



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

SEP 17 2018

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

In Reply Refer To:
HSST-1/B-309

Mr. Gerrit Dyke, P.E.
Lindsay Transportation Solutions
180 River Road
Rio Vista, CA 94571

Dear Mr. Dyke:

This letter is in response to your August 3, 2018 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-309 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:

- QuickChange Moveable Barrier Concrete Reactive Tension System (QMB-CRTS) Transition

Scope of this Letter

To be found eligible for Federal-aid funding, new roadside safety devices should meet the crash test and evaluation criteria contained in the American Association of State Highway and Transportation Officials' Manual for Assessing Safety Hardware (MASH). 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

Based solely on a review of crash test results and certifications submitted by the manufacturer, and the crash test laboratory, FHWA agrees that the device described herein meets the crash test and evaluation criteria of the American Association of State Highway and Transportation Officials' Manual for Assessing Safety Hardware (MASH). Therefore, the device is eligible for reimbursement under the Federal-aid highway program if installed under the range of tested conditions.

Name of system: QuickChange Moveable Barrier Concrete Reactive Tension System
(QMB-CRTS) Transition
Type of system: Longitudinal Barrier Transition
Test Level: MASH Test Level 3 (TL3)
Testing conducted by: Safe Technologies, Inc.
Date of request: August 3, 2018

FHWA concurs with the recommendation of the accredited crash testing laboratory as stated within the attached form.

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

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.

Any user or agency relying on this eligibility letter is expected to use the same designs, specifications, drawings, installation and maintenance instructions as those submitted for review.

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 MASH.

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-309 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 yours,



Michael S. Griffith
Director, Office of Safety Technologies
Office of Safety

Enclosures

Request for Federal Aid Reimbursement Eligibility of Highway Safety Hardware

Submitter	Date of Request:	August 03, 2018	<input checked="" type="radio"/> New <input type="radio"/> Resubmission
	Name:	Gerrit A. Dyke, P.E.	
	Company:	Lindsay Transportation Solutions, Inc.	
	Address:	180 River Road, Rio Vista, CA 94571	
	Country:	United States of America	
	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 checked="" type="radio"/> Physical Crash Testing <input type="radio"/> Engineering Analysis	QuickChange Moveable Barrier Concrete Reactive Tension System (QMB-CRTS)	AASHTO MASH	TL3

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 AASHTO Manual for Assessing Safety Hardware and that the evaluation results meet the appropriate evaluation criteria in the MASH.

Individual or Organization responsible for the product:

Contact Name:	Gerrit A. Dyke, P.E.	Same as Submitter <input checked="" type="checkbox"/>
Company Name:	Lindsay Transportation Solutions, Inc.	Same as Submitter <input checked="" type="checkbox"/>
Address:	180 River Road, Rio Vista, CA 94571	Same as Submitter <input checked="" type="checkbox"/>
Country:	United States of America	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.

Safe Technologies, Inc. (STI) performs testing and analysis services for Lindsay Transportation Solutions, Inc. (LTS). STI is a wholly owned subsidiary of LTS. STI is a fully accredited crash test facility to ISO 17025 by A2LA and is recognized by the US Federal Highway Administration (FHWA) to perform full scale crash tests per NCHRP Report 350 and MASH criteria.

The STI laboratory manager, technicians, and laborers are compensated by LTS for salaries and wages. STI and staff does not receive any incentives, compensation, commissions, or professional fees corresponding to the outcome of any testing or analysis.

STI or staff does not receive any research funding or other research support from LTS. STI and staff also do not have any financial interest in patents, copyrights, or other intellectual property associated with the products they test or analyze.

KARCO Engineering, LLC. was contracted by LTS to collaborate with STI for this testing program. KARCO provided guidance, recommendations, and suggestions for testing and reporting practices. KARCO reviewed test data and reports to ensure accuracy and correct representation of test parameters and results. KARCO nor any KARCO employee has any financial interest in LTS, STI, or the product being tested.

PRODUCT DESCRIPTION

- New Hardware or Significant Modification
 Modification to Existing Hardware

The Concrete Reactive Tension Quickchange® Movable Barrier (CRTS) system is an unanchored longitudinal barrier capable of rapid lateral transfer by a transfer vehicle. CRTS is designed to meet the rigid requirements of deployment in movable barrier applications where positive separation is required and where lane widths and lateral space are limited.

CRTS is a heavily reinforced concrete barrier connected end to end with tensioning hinge mechanisms and steel pins. Each barrier segment is approximately 39 in [1.0 m] and weighs approximately 1500 lb (680 kg). The barrier is 18 in [460 mm] wide. Steel variable length barriers (VLB) are used in conjunction with the concrete segments. The system is applicable to asphalt or concrete road surfaces.

The length of need tests, 3-10 and 3-11, for CRTS have demonstrated acceptable performance in accordance with MASH 2016 and are detailed in eligibility letter HSST-1/B-277. Some applications may require a transition to permanent or fixed barrier or other fixed roadside hardware. This request for eligibility of reimbursement of federal funds is for a crash worthy transition of CRTS to fixed barrier systems.

