


Aesthetic Alternatives for NDOT Design Standards

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executive summary

The Landscape and Aesthetic Corridor Plan's vision can be implemented by creating elegantly engineered facilities.

This document contains a library of aesthetic alternatives to existing Nevada Department of Transportation (NDOT) practices. If followed, these alternatives will help NDOT pursue a holistic approach to landscape and aesthetics on Nevada's highways. Beautiful, site appropriate highways contribute to Nevada's tourism-based economy as well as to the quality of life of its growing population.

These alternatives join together the guidelines from the Landscape and Aesthetics Corridor Plans with viable design solutions. The alternatives address the many situations occurring on Nevada's highways, including elements such as bridges, sound walls, retaining walls, and drainage.

Each aesthetic option compares the cost of the proposed alternative with existing NDOT practice so that planners, engineers, and landscape architects can make wise choices in how tax dollars are spent. If used consistently, these alternatives will contribute to NDOT's approach of making aesthetics an integral component of everything they do.

Each section contains:

- Existing Practice: A description of existing practice and why it is being discussed.
- Aesthetic Issues: An explanation of the practice's aesthetic issues with supporting imagery.
- Proposed Alternatives: A description of the alternative's aesthetic benefits, cost considerations, and potential constraints.

The document is a working resource that promotes knowledge of the practical information needed to implement aesthetic alternatives. As new information is available, NDOT may insert additional resources and alternatives to continually elevate NDOT's approach.

USER'S GUIDE

Within each section of this document you will find:

#.0 HIGHWAY FEATURE (BRIDGE, SOUND WALLS, ETC.) INTRODUCTION

Overall Aesthetic Issues

#.1 ELEMENT OF HIGHWAY FEATURE

Existing Practice

Aesthetic Issues

#.1.1 Proposed Alternative

Aesthetic Benefits

Cost Considerations

Potential Constraints

Planning Considerations

table of contents

Introduction

INTRODUCTION

History and Purpose

These alternatives are the next step in the Nevada Department of Transportation's (NDOT's) transition to more designs that respond to their surrounding environment. It is hoped that all NDOT staff and consultants will incorporate these alternatives into projects to the extent possible given the realities of schedules and budgets. Taken together, small changes can make large contributions to a higher quality of life and stronger economy.

NDOT faces an ongoing struggle to provide an adequate road system serving an increasingly sophisticated, tourist-based economy. Providing a high-quality of life is an economic necessity for Nevada. Highways either contribute to or detract from the sense of place. Many current NDOT practices fail to respect the surrounding landscape character, with structures that too often overpower Nevada's subtle beauty.

In May 2000, the State Transportation Board and NDOT began the master planning process. This plan created a vision for the state highway system and provided landscape and aesthetics a starting point for improved policies, guidelines, practices, procedures, and standards. Adopted in 2002, the Master Plan established generalized guidelines for landscape and aesthetics.

From 2003 to 2008, Landscape and Aesthetic Corridor Plans were developed. These plans addressed highway aesthetics as they are influenced by the different regions of the state. Endorsed by the State Transportation Technical Advisory Board, the plans were vetted through citizens; local, state, and federal organizations; and NDOT. Guidelines comprehensively addressed the aesthetics of the state's highway facilities and provided the framework for improving the visual quality of existing, new, and retrofit highway projects. They represented recommendations for design solutions and included written statements of how a highway segment could meet its design objectives. Studies addressing maintenance costs, the operation of the landscape and aesthetics program, and implications to project development also paralleled the Corridor Planning process.

(1) NDOT's challenge is to service a fast-growing population in a tourism-based economy.

***(2)** These alternatives serve to elevate the department's expertise and meet the vision set by the Master Plan and Corridor Plan.*

These Aesthetic Alternatives integrate landscape and aesthetic guidelines with a variety of design considerations. They focus on addressing existing design details which, if improved, offer the greatest potential to elevate highway aesthetics. These alternatives represent a more fundamental approach to considering context and aesthetics as part of the design effort. In addition the costs of the proposals are compared to those of existing practices. With regular use, these alternatives provide engineers and landscape architects the tools to continually advance their design solutions.

The Aesthetic Issues

Consideration for aesthetics has often occurred at the 60% design level. By this phase of the project, decisions regarding elements having the largest visual impact are set and unalterable. The overall project cost for more visually appealing designs may not be more costly if they are considered at the same time as structural features. They will be nearly impossible or of high cost, however, if aesthetic impact is considered only as an afterthought, as a cosmetic treatment to be applied after significant design components are set.

The objective is to integrate all facets of the design — environmental, structural, functional, and aesthetics — into a solution that simultaneously resolves the design conditions.

Decisions made about one project element influence or determine the selection of other elements. For example, the determination of the embankment slope for a bridge directly affects the bridge's proportioning of the superstructure in relation to the abutment. The slope also influences many other factors, such as whether it is possible to revegetate, the selection of appropriate stabilization materials, and the potential need for additional right-of-way. Site planning and highway alignment impacts the designer's ability to enhance or block views as well as aligning the road to reduce large cut or fill slopes.

Overall, consideration of alignment, line, form, color, shadow, and mass must be continually addressed as fundamental aesthetic elements. Thoughtful design recognizes that each structural component has an individual impact as well as a direct relationship to the overall structure.

(1) The goal of highway design is to satisfy safety, environmental, structural, and visual needs in order to create site appropriate design solutions.

(2) Aesthetic considerations should be part of the analysis of alternative roadway alignments.

Current NDOT practices are a result of many factors that influence the design and construction of the roadway and other structures within the right-of-way. These factors include existing policy and standard documents, safety requirements, budget considerations, maintenance costs, organizational knowledge/commonly accepted practice, and the timing of when aesthetic impacts are considered during a project's design stages. Development of alternatives respects these issues and understands the bearing they bring to the design process. This helps ensure the recommendations represent implementable solutions.

Although this report does not include every current practice within NDOT, it discusses several specific practices that, if addressed, have the greatest potential to improve the overall aesthetics of the highway system. In addition, these examples show the importance of considering aesthetics during the initial stages of design.

Elevating Design Solutions

NDOT engineers and designers must be equipped with additional tools before they can be expected to evolve the current practice to include new alternatives that elevate roadway aesthetics. This document provides NDOT with achievable alternatives that give rise to elegantly engineered facilities. As new alternatives are implemented, the resulting projects serve as examples which will continually expand and elevate the organization's expertise.

The document allows for the inclusion of additional pages, so that those responsible for design – and that includes everyone – can continually collect their own case studies, photos, and sketches of aesthetic design alternatives and use this document as a working tool to develop their practice. Of equal importance to the implementation of alternatives, is the sharing of this information within NDOT. Knowledge sharing is a key component of the widespread organizational change that will be required to have the meaningful yet necessary effect on the highway environment.

(1) In this example, color and pattern have been applied to decorate the bridge after the design decisions have been made. The result does not necessarily create an aesthetic structure. The point is that applying decoration does not necessarily make it more appealing.

(2) This structure's graceful form and composition indicate that the aesthetics of all its features were considered together during preliminary design. The fact the structure blends with the environment is appealing.

Fundamentals of Aesthetic Design

The basic principle for the aesthetic design is to create a setting in which the elements of design (line, shape, form, color, and texture) are in harmony with one another. A highway corridor is a combination of many structures and facilities, each with its own purpose and function. Achieving visual harmony requires an understanding of both how the elements of design affect the appearance of each individual structure and the composition of a visually appealing corridor. Aesthetic goals can be better met when a designer understands the following eight (8) qualities exhibited by an aesthetic feature.

Aesthetic Qualities

- Proportion: Balanced geometric proportions are essential for creating aesthetic structures. Proportion helps define the relationship between structural components and suggests a level of importance. The relative size of a feature signifies its structural function. Proportion adds to a structure's unity by displaying a deliberate order between components such as height, width and depth; solid and void; sunlight and shadow.
- Rhythm: Regularly reappearing elements of similar visual characteristics creates rhythm. The element's placement creates visual movement. Thoughtful use of rhythm can be used to reinforce a driver's understanding of the highway system.
- Order: The arrangement of components can create order or disorder. Components should appear to be in their proper place and function appropriately.
- Harmony: The complementary relationship of similar or identical components refers to harmony.
- Balance: Visual balance is fundamental to creating successful compositions as it is concerned with how elements are visually distributed. This includes their relationship to one another and to a central focal point.
- Contrast: The dynamic relationship of complementary, opposing elements relieves monotony and brings a heightened awareness of the elements. Where two dominating components exist, one should be primary and the other supporting.

(1) This bridge is visually appealing because it relates to the site and views. The proportion of its form and mass are appropriate - the abutments appear to be sized to perform their function in relation to the superstructure.

- Scale: The size of features in relationship to one another, to the overall structure, and to the landscape context refers to scale. The scale of a structure to its surroundings increases in importance due to the speed at which facilities are viewed.
- Unity: Unity gives a viewer a sense of completeness as the structure and corridor appropriately apply all the previous aesthetic qualities. It is the resolution of the site and the project features.

Design Objectives

Five basic aesthetic objectives should be part of every project:

- supporting a motorist's ability to read and navigate the highway,
- creating functional clarity,
- providing simple and unified approaches,
- giving balance to the corridor, and
- achieving visual scale with the structure's context.

Achieving these goals creates a clearly understandable and attractive highway corridor. These and other aesthetic objectives should be considered in tandem with engineering objectives at the beginning of the design process. Just as engineering goals give a designer direction, establishing design goals at the project onset can guide a designer to make appropriate decisions regarding the structure and its setting. Objectives should be project specific and initiate a discussion regarding solutions that respond to the site context.

- Simplicity and Continuity: Clean lines, simple form, and uncomplicated designs are hallmarks of elegant structures. Shapes should be visually related and the number of materials, colors, and textures should be as few as needed. Details should be consistent. No single element should dominate. Maintain a consistent visual theme while expressing the corridor's theme. Overly designed treatments can be distracting and disrupt a motorist's ability to understand the

(1) Texture and strong shadow lines can create contrast and help define form and reinforce a structure's linear qualities. Used appropriately, texture can reduce imposing scale and add visual interest. Because fine textures tend to appear flat when viewed from a distance, coarser textures may be appropriate for structures viewed from great distances or speeds.

highway environment. Complex pieces can distract drivers or will not be understood or appreciated.

- Glance Recognition and Reading the Highway: Aesthetics support the motorist's ability to read the roadway and navigate the highway system. Treatments provide users with a clear picture of what is going on around them and what decisions are expected of them. Key facility components are highlighted. Aesthetics work towards reducing the stress on drivers that can result from operating a vehicle in a complex environment and navigating an unfamiliar roadway.
- Functional Clarity: The structure and its components achieve their purpose in a straightforward manner. The facilities appear to have the capacity to perform their function. Key components should have strong visual character while considering the appearance of the collective group.
- Order and Balance: Highway facilities should appear to naturally progress. A balance between repetition and monotony creates rhythm. Aligning a structure's components promotes harmony. The corridor reveals a sequence of visual experiences over time. Visual chaos of a poorly designed freeway has a safety hazard potential.
- Scale and Proportion: Generally, no single element should dominate a visual composition. The structure's form should have a light appearance that is in scale with the site and other parts of the structure. Aesthetic treatments are limited to areas of the greatest visual impact.

(1) The simplicity of the purple ribbon with its shadow pattern adds interest but does not overwhelm the overall scene.

Putting it All Together

(2) As seen here, in busy traffic conditions, straight-forward aesthetics that increase wayfinding and the motorist's ability to navigate the highway system are preferred over other attention-grabbing designs.

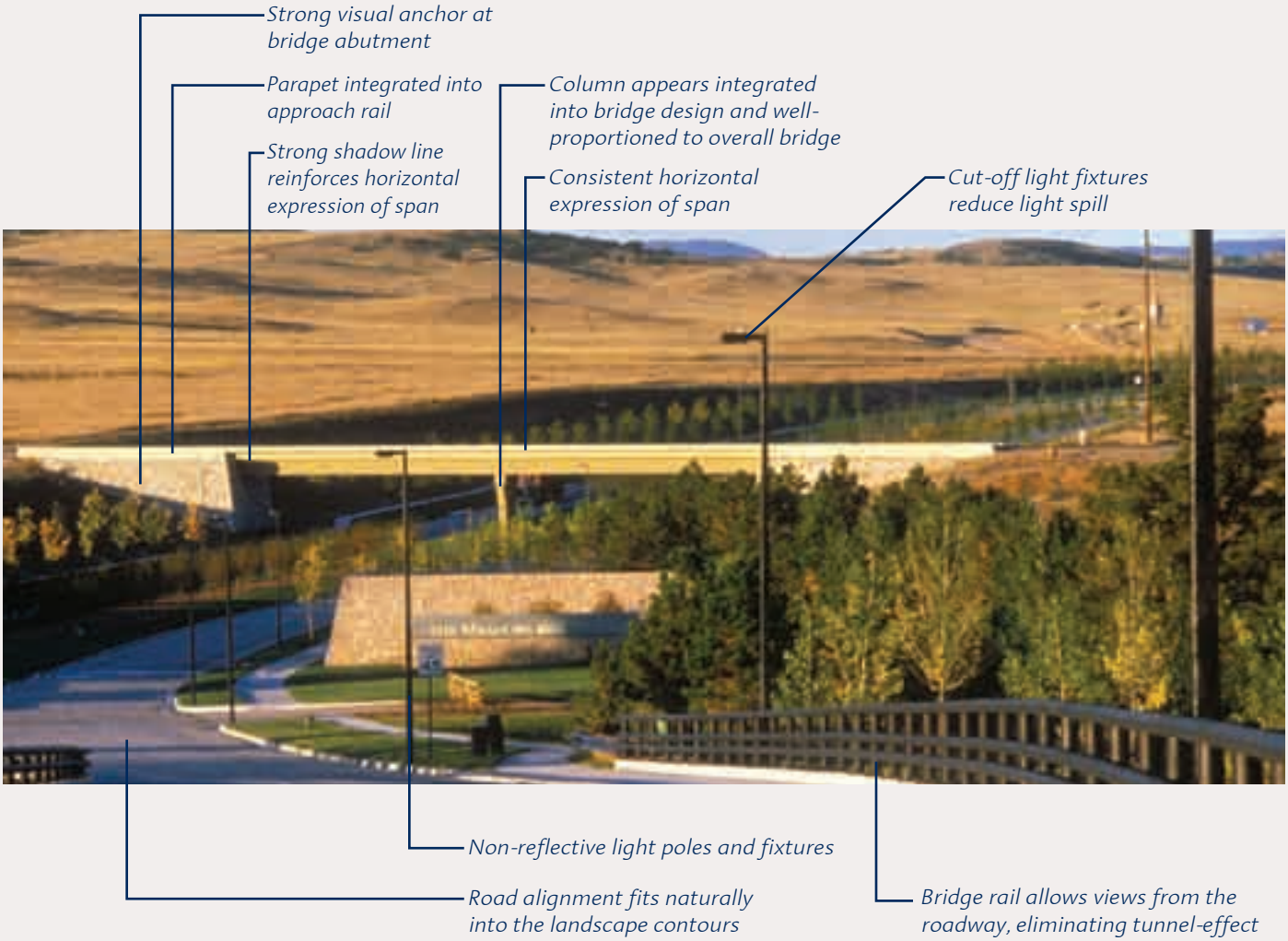
Aesthetic design considers the relationship between the structure, its site, and its mass, shape and form. Every built object is unique and has a potential effect on its environment and viewers, making the previously described concepts fundamental to aesthetic design. Considering all the aesthetic elements may seem daunting, but continually working to put the pieces together will allow Nevada to have a highway system recognized for its innovative design solutions. Creative artistic ideas can blend with scientific and technical principles and orchestrate a visually pleasing structure and corridor.

Often the easiest way to understand how components can aesthetically fit together is through imagery. For this reason the alternatives presented in the document are supported through photographs and illustrations. Example images have check marks or circle-slash symbols to categorize their recommended and not recommended aesthetic qualities.

Additionally, the images on the following pages illustrate how the majority of the recommendations can be incorporated into a highway corridor.

Note:
Images in the design guidelines document often have check marks and circle-slash symbols underneath to illustrate recommended and not recommended practices.

- ✓ positive aspects illustrated
- ⊘ negative aspects illustrated



(1) An example of putting all the design considerations together in one project.

