

Vulcan™ Barrier System (CEN)

ASSEMBLY AND ANCHORING MANUAL

Vulcan™ Barrier System (CEN)



Assembly and Anchoring Manual



15601 Dallas Parkway
Suite 525
Addison, Texas 75001



IMPORTANT: These instructions are to be used only in conjunction with the assembly, maintenance, and repair of the Vulcan™ Barrier System. These instructions are for standard assemblies specified by the appropriate highway authority only. In the event the specified system assembly, maintenance, or repair requires or involves special circumstances, contact the appropriate highway authority engineer. Valtir representatives are available for consultation with the engineer, if needed.

This Manual must be available to the worker overseeing and/or assembling the product at all times. For additional copies, contact Valtir at +1 (214) 589-8140 or download from websites below.

The instructions contained in this Manual supersede all previous information and manuals. All information, illustrations, and specifications in this Manual are based on the latest Vulcan™ Barrier System information available to Valtir at the time of printing. We reserve the right to make changes at any time.

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Customer Service Contacts

Valtir is committed to the highest level of customer service. Feedback regarding the Vulcan™ Barrier System, its assembly procedures, Manual content, and in-field performance is always welcome. Our goal is to assist highway authorities in making their highways safer. Additional information can be obtained by calling the telephone numbers below:

Valtir:

Telephone:	+1 (214) 589-8140
Internet:	http://www.Valtir.com/

Important Introductory Notes

Proper assembly of the Vulcan™ Barrier System is essential for the system to perform as tested and accepted per EN 1317. These instructions should be read in their entirety and understood BEFORE assembling the Vulcan™ Barrier. These instructions are to be used only in conjunction with the assembly of the Vulcan™ Barrier System and are for standard assemblies only as specified by the applicable highway authority. In the event your system assembly requires or involves special circumstances or, during the assembly process, a question arises regarding a particular assembly step, contact the design engineer for the highway authority before proceeding. If you proceed with an assembly that deviates from that specified and approved by the applicable highway authority, you negate the system's accepted performance standards.

A set of product and project shop drawings will be supplied by Valtir. The shop drawings will be for each section of the assembly. These drawings should be reviewed and studied thoroughly by a qualified individual who understands their content before the start of any deployment.

System Overview

Vulcan™ Barrier provides several unique advantages over traditional portable concrete barriers, or other styles of portable safety barriers:

- Energy-absorbing when impacted pursuant to accepted criteria
- Quick and easy deployment and retrieval
- Lightweight
- Economical
- Easily repaired after most impacts
- Variety of deployment and end terminal options

Vulcan™ Barrier and has been thoroughly tested to EN 1317 testing procedures. Vulcan™ Barrier has achieved N2 and H2 containment level acceptance as a redirecting longitudinal safety barrier for speeds up to 100 km/h [62 mph].



Important: Read safety instructions thoroughly and follow the suggested safe practices before assembly, maintaining, or repairing the Vulcan™ Barrier. Failure to follow this warning can result in serious injury or death to the worker and/or bystanders, as well as drivers who may impact a system so deployed. Please keep these instructions for later use.



Warning: Ensure that all of the Vulcan™ Barrier Warnings, Cautions, and Important statements within the Vulcan™ Barrier manual are completely followed. Use only specified parts. The use of non-specified parts is not authorized and renders the system unacceptable to the appropriate highway authority for use on the specified highway system. Failure to follow this warning could result in serious injury or death in the event of a collision.

Recommended Safety Rules for Assembly

*** Important Safety Instructions ***

This Manual must be kept in a location where it is readily available to persons who assemble, maintain, or repair the Vulcan™ Barrier System. Additional copies of this Manual are available from Valtir by calling +1 (214) 589-8140. Please contact Valtir if you have any questions concerning the information in this Manual or about the Vulcan™ Barrier System.

Always use appropriate safety precautions when operating power equipment, mixing chemicals; and when moving heavy equipment or the Vulcan™ Barrier components. Gloves, safety goggles, and back protection should be used.

Safety measures incorporating traffic control devices must be used to provide safety for personnel while at the assembly, maintenance, or repair site.

Safety Symbols

This section describes safety symbols that may appear in the Vulcan™ Barrier System Manual. Read the Manual for complete safety, assembly, operating, maintenance, repair, and service information.

Symbol Meaning



Safety Alert Symbol:

Indicates Danger, Warning, or Caution; failure to read and follow the Danger, Warning, Safety, or Caution notices could result in serious injury or death to the workers and/or bystanders.

Warnings and Cautions

Read all instructions before assembling, maintaining, or repairing the Vulcan™ Barrier System.



Warning: Read the instructions carefully. Be familiar with the complete instructions for the Vulcan™ Barrier before assembling, maintaining, or repairing the Vulcan™ Barrier. Failure to follow this warning could result in serious injury or death in the event of a collision.



Warning: Ensure that all Warnings, Cautions and Important statements within the Vulcan™ Barrier manual are completely followed. Failure to follow this warning could result in serious injury or death in the event of a collision.



Warning: Be sure adequate time is available for complete assembly, maintenance, or repair before beginning the assembly, maintenance, or repair process. Failure to follow this warning could result in serious injury or death in the event of a collision.



Warning: Do not assemble, maintain, or repair the Vulcan™ Barrier until you have read this Manual thoroughly and completely understand it. Please call Valtir at +1 (214) 589-8140 if you do not understand the assembly instructions. Failure to follow this warning could result in serious injury or death in the event of a collision.



Warning: Use only Valtir parts for assembling, maintaining, or repairing the Vulcan™ Barrier. Assembly, maintenance, or repairs using unaccepted accessories is strictly prohibited. Failure to follow this warning could result in serious injury or death in the event of a vehicle impact with an UNACCEPTED system.



Warning: DO NOT modify the Vulcan™ Barrier in any way. Failure to follow this warning could result in serious injury or death in the event of a collision.



Warning: Ensure that the Vulcan™ Barrier and delineation used meet all specifying agency and local specifications. Failure to follow this warning could result in serious injury or death in the event of a collision.



Warning: Ensure that your assembly meets all appropriate local standards. Failure to follow this warning could result in serious injury or death in the event of a collision.



Warning: Ensure that there is proper site grading for Vulcan™ Barrier placement as dictated by the specifying agency. Failure to follow this warning could result in serious injury or death in the event of a collision.

Know your Vulcan™ Barrier System

Application

The Vulcan™ Barrier can be used in many applications specified by the appropriate highway authority such as:

- General road maintenance performed by road authorities, contractors, local municipalities, etc.
- Road construction
- Lane closures
- Toll plazas
- Road Resurfacing
- Excavation or culvert protection
- Detours or diversions
- Bridge repairs
- Temporary or permanent assemblies
- Median or verge assemblies
- A variety of approved end terminals available or option to "Taper Through Clear Zone"

In order to select the most appropriate Vulcan™ Barrier System for a given site, this manual helps the appropriate highway authority answer the following questions:

- Is the Vulcan™ Barrier appropriate for my site?
- What is the application? What indicates the use of the Vulcan™ Barrier?
- How long must the barrier be? Refer to the length of need and beginning of length of need for Vulcan™ Barrier assembly options.
- How much clear zone is available, and how much is required for the correct functioning of the System?
- Are there curves, slopes or curbs present which may not suit the Vulcan™ Barrier?
- Is an end treatment, which has been accepted by the appropriate highway authority, available to suit my particular requirement? Refer to end terminal section of this manual.