The transition consists of typical CRTS barrier segments and VLBs in accordance with eligibility letter HSST-1/B-277 anchored to the roadway in a prescribed method. A steel transition structure provides the shape transition between the CRTS and fixed barrier geometries. Steel brackets are used to facilitate the anchorage of CRTS segments to the roadway using mechanical or adhesive anchors.

MASH testing was conducted using a portable safety shaped concrete barrier anchored to the roadway to represent a permanent or fixed rigid barrier. To accommodate variations in barrier profiles, the steel transition structure may be altered to fit. The steel transition structure shall maintain equivalent or greater structural composition and material properties.

Markings may be stamped into the steel transition structure for identification, quality assurance, and tracking. In some cases, a metal identification tag may be fastened to the barrier.

CRASH TESTING

By signature below, the Engineer affiliated with the testing laboratory, agrees in support of this submission that all of the critical and relevant crash tests for this device listed above were conducted to meet the MASH test criteria. The Engineer has determined that no other crash tests are necessary to determine the device meets the MASH criteria.

Engineer Name:	Joseph Nagy	
Engineer Signature:	Joseph Nagy	Digitally signed by Joseph Nagy Date: 2018.08.03 13:41:19 -07'00'
Address:	170 River Road, Rio Vista, CA 94571	Same as Submitter <input type="checkbox"/>
Country:	United States of America	Same as Submitter <input type="checkbox"/>

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
3-10 (1100C)	Reference HSST-1/B-277	PASS
3-11 (2270P)	Reference HSST-1/B-277	PASS
3-20 (1100C)	Optional test not conducted	Non-Critical, not conducted

Required Test Number	Narrative Description	Evaluation Results
3-21 (2270P)	<p>The CRTS Transition was judged to have successfully met all of the evaluation criteria for MASH Test 3-21 for longitudinal barriers.</p> <p>The Transition satisfied the MASH structural adequacy criteria for its intended function as a longitudinal barrier. The test article redirected the 2270P vehicle in a controlled manner. The vehicle did not penetrate, underide, or override the installation. The test article exhibited controlled permanent and dynamic deflection in the test.</p> <p>All of the occupant risk criteria were satisfied in testing the CRTS Transition. Theoretical OIVs in the longitudinal and lateral directions were well below the preferred limit of 30.0 ft/s (9.1 m/s). Ridedown accelerations in the longitudinal and lateral directions were below the maximum limit of 20.49 G. No detached components posed a threat to the occupant compartment, other vehicles, pedestrians or personnel in a work zone.</p> <p>There was minimal deformation to the occupant compartment of the 2270P vehicle. There was no intrusion into the occupant compartment. The test vehicle remained upright during and after the collision with moderate roll and pitch.</p> <p>The CRTS Transition was judged as satisfying the applicable MASH vehicle trajectory criteria.</p>	PASS

Full Scale Crash Testing was done in compliance with MASH by the following accredited crash test laboratory (cite the laboratory's accreditation status as noted in the crash test reports.):

Laboratory Name:	Safe Technologies, Inc.	
Laboratory Signature:	Joseph Nagy	Digitally signed by Joseph Nagy Date: 2018.08.03 13:45:27 -07'00'
Address:	170 River Road, Rio Vista, CA 94571	Same as Submitter <input type="checkbox"/>
Country:	United States of America	Same as Submitter <input type="checkbox"/>
Accreditation Certificate Number and Dates of current Accreditation period :	A2LA 1851.01 Valid to March 31, 2020	

Submitter Signature*: **Gerrit Dyke** Digitally signed by Gerrit Dyke
Date: 2018.08.03 13:48:38
-07'00'

Submit Form

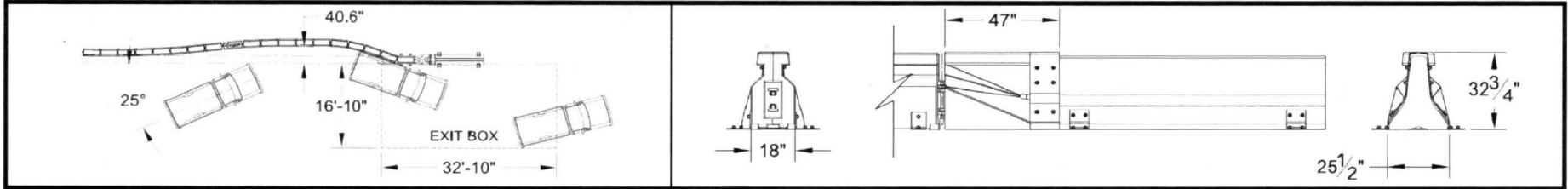
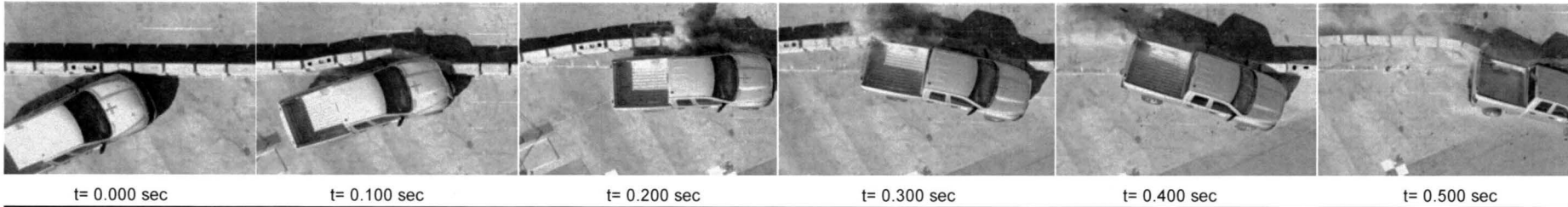
ATTACHMENTS