(1) An example of putting all the design considerations together in one project.

1.0 Bridges

ELEMENTS DISCUSSED

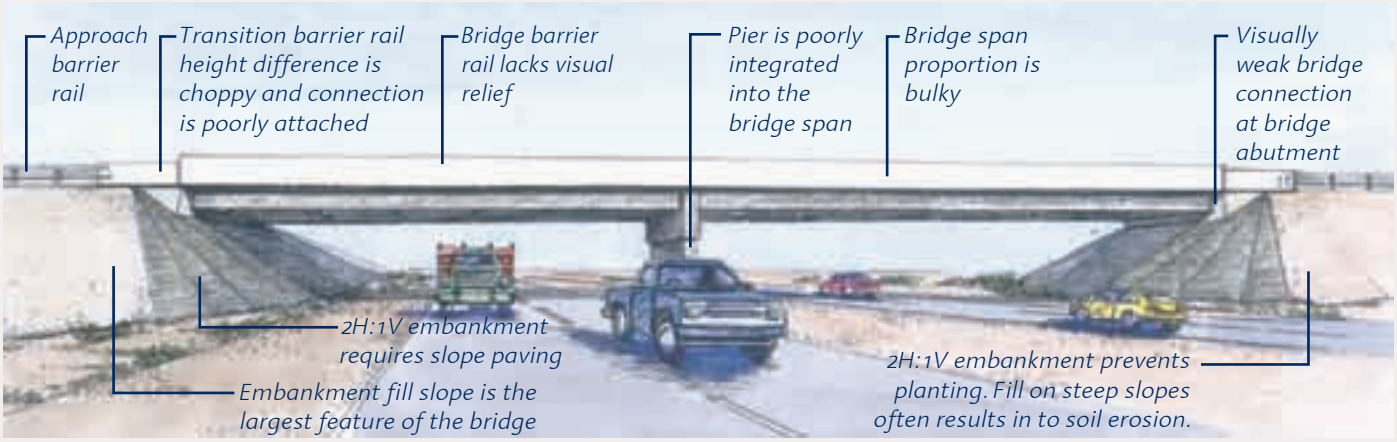
1.0 BRIDGES – INTRODUCTION

Bridge aesthetics depend upon the thoughtful combination of its many structural components. Every decision made about the structure's overall design has an aesthetic consequence. Chapter 11 of the 2008 NDOT Structures Manual states, "Structures should be aesthetically pleasing to the travelling public." Nine guidelines for aesthetic treatment are listed. These guidelines represent a new movement towards integrating aesthetics in structure design.

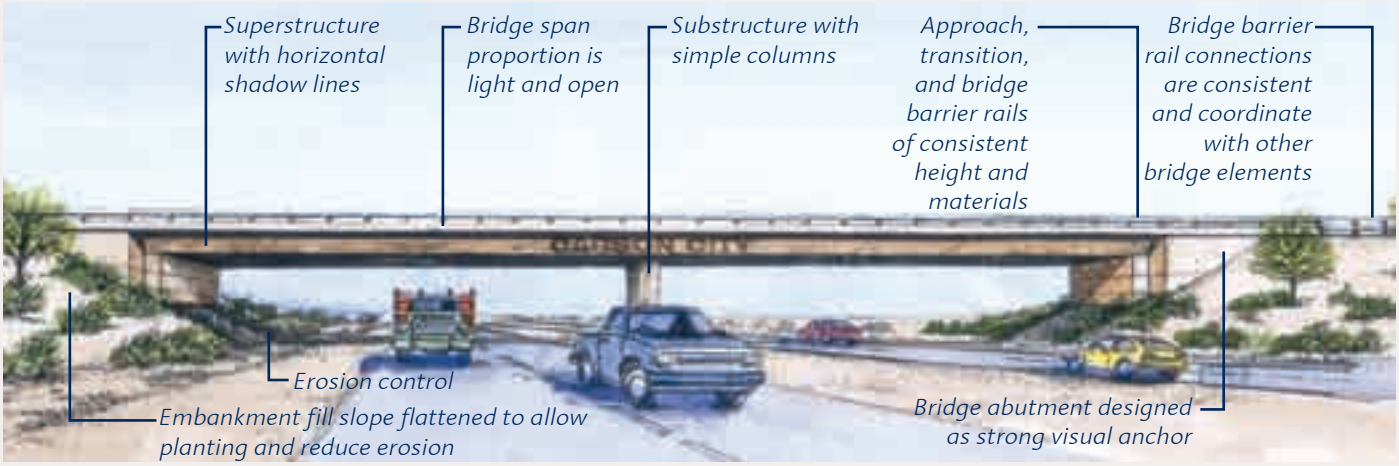
The Structures Manual references the AASHTO LRFD Bridge Design Specifications as the standard for bridge design. NDOT's Standard Plans for Road and Bridge Construction and the standard specifications are also used. These are the manuals NDOT currently uses for bridge design. These alternatives are provided as an additional resource.

Overall Aesthetic Issues

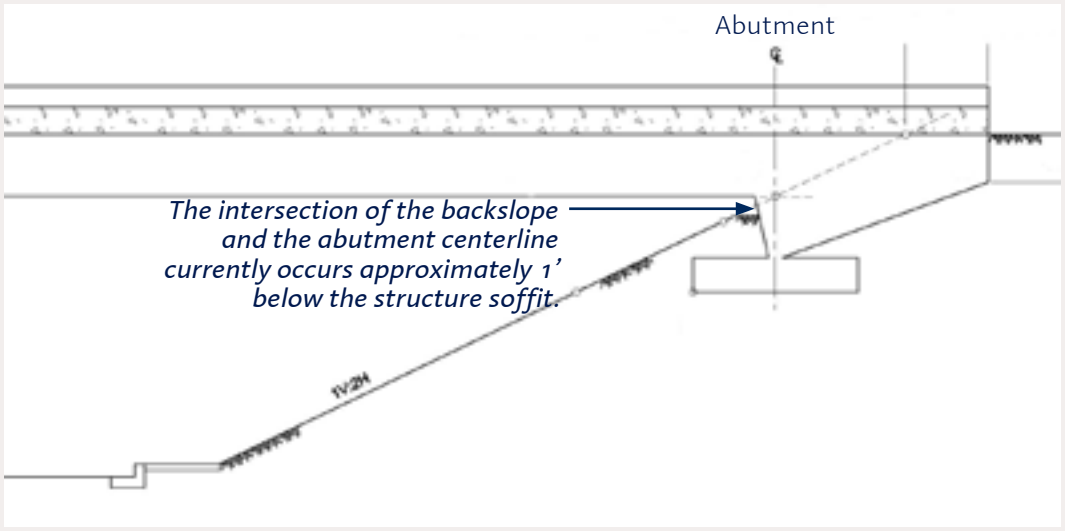
The main aesthetic issues with NDOT's current bridge design are a combination of factors. Overall, the bridge appears heavy. The superstructure is visually dominant and the pier design can sometimes be distracting when it feels out of scale with the rest of the structure. Three central causes of the visual heaviness are the relationship between the amount of exposed abutment to the superstructure, the lack of visual relief due to a solid parapet, and the visual dominance of slope paving.



(1) Existing practices that are less successful.



(2) Proposed practices to improve aesthetics.



(1) The existing standard abutment results in a minimally exposed abutment face. This detracts from the bridge's appearance by disrupting the structure's proportions.

An abutment should provide a visual anchor to the bridge. The current standard detail shows a minimally exposed abutment. In situations where a bridge rail and slope paving are used, the abutment is visually lost. A viewer cannot easily recognize the abutment's function.

The addition of slope paving with a shallow abutment magnifies the issue. Whereas typically, a bridge's horizontal profile should be emphasized, the paving overwhelms the scene by highlighting the embankment slope's opposing diagonal lines. This can cause visual discord when not carefully considered.

A strong shadow line can help underscore the bridge's horizontal profile, but the setback between the bridge deck and girder is often not deep enough to offset the visual weight created by the solid barrier rail. The rail not only throws off the proportions of bridge components, it also blocks views of the surrounding area from a motorist traveling on the bridge deck.

Signage should complement the overall bridge design and not interfere with aesthetic expression. Large signs have to be carefully designed and integrated into the design process in order to achieve visual harmony.

The objective of aesthetic design is to integrate all facets of the design – environmental, structural, functional, and visual into an elegantly engineered solution in which all the conditions of design are simultaneously resolved. The superstructure and substructure, major details, and the immediate site context should be orchestrated so that the bridge is well-coordinated and its composition is visually successful.

Although bridge design is a complex process, modifications to the following eight (8) elements will create far-reaching aesthetic improvements to Nevada's highways: embankment slope layback, abutment slope treatments, exposed abutments, superstructure shadow lines, substructure discontinuity, parapet walls, bridge and rail transitions, and coordination of signage and bridge aesthetics.

EXISTING PRACTICE

1.1 EMBANKMENT SLOPE

Existing Practice

Slope has a layback of 2H:1V.

Aesthetic Issues

- Steep slope creates erosion potential.
- Slope paving typically used to prevent erosion around bridge foundations.
- Use of softscape materials is rarely considered for slope stabilization because of increased difficulties in establishing native revegetation on steep slopes.
- Visually, the height of exposed abutment appears small in relationship to overall bridge proportions and composition.

(1) ***Not Recommended:*** *A 2H:1V Slope.*

- *Increases likelihood of slope erosion and rilling.*
- *Reduces success of revegetation efforts.*

(2) ***Not Recommended:*** *Paved Embankment Slope.*

- *Disrupts visual harmony between proportion of exposed bridge abutment to the rest of the structure.*
- *Eliminates opportunity to provide revegetation or plant material to soften structure.*

PROPOSED ALTERNATIVE

1.1.1 Alternative One: Slope Layback of 3H:1V

Reduce embankment slope layback from 2H:1V to 3H:1V.

Aesthetic Benefits

- Revegetation methods more easily established.
- Relationship of abutment to superstructure improved. Allows opportunity for increased amount of exposed abutment.
- Visual impact of abutment serving as a visual anchor.
- Erosion potential decreased.
- Amount of slope paving is reduced and sometimes eliminated along with its associated costs. Paving may be required under structure but not on embankment slopes.

Cost Considerations

- Estimated increased bridge costs range from 15% to 20%. The added cost is based on an increased bridge length (assuming an average total bridge length of 200' with 2H:1V slope). Though a flatter slope at the abutment face will require more selected borrow material in the embankment, the overall embankment volume and cost will be reduced and will partially offset the increased bridge cost. Use of flatter slopes will also increase size and cost of wingwalls. Longer wingwalls will require their own footings; cantilevered wingwalls will not be practical.
- There are potential cost savings with reduced slope paving costs. Long-term erosion maintenance costs are expected to decrease as well. Significant future costs savings are found if the roadway is expanded insomuch that the bridge does not have to be torn down.

Potential Constraints

- Changes to typical NDOT design approach will be required.
- Limitation in amount of right-of-way available.
- Increased height of typical exposed abutment.

(1) ✓

(2) ✓

(1,2) ***Recommended:*** *A 3H:1V Embankment Slope.*

✓
- *Increases likelihood of successful revegetation which will visually soften structure.*
- *Decreases need for slope paving, which improves overall bridge proportions.*
- *Decreases erosion potential or need for more expensive slope treatments.*
- *Allows for reduced costs associated with future highway widening.*

Planning Considerations

- Treatment may be more successful in northern Nevada and higher elevations with more natural precipitation.
- Because of the longer span required, this configuration allows for future lane expansions.

EXISTING PRACTICE

1.2 ABUTMENT SLOPE TREATMENTS

Existing Practice

Embankment slopes paved with concrete.

Aesthetic Issues

- Slope paving dominates the view of the bridge and makes the abutments seem disproportionately small, which reduces their ability to visually anchor the structure.
- Slope paving prevents the opportunity for native revegetation to stabilize the slope.
- Slope paving prevents the use of trees and shrubs to visually soften structure.
- Slope paving makes the bridge appear disconnected from the overall landscape instead of being integrated into the site.
- Slope paving requires on-going maintenance to remove unwanted vegetation.

(1) ***Not Recommended:*** *Paved Embankment Slopes.*

- *Disrupts visual harmony between proportion of exposed bridge abutment to the rest of the structure.*
- *Eliminates opportunity to provide revegetation or plant material to soften structure.*

(2) ***Not Recommended:*** *Tree Wells in Slope Paving.*

- *Appears unplanned and shoddy.*
- *Slope paving visually overwhelms vegetation.*
- *Draws more attention to unattractive slope paving.*
- *Does not visually soften structure.*

(3) ***Not Recommended:*** *Paved Embankment Slopes.*

- *Disrupts visual harmony between proportion of exposed bridge abutment to the rest of the structure.*
- *Eliminates opportunity to provide revegetation or plant material to soften structure.*
- *Appears as if embankments are larger than necessary.*
- *Makes bridge look bigger.*

PROPOSED ALTERNATIVE

1.2.1 Alternative One:

Revegetation Stabilizes Embankment Slope

Minimize erosion and control dust by utilizing native plants to re-establish the native desert condition. Select perennial grasses, herbs, and shrubs for their ability to establish without supplemental irrigation and for their ease of long-term maintenance.

Aesthetic Benefits

- Plant materials soften hard edges of built structures.
- Bridge structure appears integrated into the site context rather than giving the impression of sitting on top of the landscape.
- Bridge structure and supporting elements become primary visual elements.
- Bridge appears supported by abutment and substructure elements rather than slope paving.

Cost Considerations

- Estimated costs range from no cost increase to an increase of 50% over the cost of standard concrete slope paving. The range is due to the extent of slope treatments that may be needed for erosion control, plantings, hydroseeding, topsoil harvesting, etc., the cost of which will be offset by not building the concrete slope pavement.

Potential Constraints

- Erosion control needed to prevent erosion around abutment. Design solution may be incorporated at the bridge deck elevation, or top of the bridge slope, instead of on the slope itself.
- Potential water requirements for initial establishment.
- Topsoil harvesting/amending required to promote revegetation establishment
- Coordination with maintenance division to quantify and compare long-term maintenance requirements.

(1) ***Recommended:*** *A Revegetated Embankment Slope.*

- *Reduces erosion.*
- *Reduces dust.*
- *Visually softens structure and other built elements.*
- *Improves bridge's appearance of fitting into the landscape.*

(2) ***Recommended:*** *A Revegetated Embankment Slope.*

- *Reduces erosion.*
- *Reduces dust.*
- *Visually softens structure and other built elements.*
- *Improves bridge's appearance of fitting into the landscape.*

Planning Considerations

- Treatment may be more successful in northern Nevada and higher elevations with more natural precipitation.
- Minimal design effort required.
- Seed mix should be designed to minimize future maintenance and trash collection.

PROPOSED ALTERNATIVE

1.2.2 Alternative Two:

Rock Mulch Stabilizes Embankment Slope

Apply rock mulch to embankment slopes to reduce erosion and control dust.

Aesthetic Benefits

- Bridge structure appears integrated into the site context rather than giving the impression of sitting on top of the landscape.
- Bridge structure and supporting elements become primary visual elements.
- Bridge appears supported by abutment and substructure elements rather than slope paving.

Cost Considerations

- Estimated costs range from no cost increase to an increase of 50% over the cost of standard concrete slope paving. The range is dependant upon the availability of the rock mulch and number of different types of colors and sizes.

Potential Constraints

- Erosion control needed to prevent erosion around abutment. Design solution may be incorporated at the bridge deck elevation instead of on the slope itself.
- More difficult to maintain in regards to trash and weed control.
- Overuse of rock mulch can lead to driver eye fatigue and monotonous roadways.
- Coordination with maintenance division to quantify and compare long-term maintenance requirements.

Planning Considerations

- Treatment may be more useful in southern Nevada and areas of poor soil where revegetation is more difficult.
- Minimal design effort is required.

(1) ***Recommended:*** *Rock Mulch Embankment Slope.*

- *Reduces erosion.*
- *Reduces dust.*
- *Increases overall appearance of applying a landscape and aesthetic treatment that reflects the surrounding context.*

PROPOSED ALTERNATIVE

1.2.3 Alternative Three: Revegetation/Rock Mulch Combination Stabilizes Embankment Slope

Incorporate a combination of native revegetation and scattered rock mulch to reduce erosion and control dust. Select plant materials that correspond with surrounding native plant communities and which are easily established and maintained.

