehicle: 90 degrees

Wall Used in Model:
- Two courses high by ten courses long retaining wall, with each block weighing 2,500 lb.
- Above retaining courses, two courses high by ten courses long free-standing wall, with each block weighing 1,300 lb.
- Above free-standing courses, finishing cap weighing 450 lb., adhesively bonded to block it sits upon.
- The mechanical links embedded inside the wall were ¾” heavy-duty J-bolts placed between the two courses of free-standing wall, and one row of these J-bolts connecting the bottom course of free-standing blocks with the top course of retaining wall blocks. Only gravity and friction joined the two rows of retaining wall blocks.

Results:
- The wall showed little deformation remaining after vehicle rebound, however its maximum deformation was 6.6 inches.
- The top three courses acted as an integral unit and pivoted on the bottom course, resulting in a total tilt of 4.7 degrees. The two retaining wall courses demonstrated the “knob and groove” concept keeping the courses together for as long as possible. The weight of the wall and the high level of friction generated between the retaining wall courses pulled upward on the bottom row a small amount.
- The caps positioned on the top of the wall remained attached to the blocks below.
- The computer model included 3/4” J-bolts. Three out of the twenty two J-bolts used received the most stress during this analysis. According to the manufacturer, the J-bolt maximum allowable tensile stress is 44,000psi. Failure is at approximately 60,000psi. During the test, the maximum tensile stress for the exposed rebar hooks was 72,152psi. The vehicle began its rebound and the wall returned towards its original position before the J-bolts lost connection.

Conclusion:
“Any head-on collision with a vehicle weighing 4,400lbs or less, and traveling 15mph or less, should not cause the wall to fall over, or the caps to act like projectiles. There will definitely be notable shifting of the wall blocks, and possible over-stressing of the J-bolts brackets causing them to loose contact with the rebar, but again, the wall should not fall over or the caps dislodge.”
90° GUARDRAIL SIMULATION (30 mph)

Full-scale crash tests have not been performed, thus the system is not rated to any testing standard.

Simulation Agency: MDG Solutions, Inc. Pittsburg, PA 412-492-8220

Vehicle Used: 15,000 lb vehicle traveling at 30 mph
Impact Angle between wall & vehicle: 90 degrees
Wall Used in Model:

- Two courses high by twenty courses long free-standing wall, with each block weighing 1,300 lb. The concrete was simulated to be 4,000 psi.
- The mechanical links embedded inside the wall were ¾” heavy-duty J-bolts placed between the two courses of free-standing wall and ¾” steel cables in each row of blocks.
- The vehicle was defined as an infinitely rigid block (meaning that the wall must absorb all of the kinetic energy introduced from the moving impactor) roughly the size and shape of the front bumper of a truck.

Results:

- The wall stopped the impactor within 12 feet.
- Even under the harsh condition of having the impactor come in contact near the top of the wall (a high hit), the “knob and groove” design details in the concrete blocks combined with the cabling system do a good job of keeping the wall from toppling over.

Conclusion:

“In this particular test, the wall stopped the impactor within 12 feet...[T]he wall-cabling system work[s] synergistically to force the impactor to drag more of the wall with it for every inch it penetrates and pushes the wall. It is this linking and dragging of the blocks that successfully stops the impactor.”

For computer simulations, visit www.redi-rock.com
### Post Tension Cable and Connections

<table>
<thead>
<tr>
<th>Size</th>
<th>Classification</th>
<th>Nominal Strength (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Galvanized Wire Rope</strong>&lt;br&gt;(USA)</td>
<td>3/4&quot; 6 x 19 IWRC</td>
<td>58,800</td>
</tr>
<tr>
<td></td>
<td>1&quot; 6 x 19 IWRC</td>
<td>103,400</td>
</tr>
</tbody>
</table>

#### Wire Rope Terminations for 3/4" cable

- **Coarse thread stud socket fitting** (galvanized)<br> - 58,800
- **Eye Socket Fitting** (galvanized)<br> - 58,800
- **Wedge and Ferrule**<br> - 47,040
- **Drum Socket** (zinc plated)<br> - 58,800

- **3/4" End Kit** (items in **bold** included in End Kit)

#### Wire Rope Terminations for 1" cable

- **Coarse thread stud socket fitting** (galvanized)<br> - 103,400
- **Eye Socket Fitting** (galvanized)<br> - 103,400
- **Wedge and Ferrule**<br> - 82,720
- **Drum Socket** (zinc plated)<br> - 103,400

- **1" End Kit** (items in **bold** included in End Kit)

#### Steel Termination Plates (2)

- **5/8" x 6" x 9"**