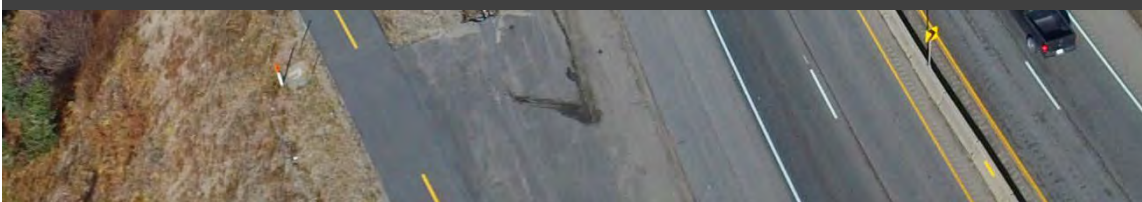




Aesthetic Guidance for the I-70 Segment on West Vail Pass

January 2022

Prepared by Jacobs for Colorado Department of
Transportation



Index – Aesthetic Guidance for the I-70 Segment on West Vail Pass

Introduction.....2

Project Background.....2

Introduction.....2

Brief History of I-70 over Vail Pass.....2

Setting.....2

Viewers.....3

Aesthetic Guidance.....3

Introduction.....3

The Crest of the Rockies.....3

Third Supplement to the Programmatic Agreement.....3

Design and Aesthetic Mitigation Measures.....3

Contributing Features to the Historic District.....3

Aesthetic Guidance Sources [1, 2, 3, 4, 5, 6].....4

Contributing Features and Visual Landmarks Map.....5

01 – Transportation and Land Relationships.....6

Adapting I-70 West Vail Pass To Existing Topography.....6

02 – Transportation Facilities Alignment.....7

Medians and Lane Separations.....7

03 – Transportation Support Structures.....8

Existing Highway Features.....8

Emergency Runaway Truck Ramps.....9

Highway Bridge Structures.....10

Highway Retaining Walls.....13

Recreation Trail Design and Retaining Walls.....15

Recreation Trail Creek Crossings.....17

04 – Guardrails, Barriers, and Edge Delineation.....18

05 – Color Selection and Consistency.....19

06 – Earthwork, Embankment, and Restoration of Disturbed Landscapes.....21

Earthwork and Grading.....21

Rock Cuts and Modification.....23

Restoration and Naturalized Appearance of Disturbed Landscapes.....25

Landscape Retaining Walls.....26

07 – Streams and Hydrologic Features.....27

08 – Landscape Planting, Revegetation, and Topsoil Management.....29

Replication of Existing Landscape Patterns.....29

Landscape Planting.....30

Landscape Plant Palette.....31

Topsoil Management.....32

09 – Wildlife Fencing and Crossings.....33

10 – Community Interface.....34

Protecting Adjacent Communities and Connections.....34

11 – Sound Attenuation.....35

12 – Avalanche Mitigation Measures.....36

13 – Roadside Facilities.....37

Chain Stations, Truck Pull-Outs and Maintenance Shed.....37

14 – Advanced Guideway System.....38

15 – Lighting.....39

16 – Signage.....40

17 – Utilities.....41

18 – Construction Material Management.....42

19 – Context Sensitive Solutions Process.....43

References.....44

Appendix A – West Vail Pass Design Studies

I-70 Aesthetic Review for Pre-cast Concrete Curved Panel Walls



INTRODUCTION

This document provides aesthetic guidance for improvements for the I-70 West Vail Pass Auxiliary Lanes Project, as well as all future CDOT projects on West Vail Pass. Photos, design strategies, sketches, and descriptions of the original Vail Pass design were taken from multiple existing I-70 aesthetic guidance and other documents and compiled into several tables of guidelines specific to West Vail Pass. The intent is to describe the aesthetic objectives and provide ideas for meeting them.

PROJECT BACKGROUND

Introduction

The *I-70 Mountain Corridor [Preliminary Environmental Impact Statement] PEIS*, approved in 2011, provides a framework for implementing a program of improvements on 144 miles of I-70 between Glenwood Springs and the western edge of the Denver metropolitan area. As a result of this “Tier 1” process, Colorado Department of Transportation (CDOT) developed design criteria for the corridor that engineers are required to implement on projects that focus on I-70 within the scope of the PEIS. The design criteria were developed to address engineering design considerations. Deviation from the design criteria requires documenting the reasons via a design exception.

In February 2021, CDOT received a Finding of No Significant Impact (FONSI) for the *I-70 West Vail Pass Auxiliary Lanes Environmental Assessment (EA)*, which analyzed safety and operational improvements on I-70 between the summit of Vail Pass (mile point [MP] 191.5) and the east side of the Town of Vail (MP 179.5). This Tier 2 document builds off the findings of the 2011 PEIS and therefore requires adherence to the design criteria and/or documentation of design exceptions. Documentation for West Vail Pass projects can be found on the I-70 West Vail Pass Design website.



The 2011 PEIS resulted in a National Historic Preservation Act (NHPA) Section 106 programmatic agreement (PA) to identify mitigation commitments for adverse effects to historic properties. The 2020 *I-70 West Vail Pass Auxiliary Lanes EA* engendered a third supplement to the original PA, as this segment of I-70 is considered eligible for listing on the NHPA as a linear historic district because of the way it was originally designed and constructed to “enhance the alpine environment.” It is the totality of design elements, not any one individual element, that makes this transportation corridor historic. The unified aesthetic design of these elements factors prominently in their historic importance. They form part of a “cohesive grouping of designed and engineered structures, buildings, and objects united aesthetically and functionally as a distinctive transportation segment,” the assemblance of which “achieves significance as whole” under the NHPA.^[1]

CDOT is bound to adhere to mitigation commitments outlined in the third supplement to the PA, as well as mitigation measures included in the FONSI for design and construction of the West Vail Pass Auxiliary Lanes Project. The EA and FONSI also include commitments to minimize slope excavation and impacts to native trees, shrubs, and vegetation to the extent possible.

Setting

I-70 between Vail Pass and the east side of the Town of Vail traverses a diverse landscape that encompasses a mix of wilderness, national forest, state land, recreational facilities, private land, and urban landscapes. This setting includes expansive views of the Rocky Mountains (including the Ten Mile and Gore Ranges); multiple ski resorts; deep valleys; mountain streams and lakes; roadway structures (bridges, walls, and culverts); water quality features; cut and fill slopes; avalanche paths; open meadows; sage brush; dense coniferous forests; and aspen groves. The landscape is seasonally dynamic due to the climate of its high mountain environment (10,666 to 8,150 feet above sea level) and is composed of varied geology, built forms, flora, and fauna, reflecting an elevation change of over 2,516 feet. Other than transportation-related elements, the setting is relatively devoid of human development.^[2]

BRIEF HISTORY OF I-70 OVER VAIL PASS

Early planning for the Vail Pass segment of I-70 started in the late 1960s as the impact of development and construction on the environment became an important national consideration. The construction of the Vail Pass segment of I-70 between 1973 and 1978 exemplifies this focus. Due to its uniquely sensitive natural setting and mountainous terrain, Vail Pass presented a special challenge to transportation design and construction. Engineers worked with landscape architects and architects to integrate aesthetic considerations into various highway elements, seeking to replicate and honor the existing forests, valleys, and surrounding natural environment. Construction techniques were employed to preserve scenic quality, stabilize slopes, and ensure highway safety. The goal was to make it difficult to discern any change in the environment once construction was complete.

These efforts resulted in several innovations, including sensitive earthwork and slope molding techniques, sculpted rock cuts to match natural outcroppings, revegetation with native plants, and selective placement of “natural” features such as boulders, stumps, and old logs along highway slopes. The value of aesthetics and the environment were also evident in the engineered roadway, bridges, retaining walls, and drainage features. As a result, the Colorado Department of Highways and supporting agencies received awards for the environmentally sensitive engineering achievement. After driving Vail Pass following project completion, a journalist who had been critical of the effort said, “There are great views, the drama of red rock shelves terraced with fresh new green grass... sculptured bridges curve against the landscape like a necklace... even though you’re traveling I-70, the imprint of nature is far stronger than man’s superhighway.”



Viewers

Viewers are composed primarily of travelers driving the highway, which includes commuters, tourists, and cross-country motor carriers.^[3] The duration and importance of views differ for these various travelers. Commuters experience views repeatedly over a potentially long period of time and are therefore likely to be sensitive to any changes to it. Tourists experience views one or a few times and are also likely focused on scenery but may be unable to compare any changes to pre-existing conditions. Shipping travelers may experience views one or multiple times but are likely to be less focused on the landscape and more on safely traversing the pass. Travelers also include pedestrians and cyclists using the Vail Pass Recreation Trail that roughly parallels the highway. These travelers likely use the trail in the warmer, snow-free months. Because they experience the landscape at slower speeds, they likely have a high appreciation for the aesthetics of the setting and are more sensitive to visual changes, particularly local and/or repeat viewers.

Viewers also include neighbors, who are people with stationary views of the road. Such neighbors exist at the east end of the project area near the Town of Vail. They include residents and overnight visitors, as well as recreationists within the town and its surroundings (e.g., visitors to Gore Creek Campground).

AESTHETIC GUIDANCE

Introduction

This document provides aesthetic guidance for the design elements listed in the index on page 1. Each element may include Prescriptive Measures, which are mitigation measures from the third supplement to the PA, and Design Strategies, which are possible approaches to help meet the aesthetic mitigation measures required by the *West Vail Pass Auxiliary Lanes EA* and maintain aesthetic continuity for future projects. The source of each Design Strategy is noted by endnotes for each strategy keyed to references listed at the end of this document.

This aesthetic guidance incorporates direction and guidance from the *Crest of the Rockies I-70 Design Segment – Aesthetic Guidance*, *Historic Context – Vail Pass Segment of Interstate Highway 70*, *Top of Vail Pass Area of Special Attention report*, *Third Supplement to the PA*, and references to design direction from the *I-70 Mountain Corridor Design Criteria* (refer to figure on page 4).

The Crest of the Rockies

Aesthetic guidance was developed in 2010 by a multi-disciplinary team led by CDOT for the Crest of the Rockies, a Design Segment within the I-70 Mountain Corridor that incorporates the segment's aesthetic principles. This segment extends from MP 163 near Edwards to MP 221 east of the Eisenhower-Johnson Memorial Tunnels and therefore encompasses Vail Pass.^[4] The Crest of the Rockies aesthetic guidance formed the basis for this document, which reflects the same design elements as indicated in the index on page 1. Design strategies applicable to West Vail Pass were adapted for this document.

Third Supplement to the Programmatic Agreement

This aesthetic guidance is also based on the following mitigation measures identified in the third supplement to the original Section 106 PA (underlined emphasis added).^[5] Although these measures only pertain to the *I-70 West Vail Pass Auxiliary Lanes EA*, they serve as useful guidelines for other CDOT projects on West Vail Pass.

Design and Aesthetic Mitigation Measures

Using the original interstate design as inspiration, CDOT will work to **preserve and enhance the alpine environment, honoring the original design of the highway and its features.**

New structures and features constructed or installed in the historic district as part of the design, including bridges, retaining walls, wildlife underpasses, landscape, and signage, will be constructed to **honor the original design** in terms of **scale, mass, materials, and workmanship** to the extent possible. Design plans for these new structures and features will be **submitted to the State Historic Preservation Officer (SHPO) and the consulting parties for review and comment.**

Existing contributing structures and features of the historic district will be rehabilitated or reconstructed, including the road alignment and shoulders, retaining walls, landscape features, the Vail Pass recreational path, the runaway truck ramps, and median walls, which will be designed to **honor the aesthetic of the original design** to the extent possible. CDOT will submit plans that include details regarding rehabilitation or reconstruction of contributing features to SHPO and the consulting parties for review and comment.



CDOT will develop project-specific aesthetic guidance that builds on the Crest of the Rockies Aesthetic Guidance and incorporates information from the historic context study of the I-70 Segment of Vail Pass historic district. The guidance will be keyed to design criteria including **alignment, slope cut and fill, bridges, disturbance, and rock cut.**

Contributing Features to the Historic District

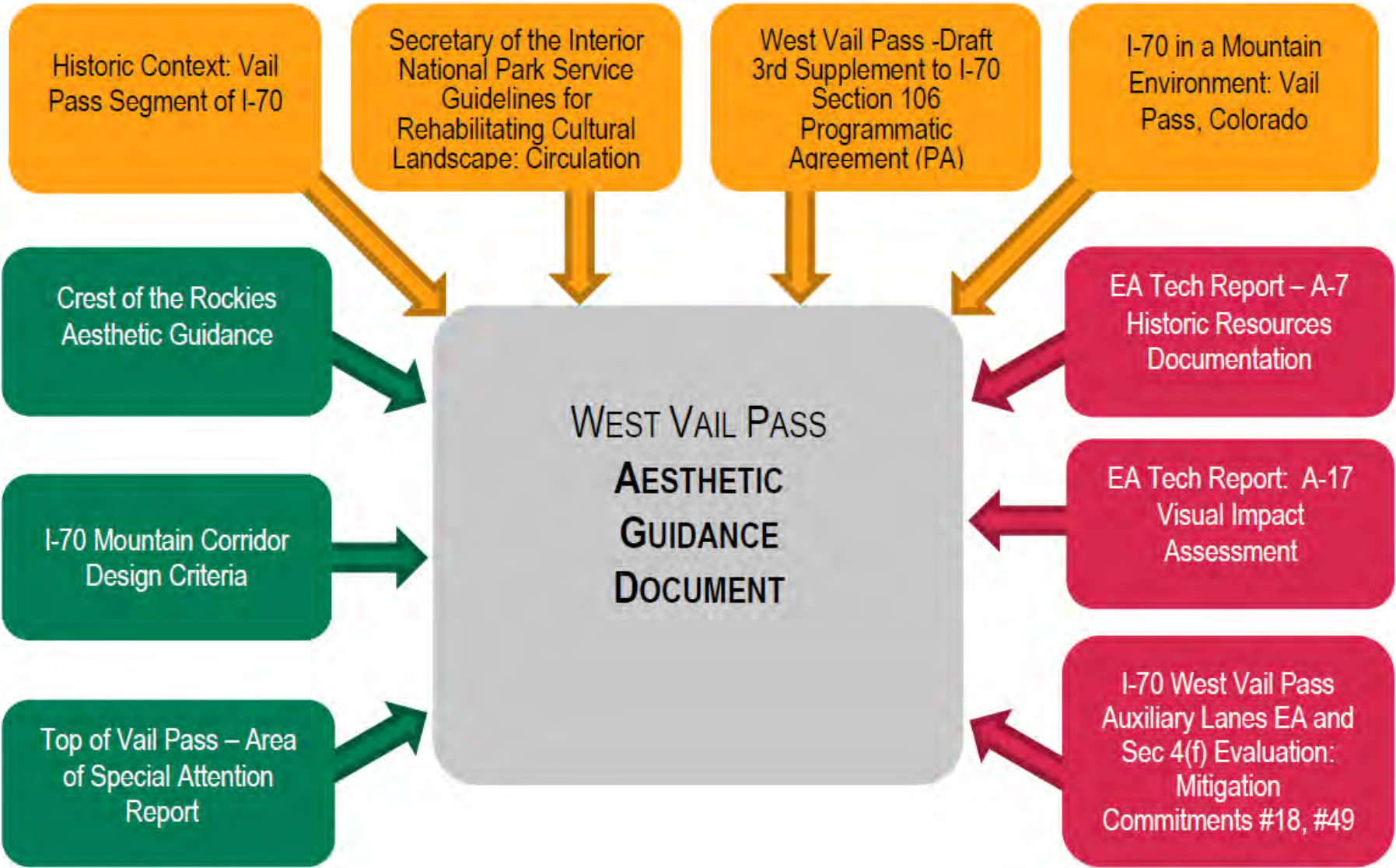
Design elements include features that do or do not “contribute” to a historic district, known as “contributing” and “non-contributing” features. Contributing features are those built as part of the original I-70 over Vail Pass project (the ‘period of significance’ for the historic district.) Non-contributing features are those that were constructed outside the period of significance for the district. New elements should be compatible with original design goals and compatible with contributing features. Therefore, this aesthetic guidance provides ideas on how to design and construct compatible elements.^[6]

The boundary of the Vail Pass historic district is the current I-70 right-of-way, beginning at mile marker (MM) 180 at the east side of the Town of Vail, and ending at MM 195.2 at Copper Mountain - Ski and Mountain Resort west of the I-70 and the SH 91 interchange at Wheeler Junction. The historic boundary is expanded to beyond the I-70 right-of-way to include the Vail Pass Recreation Trail and Black Lakes No. 1 and No. 2, which are associated with the original highway construction in the 1970s but are outside of the current I-70 right-of-way.^[7]

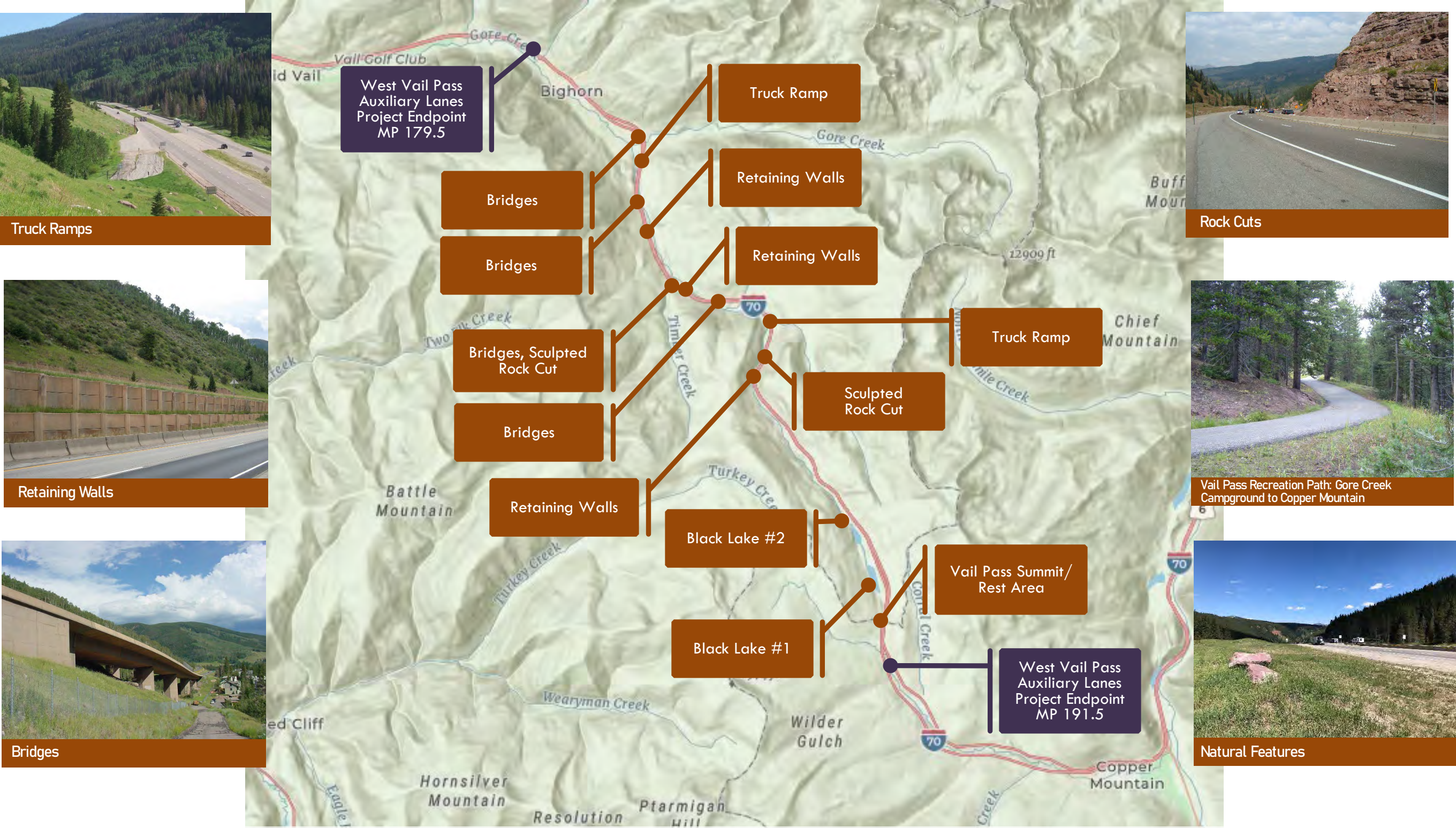
Per the terms of the third supplement to the PA, SHPO and Section 106 Consulting Parties will review and comment on designs of those components specifically identified as contributing to the corridor’s eligible historic district. Therefore, at a minimum, the new features and repairs to existing features should be designed to achieve the mitigation measures identified herein to the extent possible. When repairs are needed on the pass, an effort to replace or use in-kind materials will be made as much as possible. The contributing features listed in the *I-70 West Vail Pass Auxiliary Lanes EA* under *Appendix #7 Historic Resources* include the following: ^[8]

- ⊕ Bridges
- ⊕ Retaining Walls
- ⊕ Culverts
- ⊕ Roadbed Segment (alignment and width)
- ⊕ Vail-Frisco and Tenmile Recreational Paths
- ⊕ Landscape Features (such as sculpted rock, placed boulders, placed stumps, creek channel alterations)
- ⊕ Truck Pullout Lanes
- ⊕ Runaway Truck Ramps
- ⊕ Embankments
- ⊕ Rest Area
- ⊕ Black Lakes No. 1 and No. 2

Aesthetic Guidance Sources ^[1, 2, 3, 4, 5, 6]



Contributing Features and Visual Landmarks Map



This diagram shows the general location of I-70 on West Vail Pass features that contribute to the eligible I-70 linear historic district. These features were built as part of the original project, have special significance in the corridor and provide the best examples of the project's historic context to be preserved and enhanced.

