



Bachelor's Gulch

Avon, Colorado

Keystone Walls With Native Rock Facing

In Colorado's Rocky Mountains you will see some of the most beautiful landscape found anywhere in the world, and now you can also find Keystone working harmoniously with the environment. During the summers of 1993 and 1994, four projects with over 150,000 square feet of Keystone were installed in the Vail/Beaver Creek Valley area, with a similar amount projected for the summer of 1995. The majority of these walls are used to support roads through gulches and along steep mountain sides for access to housing developments and retreats. Kent Krien with Alpine Engineering first specified 37,000 square feet of Keystone for road and bridge walls on Mountain Star Housing Development in 1993. He was so pleased with the performance during and after construction, that Keystone was the natural selection when a similar project across the valley was presented to him.

Bachelor's Gulch is the first phase of linking Beaver Creek Resort area with Arrowhead Development. Both areas are well known for their world class skiing and golf vacations. In between the two properties is 4-5 miles (6-8 km) of timber and rough terrain. Vail and Associates is the owner/developer of the properties and is ultimately planning to connect the two ski areas, and develop an additional subdivision that will be separate from the two existing areas.



View of completed wall prior to placement of moss stone veneer.



Project:	<i>Bachelor's Gulch</i>
Location:	<i>Avon, Colorado</i>
Keystone Product:	<i>Keystone Standard Unit</i>
Licensed Manufacturer:	<i>Best Block Colorado Littleton, CO</i>
Total Wall Area:	<i>43,000 square feet</i>
Contractor:	<i>B & B Excavation Edwards, CO</i>
Specifier:	<i>Advanced Wall Structures Prior Lake, MN</i>

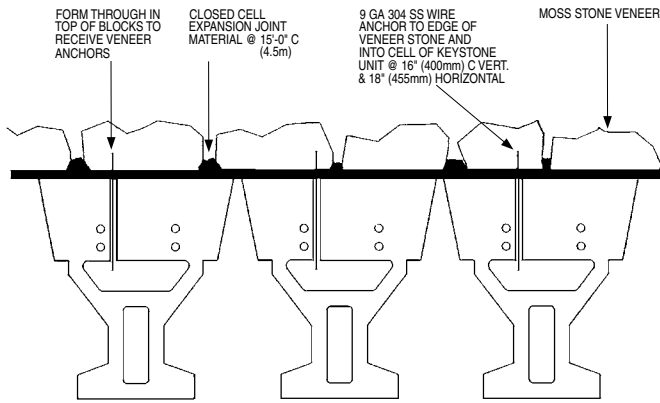
Although members of Vail and Associates were pleased with the performance and natural appearance of the Keystone system, they felt a weathered moss-rock stone would be more suitable for the architectural scheme and landscape. With wall heights of 30 feet (9m) and difficult site logistics, Keystone was selected to provide an economical and structurally sound solution. Special design considerations were required to implement attaching a native rock facing to the Keystone Retaining Wall. This veneering process normally requires a rigid sub-structure where the mortar is not exposed to flex-movement or differential settlement. The unique difference in this case was the combination of the non-structural stone veneer and the reinforcing strength of Keystone. Another concern which required consideration was adequate drainage since the stone/rock veneer was sealed off by mortar.

To accommodate these requirements, Keystone's inherent flexible system was modified to become more rigid. The modifications started with the foundation. Keystone units were placed on a 6 inch (150mm) reinforced concrete footing, 4 feet (1.2m) below grade to resist any effects of freeze-thaw cycles. To accommodate the rock veneer, concrete masonry units (CMU's) were placed on a footing extension in front of the Keystone units for the first four feet of wall. The CMU's were dry stacked then filled with a grout mix. This provided the footing for the rock veneer.

CASE STUDY



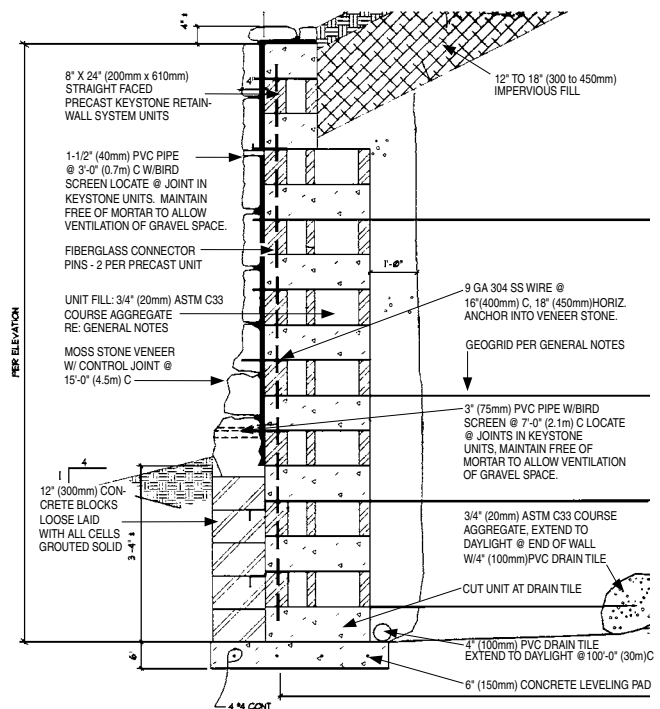
CASE STUDY



Modifications for attaching the rock veneer to the Keystone units were relatively simple; but because of time constraints associated with the project and the time required to adjust the mold, the individual Keystone units were modified in the field. As the units were being placed on the wall, the contractor cut a groove large enough to accommodate a 9 gauge wire tie in every unit, every other course.

Although the project provided difficult access and required special attention to detail, 45,000 square feet of Keystone Retaining Wall System was installed in eight weeks. The veneering process is expected to start in the summer of 1995 to allow for any settlement that may occur after the first freeze/thaw cycle.

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To ensure adequate drainage with the wall face sealed off by mortar, the rock zone behind the Keystone was increased to create a large chimney drain. At the base of the drain, a 4" pvc drain tile ran to daylight every 100 feet.



View of top of wall elevation showing grouted cap serving two purposes: (1) seal off water; (2) secure wire to units and provide clean surface for rock attachment.



Straight face, unsplit Keystone Standard units with a 9 gauge wire provided the surface and method for attaching the rock veneer.