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		
Number	Date	Key Words



General Information

Test Agency..... **SAFE TECHNOLOGIES, INC.**
 Test Number..... CRTS321-C1
 Test Designation MASH 3-21
 Date..... 4/23/2018

Test Article

Name Lindsay Transportation Solutions
 CRTS Transition
 Type Longitudinal Movable Barrier
 Installation Length 329.1 ft (100.3 m)
 Transition Length 26 ft (7.92 m)
 Width 25.5 in (648 mm)
 Height 32.75 in (832 mm)

Test Vehicle

Type / Designation 2270P
 Make and Model 2011 Dodge Ram 1500
 Curb Weight 4,933 lb (2,237.5 kg)
 Test Inertial Weight 5,018 lb (2,276 kg)
 Gross Static Weight 5,018 lb (2,276 kg)

Impact Conditions

Speed 62.3 mph (100.2 km/h)
 Angle 25.0 deg
 Location / Orientation CIP 19.7 in (500 mm) downstream from
 upstream end of barrier segment 87

Exit Conditions

Speed..... 39.0 mph (62.8 km/h)
 Angle (deg)..... 6.65
 Exit Box Criterion Pass

Post Impact Trajectory

Vehicle Stability Satisfactory
 Stopping Distance 95.8 ft (29.2 m)
 Vehicle Snagging/Pocketing..... Minimal

Occupant risk Values

Longitudinal OIV 19.7 ft/s (6.0 m/s)
 Lateral OIV 17.4 ft/s (5.3 m/s)
 Longitudinal ORA 14.9 G
 Lateral ORA 16.9 G
 THIV 26.2 ft/s (8.0 m/s)
 PHD 17.0 G
 ASI 1.14

Test Article Damage:

Moderate

Test Article Deflections

Permanent 38.4 in (975 mm)
 Dynamic 40.6 in (1,031 mm)

