

Associated General Contractors of America
2009 AON Build America Award

BNSF CAJON PASS

Third Main Track/Keenbrook to Summit Project



Submitted by:
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When Ames Construction was selected to lead the construction of the BNSF Cajon Pass, Third Main Track, Keenbrook to Summit Project, they knew that they'd have to muster all to take on the mountains and canyons of Cajon Pass. This rugged Southern California pass has been a major transportation corridor for hundreds of years, used by prospectors, trappers, pioneers, Native Americans, loggers, speculators and railroad barons. Fast forward to the 2007 scenario at Cajon Pass: two railroad tracks, one built in 1890 and the second in 1913, are reaching capacity as the nation's main thoroughfare for intermodal freight between Los Angeles and the San Pedro Ports and Chicago. With LA/Long Beach port cargo expecting to triple by 2030, BNSF Railway Company selected the Ames Construction team to face the logistical and environmental challenges of the Pass to build a third rail – all without disrupting the existing freight and passenger rail traffic.

The first BSNF line was constructed in 1890 and follows the current route of Interstate 15. The second track was built in 1913 and is two-miles longer to maintain. The BSNF Cajon Pass/ Keenbrook to Summit project is approximately 15.9 miles in length, with the new third main track running parallel to the 1913 track. Specifically, on this project, Ames Construction:

- moved mountains, cut new slopes and embankment, excavating one million cubic yards of earthwork and 90,000 cubic yards of rock
- built 16 box culverts, installing 16,000 linear feet of pipe
- built 5 railroad bridges
- demolished two railroad tunnels
- constructed 11,000 square feet of cast in place (CIP) retaining walls
- constructed 8 anchor injection walls, helping to pioneer new methods in the field
- installed 60,000 feet of toad fencing and trained certified all crews to work within this unique environment
- implemented a new off road mitigation plan and helped to develop and implement a storm drain mitigation plan

The Ames Construction team often worked within 15 feet of passing trains, balancing over vertical drops and coordinating blasting to ensure minimal delays to passing trains. Multiple crews – peaking at 250 craftsmen— worked in simultaneous phases, completing construction of the \$49 million, BSNF-funded project in less than one calendar year.

The project area is nestled within the San Bernardino National Forest, 671,000 acres of wildlife, breathtaking scenery, extensive recreational facilities, plus pre-historic and historic archaeological sites. Ames Construction, along with J.L. Patterson & Associates and Drill Tech Drilling & Shoring, worked closely with owner BSNF Railway, County officials, State officials, the U.S. Army Corps of Engineers, and Native American tribes to be sensitive and responsive to the rich environmental, cultural and historic context.

Ames Construction used perseverance, on-the-spot innovation and teamwork to successfully complete construction of the BNSF Cajon Pass, Third Main Track, Keenbrook to Summit Project – a project that significantly increases the nation's freight capacity while honoring the unique environment and history of Cajon Pass.



MEETING THE CHALLENGE OF A DIFFICULT JOB

Challenge 1: Limited Access and Maneuverability. The project area lies in a natural environment that is both beautiful and hazardous. The steep terrain that supports a bighorn sheep population is also challenging to trains, with Pass rail speeds averaging 14-22 MPH ascending and restricted to 20-30 MPH descending. Ames crews and equipment regularly worked on 80-foot vertical rock cuts, often within 15 feet of moving trains. Gale force Santa Ana winds bolster forest fires that drain public agency resources of area first responders, stop traffic on Interstate 15, close the National Forest and can result in the loss of lives. After the fires, torrential rains in January 2008 triggered floods and landslides. In addition, a major portion of this project rested on the San Andreas Fault. Specifically, Ames responded to these site constraints by:

- 1) Limiting blasting – three scheduled blasts paused train traffic for one hour each.
- 2) Using inter-modal delivery of construction materials– Ames, J.L. Patterson and BNSF worked together to use existing rail to off-load materials close to seemingly inaccessible areas. For example, 70-ton concrete girders for the Blue Cut Bridge – sitting on the San Andreas Fault – were delivered via rail flat cars and unloaded by two cranes that could place the girders within the small work area space. Eight borings were accessed by helicopter lift of drill rig.
- 3) Extensive logistical meetings and a detailed traffic management plan—there were two access truck points for each of the four project phases, using Forest Service roads, keeping any project-related traffic on nearby Interstate 15 to a minimum.
- 4) Extensive on-site wasting and reuse – Ames used on-site rock crushing and incorporated wasted materials for aggregate base, creek liner and erosion control.

