



U.S. Department
of Transportation
**Federal Highway
Administration**

1200 New Jersey Ave., SE
Washington, D.C. 20590

February 2, 2017

In Reply Refer To:
HSST-1/B-136A

Nathan Binette
Evonik Cyro LLC
1796 Main Street
Sanford, Maine 04073

Dear Mr. Binette:

This letter is in response to your December 22, 2015, request for the Federal Highway Administration (FHWA) to review a roadside safety device, hardware, or system for eligibility for reimbursement under the Federal-aid highway program. This FHWA letter of eligibility is assigned FHWA control number B-136A and is valid until a subsequent letter is issued by FHWA that expressly references this device.

Decision

The following devices are eligible, with details provided in the form which is attached as an integral part of this letter:

- ACRYLITE Soundstop TL-4 Noise Barrier System

Scope of this Letter

To be found eligible for Federal-aid funding, modified roadside safety devices should meet the crash test and evaluation criteria contained in the National Cooperative Highway Research Program (NCHRP) Report 350. However, the FHWA, the Department of Transportation, and the United States Government do not regulate the manufacture of roadside safety devices. Eligibility for reimbursement under the Federal-aid highway program does not establish approval, certification or endorsement of the device for any particular purpose or use.

This letter is not a determination by the FHWA, the Department of Transportation, or the United States Government that a vehicle crash involving the device will result in any particular outcome, nor is it a guarantee of the in-service performance of this device. Proper manufacturing, installation, and maintenance are required in order for this device to function as tested.

This finding of eligibility is limited to the crashworthiness of the system and does not cover other structural features, nor conformity with the Manual on Uniform Traffic Control Devices.

Eligibility for Reimbursement

FHWA previously issued an eligibility letter for the roadside safety system described in your pending request. Your pending request now identifies a modification to that roadside safety system.

The original roadside safety device information is provided here:

Name of system:	Paraglas Soundstop Noise Wall TL-4
Type of system:	Noise Wall atop concrete barrier
Date of original request:	April 12, 2005
Original eligibility letter date:	May 18, 2005
FHWA Control number:	B-136
Date of current request:	December 22, 2015
Complete submission received:	December 2, 2016.

The modification(s) consists of the following changes:

- 1) Connection details of horizontal rails to posts.
- 2) Replacement of four 3/4" diameter anchors with four 7/8" diameter anchors.
- 3) Modification of noise barrier panel inserts to reduce snag potential of vehicle components.
- 4) Replacement of fabricated splice sleeves with commonly available tube sections.
- 5) Clarification of allowable horizontal rail positions for concrete bridge rails of varying depths.
- 6) Clarification of allowable expansion joint details and associated splice connections.
- 7) Clarification of lowest horizontal rail position for parapets of different heights.
- 8) Clarification of allowable heights of the system and associated top horizontal rail position.
- 9) Alternate anchorage details to address variability in parapet shapes.

FHWA concurs with the recommendation of the accredited crash testing laboratory as stated within the attached form. We also note the change in the name of the "Paraglas" material to "Acrylite" with no change in the product design or characteristics.

Full Description of the Eligible Device

The device and supporting documentation, including reports of the crash tests or other testing done, videos of any crash testing, and/or drawings of the device, are described in the attached form.

Notice

If a manufacturer makes any modification to any of their roadside safety hardware that has an existing eligibility letter from FHWA, the manufacturer must notify FHWA of such modification with a request for continued eligibility for reimbursement. The notice of all modifications to a device must be accompanied by:

- Significant modifications – For these modifications, crash test results must be submitted with accompanying documentation and videos.
- Non-signification modifications – For these modifications, a statement from the crash test laboratory on the potential effect of the modification on the ability of the device to meet the relevant crash test criteria.

FHWA's determination of continued eligibility for the modified hardware will be based on whether the modified hardware will continue to meet the relevant crash test criteria.

You are expected to supply potential users with sufficient information on design, installation and maintenance requirements to ensure proper performance.

You are expected to certify to potential users that the hardware furnished has the same chemistry, mechanical properties, and geometry as that submitted for review, and that it will meet the test and evaluation criteria of the NCHRP Report 350.

Issuance of this letter does not convey property rights of any sort or any exclusive privilege. This letter is based on the premise that information and reports submitted by you are accurate and correct. We reserve the right to modify or revoke this letter if: (1) there are any inaccuracies in the information submitted in support of your request for this letter, (2) the qualification testing was flawed, (3) in-service performance or other information reveals safety problems, (4) the system is significantly different from the version that was crash tested, or (5) any other information indicates that the letter was issued in error or otherwise does not reflect full and complete information about the crashworthiness of the system.

Standard Provisions

- To prevent misunderstanding by others, this letter of eligibility designated as FHWA control number B-136A shall not be reproduced except in full. This letter and the test documentation upon which it is based are public information. All such letters and documentation may be reviewed upon request.
- This letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented system for which the applicant is not the patent holder.
- If the subject device is a patented product it may be considered to be proprietary. If proprietary systems are specified by a highway agency for use on Federal-aid projects: (a) they must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization

with the existing highway facilities or that no equally suitable alternative exists; or (c) they must be used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes. Our regulations concerning proprietary products are contained in Title 23, Code of Federal Regulations, Section 635.411.

Sincerely,



Scott T. Johnson
Acting Director, Office of Safety
Technologies
Office of Safety

Enclosures

For
Research
and
Historical
Purposes
Only

Request for Federal Aid Reimbursement Eligibility of Highway Safety Hardware

Submitter	Date of Request:	December 22, 2015	<input type="radio"/> New	<input checked="" type="radio"/> Resubmission
	Name:	Nathan Binette		
	Company:	Evonik Cyro LLC		
	Address:	1796 Main Street Sanford, ME 04073		
	Country:	USA		
	To:	Michael S. Griffith, Director FHWA, Office of Safety Technologies		

I request the following devices be considered eligible for reimbursement under the Federal-aid highway program.

Device & Testing Criterion - Enter from right to left starting with Test Level

!-!-!

System Type	Submission Type	Device Name / Variant	Testing Criterion	Test Level
'B': Rigid/Semi-Rigid Barriers (Roadside, Median, Bridge Railings)	<input type="radio"/> Physical Crash Testing <input checked="" type="radio"/> Engineering Analysis	ACRYLITE® Soundstop TL4 Noise Barrier System	NCHRP Report 350	TL4

By submitting this request for review and evaluation by the Federal Highway Administration, I certify that the product(s) was (were) tested in conformity with the NCHRP Report 350 (Report 350) and that the evaluation results meet the appropriate evaluation criteria in the Report 350.

Individual or Organization responsible for the product:

Contact Name:	Nathan Binette	Same as Submitter <input checked="" type="checkbox"/>
Company Name:	Evonik Cyro LLC	Same as Submitter <input checked="" type="checkbox"/>
Address:	1796 Main Street Sanford, ME 04073	Same as Submitter <input checked="" type="checkbox"/>
Country:	USA	Same as Submitter <input checked="" type="checkbox"/>
Enter below all disclosures of financial interests as required by the FHWA 'Federal-Aid Reimbursement Eligibility Process for Safety Hardware Devices' document.		
Evonik Cyro licenses intellectual property used in the sale of the ACRYLITE® Soundstop TL4 noise barrier system from Nutech Ventures (related to the Midwest Roadside Safety Facility). The royalty is based on the sale of Evonik Cyro's acrylic noise barrier panel component typically representing 1% to 2% of the overall ACRYLITE® Soundstop TL4 noise barrier system sales price.		

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PRODUCT DESCRIPTION

<input type="radio"/> New Hardware or Significant Modification	<input checked="" type="radio"/> Modification to Existing Hardware	<input type="radio"/> Non-Significant
<p>The ACRYLITE® Soundstop TL4 system is a noise barrier system for attachment to a crash worthy concrete bridge rail. The system was crash-tested in accordance with NCHRP 350 criteria in 2004 and originally approved by the Federal Highway Administration in 2005, reference eligibility letter B136.</p> <p>This request seeks approval for multiple modifications summarized as follows:</p> <ol style="list-style-type: none"> 1) Connection details of horizontal rails to posts (mod001 per RON's suggestion) 2) Replacement of four 3/4" diameter anchors with four 7/8" diameter anchors. 3) Modification of noise barrier panel inserts to reduce snag potential of vehicle components. 4) Replacement of fabricated splice sleeves with commonly available tube sections. 5) Clarification of allowable horizontal rail positions for concrete bridge rails of varying depths. 6) Clarification of allowable expansion joint details and associated splice connections. 7) Clarification of lowest horizontal rail position for parapets of different heights. 8) Clarification of allowable heights of the system and associated top horizontal rail position. 9) Alternate anchorage details to address variability in parapet shapes. <p>Additional details for each proposed modification are attached.</p> <p style="text-align: center;">CRASH TESTING</p> <p>By signature below, the Engineer affiliated with the testing laboratory, agrees in support of this submission that the Modification to Existing Hardware is deemed Non-significant for the device listed above to meet the MASH criteria.</p>		
Engineer Name:	Ronald K. Faller	
Engineer Signature:	Ronald Faller	<small>Digitally signed by Ronald Faller DN: cn=Ronald Faller, o=University of Nebraska-Lincoln, ou=Midwest Roadside Safety Facility, email=rfaller1@unl.edu, c=US Date: 2016.09.20 18:06:46 -05'00'</small>
Address:	Midwest Roadside Safety Facility, University of Nebraska-Lincoln, 130 Whittier Research Center,	Same as Submitter <input type="checkbox"/>
Country:	2200 Vine Street, Lincoln, Nebraska 68583-0853	Same as Submitter <input type="checkbox"/>