1 – Transportation and Land Relationships

Adapting I-70 West Vail Pass To Existing Topography

Elevating structures, retaining embankments, adapting design to topographic conditions, and respecting the historic limits of disturbance are techniques available for both retrofitted and new construction. The desired result is a transportation facility that minimizes the alteration of land and avoids slopes that appear artificially constructed. [9]

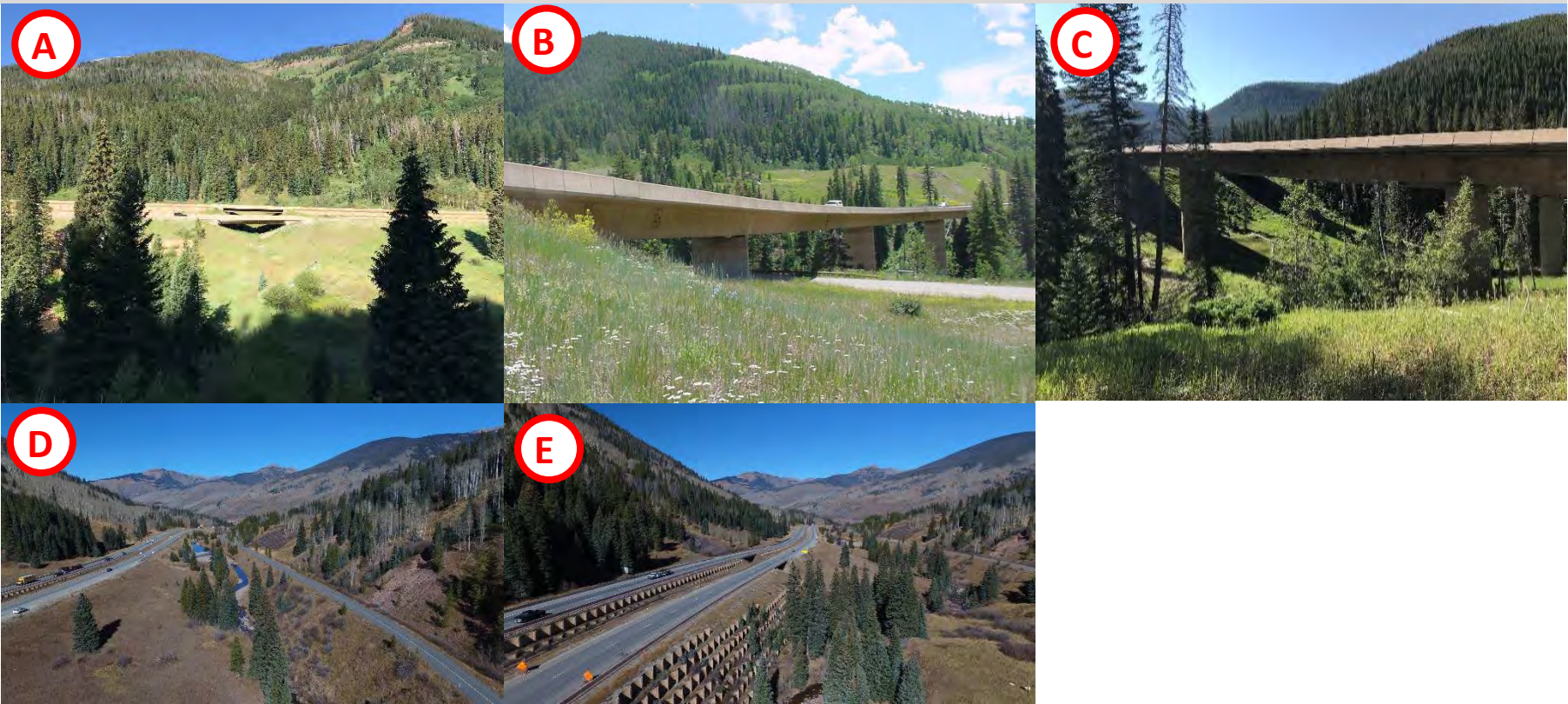
Prescriptive Measures[10]

- Using the original I-70 design as inspiration, the Colorado Department of Transportation (CDOT) will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features. [10]
- New structures and features constructed or installed in the historic district as part of the design, including bridges, retaining walls, wildlife underpasses, landscape, and signage will be constructed to honor the original design in terms of scale, mass, materials, and workmanship to the extent possible.[10]
- Existing contributing structures and features of the historic district will be rehabilitated or reconstructed, including the road alignment and shoulders, retaining walls, landscape features, the Vail Pass Recreation Trail, the emergency runaway truck ramps, and median walls, which will be designed to honor the aesthetic of the original design to the extent possible. [10]

Design Strategies

Design strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- “Preserve major site resources and features such as topography, views, unique vegetation, geological features, wetlands, and other qualities native to West Vail Pass and its surroundings,” where possible. This is one of the I-70 Mountain Corridor stakeholders’ goals.” [11]
- Maintain and use split elevations for eastbound and westbound travel lanes in areas of steep topography. Structured and elevated roadway design solutions help minimize the level of disturbance on steep slopes. [9, 12] (Refer to photos A to E.)
- The roadway should respect the sinuosity of the valley floor and natural hydrology.[9] (Refer to photos D and E.)
- Landform grading designs allow natural rock outcrops to remain and be integrated into earthwork where feasible, rather than cover-up or remove and replace rock outcrops with new retaining walls. [9, 15]
- Utilize earthwork strategies to restore disturbed areas (rock cuts, grading) to a naturalized appearance. [9, 11]



2 – Transportation Facilities Alignment

Medians and Lane Separations

The existing horizontal separation between I-70 lanes on West Vail Pass will be maintained or create a zone that does not require a guard rail or barrier, to the extent possible. This existing median width provides a method for managing water quality, storing snow, preserving vegetation, restoring the disturbed landscape, adapting to topographical conditions, and providing a tangible buffer to the opposing lane. Where vertical elevation separation exists in the existing I-70 alignment, it should be preserved in any new design, to the extent possible. The vertical separation will also help minimize the need for high barriers and devices that shield oncoming headlights. Changes to the existing I-70 median width will be designed to preserve and minimize impacts to natural environment next to the highway. ^[9, 12]

Vail Pass is a design precedent for substantial and variable median widths, successful landscape revegetation, and the integration of recreation and habitat within the median and right-of-way. ^[9]

Prescriptive Measures^[10]

- Existing contributing structures of the historic district to be rehabilitated or reconstructed, including the road alignment, road shoulders, landscape features, emergency runaway truck ramps, and median walls will be designed to honor the aesthetic of the original design to the extent possible. ^[10]

Also see Chapters 04, 06, and 08 for additional design strategies to accomplish these Prescriptive Measures.

Design Strategies

Design strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Where terrain allows and impacts to the surrounding landscape and native vegetation can be avoided and maintain the existing vegetation within variable widths of I-70 medians. ^[9]
- Where the median is disturbed, add native plantings, and include landscape features and materials characteristic of the West Vail Pass ecosystems and plant palettes. ^[9, 10] (Refer to photo B.)
- Preserve the existing vertical separation between eastbound and westbound I-70, to the extent possible. ^[9] (Refer to photo A.)



3 – Transportation Support Structures

Existing Highway Features

Visual design continuity should exist throughout the corridor, linking existing structures and features built during the original I-70 segment on West Vail Pass construction and new transportation structures. [9, 12]

Prescriptive Measures^[10]

- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features.^[10]
- New structures and features constructed or installed in the historic district as part of the design, including bridges, retaining walls, wildlife underpasses, landscape, and signage will be constructed to honor the original design in terms of scale, mass, materials, and workmanship to the extent possible.^[10]
- Existing contributing structures and features of the historic district will be rehabilitated or reconstructed, including the road alignment and shoulders, retaining walls, landscape features, the Vail Pass Recreation Trail, the emergency runaway truck ramps, and median walls, which will be designed to honor the aesthetic of the original design to the extent possible.^[10]

Design Strategies

Design strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Existing features that contribute to the Vail Pass eligible linear historic district include bridges, retaining walls, highway alignment and width, embankments, landscape features, culverts, runaway truck ramps, truck pull-off areas, and the Vail-Frisco Recreation Trail. New and reconstructed features should honor the original design to the extent possible.^[10]
- In areas of retrofit construction, refer to I-70 Vail Pass records of the original construction, its historic context, and this Aesthetic Guidance to achieve a consistent design aesthetic. Avoid constructing a series of disconnected and random structure designs.^[9, 10, 12, 13, 14] (Refer to photos A to F.)
- New construction should incorporate the I-70 West Vail Pass Aesthetic Guidance and be of the same design family as existing features that contribute to the eligible historic district.^[9, 10, 12, 13, 14] (Refer to photos A to F.)
- Consider individual I-70 West Vail Pass projects to be part of the larger context of I-70 transportation facilities and wildlife habitat, recreation, and other White River US National Forest uses.^[9, 10, 12, 15]
- Stay within the original limits of disturbance for new structure locations and their construction methods to the extent possible.^[10, 12]
- Coordinate roadway and bridge design with naturally occurring landform and associated wildlife movement patterns.^[9]



03 – Transportation Support Structures

Emergency Runaway Truck Ramps

Visual design continuity should exist throughout the corridor, linking existing structures and features built during the original I-70 segment on West Vail Pass construction with new transportation structures. [9, 12]

Prescriptive Measures^[10]

- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features. [10]
- Existing contributing structures and features of the historic district will be rehabilitated or reconstructed, including the emergency runaway truck ramps and landscape features, which will be designed to honor the aesthetic of the original design to the extent possible. [10]
- New structures and features constructed or installed in the historic district as part of the reconstructed emergency runaway truck ramps, including retaining walls, landscape, and signage will be constructed to honor the original design in terms of scale, mass, materials, and workmanship to the extent possible. [10]

Also see Chapters, 03, 06, 07, 08, and 16 for additional design strategies to accomplish these Prescriptive Measures.

Design Strategies

Design Strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- To minimize disturbance to landscape and rock formations, locate new emergency runaway truck ramps within the original limits of landscape disturbance, where feasible. [9, 12, 13]
- Blend site grading into landforms adjacent to emergency runaway truck ramps to complement adjacent natural topography and vegetation patterns. [9] (Refer to all photos for views of the original emergency runaway truck ramps site conditions.)
- Prior to final design and reconstruction of the emergency runaway truck ramps and determining construction methods, biologists and landscape architects should identify specimen trees and vegetation areas, rock formations, wetlands, springs, and other natural features to be avoided or integrated into grading design. [12, 13] (Refer to all photos for existing natural features.)
- Blend existing rock and material salvaged from the site with the new landscape. [9, 12, 13, 14] (Refer to photos B, D, E and F.)
- Use structural retaining device to minimize earthwork and stay within original limits of disturbance, where feasible. [9, 12]
- Integrate hazardous material containment features, roadside ditches, and sediment basins into the landscape. [12]
- Locate highway signs, barriers, and other features for the emergency runaway truck ramp at MP 185.5 to avoid blocking motorists' views to the existing sculpted rock cut between MP 185.5 and MP 186.2, to the extent feasible. This sculpted rock cut is a Contributing Feature to the eligible historic district. [10, 12, 13, 14] (Refer to photos D, E, and F.)



03 – Transportation Support Structures

Highway Bridge Structures

Visual design continuity should exist throughout the corridor, linking existing structures and features built during the original I-70 segment on West Vail Pass and new transportation structures. Bridges should be of similar proportion and structural components should be designed using similar and complementary materials and finishes. [9, 12]

Prescriptive Measures^[10]

- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features. [10]
- New structures and features constructed or installed in the historic district as part of the design, including bridges will be constructed to honor the original design in terms of scale, mass, materials, and workmanship to the extent possible. [10]
- Existing contributing structures and features of the historic district will be rehabilitated or reconstructed, including landscape and landscape features, which will be designed to honor the aesthetic of the original design to the extent possible. [10]

Refer to Chapters 04, 05, 06, 07, and 08 and CDOT Landscape Architecture Manual for additional design strategies to accomplish these Prescriptive Measures. [15]

Design Strategies

Design strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Simple, slim, and elegant bridge design is more appropriate than complex shapes and geometries. An elegant design provides aesthetic contrast to the complexity of the surrounding mountain landscape. Original I-70 bridge designs portray a slim, curvilinear, elegant appearance that blends into the Vail Pass landscape. [9, 10, 12, 13, 14] (Refer to photos A, B, and C.)
- Design adjacent bridges for eastbound and westbound travel lanes as matched pairs. Because adjacent bridges may be replaced at different times, design for adjacent bridges should be developed to concept-level to preserve visual continuity. Concept-level designs should identify key features for both bridges, including girder types, pier styles, abutment and wingwall types and the materials, colors, and finishes for all components. [12]
- Prior to final design of new bridges and determining construction methods, biologists, and landscape architects to locate specimen trees and vegetation areas, rock formations, wetlands and springs, riparian habitat, streams and drainages, and other natural features to be integrated into grading design. [12]
- Create a clean, uncluttered appearance below the bridges and eliminate exposed support pier face conditions. [9, 12, 13, 14] (Refer to photos A, B, C, and D.)
- Consider views from the Vail Pass Recreation Trail users in bridge span and pier design. [9, 10, 12, 13, 14] (Refer to photos D and E.)
- Incorporate a visual sense of entering “a room under the bridge” by deliberately creating shadow patterns on the superstructure and bridge abutments. One way to accomplish this is to construct the overhangs of the bridge deck to be approximately two-thirds the height of the girder to produce the desired shadow on the super structure. [9, 12] (Refer to photos A, C, D and E.)
- Use concrete vehicle barrier styles as bridge guardrail, matching the concrete barriers along highway edges that are required for hazard protection. Ensure the point of attachment between the bridge and road barriers does not sacrifice the appearance of continuity. [9, 10, 12, 13, 14] (Refer to photo F.)



Highway Bridge Structures

Visual design continuity should exist throughout the corridor, linking existing structures and features built during the original I-70 segment on West Vail Pass and new transportation structures. Bridges should be of similar proportion and structural components should be designed using similar and complementary materials and finishes. [9, 12]

- Plant tall shrubs on the bridge embankment slope, where protected from snow spray zones, to visually anchor the ends of the bridge and connect the bridge span to the embankment. Tall shrubs, rather than conifer trees, may be more resistant to snow and salt spray from snow removal activities. [9, 12] (Refer to photo G.)
- Sand and salts used to de-ice the bridge decks can degrade native plant communities and streams under the bridge. If spray screens are used on bridge barriers to minimize highway sand and magnesium chloride deposits on vegetation and streams under the bridges, spray screen color should complement the bridge colors and the Vail Pass color palette. Consult CDOT's PVC color charts and other sources for colors to complement the I-70 Vail Pass bridge color palette. [12, 16] (Refer to photo G.)
- Existing landscape (grasses forbs and shrubs) to extend underneath bridges. [9] (Refer to photos B, D, and H.)
- Separate adjacent bridges to the extent possible to allow sun to reach shrubs, grasses, and low-lying vegetation. [9] (Refer to photos A, E, and H.)
- Avoid disturbing the natural landscape below bridges, except where necessary for construction and construction access. Protect stream channels, riparian habitat, wetlands, and other designated natural features from construction activities. [9] (Refer to photos A, B, C, and H.)
- To enhance Vail Pass Recreation Trail users' views of the streams and minimize use of rip-rap scour protection, avoid locating piers in a stream or river where scour could occur. [9] (Refer to photos B and H.)
- Replace and repair highway bridge elements to match the Vail Pass color palette. Element should be made of similar and complementary materials, finishes, and colors of what was originally installed. [12]

AESTHETICS of ORIGINAL BRIDGES

- The original I-70 bridge designs include concrete and steel box girders, both continuous and segmented, supported on concrete pyramidal piers with no pier caps. [9, 12, 13, 14] (Refer to photos A to J.)
- The design of new bridges should complement dominant visual features of the original bridges, which are listed below: [10, 12, 13, 14]
 - Provides a 'slim and elegant appearance that blends into the surrounding landscape' and maximizes scenic views under and over the structure. [12, 13]
 - Clean, uncluttered appearance below the bridges. [9]
 - Creates shadow patterns on the superstructure and bridge abutments from overhanging deck. [9]
 - Concrete or steel box girders supported on concrete pyramidal piers. [12, 13, 14]
 - Original bridge piers have no pier caps. [12, 13, 14] (Refer to photos A, D, E, H, I, and J.)
 - Concrete bridge vehicle barriers. [12, 13, 14] (Refer to photos C, E and F.)
 - Bridge colors of original design are reddish-beige for concrete piers, deck, barriers and sub-structure, and weathering steel brown for girders and metal elements. [12, 13, 14] (Refer to all photos.)
 - Bridge abutment walls repeated the pier pyramidal shape formed onto the wall face. [12, 13]
 - Bridge approach walls have flat cruciform-shaped panels. [12, 13, 14]
 - Bridge abutments and approach walls are integrated into the highway embankments and adjacent natural landforms. [12, 13, 14] (Refer to photos C and H.)



Highway Bridge Structures

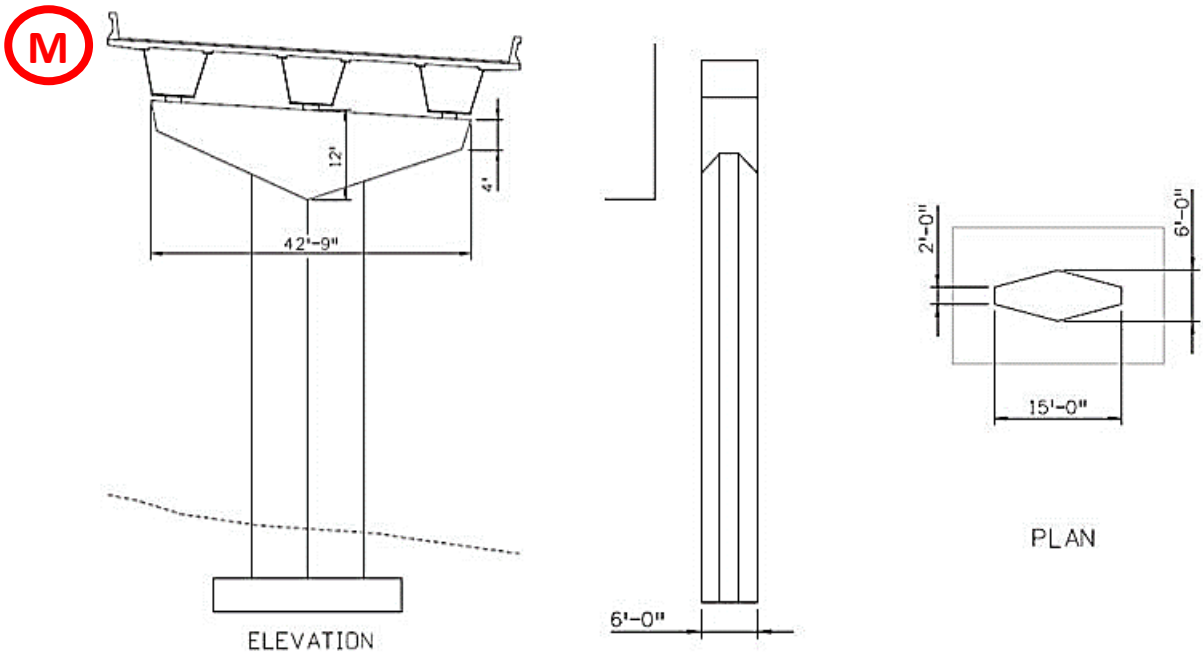
Visual design continuity should exist throughout the corridor, linking existing structures and features built during the original I-70 segment on West Vail Pass and new transportation structures. Bridges should be of similar proportion and structural components should be designed using similar and complementary materials and finishes. [9, 12]

Proposed Contemporary Re-creation of Original Bridges^[4]

A concept-level design for a contemporary re-creation of the original bridge design was developed for consideration for new bridges. (Refer to renderings K and L and sketch M for concept-level images of proposed new bridge girders and piers.) [12]

This bridge concept meets the design intent to honor the original bridge design in the following ways:

- Provides a slim curvilinear structure that sits lightly within the landscape. [12, 13, 14]
- Maximizes scenic views under and over the structure. [12, 13, 14]
- Replicates the pyramidal forms of the original bridge piers and abutment walls. Trapezoidal shaped pier caps of the new design support a wider bridge deck with narrower pier columns, allowing more sunlight and visibility under the bridges. [12]
- Bridge piers and spans present similar proportionality to the original bridges. [12]



03 – Transportation Support Structures

Highway Retaining Walls

Visual design continuity should exist throughout the West Vail Pass corridor, linking existing structures and features built during the original construction in the 1970s and new transportation structures. Highway retaining walls should be of similar proportions and designed using similar and complementary materials, colors, and finishes. [9, 12]

Prescriptive Measures^[10]

- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features. [10]
- New retaining walls constructed in the eligible historic district will be constructed to honor the original design in terms of scale, mass, materials, and workmanship to the extent possible. [10]
- Existing contributing features of the eligible historic district, such as curved panel and flat panel retaining walls, will be reconstructed to honor the aesthetic of the original design to the extent possible. [10, 12]

Refer to Chapters 05, 06, and 08 for additional design strategies to accomplish these Prescriptive Measures.