The purpose of this manual is to supply some basic application information about the Vulcan™ Barrier and to detail its performance when tested to EN 1317 criteria.

If you would like further assistance, please contact Valtir Customer Service Department at +1 (214) 589-8140.

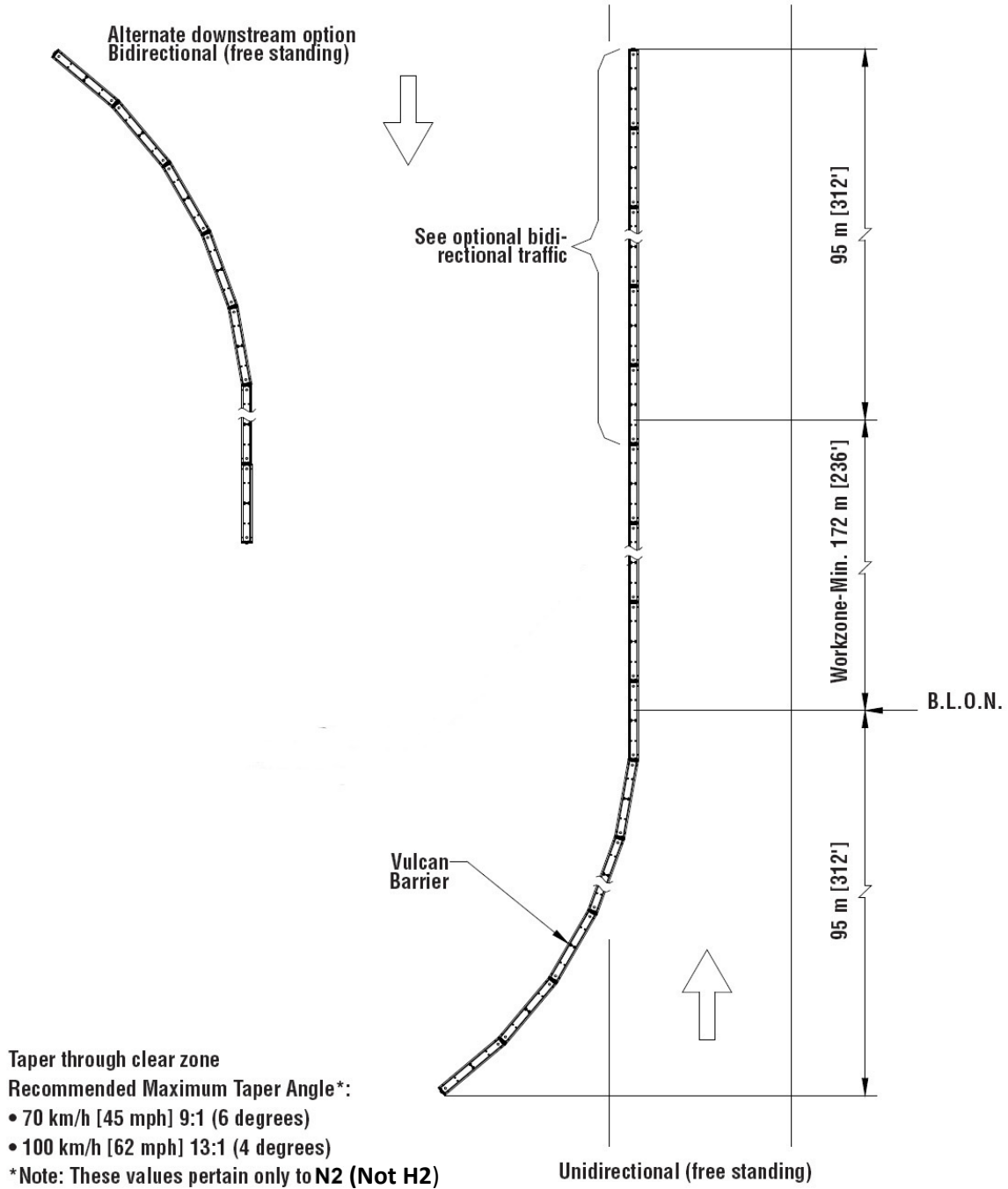


Figure 1 - Freestanding Configuration

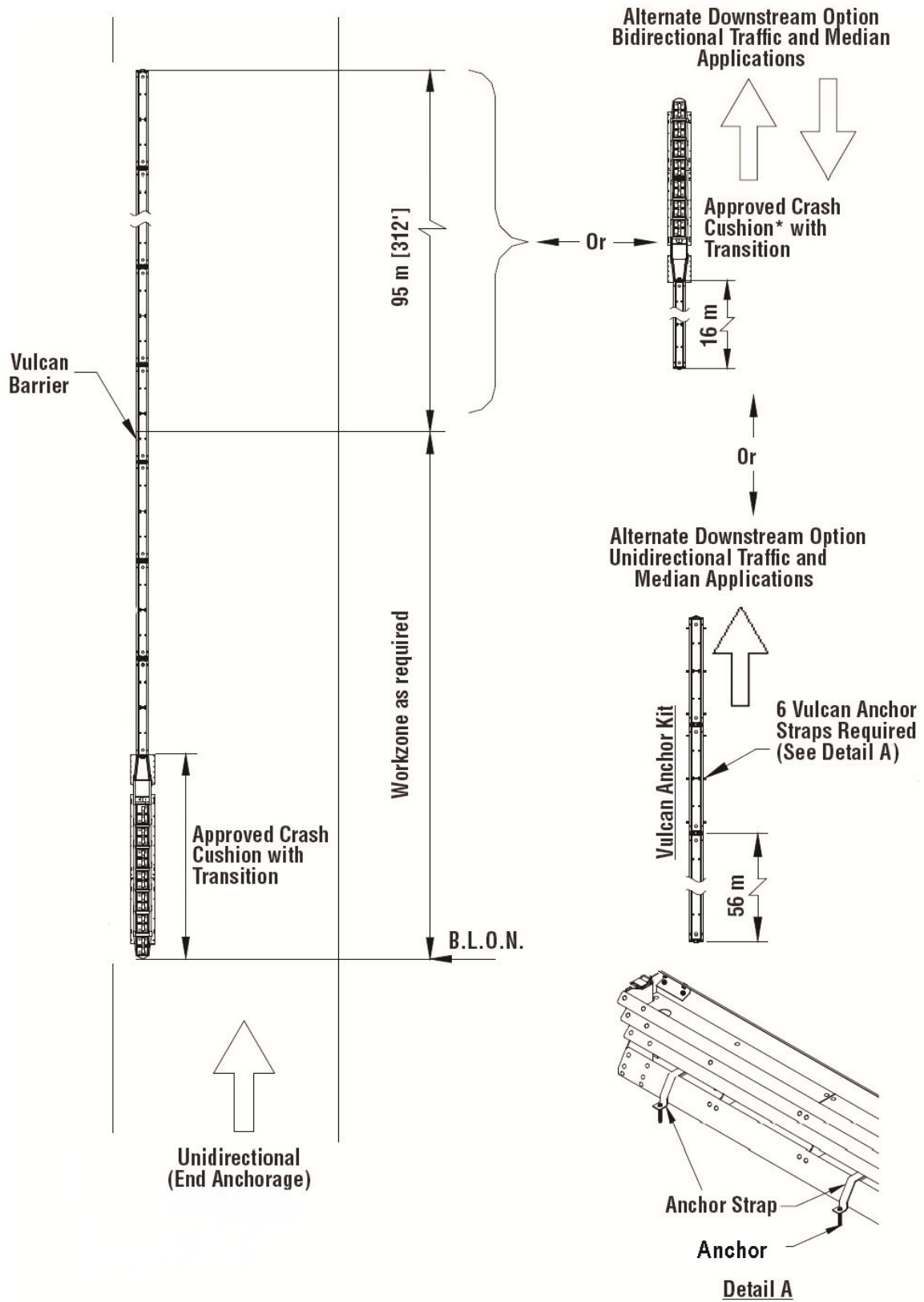


Figure 2 - Anchored Configuration

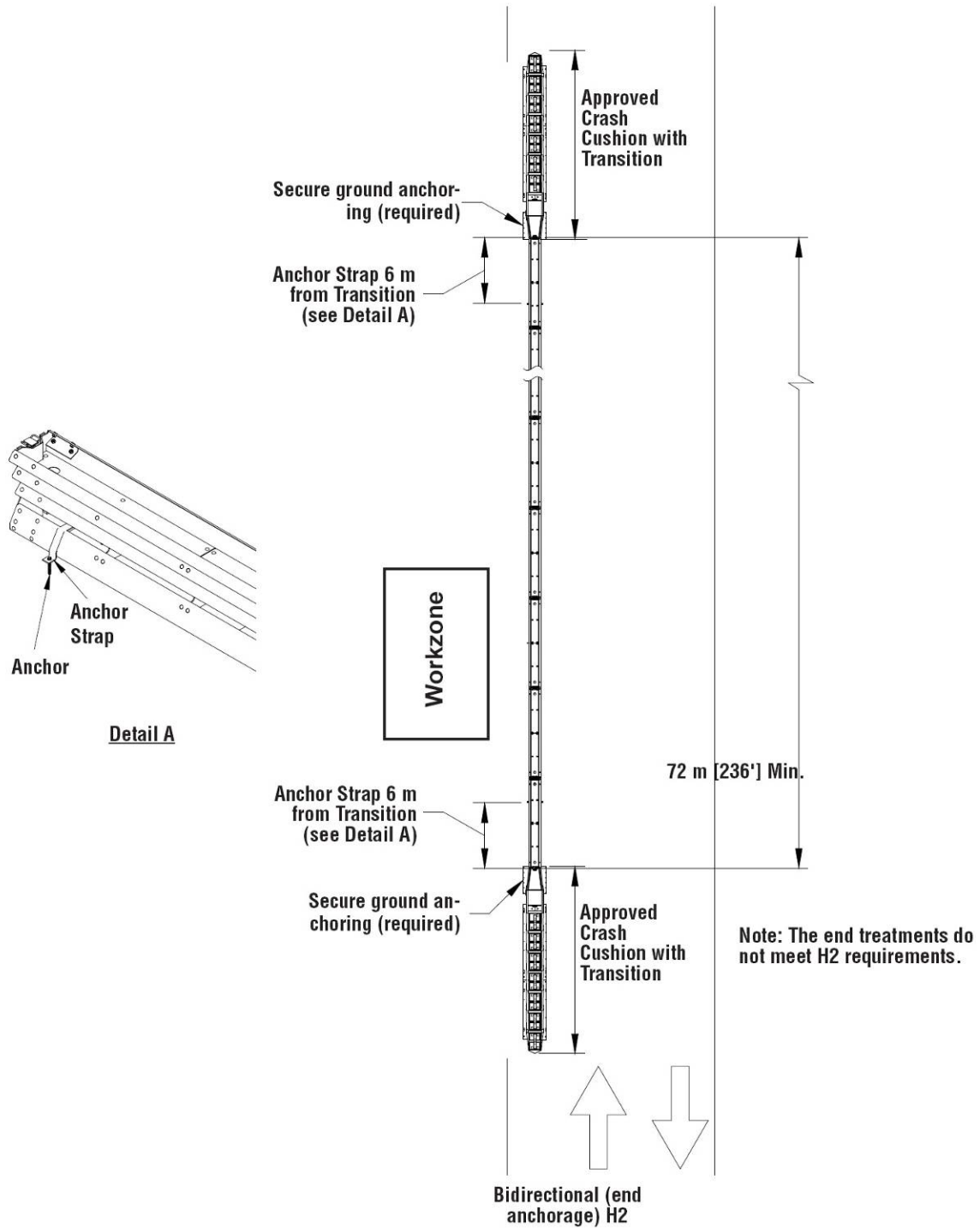


Figure 3 - Anchored Configuration

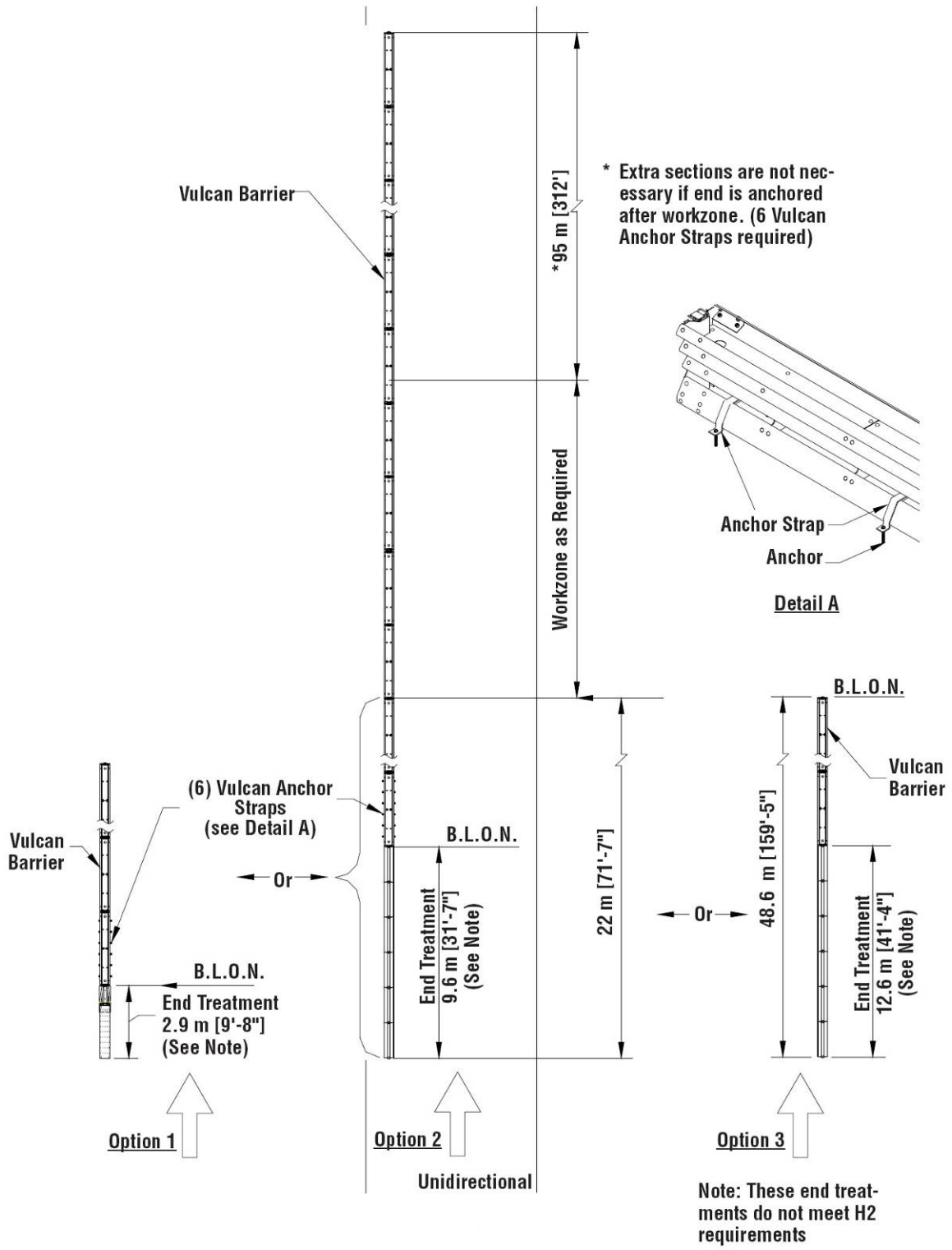


Figure 4 - Freestanding End Treatment

Anchoring Instructions

Recommended Tools

1. Vulcan™ Barrier Product Description / Instructional Manual
2. Traffic Control Plan and Approval (as required)
3. Traffic Control Equipment (as required)
4. Rebar Cutting Bit
5. 22 mm (7/8") Concrete Drill Bit (Two-Fluted*)
 - * Valtir recommends using two-fluted drills to achieve optimum tensile strength when applying the MP-3® anchoring system.
6. Grinder, Hacksaw or Torch (optional)
7. Drill Motor
8. 1/2" Drive Sockets: 1 1/8", 1 1/4"
9. Ratchet for the Above Sockets
10. Torque Wrench: 200 ft-lbs.
11. Safety Glasses
12. Gloves
13. Nylon Bottle Brush For Cleaning 7/8" Drilled Holes
14. Rags, Water, and Solvent for Touch-Up