A brief description of each crash test and its result:

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Required Test Number	Narrative Description	Evaluation Results
4-10, 4-11, 4-12	<p>The ACRYLITE® Soundstop TL4 Noise Barrier System was developed for use on rigid bridge railings and other rigid structures. The system, tested in 2004 (reference TRP-03-160-05) as CYRO's PARAGLAS SOUNDSTOP TL4 Noise Barrier System, consisted of a 34.56-m (113-ft 4 ¾-in.) long noise wall system supported by eighteen steel posts.</p> <p>Two full-scale crash tests were conducted and reported in accordance with the requirements specified in the NCHRP Report No. 350, Recommended Procedures for the Safety Performance Evaluation of Highway Features. The first test (4-12, 8000S) consisted of an 8,092-kg (17,840-lb) single-unit truck impacting at a speed of 82.4 km/h (51.2 mph) and at an angle of 17.7 degrees. Although minor vehicle snag was observed, it did not pose any occupant risk concerns. The second test (4-11, 2000P) consisted of a 2,013-kg (4,439-lb) pickup truck impacting at a speed of 99.0 km/h (61.5 mph) and at an angle of 25.0 degrees. During this test, the hood snagged on a post, thus resulting in minor engine hood penetration through the lower corner of the windshield. Although minor windshield penetration was observed, it was not believed to pose significant risk to the vehicle occupants. Therefore, the safety performance of the system was determined to be acceptable according to the Test Level 4 (TL-4) evaluation criteria specified in NCHRP Report No. 350.</p> <p>During the design phase of the barrier system, special attention was given to prevent geometric features of the noise wall design that would cause the small car test (4-10, 820C) to fail due to excessive snagging resulting from the small car's lateral extent over the concrete parapet. Therefore, due to the prior successful small car testing on concrete parapets and the attention given to the geometric features in the design, the 820-kg small car crash test was deemed unnecessary for this project.</p> <p>Optional test S4-10 (for the 700C vehicle) was not conducted.</p> <p>Transition section tests 4-20, S4-20, 4-12, & 4-22 were not tested for this system.</p>	Modification has no effect on crashworthiness

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Testing Laboratory's signature concurs that these modifications are considered Non-Significant.		
Laboratory Name:	Midwest Roadside Safety Facility	
Laboratory Signature:	Ronald Faller	<small>Digitally signed by Ronald Faller DN: cn=Ronald Faller, o=University of Nebraska-Lincoln, ou=Midwest Roadside Safety Facility, email=rfaller1@unl.edu, c=US Date: 2016.09.20 18:09:01 -05'00'</small>
Address:	Midwest Roadside Safety Facility, University of Nebraska-Lincoln, 130 Whittier Research Center, 2200 Vine Street, Lincoln, Nebraska 68583-0853	Same as Submitter <input type="checkbox"/>
Country:	USA	Same as Submitter <input type="checkbox"/>
Accreditation Certificate Number and Dates of current Accreditation period :	Certificate No. 2937.01 - Valid Through November 30, 2017	

Submitter Signature*: **Nathan Binette**

Digitally signed by Nathan Binette
DN: cn=Nathan Binette, o=Evonik Cyro LLC, ou=Performance Materials, email=nathan.binette@evonik.com, c=US
Date: 2016.09.22 08:54:07 -04'00'

Submit Form

ATTACHMENTS

Attach to this form:

- 1) Additional disclosures of related financial interest as indicated above.
- 2) A copy of the full test report, video, and a Test Data Summary Sheet for each test conducted in support of this request.
- 3) A drawing or drawings of the device(s) that conform to the Task Force-13 Drawing Specifications [[Hardware Guide Drawing Standards](#)]. For proprietary products, a single isometric line drawing is usually acceptable to illustrate the product, with detailed specifications, intended use, and contact information provided on the reverse. Additional drawings (not in TF-13 format) showing details that are relevant to understanding the dimensions and performance of the device should also be submitted to facilitate our review.

FHWA Official Business Only:

Eligibility Letter		Key Words
Number	Date	

Purposes Only

Mod001

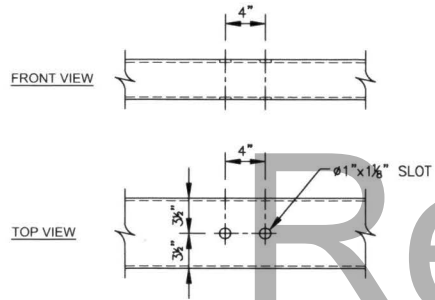
Modification benefits fabrication and on-site assembly. Affects connection of horizontal rails to posts. Submitted system utilized 1" x 1-1/8" slotted holes in the angles to which the rails attach and 1" x 1-1/8" slotted holes in the horizontal rails. Proposed modifications are:

- 1) Use 1" diameter holes in angles to which the rails attach in lieu of 1" x 1-1/8" slotted holes;
- 2) Use 1" x 1-3/8" slotted holes in the horizontal rails, increased from 1" x 1-1/8" slotted holes.

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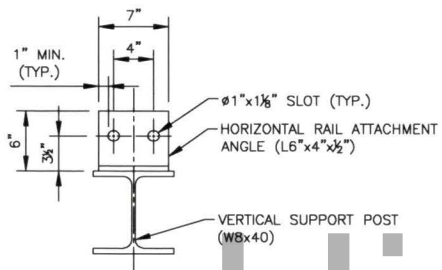
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AS-TESTED DESIGN



CRASH RAIL CONNECTION

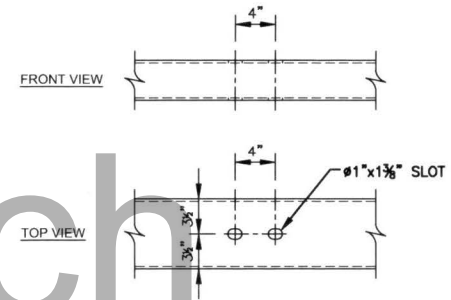
1" = 1'-0"



CLIP ANGLE CONNECTION

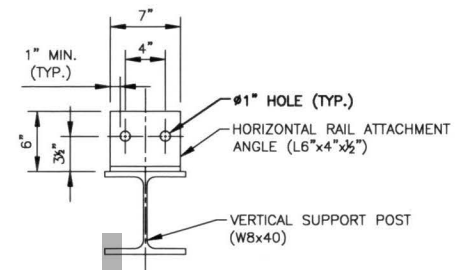
1" = 1'-0"

PROPOSED CHANGE IN DESIGN




CRASH RAIL CONNECTION

1" = 1'-0"



CLIP ANGLE CONNECTION

1" = 1'-0"

TITLE: HORIZONTAL RAIL POST CONNECTION	PROJECT NO: 16P0007	FILE NAME: 16P0007-TL4 Modifications	 VISION BUILT
	PROJECT: TL-4 MODIFICATION DRAWINGS FOR FHWA APPROVAL	DRAWN BY: MJR	
	CHECKED BY: GJS	REVISED:	DWG. NO: SK-1

Mod002

Modification to help error proof installation and simplify supply. Affects the eight epoxy set anchors connecting the vertical posts to the concrete parapet. Submitted system utilized four 7/8" diameter anchors for the upper anchorage plate and four 3/4" diameter anchors for the lower anchorage plate. Proposed modification is to replace the 3/4" diameter anchors for the lower anchorage plate with 7/8" diameter anchors. Result is a net improvement in the connection to the concrete parapet.