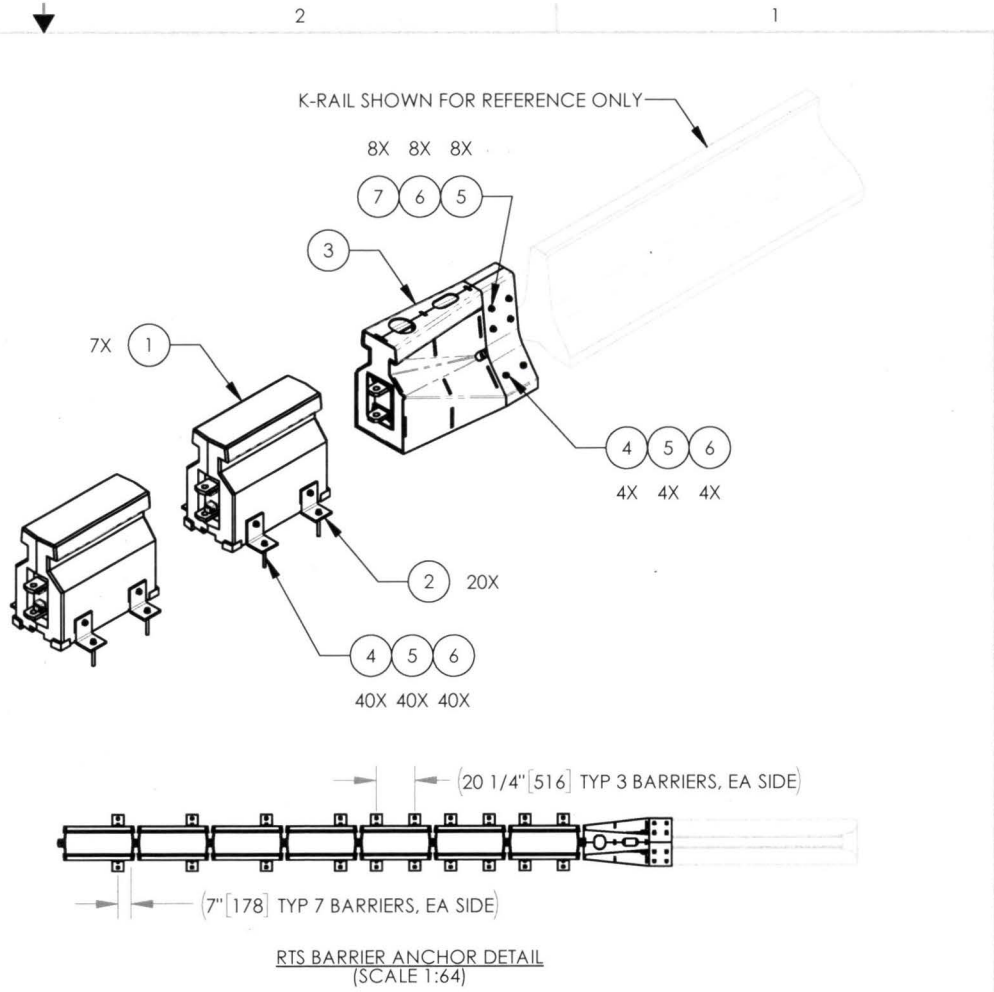
Vehicle Damage

VDS..... 11-LFQ-5
 CDC..... 11LFAS3
 Maximum Deformation 1 in (25.4 mm)-Driver side
 front door

ITEM	PART NUMBER	Description	QTY.
1	C050236	18" H2 Concrete Barrier RTS	7
2	BSI-1502057-00	Anchor Brkt, RTS Barrier, Galv	20
3	BSI-1806001-00	TRANSITION ASSEMBLY, 18" CRTS TO K RAIL	1
4	B011001	Thread Anchor 3/4-10x8 1/4 Gr2	44
5	2001399	Nut HN 3/4-10 Hvy A563 HD Galv	52
6	2001380	Wshr 3/4 F436 Flat Rd Struct, HD Galv	52
7	B020743	Sfg Thrd Anchor 3/4x4 1/2 Gr2, Galv	8

NOTES: UNLESS OTHERWISE SPECIFIED.

- RTS TRANSITION TO BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS.
- RTS BARRIER ANCHORS REQUIRE 6 IN. EMBEDMENT IN BARRIER AND FOUNDATION. USE 3/4 IN. X 8 1/4 IN. (B011001) GALVANIZED ANCHORS TORQUED TO 120 FT-LBS.
- DRILL AND INSTALL ONE RTS ANCHOR BRACKET TO DOWNSTREAM END OF FIRST FOUR RTS BARRIERS, EACH SIDE. SEE DETAIL.
- DRILL AND INSTALL TWO RTS ANCHOR BRACKETS TO LAST THREE RTS BARRIERS, EACH SIDE. SEE DETAIL.
- PIN RTS TRANSITION ASSEMBLY TO LAST ANCHORED RTS BARRIER.
- ANCHOR TRANSITION WELDMENT TO DOWNSTREAM PERMANENT CONCRETE BARRIER, SIX ANCHORS PER SIDE. USE (2) 3/4 IN. X 8 1/4 IN. (B011001) WITH 6IN. EMBEDMENT AT LOWER LOCATIONS, EA SIDE. USE (4) 3/4 IN. X 4 1/2 IN. (B020743) WITH 3 IN. EMBEDMENT AT UPPER LOCATIONS, EA SIDE.



RTS BARRIER ANCHOR DETAIL
(SCALE 1:64)

