

# Rock, Gravel & Rip-Rap



## Why does it matter what rock I use?

Your choice in rock or “aggregate” to reduce erosion or for use in an engineered conservation practice requires certain characteristics for it to work well in the long term. Selecting the wrong aggregate can be a waste of time and money by either worsening an issue by impeding water flow or by being washed away during the first big storm. We recommend reaching out to the district or another professional for guidance when selecting and using aggregate.

## Rock Characteristics

### Well graded vs poorly graded

- Rock that is poorly graded has rock sizes that are very uniform in the mix
  - Poorly graded rock drains well but is also displaced easily, often better used for concrete bases.
- Rock that is well graded has rock sizes that are variable in the mix
  - The mix of particle size allows the gravel to more seamlessly lock together and better fills void space.
  - This means that well graded rock is good as a surface material and where you need rock to compact to a high density and stability.

### Washed vs Unwashed (and clean stone)

- Washed rock is rock that has had its rock dust washed off
- Unwashed rock is rock that still has rock dust and very fine particles in the mixture
- “Clean” stone is rock that has had some of its dust removed, but not as thoroughly as a washed stone.
  - **The amount of dust within a rock mix increases the level of compaction that can be reached, and reduces water infiltration.**

### Crushed stone vs river rock

- Crushed rock is stone that is processed by crushing which leaves the rock with a variable and rough texture.
- River rock is rock that has been smoothed through natural processes.
  - **The rough texture of crushed rock allows the stone to lock together like a puzzle, which helps it to better withstand weight and pressure.**

Type C rip-rap used near large culvert outlet



**Void space:** *the space in-between rock particles.*

**Rock dust:** *the super fine rock particles that are often created during the rock crushing process.*

**Infiltration:** *the process of water seeping through a substance.*

Poorly graded river rock



Well Graded crushed rock



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## Small sizes

- **304s** - rocks measures < 1.5 in.<sup>1</sup>
- **411s** - rocks measure < 1 in.<sup>1</sup>
  - 304s and 411s both compact very tightly and create a very stable topper to heavy use areas and access roads. Recommended for use in livestock practices. 304s and 411s do not allow for good drainage.

- **57s** - rocks measure between 1 - 3/16 of an in.<sup>2</sup>
- **67s** - rocks measure 3/4 - 3/16 of an in.<sup>2</sup>
  - 57s and 67s pack down less than 304s and 411s, (since they have less dust) making them better for drainage fill. These two sizes are good for fill around pipe, underneath concrete or any other structure that needs drainage.

## Medium sizes

- **1s** - rocks measures between 3.5- 1.5 in., majority ~2.5 in.<sup>2</sup>
- **2s** - rocks measures between 2.5-1.5 in., majority ~2 in.<sup>2</sup>
  - These are good for creating bases for driveways and other practices. Like 57s and 67s they are good for drainage but leave less of a smooth finish. Good for filling in areas of erosion like rills and downspout outlets.

1s (left) and type D rip-rap (right), boot for scale.



Alternative geogrid product used in a concentrated water channel.



## Quarries in our region

Arch Materials - 4438 OH-276, Batavia, OH 45103  
 Heidelberg Materials - 13526 Overstake Rd, Winchester, OH 45697  
 Martin Marietta - 3744 Turnbull Rd, Cedarville, OH 45314  
 Melvin Stone Company - 228 Melvin Rd, Wilmington, OH 45177

Use of geotextile fabric can be a beneficial addition when laying down rock. Geotextile acts as a base that keeps rock from sinking into the earth while allowing water to pass through it. The district has geotextile for sale.

411s used as a topper for a heavy use area near a dry hydrant.



## Large sizes (Rip-Rap)

- **Type B** - Mix comprised of mostly of 12-24 in. rocks.<sup>1</sup>
- **Type C** - Mix comprised of mostly 6-18 in. rocks.<sup>1</sup>
- **Type D** - Mix comprised of mostly 3-12 in. rocks.<sup>1</sup>
  - All sizes of rip rap are good for stabilizing slopes and reducing erosion. the larger the stone, the more force the rock can withstand. Type B is not necessary for typical property improvements or practices. Type D is commonly used in fields and type C is more commonly used within streams.

## Alternatives

- There are products on the market that combine concrete or plastic blocks and a flexible geogrid, these often work well in areas of high erosion.
- Crushed concrete can be a lower cost alternative to traditional limestone rip-rap but can break down faster and negatively impact water quality since they have a high pH.

1. **Based on American Association of State Highway and Transportation Officials (AASHTO) standards.**
2. **Based on Ohio Department of Transportation (ODOT) standards.**

