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Highway Wall Structure Aesthetic Design Guidance

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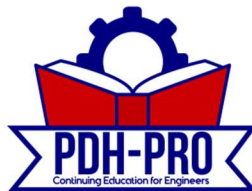
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1.0 INTRODUCTION

1.1 Background

Wall structures are prominent and high-cost components of the highway system and their aesthetic treatments can have a strong influence on the visual character of a highway corridor. It is likely that wall structures will be seen by millions of viewers, both from the highway and toward the highway, and therefore their aesthetic treatments must be carefully considered in the context of comprehensive corridor aesthetic planning as well as local community planning.

Constructability issues with aesthetic treatments, such as misaligned patterns, staggered top of wall profile, or placement of expansion joints at locations that conflict with the aesthetic treatment, can compromise the wall structure appearance and create construction challenges. Remediation of design related constructability issues may not be easily or cost effectively accomplished, and may result in poorly considered treatments becoming permanent features of the wall.

Caltrans, in collaboration with the construction industry, identified wall structure aesthetic treatment constructability issues and design solutions that may be used to reduce conflicts between construction and design. This course reviews the design guidance resulting from this collaborative effort and is intended to satisfy the expectations of designers, contractors, the local community, and other stakeholders.



The staggered appearance and misaligned pattern of this wall structure are the result of inadequate coordination of the aesthetic design, wall design, and construction methods.

1.2 Definitions

Wall Structure – Concrete walls including Concrete Cantilever Walls and Soil Reinforcement Systems (e.g. Mechanically Stabilized Earth (MSE)) including walls which are independent of other structures and walls which are part of other structure systems.

Aesthetic Treatment – For the purpose of this DIB, aesthetic treatment, also commonly referred to as “architectural treatment”, refers to the overall form of the wall and its elements such as columns,

end treatments, caps, and concrete barriers. It also refers to the incorporation of color, texture, pattern, and/or imagery to the surfaces of concrete wall structures (referred to as “concrete surface textures” in Caltrans Standard Specifications) and elements incorporated to improve the appearance and integration of walls into their surrounding environment.

1.3 Purpose of Wall Structure Aesthetics

Wall structures are an essential and integral component of the State Highway System (SHS). They are generally massive in scale and can dominate the surrounding context and the views to and from the highway corridor and adjacent community. A principle objective of highway corridor aesthetics is for the physical elements of the highway, including the wall structures, to visually relate to one another as a unified whole and be integrated into the surrounding context of the corridor. Aesthetic treatments and other techniques such as slope terracing, can reduce the apparent scale of a wall structure and help to integrate it into the surrounding natural and cultural context.



Aesthetic treatments on wall structures can reflect an image of the surrounding community and create visual interest for motorists.

Aesthetic treatments are incorporated into wall structures to achieve various objectives. Environmental analysis of transportation improvement projects often requires that wall structures incorporate aesthetic treatments to improve their appearance and reduce their visual impact on viewers. Aesthetic treatments can help compensate for a loss of visual quality in the corridor due to the removal of vegetation or other existing aesthetic features by a transportation project, or for their potential urbanizing effect in rural areas.

Aesthetic treatments on wall structures also provide functional benefits, such as reduction of surface glare and providing visual interest to stimulate driver alertness. Walls are prone to vandalism which is an aesthetic and maintenance problem and must be considered when making aesthetic design decisions. For example, aesthetic surface treatments incorporating rough textures and varied patterns tend to discourage graffiti and improve worker safety by reducing the need for graffiti removal.



Wall structure aesthetic treatments should be coordinated with other highway elements in a well-considered corridor design. In Orange County, repeating the orange motif aesthetic treatment from the MSE wall (left) to the sound wall columns and adjacent slope paving is one technique used to help provide unity to the appearance of the highway corridor.

Implementation of a Context Sensitive Solutions (CSS) process, which balances transportation goals with other stakeholder goals, can lead to the selection of aesthetic treatments that reinforce overall corridor aesthetic themes and reflect local community aesthetic, scenic, cultural, and historic values and reinforce community identity. Highways can be a major component of community image, having a significant impact on the local economy and quality of life. Therefore, identifying wall aesthetic treatments that meet stakeholder desires is often crucial to obtaining project approval from local agencies, community members and other stakeholders. Deploying an effective stakeholder involvement process and incorporating well designed aesthetic treatments into transportation projects can reduce the risk of project delay and foster public trust, which can lead to a streamlined approval process in subsequent projects, saving both time and dollar resources.

1.4 Reference - DIB

The DIB is to be used in conjunction with the Highway Design Manual, including but not limited to, Topic 81 – Project Development Overview; Topic 109 – Scenic Values in Planning and Design; Topic 210 – Reinforced Earth Slopes and Earth Retaining Systems; and Topic 1102 – Design Criteria; as the current state of the practice for the planning, design, and construction of aesthetic treatments for certain wall structures on the SHS.

2.0 DESIGN GUIDANCE

2.1 Collaboration and Coordination

The architectural design of aesthetic treatments must be compatible with the structural design of the wall and design efforts must be coordinated so that the constructed wall structure satisfies the design intent. All members of the Project Development Team (PDT), including but not limited to, Division of Engineering Services (DES) Structures Design (Structures) engineers and architects, district transportation and environmental planners, landscape architects and engineers, design consultants, and partners, must collaborate on critical aesthetic design decisions throughout wall structure design development, beginning in the planning phase and continuing through construction. The involvement of individual PDT members will fluctuate throughout the project development process and the landscape architect or structures architect will coordinate

communication of aesthetic issues with all PDT members throughout the project development phases.

The PDT, including key community stakeholders, should develop a clear and concise aesthetic design intent statement for the wall aesthetics early in project development. The PDT determines the format and content of the aesthetic design intent statement to fit project specific needs. At a minimum the aesthetic design intent statement should account for requirements of the environmental document, in particular the visual impact assessment, and should reference applicable corridor master plans or community planning goals and objectives. It should provide guidance to the PDT throughout planning and design to ensure that the wall structure and related corridor features are coordinated aesthetically and can be constructed and maintained to fulfill the design intent. It should also be used to provide aesthetic continuity on the project if changes in project personnel or community partners occur. The aesthetic design intent statement should provide the flexibility to be updated if changes to the aesthetic design, agreed upon by the PDT, must be accommodated.

The layout of the aesthetic treatment and the wall structure must be carefully considered if the desired aesthetic results are to be achieved. Appropriate grading, location, and dimensioning of footing steps, footing heights, expansion joints, weakened joints, horizontal wall angle points, and horizontal curve layout are critical for aesthetic treatments to align correctly to create a continuous and unified appearance. When architectural and engineering design are not coordinated, constructability issues such as misaligned patterns, staggered profiles, or poor placement of expansion joints, drainage features, and weep holes are more likely to occur, compromising the design intent and the final appearance of the wall.



The design of aesthetic treatments must be well coordinated with the engineering design of the wall structure. Aesthetic treatments must be compatible with footing steps, footing heights, and expansion joints to avoid misalignment issues in construction.



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