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.XXX = ±.010

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Y14.5-1994

APPROVALS

DRAWN BY: JMT
DRAWN DATE: 5/30/2018
APPR'D BY: GAD
APPR'D DATE: 5/30/2018

THIRD ANGLE PROJECTION



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REV ECN# DATE



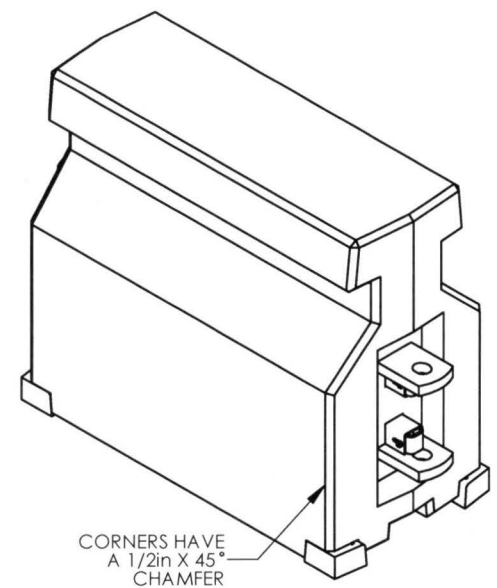
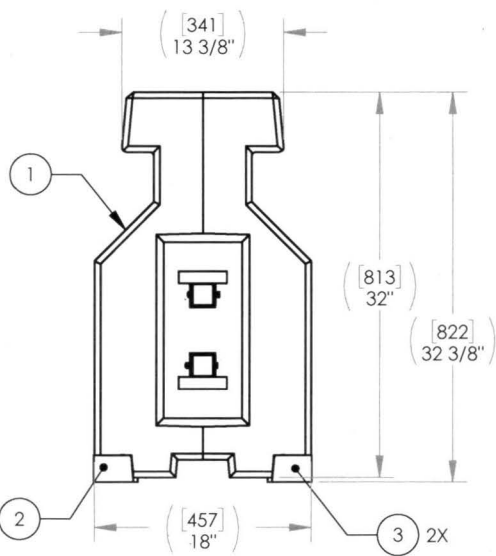
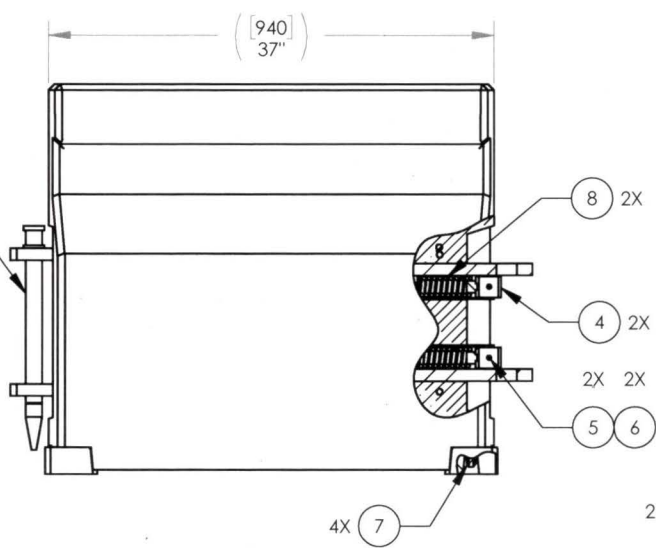
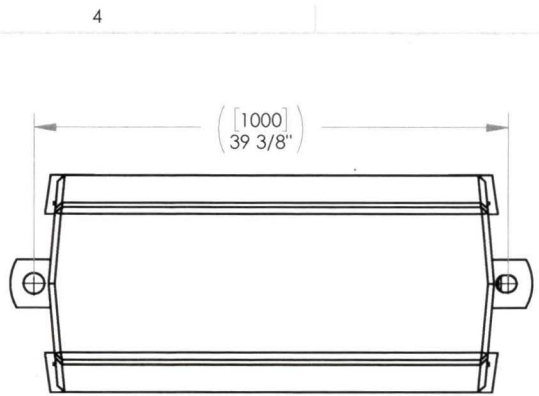
LINDSAY TRANSPORTATION SOLUTIONS
180 River Road
Rio Vista, CA 94571
Tel: 988-900-3691
www.barriersystemsinc.com

TITLE
**18in MASH CRTS BARRIER
TRANSITION TO RIGID BARRIER**

SIZE DWG NO. REV.
B BSI-1806002-US A

SCALE 1:32 SHEET 1 OF 1

D
C
B
A



ITEM	PART NUMBER	Description	QTY.
1	C050234	H2, BARRIER MODULE 18in, REACTIVE TENSION SYSTEM	1
2	C060317	FOOT BUMPER RH, DOMESTIC, CONCRETE BARRIER	2
3	C060318	FOOT BUMPER LH, DOMESTIC, CONCRETE BARRIER	2
4	BSI-1608031-00	PUSHER PLATE WELDMENT, RTS BARRIER, GALV,	2
5	2000114	NUT, NYLOK, 1/4-20, STEEL, GRADE 5, ZINC PLATED	2
6	2000172	C-SCR HH 1/4-20 X 2 1/2 GR5 PLT	2
7	2001589	LOCKNUT, BRASS, 1/2-13 NC, NYLOK	4
8	4000145	SPRING NARROW BARRIER HINGE	2
9	B021156	RTS 2 3/4" PIN, GALV	1

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 .xxx = ±.010

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APPROVALS	
DRAWN BY:	RGC
DRAWN DATE:	5/11/2005
APPR'D BY:	JSM
APPR'D DATE:	5/11/2005

THIRD ANGLE PROJECTION	C	3764	05/18/18
	B	3280	12/01/16
	A	1758	10/12/11
REV	ECN#	DATE	

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BARRIER SYSTEMS
 180 River Road
 Rio Vista, CA 94571
 Tel: 888-800-3691
 www.barrriersystemsinc.com

TITLE		18" H2 CONCRETE BARRIER REACTIVE TENSION SYSTEM	
SIZE	DWG NO.	REV.	
B	C050236-US	C	
SCALE	1:10	SHEET	1 OF 1

4

3

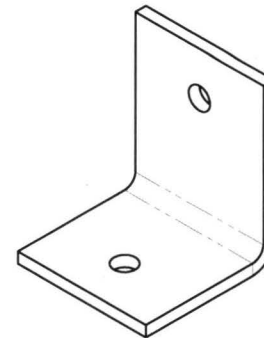
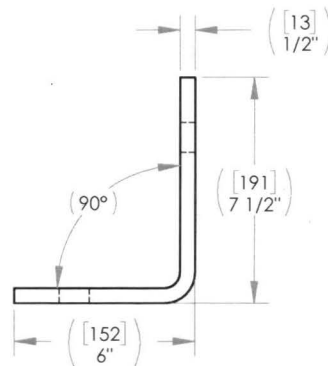
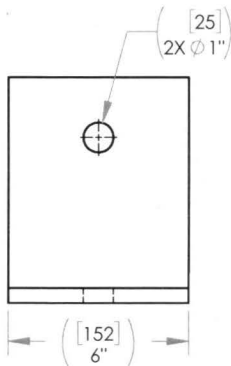
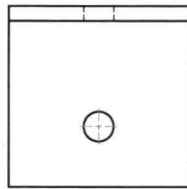
2