Challenge 2: Tunnel 2 Collapse. On the Tuesday before Thanksgiving, a BNSF train engineer notified BNSF and Ames that cracks were appearing in the portal crown of Tunnel 2, in the midst of excavation. By 3PM, BNSF Railway committed to closing the track for 24. Ames Construction put all manpower and equipment on Tunnel 2, working overnight. Within 24 hours, crews had demo'ed the Tunnel 2 cap and excavated 30,000 cubic yards of dirt. The rail was in operation for Thanksgiving traffic by Wednesday afternoon – 24 hours and four minutes after trains were stopped.

Challenge 3: Environmental Sensitivity. Environmental surveys found 147 wildlife species and 41 United States Forest Service Management indicator species within the Cajon Pass project area. Ames Construction and BNSF Railway crews halted all activity for three months within a four-mile area, the nesting habitat for the endangered Southwestern Willow Flycatcher. (Project crews were re-deployed to work on other phases.) Constructability issues and environmental constraints also drove creation of a new non-traditional anchor wall system that was used at Wall 4 in phase C. The challenge was to widen the embankment for a third rail, without impacting the thriving wetlands at the bottom of the canyon. Ames and Drill Tech used a new non-traditional anchor injection wall system, an ingenious approach that worked in the limited space, saved money, and helped to preserve the wetlands, home to special status species such as the Speckled Dais, the Arroyo Toad, Least Bell's Vireo and the Southwestern Willow Flycatcher. Ames also incorporated the anchor system into Wall 9, a wall with its own context challenges – a Fault line location near a lake.

EXCELLENCE IN PROJECT MANAGEMENT: WAS PARTNERING UTILIZED, VALUE ENGINEERING PROPOSALS DEVELOPED, ETC.?

This project's large crew working in this demanding and inaccessible environment required communication that was frequent, open and honest among the team: BNSF, Ames Construction, J.L. Patterson and Drill Tech. Although there was no formalized partnering, the team participants were committed to the philosophy and principles of partnering. (The team had 10+ years of trust and respect earned from previous projects.) Team members shared trailer space for quick consults. There were daily stand up meetings and weekly project meetings, along with regular feedback accountability sessions led by BNSF with interested stakeholders – Agency officials, Forest Service personnel, and local regulators. When Drill Tech offered up new non-traditional injection wall methods, Ames and J.L. Patterson crews consulted and implemented. When Tunnel 2 began to collapse, construction halted and all crews worked overnight to have the track open in 24 hours on the eve of a holiday. When a fire threatened the project, the team worked with County and Forest Service fire crews. The team coordinated three blasts next to live track without disrupting trains for more than an hour. The project safety record is a reflection of this team effort--Ames Construction had no major safety accidents and no loss of life.

Ames Construction offered up value engineering that resulted in a \$2 million savings and an innovative solution given the site's constraints. Eight walls were changed from post and panel engineering to an anchor injection wall system.

CONTRACTOR'S INNOVATION IN CONSTRUCTION TECHNIQUES OR MATERIALS

Ames Construction and Drill Tech Drilling & Shoring worked together to create and implement a new non-traditional anchor injection wall system in response to Wall 4. The challenge was to create enough space for an embankment and a third rail plus build Wall 4 as a barrier to the wetlands in the canyon below. The solution was to construct Wall 4 from the "ground up" using an innovative self-drilling soil nail system. The anchors were installed up to 18 feet above the working bench using Drill Tech's custom built drill rig. The custom drill rig consists of a modified Hyundai 140 excavator base with a 20-foot-long drill boom attached to the arm. The excavator base allows for a higher reach and flexibility in drilling tiebacks in hard-to-reach locations.

Without Drill Tech's custom built drill rig, the construction of Wall 4 would not have been possible without a significant fill and potential impact to the wetlands. Most conventional drill rigs are limited to an overhead drilling reach of eight feet and a boom length of 12 feet compared to Drill Tech's custom built rig with a drill and reach up to 25 feet above the base of the rig and have drill booms as long as 30 feet.

CONTRACTOR'S STATE-OF-THE-ART ADVANCEMENT

Traditionally, anchor injection walls are constructed from the top down. An earthwork crew would excavate six to eight feet vertically from the top of the wall down, drill and install anchors, mesh and shotcrete. This process would continue down the face of the wall to the bottom. The construction of Wall 4 defined today's advancement in construction. The earthwork crew constructed a ten-foot-wide road at the base of the wall allowing for limited access. This road was the maximum amount

of earthwork allowed without damaging the wetland area below the wall. Upon completion of the access road, Drill Tech began construction of the non-traditional anchor injection wall. A six-foot stay-in-place mesh form was installed at the face of the wall. A concrete slurry was placed behind the wall filling the void between existing ground and the new wall. Drill Tech then installed the injection anchors and the process was repeated until the wall was constructed to plan height.