(1) ✓

(2) ✓

(1, 2) ***Recommended:*** *Revegetation with Scattered Rock Mulch Applied to Embankment Slope.*

- *Uses a variety of sizes and colors of rock mulch.*
- *Promotes water harvesting as run-off is slowed by rock and plant material.*
- *Reflects patterns of the natural landscape.*

Aesthetic Benefits

- Plant materials soften hard edges of built structures.
- Plant materials establish easier in pockets of rock mulch and larger rock groupings. Water naturally accumulates there.
- Bridge structure appears integrated with the site context rather than looking like it is sitting on top of the landscape.
- Bridge structure and supporting elements become primary visual elements.
- Bridge appears supported by abutment and substructure elements rather than slope paving.
- Plant materials soften the stark visual quality of large planes of rock mulch.

Cost Considerations

- Estimated costs range from an increase of 25% to 75% over the cost of standard concrete slope paving. The range is due to the extent of slope treatments that may be needed for erosion control, plantings, hydroseeding, top soil harvesting, etc., the cost of which will be offset by not building the concrete slope pavement and upon the availability of the rock mulch and number of different types of colors and sizes.

Potential Constraints

- Erosion control needed to prevent erosion around abutment. Design solution may be incorporated at the bridge deck elevation instead of on the slope itself.
- More difficult to maintain in regards to trash and weed control.
- Overuse of rock mulch can lead to driver eye fatigue and monotonous roadways.
- Potential water requirements for initial establishment.
- Coordination with maintenance division to quantify and compare long-term maintenance requirements.
- Topsoil harvesting/amending required to promote revegetation establishment.

Planning Considerations

- Use in rural areas with high visibility and in scenic areas.
- Minimal design effort is required.
- Seed mix should be designed to minimize future maintenance and trash collection.

EXISTING PRACTICE

1.3 EXPOSED ABUTMENT

Existing Practice

Shallow abutment used. Abutment typically has 2' of exposed face. Slope intersects the face of open abutments 2' below the soffit.

Aesthetic Issues

- Slope paving visually overpowers the abutment and makes the abutment appear even smaller.
- Minimally-sized abutment has a weak visual connection with the embankment slope and surrounding landscape.
- Can create a situation with steep slopes that requires the use of slope paving to prevent erosion around bridge foundations.
- Visually, the height of exposed abutment appears small in relationship to overall bridge proportions and composition.

(1) ***Not Recommended:*** *Abutment exposure of 2' or less.*

- *Appears out of scale with other bridge elements (slope paving, girder, and parapet).*
- *Creates uncertainty regarding the purpose of the abutment and its connection with overall structure.*
- *Shallow abutment can create a situation that requires either costly slope paving or steep, erodible slopes.*

(2) ***Not Recommended:*** *Abutment exposure of 2' or less.*

- *Causes bridge to look inadequately supported.*

PROPOSED ALTERNATIVE

1.3.1 Alternative One:
Six Foot Exposed Abutment

Increase the exposed portion of abutments from 2' to 6'.

Aesthetic Benefits

- The need for slope paving is reduced.
- Relationship between the proportion of abutment as it relates to overall bridge and parapet is improved.
- Abutment provides strong visual beginning and endpoint of bridge.
- Bridge appears anchored into the landscape by the abutment.

Cost Considerations

- Taller abutments will allow for a shorter bridge and a proportionate reduction in superstructure cost. However, the savings in superstructure cost could be offset or even exceeded by increased abutment costs, particularly in cases where the added height requires the abutment type be changed to a more costly design. For example, changing from a relatively inexpensive diaphragm type to a more costly seat type abutment. The impact on costs for incorporating taller abutments is variable based on project specific configurations.

Potential Constraints

- Change to typical NDOT design approach.
- Does not allow for future widening under structure.

Planning Considerations

- Associated revegetation treatments may be more successful in northern Nevada and higher elevations with more natural precipitation.

(1) ✓

(2) ✓

(3) ✓

(1, 2, 3) ***Recommended:*** *Abutment exposure of 6'.*

✓
- *Provides definitive beginning and end points of structure.*
- *Creates visual balance and proportion of bridge components appear properly scaled to one another.*
- *Allows for a 3H:1V slope which reduces the potential for erosion and costs associated with slope pavement.*

PROPOSED ALTERNATIVE

1.3.2 Alternative Two: Applied Panel

Use of applied panel visually closes abutment. Panel is a facade attached to the abutment.

Aesthetic Benefits

- Panel is a cost effective alternative.
- Simple patterns are easy to add to the pour.

Cost Considerations

- Estimated costs range from about $40,000 to $80,000 additional expense for the panels.

Potential Constraints

- Change to typical NDOT design approach.

Planning Considerations

- Approach has potential for use during retrofits or when aesthetics are considered later in design stages.

(1) ***Recommended:*** *Applied Panel.*

- *Visually closes the abutment.*
- *Provides low cost method of aesthetically treating the standard bridge structure.*
- *Offers opportunity for design or theme expression.*

EXISTING PRACTICE

1.4 SUPERSTRUCTURE SHADOW LINE

Existing Practice

Shallow overhang of bridge deck on girder.

Aesthetic Issues

- No prominent shadow line is created to differentiate the bridge deck from the girder.
- Girder appears too thick in comparison to parapet.
- Shadow line at awkward location makes superstructure appear too thick.
- Bridge superstructure appears too thick in relation to other components and abutments appear to be undersized. The bridge is not visually anchored into the landscape.

(1) ***Not Recommended:*** *Shallow Overhang and Weak Shadow Line of Bridge Deck in Proportion to the Girder.*

- *Makes girder appear overly large and bridge looks bottom-heavy.*
- *Does not create prominent shadow line due to shallow overhang.*
- *Reduces expression of horizontal lines of span.*
- *Makes abutments and other bridge components appear undersized in relationship to the girder.*

PROPOSED ALTERNATIVE

1.4.1 Alternative One: Bridge Deck Overhang Designed to Create Shadow Lines and Good Proportion

Utilize the shadow cast by the bridge deck overhang to create a distinct separation between the bridge deck and the bridge girder. The width of overhang is dependant upon parapet and girder size and materials, but generally neither the deck nor the girder should dominate the visual composition. Rather the bridge span should feel light and open with horizontal shadow lines along the superstructure. The deck overhang should be about 2/3 the girder depth. This overhang needs to be weighed against girder spacing. For engineering, the overhang should not exceed 40% of the spacing between the exterior and first interior girders.

Aesthetic Benefits

- Girder appears proportional to parapet and overall bridge structure.
- Horizontal continuity dominates scene.
- Setback is large enough to create a strong shadow line.
- Color separation highlights the difference between setback and deck (refer to Corridor Plans for colors).
- Setback appears in proportion to bridge deck.
- Superstructure appears slender but not delicate.

Cost Considerations

- Girder depth and location (i.e., position relative to edge of bridge deck and spacing between adjacent girders) are integral to the design of a structure. The cost associated with differing options will be greatly dependent upon the viable options for a given location. Increased overhang length will add to both design and construction costs, and in the extreme, could increase the total bridge cost by 10% or more.

(1) ***Recommended:*** *Strong Shadow Line.*

- *Reinforces horizontal expression of bridge span.*
- *Clearly distinguishes between superstructure and substructure.*

Potential Constraints

- Changes in overhang width affect other bridge design elements. Coordination needed for overall structural aesthetic proportions.
- Depth of girder is a function of the length of span and can be varied only slightly for a given configuration.
- Maximum overhang length is a function of girder spacing – there is a practical limit for a given spacing of girders.

Planning Considerations

- Shadow lines help drivers read the landscape and improve glance recognition. This Increased visual recognition of bridge structure and road alignment can have potential safety benefits.
- Painting a shadow line may help achieve the desired effect when engineering does not allow for recommended proportions. But creating shadow lines will be the most successful and visually appealing strategy.

Recommended Overhang: 2/3 girder depth

(2) ***Recommended:*** *Shadow Line Creates Balance Between Superstructure and Substructure.*

- *Reinforces horizontal expression of bridge span.*
- *Clearly distinguishes between superstructure and substructure.*
- *Balances bridge profile as superstructure appears more slender.*

EXISTING PRACTICE

1.5 SUBSTRUCTURE DISCONTINUITY

Existing Practice

Exposed pier cap used. The pier's proportions are sometimes visually out of balance with the rest of structure. Complicated shapes, patterns, and textures are sometimes used.

Aesthetic Issues

- Pier cap draws unnecessary attention to the substructure or distracts the driver and disrupts the horizontal lines of the superstructure.
- Disproportionately scaled piers or piers with unique forms detract from the overall balance and continuity of the bridge appearance.

(1) ***Not Recommended:*** *Exposed Pier Cap.*

- *Disrupts horizontal lines of bridge.*
- *Disrupts transition between superstructure and substructure.*
- *Draws attention to bridge components that should visually recede.*
- *Distracts driver.*

(2) ***Not Recommended:*** *Use of Numerous, Small Diameter Piers.*

- *Appears too small in relationship to overall bridge.*

PROPOSED ALTERNATIVE

1.5.1 Alternative One: Use of Integral Pier Cap

Preserve the horizontal quality of the superstructure by eliminating the pier cap entirely. In circumstances where an integral pier cap can not be used, the visual impacts can be minimized by eliminating cantilevered pier cap ends, incorporating the pier cap with overall design considerations.

Aesthetic Benefits

- Pier caps do not appear large and visually awkward in relation to the total pier.
- Pier cap does not disrupt the structure's horizontal visual emphasis.
- Superstructure visually relates well to substructure elements and piers do not become the visual focal point of the bridge composition.

Cost Considerations

- Estimated costs will vary greatly, from no added costs to moderate added costs, depending upon the selected design. Integral pier caps are standard for cast-in-place concrete construction and their use will not impact bridge costs. For precast concrete and steel girder bridges, integral pier caps become more complicated to construct and can add as much as 15% to the cost of the bridge. The addition of facade elements to visually mask piers and caps can be accomplished with no added cost for simple configurations or up to a 5% increase of total bridge costs for more elaborate designs.

Potential Constraints

- Integral caps used with steel girders can be either steel cross beams or post-tensioned concrete. Integral steel caps are non-redundant, expensive and require precise fabrication. Integral concrete caps with steel girders are difficult to construct, require temporary falsework and do not allow inspection of the top tension flanges after the bridge goes into service.
- Integral caps may be more difficult to achieve when pre-cast girders are utilized. In such circumstances, the bridge should be designed to visually connect the pier cap with the overall structure.

(1) ***Recommended:*** *Integral Pier Cap.*

- *Does not disturb horizontal line of bridge.*
- *Appears to serve its purpose without visual dominance.*

(2)

(3)

(2, 3) ***Recommended:*** *Facade Piece to Mask Exposed Pier Cap.*

- *Masks exposed pier so it appears coordinated with rest of bridge design.*
- *Creates an opportunity for theme expression as part of overall structure.*
- *Uses similar facade treatment to reduce disruption of horizontal expression.*

Planning Considerations

- Because of increased complexity of the design issues associated with the alternative, greater coordination is required between the structural division and landscape and aesthetics section of design division.

PROPOSED ALTERNATIVE

1.5.2 Alternative Two: Simplified Pier Surface Treatments

Reduce the visual prominence of piers by minimizing the use of surface treatments, and by proportioning piers appropriately to the overall structure.

Aesthetic Benefits

- Pier appears integrated into overall design concept of bridge structure without being visually overwhelming.
- Piers do not block observers' sight when viewed at an oblique angle.
- Superstructure visually relates well to substructure elements and piers do not become the visual focal point of the bridge composition.

Cost Considerations

- By simplifying the surface treatments, a slight cost savings could be realized. However, there will likely be a slight cost increase associated with adding a surface treatment where none would typically be included.

Potential Constraints

- Design of pier surface treatment relates to pier shape and size. Modifying one element affects the visual quality of how the pier looks in relationship to the overall structure.
- Size and shape of columns must meet seismic requirements.

Planning Considerations

- Because of increased complexity of the design issues associated with the alternative, greater coordination is required between the structural division and landscape and aesthetics section of design division.

(1) ***Recommended:*** *Simple Surface Treatment.*

- *Reinforces horizontal line with intermittent shadow lines.*
- *Does not distract.*

(2) ***Recommended:*** *Simple Surface Treatment.*

- *Does not draw unnecessary attention to pier as the use of texture and color is minimized.*

PROPOSED ALTERNATIVE

1.5.3 Alternative Three:
Pier Size Proportional to Overall Structure

Piers are required to support the superstructure and they should appear proportional to their structural task. A general guideline for pier width is for it to be approximately one-third of the superstructure's girder and parapet height. In circumstances of an open rail, pier width should be approximately three-fifths the superstructure height. Piers less than 30" wide are not generally recommended. Beveled edges and surface treatments make columns appear thinner.

Aesthetic Benefits

- Pier appears proportional to their structural task. They look as if they can support the superstructure without being oversized.
- Superstructure visually relates well to substructure elements and piers do not become the visual focal point of the bridge composition.

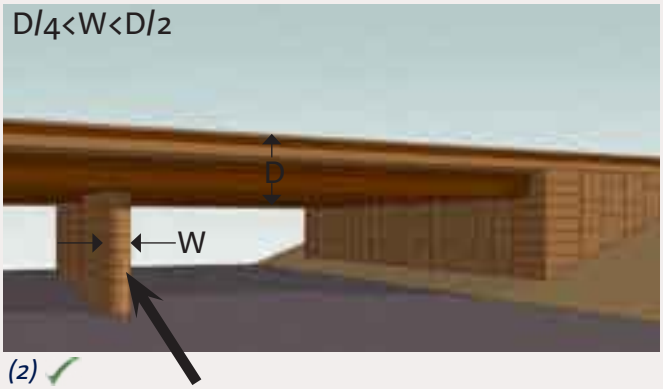
Cost Considerations

- Costs to incorporate could be minimal, but could also result in a significant cost increase where wider supports result in a longer bridge and even added right-of-way to accommodate the required roadway width between supports.

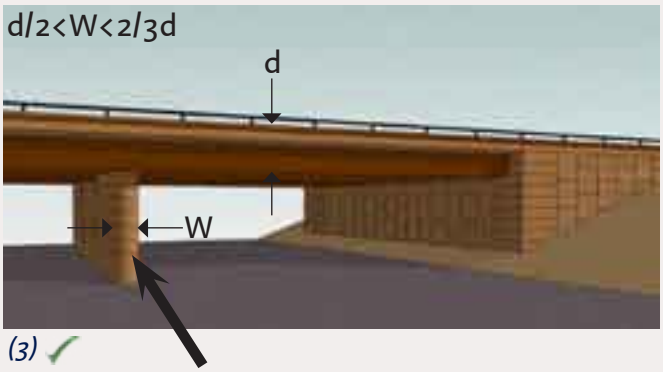
Potential Constraints

- Size and shape of columns must meet seismic requirements and be coordinated with roadway geometry and fit within the roadway cross-section.
- Standard column shape and size has been developed. The standard has an octagonal shape with 4' outside dimensions to allow the use of a continuous transverse spiral or welded hoops. Rectangular columns up to 8' in width by 4' in depth have been used with interlocking transverse spiral reinforcement.
- Description of standard shape and size needs to account for aesthetic impact of piers and their recommended proportion to the overall structure.

(1) ✓



(2) ✓



(3) ✓

(1, 2, 3) ***Recommended:*** *Pier in Proportion to Structure.*

✓ *• Appears large enough to support the bridge and small enough not to look bulky.*

Abbreviations Key:
D: total superstructure depth
d: girder depth
W: pier width

Planning Considerations

- Because of increased complexity of the design issues associated with the alternative, greater coordination is required between the structural division and landscape and aesthetics section of design division.

EXISTING PRACTICE

1.6 PARAPET WALL

Existing Practice

White fine surface finish, concrete parapet attached to bridge deck on straight sections. Twenty-four foot (24') long white fine finish reinforced concrete approach slabs attached to the end of bridge.

Aesthetic Issues

- Solid concrete parapet causes the overall superstructure to appear thick and heavy in proportion to span and abutment height.
- Fascia girders that do not contrast with the railing and deck fascia cause the superstructure to appear thick and heavy.
- Solid parapet constrains views of the surrounding landscape for drivers on the bridge deck.