1

ITEM	PART NO	DESCRIPTION	QTY
1	BSI-1502056-00	Anchor Bracket, RTS Barrier,	1

NOTES: UNLESS OTHERWISE SPECIFIED.

1. FINISH TO BE HOT-DIP GALVANIZED PER ASTM A123.



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 .XXX = ± 0.10

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THIRD ANGLE PROJECTION



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 180 River Road
 Rio Vista, CA 94571
 Tel: 925-800-3691
 www.barriersystemsinc.com

TITLE
**ANCHOR BRACKET,
 RTS BARRIER, GALV**

APPROVALS

DRAWN BY: JMT

DRAWN DATE: 2/19/2015

APPR'D BY: GAD

APPR'D DATE: 2/19/2015

REV

A

3764

05/18/18

ECN#

DATE

SIZE

DWG NO.

B

BSI-1502057-US

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REV.

A

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1 OF 1

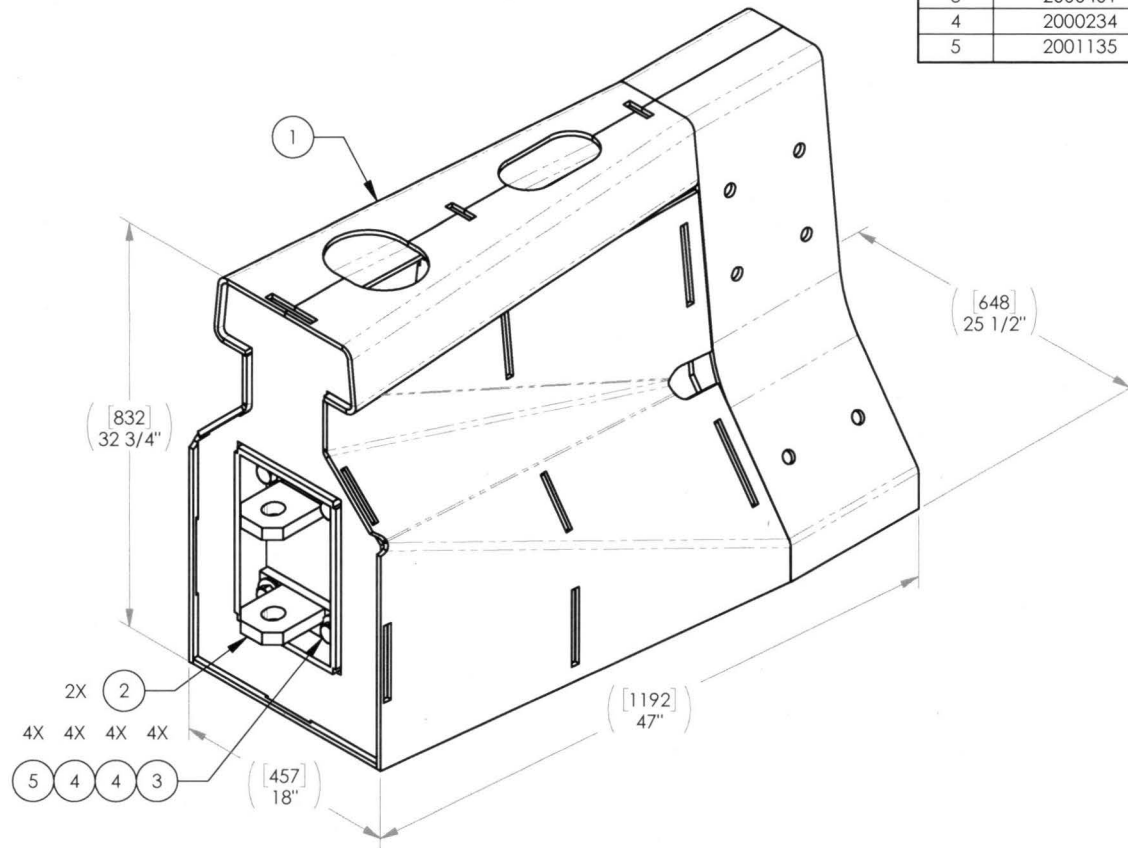
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1