Design Strategies

Design Strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Each wall design will complement the historic Vail Pass wall aesthetics in a cohesive way but will be designed to meet site specific construction methods, safety improvements, and geotechnical conditions. [12]

Design Strategies Common to All Wall Types

- Prior to constructing new retaining walls and determining construction methods, environmental specialists and landscape architects should locate specimen trees and vegetation areas, rock outcrops, and other natural features to be preserved and integrated with wall and grading designs. [9, 12, 13]
- Blend site grading into landforms adjacent to retaining walls to complement natural topography and vegetation patterns. [9] (Refer to photos A, E and F.)
- Allow rock outcrops to remain and retain cut slopes rather than construct new retaining walls, where feasible. [9, 12, 13] (Refer to photo J)
- Locate new walls and construction disturbance within original limits of landscape disturbance, where feasible. [9, 10, 13]
- Utilize landscape terraces between walls. Match planting area width to nearby rock shelves or walls, where feasible. (Refer to photos C and J.) Turn ends of walls into slopes so retaining walls are integrated with adjoining slopes. [9, 12, 15] (Refer to photos A and F.)
- Use grading strategies and landscape screening treatments to minimize visual heights of walls. [9] (Refer to photos A, C and F.)
- Blend and minimize use of valley gutters and other visible retaining wall drainage systems. [12]
- Visually anchor walls into landforms by planting vegetation to grow over the top and ends of walls. [12] (Refer to photos C and F.)
- Replace and repair walls with elements made of similar materials, finishes, and colors of what was originally installed. [12]
- If protective measures are required on walls per Occupational Safety and Health Administration (OSHA) standards, utilize the least obtrusive option, to maintain visibility and visually integrate barrier into landscape. [12]
- Provide color samples applied to materials for different wall elements for CDOT’s review, selection, and approval. [12]

Design Strategies for Walls Contributing to the Historic District

- Design new walls to preserve and enhance the alpine environment and honor the original design of the highway and its features. [10, 13]
- Three retaining wall types constructed as part of the original project and considered to be Contributing Features to the eligible historic district: [10, 12, 13, 14]
 - Pre-cast Concrete Curved Panel Walls [10, 12, 13, 14] (Refer to photos A, B, C, D and H.)
 - Concrete Flat Panel Walls [10, 12, 13, 14] (Refer to photos E and F.)
 - Timber Crib Walls [10, 12, 13, 14] Although timber crib walls are contributing features to the eligible historic district, they will not be used for West Vail Pass due to maintenance issues.



Highway Retaining Walls

Visual design continuity should exist throughout the West Vail Pass corridor, linking existing structures and features built during the original construction in the 1970s and new transportation structures. Highway retaining walls should be of similar proportions and designed using similar and complementary materials, colors, and finishes. [9, 12]

- New retaining wall designs should meet the design intent to preserve and enhance the alpine environment. This includes the wall design concepts described in the 1972 Vail Pass Environmental Study and its design studies. The original design concepts for retaining walls include the following: [10, 13]
 - ‘Emphasize blending textures and contours of the landscape.’
 - ‘Avoid smooth and flat surfaces and incompatible colors.’

Pre-cast Concrete Curved Panel Walls

- Design new walls to have similar dominant visual features as the original walls, as listed below: [10, 12, 13, 14] (Refer to photos A, B, C, D, H and sketch G.)

Vertical Dominant Features:

- Walls are tiered with minimum 4-foot width for planting areas between walls.
- Vertical columns are 10-foot 4-inch on center, 1-foot 10-inch wide, and 8-inch proud.
- Each wall within tiered arrangement is 3-foot 4-inch minimum height, or 8-foot to 10-foot maximum height, including buried toe of wall.
- Top of wall elevation is parallel with the grade of I-70.

Horizontal Dominant Features:

- Horizontal lines resulting from the stacked precast panels occur about 3 feet 4 inches apart for full panels.
- Curved panels are between the columns.
- The curve dimension is approximately 2 feet 6 inches deep.
- Shadow: Shadow line is created by the curved panels.
- Color: Concrete to have a structural coating or stain to match original wall color (reddish-tan), which was originally achieved by adding iron-oxide to concrete.
- Colors and planting area widths on new walls should match the colors and widths on existing adjacent or nearby curved panel wall. [12, 13, 14]

Concrete Flat Panel Walls

- Walls used to support the highway fill slopes immediately downhill of I-70 will be constructed to complement the original flat panel walls below I-70. [10, 12, 13, 14] (Refer to photos E and F.)
- Flat panel walls below the elevation of I-70 can be greater than 12 feet high. [9] (Refer to photos E and F.)
- Color: Concrete to have a structural coating or stain to match original wall color. [12]

Concrete Shotcrete Faced Walls with Simulated Rock Texture [12]

- Where bedrock is exposed, or where simulated rock textured walls would blend with the adjacent natural landscape away from prominent views, consider constructing short lengths of concrete shotcrete faced walls that mimic rock formations typical to the Black Gore Creek Valley. [12] (Refer to photos I, J and K.)
- The shotcrete contractor should present test panels showing the proposed rock texture, form, mass, and colors to CDOT for review and approval prior to construction. [12]
- Consider constructing planting benches on shotcrete faced walls and plant or seed with native plants to mimic the natural rock face and vegetation seen on undisturbed rock outcrops in the Valley. [12, 15] (Refer to photos J and K.)

Concrete Form-Liner Walls with Rock Texture [12]

- Cut and fill walls along the Vail Pass Recreation Trail may be concrete walls constructed with rock texture made with form liners that mimic the geologic character of rock outcroppings viewed in the Black Gore Creek Valley. (Refer to photo L – Petaluma Fieldstone: random rough stacked rock pattern.) [12]
- Concrete wall contractor should present test panels showing the proposed rock texture, form, mass, and colors to CDOT for review and approval prior to construction. [12]
- Refer to the following section on Recreation Trail Design and Retaining Walls for more detail.



03 – Transportation Support Structures

Recreation Trail Design and Retaining Walls

All site grading and existing disturbance restoration in the corridor should utilize landforms that reflect the patterns and diversity naturally occurring throughout the Black Gore Creek Valley. Earthen embankments are natural reflections of the landscape and should mimic the patterns found in pre-existing conditions. Grading should avoid scarring on steep slopes, as well as the negative visual effects that result. New rock cuts should be naturalized with custom shaping and coloration will be applied to reduce the contrast between new cuts and existing rock faces. [9, 12]

Prescriptive Measures^[10]

- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features. [10]
- New features constructed or installed in the historic district as part of the new segment of the Vail Pass Recreation Trail, including the trail profile and grade, retaining walls, landscaping and landscape features will be constructed to honor the original design in terms of scale, mass, materials, and workmanship to the extent possible. [10]
- Existing contributing structures and features of the historic district, including the Vail Pass Recreation Trail fill retaining walls next to I-70, landscape, and landscape features will be designed, reconstructed and/or rehabilitated to honor the aesthetic of the original design to the extent possible. [10]

Refer to Chapters 06, 07, and 08 for additional Design strategies to meet these Prescriptive Measures. [9, 12]

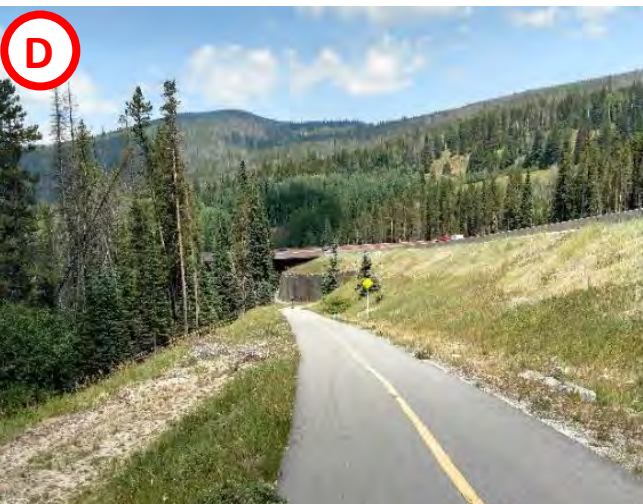
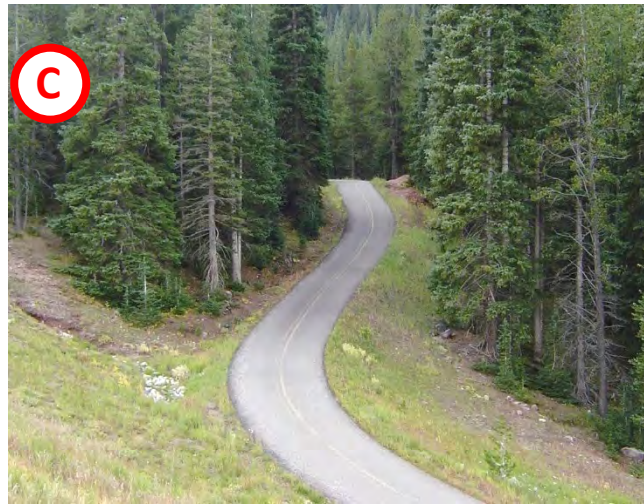
Design Strategies

Design strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Integrate new recreation trail alignments within existing natural landforms as much as possible. [12] (Refer to photos C and D.)
- Prior to final design of new trail alignments and determining construction methods, the trail alignment should be staked in the field and CDOT staff, trail designers, construction staff, biologists, and landscape architects should walk the alignment to identify natural features to avoid or integrate into grading design. Natural features include (but are not limited to) specimen trees and vegetation areas, rock formations, wetlands, springs, riparian habitat, ephemeral streams, and drainages. Ways to avoid and/or mitigate for these impacts will be researched. [12]
- New recreation trail retaining walls will be designed based on the wall location, construction methods, pedestrian and cyclist safety, user experience, and existing geotechnical conditions. [12]
- To enhance Vail Pass Recreation Trail users' views of the streams and minimize use of rip-rap scour protection, avoid locating piers in a stream where scour could occur. [9]
- Replicate the diversity of natural slope conditions seen in Black Gore Creek Valley in new earthwork design and construction. [9, 12] (Refer to photos A, B, C and D.)
- Avoid the use of sliver cuts and fills along the recreation trail to minimize impacts to existing vegetation. [12] (Refer to photo B.)

Description of Recreation Trail Walls:

- New retaining walls that retain earth specifically for the purpose of creating a platform for the Vail Pass Recreation Trail should reflect the context of the local surroundings. The wall facade should match the texture, mass, form, and colors of surrounding geology visible in the Black Gore Creek Valley to the extent possible. These walls types include, but are not limited to: [9, 12]
 - Cast-in-place concrete wall with form-lined rock textures. [12] (Refer to photos E and F)
 - Dry stacked or mortared rock walls. [12] (Refer to photos G and H.)
 - Concrete shotcrete faced walls with simulated rock texture. [12] (Refer to photo I and J.)



Recreation Trail Design and Retaining Walls

All site grading and existing disturbance restoration in the corridor should utilize landforms that reflect the patterns and diversity naturally occurring throughout the Black Gore Creek Valley. Earthen embankments are natural reflections of the landscape and should mimic the patterns found in pre-existing conditions. Grading should avoid scarring on steep slopes, as well as the negative visual effects that result. New rock cuts should be naturalized with custom shaping and coloration will be applied to reduce the contrast between new cuts and existing rock faces. [9, 12]

- Low walls (approximately 4-foot height maximum or) are preferred next to trail segments without a landscape buffer. Consider rockery or alternative wall types for low wall heights. [12] (Refer to photo G.)
- Wall materials to be (or mimic) native natural materials. [12] (Refer to photos E, F, G, H, I, J and K.)
- Rockery walls to use durable boulders, rock, or talus from local sources to replicate natural rock formations and materials from the Black Gore Creek Valley. [12] (Refer to photos G, H, K and L.)
- Recreation path walls that also support the highway should follow the guidelines for flat panel walls (described in the previous sections) to support the elements of the District. [10, 12, 13, 14] (Refer to photos A and B.)
- The rock texture for the concrete shotcrete faced and cast-in-place walls will mimic rock formations typical to the Black Gore Creek Valley. [12] (Refer to photos K, L and Chapters 03 and 06.)
- Prior to any wall construction, samples of the simulated rock texture and colors proposed by the construction contractor will be provided for review by a qualified geologist and / or landscape architect and approved by CDOT. [12]
- The design of Vail Pass Recreation Trail walls should be separate aesthetic styles from the highway walls and should contrast with the aesthetic of walls directly related to the I-70 highway. [9]
- Minimize use of valley gutters above and at ends of walls where feasible, and other visible drainage systems. [12]
- Visibly anchor the wall into adjacent landforms by planting native vegetation to grow over the top and edges of walls, where feasible. [12] (Refer to photos G and H.)
- Provide a minimum of 2 feet (3 feet preferred) between the wall face and edge of the Recreation Trail pavement for a landscape buffer, where possible. [12] (Refer to photos A and B.)
- Where landscape disturbance can be minimized, slopes and natural rock cuts are preferred over retaining walls. [9, 12] (Refer to photos K and L.)
- Allow natural rock outcrops to remain and be integrated into earthwork where feasible, rather than covered up or removed and replaced with new retaining walls. [9, 15] (Refer to photos K and L.)
- Design of recreation trail retaining walls should complement the aesthetic of the Vail Pass Recreation Trail creek crossings, railing, and other structural elements supporting the trail but be visibly separate from the highway elements. [9, 12]
- Replace and repair retaining walls with similar and complimentary material, finish, and color of what was originally installed. [12]
- Plan for potential future pull-outs or rest areas along the Vail Pass Recreation Trail to highlight key viewpoints, interpretive signs, or cultural interests that may include seating and pull-out area in shade for at least two cyclists or pedestrians. [12] (Refer to photo E.)
- Existing Flat Panel Walls next to I-70 are associated with supporting the highway and considered to be contributing features to the eligible historic district. New fill walls supporting the highway should honor the Flat Panel Walls styles and be tiered and planted where possible to improve aesthetics for recreation trail users. [12] (Refer to photos A, B, and D.)
- Where the Vail Pass Recreation Trail is parallel to the highway, incorporate a landscaped buffer of 30 feet (preferred) between the roadway shoulder and adjacent Vail Pass Recreation Trail (where possible) to minimize deposits of snow thrown from highway. [9, 12] (Refer to photo D.)
- Trail hazard protection railing should be made of wood (to match East Vail Pass Recreation Path bridges) or metal that is coated, tinted or painted to match the Vail Pass color palette. [12] (Refer to next section for photos.)



03 – Transportation Support Structures

Recreation Trail Creek Crossings

Visual design continuity should exist throughout the Vail Pass Recreation Trail, linking the existing creek crossing and barrier designs along the trail on the west and east side of Vail Pass. Recreation Trail crossings should be of similar proportion and structural components and designed using like materials and finishes. [9]

Prescriptive Measures^[10]

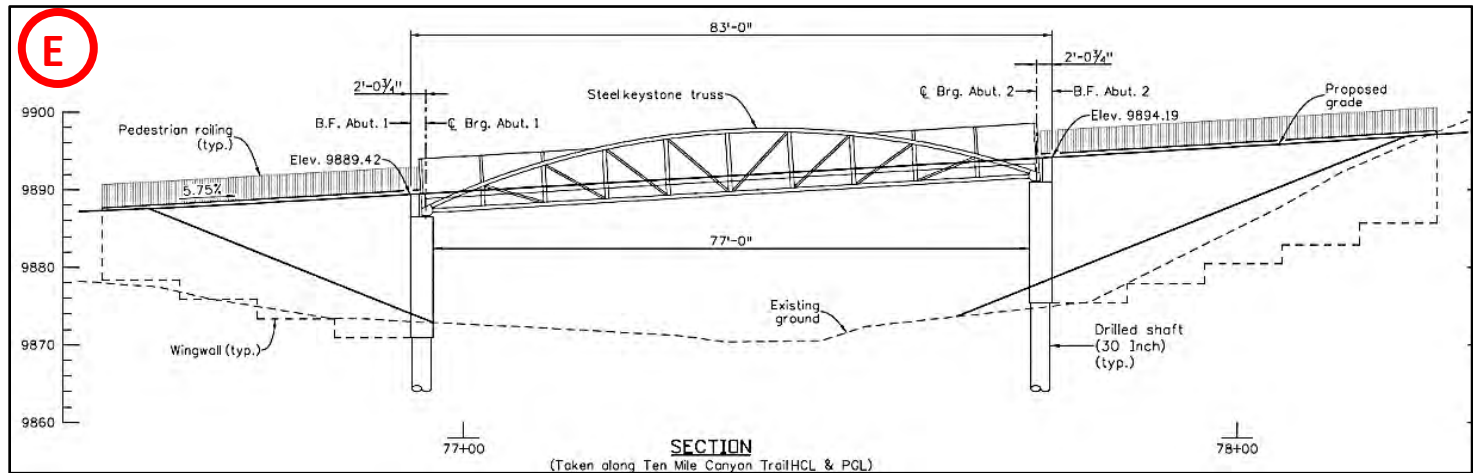
- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features. [10]
- New structures and features constructed or installed in the historic district as part of the design, including Vail Pass Recreation Trail creek crossings will be constructed to honor the original design in terms of materials, and workmanship to the extent possible while meeting safety and maintenance requirements. [10, 12]
- Existing contributing structures and features of the eligible historic district will be rehabilitated or reconstructed, including landscape and landscape features, which will be designed to honor the aesthetic of the original design to the extent possible. [10, 12]

Refer to Chapters 07 and 08 for additional strategies to accomplish these prescriptive measures.

Design Strategies

Design Strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Prior to final design of the new Recreation Trail alignment and creek crossings, and determining construction methods, biologists and landscape architects should identify specimen trees and vegetation areas, rock formations, wetlands, springs, riparian habitat, ephemeral streams and drainages, and other natural features to avoid impacts, to integrate features into grading design where appropriate, or provide mitigation for impacts. [12]
- To enhance Vail Pass Recreation Trail users' views of the streams and minimize use of rip-rap scour protection, avoid locating piers in a stream or river where scour could occur. [9] (Refer to all photos.)
- Make bridge guardrail of wood to match East Vail Pass Recreation Path bridges (refer to photos A and B) or metal railing (refer to photo D) coated, tinted, or painted to match color of the Vail Pass color palette. [12]
- Simple and elegant bridge or other creek crossing designs are more appropriate than complex shapes and geometries. The elegant design provides as aesthetic contrast to the complexity of the surrounding mountain landscape. [9, 10, 12, 13] (Refer to all photos.)
- The recreation trail should accommodate creek or stream sinuosity and natural appearance. [9, 12]
- Create a clean, uncluttered appearance below the bridge or culvert. [9, 12] (Refer to photos C and D.)
- Plant shrubs on the stream embankment to visually anchor the ends of the crossing structure to riparian habitat or upland vegetation. [9, 12]
- Replace and repair bridges with similar material, finish, and colors that honor what was originally installed. [12]



4 – Guardrails, Barriers, and Edge Delineation

Guardrails should be constructed using concrete barrier colored to match the I-70 segment on Vail Pass color selection or W-beam with timber posts. A consistent design will be used throughout the corridor. A recovery zone is preferable to guardrail or barriers for protection from edge obstacles.^[9]

Prescriptive Measures^[10]

- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features.^[10]
- The roadway alignment and edge delineations are existing contributing features of the historic district. Their rehabilitation or reconstruction, which will be designed to honor the aesthetic of the original design to the extent possible.^[10]
- New structures and features, including new roadway barriers, edge delineation and guardrails, that are re-constructed or installed in the historic district as part of the design, will be constructed to honor the original design in terms of scale, mass, materials, and workmanship to the extent possible.^[10]

Refer to Chapter 05 for Vail Pass color palette and CDOT Landscape Architecture Manual for additional strategies to accomplish these Prescriptive Measures.^[9, 15]

Design Strategies

Design strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Use concrete vehicle barrier along road edges where appropriate for hazard protection. Match colors of concrete road edge barrier to bridge concrete guardrails and connect to appear continuous.^[9, 10, 12, 13, 14] (Refer to all photos.)
- Concrete barrier finishes to be consistent throughout West Vail Pass and color to match the Vail Pass color palette. Refer to Chapter 05 for details.^[9, 12]
- Use concrete vehicle barriers, continuous cast-in-place or pre-cast segments with consistent color treatments.^[9]
- End concrete barriers with flare sections of W-beam and posts with materials and finishes meeting CDOT maintenance guide and the Federal Lands Memorandum of Understanding (MOU). Utilize post and W-beam guardrail sparingly and only where necessary.^[9, 12] (Refer to photo D.)
- Incorporate landform and plantings behind concrete barriers at road edges adjacent to uphill slopes, and medians where possible.^[9, 12] (Refer to photo E.)
- Provide edge delineation with applied markings and reflectors on concrete barriers to reduce visual clutter of reflectors on individual signposts.^[9]
- Replace and repair guardrails, barriers, and edge delineation materials with the similar and complementary materials, finish, and colors that complement what was originally installed while meeting the modern safety standards and functional requirements.^[12]



5 – Color Selection and Consistency

A color palette has been selected for use on Vail Pass. Color selected for transportation features – including bridges, retaining and sound walls, guardrails and barriers, lighting, utility poles and accessories, and signage, and other visible features – will blend into the background of the natural and built environment. [9, 12]

Prescriptive Measures^[10]

- Honor the original I-70 on Vail Pass highway design by replicating the architectural finishes and color palette of existing structures and features. [10]

Refer to CDOT Landscape Architecture Manual for additional strategies to accomplish these Prescriptive Measures. [15]

Design Strategies

Design strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- The Vail Pass section of the I-70 Crest of the Rockies design segment is historic; therefore, colors chosen for new Vail Pass highway and recreation trail features should match the color choices previously used. These colors complement the unique natural features found on Vail Pass (such as rock formations and soils) and provide design consistency across the entire Vail Pass corridor. [9, 12] (Refer to all photos for examples of colors applied to the original highway features, but as they appear today, faded and weathered.)