(1) ***Not Recommended:*** *Solid 32" or 42" High Concrete Barrier Rail.*

- *Constrains motorist's view and disengages them from contextual environment.*

(2) ***Not Recommended:*** *Solid 32" or 42" High Concrete Barrier Rail.*

- *Contributes to overall impression of an oversized superstructure in relation to substructure.*
- *Does not provide visual distinction between the parapet or deck facia and the girder.*

PROPOSED ALTERNATIVE

1.6.1 Alternative One: Steel Tube Bridge Rail Attached to Parapet – Parapet Type BR 27D

Utilize a 42" high double steel tube railing attached to the bridge parapet that meets the TL-4 testing requirements. Rail is listed in the National Cooperative Highway Research Program Report 350.

Aesthetic Benefits

- Visual relief provided to superstructure, with the incorporation of steel tube rail. Open quality of the rail relates better to its structural role, thereby enhancing the bridge's aesthetic appeal.
- Additional horizontal shadow lines created to enhance bridge's visual proportions while keeping the span light and open.

Cost Considerations

- The cost of a standard concrete rail system is expected to be in the range of 2% of the total cost of a bridge. A combination steel tube rail mounted atop a concrete parapet is expected to double the railing cost to 4% of the total bridge cost.

Potential Constraints

- FHWA has approved barrier rail testing. NDOT needs to accept approval or do their own testing.
- Crash testing of connections from approach guard rail to bridge rail is needed.
- Incorporation of standard NDOT pedestrian fencing not currently designed.
- Vandal-resistant features need to be in place. Ensure steel tubes cannot be easily removed.

Planning Considerations

- Appropriate for use in scenic areas and where there are views of environmental resources.
- Appropriate for use in urban areas.
- Appropriate for use in snow removal areas.

(1) ✓

(2) ✓

(1, 2) ***Recommended:*** *Parapet with Steel Tube Rail.*

✓
- *Brings visual balance to bridge (between superstructure and substructure).*
- *Reinforces horizontal line of superstructure, making bridge appear more slender.*
- *Creates clear connection point without the introduction of additional material types.*
- *Does not block views of landscape.*

PROPOSED ALTERNATIVE

1.6.2 Alternative Two: Steel Tube Bridge Rail Attached to Parapet – Minnesota Combination Bridge Rail Design #3

Utilize a 32" high single steel tube railing attached to the bridge parapet that meets the TL-4 testing requirements. Rail is listed in the National Cooperative Highway Research Program Report 350. Epoxy-coated reinforcing steel used in the concrete.

Aesthetic Benefits

- Bridge span proportion is light and open, creating a better relationship between the rail and its structural role.
- Allows better views from bridge which improves the motorist's and tourist's experience.
- Bridge rail visually lightens the bridge span and enhances the visual relationship between superstructure and abutment. Abutment appears more in scale with overall structure, thereby enhancing the bridge's appeal.

Cost Considerations

- The cost of a standard concrete rail system is expected to be in the range of 2% of the total cost of a bridge. A combination steel tube rail mounted atop a concrete parapet is expected to double the railing cost to 4% of the total bridge cost.

Potential Constraints

- FHWA has approved barrier rail testing. NDOT needs to accept approval or do their own testing.
- Crash testing of connections from approach guard rail to bridge rail is needed.
- Incorporation of standard NDOT pedestrian fencing not currently designed.
- Vandal-resistant features need to be in place. Ensure steel tubes cannot be easily removed.

(1) ✓

(2) ✓

(1, 2) ***Recommended:*** *Parapet with Steel Tube Rail.*

✓
- *Brings visual balance to bridge (between superstructure and substructure).*
- *Reinforces visual clarity and wayfinding through horizontal line of superstructure, making bridge appear more slender and providing subsequent safety benefits.*
- *Creates clear connection point without the introduction of additional material types.*
- *Provides view opportunities.*

Planning Considerations

- Appropriate for use in scenic areas and where there are views of environmental resources.
- Appropriate for use in urban areas.
- Appropriate for use in snow removal areas.

EXISTING PRACTICE

1.7 BRIDGE AND RAIL TRANSITIONS

Existing Practice

Transition from concrete parapet to thrie beam rail is made with reinforced concrete approach slab beginning at the abutment.

Aesthetic Issues

- Connection points disrupt the visual impact of the abutment and create a cluttered appearance of different materials and component lines coming together.

.

(1)

(2)

(1,2) ***Not Recommended:*** *Use of Visually Distinctive Concrete Piece to Connect Parapet and Approach Rail.*

- *Distracting – draws attention to connection point.*
- *Disrupts visual continuity of horizontal line of the bridge in the landscape.*
- *Appears unplanned and awkward with the use of different materials.*

PROPOSED ALTERNATIVE

1.7.1 Alternative One: Connection Point is Coordinated as Part of the Overall Bridge Structure

Create a distinct rail termination by extending the parapet beyond the bridge and abutment by a minimum of 6'.

Aesthetic Benefits

- Connection points visually recede.
- Bridge components appear coordinated and part of a deliberate design approach.

Cost Considerations

- Estimated cost will be minimal and will be dependent upon specific design at each installation.

Potential Constraints

- NDOT testing required for connection points.

Planning Considerations

- Straightforward design consideration that adds a great deal to the structure's aesthetic quality.

(1) ✓

(2) ✓

(1, 2) ***Recommended:*** *Connection of Parapet to Approach Rail is Part of Overall Parapet Design.*

✓
- *Appears clean and seamless.*
- *Focuses visual impact on overall structure rather than a connection point.*
- *Appears as if the rail is a natural continuation of structure.*
- *Appears well-planned and thoughtful.*

EXISTING PRACTICE

1.8 COORDINATION OF SIGNAGE AND BRIDGE AESTHETICS

Existing Practice

Signage and support structure design not coordinated with bridge and aesthetic design.

Aesthetic Issues

- Truss blocks view of bridge and can distract driver at decision-making point.
- Support structures and signage can detract from the bridge's aesthetic treatments if placed too close to structure.
- Signage can look disorganized and oversized.

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(1) ***Not Recommended:*** *Signage Blocking View of Bridge.*

- *Interferes with expression of aesthetics and design theme on bridge structure.*

PROPOSED ALTERNATIVE

1.8.1 Alternative One: Signage Coordinated with Overall Bridge Design

Where possible, place signs and support structures so they do not block or visually interfere with bridge aesthetics. Paint support structures where possible to coordinate with bridge aesthetics. Incorporate enhanced support structures for landmark designs.

Aesthetic Benefits

- Support structures designed to be visually light and visually recede as a background element.
- Signs located to provide good visual presentation of the bridge structure, and in particular, the architectural and aesthetic treatments or details used to create visual distinction such as signature bridge railings.
- Sign and support structures do not distract from corridor aesthetics.
- Sign and support structures integrated into design to reflect uniqueness of corridor.
- Composition visually complements superstructure depth and railing system design.

Cost Considerations

- Estimated cost will be minimal and will be dependent upon specific design at each installation.

(1) ***Recommended:*** *Sign Placement Does Not Interfere with Bridge Aesthetics.*

- *Accomplishes information function but does not dominate bridge.*
- *Provides required access to sign.*

Potential Constraints

- Timing of signage design not coordinated with bridge and structure design.
- Spacing of interchanges, structures, and other signs may limit sign placement.
- Dynamic message signage requires access which may be difficult to provide in urban applications.

Planning Considerations

- Identify potential locations for changeable message signs in order to coordinate sign locations.

PROPOSED ALTERNATIVE

1.8.2 Alternative Two: Align Sign Elements

Align sign elements in organized manner so that sizes and proportions appear balanced.

Aesthetic Benefits

- Consistent or proportional sign panel sizes coordinated to strengthen visual ties between adjacent signs and to their relationship to its mounting structure.
- Panel size kept within silhouette of bridge.

Cost Considerations

- Significant cost impacts are not anticipated

Potential Constraints

- Manual of Uniform Traffic Control Devices establishes panel size.
- Directional arrows on individual panels must align with appropriate traffic lanes.

Planning Considerations

- Coordination required to determine clear wayfinding strategies in locations with large signage needs. Span may limit the spacing and the number of signs to be placed.

(1) ***Recommended:*** *Signage Size and Placement Aligned.*

- *Stays within profile of bridge.*
- *Appears organized.*
- *Accomplishes wayfinding task but does not dominate bridge.*

2.0 Sound Walls

ELEMENTS DISCUSSED

2.0 SOUND WALLS – INTRODUCTION

Sound walls serve an important role in reducing noise pollution in areas adjacent to the highway. Although sound walls can have a variety of appearances, their basic design is primarily influenced by the desired level of sound abatement, available right-of-way, and safety considerations. Wall height is a function of the required decibel (dB) reduction level which is determined by the Federal Highway Administration (FHWA).

NDOT standard sound walls are either post-and-panel or cast-in-place structures depending on a site's characteristics. Cast-in-place walls are generally less expensive but require a larger area for foundation construction. If the wall height does not exceed 8' they can easily be constructed on top of an existing barrier rail. Post-and-panel walls are often used on long, straight sections of highway that have minimal grade transitions or when future changes along the corridor are anticipated. Short runs are not economical.

Sound walls within the clear zone must be designed so the bottom 32" has the same shape as the standard Jersey Barrier or "F" shape barrier.

Overall Visual Issues

The main aesthetic issues pertaining to sound wall design are grouped into the following categories: the wall's relationship to the barrier rail, the design of the aesthetic treatment, and height transitions. Seven areas of specific recommendations are made: color separation, limited variation in surface treatments, visually distracting patterns, position and patterning of aesthetic treatments, single-sided surface treatments, post and panel treatments, and height steps and transitions.

Where a wall is constructed on a barrier rail, the focus should be on minimizing the visual disruption between the two systems and allowing the barrier rail to visually anchor and support the wall. Where this is not achieved, the wall looks awkward and mismatched in relation to the rail.

(1) Sound walls should be thoughtfully coordinated with the barrier rail as shown above.

(2) Sound walls provide a great opportunity to reflect the surrounding context through aesthetic patterning.

Aesthetic treatments can range from being too repetitive and boring to being visually distracting. Patterns positioned too low make the wall look out of scale. Monotonous patterns lead to driver fatigue and disengagement with the corridor. Visually demanding patterns can divert the motorist's attention and create safety issues, especially if a driver is at a decision-making location such as a busy interchange. Overall, treatments offer opportunities for design expression and corridor beautification from both the motorist's view and neighboring developments. Achieving this goal requires the use of more than just a few panels to create a compelling design as well as treating both sides of the wall.

Lastly, wall height transitions should not be readily noticed along a corridor. Large steps between wall heights grab the driver's attention as it looks unplanned and out of place.

EXISTING PRACTICE

2.1 COLOR SEPARATION

Existing Practice

White fine surface finish color of barrier rail contrasts with sound wall and highlights the fact that two separate features are combined.

Aesthetic Issues

- Contrast is visually distracting.
- Contrast reduces the sound wall's visual integrity and makes it look like an add-on feature.

(1)

(2)

(1, 2) ***Not Recommended:*** *Differing Barrier Rail and Sound Wall Color.*

- *Draws attention to barrier rail.*
- *Makes sound wall appear like an afterthought.*

PROPOSED ALTERNATIVE

2.1.1 Alternative One: Concrete Barrier Color is Consistent with the Base Color of the Sound Wall

Coordinate the color finish of concrete barriers with sound walls. Avoid using a white fine surface finish. Addressing the color separation between sound walls and concrete barriers is the simplest way to create consistency between structures.

Aesthetic Benefits

- Overall structure looks visually consistent.
- Concrete barrier does not visually distract from overall design approach.

Cost Considerations

- There is no estimated cost increase as the same amount of painting or staining is required for the existing and proposed practices. This includes situations where median barrier rail is typically painted.

Potential Constraints

- There is a perception that the white fine surface finish is believed to provide better visibility. Therefore additional discussions may be required to coordinate colors.
- There is a need to paint all the barrier rail within the project limits, not just the rail in front of the sound wall.

Planning Considerations

- Straightforward method of unifying corridor.

(1) ***Recommended:*** *Barrier Rail Same Color as Sound Wall.*

- *Creates unified appearance.*
- *Does not draw unnecessary attention to the barrier rail.*

EXISTING PRACTICE

2.2 NOT ENOUGH VARIATION IN SURFACE TREATMENTS

Existing Practice

Tight budgets restrict the number of different panel designs that can be used on long corridors.

Aesthetic Issues

- Wall patterning tends to be over-simplified and monotonous.

(1) ***Not Recommended:*** *Overly Simplistic Aesthetic Pattern.*

- *Limits variation.*
- *Appears monotonous over long stretches of roadway.*

(2) ***Not Recommended:*** *Low Number of Different Design Panels.*

- *Restricts ability to create visual interest.*
- *Appears monotonous over long stretches of roadway.*

PROPOSED ALTERNATIVE

2.2.1 Alternative One: Panel Design Allows for Use of One or Two Panel Designs that can be Repeated Yet Rotated to Increase Pattern Variation

Increase the complexity of panel designs with pattern applications so they can be rotated and used in multiple arrangements.

Aesthetic Benefits

- Increased pattern variation reduces visual monotony.
- Rearranged patterns provide a sense of variety while relating to the overall corridor design.

Cost Considerations

- Estimated cost increase is 5% to 10% of total wall costs depending on the complexity of the pattern.

Potential Constraints

- Landscape and aesthetics designer required to illustrate how panel design reduces visual monotony while maintaining legibility of highway system.

Planning Considerations

- Applicable in urban areas designated for enhanced hardscape treatment applications.
- Complex designs are more appropriate for low speed roadways.

(1) ***Recommended:*** *Interesting but not Visually Demanding Patterns.*

- *Offers variety and interest while coordinating with overall corridor theme.*
- *Highlights specific roadway features when special panels are used. Reinforces the legibility of the highway system.*

(2) ***Recommended:*** *Aesthetic Treatment Designed to Allow Panels to be Rotated or Flipped.*

- *Maximizes the patterns' variety while minimizing the need for numerous panel forms.*

PROPOSED ALTERNATIVE

2.2.2 Alternative Two:
Use of a Family of Panel Designs

Increase the number of panels used in order to expand the range of patterns while establishing unity.

Aesthetic Benefits

- Opportunity for variety within a particular theme is improved.
- Overall visual monotony is reduced.

Cost Considerations

- Estimated cost increase is between 5% to 10% of total wall cost due to increased number of form liners required.

Potential Constraints

- None.

Planning Considerations

- Applicable for long stretches of roadway to establish continuity with variety.
- Detailed designs are appropriate for slower speed roadways.

(1) Denver Highway T-REX project area stretched over 19 miles through the urban fabric. A family of different pattern designs were incorporated to provide variety.

(2) Denver Highway Corridor - Panel Design Series 1 ✓

(3) Denver Highway Corridor - Panel Design Series 2 ✓

(4) Denver Highway Corridor - Panel Design Series 3 ✓

(2, 3, 4) ***Recommended:*** *Increased Number of Design Panels.*

✓
- *Increases overall variety within the corridor.*
- *Increases opportunity for aesthetic expression of contextual landscape.*

INDUSTRY PRACTICE

2.3 VISUALLY DISTRACTING PATTERNS

Industry Practice

Overly complicated patterns, or motifs inconsistent with the themes identified in the Landscape and Aesthetics Corridor Plans are applied as aesthetic wall treatments. Although not currently an issue with most Nevada highway aesthetic treatments, there is now a greater potential for their occurrence as funds are now provided for aesthetic treatments. This practice is included to offer alternatives to avoid potential issues with visually distracting patterns.

Aesthetic Issues

- Overly complicated designs are distracting for drivers and potentially dangerous.
- Motifs that are inconsistent with a corridor's design theme disrupts the Corridor Plan's objective of unifying the highway system and reflecting ideas vetted through the public.
- Use of multiple surface treatments complicates maintenance requirements.

(1) ***Not Recommended:*** *Distracting Aesthetic Treatments.*

- *Overwhelms the scene with large expanses of bold, bright color patterns.*
- *Draws too much attention away from motorists' prime objective of navigating the highway system.*

PROPOSED ALTERNATIVE

2.3.1 Alternative One: Simple and Elegant Structures

Design structures to comply with the themes and treatment levels identified in the Landscape and Aesthetics Corridor Plans. The highway experience should be characterized by consistent and elegantly designed structures that reflect the heritage, cultural and environmental qualities of the unique region through which the highway passes.