ITEM	PART NUMBER	Description	QTY.
1	BSI-1801014-00	18" CRTS TRANSITION WELDMENT, GALV	1
2	B020134	WELD, HINGE, RTS	2
3	2000401	C-Scr HH 7/8-9x3 1/2 Gr5 Plt	4
4	2000234	Wshr 7/8 SAE HD Plt	8
5	2001135	Nut Nylok 7/8-9 Plt	4



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 180 River Road
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 Tel: 925-900-3691
 www.barriersystemsinc.com

TITLE
**TRANSITION ASSEMBLY,
 18" CRTS TO K RAIL**

APPROVALS

DRAWN BY:	JMT
DRAWN DATE:	05/30/18
APPR'D BY:	GAD
APPR'D DATE:	05/30/18

REV	ECN#	DATE
A	3764	06/05/18

SIZE	DWG-NO.	REV.
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SCALE	1:8	SHEET
		1 OF 1

4

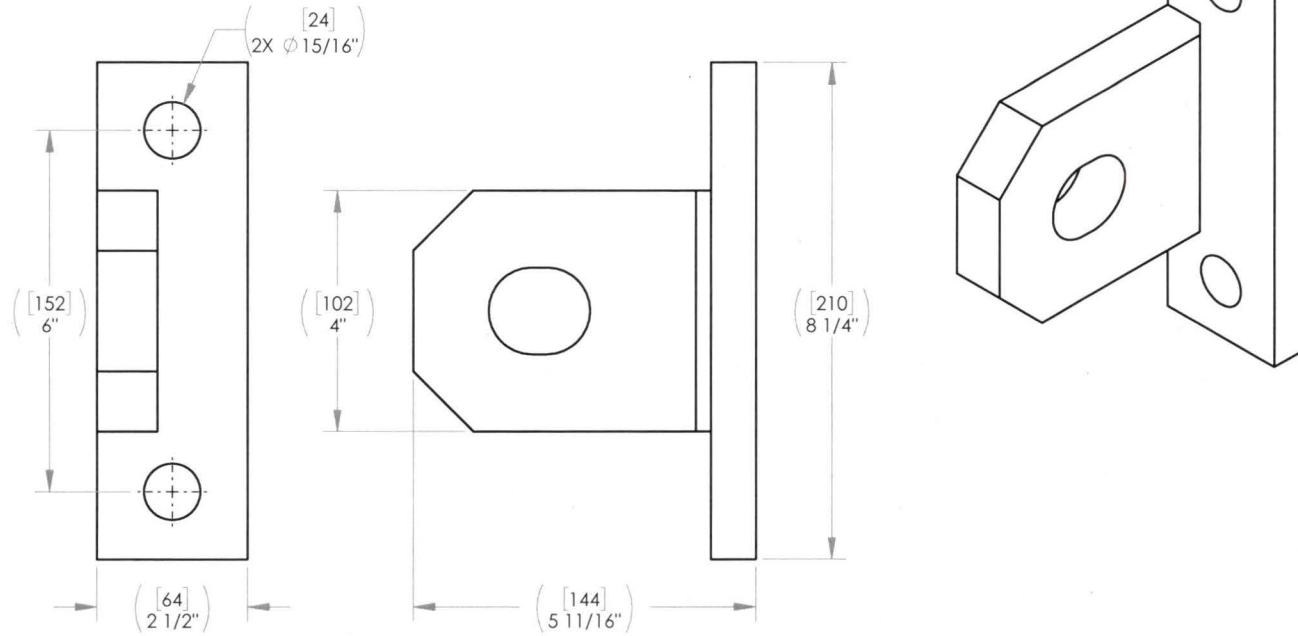
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1. FINISH TO BE HOT DIPPED GALVANIZED PER ASTM A 123



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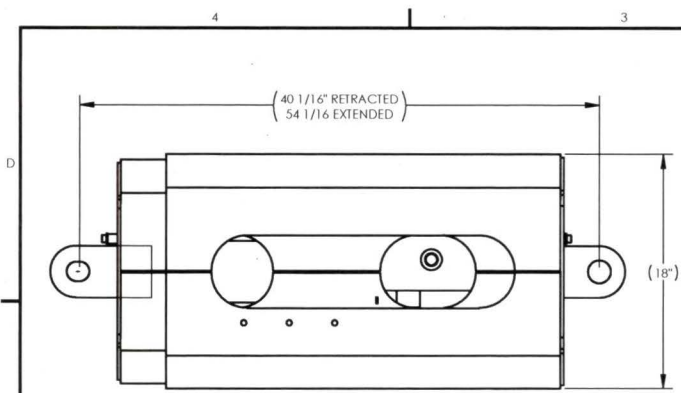