Design Strategies for Bridges, Highway Guardrails, Barriers and Glare Screens

- Highway bridge concrete constructed as part of the original design “was tinted in colors of red, beige and pink to complement the surrounding terrain.” Use field color matching techniques for new concrete bridges to be built adjacent to existing concrete structures to remain in place. [12, 13] (Refer to photos A to D.)
- New bridge girders will likely be trapezoidal box girders made of steel or concrete. [12]
- To produce a consistent corridor design for concrete and steel girders, and to match the original bridge colors as much as possible, apply the following color treatments:
 - Steel girders should be uncoated weathering steel similar to the aged appearance of the original steel box girders. [12, 13] (Refer to photo B.)
 - Concrete girders should be stained a weathering-steel color (Federal Color Number 30045) for design consistency. [12] (Refer to photo A.)
- New concrete bridge piers, deck, curbs, barriers, visual substructures etc. should be colored to complement the original “reddish-beige” tones as follows: [12] (Refer to photos A, B, and C. Photo D shows the variety of the original beige and pink colors on barriers.)
 - Apply stain or structural coatings to match Federal Standard 595B, Color 30233 (red-green-blue value [RGB] 160/111/97) on new stand-alone concrete bridge elements. [12, 17]
 - Use field color matching techniques for new concrete bridge features to be built adjacent to existing concrete bridge elements to remain in place.
- Highway guardrail and posts shall meet the material and color specifications described in *Appendix A-3 - Supplemental Visual and Scenic Resources Guide for CDOT Maintenance and Operations* and the 2016 CDOT, Federal Highway Administration (FHWA), and Federal Lands MOU, which states: [17]
 - New guardrail shall be galvanized steel with stained low-contrast finish to match other galvanized highway elements.
 - New guardrail posts shall be finished natural wood in complement with surrounding natural environment.
- Highway glare screens mounted on top of median barriers should be tinted to match the color of the barrier and blend with the surrounding natural environment. [12]
- Recreation trail bridges shall meet material and color specifications described in *Appendix A-3 - Supplemental Visual and Scenic Resources Guide for CDOT Maintenance and Operations*. [12, 17]
 - Recreation trail bridge railings, trail guardrail, gates and other metal features shall be colored Forest Service Brown (Federal Standard 595 Color FS 20059 [dark brown].) [12, 17]



A color palette has been selected for use on Vail Pass. Color selected for transportation features – including bridges, retaining and sound walls, guardrails and barriers, lighting, utility poles and accessories, and signage, and other visible features – will blend into the background of the natural and built environment. ^[9, 12]

Design Strategies for Highway, Sound and Recreation Trail Walls

- New or reconstructed retaining walls with curved panel designs should be colored to match the original walls that were “tinted in colors of red, beige, and pink to complement the surrounding terrain.” ^[13, 12] (Refer to photo G.)
 - Apply concrete stain to match Federal Standard 595B, Color 30233 (RGB 160/111/97) on curved panel walls.
- New sound attenuation walls should be stained to match color of curved panel walls: Federal Standard 595B, Color 30233 (RGB 160/111/97.)
- New or reconstructed flat panel retaining walls constructed to support the highway should be colored to complement the color of the original flat panel retaining walls built with cruciform-shaped panels. ^[13, 12] (Refer to photo H.)
- Recreation trail walls with simulated concrete rock texture will be stained to replicate colors and textures of nearby natural rock formations visible from the trail and highway. ^[12] (Refer to photo I.)
- Shotcrete faced walls with simulated rock texture will be formed and colored to match the textures and colors of nearby natural rock formations. ^[12] (Refer to photo J.)
- Fall protection (guardrail) if required on top of walls should be colored to match the wall color. ^[12]

Design Strategies for Lighting, Signage, Utility Poles and Accessories

- For highway and recreation trail sign poles, light standard and utility poles (including support arms and accessories), apply Forest Service Brown color (Federal Standard 595 Color FS 20059 [dark brown] to be consistent with Appendix A-3 Supplemental Visual and Scenic Resources Guide for CDOT Maintenance and Operations of the CDOT and Federal Lands MOU. ^[12, 17]
- Apply Forest Service Brown color to recreation trail sign poles and backs and other recreation trail vertical features. ^[12, 17]
- Use durable, powder-coated color finish to lighting and sign poles and fixtures match existing Vail Pass corridor colors (Federal Standard 595 Color FS 20059 [dark brown]. ^[12, 17]

Design Strategies Common to All West Vail Pass Features

- Coordinate color selections with CDOT’s Region 3 Landscape Architect. ^[12]
- Improve the consistency in design and color schemes for roadway and recreation trail structures. ^[11, 12]
- Field color match techniques should be used to ensure colors complement the unique natural features (such as rock formations and soils) found on Vail Pass.
- Test panels (two minimum) should be provided to display the proposed color options on the material and texture of each feature for CDOT approval prior to installation. Colors will be tested for individual elements of bridges, retaining and sound walls, guardrails and barriers, wildlife fence, lighting, utility poles and accessories, signage, and other visible features. ^[12]
- Highway and recreation trail features to be repaired or replaced after construction should be constructed with similar and complimentary material, finish, and color of what was originally installed. ^[12]



6 – Earthwork, Embankment, and Restoration of Disturbed Landscapes

Earthwork and Grading All site grading and existing disturbance restoration in the corridor should utilize landforms that reflect the patterns and diversity naturally occurring throughout the Black Gore Creek Valley. Earthen embankments are natural reflections of the landscape and should mimic the patterns found in pre-construction conditions to the extent possible. Grading should avoid scarring on steep slopes, as well as the negative visual effects that result. [9, 12]

Prescriptive Measures^[10]

- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment. [10]
- New features constructed or installed in the historic district as part of the design, including landscape and the new segment of the Vail Pass Recreation Trail, will be constructed to honor the original design in terms of scale, mass, materials, and workmanship to the extent possible. [10]
- Existing contributing structures and features of the historic district will be rehabilitated or reconstructed, including landscape features and the Vail Pass Recreation Trail, will be designed to honor the aesthetic of the original design to the extent possible. [10]

Refer to Chapters 07 and 08 and CDOT Landscape Architecture Manual for additional strategies to accomplish these Prescriptive Measures. [9, 12, 15]

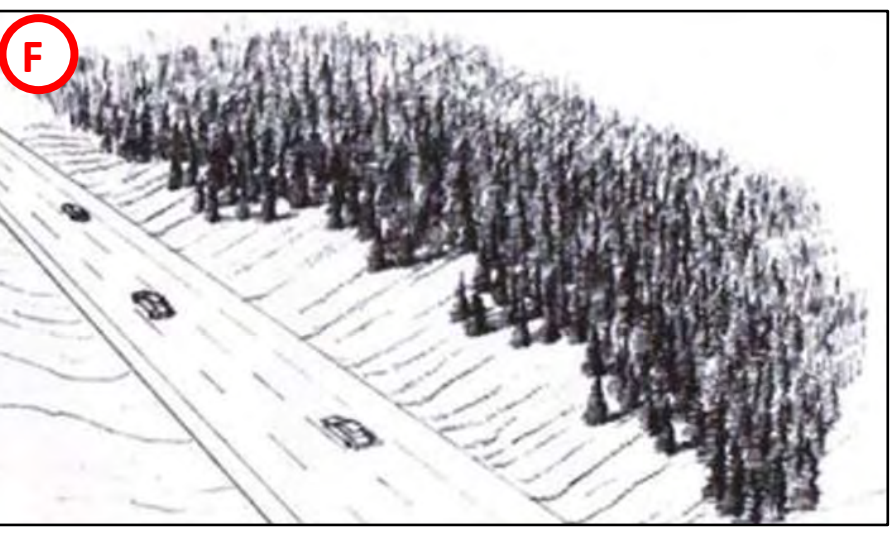
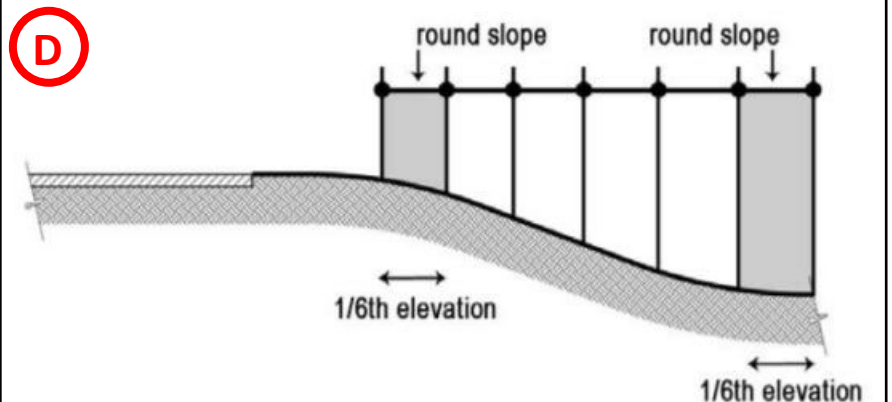
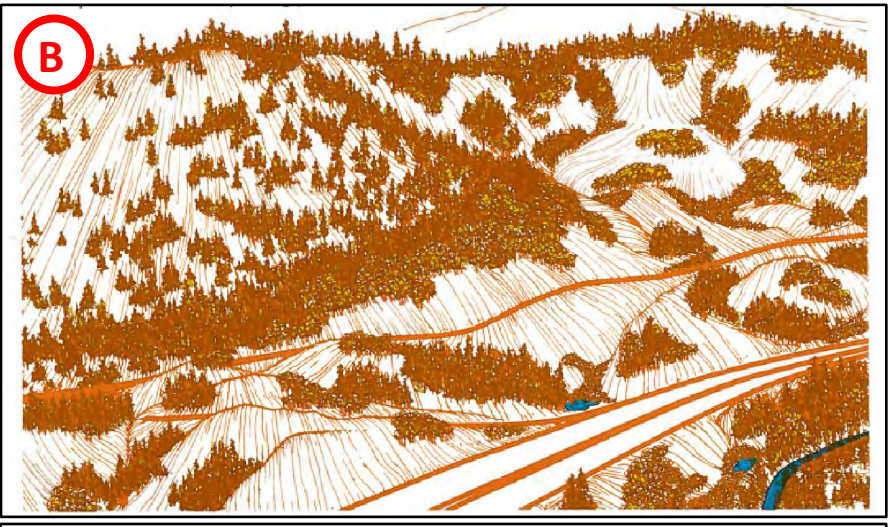
Design Strategies

Design Strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Each new construction site will require a unique earthwork grading design based on the location, rock, and geological conditions, soil types and soil moisture, safety improvement design requirements and construction methods. [12] This chapter is organized into the following sub-headings:
 - Earthwork, Embankment and Restoration of Disturbed Landscapes
 - Rock Cuts and Modifications
 - Restoration and Naturalized Appearance of Disturbed Landscapes
 - Landscape Retaining Walls

Design Strategies Common to All Earthwork

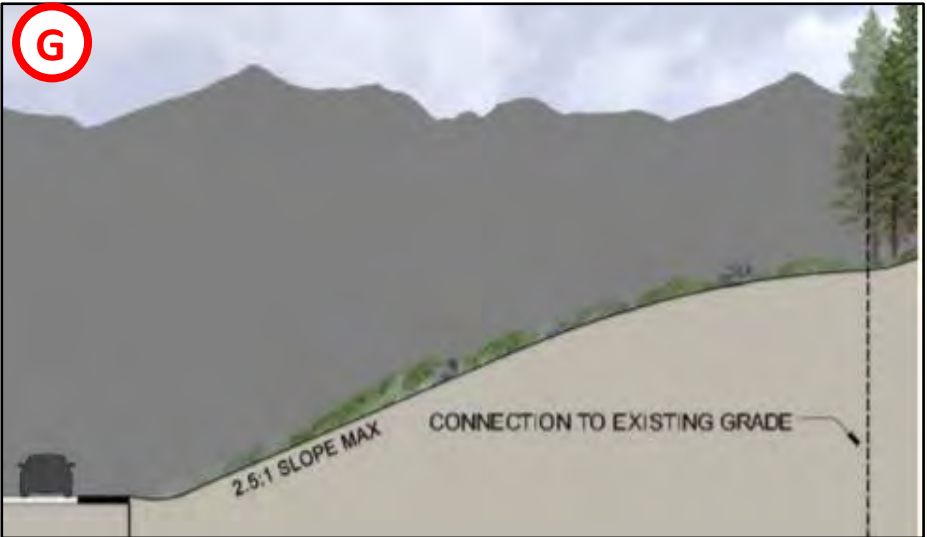
- Honor the original grading designs by replicating the landform character, mass, and scale of the Black Gore Creek Valley environment in new earthwork design and construction. [9, 12] (Refer to photos A and C and sketch B.)
- Apply earthwork and grading construction methods to minimize disturbance to the landscape (i.e., landforms, rock formations, soils, waterways, vegetation, and other natural features). [12] (Refer to sketch D.)
- Preserve major site resources and features such as topography, views, unique vegetation, geological features, wetlands, and other scenic resources native to West Vail Pass and its surroundings, where possible. [11] (Refer to photo E.)
- Road widening will avoid existing sculpted rock cuts and reducing need for cut slope walls by widening away from rock face, adding fill walls, where feasible. [9, 12] (Refer to photo E.)
- Allow natural rock outcrops to remain and be integrated into earthwork where feasible, rather than covered up or removed and replaced with new retaining walls. [9, 15] (Refer to photo E.)
- Prior to final grading design and determining construction methods, biologists, and landscape architects should identify scenic natural areas such as visually prominent native plant communities, rock formations, wetlands, springs, riparian habitat, ephemeral streams and drainages, and other natural features to be avoided or integrated into grading designs, where feasible. [12]
- Utilize strategies to restore disturbed areas (rock cuts, grading) to a naturalized appearance. [9, 11]



Earthwork and Grading

All site grading and existing disturbance restoration in the corridor should utilize landforms that reflect the patterns and diversity naturally occurring throughout the Black Gore Creek Valley. Earthen embankments are natural reflections of the landscape and should mimic the patterns found in pre-construction conditions to the extent possible. Grading should avoid scarring on steep slopes, as well as the negative visual effects that result. [9, 12]

- West Vail Pass' cut and fill slope gradients should blend earthwork into adjacent landforms. A Context Sensitive Solutions (CSS) Engineering Design Exception would be required for slopes steeper than 2.5H:1V. Slope gradients of 2V:1H may be used in very limited areas where rock cuts are not appropriate. Slope gradients of 3H:1V are preferred for more successful plant establishment and maintenance safety. [9, 11, 12, 15] (Refer to sketch G.)
- Where possible, preserve and restore significant stands of vegetation, especially along riparian corridors. [11]
- Round the top and bottom of the slope to provide a stable area for revegetation and transition the embankment back into natural grade. When viewed in elevation, this rounded transition should occur over the top and toe of the slope: the last 1/6th of the slope elevation. [9, 15] (Refer to sketches B, D and G and photo C.)
- When clearing vegetation is necessary for earthwork, the roadway design may remove more vegetation than required in order to create a natural and irregular edge, allow a naturalized rounding of the slope, frame scenic views, and preserve areas of significant existing trees and shrubs. [9, 15] (Refer to sketches B and F.)
- Use a warped or variable slope technique in areas where the terrain is rolling, and road work requires frequent shifts between cuts and fills. [9, 15] (Refer to sketch D.)
- Soften transitions by laying back the slopes more at the ends of the cuts and fills, rather than in the middle. [9, 15] (Refer to photo H.)
- Vary the slope of the embankment through the length of a large cut or fill area, where feasible. To blend with adjacent Vail Pass landforms, new consistent slopes may appear to fit into the landscape if slopes with longitudinal lengths greater than 300 feet are varied. [9, 12, 15] (Refer to photo H)
- Minimize the linear effect of vegetation clearing. [9] (Refer to photo F.)



06 – Earthwork, Embankment, and Restoration of Existing Disturbance

Rock Cuts and Modification

All site grading and existing disturbance restoration in the corridor should utilize landforms that reflect the patterns and diversity naturally occurring throughout the Black Gore Creek Valley. New rock cuts will be naturalized with custom shaping and coloration will be applied to reduce the contrast between new cuts and existing rock faces. [9, 12]

Prescriptive Measures^[10]

- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features. [10]
- Existing contributing structures and features of the historic district, such as sculpted rock cuts and landscape, will be preserved and rehabilitated to honor the aesthetic of the original design to the extent possible. [10]

Refer to Chapters 07 and 08, FHWA Context Sensitive Rock Slope Design Solutions, and CDOT Landscape Architectural Manual for additional strategies to accomplish these Prescriptive Measures. [9, 12, 15, 16, 18]

Design Strategies for Rock Cuts and Modifications

Design strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- The geological properties of rock within I-70 West Vail Pass serve as the basis for strategies to contain rock fall to retain these natural forms. The design team should include a multidisciplinary group of geotechnical engineers, civil engineers, and landscape architects whose role is to maintain the inherent character of the natural bedding planes, fractures, joints, and overall stability of rock along West Vail Pass. [9, 15]
- Design new rock cut slopes along I-70 on West Vail Pass to blend with existing rock formations. [12].
- Use rock staining, soil-coloring treatments, and/or accelerated weathering treatments to match new rock and soil excavations with existing rock and soil. Do not leave rock in a fresh blasted appearance unless directed to do so by the project Registered Landscape Architect. [9, 15, 16] (Refer to photo E for example of unstained rock cut and photo F for example of stained rock cut.)
- Allow natural rock outcrops along I-70 West Vail Pass to remain and be integrated into earthwork rather than covered up or removed. [9, 15] (Refer to photos A to D for examples of existing sculpted rock outcrops.)
- When a rock cut is necessary, place-boulders from the excavation within the slope to be visually compatible with existing rock outcrops. [9]
- Assess the cost, location, access, right-of-way, applicability, etc. of all the guidelines to determine the most appropriate method for creating and expanding existing rock cuts. All guidance may not be appropriate for every project (e.g., rock fall mitigation may require nearly vertical cuts in lieu of natural sculpting for safety reasons). [9, 16]
- Discuss feasibility of an individual rock cut on a project-by-project basis before involving stakeholders. [9]
- Recommendations to stakeholders should be based on opportunities and constraints of the individual rock cut. [9, 16]



Rock Cuts and Modification

All site grading and existing disturbance restoration in the corridor should utilize landforms that reflect the patterns and diversity naturally occurring throughout the Black Gore Creek Valley. New rock cuts will be naturalized with custom shaping and coloration will be applied to reduce the contrast between new cuts and existing rock faces. [9, 12]

- Consider wildlife impacts when selecting and utilizing rock fall protection. Work with a wildlife biologist to determine the impacts of rock fall mitigation measures. [9]
 - Incorporate a catch ditch along cuts to allow rock fall catchment and maintenance access to remove fallen rock. [9] (Refer to photo G.)
 - Evaluate moving the road away from the rock face to avoid rock fall protection. [9, 12]
 - Use scatter blasting techniques, where feasible and safe, and random rock drilling at varying depths to cause rock to break in natural patterns and expose natural rock fractures. [9, 15]
 - Where feasible, sculpt new rock cuts to include soil pockets within rock ledges. The soil pockets will present opportunities for revegetation that reflect the natural patterns found along the Black Gore Creek Valley. [9, 15, 16] (Refer to photos A to D for examples of existing sculpted rock cuts.)
 - Provide planting benches on sculpted rock cuts and plant and seed with native plants to reduce erosion and mimic the natural rock face and vegetation seen on undisturbed rock outcrops in the Valley. [12, 15]
-
- Employ custom natural cuts and staggered benches and avoid the use of straight vertical cuts and benches that have a sheer and unnatural appearance. [9, 16]
 - Half casts (holes drilled in rock to place explosives and spilt in half from blasting) or any visual mechanical lines should be avoided. Consider all alternative cut methods and acquiring appropriate right-of-way. When half casts are visible, hide the casts by chipping away remaining indentations in a random fashion. Disguising the half casts should be done as the slope is excavated. [9, 16]
 - Consider applying stain to new cut rock to help blend the new cut rock into the existing terrain. Conduct several test sections on excavated rock to determine the best type and color of stain to match the surrounding rock. [16] (Refer to photo E for example of rock cut without stain and photo F to rock that has been stained.)
 - Evaluate the use of tieback and other anchoring strategies to preserve and stabilize rock formations rather than the installation of rock fall protection devices. [9, 15]
 - Based on careful geological, site and cost analysis, rock cuts should strive to minimize the need for rock fall protection. When rock fall protection is deemed necessary, consider the scale of rock fall protection. [9]
 - Use controlled rock scaling techniques to remove rockfall hazards rather than install rock fall protection devices, where feasible. If this is not feasible, use naturally sculpted benches and ledges across the face of rock instead of human-made features. When required, the use of natural contours supplemented with retention devices, such as protection fences or mesh screens) can be used to minimize the extent of benching. [9]
 - When mesh rock fall draping is required, it should complement the colors of the rock face and follow the existing natural contours of the rock face. [9, 15] (Refer to photo G.)
 - Rock quality and topographical conditions should be considered as part of natural sculpting techniques in order to limit rock fall potential on or above the subject slope. [9, 15]
 - Efforts should be made to reduce the visual clutter of rock face protection devices. Consider tinted, powder coated, or other types of colored mesh, draping the mesh over the edge of the rock face, and attaching the mesh reasonably close to the face. The end of the mesh material should terminate in a hidden condition when possible. [9, 12] (Refer to photo G.)
 - Consider low reflectivity and color matching materials for rock safety structures. Rock safety structures, including mesh, will be earth-tone colors to match the patterns of surrounding rocks. [9, 12]



06 – Earthwork, Embankment, and Restoration of Existing Disturbance

Restoration and Naturalized Appearance of Disturbed Landscapes

All site grading and existing disturbance restoration in the corridor should utilize landforms that reflect the patterns and diversity naturally occurring throughout the Black Gore Creek Valley. Earthen embankments are natural reflections of the landscape and should mimic the patterns found in pre-construction conditions. Grading should avoid scarring on steep slopes, as well as the negative visual effects that result. [9, 12]

Prescriptive Measures^[10]