Note: The above list of tools is a general recommendation. Depending on specific site conditions and the complexity of the assembly specified by the appropriate highway authority, additional or fewer tools may be required. Decisions as to what tools are needed to perform the job are entirely within the discretion of the specifying highway authority and the authority's selected contractor performing the assembly of the system at the authority's specified assembly site.

Anchored Vulcan™ Foundations

The Vulcan™ Barrier may be assembled on any of the following foundations using the specified anchorage:

Note: MP-3 is Valtir available anchoring system. Other options are acceptable if they provide identical (or better) anchoring properties.

Foundation A: Concrete Pad or Roadway

- Foundation: 150 mm [6"] minimum depth
Portland Cement Concrete (P.C.C.)
- Anchorage: MP-3® with 180 mm [7"] studs
140 mm [5.5"] embedment

Foundation B: Asphalt over Portland Cement Concrete

- Foundation: Minimum anchor embedment depth is 140 mm [5.5"]
- Anchorage: Length of anchor required is 180 mm [7"] stud + asphalt thickness.

Foundation C: Asphalt over Sub-base

- Foundation: 150 mm [6"] minimum (A.C.) over
150 mm [6"] minimum Compacted Sub-base (C.S.)
- Anchorage: MP-3® with 460 mm [18"] studs
420 mm [16.5"] embedment

Foundation D: Asphalt Only

Foundation: 200 mm [8"] minimum Asphalt Concrete (A.C.)

Anchorage: MP-3® with 460 mm [18"] studs – 420 mm [16.5"] embedment