Aesthetic Benefits

- Express a consistent theme along the highway.

Cost Considerations

- Minimal cost impacts due to simplified patterns.

Potential Constraints

- Every project team working on a design within the right-of-way will have their own interpretation of the Corridor Plan.

Planning Considerations

- Applicable along high speed roadways and in most other situations. Straightforward aesthetic design improves wayfinding as driver distractions are minimized.

(1) ✓

(2) ✓

(1, 2) ***Recommended:*** *Straightforward Aesthetic Treatments that Support the Overall Corridor Theme.*

✓
- *Adds interest to structure while not distracting drivers at a point of convergence with other traffic.*
- *Allows for patterns with adequate depth to enhance shadowing and texture and avoid monotony.*
- *Reinforces the motorists' understanding of the roadway system.*

EXISTING PRACTICE

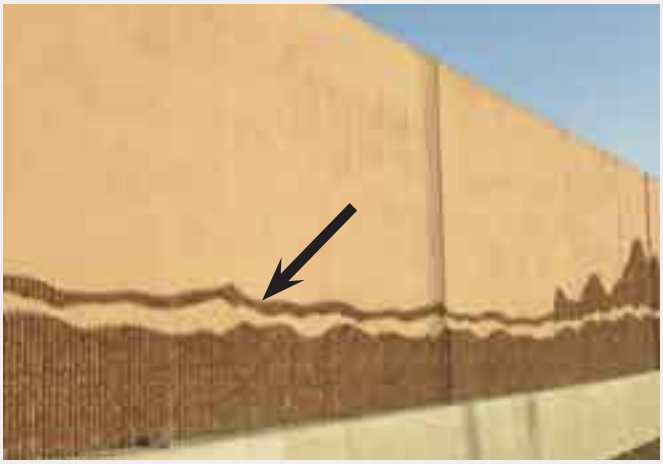
2.4 POSITION AND PATTERNING OF AESTHETIC TREATMENTS

Existing Practice

Pattern is positioned on the lower third portion of the wall. Pattern is not changed in proportion to the height changes of the sound wall.

Aesthetic Issues

- Pattern is positioned too low in proportion to the overall wall height, making the walls appear even taller.
- Simplistic pattern does not substantially improve the highway aesthetic.



(1) ***Not Recommended:*** *Disproportionately Applying Relief Pattern – Pattern Applied too Low on Wall.*

- *Accentuates height of the wall.*
- *Appears unintended and poorly coordinated.*

(2) ***Not Recommended:*** *Repetitive, Oversimplified Pattern.*

- *Makes the highway system appear uninteresting and monotonous.*

PROPOSED ALTERNATIVE

2.4.1 Alternative One: Pattern Applied Proportionally to Wall Height

Position aesthetic treatments according to overall wall proportions. Pattern designs should seamlessly transition between walls of varying heights.

Aesthetic Benefits

- Overall structure looks like an intentionally designed, coordinated feature.
- Wall appears appropriately sized in relation to surface treatment.

Cost Considerations

- Cost increases vary greatly, from minimal additional costs to moderate additional costs, possibly adding 25% to the total wall cost depending upon the selected design.

Potential Constraints

- Projects that must address graffiti require designs with detailed color and patterning to be placed 8' or higher on wall to discourage graffiti.

Planning Considerations

- Applicable for all wall designs.
- Consultant/internal design requirement to illustrate pattern as it is applied to different height requirements.
- Consultant/internal design requirement to illustrate transition points between wall pattern applications.

(1) ***Recommended:*** *Apply Relief Pattern Proportional to Wall Height*

- *Transitions seamlessly between walls of varying heights.*

(2) ***Recommended:*** *Apply Relief Pattern Proportional to Wall Height*

- *Balances amount of relief pattern proportional and in relationship to smooth surface.*

EXISTING PRACTICE

2.5 SINGLE-SIDED SURFACE TREATMENTS

Existing Practice

Wall treatment is not applied to both sides of sound wall.

Aesthetic Issues

- Walls create an unattractive barrier when viewed from surrounding development.
- Not sensitive to neighborhood or surrounding community.

(1)

(2)

(1, 2) ***Not Recommended:*** *Aesthetic Surface Treatment Applied Only to Travel Lane Side of Wall.*

- *Creates unattractive barrier when viewed from surrounding development.*
- *Lacks visual interest when viewed from untreated side.*
- *Reinforces perception of highway facility as a major barrier and visual obstruction.*

PROPOSED ALTERNATIVE

2.5.1 Alternative One: Surface Treatment Applied to Both Sides of Wall

Utilize aesthetic surface treatments on both sides of sound walls in areas of high visibility.

Aesthetic Benefits

- Improved visual perception of highway facilities.
- Discourages graffiti.

Cost Considerations

- Estimated cost increase is 10% to 15% higher than treating a single side of the wall due to method of forming panels, particularly when precast wall systems are used.
- Reduces long-term maintenance costs associated with graffiti removal.

Potential Constraints

- Flipping or alternating panels to increase overall pattern variety may be limited if both sides do not correctly align.
- Design must consider two scales – how it is viewed by high-speed traffic as well as by adjacent residential areas.

Planning Considerations

- Providing aesthetics on both sides of a wall shows mutual respect and care for the community. Aesthetics have the ability to improve the quality of neighborhoods. The area can seem safer and more cared for.
- Discourages graffiti.

(1) ***Recommended:*** *Application of Aesthetic Treatment to Both Sides of Sound Wall.*

✓ • *Improves perception of roadway facilities when viewed from residential and community areas.*

EXISTING PRACTICE

2.6 POST AND PANEL TREATMENTS

Existing Practice

Post and panel systems used for sound barrier. Pattern utilizes horizontal linework for panel surface treatment.

Aesthetic Issues

- Posts can break up visual continuity of wall.
- Use of horizontal pattern on panels draws greater attention to where the pattern stops and starts at each post.

(1) ***Not Recommended:*** *Horizontal Pattern on Post and Panel System.*

- *Focuses attention on separate wall components – beams and posts.*
- *Breaks up visual continuity.*

PROPOSED ALTERNATIVE

2.6.1 Alternative One: De-emphasize Visual Breaks Between Post and Panel Sections

Utilize a surface pattern and color scheme which minimize the focus on where segments stop and start. This can be achieved through vertical patterning on the panels and color patterns that do not highlight the horizontal/vertical discontinuity.

Aesthetic Benefits

- Increased continuity between treatments on standard NDOT walls and the post and panel walls.
- Reduced visual distraction as attention is not drawn to pattern breaks.

Cost Considerations

- Cost impacts are expected to be minimal.

Potential Constraints

- Vertical pattern must be aligned appropriately to minimize jogs in the pattern.

Planning Considerations

- Permanent treatments may require additional design elements to enhance aesthetics.

(1) ***Recommended:*** *Color Used to De-emphasize Pattern Breaks.*

- *Reduces visual emphasis on the breaks between each post/ panel section.*
- *Visually integrates sound wall with surrounding features.*

(2) ***Recommended:*** *Running Bond Pattern with Staggered Vertical Joints.*

- *Reduces visual emphasis on the breaks between each post/ panel section.*

EXISTING PRACTICE

2.7 HEIGHT STEPS AND TRANSITIONS

Existing Practice

The transition between walls of differing heights is out of proportion.

Aesthetic Issues

- Disproportionate, stepped transitions greater than 2' make the wall appear unnecessarily high.

(1) ***Not Recommended:*** *Disproportionate Wall Height Transition.*

- *Makes higher wall appear taller than necessary.*
- *Looks awkward and distracts viewer.*

(2) ***Not Recommended:*** *Abrupt Termination of Sound Wall.*

- *Looks awkward.*
- *Appears unplanned and does not coordinate with surrounding development.*

PROPOSED ALTERNATIVE

2.7.1 Alternative One: Stepped Transition Does Not Exceed 2'and is Proportional to Wall Height

Utilize a maximum 2' stepped transition. Horizontal transition distance varies either in relationship to the vertical distance or in relationship to topographic conditions.

In circumstances requiring quick vertical changes, such as sound abatement needs, the preferred option is for the horizontal measurement to equal or be in proportion to the vertical change (for example, 1V:1H or 1V:3H).

In areas where topography changes necessitate the need for height transitions, the distance between transition points should be regularly spaced or visually correlate with topography changes.

Aesthetic Benefits

- Increases in wall height seem to be the result of aesthetic considerations rather than responses to noise requirements.
- Overall structure looks like an intentionally designed, coordinated feature.

Cost Considerations

- Estimated cost increase is minimal but is dependent on the overall height difference to overcome.

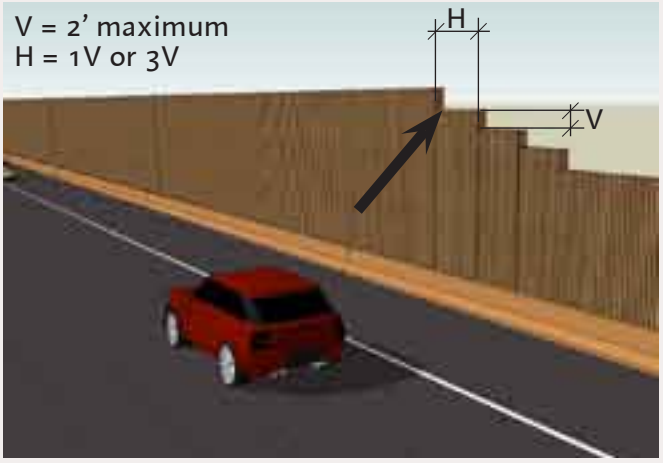
Potential Constraints

- At transition points, portions of adjoining sound walls will have higher walls than federally required in order to create proportional transitions.
- Consultant/internal design requirement to Illustrate transition points where wall height changes.

Planning Considerations

- Coordination with local and regional planning agencies to direct adjacent land uses may reduce need for tall walls or large jumps in required wall heights.

(1) ✓



(2) ✓

(1, 2) ***Recommended:*** *Proportional Wall Height Transitions Over a Corridor Section.*

✓
- *Reinforce the rhythm of the aesthetic patterning.*
- *Meets requirement for a 2' limit for stepped transitions.*

Abbreviations Key:
H: horizontal distance
V: vertical distance

PROPOSED ALTERNATIVE

2.7.2 Alternative Two: Curved and Tapered Transitions Do Not Exceed 3' and are Proportional to Wall Heights

Utilize curved and tapered wall transitions that do not exceed 3' wall height changes. Curved transitions appear more naturalized and subtle, allowing for a maximum of a 3' height transition.

Aesthetic Benefits

- Wall height gradually increases. Visual impression of height change is not abrupt.
- Tapered transitions should not exceed 3' over a period of 20' to 30'. Curved tops may have greater flexibility but should have a few long radii versus several short radii.

Cost Considerations

- Estimated cost increase is minimal.

Potential Constraints

- At transition points, portions of adjoining sound walls will have higher walls than federally required in order to create proportional transitions.
- Only applicable for cast-in-place walls.

Planning Considerations

- Coordination with local and regional planning agencies to direct adjacent land uses may reduce need for tall walls or large jumps in required wall heights.
- Consultant/internal design requirement to Illustrate transition points where wall height changes.

(1) ***Recommended:*** *Proportionate Curved and Tapered Wall Transitions.*

- *Meets limit of 3' rise in height over a 20' to 30' length of highway.*
- *Softens appearance of structure by curving top of wall.*
- *Adds variety to corridor design with curved top.*

PROPOSED ALTERNATIVE

2.7.3 Alternative Three: End Treatment Transitions to Ground Plane Elevation

Wall end points use overall design consistency to transition from the top of the wall to the ground plane.

Aesthetic Benefits

- Overall structure looks like an intentionally designed, coordinated feature.

Cost Considerations

- Estimated cost increase is minimal but is dependent on the overall wall height.

Potential Constraints

- Design requirement to illustrate transition points where wall terminates.

Planning Considerations

- Useful in highly visible urban areas or scenic areas.

(1) ***Recommended:*** *Wall End Piece Transitions Between Top of Wall and Barrier Rail.*

- *Expresses a clear and thoughtful end to the sound wall.*
- *Appears thoughtfully integrated into corridor design.*

3.0 Retaining Walls

ELEMENTS DISCUSSED

3.0 RETAINING WALLS – INTRODUCTION

There are a variety of wall types as well as numerous factors that control wall type selection. In general, wall types can be classified into either fill-walls or cut-walls. Fill-walls are typically used to retain slopes for bridge construction. The two types of most commonly used fill-walls are standard concrete cantilever walls, and Mechanically Stabilized Earth (MSE) walls.

Concrete cantilever walls are constructed of cast-in-place reinforced concrete. Mechanically Stabilized Earth (MSE) walls consist of tensile reinforcements in soil backfill, typically with facing elements of precast reinforced concrete panels. Geometry of the panels is unrestricted. When settlement issues exist, the recommended maximum size is 30 sq ft. However, when settlement issues are not a concern most projects should be able to accommodate 50 sq ft panels. Most MSE wall applications use proprietary systems where the shape of the panels is specific to the wall vendor.

Wall heights consider a number of factors including grades, soils, and amount of available right-of-way. Often these influences push wall design towards the creation of overly tall wall systems.

(1) Panel size and shape have direct bearing on aesthetic composition. Larger panels such as those shown above tend to reduce the visual impact of numerous joint lines.

(2) Aesthetic patterns, such as the image shown, are an opportunity for design theme expression as guided by the Corridor Plan.

Overall Aesthetic Issues

The main aesthetic issues related to retaining walls include first, the lack of coordination with bridge materials, colors, and patterns and second, the wall height. Wall aesthetics should consider how they relate to bridge aesthetics or other adjacent structures. Materials, patterns, and design expression should relate to one another and create a harmonious appearance. Wall systems that do not take into account the look of other elements appear makeshift and reduce a traveler's overall impression of the highway system.

Use of small, odd-shaped MSE panels requires a designer to deal with numerous panel joints. Ideally, joints should visually recede and the shape of a panel not be readily apparent. Odd panel shapes and small panel sizes can make the jointing pattern be more obvious than the aesthetic treatment. Using panels that minimize breaks in the vertical joint lines reduces the visual distraction and allows the aesthetic treatment to be more easily understood with glance recognition.

Finally, the use of extremely tall walls can block the driver's view of the surrounding landscape and create a tunnel-like effect along the roadway. This is especially true if the wall is located close to the travel lanes. Creating opportunities for motorists to see the surrounding context provides visual relief and connects the viewer to the greater landscape and city. Visual opportunities may include views of a ridgeline, adjacent tree canopy, or neighboring or distant buildings. Tall walls disconnect the driver from the city and context, adding to a reduced awareness of their surroundings.

EXISTING PRACTICE

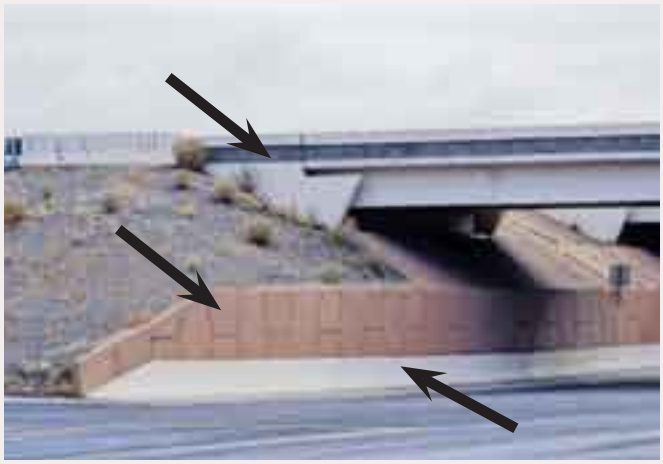
3.1 LACK OF COORDINATION WITH BRIDGE MATERIALS, COLORS, AND PATTERNS

Existing Practice

Uncoordinated surface treatments are used in the same area.

Aesthetic Issues

- Combination of textures looks disorganized and draws attention away from well-designed features.
- Use of multiple surface treatments complicates the maintenance requirements.