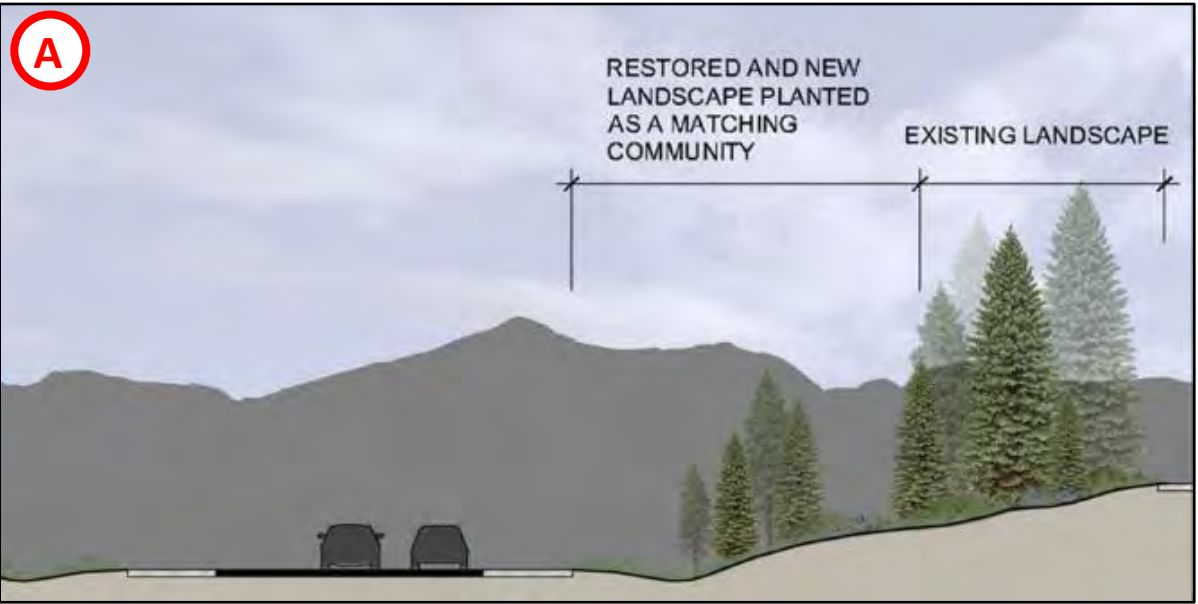
- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features. [10]
- Existing contributing structures and features of the eligible historic district will be rehabilitated or reconstructed, including landscape and landscape features, will be designed to honor the aesthetic of the original design to the extent possible. [10]

Refer to Chapters 07 and 08 and CDOT Landscape Architecture Manual for additional strategies to accomplish these Prescriptive Measures. [9, 12, 15]

Design Strategies for Restoration of Naturized Appearance of Disturbed Landscapes

Design Strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Restore graded areas with a landscape pattern that resembles the existing natural plant community. [9] (Refer to sketch A and Chapter 08 for strategies to accomplish this.) (Refer to sketch A.)
- Use large-scale riprap and talus (including boulders) from Black Gore Creek Valley or similar rock sources in conjunction with native grass, wildflower, shrub, and tree species for restoration on steep slopes. [9, 12] (Refer to photo B.)
- Analyze the location and amount of native topsoil prior to construction. Where feasible, strip, store, and ultimately reuse any topsoil removed during construction within this segment to retain the seed bank and bacteria in the soil. [9]
- Grind and chip existing shrubs and other plants grubbed in disturbance where feasible and mix with topsoil prior to reuse to increase organic matter and regenerative capacity. [9, 15]
- Promote more successful plant establishment by planting where moisture can be provided naturally. Use temporary drip irrigation techniques where feasible and as needed where new plantings are easily accessed and visible (such as along the Recreation Trail.) Examples of temporary irrigation techniques include truck watering or temporary gravity-fed drip irrigation systems with water tank reservoirs. Irrigation would be used for CDOT's standard Plant Establishment Period. [9, 12]
- Disturbed slopes should have a rough and undulating appearance that mimics the surrounding natural condition as opposed to a smooth and geometric appearance. [12]
- Increase the success of revegetation by track walking with earthwork equipment to create small depressions and pockets for water capture. [9]



06 – Earthwork, Embankment, and Restoration of Existing Disturbance

Landscape Retaining Walls

All site grading and existing disturbance restoration in the corridor should utilize landforms that reflect the patterns and diversity naturally occurring throughout the Black Gore Creek Valley. Earthen embankments are natural reflections of the landscape and should mimic the patterns found in pre-construction conditions. Grading should avoid scarring on steep slopes, as well as the negative visual effects that result.^[9, 12]

Prescriptive Measures^[10]

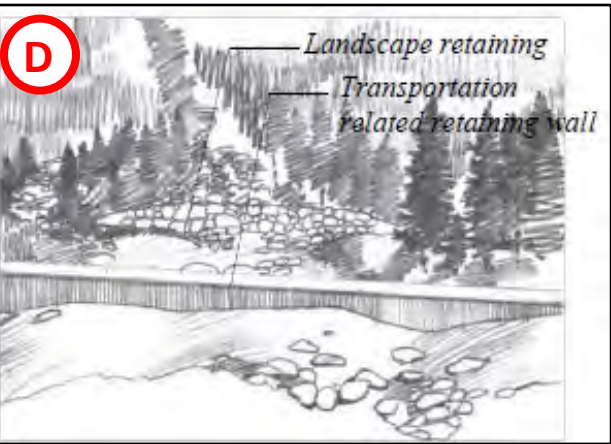
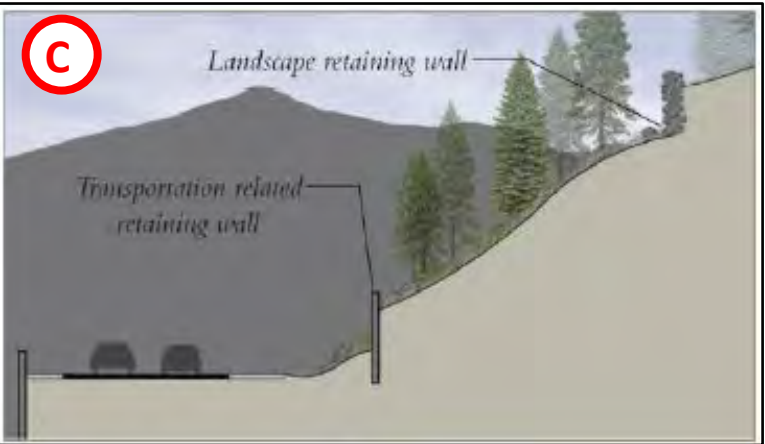
- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features.^[10]

Refer to Chapters 03 and 08 for additional strategies to accomplish these prescriptive measures.^[9, 12]

Design Strategies

Design Strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Landscape retaining walls are defined as being completely set within the existing landscape – not associated with the highway structure or surface and are generally small in size and more organic in nature. Wall materials include rock, talus, boulders and similar.^[9] (Refer to photos A, B, F, and G and sketches C, D, and E.)
- Landscape retaining walls can be used to minimize impacts to trees and shrub roots in areas where existing landforms require regrading to accommodate highway improvements or wildlife crossing structures.^[12] (Refer to photos A, B, F, G and sketches C, D, and E.)
- Dry laid stone stacked no taller than 4 feet will be used to retain vegetation roots. (Refer to photo B.) Wall height less than 4 feet tall should not require structure engineering design. Rock sources should use materials found locally. Terrace to match the rock geology of Vail Pass and reflect the context of local surroundings.^[12] (Refer to photos F and G.)
- Landscape retaining walls retain tree and shrub roots with earth to preserve this vegetation for wildlife habitat and screening adjacent to wildlife underpasses.^[12]
- Prior to final grading design and determining construction methods, wildlife biologists and landscape architects should identify specimen trees and other natural features to be preserved with landscape retaining walls and integrated into grading design.^[12] (Refer to photos A and B.)



7 – Streams and Hydrologic Features

Hydrologic features such as streams, intermittent drainages, ponds, and wetlands that may be affected by I-70 West Vail Pass construction should be designed to reflect the surrounding environment. Channels, ponds, drainages on slopes, and riparian environments hold high ecological and scenic value. Therefore, they require aesthetic design consideration as part of their implementation. [9, 12]

Prescriptive Measures^[10]

- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features. [10]
- Existing contributing structures and features of the historic district will be rehabilitated or reconstructed, including retaining walls and landscape features, which will be designed to honor the aesthetic of the original design to the extent possible. [10]

Refer to Chapters 03 and 08 and CDOT Landscape Architecture Manual for additional strategies to accomplish these prescriptive measures. [9, 12, 15]

Design Strategies

Design strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Bridge or completely span perennial stream floodways and significant drainages, where possible, to minimize disturbance and preserve hydrologic and visual quality of the landscape. [9, 12] (Refer to photo A.)
- Avoid and minimize disturbance to stream channels during construction. [9]
- Creeks should not be straightened or channelized to accommodate highway or recreation trail improvements. Highway and trail should accommodate creek or stream sinuosity and natural appearance. [9, 12] (Refer to photos A and C and sketches B and D.)
- Analyze the entire stream course to understand the overall hydraulic and geomorphologic conditions as a foundation for the design of stream enhancements, including landform, planting, edge conditions, and drop structures. [9, 15]
- Incorporate the recommendations of the Black Gore Creek Sediment Control Action Plan (SCAP) and other appropriate documents to address sediment management. [12]
- Restore stream edges with a variety of local rock, riparian plant materials, and landform so they feather into the landscape as a naturally appearing stream or drainage. [9, 12] (Refer to photos A, F, and H and sketch G.)
- Allow sedimentation basins to perform water quality functions and then drain into natural hydrological patterns, including wetlands to serve as tertiary water quality treatment. Shape wetlands and basin edges with naturalized forms to appear as if they were existing features. [9, 12, 15] (Refer to photos I and J.)
- Detention basins should be revegetated or edged with rock, logs, or plants where possible to blend with adjacent natural landscape and reduce the look of an engineered landscape. This strategy is most important where basins are visible from the Vail Pass Recreation Trail , I-70 or local roadways. [9, 15, 12] (Refer to photos I and J.)
- Design sediment basins with maintenance access under bridges and next to highway to remove sediment and protect vegetation and waterways. [9, 12] (Refer to photo E.)



Hydrologic features such as streams, intermittent drainages, ponds, and wetlands that may be affected by I-70 West Vail Pass construction should be designed to reflect the surrounding environment. Channels, ponds, drainages on slopes, and riparian environments hold high ecological and scenic value. Therefore, they require aesthetic design consideration as part of their implementation. ^[9, 12]

- Vary the size of rock treatments. Meander naturalized treatments so that they feather into the landscape as a naturally appearing stream. ^[9, 15]
- Design drop structures and other stream improvements with natural materials rather than concrete structures, where feasible. ^[9, 15] (Refer to photos K, L, and M.)
- Concrete sediment basins and other visible manmade water features should be tinted non-reflective dark brown tone that blend with adjacent natural features such as rock formations and soils. This concrete color should provide design consistency across the entire Vail Pass corridor. ^[12] (Refer to photo K.)
- Utilize locally sourced rock and aggregate at culvert outlets to provide a natural appearance, where possible. ^[9, 12]



8 – Landscape Planting, Revegetation, and Topsoil Management

Replication of Existing Landscape Patterns

A landscape planting plan will be included in every project in this I-70 segment. Native trees, shrubs, herbaceous plants, and grasses will be incorporated into every new West Vail Pass project. The incorporation of new landscape is essential to restoring the natural appearance of land after construction and restoring the visual conditions of the corridor. [9]

Prescriptive Measures[10]

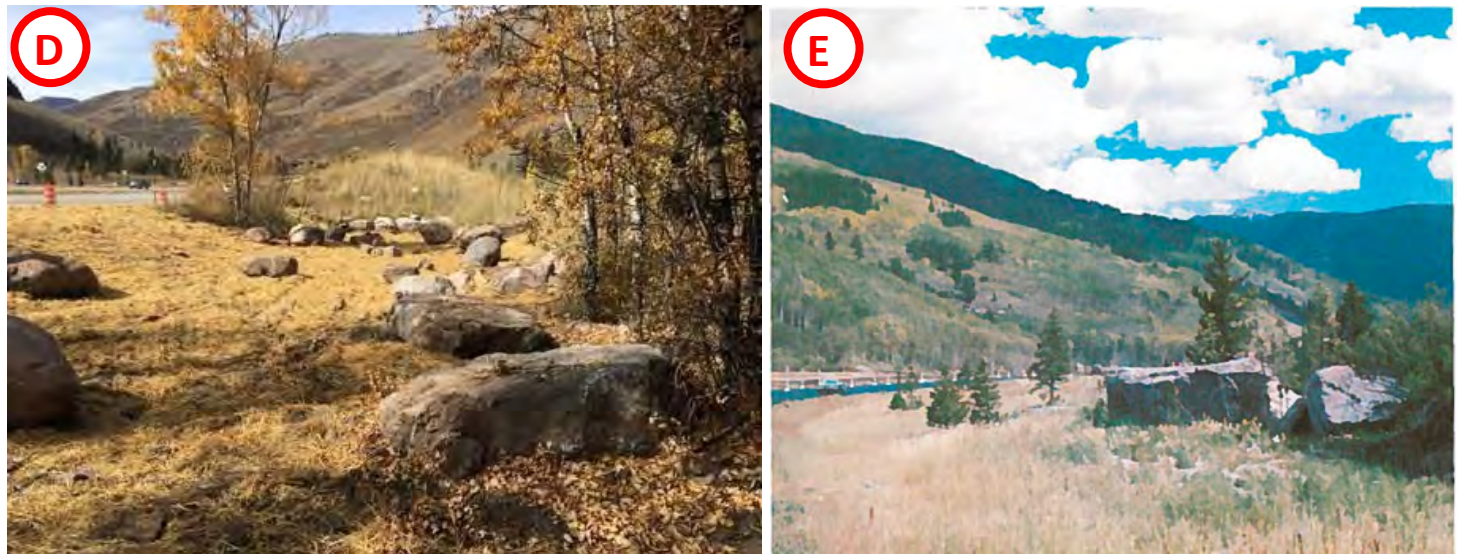
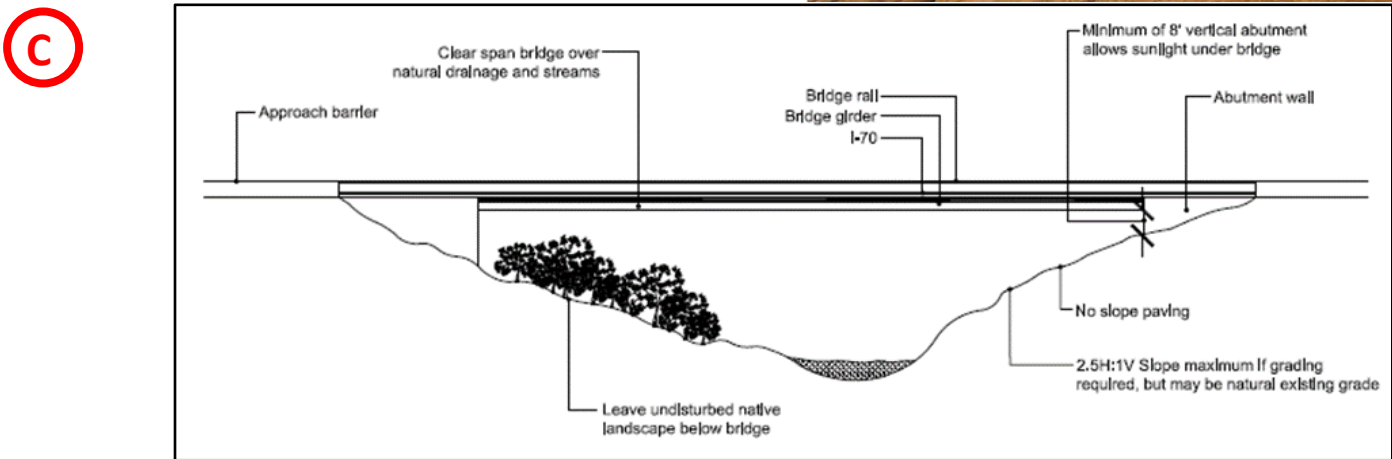
- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features. [10]
- New landscape constructed or installed in the historic district as part of the design, will be constructed to honor the original design in terms of scale, mass, materials, and workmanship to the extent possible. [10]
- Existing contributing landscape features of the historic district, which will be rehabilitated or reconstructed, will be designed to honor the aesthetic of the original design to the extent possible. [10]

Refer to Chapters 06 and 07, and CDOT Landscape Architecture Manual for additional design strategies to meet these Prescriptive Measures. [9, 15]

Design Strategies

Design strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Honor the original landscape design for Vail Pass by replicating the existing landforms in the surrounding natural environment, with the goal to make it difficult to discern change in the environment once construction is over. [10, 12, 13, 14] (Refer to photo A.)
- Blend existing rock and natural materials from the site with the landscape. Save and reuse native rock, stumps, and other natural materials in conditions such as boulder fields, talus slopes or ground cover that emulates the existing landscape. Reuse of existing materials should be considered part of the site design. [9, 12, 13] (Refer to photo A, B, D, and E and sketch C.)
- Plant selections should be reviewed for drought tolerance, salt and alkali tolerance, seedling vigor, fire retardant characteristics, growth habit, suitable soil groups, and seeding rates. Use native plants indigenous to Vail Pass and Black Gore Creek environment. [9, 12]
- Preserve and restore significant stands of vegetation impacted by recent construction or maintenance activities, especially along riparian corridors. [9, 11, 12, 15] (Refer to photo A and sketch C.)
- Evaluate sites for elevation, solar orientation, soil conditions, and Crest of the Rockies ecosystem types (sub-alpine, riparian, or montane). [9, 12]
- Recreate natural vegetation patterns and distribution of plants. Mimic surrounding conditions of plant density and spacing, species composition, and plant community structure. Restored plant communities should have variations in plant height, size, and width. [9, 15] (Refer to photos A, D, and E.)
- Minimize the linear effect of vegetation clearing. [9]
- Create a continuous habitat pattern by extending planting across the full extent of medians and roadway edges. [9]



08 – Landscape Planting, Revegetation, and Topsoil Management

Landscape Planting

Native trees, shrubs, herbaceous plants, and native grasses should be incorporated into every West Vail Pass project with site disturbance. The incorporation of new landscape is essential to restoring the natural appearance of land after construction and to restoring the visual conditions of the corridor.

Prescriptive Measures^[10]

- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features.^[10]
- New landscape constructed or installed in the historic district as part of the design, will be constructed to honor the original design in terms of scale, mass, materials, and workmanship to the extent possible.^[10]
- Existing contributing landscape features of the historic district, which will be rehabilitated or reconstructed, will be designed to honor the aesthetic of the original design to the extent possible.^[10]

Refer to Chapters 06 and 07, and CDOT Landscape Architecture Manual for additional design strategies to meet these Prescriptive Measures.^[9, 15]

Design Strategies

Design strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Prepare a landscape planting plan for projects with site disturbance to large visible areas of trees and shrubs in the corridor. All disturbed areas will be seeded with native grasses for erosion control.^[9, 12]
- Install less detailed planting designs where motorist viewers travel at high speeds, similar to planting designs for the original I-70 Vail Pass project. For example, consider planting areas viewed at high traffic speeds including clusters of trees, without understory shrubs, grouped by plant community and strategically located for year-around visibility. Distinctive wildflowers and forbs, with seasonal color or texture, could be seeded in large areas on slopes and medians visible the highway.^[12, 13] (Refer to photos A, B and D.)
- Complete a noxious weeds inventory and management to control noxious weeds and invasive plant species. In areas requiring revegetation, quickly establishing native species is the most effective method of controlling invasive weeds. Use biotic or organic forms of control, such as temporary mulches, to prevent invasive species from establishing.^[9, 12] (Refer to photo C.)
- Install more varieties of native trees, shrubs, forbs, and grasses where Vail Pass Recreation Trail users, traveling at slower speeds, can view planting areas. For example, the original design for I-70 on Vail Pass added wildflowers such as penstemon, primrose, fringed gentian, wild iris, columbine, aspen daisy, aspen, spruce, fir, lodgepole pine, willow and bog birch, and native alpine grasses next to the Vail Pass Recreation Trail.^[12, 13] (Refer to photos A, B, D, and E)
- Transplant vegetation to be disturbed by construction and from nearby sources, where feasible. Select plants based on size, location, soils, plant value, and potential survival rate. Salvaged plants can provide native specimens that would otherwise take years to establish.^[9, 12]
- Where existing native plants cannot be reused, chip salvaged woody plants and incorporate them into the topsoil where feasible, while still meeting topsoil requirements.^[9, 12]
- When seed collection is feasible for species native to Vail Pass, initiate process for native seed collection prior to construction. Collect native seed from sites near the revegetation area. Plan for seed collection as several factors can affect seed availability. If locally collected native seed is not available, acquire alternatives through seed companies or Bureau of Land Management nurseries.^[9]
- Source nursery stock grown from native plants sourced from plants originally from elevations similar to the study area, where possible. I-70 on West Vail Pass includes Rocky Mountain plant communities typical for elevations between 10,666 feet and 8,150 feet above sea level.^[9]
- Monitor revegetation during construction to ensure the specified materials and installation methods have been used.^[9]
- Monitor and maintain areas of revegetation and control weeds to make certain there is successful native plant establishment.^[9]
- Provide temporary watering to establish containerized native plants for the establishment period, at a minimum.^[9, 12]
- Utilize the ecosystem type (sub-alpine, riparian, wetland, or montane) plant palettes appropriate to this design segment as a starting point to develop a full revegetation plant list tailored to Vail Pass.^[9, 12]
- Incorporate the FHWA Operation Wildflower Program for native Vail Pass forbs in revegetation efforts.^[9, 12]
- Maintain 30 feet clear of new trees and tall shrubs from the edge of highway pavement for plowed snow storage and thrown snow. Avoid planting trees and shrubs in this snow throw zone. Plant salt tolerant native grasses, forbs, and low shrubs with irregular edges, mimicking existing native plant communities adjacent to the roadside. Consider wildlife movements with new shrubs and tree locations at wildlife underpass entrances.^[12]



08 – Landscape Planting, Revegetation, and Topsoil Management

Landscape Plant Palette A landscape planting plan will be included in every project with site disturbance to large visible landscape areas in the corridor. [9, 12]