Foundation Specifications for Foundations A, B, C and D

Note: Walk-up inspections are recommended at least once every six months for assemblies on asphalt.

Asphalt Concrete (A. C.)

AR-4000 A.C. (per ASTM D3381 '83) .75" Maximum, Medium (Type A or B) aggregate

Sieve Size	Operating Range (%) Passing
1"	100
3/4"	95 to 100
3/8"	65 to 80
No. 4	49 to 54
No. 8	36 to 40
No. 30	18 to 21
No. 200	3 to 8

Portland Cement Concrete (P.C.C.)

Stone aggregate concrete mix

4000 psi [28MPa] minimum compressive strength

(Sampling per ASTM C31-84 or ASTM C42-84a, testing per ASTM C39-84)

Compacted Sub-base (C.S.)

150 mm [6"] minimum depth 95% compaction

Class 2 aggregate

Sieve Size	Moving Average % Passing
3"	100
2 1/2"	90 to 100
No. 4	40 to 90
No. 200	0 to 25

Vulcan™ Barrier Sections assembled on asphalt must be inspected by the appropriate authority to ensure the anchors are still properly set following each impact. Re-anchor as necessary.

Position the Vulcan™ Barrier Sections

Locate anchor straps at panel connection points as shown in Figure 5 when anchoring each barrier section.

Use the Anchor Straps as templates to drill anchor holes. Refer to Figure 6 and instructions contained in the MP-3® Polyester Anchor box supplied with the system (or equivalent anchoring options) for detailed anchoring instructions.