(1) ***Not Recommended:*** *Combining Uncoordinated Textures and Colors*

- *Looks ad hoc and inconsistent.*
- *Loses design expression amid the varying treatment types.*

PROPOSED ALTERNATIVE

3.1.1 Alternative One:
Coordinate Retaining Wall Materials and Treatments with Surrounding Structures

Utilize a coordinated family of surface treatments. In circumstances where MSE walls are used adjacent to cast-in-place structures, design surface applications to minimize the appearance of joints.

Aesthetic Benefits

- Bridge structures and surrounding wall treatments appear visually related rather than distinct and separate.
- Increased visual unity between structures.
- Minimized wall joints. Design theme is easily understood.

Cost Considerations

- Estimated cost is minimal to coordinate.

Potential Constraints

- Early coordination and communication between design divisions to consider panel size and shape and material types.
- Available panel sizes and shapes are from the approved MSE wall system vendors on NDOT's Qualified Products List (QPL). Limiting panel size/shape may reduce competition and adversely impact wall costs.
- Availability of long, vertical panels to reduce joint appearance should be confirmed with QPL-listed vendors.

Planning Considerations

- Unified structure enhances glance recognition and has subsequent wayfinding and safety benefits.

(1) ***Recommended:*** *Coordinated Use of Materials for Structure Components and Walls.*

- *Appears rooted into the overall roadway corridor.*
- *Improves the traveler's impression of the highway's appearance and the State's desire and care for a coordinated corridor.*

EXISTING PRACTICE

3.2 WALL HEIGHT & ADJACENCY TO ROADWAY

Existing Practice

Retaining walls exceed 14' in vertical height for a single wall face.

Aesthetic Issues

- Imposing walls create a tunnel effect along the length of the freeway.
- Odd angles distract drivers.
- Walls block views to surrounding landscape.

(1) ***Not Recommended:*** *Retaining Walls Greater than 14' in Vertical Height.*

- *Overwhelms the view from a motorist.*
- *Creates a wall out of scale with rest of corridor features.*
- *Blocks views and creates imposing roadway feature.*

(2) ***Not Recommended:*** *Tall Retaining Walls Directly Parallel Travel Lanes.*

- *Blocks views in a location where travel decisions must be made as travel lanes are converging and diverging.*
- *Can create a tunnel effect which may increase driver anxiety.*
- *Wall dips randomly which can be distracting to motorist.*

PROPOSED ALTERNATIVE

3.2.1 Alternative One: Stepped Retaining Walls

Step walls exceeding 14' vertical height. Where possible provide planting between wall segments.

Aesthetic Benefits

- Reduced overall visual impact and tunnel-like effect of tall walls.
- Increased opportunity to incorporate plant material in highway corridor. Softscape treatments further enhance the aesthetic quality of the highway by softening the appearance of structures.

Cost Considerations

- Cost increases will be primarily a function of additional right-of-way costs, which will be minimal in some locations and preclude the use of this alternative in other locations. Stepped walls may add 5% or 10% to the cost of a single-plane wall system. Plantings and irrigation systems in wall steps will add further to the cost and increase maintenance requirements.

Potential Constraints

- Limited right-of-way space.
- Long-term maintenance requirements need to be quantified.

Planning Considerations

- Use in areas of adequate right-of-way.

(1) ✓

(2) ✓

(1, 2) ***Recommended:*** *Setting Walls Back from Travel Lanes and Stepping Walls Exceeding 14' in Vertical Height.*

✓
- *Reduces perception of tunnel-effect.*
- *Opens views of contextual landscape.*
- *Provides opportunities for vegetation in transition area.*
- *Breaks down scale of wall.*

PROPOSED ALTERNATIVE

3.2.2 Alternative Two: Grading Used to Reduce Wall Height

Set walls back from travel lanes and utilize gradually sloped landforms to reduce required wall heights.

Aesthetic Benefits

- Reduced perception of wall height.
- Opened views of surrounding landscape.
- Increased opportunity for incorporating plant material and landforms into the roadway design. Softscape treatments make the walls appear more in scale with the highway and surrounding landscape.

Cost Considerations

- Cost increases will be primarily a function of additional right-of-way costs which will be minimal in some locations and preclude the use of this alternative in other locations. The material required for grading will typically be offset by the reduced wall costs.

Potential Constraints

- Limited right-of-way space.
- Long-term maintenance requirements need to be quantified.

Planning Considerations

- Use in areas of adequate right-of-way.

(1) ***Recommended:*** *Using Landform and Grading to Reduce Wall Height and Open Views.*

- *Reduces height of wall directly adjacent roadway.*
- *Allows wall to be set back from roadway and opens views of surrounding landscape.*

(2) ***Recommended:*** *Using Natural Landforms to Integrate Wall into Landscape Context.*

- *Coordinates wall texture and color with natural rock outcropping.*
- *Steps wall back from roadway as a natural progression of the rock outcrop and opens views of landscape.*

4.0 Drainage Facilities

ELEMENTS DISCUSSED

4.0 DRAINAGE FACILITIES – INTRODUCTION

Highway drainage facilities consist of on-site and off-site ditches and channels. These facilities may be lined or unlined and are often aligned using straight, angular layouts. Design considerations include right-of-way limitations, maintenance requirements, and geometric constraints, such as minimum slope. The function of the facility is to collect stormwater run-off from the pavement and adjacent area and convey it to appropriate outfall locations. On-site drainage, also referred to as roadway surface drainage, includes roadside and median ditches within the highway right-of-way. Off-site drainage includes channelization that may be required as mitigation when roadway improvements encroach into natural watercourses. Channelization may also be required to protect roadway facilities from damage due to flooding.

NDOT's Drainage Manual states that "all new channels are to be designed to be non-erosive and horizontally and vertically stable for the design event. Earthen channel side slopes shall be 3H:1V or flatter and riprap-lined channels shall have 2H:1V or flatter side slopes. Stream bank stabilization shall be provided when appropriate."

For lesser velocities, channels may be unlined or use appropriate linings such as riprap, gravel, or vegetation (unreinforced or reinforced with synthetic mats). For higher flow velocities, linings may include higher class riprap, preformed blocks or concrete lining.

(1) Drainage facilities can be a visually dominating feature because of the scale needed to handle flows. The facility shown above requires aesthetic design consideration to try and blend it into the natural landscape so it does not create an eyesore.

(2) Lining roadside swales with asphalt increases water velocity and the intensified flows can lead to increased downstream erosion and stabilization issues. Another negative element is the way it visually stands out against the landscape.

Overall Aesthetic Issues

The main aesthetic concerns regarding drainage facilities include the visual impact of paving the facilities and the unnatural appearance of layouts with straight alignments. Stormwater run-off may require large-scaled drainage facilities to handle the flows. The facilities provide an opportunity to appear part of the naturalized hydrologic system, but the typical design practice results in them looking very hard and unnatural. Paving the channel and not weaving the alignment and the slope edges into the existing landforms makes the facility look artificial and stand out instead of visually receding and looking like a natural landscape feature. The proposed alternatives discuss options for achieving this objective. Some of the aesthetic alternatives for rock cuts, discussed in Section 5, may also be appropriate for improving channel aesthetics.

EXISTING PRACTICE

4.1 PAVED DRAINAGE FACILITIES

Existing Practice

Roadside channels, even those with slopes less than 3H:1V, are paved with asphalt or concrete. Drainage ditches and channels follow unattractive straight lines and sharp, angular shapes.

Paved swales are used to limit water getting to the roadway. For example, the third image shows a situation where soils are such that water going into the subgrade could degrade the roadbed and cause failure of the system. In these situations, curving the swale may be an option if safety slopes can be met.

Aesthetic Issues

- Asphalt and concrete linings visually stand out in the landscape.
- Linear, man-made forms draw attention rather than being secondary landscape elements.
- Paving increases water velocity and downstream stabilization issues.
- The use of additional asphalt adjacent to the roadway increases the perception of an overly wide highway.

(1)

(2)

(1, 2) ***Not Recommended:*** *Paved Channel Linings.*

- *Reinforces the impression of the highway system's dominance over the contextual landscape.*
- *Draws attention to the channel.*
- *Exaggerates the appearance of straight, angular lines.*

(3) ***Not Recommended:*** *Paved Drainage Swales.*

- *Draws attention to the drainage swale.*
- *Reduce the corridor's overall visual quality.*

PROPOSED ALTERNATIVE

4.1.1 Alternative One: Open-Cell Concrete Block Used as Channel Lining

Utilize open-cell concrete block as a structural channel lining. Blocks are stained or colored to blend with surrounding native rock and soil. Cells are filled with rock mulch in arid applications. But, where soil moisture and precipitation allow, native grasses are planted in the voids.

Aesthetic Benefits

- Reduced visual contrast between drainage feature and surrounding landscape.
- Reduced water velocity when native grasses are included. This may be negligible as vegetative uptake varies by location. Grasses may help stabilize soil between blocks and decrease potential for sediment transport.

Cost Considerations

- Cost factors include the proximity of the concrete casting plant and irrigation requirements necessary to establish vegetation, with overall cost anticipated to be within 3% of a concrete-lined channel.
- Need coordination with maintenance to ensure large equipment can be used.

Potential Constraints

- Coordination between maintenance and hydraulics.
- Geometric constraints. Blocks manufactured with mats do not adapt easily to alignment changes.
- Potential need for temporary water at remote locations depending on vegetation choice.

(1) ***Recommended:*** *Open-Cell Concrete Block.*

- *Provides opportunity to match concrete and filler color with native soil.*
- *Provides opportunity to incorporate native grasses in voids.*
- *Provides structural surface for maintenance as well as opportunities to blend the block into contextual landscape.*

(2) ***Recommended:*** *Stain Open-Cell Concrete Block to Blend with Native Soil.*

- *Ties color in with surrounding landscape.*
- *Provides opportunity to fill voids with grasses or rock mulch.*

Planning Considerations

- Most applicable in southern Nevada and areas of poor soils where vegetated swales and drainage channels are more difficult to establish.
- Do not have the same failure method as concrete channel and will last longer if properly installed.
- Can withstand high velocities and can replace large riprap in some instances.
- Has the most similar maintenance practices to the typical concrete-lined channel.

PROPOSED ALTERNATIVE

4.1.2 Alternative Two: Revegetated Channel

Revegetate channel using appropriate, low-water use vegetation. Plant materials should be selected based not only on their ability to establish but also their ability to adapt to channel maintenance. For example, consider grasses and forbs which quickly regenerate after being mowed or having the channel surface scraped. Native plant varieties are recommended.

Aesthetic Benefits

- Minimized visual contrast between drainage feature and surrounding landscape.
- Reduced water velocity due to inclusion of native grasses after vegetation is adequately established.

Cost Considerations

- Minimal cost savings. Channel lining can not be completely eliminated due to need to accommodate flows during vegetation establishment period and there are costs for establishing vegetation as well as long term maintenance.

Potential Constraints

- Coordination between maintenance and hydraulics. In some cases, flow requirements may restrict feasibility of a vegetated channel due to reduced channel velocity.

Planning Considerations

- Most applicable in northern Nevada and areas of high elevation with more natural precipitation.
- Include additional channel depth as the lower water velocities that may occur will raise the water surface elevation.
- Design channel for two periods – when vegetation is not adequately established and for period after establishment.
- Use in scenic areas and highly visible areas.
- Seed mix should be designed to minimize water use, future maintenance, and trash collection.

(1) ***Recommended:*** *Revegetated Drainage Channel.*

- *Slows water velocity.*
- *Blends drainage facility with surrounding landscape.*
- *Reduces heat island effect through use of plant materials over paving.*

(2) ***Recommended:*** *Revegetated Drainage Channel.*

- *Slows water velocity.*
- *Blends drainage facility with surrounding landscape.*
- *Reduces heat island effect through use of plant materials over paving.*

PROPOSED ALTERNATIVE

4.1. 3 Alternative Three: Pockets of Boulder Rip Rap Used at Channel Edge

Anchor the edges of drainage channels with pockets of boulder rip rap.

Aesthetic Benefits

- Reduced water velocity. Boulders slow water movement.
- Naturalized appearance of the channel. Boulders and rock material provide pockets for soil and plant material to become established.

Cost Considerations

- Estimated cost is unknown, dependent upon the proximity of suitable material. Any costs would be offset by the savings realized by not constructing a paved channel. Long term maintenance costs would likely increase.

Potential Constraints

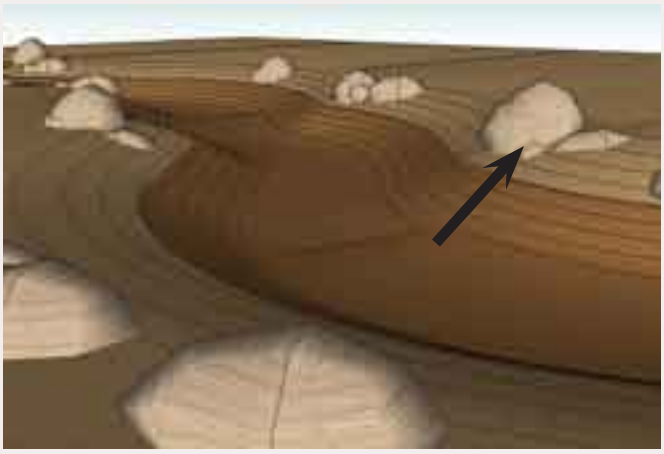
- Periodic clean-out of silt and debris deposited around boulder rip-rap.
- Potential need for training of maintenance crews for curvilinear alignment.
- Must use large enough material so that it does not get dislodged from a 50-year storm event.

Planning Considerations

- Use in areas of higher water velocity where there is a desire for a more naturalized appearance.

(1) ***Recommended:*** *Incorporating Pockets of Boulder Rip-Rap and Vegetation.*

- *Softens appearance of drainage channel.*
- *Slow water velocities – reducing downstream erosion potentials.*
- *Connects channels visually to landscape context.*



(2) ***Recommended:*** *Incorporating Pockets of Boulder Rip-Rap along Channel Slope.*

- *Softens the transition point between channel and surrounding landscape.*
- *Minimizes maintenance concerns by locating rip-rap outside of main channel flow.*

PROPOSED ALTERNATIVE

4.1.4 Alternative Four: Top and Toe of Channel Rounded to Blend into Landscape

Round channel edges to transition into existing grade.

Aesthetic Benefits

- Reduced visual distinction between top of channel and channel edges.
- Minimized effect of exaggerated slope edges as soil is eroded over time. Feathering slope ends decreases the potential for erosion.

Cost Considerations

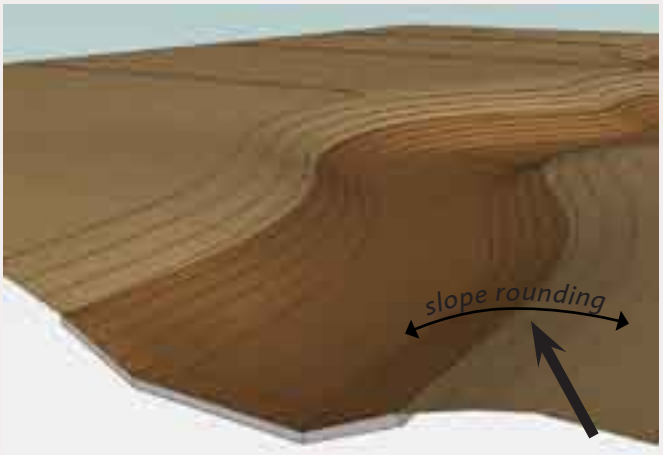
- Estimated cost is minimal, assuming the rounding can be accomplished within the right-of-way that exists or would have been acquired for the project. Additional costs may be offset by reduced riprap paving.

Potential Constraints

- Initial excavation increased.
- Potential need for training of maintenance crews for curvilinear alignment.
- Construction administration needed to ensure rounding of top and toe and of slope.
- Potential need for more right-of-way for layout. Additional width and length may be required.

Planning Considerations

- Can be used in combination with other alternatives.



(1) ***Recommended:*** *Rounded Channel Edges.*

- *Softens visual transition between channel and landscape context.*
- *Appears more integrated and a natural part of the surrounding landforms and hydraulic pattern.*

PROPOSED ALTERNATIVE

4.1.5 Alternative Four: Curvilinear Channel Layout Used

Meander channel alignments to create naturalized patterns while keeping engineering and hydraulic considerations in focus.

Aesthetic Benefits

- Integrated appearance of drainage channel into the landscape.
- Reduced water velocity.
- Increased opportunity for incorporating pockets of boulders.