Montane Ecosystem (8,000 to 9,500 feet) Native Species ^[9]			Sub-alpine Ecosystem (9,500 to 11,500 feet) Native Species ^[9]			Riparian Ecosystem Native Species ^[9]	
Trees	Shrubs	Perennials/Grasses	Trees	Shrubs	Perennials/Grasses	Trees	Shrubs
<ul style="list-style-type: none">▪ White Fir, <i>Abies concolor</i>▪ Engelmann Spruce, <i>Picea engelmannii</i>▪ Colorado Spruce, <i>Picea pungens</i>▪ Lodgepole Pine, <i>Pinus contorta latifolia</i>▪ Limber Pine, <i>Pinus flexilis</i>▪ Ponderosa Pine, <i>Pinus ponderosa</i>▪ Southwestern White Pine, <i>Pinus strobiformis</i>▪ Narrowleaf Cottonwood, <i>Populus angustifolia</i>▪ Douglas Fir, <i>Pseudotsuga menziesii</i>▪ Rocky Mountain Juniper, <i>Juniperus scopulorum</i>▪ Bristlecone Pine, <i>Pinus aristata</i>▪ Pinon Pine, <i>Pinus edulis</i>▪ Quaking Aspen, <i>Populus tremuloides</i>▪ Gambel Oak, <i>Quercus gambelii</i>	<ul style="list-style-type: none">▪ Mountain Mahogany, <i>Cercocarpus montanus</i> ^[a]▪ Red Twig Dogwood, <i>Conus sericea</i>▪ Western Chokecherry, <i>Prunus virginiana</i>^[b]▪ Rocky Mountain Willow, <i>Salix monticola</i>▪ Native Mountain Ash, <i>Sorbus scopulina</i>▪ Rock Spirea, <i>Holodiscus dumosus</i>▪ Whitestem Currant, <i>Ribes inerme</i>▪ Bristly Currant, <i>Ribes lacustre</i>▪ Western Thimbleberry, <i>Rubus parviflorus</i>▪ Red-Berried Elder, <i>Sambucus racemosa</i>▪ Bearberry, <i>Arctostaphylos patula</i>▪ Kinnikinnik, <i>Arctostaphylos uva-ursi</i>▪ Silver Sagebrush, <i>Artemisia cana</i>	<ul style="list-style-type: none">▪ Aspen Daisy, <i>Erigeron speciosus</i>▪ Blanket Flower, <i>Gaillardia aristata</i>▪ Sticky Geranium, <i>Geranium viscosissimum</i>▪ Fairy Trumpets, <i>Ipomopsis aggregate</i>▪ Blue Flax, <i>Linum lewisii</i>▪ Bee Balm, <i>Mondarda fistulosa</i>▪ White-Tu'ed Evening Primrose, <i>Oenothera caespitosa</i>▪ Pasque Flower, <i>Pulsatilla patens</i>▪ Scarlet Bugler Penstemon, <i>Penstemon barbatus</i>▪ Mat Penstemon, <i>Penstemon caespitosus</i>▪ Smooth Penstemon, <i>Penstemon glaber</i>▪ Shell Leaf Penstemon, <i>Penstemon grandiflorus</i>	<ul style="list-style-type: none">▪ Sub-Alpine Fir, <i>Abies lasiocarpa</i>▪ Engelmann Spruce, <i>Picea engelmannii</i>▪ Lodgepole Pine, <i>Pinus contorta latifolia</i>▪ Limber Pine, <i>Pinus flexilis</i>▪ Douglas Fir, <i>Pseudotsuga menziesii</i>▪ Thinleaf Alder, <i>Alnus tenuifolia</i>^[a]▪ Bristlecone Pine, <i>Pinus aristata</i>▪ Quaking Aspen, <i>Populus tremuloides</i>^[b]	<ul style="list-style-type: none">▪ Mountain Mahogany, <i>Cercocarpus montanus</i>^[a]▪ Native Mountain Ash, <i>Sorbus scopulina</i> ^[b]▪ Bog Birch, <i>Betula glandulosa</i>▪ Bristly Currant, <i>Ribes lacustre</i>▪ Red-Berried Elder, <i>Sambucus racemose</i>^[b]▪ Kinnikinnik, <i>Arctostaphylos uva-ursi</i>▪ Common Juniper, <i>Juniperus communis Montana</i>▪ Shrubby Cinquefoil, <i>Potentilla fruticosa</i>▪ Woods Rose, <i>Rosa woodsii</i>▪ Russet Buffaloberry, <i>Shepherdia Canadensis</i>^[a]	<ul style="list-style-type: none">▪ Pearly Everlasting, <i>Anaphalis margaritacea</i>,▪ Pussytoes, <i>Antennaria parvifolia</i>▪ Colorado Columbine, <i>Aquilegia caerulea</i>▪ Golden Columbine, <i>Aquilegia chrysantha</i>▪ Fringed Sage, <i>Artemisia frigida</i>▪ Silver Sage, <i>Artemisia ludoviciana</i>▪ Prairie Smoke, <i>Geum triflorum</i>▪ Silver Lupine, <i>Lupinus argenteus</i>▪ Sulphur Flower, <i>Eriogonum umbellatum</i>▪ Rocky Mountain Penstemon, <i>Penstemon strictus</i>▪ Bluemist Penstemon, <i>Penstemon virens</i>▪ Wand Bloom Penstemon, <i>Penstemon virgatus</i>▪ Showy Goldeneye, <i>Viguera multiflora</i>▪ Needle Grass, <i>Stipa neesiana</i>	<ul style="list-style-type: none">▪ Box Elder, <i>Acer negundo</i>▪ Narrowleaf Cottonwood, <i>Populus angustifolia</i>▪ Balsam Poplar, <i>Populus balsamifera</i>▪ Plains Cottonwood, <i>Populus sargentii</i>▪ Douglas Fir, <i>Pseudotsuaga menziesii</i>▪ Blue Spruce, <i>Picea pungens</i>▪ Engelmann Spruce, <i>Picea engelmannii</i>▪ Peachleaf Willow, <i>Salix amygdaloides</i>▪ Rocky Mountain Juniper, <i>Juniperus scopulorum</i>▪ Thinleaf Alder, <i>Alnus incana tenuifolia</i>^[a]	<ul style="list-style-type: none">▪ Mountain Willow, <i>Salix monticola</i>▪ Drummond's Willow, <i>Salix drummondiana</i>▪ Narrowleaf Willow, <i>Salix exigua</i>▪ Bluestem Willow, <i>Salix irrorata</i>▪ Pacific Willow, <i>Salix lucida</i>▪ Snowberry, <i>Symphoricarpos alba</i>▪ Rocky Mountain Maple, <i>Acer glabrum</i>▪ River Birch, <i>Betula fontinalis</i>▪ Red-Osier Dogwood, <i>Cornus sericea</i>▪ River Hawthorn, <i>Crataegus rivularis</i>▪ Stretchberry, <i>Forestiera pubescens</i>▪ Chokecherry, <i>Prunus virginiana</i>▪ Skunkbrush, <i>Rhus trilobata</i>

[a] Rocky Mountain Actinorhizal Plant Species

[b] Plant species suggested for planting below avalanche protection fencing

Wetlands

Recommended Species for Wetland Restoration		
<ul style="list-style-type: none">▪ Baltic Rush, <i>Juncus balticus</i> ^[c]▪ Drummond's Rush, <i>Juncus drummondii</i>▪ Dagger-leaf Rush, <i>Juncus ensifolius</i>▪ Common Spike-rush, <i>Eleocharis palustris</i>▪ Bluejoint, <i>Calamagrostis canadensis</i>	<ul style="list-style-type: none">▪ Tufted Hairgrass, <i>Deschampsia caespitosa</i>▪ Leafy Tussock Sedge, <i>Carex aquatilis</i>▪ Small-Wing Sedge, <i>Carex microperta</i>▪ Wooly Sedge, <i>Carex pellita</i>▪ Arrow-leaf Ragwort, <i>Senecio triangularis</i>	<ul style="list-style-type: none">▪ Tall Fringe Bluebells, <i>Mertensia ciliata</i>▪ Large Mountain Bittercress, <i>Cardamine cordifolia</i>▪ Fendler's Meadow-rue, <i>Thalictrum fendleri</i>▪ Large-leaf Avens, <i>Geum macrophyllum</i>▪ Columbian Monkshood, <i>Aconitum columbianum</i>

[c] Salt tolerant species suggested for planting in roadside drainage ditches

08 – Landscape Planting, Revegetation, and Topsoil Management

Topsoil Management

Salvaging, storing, and redistributing topsoil in all disturbed areas is a required practice throughout the West Vail Pass corridor. The native topsoil contains a natural seed bank, moisture-retaining capacity, and nutrients to support plant growth. When these resources are managed properly, successful revegetation and long-term restoration can be achieved. Restoring disturbed areas eliminates the appearance of artificial construction, thereby creating an authentic representation of the site’s natural conditions.^[9]

Prescriptive Measures^[10]

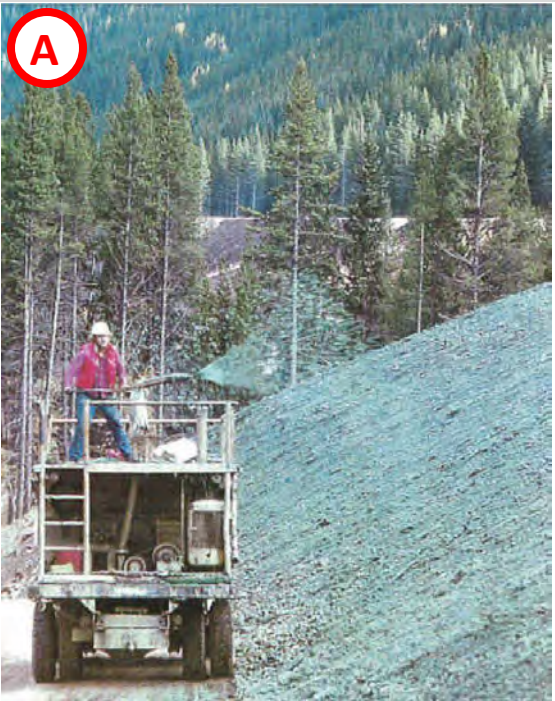
- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features.^[10]
- New landscape constructed or installed in the historic district as part of the design, will be constructed to honor the original design in terms of scale, mass, materials, and workmanship to the extent possible.^[10]
- Existing contributing landscape features of the historic district, which will be rehabilitated or reconstructed, will be designed to honor the aesthetic of the original design to the extent possible.^[10]

Refer to Chapter 06, and CDOT Landscape Architecture Manual for additional design strategies to meet these Prescriptive Measures.
^[9, 15]

Design Strategies

Design strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Collect native topsoil from CDOT approved locations on-site to support plant growth and establishment with this valuable source of native plant seed and soil microorganisms. Carefully remove, stockpile, and store the native topsoil of new construction projects to be used for final bedding material. Make sure native soil stockpiles are protected from the wind to avoid erosion and the creation of a dust hazard.^[9, 15]
- Where possible, store and maintain topsoil in separate piles based on source locations. For example, topsoil harvested from riparian corridors located away from roadway runoff will be stored separately from soils harvested from roadside ditches. Upland topsoil, wetland topsoil, and other topsoil types will be stored in the same manner.^[12]
- Take representative topsoil samples for each of the topsoil harvest locations. Label topsoil stockpiles and record their source location on maps with the dates each topsoil was harvested.^[12]
- Topsoil stockpiles should be located as close as possible to their harvest locations.^[12]
- Where possible, reuse topsoil harvested or stored topsoil in nearby areas with similar topsoil conditions. Prior to start of construction or locating material storage areas, biologists, and landscape architects shall approve locations of different topsoil to be harvested and their stockpile locations. One option to salvage and store topsoil includes scraping topsoil layers to the edge of the construction area and stockpiling as windrows.^[12]
- To restore native plant communities, analyze the soil on the site to determine the need for fertilizers and pH amendments. This is particularly important if there is insufficient native topsoil on site.^[9]
- Include erosion protection control measures for topsoil stockpiles, especially for stockpiles that would remain over the winter and be subject to erosion due to snow and weather.^[12, 15]
- Apply a prescribed soil treatment. Treatments such as plowing, disking, harrowing, furrowing, and hydroseeding can help with successful reestablishment, as does applying mulches (such as certified straw) and tackifiers. Soils should be roughened before planting to create favorable seed sites, particularly for grass and forb seeds.^[9]
- Mulching should be used to reduce visual degradation with dust and erosion impacts and promote successful revegetation.^[9] (Refer to photos A and B.)
- Utilize soil retention netting, mulch, and other revegetation techniques to improve chances of successful re-establishment.^[9] (Refer to photo C.)
- Implement discing stair step grading methods or groove cutting (or similar methods) on steep and highly erodible slopes to slow soil erosion and create micro benches for faster plant establishment.^[12]



9 – Wildlife Fencing and Crossings

Wildlife corridors and crossings planned for inclusion in the I-70 segment on West Vail Pass should allow animals to move naturally without physical barriers. Wildlife crossings should provide for species-appropriate clearances, clear sight lines, and buffering that creates usability for animals. Wildlife protection fence design will strive to blend into the environment and use similar and complimentary materials throughout the I-70 Mountain Corridor. ^[9, 12]

Prescriptive Measures^[10]

- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features.^[10]
- New structures and features constructed or installed in the historic district as part of the design, including wildlife underpasses and landscape, will be constructed to honor the original design in terms of scale, mass, materials, and workmanship to the extent possible.^[10]
- Existing contributing structures and features of the historic district will be rehabilitated or reconstructed, including the road alignment and shoulders, retaining walls, landscape features, the Vail Pass Recreation Trail, the emergency runaway truck ramps, and median walls, which will be designed to honor the aesthetic of the original design to the extent possible.^[10]

Refer to Chapters 03 and 06 and CDOT Landscape Architecture Manual for additional design strategies to help meet these Prescriptive Measures.^[12, 15]

Design Strategies

Design strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- To minimize visibility of wildlife crossings from the Vail Pass Recreation Trail, US 6 or I-70, wildlife underpass entrances should incorporate native materials, such as strategically-placed plants, boulders, logs or stumps on the ground surface next to entrances.^[9, 15] (Refer to photo B.)
- Consider wildlife habitat requirements when selecting seed mixes, shrub and tree species and plant community locations. Native vegetation cover is especially important for small animal wildlife crossings and to replicate historic landscape features.^[12]
- Preserve existing trees, shrubs, and tree stumps from felled trees in front of underpasses, where possible.^[12]
- Install boulders and stumps at entrances to wildlife underpasses to deter underpass use by humans, especially with motorized transportation, and to satisfy historic landscape feature requirements.^[12]
- Use wooden pressure-treated posts with high tensile strength wire tinted to blend with landscape in the construction of wildlife fencing to look as natural as possible. Use field color matching techniques to select colors of environmentally and animal-safe stains for metal and wood fence components.^[9, 12, 15] (Refer to photos C, D, E, and F.)
- Visually buffer wildlife fencing by integrating fencing into existing landforms and away from the road edge where possible. Plant native trees and shrubs to screen fencing from roadway and trail views where possible. Anchor the ends of fencing into landforms, rock faces, or structures rather than simply terminating posts and wire.^[9, 12, 15]
- Coordinate locations of wildlife fencing with avalanche protection structures. Use one structure for both purposes to reduce visual clutter, if possible. Ensure wildlife fencing is placed in a location where it is not routinely damaged by avalanche flows.^[12]
- Integrate wildlife fencing, snow storage, and roadside ditch and sediment basin design with cut/fill slope design.^[12]
- Replace and repair wildlife fencing and gates with items finished with similar and complimentary material and colors matching that originally installed.^[12]



10 – Community Interface

Protecting Adjacent Communities and Connections

A thoughtful transition between I-70 on West Vail Pass and the adjacent East Vail neighborhood will help buffer visual impacts and preserve the quality of life for residents living and working next to I-70. Highway improvements, landscape, earthwork, and structural solutions should include an evaluation of their potential interface with the adjacent East Vail neighborhood. Recreation Trail and bridge designs that facilitate pedestrian and multi-modal connections across I-70 strengthen mobility within the Vail community and encourage successful land use patterns and circulation to recreational or cultural facilities. Access from East Vail to the Vail Pass Recreation Trail and the US Forest Service (USFS) Gore Creek Campground should be highlighted to visually communicate their importance to Vail visitors. [9, 12].

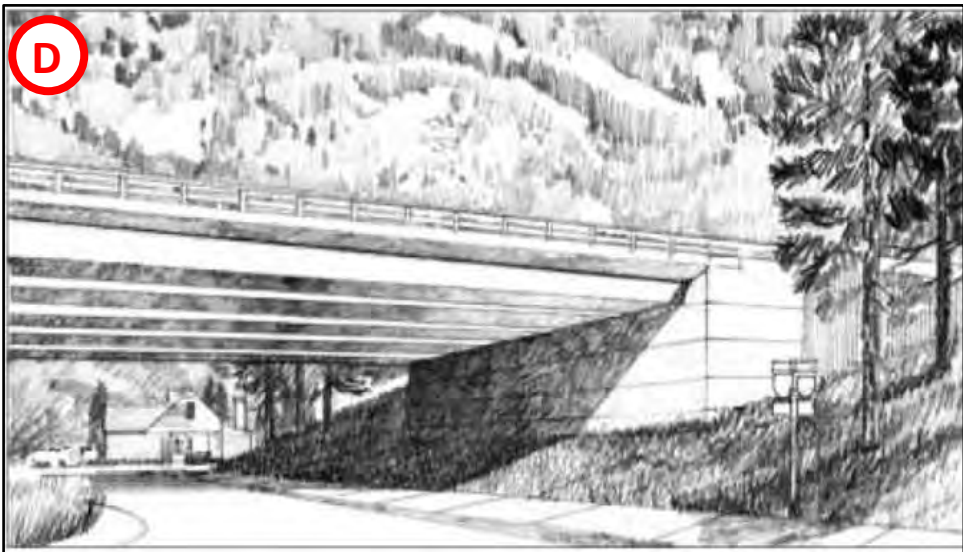
Prescriptive Measures^[10]

- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features. [10]
- New structures and features constructed or installed in the historic district as part of the design, including bridges, retaining walls, wildlife underpasses, landscape, and signage will be constructed to honor the original design in terms of scale, mass, materials, and workmanship to the extent possible. [10]
- Existing contributing structures and features of the historic district will be rehabilitated or reconstructed, including the road alignment and shoulders, retaining walls, landscape features, the Vail Pass Recreation Trail, the emergency runaway truck ramps, and median walls, which will be designed to honor the aesthetic of the original design to the extent possible. [10]

Design Strategies

Design strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Design I-70 improvements in partnership with the Vail community, agencies, and future project planners to create a buffer and transition from I-70 to community-oriented land uses. Landscape, earthwork, and structural solutions may be used to create appropriate transitions based on the adjacent land uses and character. [9, 12] (Refer to photo A as an example of landscape character of the Gore Valley Trail in East Vail.)
- Promote safe I-70 pedestrian crossings in conjunction with existing or planned Town of Vail pedestrian circulation networks. Pedestrian networks should promote links between the Vail Pass Recreation Trail and the Gore Valley Trail, community parks, and other cultural attractions or businesses. [9, 12] (Refer to photos B, C, and D for an example of how the I-70 East Vail Interchange overpass, a contributing feature to the eligible historic district, could be rehabilitated or reconstructed to promote safe I-70 pedestrian crossing and integrate the highway structure with the natural Vail Valley landscape.)
- Consider design alternatives that improve community interface. The East Vail Interchange at mile point (MP) 180 is a local access connection with I-70 to primarily residential land uses, the Gore Valley Trail and the Vail Pass Recreation Trail. (Refer to photo B and sketch D.) It also provides a connect to the USFS Gore Creek campground. [9, 12] (Refer to photo C.)
- Preserve views to major site resources and features such as topography, unique vegetation, geological features, wetlands, and other qualities important to Town of Vail residents, where possible. [11, 12]
- Refer to CDOT Landscape Architecture Manual for additional design strategies for successful community interface. [15]



11 – Sound Attenuation

A goal for the corridor is to eliminate the need for sound attenuation through facility design.^[9] Alternatives to sound walls should be considered in the search for sound attenuation solutions. Sound walls should be avoided where possible. Cases in which sound walls are obligatory, such as those where right-of-way space is lacking, walls should incorporate landscape features and earth forms, where possible.^[9]

Prescriptive Measures^[10]

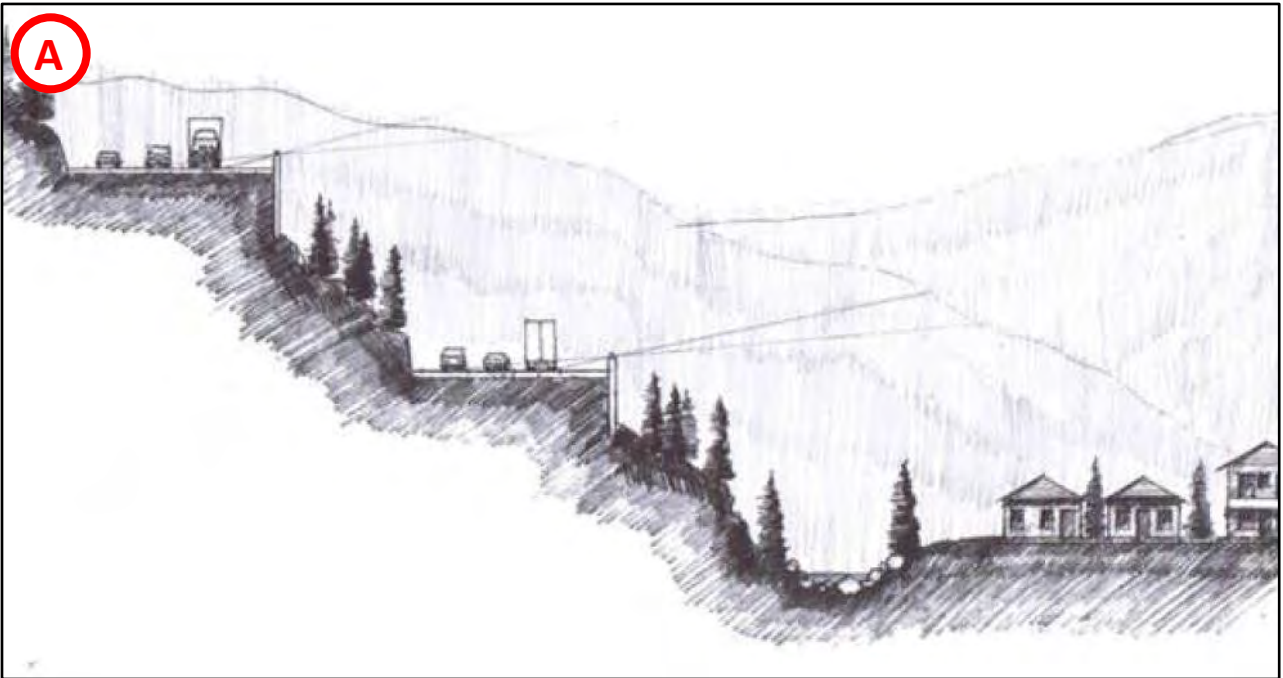
- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features.^[10]
- New structures and features constructed or installed in the historic district as part of the design, will be constructed to honor the original design in terms of scale, mass, materials, and workmanship to the extent possible.^[10]

Refer to Chapter 05 and the CDOT Landscape Architecture Manual for additional ideas for aesthetic design for sound attenuation.^[15]

Design Strategies

Design strategies help meet I-70 West Vail Pass goals and mitigation measures for aesthetics.