CONTRACTOR'S SENSITIVITY TO THE ENVIRONMENT AND SURROUNDINGS

California has the highest density of special status species in the U.S. and this project was no exception, requiring the involvement of 17 public agencies and five major permits (United States Forest Service Special Use Permit, Clean Water Act 404 & 401, Endangered Species Act Take Permit, California 1602 Stream Bed Alteration, 2081 California Endangered Species Act). Preserving the area's environment, wildlife, history and culture was a priority for project participants. For example, the project team included an environmental scientist, regional historian, archeologist, and paleontologist. All project participants were trained and certified to recognize and protect native plant and wildlife. Approximately 60,000 feet of special 'toad' friendly fencing provided a porous pathway that also protected species from falling debris. And, Ames suspended all work in a four-mile 'Bird Area' during the Southwestern Willow Flycatcher's nesting season. The project team custom carved and stained two large soil and nail concrete walls to harmonize with the surrounding terrain.

On-site excavation and use-reuse of materials reflected Ames' sensitivity to context and adaptability. Some 100,000 cubic yards of rock were crushed on site and put into aggregate base; 30,000 cubic yards of that material was recycled concrete rubble. Tunnel rubble was used in implementing the Off-Road Vehicle Plan. Concrete blocks originally used to protect Tunnel 1 from mudflows were removed and reused within the project. And, excavated dirt was incorporated into contour landscaping and erosion control for the Forest Service.

EXCELLENCE IN CLIENT SERVICE

Ames Construction and BNSF Railway have a relationship built on trust and experience, based on more than 15 years of project work. BNSF Railway Company selected Ames Construction for the Third Main Track, Keenbrook to Summit project because of Ames' proven track record of innovation and professionalism. According to Tom Schmidt, BNSF's Director of Engineering Services, *"The Ames Construction team once again exceeded expectations for service and delivery on our most critical infrastructure project of 2008. Your construction team met all the challenges that Cajon Pass had to offer with creativity, persistence and professionalism. Thank you-- - because of the work of the Ames Construction and BNSF team, our LA/Long Beach to Chicago freight capacity will increase by 30%."*

Feedback for the construction team was immediate, candid, and continuous; during the project, BNSF Railway conducted nearly 30 ground level and helicopter 'feedback' tours across a wide range of stakeholder groups including representatives from San Bernardino County, utilities, U.S. Army Corps of Engineers, U.S. Fish and Wildlife, California Department of Fish & Game, Regional Water Quality Control, and the U.S. Forest Service, among others.



CONTRACTOR'S CONTRIBUTION TO THE COMMUNITY

Driving the local and national economy: Ames Construction drew from the local workforce, with 98% of the project crew hired from area unions. BNSF Railway officials estimated that the project work alone would have a \$10 million impact on the local and regional economy. And the addition of a third rail alleviates a large bottleneck and increases BNSF's rail capacity on Cajon Pass from 100 to 150 trains a day. According to Robert Brendza, the then-Director of Facility Development for BNSF, "The third rail will increase the velocity of goods movement through this corridor, and ultimately across the nation."

Fighting fires with first responders: When a stalled car on Interstate 15 triggered a fire in October 2007, first responders asked the nearby project team for help. Over 48 hours, Ames Construction, J.L. Patterson & Associates, and BNSF Railway personnel worked with fire fighters from San Bernardino County and San Bernardino National Forest to quell the fast moving fire. The project team rotated four water trucks and wet down the track area.

Improving and implementing mitigation plans: When the U.S. Forest Service revised their Off Road Vehicle guidelines and plan, Ames helped with implementation by closing trails and access points using natural material from the surrounding area. And when floods hit the area in January 2008, the project team revised the Storm Water Pollution Protection Plan (SWPPP) and developed new stabilization and erosion control methods in concert with County officials.

Extending goodwill and extending community: The project drew the attention and admiration of "railfans". A dedicated group of national and international train buffs visited the site and meticulously documented the construction activity of Ames and BNSF Railway crews over a year. When tunnel 2 was demolished, Ames salvaged a piece of rail with an 1895 date stamp and donated it to the train buffs, a core group of Werner Meer, Don E. Toles, Marc Fournier, and Gary G. Gray. Ames also salvaged a piece of the Tunnel 1 portal with a 1913 date for the group, who created a monument on Hill 582 overlooking the construction site. Nearly 1500 Third Rail project photos with commentary are featured at www.trainmaster.ch/, creating virtual buzz among railroad fans about the project.