Cost Considerations

- Estimated cost increases will be directly related to the increased length of channel and potential additional right-of-way required to construct the channel. Both items will vary with individual designs and locations. A minor cost increase is expected from the added complexity in laying out and constructing curvilinear features.

Potential Constraints

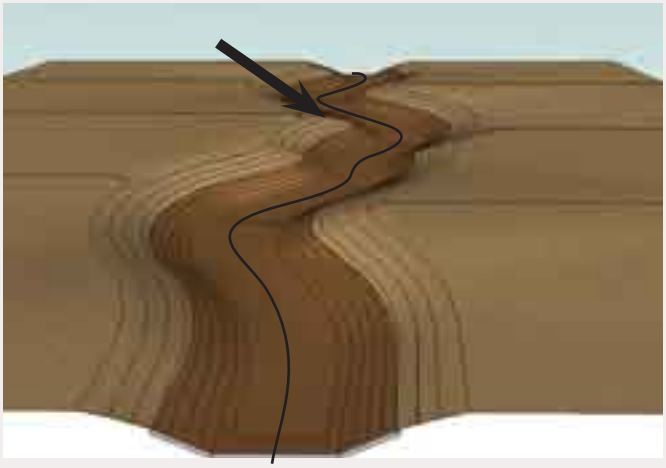
- Construction administration needed for staking and to ensure appropriate channel layout.
- May require right-of-way.
- Minimum channel slope must be accommodated. Adding channel length flattens the slope and may advantageously decrease velocities. But the slope cannot be flattened below a functional threshold.
- Potential need for training of maintenance crews for curvilinear alignment.
- Potential need for more right-of-way as layout meanders back and forth rather than being a straight line.

Planning Considerations

- Use in areas with adequate right-of-way.
- Use in areas of lower water velocities if using small riprap.

(1) ✓

(2) ✓



(3) ✓

(1,2,3) ***Recommended:*** *Curvilinear Channel Layout.*

✓
- *Looks more natural.*
- *Appears more integrated and a natural part of the surrounding landforms and hydraulic pattern.*
- *Provides opportunities to slow water velocities.*

5.0 Rock Cuts

ELEMENTS DISCUSSED

5.0 ROCK CUTS – INTRODUCTION

Standards and guidelines for rock cuts deal primarily with the stability of the slope for safety and erosion control. Other safety considerations include the provision of an adequate clear recovery zone below the rock cut and space for falling boulders and snow removal. Slope laybacks are typically 2H:1V with benching between cuts for large excavations. Right-of-way limitations and disposal of additional cut material may trigger the creation of unnatural, steep cuts.

Overall Aesthetic Issues

The main aesthetic concern regarding rock cuts is their unnatural appearance. Rock cuts are one of the most visually dominant features of a roadway environment. Not only do they visually overwhelm the adjacent landscape context, but they can also create a scar along a mountain-side which is visible from many miles around. The steep cuts look unnatural and are often extremely difficult to revegetate. Therefore NDOT continually works to stabilize erosion and rock areas. The freshly exposed soil stands out against the undisturbed landscape, drawing extra attention to the rock cut.

Overall the practice results in an element which expresses the highway's dominance over the landscape rather than an effort to fit the roadway to the contours of the land. The following alternatives provide options for blending the necessary cut into the landscape. In addition some of the rock cut treatments may be appropriate for improving channel aesthetics.

(1) These steep cuts and benching visually scar the landscape and are difficult to revegetate in Nevada's arid climate.

(2) Large rock cuts can negatively impact an otherwise scenic view.

EXISTING PRACTICE

5.1 UNNATURAL APPEARANCE OF CUT

Existing Practice

Slope embankments are laid back at a minimum 2H:1V slope with benching between cuts for large excavations. Cut slopes abruptly transition into the adjacent natural grade. Excavations result in flat, untextured slopes. Light colored, freshly exposed surfaces accentuate the visual contrast.

Aesthetic Issues

- Steep rock cuts and angular shapes prominently stand out in the landscape and are one of the most visually invasive parts of the highway facility.
- Lightly colored, untreated rock cuts draw attention to the cut slope.
- Steep slopes are difficult to revegetate and continual erosion and sloughing of rock occurs.
- Flat, evenly cut surfaces appears dull and unnatural.
- Abrupt transitions to natural grade can expose the roots of existing vegetation and cause plant die back, drawing greater attention to the transition line.

(1) ***Not Recommended:*** *Large, Stepped Cut Slopes.*

- *Overwhelms the scenic view.*

(2) ***Not Recommended:*** *Unstained Cut Slopes.*

- *Draws additional attention to cut slope because of contrasting color with lightly colored cut slope.*

(3) ***Not Recommended:*** *Flat, Uncontoured Cut Slopes of 2H:1V.*

- *Reduces likelihood of successful revegetation on steep slope.*
- *Appears dull and stark against the contextual landscape.*

PROPOSED ALTERNATIVE

5.1.1 Alternative One: Slope Layback of 3H:1V

Increase slope layback from 2H:1V to 3H:1V.

Aesthetic Benefits

- Reduced need for continual retrofit of erosion control measures.
- Improved establishment of revegetation and reduced need of extensive rock mulch.
- Enhanced view corridor as cut blends in with existing landforms.

Cost Considerations

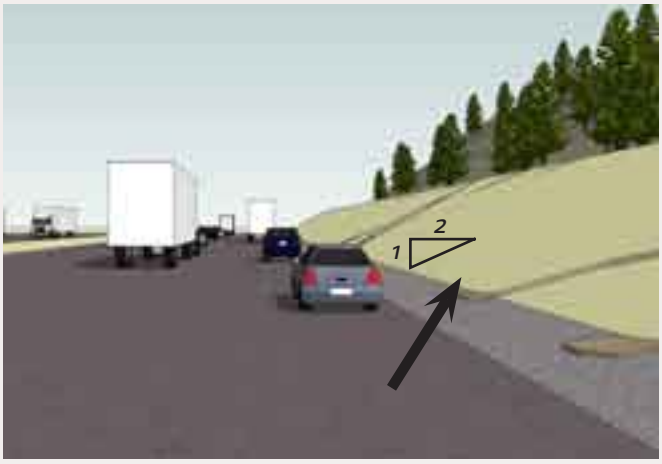
- The additional volume of material to be moved to achieve flatter slopes will proportionately increase the cost over the volume required for standard 2H:1V slopes. Estimated costs will vary greatly with location and project, with additional right-of-way needs presenting the potential to preclude this approach as a viable option.

Potential Constraints

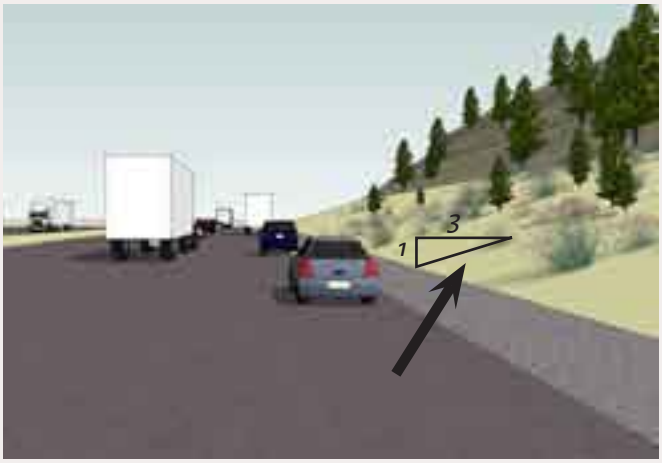
- Increased excavation requirements.
- Amount of right-of-way may be limited.

Planning Considerations

- Use in areas of sufficient right-of-way and in scenic areas.
- Consider for use in channel aesthetics.



(1) ***Not Recommended:*** *Slope Layback of 2H:1V.*



(2) ***Recommended:*** *Slope Layback of 3H:1V.*

- *Increases likelihood of successful revegetation efforts.*
- *Increases ability to work cut slope into existing landforms.*

PROPOSED ALTERNATIVE

5.1.2 Alternative Two: Undulating Rock Cut

Create cut that is undulating with varied slopes. Mimic naturalized boulder groupings and other features such as talus.

Aesthetic Benefits

- Increased visual interest as slope variations create pockets of light and shadow.
- Enhanced integration of cut slope into surrounding landforms.
- Mimics naturalistic landscape.
- Improved revegetation establishment in areas of reduced slope. Undulations create natural pockets for rainwater harvesting without the addition of irrigation.

Cost Considerations

- A minor increase in construction cost is anticipated to construct non-uniform slopes. However the increase may be negligible, assuming the overall slope of the undulated surface approximates that of the straight, flat cut.

Potential Constraints

- Construction administration needs to ensure appropriate undulation and slope variation.

Planning Considerations

- Use for highly visible landforms and in scenic areas.
- Use in other locations when budget allows.
- Consider for use in channel aesthetics.

(1) ***Recommended:*** *Contoured Slope Surface.*

- *Provides variety to slope surface.*
- *Increases likelihood of successful revegetation in areas of reduced slope layback.*
- *Looks more natural than flat surfaces.*

PROPOSED ALTERNATIVE

5.1.3 Alternative Three: Staining Exposed Rock Cut

Stain exposed rock cuts to match surrounding landforms.

Aesthetic Benefits

- Increased blending of rock cut into contextual landscape.

Cost Considerations

- Estimated cost is 25 cents to 50 cents per square foot for locations with reasonable access. For vertical faces exceeding 80' in height, there will be additional costs associated with the complexity of application.

Potential Constraints

- Coordination with environmental division to ensure appropriate stain is used, or used in a manner that does not negatively affect water quality.

Planning Considerations

- Use for highly visible landforms and in scenic areas.
- Use in other locations when budget allows.

(1) ***Recommended:*** *Stained Rock Cuts.*

- *Matches color of cut slope with existing ground surface.*
- *Reduces visual distraction of cut slope.*

PROPOSED ALTERNATIVE

5.1.4 Alternative Four: Rounded Top and Toe of Slope

Grade slopes to gradually blend with existing topography.

Aesthetic Benefits

- Enhanced long-term appearance of slope. Un-rounded slope edges tend to become more exaggerated over time as slopes become eroded. Feathering the top and toe of a slope minimizes that effect.
- Reduced visual distinction between slope and natural grade.
- Reduced future disturbance and maintenance issues. Although more initial disturbance is often required, there is reduced long-term maintenance requirements for continual slope stabilization and concern regarding large trees and shrubs located at the transition zones.

Cost Considerations

- Estimated cost is minimal, though a larger volume of material will be moved to develop rounded slopes. However, if additional right-of-way is required at a given location, cost could increase significantly or possibly preclude this alternative from consideration.

Potential Constraints

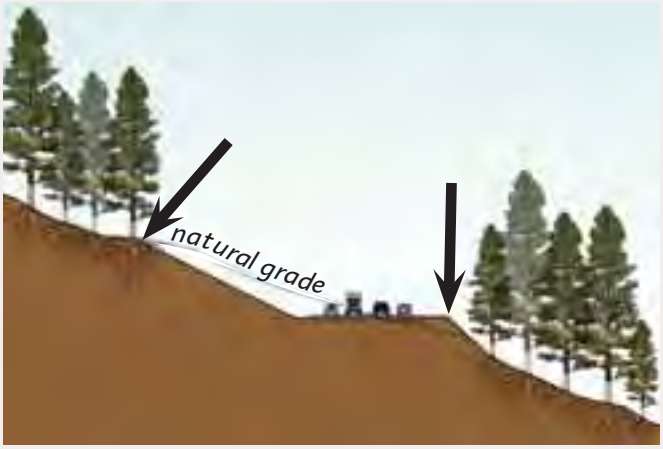
- Increased excavation requirements.
- Potential increase in vegetative disturbance.
- Construction administration to ensure rounding of top and toe and of slope.

Planning Considerations

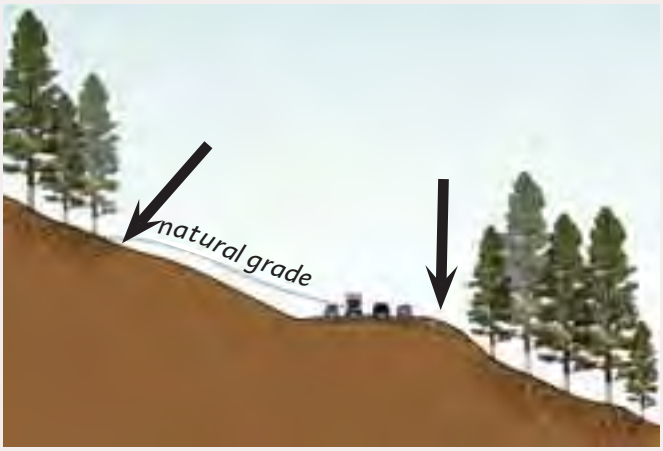
- Easy to implement alternative. Use whenever possible as it is an easy way to improve aesthetics.
- Consider for use in channel aesthetics.

(1) ***Recommended:*** *Slope Rounding.*

- *Improves transition between cut slope and natural grade.*



(2) ***Not Recommended:*** *Non-Rounded Slope Transition.*



(3) ***Recommended:*** *Slope Rounding.*

- *Conforms to hills natural contour.*
- *Appears naturalized.*

PROPOSED ALTERNATIVE

5.1.5 Alternative Five:
Rock Cut Along Natural Bedding Planes

Design rock cuts to be natural in form, shape, and texture. Use natural bedding planes to develop rock cuts.

Aesthetic Benefits

- Increased visual relationship between rock cut and surrounding rock formations.
- Enhanced visual quality as rock cut appears more natural.

Cost Considerations

- Estimated cost is dependent upon specific location, and could vary from no additional cost to prohibitive cost.

Potential Constraints

- Construction administration to ensure drill and blast marks do not negatively affect the aesthetics of the rock's surface cut.
- Rock must meet geotechnical requirements for stability.
- Must meet clear zone requirements (rock overhangs).

Planning Considerations

- Use whenever rock geology allows.

(1) ***Recommended:*** *Rock Cut Along Natural Bedding Plane.*

- *Appears like a natural rock outcrop.*
- *Blend the rock cut with the landscape when weathering techniques are used.*

(2)

(3)

(2, 3) ***Recommended:*** *Rock Cut Along Natural Bedding Plane.*

- *Appears natural in form, shape, and texture.*

6.0 Rock Mulch

ELEMENTS DISCUSSED

6.0 ROCK MULCH – INTRODUCTION

Rock mulch is used to stabilize slopes (in drainage channels and embankments, for example), to provide dust and weed control, and to allow for the infiltration of water into the soil. This is considered a standard project cost. Currently, the Silver Book does not include standards for rock mulch as used for erosion control or roadside material. According to the Green Book, considerations for the selection of rock material include the ability to produce a well-graded surface that minimizes voids.

Overall Aesthetic Issues

The main aesthetic concern is the uniform size and color of the rock mulch. Using rock mulch in large quantities produces negative impacts on the visitor experience, including glare, maintenance, and roadway safety. Plant growth and revegetation are inhibited. Overuse of lightly colored mulches creates a monotonous visual environment. These alternatives address these considerations. Appropriate selections of rock mulch may also be applicable aesthetic treatments for riprap channel lining.

(1) In southern Nevada, large quantities of rock mulch are used to stabilize slopes and provide dust and weed control. The overuse of rock mulch eliminates the potential for slope revegetation and a softening of the highway environment.

EXISTING PRACTICE

6.1 UNIFORM SIZE AND COLOR OF ROCK MULCH

Existing Practice

Rock mulch of a uniform size and color is applied over an expansive area.

Aesthetic Issues

- Uniform treatment creates an unnatural appearance when compared to surrounding natural features.
- Monochrome color creates a dull, lifeless visual landscape.
- Long stretches of uniform light colored rock mulch contribute to eye fatigue and driver's lack of concentration. This can pose a potential safety risk. High reflectivity/albedo of rock increases potential for eye fatigue.
- Extensive application of rock mulch prevents establishment of native revegetation.