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For

Research

and

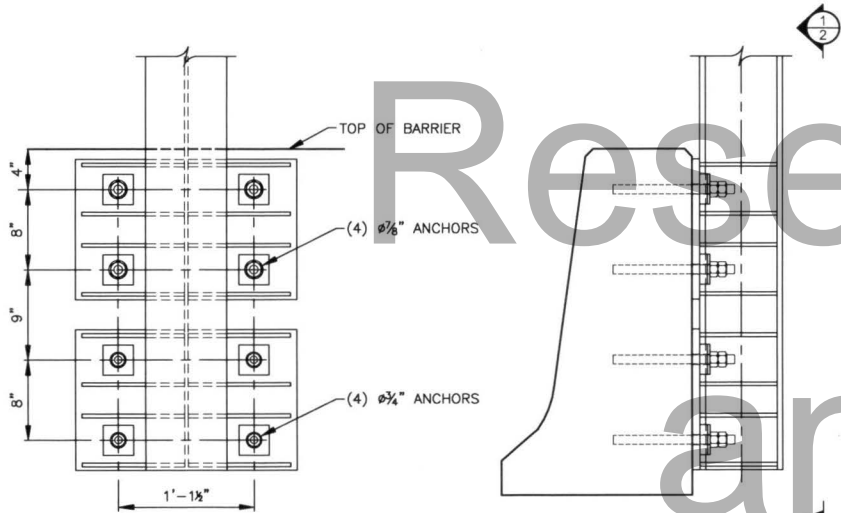
Historical

Purposes

Only

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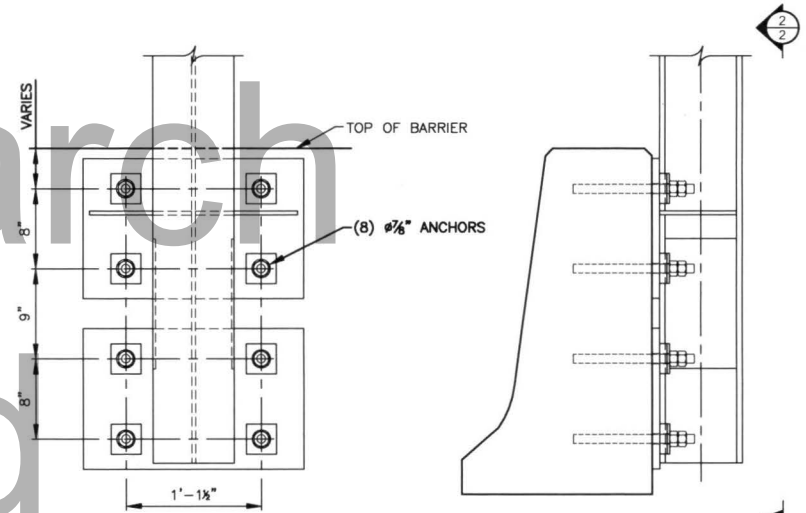
AS-TESTED DESIGN



SECTION
1
2
1" = 1'-0"


SECTION THRU WALL
1" = 1'-0"

PROPOSED CHANGE IN DESIGN (WITH CYRO MODIFICATIONS)



SECTION
2
2
1" = 1'-0"

SECTION THRU WALL
1" = 1'-0"

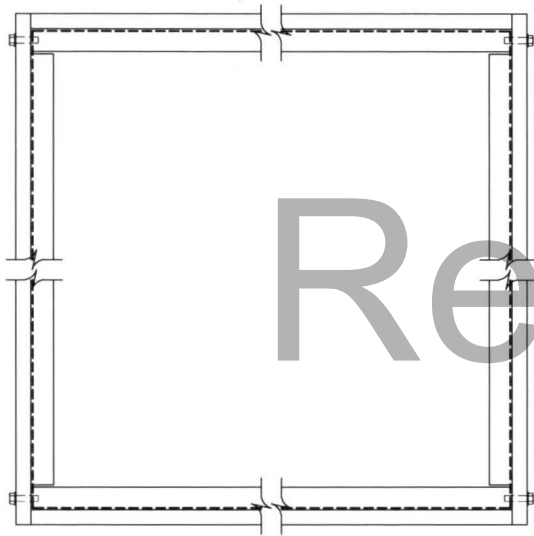
TITLE: ANCHOR ARRANGEMENT	PROJECT NO: 16P0007	FILE NAME: 16P0007-TL4 Modifications	 VISION BUILT
	PROJECT: TL-4 MODIFICATION DRAWINGS FOR FHWA APPROVAL	DRAWN BY: MJR	
	CHECKED BY: GJS	REVISED: APRIL 13, 2016	DWG. NO: SK-2

Mod003

Modification to reduce snag potential of vehicle components versus the crash tested configuration. Affects the implementation of the noise barrier panels within the posts, behind the crash rails. Submitted system utilized framed noise barrier panels with anti-intrusion cover plates to minimize snag potential of peripheral vehicular components which might protrude in beyond the 7" wide x 4" high horizontal crash rails.

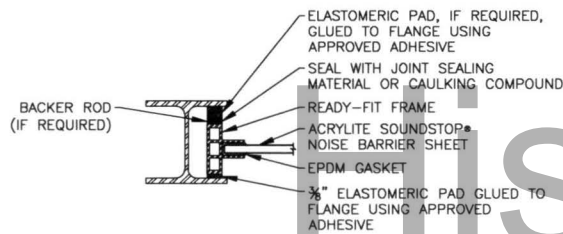
Proposed modification is to replace the framed noise barrier panels which produce an approximate 2.5" offset from the post flange to the noise barrier panel surface with 'unframed' noise barrier panels installed flush to the inside face of the post flange. Support for unframed noise barrier panels is provided by steel angles attached to the post web for the vertical noise barrier panel edges and a paired angle connection spanning a gusset plate inside the post for the bottom noise barrier panel edge. Effect of this modification is thought to be a net improvement to / reduction of the snag potential and irrelevant to the crash tested nature of the system since the noise barrier panels reside behind the horizontal crash rails which (along with the concrete parapet) bear the vehicular impact. Vehicular components which may extend beyond the crash rails have little impact value and any snag potential of such protrusion is reduced by this modification.

APPROVED DESIGN



READY-FIT FRAME

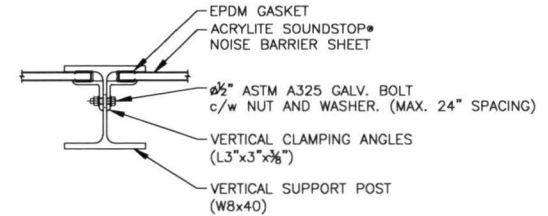
1" = 1'-0"



READY-FIT PANEL DETAIL

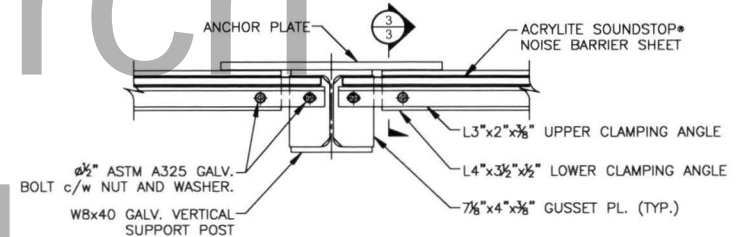
1" = 1'-0"

PROPOSED CHANGE IN DESIGN



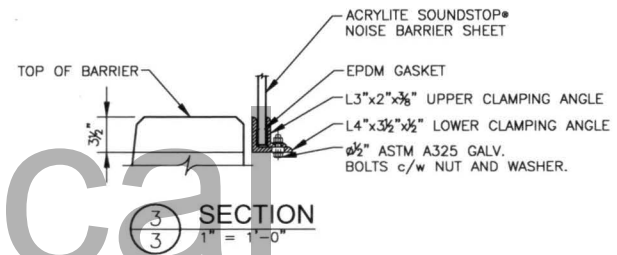
VERTICAL CLAMPING ANGLES


1" = 1'-0"



HORIZONTAL CLAMPING ANGLES

1" = 1'-0"



TITLE: ACRYLITE MOUNTING	PROJECT NO: 16P0007	FILE NAME: 16P0007-TL4 Modifications	 VISION BUILT
	DRAWN BY: MJR	DATE: APRIL 5, 2016	
PROJECT: TL-4 MODIFICATION DRAWINGS FOR FHWA APPROVAL	CHECKED BY: GJS	REVISED: JUNE 3, 2016	DWG. NO: SK-3

Mod004

Modification to simplify the fabrication of splice sleeves and on site assembly issues. As originally designed the splice sleeves used to connect horizontal crash rails were constructed of four 1/2" thick steel plates welded together to make a tubular sleeve. The dimensions of the fabricated sleeve for the lower rail with 5/16" wall thickness are 6 1/8" x 3 1/8" x 16" (see attached detail). This leaves a planned 1/4" of fit space for both the width and the length.

Proposed modification is to replace fabricated splice sleeves with readily available 6" x 3" tube steel in the same 16" length. Tube sections for the lower rail with 5/16" wall thickness would create an additional 1/8" of fit space for both the width and length, an important feature since installations made with the fabricated sleeve have been subject to interference with the as produced weld seam inside the horizontal crash rails.

Splice sleeves for the middle and upper (3/16" wall thickness) horizontal crash rails would similarly be constructed of 6" x 3" x 16" tube steel segments but would also include welded plates on two sides to achieve a fit similar to the outgoing fabricated splice sleeve. See attached details, note gap between plates on bottom of 6" x 3" tube to avoid interference with weld seam inside horizontal crash rail.