- CDOT's district noise specialist in the Environmental Programs Branch should be consulted to identify whether a noise analysis is required to determine the need for noise barriers. Sound abatement is regulated by federal regulations and CDOT's noise policy.^[12]
- Where noise mitigation is required, use landform and berm-forming strategies or integrated landform and wall systems for noise protection rather than stand-alone sound walls, where feasible and cost reasonable per noise abatement criteria.^[9, 12] (Refer to sketch A.)
- Incorporate a 90-degree stepped or sinuous horizon line at the top of walls. Elevation changes should be 6 inches to 24 inches tall. Angular and irregular designs are not appropriate for this segment.^[9]
- Avoid placing sound walls on top of concrete vehicle barriers. Where a wall must be constructed on concrete barrier, minimize the visual disruption between the two systems, so the barrier visually anchors and supports the sound wall. Coordinate color and finishes between barrier and wall to create visual consistency between the structures. As an alternative, install sound walls separate and parallel to barriers, leaving at least 8 feet between.^[9, 12, 15] (Refer to photo B for an example of existing sound wall on vehicle barrier between I-70 and East Vail neighborhood.)
- Where sound walls are required, include simple smooth concrete textures on both sides with staining to match the Vail Pass color palette.^[12] (Refer to photos B and C for existing sound walls next to East Vail neighborhood.)
- Motifs or pictorial representations are not to be used on I-70 West Vail Pass sound walls.^[9, 12]
- Aesthetic treatments can be considered on sound walls facing East Vail neighborhood with coordination and a signed agreement regarding costs and maintenance.^[9]
- Integrate sound walls into the right-of-way of the segment with landscape planting as a transition between sound walls and the roadway. The use of grading and earthwork in the landscape area will allow for reductions in the height of the exposed sound walls.^[9] (Refer to sketch A and photo C.)
- Use variable grade options and landscape screening on both sides of the sound wall, where feasible, to limit the height of the exposed wall to 12 feet.^[9, 12] (Refer to photo C.)
- Replace and repair sound walls visible from the highway or town of Vail neighborhoods with panels and supporting elements matching the colors and materials meeting the Vail Pass color palette from the original installation.^[12]



12 – Avalanche Mitigation Measures

CDOT would like to reduce the risk of avalanches from deep snow accumulations on Vail Narrows slopes from hitting the I-70 travel lanes (MP 186 to 186. 5). CDOT's strategy to protect I-70 from avalanche would be to install snow fence, avalanche umbrellas, or other avalanche mitigation measures on the forest and rock slopes above the highway to hold the snow on the slope through the winter season. Permanent avalanche mitigation measures should visually blend into the environment, avoid permanent landscape disturbance, and minimize negative visual effects. [19]

Prescriptive Measures^[10]

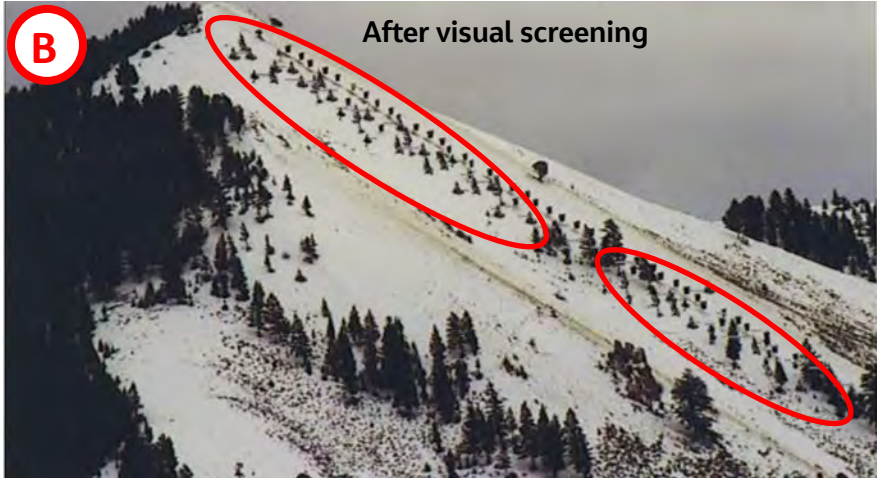
- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features. [10]
- New structures and features constructed or installed in the historic district as part of the design, will be constructed to honor the original design in terms of scale, mass, materials, and workmanship to the extent possible. [10]

Refer to Chapters 05, 06, and 08 for additional design strategies to accomplish these Prescriptive Measures.

Design Strategies

Design strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Restore areas disturbed by construction with a landscape planting pattern that resembles the existing adjacent natural plant communities and helps blend avalanche mitigation structures into the landscape. (Refer to photo A displaying a visual simulation of tree planting next to snow fencing.) [12]
- Plant Aspen, Mountain Ash, Red-berried Elder, and Western Chokecherry below avalanche control structures. Tree species would be selected based on the appropriate size for the specific location. [12]
- Use visual photo simulations to minimize negative visual effect to the Vail Pass scenic resources to from avalanche mitigation structures and reforestation. [12] (Refer to photos A and B.)
- Visually buffer snow fence, snow umbrellas or other avalanche mitigation equipment by integrating structures into existing landforms and away from motorists and recreation users where possible. [12]
- Snow avalanche mitigation equipment will be made of naturally colored material to meet the Vail Pass color palette (i.e., Forest Service Brown, or matching colors) as approved by CDOT landscape architect. [12] (Refer to photos C and D.)
- Avoid using straight lines when placing structures in long segments along or across open areas, where feasible. [12]
- Avoid placing structures along ridgetops where structures would be visible as a human made horizon feature, where feasible. [12]



13 – Roadside Facilities

Chain Stations, Truck Pull-Outs and Maintenance Shed

New or rehabilitated chain stations, truck pull-out lanes/parking areas, and the maintenance shed and yard along I-70 on West Vail Pass will be designed in conjunction with the roadway as a complete design effort. The utilization of colors, materials, architectural elements, and plant communities that are reflected in the adjacent landscape will integrate these facilities into the surrounding Vail Pass context. Roadside facilities that are directly related to safety and maintenance – such as chain stations and maintenance facilities– should remain dedicated to those specific functions. Visually screening maintenance and equipment areas will limit visual clutter and ensure a consistent relationship among the roadway, the traveler, and the surrounding natural Vail Pass environment. [9, 12].

Prescriptive Measures^[10]

- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features. ^[10]
- New structures and features constructed or installed in the historic district as part of the design, including bridges, retaining walls, wildlife underpasses, landscape, and signage will be constructed to honor the original design in terms of scale, mass, materials, and workmanship to the extent possible. ^[10]
- Existing contributing structures and features of the historic district will be rehabilitated or reconstructed, including the road alignment and shoulders, truck pull-out lanes and parking areas, retaining walls, landscape features, and median walls, which will be designed to honor the aesthetic of the original design to the extent possible. ^[10]

Refer to Chapters 05, 15, and 17 for additional design strategies to accomplish these Prescriptive Measures.

Design Strategies

Design strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Research and review the I-70 Chain Station Study and all appropriate documents and plans associated with truck parking, chain stations, and CDOT maintenance facility, including restrooms at truck parking areas, and other road service facilities that have been previously prepared. ^[9, 12]
- Design road service areas to consider scenic site resources and features such as topography, views and vistas, unique vegetation, geological features, wetlands, and other qualities native to the site and its surroundings. ^[9]
- Mitigate unfavorable visual appearances by utilizing landform and landscaped buffers. ^[11, 12] (Refer to photos A and B for views of existing conditions in need of visual aesthetic enhancements to blend with the adjacent alpine landscape.)
- Use local materials, plantings, and landscape features to blend new facilities seamlessly with the surrounding landscape. ^[9]
- During design of new or reconstructed facilities, consider using visual photo simulations to select designs that minimize negative visual effect to scenic viewsheds for motorists and recreation users. ^[12]
- Include building color aesthetic guidance to be applied to all parts of the building and all associated structures. ^[12]
- Scale light levels and the height of light poles appropriately, and direct light toward the ground are to be illuminated to ensure preservation of the night sky. ^[9, 11]



14 – Advanced Guideway System

Design the Advanced Guideway System (AGS) along the I-70 segment of West Vail Pass considering other Aesthetic Guidance that applies to I-70 in order to develop a uniform, comprehensive design solution for the corridor. Structures that support transit infrastructure should share a design language that is common in form, color, and material to that used for the highway. This consistency will apply across all transit-associated facilities, including stations, yet allow several opportunities for location specific elements. [9]

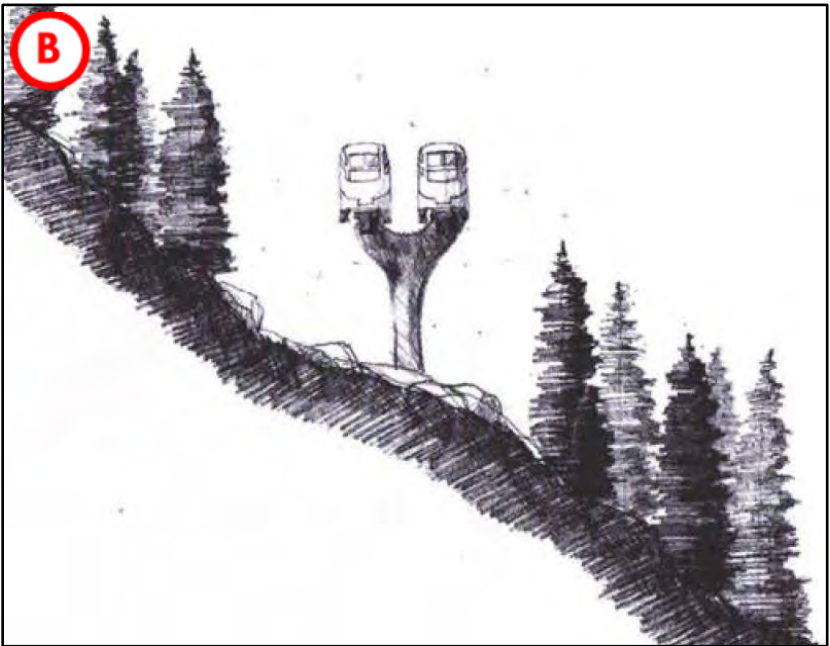
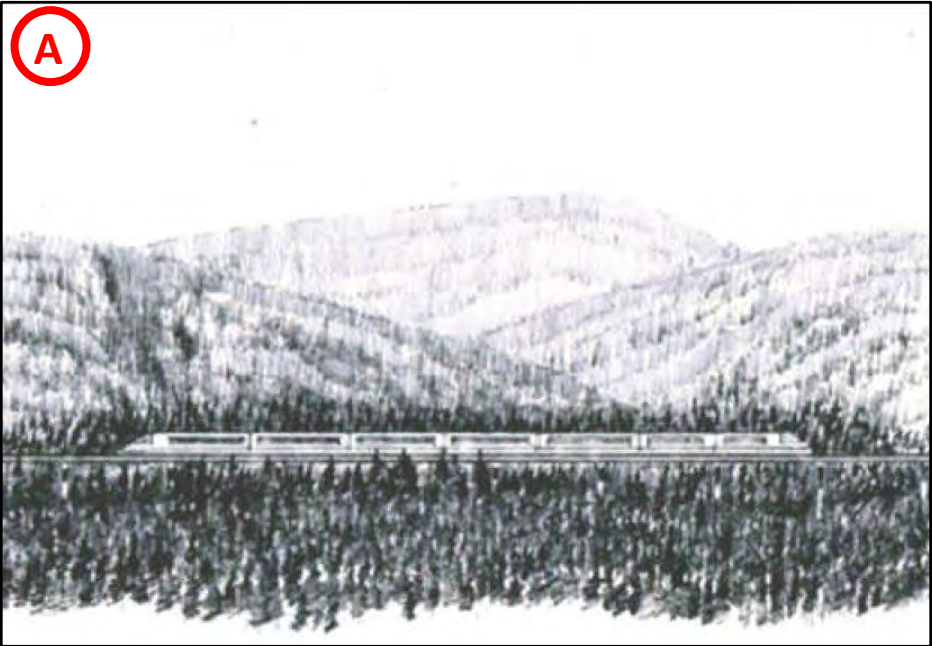
Prescriptive Measures^[10]

- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features. [10]
- New structures and features constructed or installed in the historic district as part of the design, including bridges, retaining walls, wildlife underpasses, landscape, and signage will be constructed to honor the original design in terms of scale, mass, materials, and workmanship to the extent possible. [10]

Design Strategies

Design strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Coordinate the location of transit support facilities throughout the I-70 Mountain Corridor with the Rocky Mountain Rail Authority High Speed Rail Feasibility Study and the I-70 Coalition Transit Land Use Study or the most recent transit implementation study. [9] (Refer to sketches A and B.)
- Transit facilities should be designed comprehensively to include architecture, engineering, and landscape architecture. [9]
- Apply roadway Aesthetic Guidance to transit facilities. [9]
- Avoid locating the AGS where it can be viewed silhouetted against the sky. [9]



15 – Lighting

Corridor lighting along the I-70 segment on West Vail Pass will satisfy safety and functional needs while avoiding excessive light levels and high mast lighting applications. Light spillage and encroachment will be avoided in consideration of adjoining neighborhoods and the protection of the dark night sky. [9]

Prescriptive Measures [10]

- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features. [10]
- New structures and features constructed or installed in the historic district as part of the design, including lighting will be constructed to honor the original design in terms of scale, mass, materials, and workmanship to the extent possible. [10, 12]

Refer to Chapters 04, 05, and 17 for additional design strategies to accomplish these Prescriptive Measures.

Design Strategies

Design strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Lighting designs should address lighting from multiple perspectives – including, but not limited to, minimum transportation lighting requirements, impacts on wildlife and recreation, and East Vail residential neighborhood perspectives. [9, 12]
- Focus attention on luminance versus illumination (i.e., brightness of pavement versus brightness of light) when establishing light levels to be provided. [9]
- Use lighting fixtures that minimize light pollution and glare, provide even light dispersion, and fully conceal the light source. Use fixtures without up light (U0 rating.) U0 has the same meaning as full-cutoff but is updated terminology to reflect new LED technology. [9, 17]
- Avoid high mast lighting as it is not appropriate for this segment. [9]
- Avoid metal halide light sources. [9]
- Design lighting in accordance with the policies and programs of the International Dark Sky Association to minimize light pollution along the corridor. [9]
- Scale light levels and the height of light poles appropriately to ensure preservation of the night sky. [9, 11]
- Use intelligent lighting systems for roadside facilities that are only functional during specific situations – for example, recent lighting upgrades at chain stations only activate when the chain law is in effect. [9]
- Ensure that lights are on only when necessary (i.e., at chain stations ensure that lights are on only when chain-up or chain-down is necessary). [9, 12]
- Select an elegant and simple pole configuration that match Vail Pass light styles, colors, and materials. [9, 12] (Refer to photos A and B.)
- Use a durable, powder-coated color finish for light poles and fixtures to meet CDOT state luminaire standards and match the Vail Pass design segment color palette. [9, 12, 17] (Refer to photo C.)
- Replace and repair luminaires, poles and arms, cameras, pole base covers, and other lighting equipment with items finished with materials and color matching the Vail Pass color palette. [12, 17]



16 – Signage

The traveler should enjoy the beauty of the surrounding landscape, and the traveler’s dominant experience should be a clear and intuitive visual scene that is free of the clutter caused by signs of various types, sizes, materials, and purposes. Signage should be kept to a minimum. Where it is used, it should be simple and elegant – constructed with a palette of consistent, high-quality materials and colors. Commercial billboard and advertisement signage affect the visual integrity of the landscape and are not appropriate for the Vail Pass corridor. [9, 12]

Prescriptive Measures^[10]

- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features. [10]
- New structures and features constructed or installed in the historic district as part of the design, including signage will be constructed to honor the original design in terms of scale, mass, materials, and workmanship to the extent possible. [10, 12]

Refer to Chapters 04, 05, and 15 for additional design strategies to accomplish these Prescriptive Measures.

Design Strategies

Design strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Design all signage to meet all applicable CDOT and FHWA Manual on Uniform Traffic Control Devices (MUTCD) standards. [9]
- For Recreation Trail signage, follow Sign and Poster Guidelines for Forest Service (EM 7100-15), including MUTCD Traffic Controls for Bicycle Facilities standards. Use consistent color and material for all Recreation Trail signs. [12, 17] (Refer to photos B and C.)
- Signing plans will be prepared as part of the design process. The location and size of overhead signs that have the potential to impact project sightlines will be evaluated during the design process including FIR and FOR review process. Early identification of potential impacts to sight lines by signs is desirable to avoid or minimize impacts to sight lines. [9, 12]
- Apply a consistent material, color, and finish to signage support structures to match the Vail Pass color palette. [9, 12]
- Construct signs of a high quality and durable material. Consider durable, powder-coated color finishes like light pole finishes. Refer to Chapter 15. [9, 12]
- Use single arm monotube systems with one or two posts to support overhead highway signage rather than complex steel trusses to reduce visual clutter. [9, 12] (Refer to photo D.)
- Limit signage on the roadway and Recreation Trail to identify safety issues, road services, communities, and cultural, recreational, or historical points of interest. [9, 12] (Refer to photos A and C.)
- Integrate Recreation Trail and highway signage into bridge structures, where feasible. Eliminate a tacked-on appearance by considering placement as an early component of design. [9, 12]
- Replace and repair signs, sign poles and arms, pole base covers, and other sign equipment with items finished with similar and complementary materials and color matching the Vail Pass color palette. [12, 17]



17 – Utilities

Utility infrastructure, such as electrical power, gas distribution lines and communication lines, can create poor visual quality in the West Vail Pass corridor. Burying overhead lines, relocating them, and reducing the crossing of utility lines over the highway will avoid visual degradation. These scenic improvement opportunities must be considered for West Vail Pass projects. [9, 12]

Prescriptive Measures^[10]

- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features. [10]

Refer to Chapters 04, 05, and 06 for additional design strategies to accomplish these Prescriptive Measures. [9, 12]

Design Strategies

Design strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Consider placing utility lines underground to minimize conflict with high-value views and improve scenic and visual appearance. [9] (Refer to photos A and B.)
- Add landscape plantings and landforms to screen and block views from the transportation corridor toward existing utility corridors. [9]
- Avoid straight-line cut patterns in forests or dense vegetation. Varying cuts will create a feathered or irregular pattern, providing a more natural appearance. [9] (Refer to photos A and C.)
- Apply the appropriate color to visible utility equipment from the Vail Pass design segment color palette. [9, 12, 17] (Refer to photo C and D for examples of poles (not the attached boxes and cameras) matching the Vail Pass color palette for Forest Service Brown.)
- Replace and repair utility poles, arms and base covers; cameras, luminaires, and other pole mounted utility equipment; ground-mounted utility boxes, and other metal utility with items finished with similar and complementary materials and color matching the Vail Pass color palette. [12, 17]



18 – Construction Material Management

Materials used for construction will be managed to minimize the negative aesthetic implications of construction logistics. [9]

Prescriptive Measures^[10]

- Using the original I-70 design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features. ^[10]
- Existing contributing features of the historic district will be rehabilitated or reconstructed, including landscape and landscape features, which will be designed to honor the aesthetic of the original design to the extent possible. ^[10]

Design Strategies

Design Strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Materials acquisition, storage, and clearance of excess cut and fill, and the disposal of waste materials will be predetermined and controlled on a project-by-project basis to assist in anticipating where materials may be stored and sourced. ^[9, 12]
- Do not stockpile construction materials in medians, road shoulders, or other areas of high visual or recreational value beyond the life of the construction project. ^[9, 12] (Refer to photos A and B showing visual impacts by construction yards and stockpiles.)
- Manage dust on stockpiles and/or construction zones by revegetating with native annual grasses or mechanical methods. ^[9]
- Place batch plants, stone crushing, construction material and equipment within the original limits of disturbance, where possible. ^[12]
- To provide the best opportunity to restore the natural appearance of the land after construction, protect plants and landscape materials from weather, freeze protection, drought, animal browsing, and general damage in temporary nurseries until plants are installed. ^[12]
- To maintain the health and vigor of nursery-grown plants, provide dependable sources of water for plant temporary storage areas. ^[12]



19 – Context Sensitive Solutions Process

The Aesthetic Guidance document is intended to serve as guidance for all major elements of projects on the I-70 Mountain Corridor, including I-70 segment on West Vail Pass. If a project specific element is not addressed in this document, the Project Team should engage in the CSS Process to address the design by following the principles below. [9]

Design Strategies

Design strategies help meet the I-70 West Vail Pass goals and mitigation measures for aesthetics.