(1) ***Not Recommended:*** *Uniformly Sized and Colored Rock Mulch.*

- *Appears uninviting and lifeless.*
- *Appears bland, boring, and monotonous.*

(2) ***Not Recommended:*** *Large Expanses of Rock Mulch.*

- *Eliminates potential for revegetation.*
- *Appears uninviting and lifeless.*
- *Appears bland and boring.*

PROPOSED ALTERNATIVE

6.1.1 Alternative One: Rock Mulch Combined with Native Revegetation

Incorporate a combination of native revegetation and scattered rock mulch. Revegetation techniques should not require permanent irrigation, and rock mulches should blend with existing scattered rock.

Aesthetic Benefits

- Increased aesthetic appeal as native vegetation visually softens the highway corridor.
- Enhanced relationship between the highway and the surrounding context as rock mulch corresponds to the existing geology and boulders.
- Improved revegetation establishment as water movement slows around rocks.
- Reduced visual monotony as rock mulch is integrated with plant material.

Cost Considerations

- Cost of establishing vegetation will be offset by reduced rock required, and will need site-specific consideration due to variations in costs of rock, topsoil, hydroseeding, temporary irrigation, long-term maintenance, etc.

Potential Constraints

- Long-term maintenance requirements need to be quantified.
- Potential initial water requirements for establishing revegetation.
- Topsoil harvesting/amending required to promote revegetation establishment and harvest rock mulch that corresponds to the landscape palette.
- Increased staging needed to store harvested topsoil.

(1) ✓

(2) ✓

(1,2) ***Recommended:*** *Use of Revegetation with Scattered Rock Mulch.*

✓
- *Softens the corridor's built elements.*
- *Reduces heat island effects.*
- *Adds visual interest while connecting corridor to larger landscape context.*
- *Improves traveler satisfaction as vegetation is typically preferred by community members.*

Planning Considerations

- Use in rural and transition areas.
- Treatment may be more successful in northern Nevada and higher elevations with more natural precipitation.

PROPOSED ALTERNATIVE

6.1.2 Alternative Two: Use of a Variety of Rock Sizes

Vary rock sizes from large to small while adhering to highway safety standards within the clear zone.

Aesthetic Benefits

- Improved relationship between rock mulch and surrounding landscape patterns.
- Increased visual depth and interest. Shadow pockets are created which increase roadside aesthetics.
- Reduced visual monotony and boredom.
- Increased driver alertness and safer driving due to reduced eye fatigue.

Cost Considerations

- Estimated cost increase of 0% to 5% due to additional effort required during placement of material to ensure the proper placement of selected rock varieties. In addition, there is added cost for use of large sizes of rock and rock mulch.

Potential Constraints

- Consultant/internal design team to ensure rock size used within clear zone meets safety requirements while also providing aesthetic relief.

Planning Considerations

- Use in urban areas, especially on long stretches of roadway.
- Varying rock sizes and creating natural shadow-lines reduces the potential for eye fatigue and related safety issues.

(1) ***Recommended:*** *Use of Varying Rock Sizes.*

- *Breaks up the monotony of a continuous plane of mulch.*
- *Looks more natural.*
- *Creates shadow lines.*

(2) ***Recommended:*** *Use of Varying Rock Mulch Textures.*

- *Breaks up the monotony of a continuous plane of mulch.*
- *Coordinates color of mulch to provide consistency.*

PROPOSED ALTERNATIVE

6.1.3 Alternative Three: Use of Different Mulch Colors

Utilize a variety of mulch colors that correspond to the corridor's base color and the natural surrounding ground plane.

Aesthetic Benefits

- Enhanced visual depth and interest. Subtle hue changes provide opportunities for naturalized patterns that harmonize with the surrounding landscape.
- Increased driver alertness and safer driving due to reduced eye fatigue.

Cost Considerations

- Estimated cost increase is 0% to 5% due to additional effort required during placement of material to ensure the proper placement of selected rock varieties. There can be a wide variety of cost depending on color choice. Some colors can be expensive.

Potential Constraints

- Availability of rock colors.

Planning Considerations

- Use in urban areas, especially on long stretches of roadway.
- Varying rock sizes and adding to the depth of the visual scene reduces the potential for eye fatigue and related safety issues.

(1) ✓

(2) ✓

(1,2) ***Recommended:*** *Use of Varying Rock Colors.*

✓
- *Adds special visual interest.*
- *Provides opportunity to reinforce the corridor theme with the use of differing colors.*
- *Adds to depth of visual scene.*

7.0 Lighting

ELEMENTS DISCUSSED

7.0 LIGHTING – INTRODUCTION

Community awareness regarding dark sky issues makes highway lighting a typical public discussion topic. The standard specifications set the standard for the type of cut-offs, fixtures, and finishes used. Typically NDOT selects a semi-cutoff luminary with a refractor or a cutoff luminary with a flat lens. The standard light post is a hot-dipped galvanized steel pipe. And unless specifically required, such as in the Lake Tahoe Basin, the galvanized metal poles are not primed and painted. High mast lighting is being used more, frequently in urban areas. The lights are located away from vehicle traffic which improves maintenance access and reduces traffic conflicts with maintenance.

Overall Aesthetic Issues

The main aesthetic concerns include over-lighting the roadway and using highly reflective finishes. Light spill from fixtures impacts the night sky and can visually disturb adjacent residential areas as well as impact bird flying patterns. Over-lighting the roadway can also require the installation of additional lights. Numerous poles and fixtures can break up the skyline and be visually overwhelming for a driver. Requiring additional lights enlarges the visual impact.

Roadway elements such as light poles and fixtures should be a tertiary visual element within the highway corridor. Reflective surfaces such as those used for high mast fixtures can produce glare and be distracting. Shiny surfaces divert the driver's attention and make an element that should be less important become visually dominant. Additionally, plastic cobra head fixtures typically do not have the same color as a painted pole. This can cause them to stand out and look awkward.

EXISTING PRACTICE

7.1 OVER-LIGHTING ROADWAY

Existing Practice

Roadways are illuminated beyond the level required for safety only. Lighting requirements are determined by using luminance versus illumination (i.e. brightness of the pavement versus brightness of the light). High mast lighting is used to meet the design level.

Aesthetic Issues

- Excessive luminance creates light pollution along a corridor and impacts views to the surrounding landscape.
- Excessive luminance requires unnecessary light standards and high mast lighting that can be a visually distracting element in the landscape.

*(1) **Not Recommended:** Over-Lighting Roadway Facilities.*

- *Creates light pollution.*
- *Impacts view of surrounding landscape.*
- *Requires use of more lights than needed to illuminate paving.*

*(1) **Not Recommended:** Use of High Mast Lighting.*

- *Looks out of scale with other highway components because of extreme height.*
- *Breaks up skyline.*

PROPOSED ALTERNATIVE

7.1.1 Alternative One: Use of Full Cut-off Fixtures

Utilize full cut-off fixtures.

Aesthetic Benefits

- Minimized light spill into surrounding properties.

Cost Considerations

- Estimated cost increase is minimal, 1% to 2%, assuming shielding does not increase the number of required fixtures.

Potential Constraints

- Time and money needed to change all the fixtures in a roadway corridor over to full cut-off at the same time. Use of different fixtures along the same portion of roadway complicates maintenance procedures as different equipment may be needed.

Planning Considerations

- Useful in all highway situations, especially those with night sky ordinances and in rural areas where promoting night sky is beneficial for tourism.

(1) ***Recommended:*** *Use Full Cut-Off Fixtures.*

- *Minimizes light spill.*

EXISTING PRACTICE

7.2 HIGHLY REFLECTIVE FINISHES

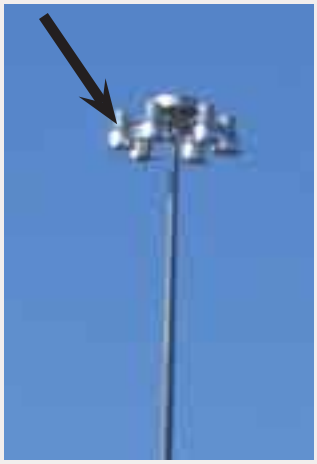
Existing Practice

Standard galvanized steel finish used for light standards and fixtures.

Aesthetic Issues

- Galvanized steel finish reflects light which makes the standards and fixtures stand out more and break up the skyline.
- High mast light fixtures have a highly reflective, shiny silver finish that intensifies their visual presence high above the roadway.

(1)



(2)

(3)

(1, 2, 3) ***Not Recommended:*** *Highly Reflective Finishes.*

- *Draws attention to light standard and fixture.*
- *Creates glare along roadway and can be visually distracting.*

PROPOSED ALTERNATIVE

7.2.1 Alternative One: Use of Acid-Washed Light Standards and Fixtures

Utilize acid-washed finish light standards or die-cast aluminum fixtures in lieu of shiny galvanized metal components.

Aesthetic Benefits

- Reduced visual contrast between light features and surrounding environment. This is especially applicable in urban applications.

Cost Considerations

- Estimated cost increase is minimal depending on supplier availability.

Potential Constraints

- Acid wash is not a typical treatment for light standards and fixtures. Suppliers may be difficult to locate.

Planning Considerations

- Use in urban areas designated for standard or enhanced hardscape treatments.

(1) ✓

(2) ✓

(3) ✓

(1, 2, 3) ***Recommended:*** *Use Muted Finishes.*

✓
- *Allows standards and fixtures to visually recede into background.*
- *Dulls the shine and reduces glare from fixtures.*

PROPOSED ALTERNATIVE

7.2.2 Alternative Two:
Use of Colored Light Standards and Fixtures

Paint light standards and fixtures to blend into the overall environment where appropriate. Use shoebox fixtures where appropriate.

Aesthetic Benefits

- Improved ability to paint shoebox fixture. Aesthetic treatments such as painting are more easily applied to shoebox features when compared to typical cobra-head housing.
- Enhanced visual compatibility between light standard and site context. Light standards recede rather than being a prominent element of the visual landscape.

Cost Considerations

- Estimated cost increase over the standard Type 7 galvanized pole with a cobra head is 10% to 30% depending upon the selected finish and fixture.

Potential Constraints

- Long-term maintenance costs for colored fixtures needs to be quantified.
- Coordination with structural division is required to ensure appropriate pole materials are used.
- Where shoebox fixtures are used, multiple fixtures should be updated at the same time. This simplifies maintenance procedures by minimizing the types of equipment needed.

Planning Considerations

- Use in urban community highways (downtown areas) designated for focal or landmark hardscape treatments and in scenic areas.

(1) ***Recommended:*** *Shoebox Fixtures*

- *Improves ability for fixture to be painted same color as standard.*
- *Gives impression of concerted design effort.*

(2)

(3)

(2,3) ***Recommended:*** *Painting Light Standard and Fixtures.*

- *Provides method for design expression.*
- *Recedes into background when dark colors are used.*

8.0 Millings

ELEMENTS DISCUSSED

8.0 MILLINGS – INTRODUCTION

Millings are commonly used as roadway shouldering material in Nevada. The standard specifications and NDOT's "Guidelines for Coldmillings" establish the guidelines and specifications for use of coldmillings in different conditions. Typical applications include salvaging millings and compacting them as part of roadway shoulder surfacing. This practice reduces the need for off-site disposal and the requirement for shoulder vegetation control as the millings restrict plant growth. Wildlife is also more easily spotted by motorists as vegetation is located so far from the travel lane. Often County or City road departments are offered the millings for use along their roadways. The department views this as a way to build good relationships with the local agencies.

(1) Coldmillings have negative visual impact. Distinctive black bands are visually distracting and unattractive.

Overall Aesthetic Issues

The main visual issues associated with this practice center on the fact that use of millings as shouldering material can almost double the perceived width of the roadway. A basic principle of highway design should be the integration of roadway facilities into the landscape. Whereas a context-sensitive road would fit into the overall visual landscape, the use of millings as shouldering material increases the likelihood that the road dominates the visual landscape.

NDOT's "Guidelines for Coldmillings" recognize the scenic issues associated with the use of millings. It is acknowledged that they "are considered not aesthetically pleasing" (Guidelines for Coldmillings, 2). Therefore they are not allowed along I-15 from Las Vegas south to the state line, within the Tahoe basin, or other visually sensitive areas.

The application of millings also restricts root growth and limits the ability to revegetate roadsides. Nevada's arid environment and difficult soils already make revegetation a complex undertaking. Using millings along the roadside further complicates the efforts. However, healthy native roadside vegetation goes a long way towards making a visually attractive highway system. A balance between managing vegetation for wildlife control and allowing some re-growth of the native plant material will visually soften the corridor and meet the Master Plan and Corridor Plan guidelines for environmental and contextual factors visually dominating the view of rural highway and interstate segments.

Using millings for shouldering material requires the use of new asphaltic material for the paving overlay. Rather than recycling the millings and using them as part of the paving overlay, new material must be brought in. This practice reduces NDOT's ability to be a leader in sustainable practices as their reliance on oil-based products remains high. Currently coldmillings are recommended for cold and recycled asphalt pavement. They are not recommended for hot recycling due to a detrimental effect polymer modified binders may have on pavement. The Materials Division is working with the Low Volume Road Task Force to expand the use of coldmillings.

EXISTING PRACTICE

8.1 MILLINGS USED FOR SHOULDERING MATERIAL

Existing Practice

Asphalt millings are used as roadway shouldering material and sometimes left in piles along the roadway.

Aesthetic Issues

- Millings increase the visual appearance of roadway width, sometimes making the road almost double in visual impact.
- Millings on the highway shoulder create a stark contrast between the road and the adjacent undisturbed landscape.
- Asphalt millings prevent slope revegetation or use of enhanced landscape treatments. The millings harden and restrict root growth.
- Piles of millings create a sloppy, unkempt impression.

(1) ***Not Recommended:*** *Roadway Millings Used for Shouldering Material.*

- *Makes highway appear wider.*
- *Reinforces appearance of highway dominating the landscape.*
- *Fails to meet scenic objectives.*

(2) ***Not Recommended:*** *Roadway Millings Used for Shouldering Material.*

- *Provides changeable surface as vehicles create ruts in the millings.*
- *Inhibits any revegetation opportunities.*
- *Fails to meet scenic objectives.*

(3) ***Not Recommended:*** *Piling Millings Along Shoulder.*

- *Gives a negative impression of the standard of care for Nevada's roadway system.*
- *Look unkempt.*
- *Fails to meet scenic objectives.*

PROPOSED ALTERNATIVE

8.1.1 Alternative One: Limited Use of Coldmillings for Shoulder Backing and Progressive Research on the Use of Recycled Millings for Paving Overlays or New Paving

Recycle cold millings and limit their use as shoulder backing along the state's major interstates and highway facilities. Millings are re-used for bike paths and emergency turn arounds, but not for drainage facilities.

Aesthetic Benefits

- Enhanced scenic quality of the state's highway system. Areas not previously identified as having extraordinary scenic quality are enhanced through improved highway aesthetics.
- Improved revegetation establishment of roadsides.
- Enhanced impression of road system as millings are not left adjacent to the roadway.
- Increased integration between the roadway and the surrounding landscape as the appearance of the road's overall width is decreased.
- Increased national recognition of NDOT for setting the standard for re-use and recycling of cold millings. By becoming a model for other states, NDOT has the ability to be recognized for implementing innovative sustainable highway practices.

Cost Considerations

- Estimated cost varies greatly, depending upon the distance the contractor must haul the material to re-use it and availability of "in-place" recycling machinery. Costs should be evaluated on a case-by-case basis. Project costs may increase when millings are not used for shouldering and new material must be imported along with revegetation of shoulder where appropriate.

Potential Constraints

- Commitment from NDOT to be a leader in cold milling recycling.

(1) ***Recommended:*** *Use of Millings for Bike Paths/ Parking Areas/Schools.*

- *Provides necessary resource for communities to create alternative transportation systems.*
- *Garners good will between communities and NDOT.*

(2) ***Recommended:*** *Recycling Cold Millings for Paving Overlays.*

- *Promotes re-use of an expensive component of highway maintenance.*
- *Establishes NDOT's commitment to sustainability and to reduce reliance on oil-based products.*

- Millings have been used as a relationship-building tool for NDOT and other public entities such as Counties and Cities.
- Testing and sign-off to use recycled millings as part of re-surfacing materials.
- Recycling millings is not always an appropriate roadway surfacing repair strategy.
- Need for vegetative control methods along rural highways to minimize locations for animals to hide before crossing roadway.
- Use of coldmillings for shoulder backing is a long-standing practice.

Planning Considerations

- Identify areas, screened from the roadway, to stockpile millings for future use.

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