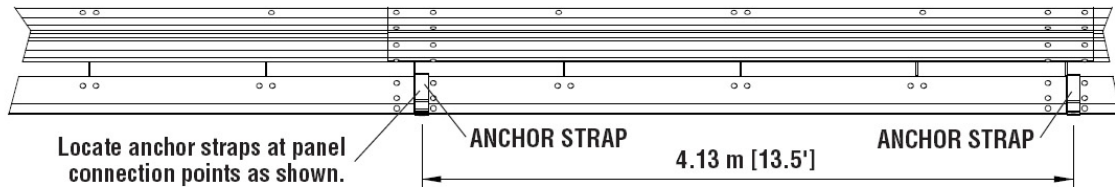


Figure 5 - Anchor Strap Locations

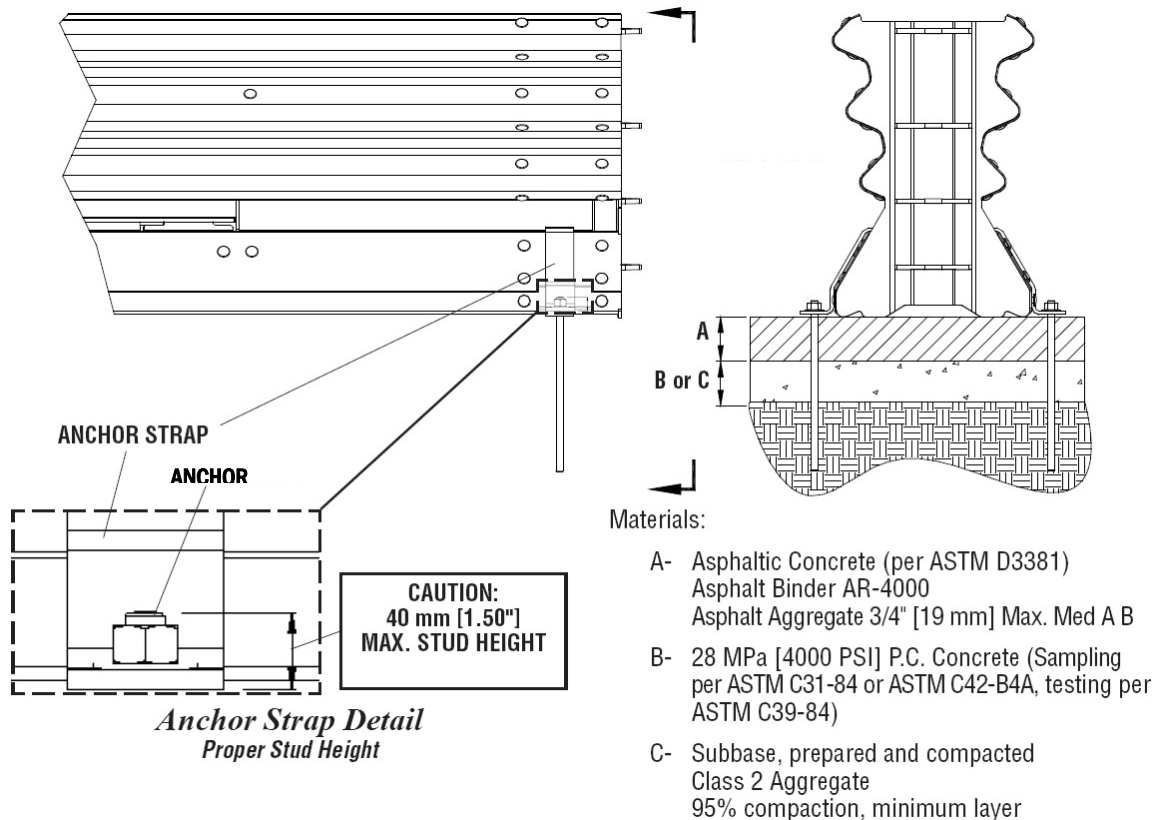


Figure 6 - Anchoring the System

MP-3 Polyester Anchoring System

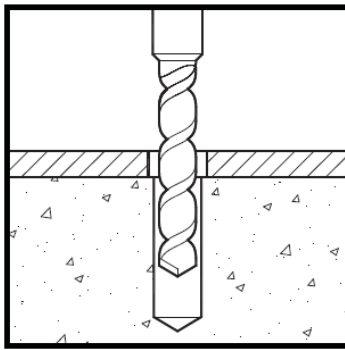
Assembly and Safety Instructions



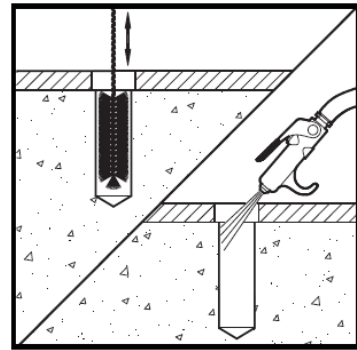
Important: Read all instructions and materials thoroughly before proceeding.



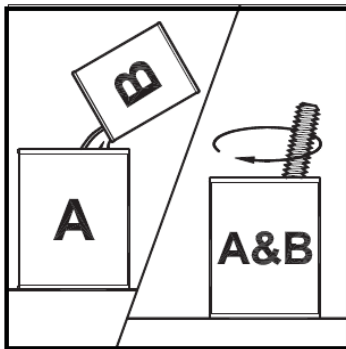
1. Do not allow contact with skin or eyes. Use only in a well-ventilated area. Do not use near open flame.



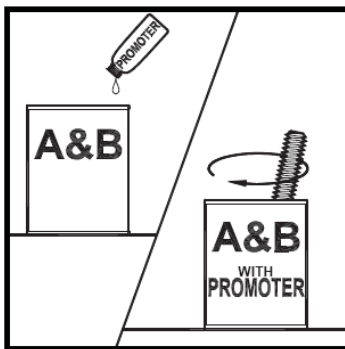
2. Wear safety goggles. If possible, use the part to be anchored as a drilling template. Drill the holes 1/8" larger than the stud diameter to the recommended depth, using a two fluted rotary percussive drill. Full strength will not be achieved if a diamond drill is used. Check to be sure all holes are drilled to the proper depth and aligned with the part to be anchored.



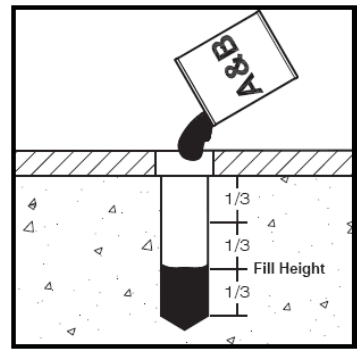
3. While wearing safety glasses, blow the concrete dust from the hole, using oil-free compressed air. Thoroughly clean the hole with a stiff-bristled brush, and then blow it out again. If the hole is wet, completely flush it with water while brushing. Then blow it clean using oil-free compressed air.



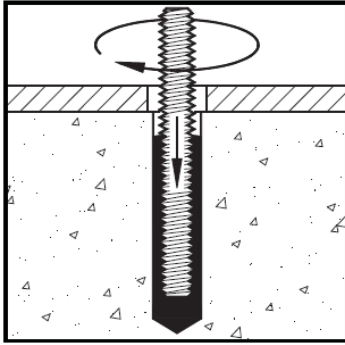
4. While wearing gloves and safety goggles, remove the lids from the MP-3 Part A-Resin and Part B-Hardener containers. Pour Part B into Part A and mix vigorously for 30 seconds to form MP-3 grout. (An anchor stud may serve as a stirring rod.)



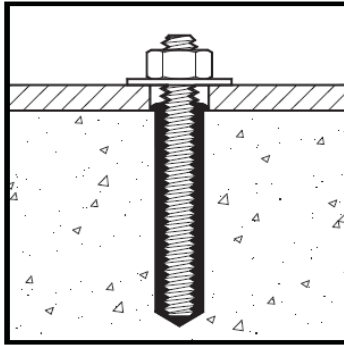
5. For faster hardening in cold weather, Promoter may be used. **Do not use Promoter when the temperature is above 60°F.** Add the entire contents of the Promoter container to the MP-3 grout and mix for an additional 30 seconds. Use immediately, the MP-3 grout will thicken quickly.



6. Position the part to be anchored over the clean holes. Crimp the mouth of the can to form a spout and pour the MP-3 grout mixture down into the hole through the part. Fill 1/3 of the hole. Do not over- or under-fill the hole.



7. Push the stud down through the part to be anchored and into the hole. Leave enough of the stud exposed to attach the nut and washer. Twist the stud several turns in the grout to wet the threads.



8. Place a flat washer onto the stud and thread a nut on until it is flush with the top of the stud or seated against the part. Do not disturb or load the stud until the material has hardened.

Hardening Times (Hours)		
Temp. (°F)	No Promoter	With Promoter
>80	1/2	N/R*
70-79	1	N/R
60-69	2	N/R
50-59	4	3/4
40-49	8	1
30-39	N/R	1 1/2
<30	N/R	N/R
* Not Recommended		

9. Once the grout has hardened, torque the nut to recommended values.

In compliance with the US Department of Labor Hazard Communication 1910.1200, Material Safety Data Sheets are available upon request.

Valtir expressly disclaims any express or implied warranty of any kind in connection with the use of the MP-3 Polyester Anchoring System.

Valtir expressly disclaims liability for injury to persons or damage to property resulting from failure to follow instructions or improper application of the MP-3 Polyester Anchoring System.

Valtir is committed to meeting our customer's requirements and to supplying high quality, safe products to the requesting highway authority for use on the nation's highways. If you have any questions, please contact our Customer Service Department at +1 (214) 589-8140.