Proposed splice sleeves use tube with 1/2" wall thickness and have greater structural strength than the fabricated sleeves. Result is a modification to benefit fabrication with no change to the crashworthiness of the system.

and

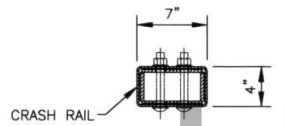
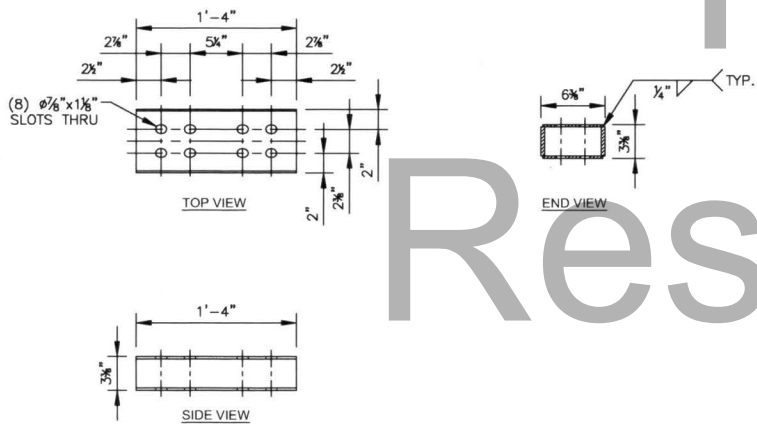
Historical

Purposes

Only

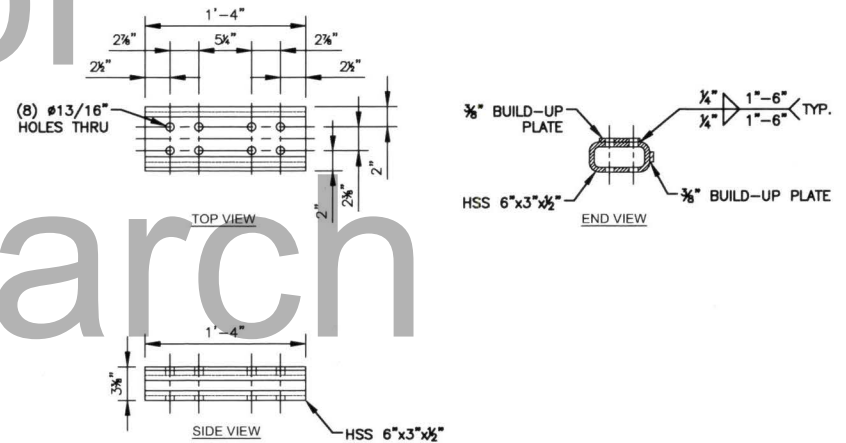
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AS-TESTED DESIGN

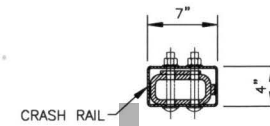


SPLICE CONNECTION
1" = 1'-0"


PROPOSED CHANGE IN DESIGN



SPLICE TUBE
1" = 1'-0"



SPLICE CONNECTION
1" = 1'-0"

TITLE: SPLICE CONNECTION	PROJECT NO: 16P0007	FILE NAME: 16P0007-TL4 Modifications	 VISION BUILT
	PROJECT: TL-4 MODIFICATION DRAWINGS FOR FHWA APPROVAL	DRAWN BY: MJR	
	CHECKED BY: GJS	REVISED: APRIL 13, 2016	DWG. NO: SK-4

Mod005

Modification for ACRYLITE Soundstop TL4 noise barrier system application on a thicker concrete parapet.

As tested, the parapet section was 9.5" thick at the top. The leading edge of the 7" x 4" horizontal crash rail is 3.25" behind the top corner (accounting for the 3/4" setback of the post due to the 3/4" anchorage plate).

In accordance with HSA-10/B-136, the ACRYLITE Soundstop noise barrier system is acceptable for use on single slope, NJ, and F shape type parapets. However, parapets of different thicknesses can create a variable setback of the horizontal crash rails. In such cases, it is desirable to maintain a horizontal rail setback similar to the condition during the crash test.

It is proposed to:

- 1) allow the horizontal crash rail setback to range from plus 2" and minus 1" from the as-tested configuration. This results in an allowable range from 2.25" to 5.25" (for clarity it is noted this proposed change to the horizontal rail setback does not change the anchorage requirements. Any proposal for modification of anchorages would require a separate modification request);
- 2) in situations where the concrete parapet is substantially thicker than the as-tested parapet and to position the horizontal crash rails within the acceptable range by using strong tube supports between the horizontal crash rail and the vertical posts (reference Mod005 Weld Doc.pdf);
- 3) in situations where there are existing allowed noise barrier walls with a position that is closer to roadway than the allowable range of this system's horizontal crash rails, allow the leading edge of the horizontal crash rails to match the position of the existing allowed noise barrier wall (reference Mod005 Details View.pdf which shows this system in conjunction with a Caltrans approved Masonry wall system).

An evaluation of the extended horizontal crash rail attachment angles is attached as Mod005 Weld Doc.pdf to show that the welded connections have adequate lateral and vertical capacity to support the longer angles.

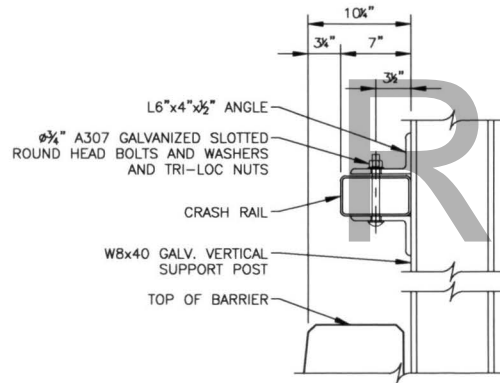
The primary requirement relating to the position of the crash rails is to avoid a scenario where a vehicle colliding with the parapet and ACRYLITE Soundstop TL4 noise barrier system would act differently than the as-tested condition. This is most likely to occur if a vehicle is allowed to roll more than the as-tested condition and thus act in a less predictable manner than if the rails are maintained close to the 3.25" as-tested setback location.

In the two cases where the rails would be moved slightly toward the roadway, vehicular roll would be slightly reduced versus that observed in the crash-tested condition. In this case, an increased chance of rail contact with a vehicle occupant in a head ejection scenario is acknowledged, but it is further noted that such consideration is outside the scope of the prior NCHRP 350 crash-test criteria.

In the case where the rails would be allowed to be positioned 2" farther back from the top corner of the parapet, vehicular roll would be slightly increased versus the as-tested condition but still expected to perform in a similar manner to the crash-tested condition.

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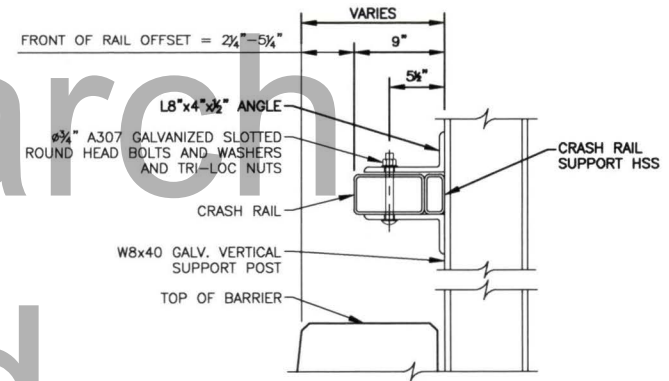
AS-TESTED DESIGN



STANDARD RAIL CLIP ANGLES


1" = 1'-0"

PROPOSED CHANGE IN DESIGN



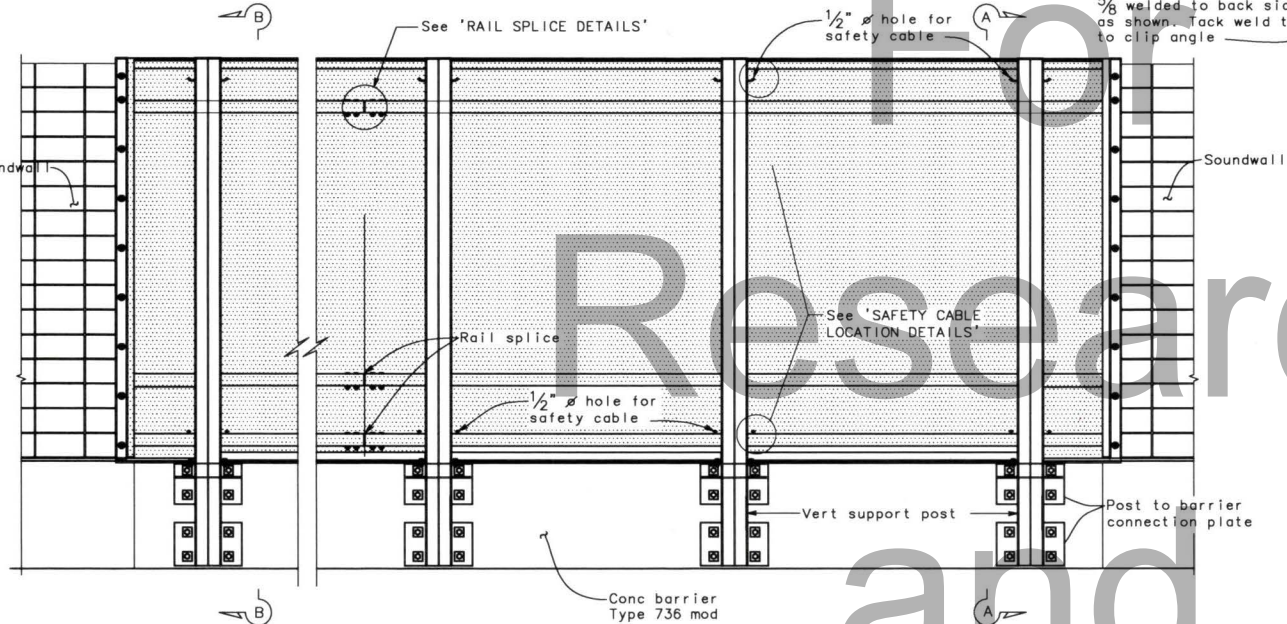
CRASH RAIL SUPPORT HSS (AS REQUIRED)