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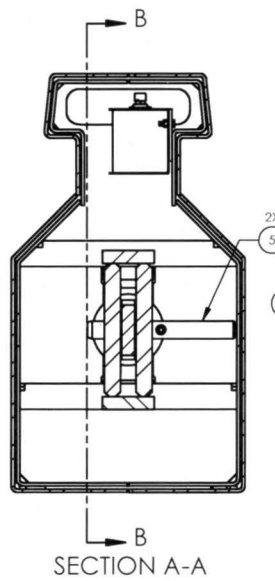
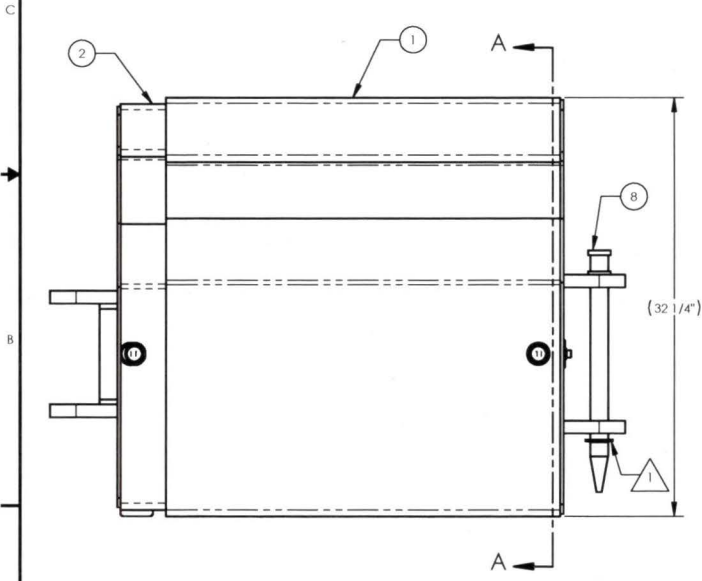
APPROVALS	
DRAWN BY:	JMT
DRAWN DATE:	2018-06-04
APPR'D BY:	GAD
APPR'D DATE:	2018-06-04

REV	ECN#	DATE
A	3764	06/04/18

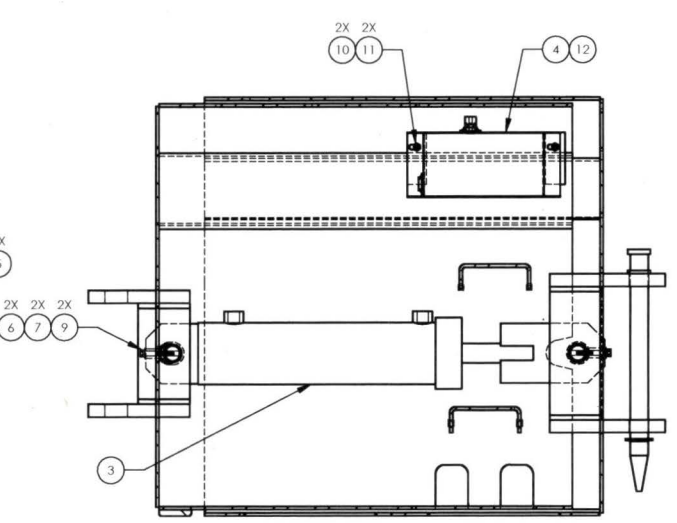
TITLE		HINGE, RTS	
SIZE	DWG NO.	REV.	
B	B020134-US	A	
SCALE	1:2	SHEET	1 OF 1



ITEM	PART NO.	DESCRIPTION	QTY.	UoM
1	BSI-1010077-00	OUTER SHELL WELDMENT, 18" VLB	1	EA
2	BSI-1010076-00	INNER SHELL WELDMENT, 18" VLB	1	EA
3	B050609	HYDRAULIC CYLINDER, VLB	1	EA
4	BSI-1612002-00	VLB HYD DIAGRAM	1	EA
5	A050539	CYL CONNECTION PIN 18" VLB	2	EA
6	A050802	PIN-LOCK SPACER	2	EA
7	2000228	WSHR 3/8	2	EA
8	B021156	BSI, HINGE PIN 2 3/4 TAPER	1	EA
9	2001043	C-SCR SH 3/8-16X2 1/4	2	EA
10	2000363	C-SCR HH 5/16-18 X 1	2	EA
11	2000131	NUT NYLOK 5/16-18	2	EA
12	1405610	HYD OIL	1.62	GA

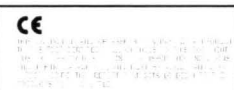


SECTION A-A



SECTION B-B

NOTES: UNLESS OTHERWISE SPECIFIED.
 ⚠️ RETAINING RING AND WASHER WILL BE SUPPLIED SEPARATELY BY LINDSAY TRANSPORTATION SOLUTIONS. USE WASHER: BSI-1405130-00. USE RETAINING CLIP: 2000085 (LEASE) OR: BSI-1510044-00 (PERMANENT)



DRAWN BY: JTL DRAWN DATE: 12/01/16 CHECKED BY: GAD CHECKED DATE: 12/01/16		THIRD ANGLE PROJECTION 		C 3441 05/18/17 B 3357 03/10/17 A 3280 12/01/16		LINDSAY TRANSPORTATION SOLUTIONS 18" RTS VLB - MASH BSI-1612001-US		REV: C DATE: 12/01/16 SCALE: 1:6 SHEET: 1 OF 1
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