Document No. 2735041-0000, Sheet 1/2 Revision B

Alternative Anchoring Options

There are numerous manufacturers of anchors that provide a product that will successfully anchor the Vulcan™ Barrier CEN System to the foundation. Valtir has performed anchor performance tests on several of these alternative anchors. The following list states which anchors have satisfactorily passed our minimum requirements (i.e. min. pull out strength of 82.3kN [18,500lbs] and min. shear strength of 109kN [24,500lbs]). Valtir makes no representations as to the performance of anchors that it has not tested and is not listed herein.



Caution: All anchors must be assembled strictly according to each anchor manufacturer's specific requirements. It is recommended that the anchor manufacturer be consulted to discuss your specific assembly site conditions prior to finalizing your anchor selection.

Concrete:



<http://www.hilti.com>

Models [Epoxy-based anchoring systems]:

HVU M20 x 170
HY 150
RE 500

Asphalt:



<http://www.kelken.com>

Model [Epoxy-based anchoring system]:

N/A Kelken "Lefty" anchor coated with Kelislip bond release agent and anchored with KeligROUT epoxy

- Kelken "Lefty" anchors (3/4 inch diameter x 18 inch long)
 - 3/4-10 threads at top 2 inches of anchor, 3/4 inch "Lefty" removable thread for remaining anchor length (~16 inches)
 - Material per ASTM A449 Type 1 or ASTM A193 Grade B7 or SAE J429 Grade 5
 - Galvanized for corrosion resistance
 - Includes 3/4 inch galvanized washers and 3/4-10 galvanized nuts
- 1KS12Q (Kelislip bond release agent)
- 1KG101T (KeligROUT epoxy)



<http://www.simpsonanchors.com>

Model [Mechanical anchoring systems]:

THD75812HMG (3/4 inch diameter x 8.5 inches long; mechanically galvanized)

THD75100HMG (3/4 inch diameter x 10 inches long; mechanically galvanized)



<http://toge-road.de>

Model [Epoxy-based anchoring system]:

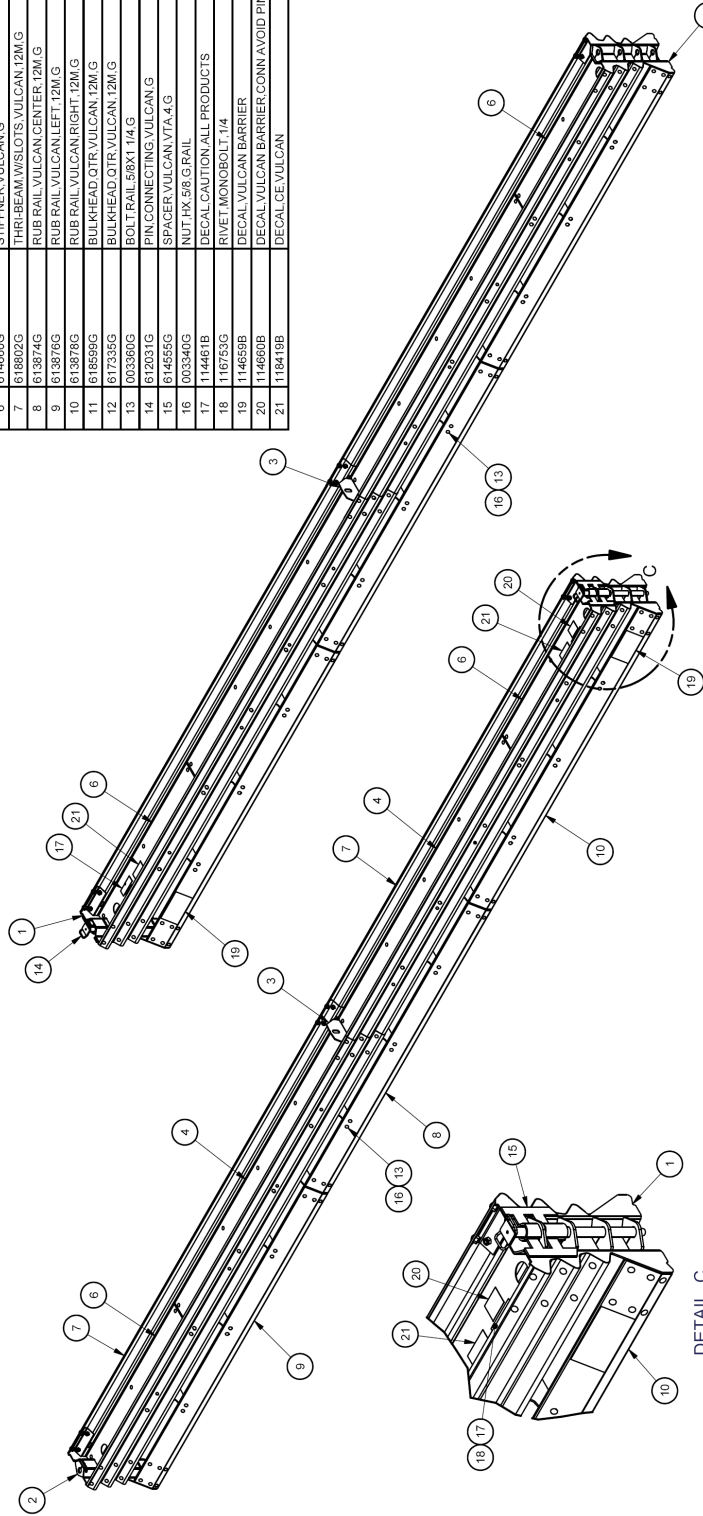
TSM B 22 X 155 IM 16 ASPHALT

Inspection Notice

For **permanent** applications on asphalt, using alternative anchor options (like Toge); Valtir recommends that the system be inspected by qualified personnel according to the guidelines set forth in the Maintenance and Repair section in the Product Manual, with the following additions:

1. Increase the frequency of Walk-Up Inspections to once every six months (instead of once every 12 months for concrete applications).
2. After each impact, check to see that all Anchor Bolts are not damaged and have remained firmly anchored in the roadway surface. Damaged anchor bolts are those found to be loose, broken, or showing signs of pull out and are to be replaced. If the system is anchored to asphalt, then up to 20% of the total anchors may be replaced if damaged. If more than 20% of the anchors are damaged, then the system shall be relocated and reassembled onto new and undisturbed asphalt.

PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	QTY.
1	605675G	BULKHEAD END, RT, VULCAN, 4M/G	1
2	605672G	BULKHEAD END, LT, VULCAN, 4M/G	1
3	618673G	BULKHEAD CTR, VULCAN, 12M/G	1
4	117486G	STIFFNER VULCAN, 12M/G	2
5	605684G	BULKHEAD, QTR, VULCAN, 4M/G	6
6	614660G	STIFFNER, VULCAN, G	2
7	618802G	THR-BEAM, W/SLOTS, VULCAN, 12M/G	4
8	613874G	RUB RAIL, VULCAN, CENTER, 12M/G	2
9	613876G	RUB RAIL, VULCAN, LEFT, 12M/G	2
10	613878G	RUB RAIL, VULCAN, RIGHT, 12M/G	2
11	618596G	BULKHEAD, QTR, VULCAN, 12M/G	2
12	617336G	BULKHEAD, QTR, VULCAN, 12M/G	2
13	003380G	BOLT, RAIL, 5/8X1 1/4, G	212
14	612031G	PIN, CONNECTING, VULCAN, G	1
15	614565G	SPACER, VULCAN, VTA, 4 G	1
16	003340G	NUT, HX, 5/8, G, RAIL	212
17	114461B	DECAL, CAUTION, ALL PRODUCTS	1
18	116753G	RIVET, MONOBOLT, 1/4	1
19	114658B	DECAL, VULCAN BARRIER	2
20	114660B	DECAL, VULCAN BARRIER, CONN, AVOID PINCHING	1
21	118419B	DECAL, CE, VULCAN	1



NOTE:
 1. WHEN CONNECTING MULTIPLE SYSTEMS, INSERT PIN AND SPACER (ITEMS 14 & 15) TO JOIN OF ADJACENT BARRIER SEGMENTS TOGETHER.
 2. CONNECT BARRIER SEGMENTS BY PLACING LABEL END TO NON-LABEL END.
 3. LOCATE DECALS APPROXIMATELY AS SHOWN.