1" = 1'-0"

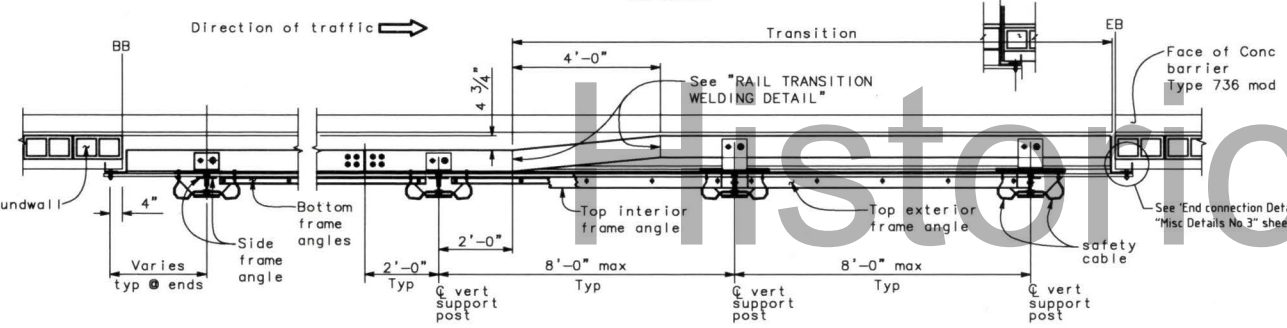
TITLE: VARYING PARAPET WALL DEPTHS	PROJECT NO: 16P0007	FILE NAME: 16P0007-TL4 Modifications	 VISION BUILT
	DRAWN BY: MJR	DATE: APRIL 5, 2016	
PROJECT: TL-4 MODIFICATION DRAWINGS FOR FHWA APPROVAL	CHECKED BY: GJS	REVISED: APRIL 13, 2016	DWG. NO: SK-5

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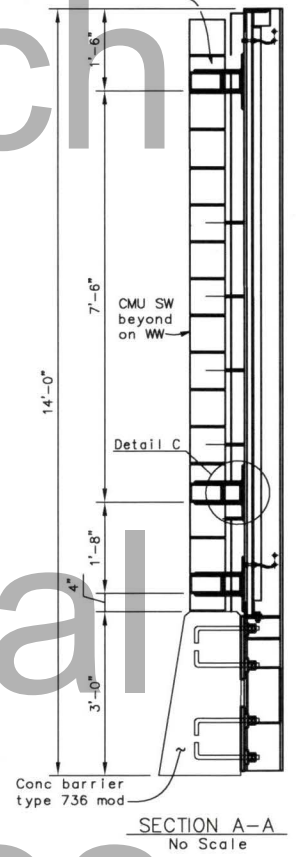
Notes:
 1. For Section B-B, see "Miscellaneous Details 1" sheet.
 2. No mechanical rail splices in transition section.



ELEVATION
No Scale



PLAN
No Scale



- Design Criteria:**
- Provide materials and perform work in accordance with Division II of the AASHTO/AWS D1.5-Bridge Welding Code (use ANSI/AWS D1.1 for welding not covered in ANSI/AASHTO/AWS D1.5)
 - Design Specifications:
 - Steel Frame Components: 1989 AASHTO Guide Specifications for Structural Design of Sound Barriers (including 1999 & 2000 AASHTO Standard Specifications for Highway Bridges (17th edition), as modified by CALTRANS Criteria.
 - Paraglas Soundstop GSCC Noise Barrier Sheet. Refer to product specification by Cyro Industries, 100 Enterprise Drive, Rockaway, NJ 07866
 - Design Loads:
 - Group 1: D + E + SC
 - Group 2: D + W + SC + E
 - Group 3: D + EQD/1.4 + E
 - Where D = Dead load
 - E = Lateral Earth Pressure (=0)
 - SC = Live load surcharge (=0)
 - W = Wind load (=46 psf)
 - EQD = Seismic dead load
 - Design is in accordance with Working Stress Design (WSD)
 - Steel frame members have not been designed for a vehicle impact load.
 - Horizontal frame deflection limited to the span length of the frame divide by 240.
 - Alternate anchorage devices/methods may be used for the connection of the vertical support post to the barrier, including cast in place steel anchorage plates or inserts. The devices/methods must provide a tensile capacity equal to or greater than the system shown and must be designed by the engineer of record for the individual structure.
 - All connections are designed as bearing connections, unless indicated otherwise.

MO 005

Purposes

Mod006

Modification for ACRYLITE Soundstop TL4 noise barrier system to increase the separation of posts at expansion bays. It is noted that the as-tested configuration did not include an expansion bay but, by necessity, expansion bay details were added to the submission culminating in approval HSA-10/B-136.

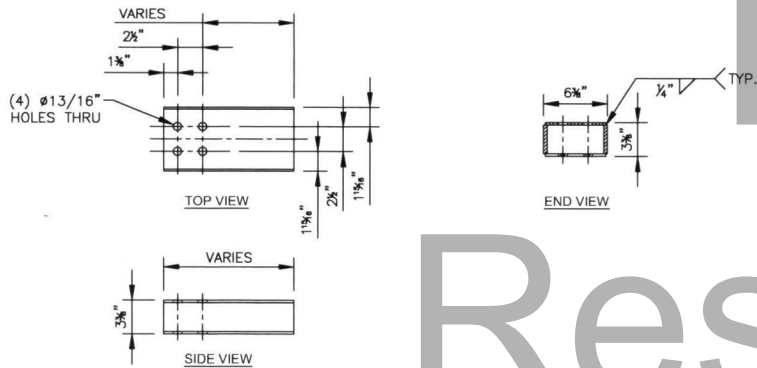
The expansion bay details per HSA-10B/B-136 included posts connected to the parapet on each side of the expansion joint. The posts are separated 24" from post center to post center, which positions the 22" wide post to parapet anchorage plates of these posts only 2" apart.

It is proposed to allow the space between posts spanning an expansion joint to increase from 24" to 96". The 96" dimension between posts would match the maximum span allowable for the ACRYLITE Soundstop TL4 noise barrier system per the HSA-10/B-136 approval. Details to include an ACRYLITE Soundstop panel in lieu of the polymeric expansion joint strip seal are provided in Mod006 proposed 8 ft expansion joint details.pdf.

The expansion joint includes a detail for splice sleeves in the horizontal crash rail to allow the intended expansion. This splice sleeve for the expansion bay is 16.5" long with eight 7/8" x 1 1/2" slots to connect the splice to the horizontal crash rails (see Mod006 expansion joint splice detail.pdf). It is noted that the splice is connected using 5/8" diameter bolts, which would allow a maximum range of movement of ± 1.75 ". In addition to the proposal to widen the expansion bay from 24" to 96", the following changes are also proposed for the expansion bay splice sleeves / connections:

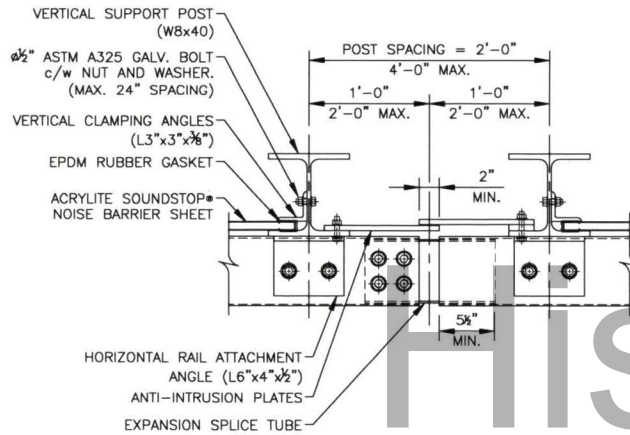
- 1) When the expansion bay is 28" to 48" long, a 20" long splice tube with four 7/8" x 1-1/8" slots is to connect to one horizontal crash rail only, with no intended connection to the other horizontal crash rail other than a long inserted end, may be substituted for the existing (as-tested) 16.5" long splice sleeve with eight 7/8" x 1-1/2" slots intended to connect to both horizontal crash rail ends.
- 2) When the expansion bay is >48", up to 96" wide, a 20" long splice tube with eight 7/8" x 2" slots may be substituted for the 16.5" long splice sleeve with eight 7/8" x 1-1/2" slots. This longer rail would connect to both sides in the same manner as the 16.5" long splice but would allow for a maximum range of movement of 2.75".