- Employ the CSS process when project specific design questions arise that are not addressed in the Aesthetic Guidance, Design Criteria, or other available documents related to the West Vail Pass or I-70 Mountain Corridors and CSS. [9]
- Consult the Project Leadership Team to outline the decision process to be used. [9]
- Employ developed guidance from other agencies involved in the project such as local, state, or federal agencies. [9]
- for larger projects where such CSS teams are established, engage the Technical Team, Issues Task Forces, and/or affected jurisdictions to develop design solutions. [9]
- Form a recommendation for a design solution using the CSS process and present recommendations to the Technical Team and others as previously deemed appropriate. [9]



REFERENCES

[1] CDOT. 2020. I-70 West Vail Pass Auxiliary Lanes Environmental Assessment. Appendix B Draft Supplement to the I-70 Mountain Corridor Programmatic Agreement.

[2] CDOT. 2020. I-70 West Vail Pass Auxiliary Lanes Environmental Assessment. Appendix A17 Visual Impact Assessment.

[3] CDOT. 2020. I-70 West Vail Pass Auxiliary Lanes Environmental Assessment. Appendix A17 Visual Impact Assessment.

[4] CDOT. 2010. Crest of the Rockies Design Segment Aesthetic Guidance.

[5] CDOT. 2020. I-70 West Vail Pass Auxiliary Lanes Environmental Assessment. Appendix B Draft Supplement to the I-70 Mountain Corridor Programmatic Agreement.

[6] CDOT. 2020. I-70 West Vail Pass Auxiliary Lanes Environmental Assessment. Appendix A7 Historic Resources Documentation.

[7] Mead & Hunt. April 2019, *Historic Context - Vail Pass Segment of Interstate Highway 70*. Prepared for CDOT.

[8] CDOT. 2020. I-70 West Vail Pass Auxiliary Lanes Environmental Assessment. Appendix A7 Historic Resources Documentation.

[9] [Crest of the Rockies Design Segment Aesthetic Guidance Index](https://www.codot.gov/projects/contextsensitivesolutions/assets-1/docs/aesthetics/aesthetics-design-segment-guidance/110331-crest-of-the-rockies.pdf). <https://www.codot.gov/projects/contextsensitivesolutions/assets-1/docs/aesthetics/aesthetics-design-segment-guidance/110331-crest-of-the-rockies.pdf>.

[10] Mitigation measures from Section 106 *Programmatic Agreement 3rd Supplement and I-70 West Vail Pass Auxiliary Lanes Environmental Assessment*.

[11] Colorado Department of Transportation (CDOT), *Top of Vail Pass – Area of Special Attention - Draft*.

[12] Aesthetic guidance developed specifically for I-70 on West Vail Pass.

[13] *Historic Context - Vail Pass Segment of Interstate Highway 70*, June 2019, Mead & Hunt.

[14] Colorado Department of Transportation (CDOT), 1978, *I-70 in a Mountain Environment, Vail Pass, Colorado*.

[15] Colorado Department of Transportation (CDOT), 2014, Revised 2020, *CDOT Landscape Architecture Manual*.

[16] US Department of Transportation – Federal Highway Administration (FHWA), Center for Local Aid Support. [Context Sensitive Rock Slope Design Solutions-Chapter 6](https://www.fhwa.dot.gov/clas/ctip/context_sensitive_rock_slope_design/ch_6_1.aspx#6_1_1_1). https://www.fhwa.dot.gov/clas/ctip/context_sensitive_rock_slope_design/ch_6_1.aspx#6_1_1_1.

[17] Memorandum of Understanding Between the Bureau of Land Management, the Colorado Department of Transportation, the Federal Highway Administration and the USDA, Forest Service Rocky Mountain Region, April 2016.

[18] US Department of Transportation – Federal Highway Administration (FHWA), Center for Local Aid Support, [Context Sensitive Rock Slope Design Solutions-Chapter 3](https://www.fhwa.dot.gov/clas/ctip/context_sensitive_rock_slope_design/ch_3_2.aspx). https://www.fhwa.dot.gov/clas/ctip/context_sensitive_rock_slope_design/ch_3_2.aspx.

[19] Engineerisk - Snow Avalanche Management, March 2015, *Avalanche Protection Strategy: I-70 & US 6 Loveland Pass*.

Appendix A :
I-70 Aesthetic Review for Pre-cast Concrete Curved
Panel Walls

I-70 Aesthetic Review for Pre-cast Concrete Curved Panel Walls

1. Introduction

This memorandum discusses options related to the construction and aesthetics of the pre-cast concrete curved panel retaining walls associated with the Proposed Action defined in the West Vail Pass Environmental Assessment (EA) and Finding of No Significant Impact (FONSI).

The construction method used for the original walls will not be replicated because current construction methods will provide a more stable structure with a reduced disturbance area.

The aesthetics of the curved panel will comply with mitigation commitments outlined in the FONSI.

This memo supports the selection of the preferred option, Option 1 Match Existing Concrete Curved Panel Wall. The proposed solution replicates the dominant visual features of the pre-cast concrete curved panel walls and is based on West Vail Pass (WVP) aesthetic guidelines developed to honor the historic context of WVP.

2. Proposed Action Description

The Proposed Action will improve the safety and operations of the interstate through the addition of auxiliary lanes, improved geometry at curves, and other improvements. These improvements will require the construction of new retaining walls and the lengthening of some existing retaining walls.

This memorandum proposes panel design for any new pre-cast concrete curved panel walls within the scope of the Proposed Action.

Along the length of the Proposed Action several walls will be required. Walls will be constructed to retain cut slopes and to support fill slopes. Each wall application will be different based on the location, the construction, the improvement, and the existing geotechnical conditions. Each will require a unique structural design and the aesthetics of all walls will be guided by the Aesthetic Guidelines.

This memo describes an aesthetic treatment for new pre-cast concrete curved panel walls visible from I-70 which are a contributing feature of the historic resource.

3. Background and Related Commitments

A Programmatic Environmental Impact Statement (PEIS) was completed in 2011 to analyze improvements to I-70, including Vail Pass, which resulted in a Section 106 programmatic agreement (PA) to address adverse impacts to historic properties. The I-70 Vail Pass Auxiliary Lanes EA was prepared in 2020 to further analyze impacts specifically to the west side of Vail Pass, resulting in a third supplement to the original PA. The PA supplement stipulated the following (emphasis added):

B. DESIGN and AESTHETIC MITIGATION

- 1) Context Sensitive Design Elements: CDOT will follow the I-70 Mountain Corridor Context Sensitive Solutions (CSS) process. Using the original interstate design as inspiration, CDOT will work to preserve and enhance the alpine environment, honoring the original design of the highway and its features. Included in this effort will be the following commitments related to design within the boundary of the I-70 Segment of Vail Pass historic district:
 - a) New structures and features constructed or installed in the historic district as part of the design, including bridges, retaining walls, wildlife underpasses, landscape, and signage will be constructed to honor the original design in terms of scale, mass, materials, and workmanship to the extent possible. Design plans for new structures and features will be submitted to SHPO and the consulting parties for review and comment.

In addition to these Section 106 commitments, the EA and FONSI include commitments to minimize slope excavation and impacts to native trees, shrubs, and vegetation to the extent possible. The EA/FONSI also commits CDOT to avoid I-70 lane closures to the greatest extent possible.

The Secretary of Interior's (SOI) Standards for the Treatment of Historic Properties were developed and refined in the 1970s and into the mid-1990s and are "common sense historic preservation principles that promote historic preservation best practices approaches to the treatment of historic properties." The standards address "maintaining, repairing, and replacing historic materials, as well as designing new additions or making alterations, and can be applied to historic properties of all types, materials, construction, sizes, and use."^[1]

CDOT consulted informally with SHPO staff and determined that the standards and guidelines for reconstruction as defined in the SOI standards were most applicable to this project. The SOI defines reconstruction as "the act or process of depicting, by means of new construction, the form, features, and detailing of a non-surviving site, landscape, building, structure, or object for the purpose of replicating its appearance

at a specific period of time and in its historic location.” Standards of Reconstruction “will take into consideration the economic and technical feasibility of each project” as follows: ^[2]

1. Reconstruction will be used to depict vanished or non-surviving portions of a property when documentary and physical evidence is available to permit accurate reconstruction with minimal conjecture, and such reconstruction is essential to the public understanding of the property.
2. Reconstruction of a landscape, building, structure or object in its historic location will be preceded by a thorough archeological investigation to identify and evaluate those features and artifacts that are essential to an accurate reconstruction. If such resources must be disturbed, mitigation measures will be undertaken.
3. Reconstruction will include measures to preserve any remaining historic materials, features and spatial relationships.
4. Reconstruction will be based on the accurate duplication of historic features and elements substantiated by documentary or physical evidence rather than on conjectural designs or the availability of different features from other historic properties. A reconstructed property will re-create the appearance of the non-surviving historic property in materials, design, color and texture.
5. A reconstruction will be clearly identified as a contemporary re-creation.
6. Designs that were never executed historically will not be constructed.

4. Historic Context of Pre-cast Concrete Curved Panel Walls

Existing pre-cast concrete curved panel walls constructed on Vail Pass incorporated innovative designs to help them blend into the landscape (Figure 1), as described in *I-70 in a Mountain Environment - Highway 70 over Vail Pass*, prepared in 1978 by CDOH, USFS, and FHWA. Describing these walls, the document states, “The wall panels between tiebacks are parabolic in shape to minimize bending stresses from horizontal soil pressure. In addition, the design is considered to be superior to other shapes from an appearance standpoint. A final touch was the addition of iron oxide to the cement to produce a reddish-tan color that would blend into the natural surroundings on Vail Pass.” ^[3] These parabolically-shaped walls, also referred to as “curved”,



Figure 1. Existing Pre-cast Curved Concrete Wall in Landscape

“scalloped” or “concave” walls, were “an important feature of the landscape design and aesthetic treatments of the highway.... Avoidance of smooth and flat surfaces and incompatible colors were important principles.” [4] The original design study team recommended the use of precast angled units, which would allow following a curved alignment and provide pockets for plantings between each level. [4]

These walls are part of a “cohesive grouping of designed and engineered structures, buildings, and objects united aesthetically and functionally as a distinctive transportation segment,” the assemblance of which “achieves significance as whole” under Criterion A and C of the NHPA. As such, retaining walls have been identified as a contributing feature to the Vail Pass’ eligibility for listing under the NRHP.

5. Original Construction

The curved walls were originally constructed with a pre-cast foundation with monolithic posts and panels that were then backfilled (Figure 2). Original walls were constructed on fill, starting at the lowest elevation and stair-stepping up the slope with each ensuing wall behind and above the last. Fill was placed behind each wall to build the next higher tier. The walls feature vertical columns, concave panels, and horizontal lines between the concave panels. The top of the wall has an elevation parallel to the roadway grade, and a maximum height of approximately 8 feet 6 inches above ground.



Figure 2. Original Pre-cast Curved Concrete Wall

To assist with development of a new wall design, the dominant visual features listed in Table 1 were identified for the original walls.

Table 1. Dominant Visual Features of Original Walls

Dominant Visual Feature	Original Walls
Vertical	<ul style="list-style-type: none"> Vertical columns 10 feet on center about 1 foot 10 inches wide and 8 inches proud Walls are maximum 8.5 feet high above the ground Top of wall elevation is parallel with the grade of I-70
Horizontal	<ul style="list-style-type: none"> Horizontal lines resulting from the stacked precast panels about every 3 feet 4 inches for full panels Concave panels between the columns, the concave dimension is approximately 2.5 feet deep, including the prominent nose
Shadow	Shadow line is created by the concave panels and the prominent angular nose
Slope	<ul style="list-style-type: none"> Space between the walls allows for planting Slope of the planted areas appears flat
Color	Iron oxide added to concrete mix



Figure 3. Existing Pre-cast Curved Concrete Wall

6. Solutions Considered for Pre-cast Concrete Curved Panel Walls

To both honor the historic context of the corridor and reduce ground disturbance, designers reviewed the original construction method and materials to propose a modern recreation. In accordance with the DOI's Standards for Reconstruction,

evidence documenting the original walls was analyzed to “re-create the appearance of the non-surviving historic property in materials, design, color and texture,” as well as spatial relationships.

Multiple options were considered and evaluated for construction of new curved panel walls. Construction using a soil nail wall system was evaluated and found to reduce the impacts resulting from disturbance to soil, vegetation, and trees.

The soil nailed wall system is built from the top down and will not require shoring or over excavation for footings. The analysis shows approximately 20 feet of disturbance area is needed to construct a three-tiered curved wall, compared to the 55 feet of disturbance using the original construction method and wall type.

This soil nail system is the preferred construction method and is proposed with a façade of pre-cast curved panels, designed to replicate the dominant visual features of the existing walls.

7. The Proposed Curved Panel Design

Several horizontal depths for the panels were discussed and studied by the design team and stakeholders, from 2.5 feet front of column to front of wall (the depth at the concave in the original wall panels) to 1.5 feet front of column to front of wall. The depths were analyzed for historic replication of the visual features, disturbance area, constructability, maintenance, and costs. The analysis of all of these variations is shown in Attachment 1.

To replicate the historic design to the fullest, the proposed panel design will match the existing in all dominant visual features. Figure 4 illustrates the proposed panel dimensions, and Table 2 itemizes the dominant visual features of the proposed panels.

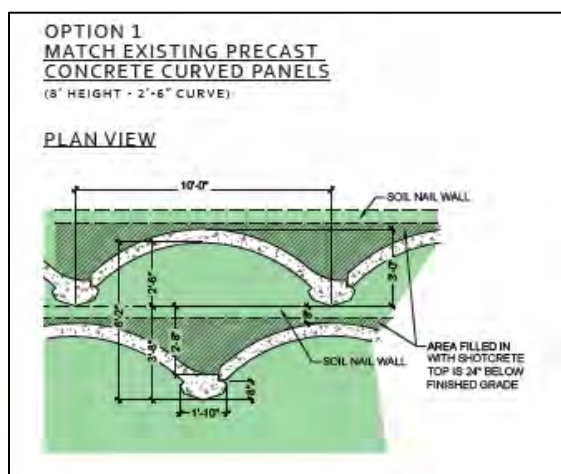


Figure 4. Plan View of Proposed Curved Panels

Table 2. Proposed Curved Panels Compared to the Original Design Using Dominant Visual Features

Dominant Visual Feature	Original Walls	Proposed Solution: New Construction
Vertical	Vertical columns 10 feet on center about 1 foot 10 inches wide and 8 inches proud	Vertical columns 10 feet on center about 1 foot 10 inches wide and 8 inches proud
Vertical	Max tier heights are typically 8 feet tall +/-; there may be some sections, but very few, that go up to 10 feet tall	Maximum of 10 feet high
Vertical	Top of wall elevation is parallel with the grade of I-70	Top of wall elevation parallel to roadway
Vertical	Prominent angular nose	Prominent angular nose
Vertical	Strong vertical line on both sides of each column	Strong vertical line on both sides of each column
Horizontal	Horizontal lines about every 3 feet for full panels	Horizontal lines at 3 feet high created with a scored line
Horizontal	Concaved dimension is 2.5 feet deep	Concaved dimension is 2.5 feet deep
Shadow	Shadow line created	Shadow line created
Slope	Around 8 inches over the 3-foot planting area between walls	8 inches over the 3-foot planting area between walls
Slope	Flat slope in the planted areas	Slope of the planted areas varies from flat to a 2:1 slope
Color	Iron oxide color	Concrete color to match

8. Historic and Visual Considerations in Selecting Option 1 Match Existing

All of the studied options would replicate the mass and scale of the original curve panel walls (Figure 5). Like the historic walls, new walls would continue to be tiered. Proposed wall heights are approximately 8 to 10 feet tall, and designs would provide planting areas between the walls with space to grow native shrubs, forbs, and grasses. New wall panels would be a single unit, instead of the 3-foot-high stacked panels, and would incorporate a score line in the concrete replicating the horizontal line seen in the original design. The width of the panels and distance between vertical columns would mimic the original design. The new wall designs would be concrete and would have integral color to match the color of the sandstone rock escarpments typical to the Black Gore Creek Valley.



Figure 5. Option 1 Match Existing Curve

Key differences between the proposed options for new construction were the depth of the curved panels. If a wall panel proposed for new construction was set alongside an original panel, the difference would be visible. Shadows and the curvature of the wall panels would differ. However, when a single new wall, separated from existing walls, is viewed from a fast-moving vehicle in the I-70 travel lanes, the new wall design would appear similar to the concrete curved panel walls constructed in the 1970s.

Other differences among the alternatives include square footage, constructability, and costs. Option 1, the Match Existing Precast Concrete Curved Panel, a curve of 2.5 feet in depth, results in 20% more square foot of wall, 20% more area of construction disturbance, and a 25% cost increase per square foot of wall. Further, Option 1 requires a two-sided form and a vertical pour of concrete, this results in the additional time and construction costs.

However, when reviewing the entire project area, the additional impacts and costs do not overshadow the benefit of exactly replicating the existing curved panel dominant features. Therefore, the proposed Concrete Curved Panel Wall design is Option 1, which matches the existing panel design.

9. References

- [1] U.S. Department of the Interior, National Park Service. [The Secretary of the Interior's Standards for the Treatment of Historic Properties](https://www.nps.gov/orgs/1739/secretary-standards-treatment-historic-properties.htm).
<https://www.nps.gov/orgs/1739/secretary-standards-treatment-historic-properties.htm>.
- [2] U.S. Department of the Interior, National Park Service. [Standards for Reconstruction](https://www.nps.gov/tps/standards/four-treatments/treatment-reconstruction.htm). <https://www.nps.gov/tps/standards/four-treatments/treatment-reconstruction.htm>.
- [3] Colorado Department of Highways. 1978. *I-70 in a Mountain Environment Highway 70 over Vail Pass*. FHWA-TS-78-208.
- [4] Mead & Hunt. 2019. *Historic Context Vail Pass Segment of Interstate Highway 70*. June.

Attachment 1

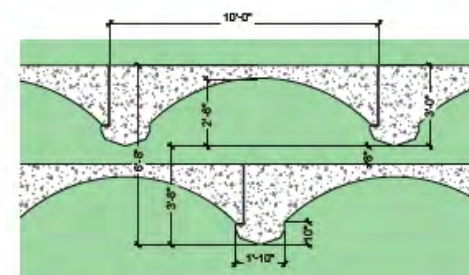
Table A-1. Analysis of the Project Options

Category/Core Value	Critical Issue	Criteria	Option 1 Match Existing Precast Concrete Curved Panels	Option 2 Modified Curve with Flat Back	Option 3 Solid Full Curve with Flat Back
Safety	None	No differentiators	Not applicable	Not applicable	Not applicable
Operations	None	No differentiators	Not applicable	Not applicable	Not applicable
Corridor Character and Aesthetics	Maintain the context-sensitive design of the road while modernizing the facility and impacts to the high-quality view in the corridor	Aesthetic considerations	Modern aesthetic replica of original scallop design	Honors original design with modern interpretation	Modern aesthetic replica of original scallop design
Corridor Character and Aesthetics	Maintain the context-sensitive design of the road while modernizing the facility and impacts to the high-quality view in the corridor	Planting area (square feet)	28.6 square feet	39.4 square feet	32.5 square feet
Corridor Character and Aesthetics	Maintain the context-sensitive design of the road while modernizing the facility and impacts to the high-quality view in the corridor	Plant growth potential	Lowest potential for plant growth; 24-inch depth of soil, but no connection to existing ground, soil will not hold as much moisture and grass will be more difficult to establish	Best potential for plant growth; 24-inch depth of soil plus connection to existing ground to retain moisture	Moderate potential for plant growth, but grass will never grow over nose of wall due to thickened concrete section; 24-inch depth of soil, but would need to widen wall by 1 foot 4 inches to get connection to existing ground
Enhanced Environment	Wildlife corridors and habitat, threatened and endangered habitat	Footprint of disturbance (width per lineal foot)	Smallest footprint	Smallest footprint	7% higher area of disturbance than Options 1 or 2
Recreation	User impacts	No differentiators	Not applicable	Not applicable	Not applicable
Collaborative Decision Making	None	No differentiators	Not applicable	Not applicable	Not applicable
Implementability	Cost	Total wall cost per square foot	\$144	\$106	\$130
Implementability	Cost	Wall cost for additional footprint of wall	\$0	\$0	\$2,473,089
Implementability	Cost	Total wall cost premium for INFRA only (approximately 23,000 square feet)	\$853,480	\$0, lowest cost wall	\$314,440

Category/Core Value	Critical Issue	Criteria	Option 1 Match Existing Precast Concrete Curved Panels	Option 2 Modified Curve with Flat Back	Option 3 Solid Full Curve with Flat Back
Implementability	Cost	Total wall cost premium (assumes around 272,000 square feet of wall on the project)	\$10,327,184	\$0, lowest wall cost	\$6,522,432
Implementability	Cost	Additional cost considerations	Full scallop is a two-sided form that needs to be poured vertically versus a one-sided form for the modern scallop; two-sided form means more material and labor cost to pour and strip panels; additional concrete in void space behind precast panel	Cost for additional forms to do Option 1 in areas of existing scalloped wall is \$15,000	Full scallop has much more concrete than Options 1 or 2 and requires larger equipment to set the panels
Implementability	Impacts to the traveling public	No differentiators	Not applicable	Not applicable	Not applicable
Sustainability	Maintenance and operational financial feasibility	Level of effort for CDOT to maintain	None	None	More disturbance area with the full scallop, therefore more square feet of wall to maintain versus Options 1 or 2 in the same location (around 19,000 square feet additional wall)

OPTION 3
SOLID FULL CURVE WITH FLAT BACK
(8" HEIGHT - 2'-6" CURVE)

PLAN VIEW



PERSPECTIVE