Revision	Date	Rev	By	Chk	App
WAS EAST PAK 389607/2007, ADDED ITEM 23 & UPDATED BOM TO ROMAS (ECO 3047)	12/14/10	F	WJL	JME	PLK
MAJOR BOM CHANGE AND REDESIGN.	1/10/12	G	DK	JME	AVB
ECO 3435; ITEM 13 WAS 113793G, 16 WAS 116027G	7/23/12	H	DOO	JME	AVB

ASSEMBLY NO. 616960B

DATE	1/23/2007
BY	D. Hayes Jr.
DATE	1/19/2007
BY	K. Looney
DATE	2/8/2007
BY	J. Espinoza
DATE	2/12/2007
BY	K. Looney
FILE	616960.dwg

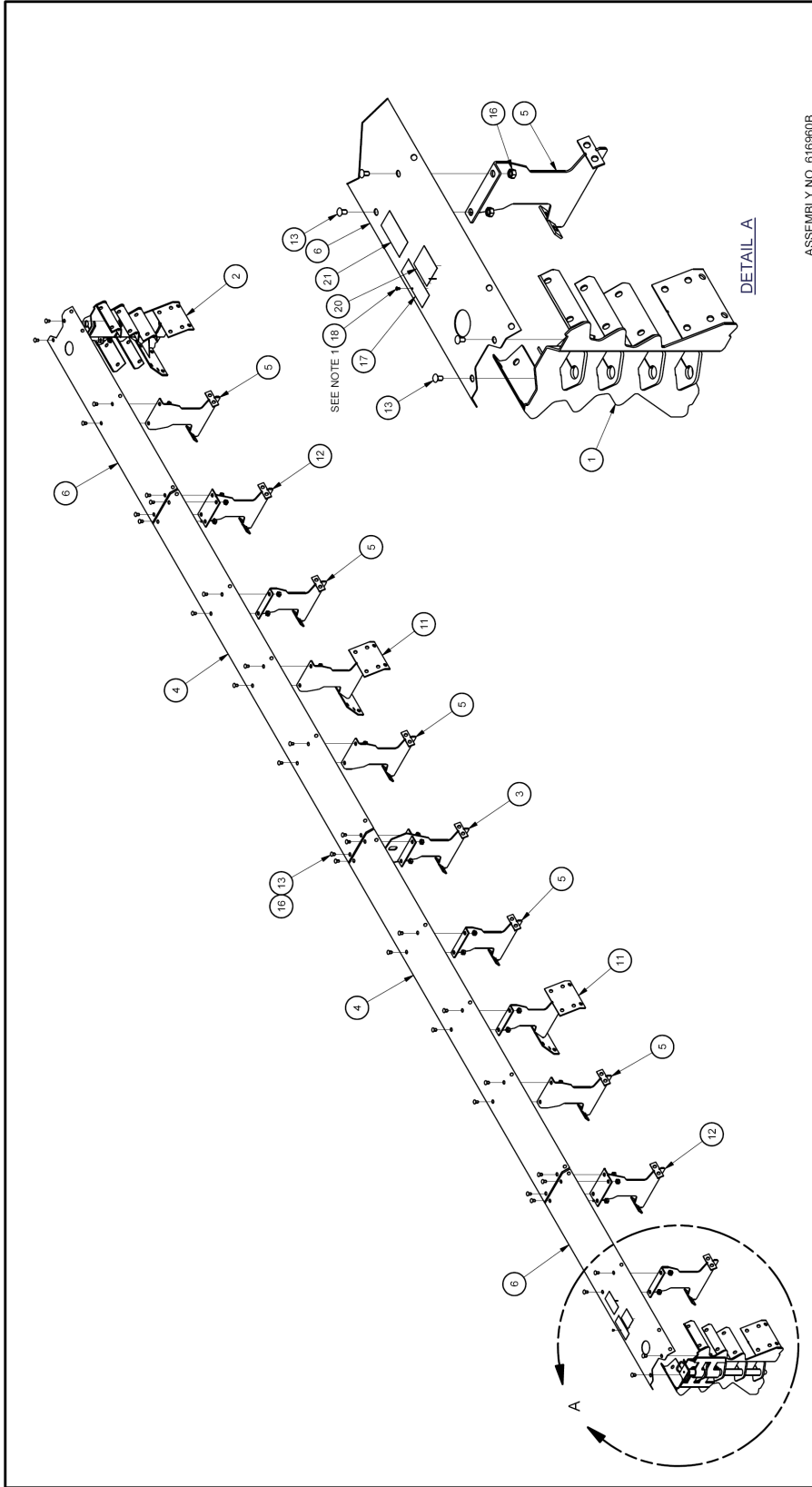
VULCAN™, 12M

SCALE: NTS

REV. H

VULCAN™ 12M Drawings

Assembly Drawing 616960 (Sheet 1) Vulcan 12m



ASSEMBLY NO. 616960B

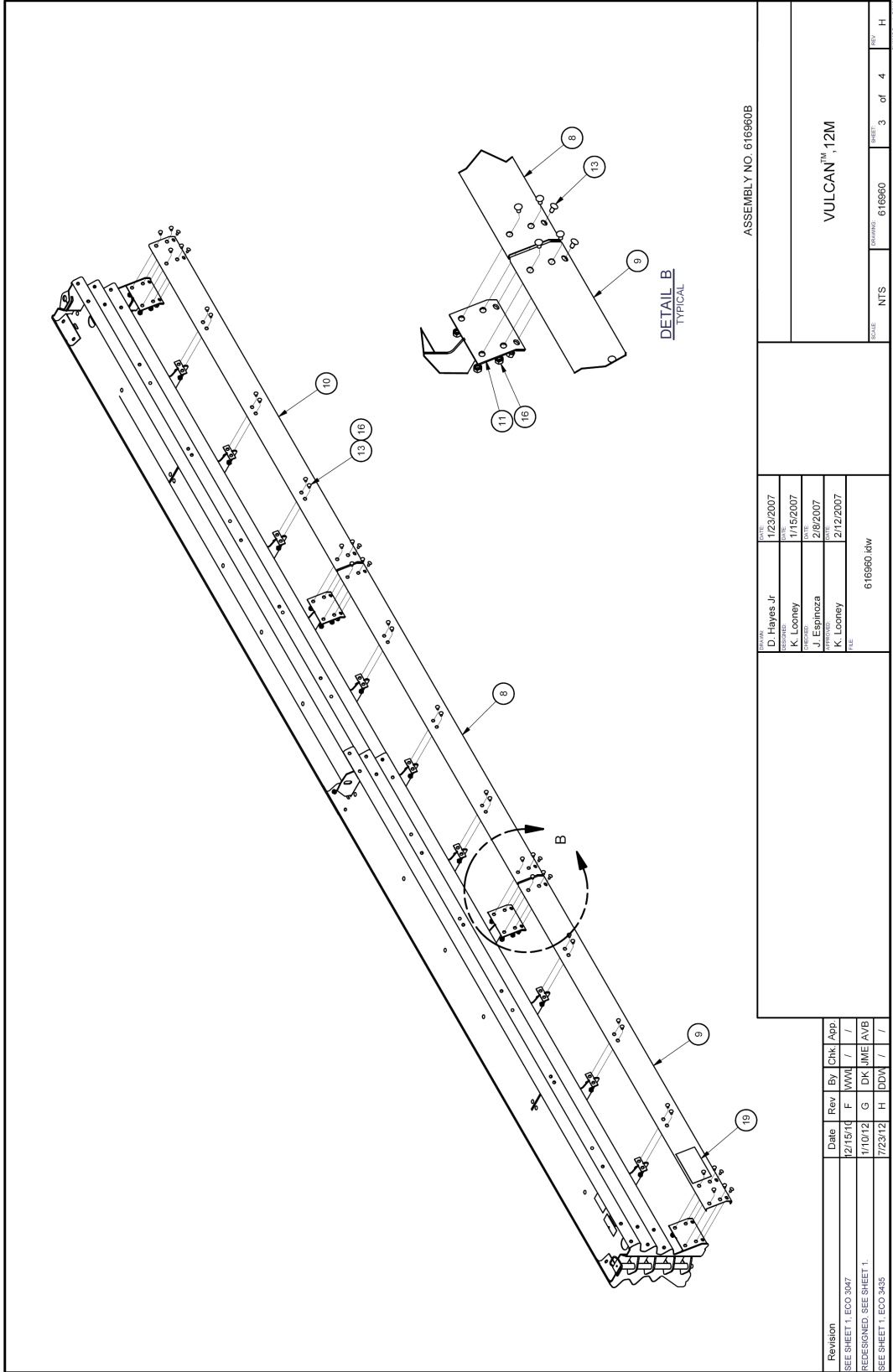
VULCAN™, 12M

DESIGNED BY	D. Hayes Jr.	DATE	1/23/2007
CHECKED BY	K. Looney	DATE	1/15/2007