APPROVED DESIGN



EXPANSION SPLICE TUBE

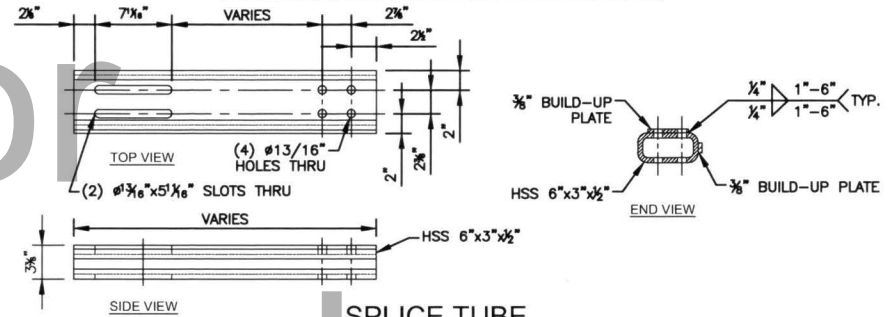
1" = 1'-0"



STANDARD EXPANSION BAY

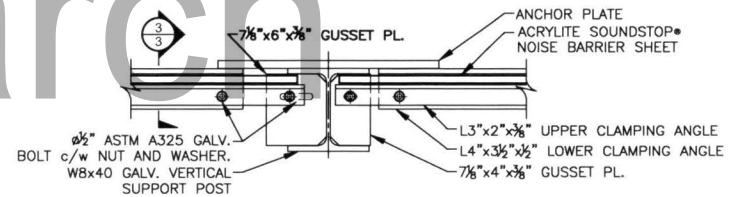
1" = 1'-0"

PROPOSED CHANGE IN DESIGN



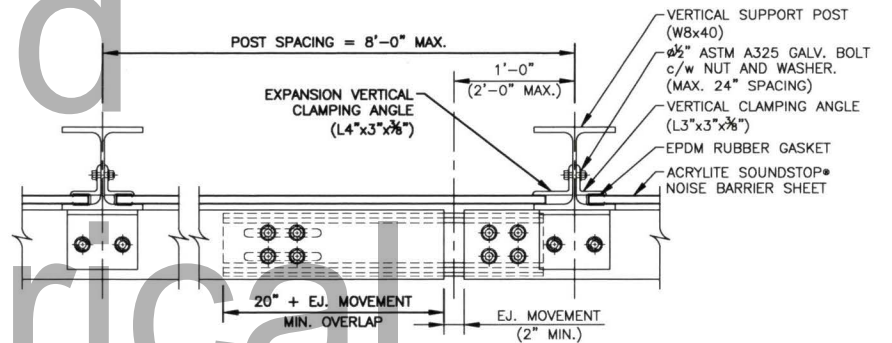
SPLICE TUBE

1" = 1'-0"




HORIZONTAL CLAMPING ANGLES

1" = 1'-0"

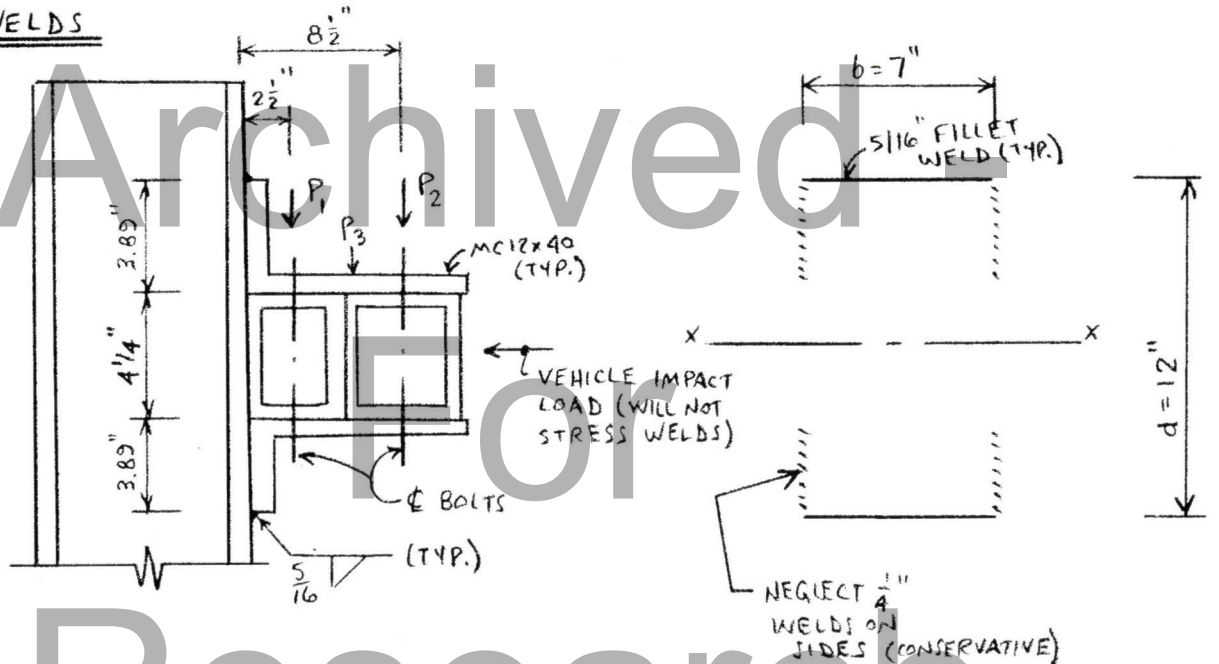


SPLICE CONNECTION

1" = 1'-0"

TITLE:	EXPANSION JOINT SPLICE DETAILS	PROJECT NO:	16P0007	FILE NAME:	16P0007-TL4 Modifications	 VISION BUILT	
PROJECT:	TL-4 MODIFICATION DRAWINGS FOR FHWA APPROVAL	DRAWN BY:	MJR	DATE:	APRIL 5, 2016		
		CHECKED BY:	GJS	REVISED:	JUNE 6, 2016	DWG. NO:	SK-6

CHECK WELDS



$$\begin{aligned}
 P_1 &= HSS 5 \times 4 \times 1/4 = 13.91 \text{ Lb/ft} \times 0.583' = 9 \text{ Lbs} \times 2.5'' = 77 \text{ LbIn} \\
 P_2 &= HSS 7 \times 4 \times 5/16 = 21.21 \text{ Lb/ft} \times 8' = 170 \text{ Lbs} \times 8.5'' = 1,445 \text{ LbIn} \\
 P_3 &= 2 \cdot MC12 \times 40 = 2 \times 40 \text{ Lb/ft} \times 0.583' = 47 \text{ Lbs} \times 6''(\pm) = 282 \text{ LbIn} \\
 P &= 226 \text{ Lbs} \qquad M = 1,804 \text{ LbIn}
 \end{aligned}$$

5/16" FILLET WELD CAPACITY

$$0.27 F_u = 0.27 \times 70 \text{ ksi} \times 0.707 \times 5/16'' = 4.18 \text{ k/in} \dots \text{AASHTO Eq. (10-12)}$$

FORCE ON WELDS

$$\begin{aligned}
 S_w &= bd = 7'' \times 12'' = 84 \text{ in}^2 \dots \text{BLDGGETT, Table 5 (p. 74-7)} \\
 M/S_w &= 1804 \text{ LbIn} / 84 \text{ in}^2 = 21.5 \text{ Lb/in} \\
 P/A &= 226 \text{ Lbs} \div (2 \times 7'') = 16.2 \text{ Lb/in} \\
 R &= \sqrt{(21.5)^2 + (16.2)^2} = 27 \text{ Lbs/in} \\
 &\qquad \qquad \qquad \div 1000 \\
 &\qquad \qquad \qquad 0.03 \text{ k/in}
 \end{aligned}$$

$$0.03 \text{ k/in} \ll 4.18 \text{ k/in} \quad (\text{OK})$$

Historical
Purposes
Only

Mod007

Modification for ACRYLITE Soundstop TL4 noise barrier system for use on taller parapets.

The ACRYLITE Soundstop TL4 noise barrier system was crash tested on a 32" high single slope concrete parapet. with horizontal crash rails at 38", 60", and 128". Horizontal crash rail locations are measured from top of deck to the center of the 4" high vertical face of a particular horizontal crash rail. The intent of the horizontal crash rails are to bear contact and safely redirect the vehicle to prevent substantial impact and snag with the vertical posts and panels.

With the bottom rail centered at 38", the traffic facing surface of this rail vertically extends from 36" to 40" with 4" of clearance between the lowest edge of the rail and the top of the parapet (less considering the attachment angle below the rail). Due to potential interference between the attachment angle and the concrete parapet it is necessary to maintain the 4" clearance from the top of the parapet for parapets that are taller than the 32" high as-tested parapet. When the parapet height however reaches 40", the same height as the top surface of the lowest rail as-tested, the lowest rail may be omitted.

