Richmond Hill Bridge
Conifer, CO

Team

Owner:
Colorado Department of Transportation
Denver, CO

Engineer:
Colorado Department of Transportation
Denver, CO

General Contractor:
Lawrence Construction Co., Littleton, CO

Cast-in-place (CIP) Concrete Supplier:
Aggregate Industries, Denver, CO

Precast Concrete Supplier:
Plum Creek Structures, Littleton, CO

Reinforcing Bar Fabricator:
Banner Reinforcing Bar, Denver, CO

Additional Reinfocing:
Nucor Steel, CMC Steel Texas, Williams Forms

Total Project Cost:
$1.354 million

Total Project Size:
215 ft (overall span -142 ft typical span)

STRUCTURAL FRAMING SYSTEM

To create an effective design for the new Richmond Hill Bridge, designers at the Colorado
Department of Transportation combined a cast-in-place substructure with a precast reinforced
concrete superstructure. The project, which helped widen US 285 from two to four lanes for
about two miles, features a creative signature slant-leg design that maximized safely completed
construction quickly and lowered final costs.

Cast-in-place reinforced concrete provided the ideal material for constructing the dominant
V-shape of the legs, smoothing geometric fit-up and connections at both ends. Cast-in-place
concrete abutments and pier footings also provided the best protection and seal against
degradation. The piers combine conventional Grade 60 reinforcing steel (rebar) with high-strength
150-ksi steel reinforcement to minimize section sizes.

For the superstructure, precast concrete tub girders provided support and formwork for the cast-
in-place concrete diaphragms. Cast-in-place reinforced concrete also was used to splice the
girders, provide internal diaphragms over the piers and internally thicken the webs and bottom
flanges of the girders through the superstructure negative moment regions.

The slant legs work like an arch, staying in compression during normal loads. They were designed
as rectangular sections, but by slanting them at 45 degrees and orienting them in a V configuration,
they become visually arresting parallelograms.

Overall, the structure is inherently rigid and in compression, with predictable structural behavior
that is symmetrical about the centroid. Expansion occurs at the abutments, so the frame is not
only aesthetically pleasing but efficient and durable.

The post-tensioned precast concrete tub girders saved significant cost, as they were produced
with a bottom flange of variable depth for high negative-moment stress over the pier—but they
were cast and delivered as constant-depth girders that were adjusted at the site. Full-width, full-
depth precast concrete panels were used for the deck.

The result of this attention to detail is an attractive bridge with slender pier legs that spring out
of hidden footings, thrusting against the granite rock slopes. They slant gracefully into the air to
open up views of the nearby mountains.

To minimize pier section sizes, Grade 60 reinforcing steel (rebar) was combined with high-
strength 150-ksi steel reinforcement.