The following is a partial list of appropriate locations for the lowest rail based on parapet height:

32" high parapet (as-tested), lowest rail centered at 38"

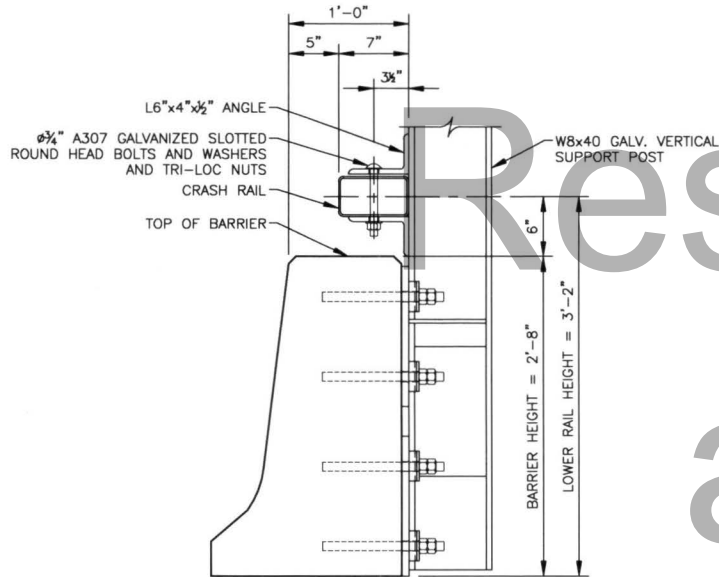
34" high parapet, lowest rail centered at 40"

36" high parapet, lowest rail centered at 42"

38" high parapet, lowest rail centered at 44"

40" high parapet, minimum parapet height where lowest rail not required.

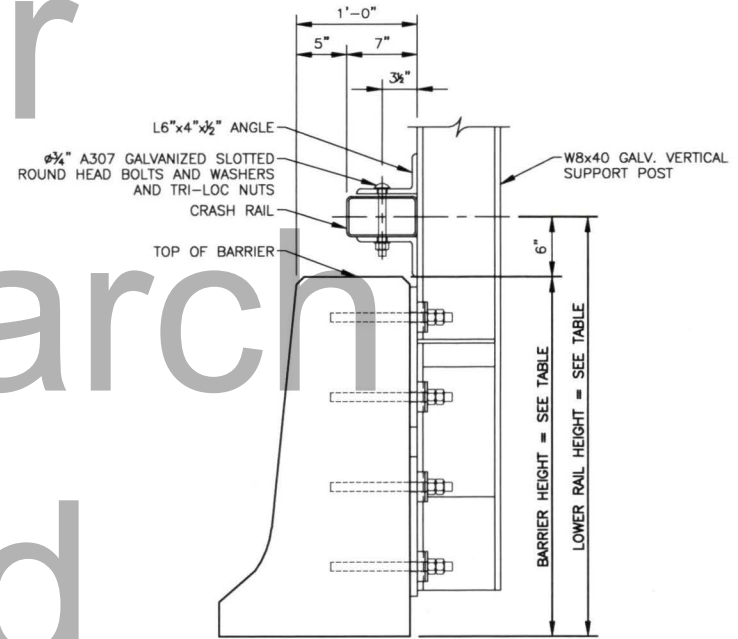
AS-TESTED DESIGN



AS-TESTED LOWER RAIL HEIGHT

1" = 1'-0"


PROPOSED CHANGE IN DESIGN



BARRIER HEIGHT	LOWER RAIL HEIGHT
32" (AS-TESTED)	38"
34"	40"
36"	42"
38"	44"
40" (MIN.)	NOT REQUIRED

ALTERNATE LOWER RAIL HEIGHT

1" = 1'-0"

TITLE: LOWER RAIL PLACEMENTS FOR VARYING HEIGHT BARRIER WALL	PROJECT NO: 16P0007	FILE NAME: 16P0007-TL4 Modifications	 VISION BUILT
	PROJECT: TL-4 MODIFICATION DRAWINGS FOR FHWA APPROVAL	DRAWN BY: MJR	
	CHECKED BY: GJS	REVISED: JUNE 16, 2016	DWG. NO: SK-7

Mod008

Modification for ACRYLITE Soundstop TL4 noise barrier system to establish appropriate overall heights.

The ACRYLITE Soundstop TL4 noise barrier system was crash tested on a 32" high single slope concrete parapet with with horizontal crash rails at 38", 60", and 128". Horizontal crash rail locations are measured from top of deck to center of 4" high vertical face of horizontal crash rail. The overall tested height was 229" inches (19'-1"). The intent of the horizontal crash rails are to bear contact and safely redirect the vehicle to prevent substantial contact and snag with the vertical posts and panels.

Shorter overall heights are allowable and straightforward when the overall wall height remains high enough to position the uppermost horizontal crash rail at the as-tested position of 128". Note that the minimum overall wall height including the uppermost horizontal crash rail centered at 128" is 135" (+7"), which includes the upper half of the 4" high rail plus 5" for attachment of the horizontal crash rail support angle.

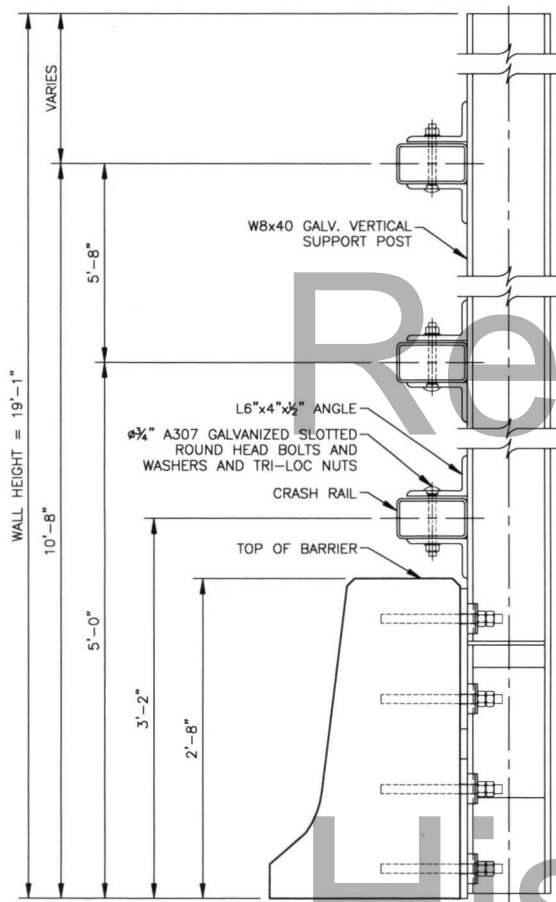
The 5" extension of the post beyond the top edge of the 7" wide horizontal crash rail creates an angle of 54.5 degrees from the top of the horizontal crash rail to the top of the post (reference attached Mod008 sketch.pdf). This is noteworthy as it would require an extreme vehicular lean to create contact with the section of post above the horizontal crash rail.

Wall heights shorter than 135" require that the uppermost crash rail be moved down yet maintained at the top of wall, specifically 7" from top of wall to the center of the uppermost horizontal crash rail. This is acceptable as the uppermost rail is still expected to prevent substantial vehicular contact with the posts, as intended.

The uppermost horizontal crash rail may be moved down from the crash-tested position of 128" (overall height of 135") to a minimum height of 70" (overall height of 77"). Lowering this horizontal crash rail any farther would result in interference with the horizontal crash rail centered at 60".

For wall heights shorter than 77" overall, it is acceptable to omit the uppermost horizontal crash rail while maintaining the horizontal crash rail centered at 60". This results in an overall wall height of 67". Wall heights less than 67" as well as wall heights between 67" and 77" are not considered by this request.

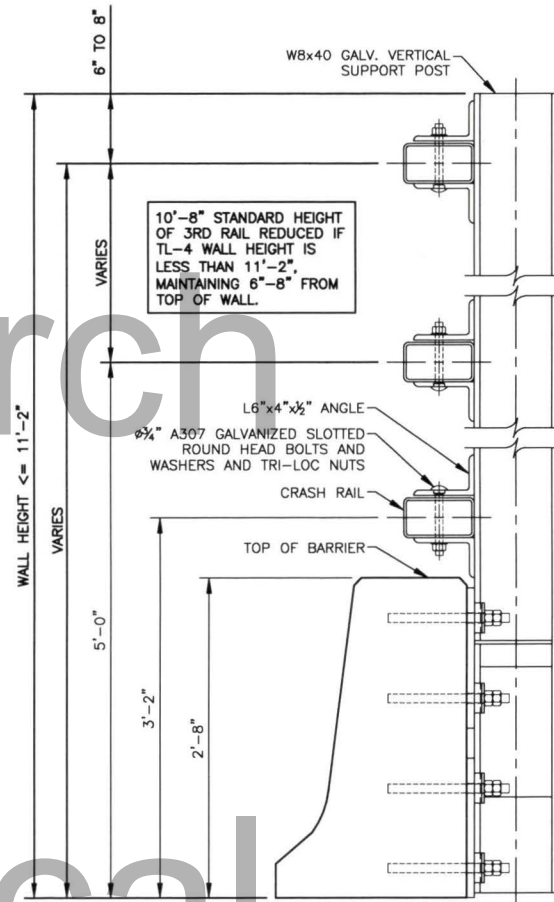
AS-TESTED DESIGN



STANDARD UPPER RAIL PLACEMENT


1" = 1'-0"

PROPOSED CHANGE IN DESIGN

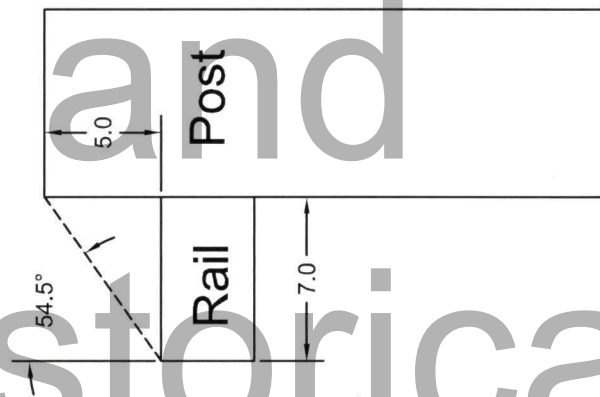


ALTERNATE UPPER RAIL PLACEMENT

1" = 1'-0"

TITLE:	PROJECT NO:	FILE NAME:	 armtec VISION BUILT
UPPER RAIL HEIGHT FOR VARYING HEIGHT OF TL-4 BARRIER	16P0007	16P0007-TL4 Modifications	
PROJECT:	DRAWN BY:	DATE:	
TL-4 MODIFICATION DRAWINGS FOR FHWA APPROVAL	MJR	APRIL 5, 2016	
	CHECKED BY:	REVISED:	DWG. NO:
	GJS	APRIL 13, 2016	SK-8

Archived - For Research and Historical Purposes Only



Mod010 09

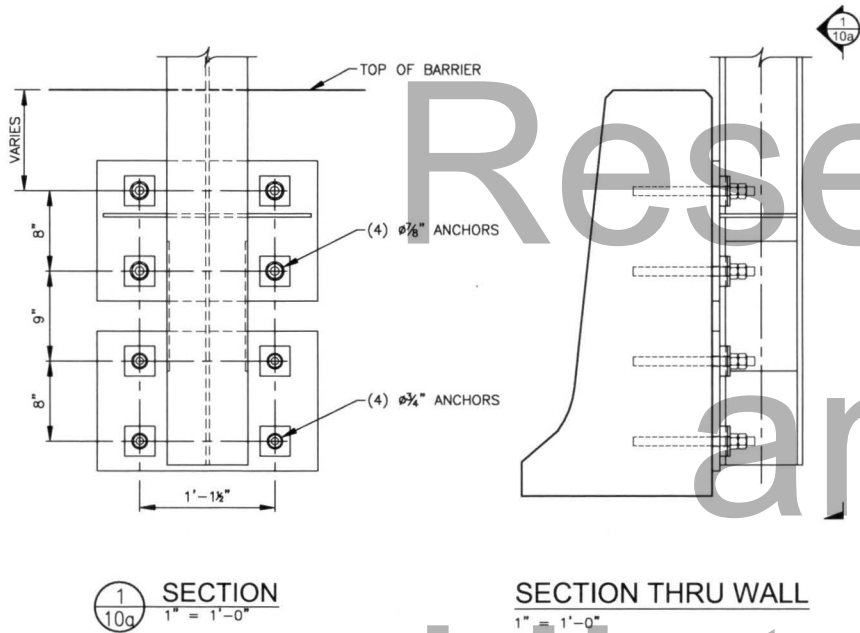
Modification for ACRYLITE Soundstop TL4 noise barrier system to provide alternative post-to-barrier anchorage details.

The need to provide an alternative connection option relates to system attachment to differing parapet geometries, which do not allow for the full development of anchor bolt capacities as the as-tested configuration. In this specific case, the concrete parapet may not be thick enough to provide the minimum 7 1/2" anchor embedment that was used in the as-tested installation. For this reason, the anchor plates have been re-configured and used in combination with larger diameter anchors set with a 5 5/8" minimum embedment. The net impact of the modification results in greater anchor bolt capacity as compared to the as-tested configuration. The engineering analysis is attached as Mod010 Evonik TL-4 Alternate Anchorage Comparison.pdf.

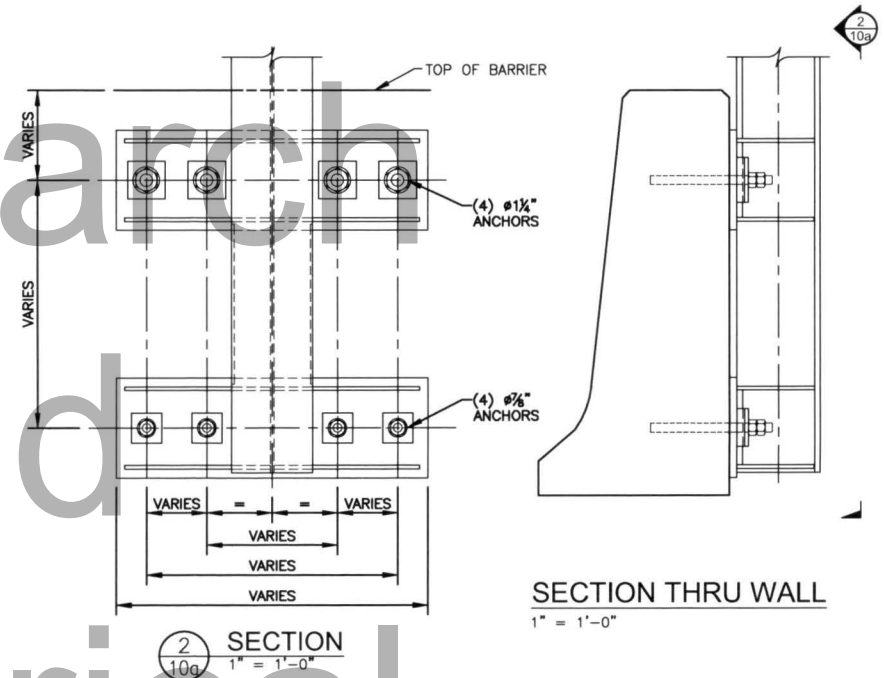
This proposal requests eligibility to use the alternative connection option to anchor the posts to the parapet as well as future modifications on the basis that an engineering analysis is performed to similarly show that the anchorage configuration results in greater anchor bolt and anchor plate capacity as compared to the as-tested configuration.


Archived -

APPROVED DESIGN



PROPOSED CHANGE IN DESIGN



TITLE: ALTERNATE ANCHORAGE DETAILS FOR VARYING BARRIER WALLS	PROJECT NO: 16P0007	FILE NAME: 16P0007-TL4 Modifications	 VISION BUILT
	PROJECT: TL-4 MODIFICATION DRAWINGS FOR FHWA APPROVAL	DRAWN BY: MJR	
	CHECKED BY: GJS	REVISED: APRIL 13, 2016	DWG. NO: SK-10a

MOR

For Research and Historical Purposes

Archived -

PROPOSED CHANGE IN DESIGN

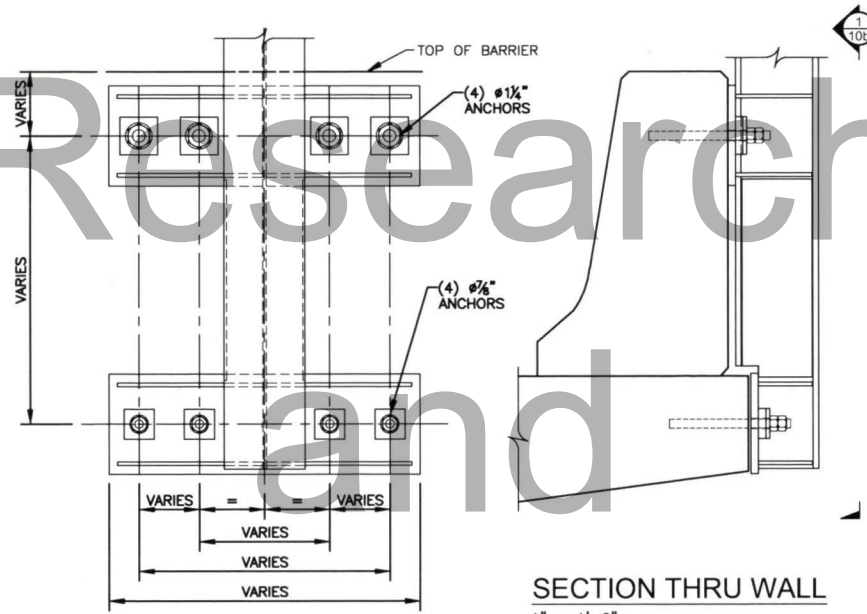
For

Research

and


Historical

Purposes



SECTION
1/10b
1" = 1'-0"

SECTION THRU WALL
1" = 1'-0"

TITLE: ALTERNATE ANCHORAGE DETAILS FOR VARYING BARRIER WALLS (CONT'D)	PROJECT NO: 16P0007	FILE NAME: 16P0007-TL4 Modifications	 VISION BUILT
	PROJECT: TL-4 MODIFICATION DRAWINGS FOR FHWA APPROVAL	DRAWN BY: MJR	
	CHECKED BY: GJS	REVISED: APRIL 13, 2016	DWG. NO: SK-10b

bcm