DESIGNED BY	J. Espinoza	DATE	2/8/2007
CHECKED BY	K. Looney	DATE	2/12/2007
PART NO.		616960.klw	

Revision	Date	Rev	By	Chk	App
ADDED ITEM 24 (SEE SHEET 1), ECO 3047	12/15/11	F	WM	/	/
REDESIGNED, SEE SHEET 1.	1/10/12	G	DK	JMA	AVB
SEE SHEET 1, ECO 3435	7/23/12	H	DDV	/	/

NOTES:
1. DRILL #2 HOLE THROUGH ITEM 6 USING ITEM 20 AS TEMPLATE.

Assembly Drawing 616960 (Sheet 2) Vulcan 12m



ASSEMBLY NO. 616960B

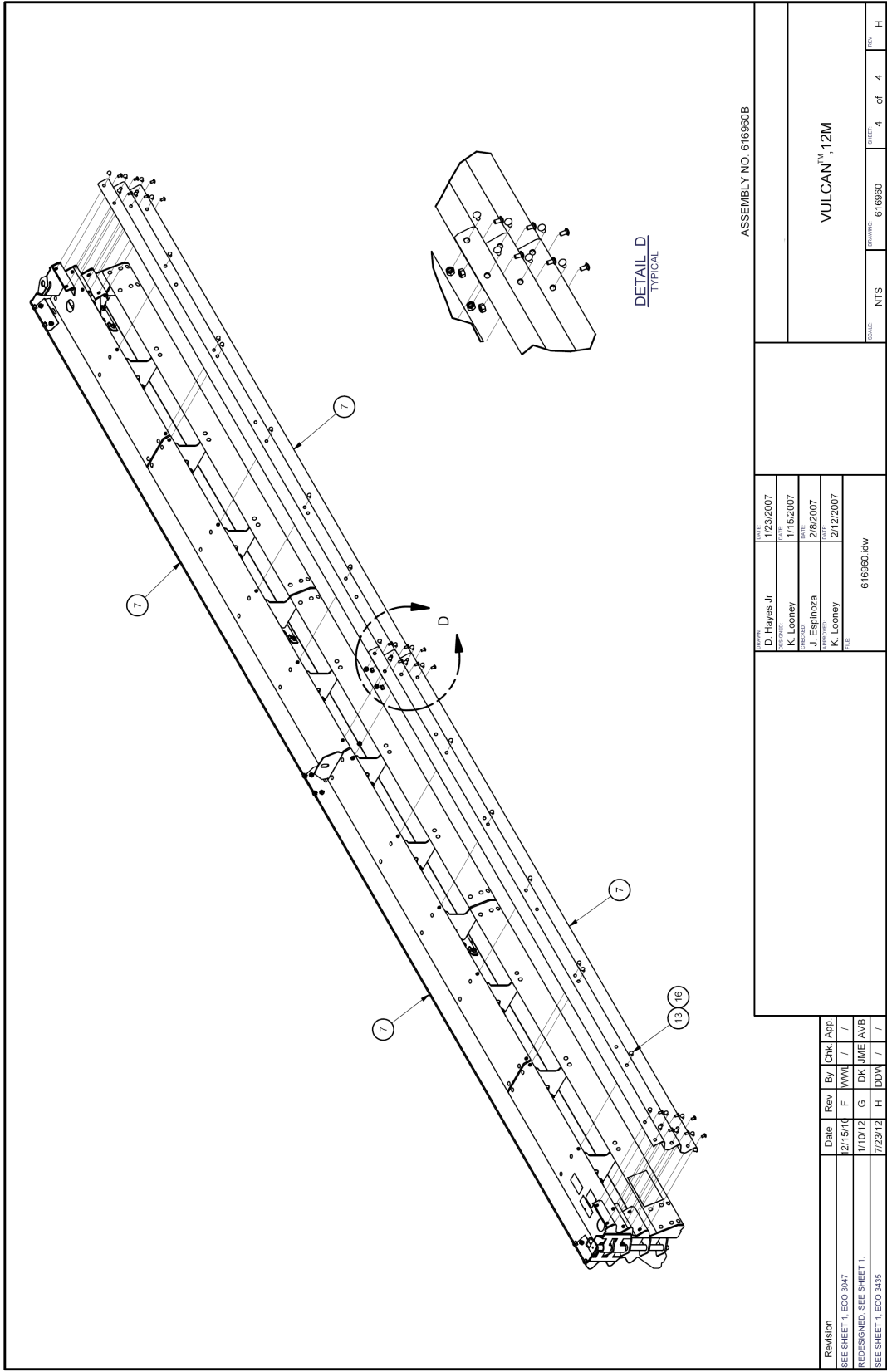
VULCAN™, 12M

DATE	1/23/2007
BY	D. Hayes Jr.
DATE	11/15/2007
BY	K. Looney
DATE	2/8/2007
BY	J. Espinoza
DATE	2/12/2007
BY	K. Looney
FILE	616960.idw

Revision	Date	Rev	By	Chk	App
SEE SHEET 1, ECO 3047	12/15/16	F	MMB	/	/
REDESIGNED, SEE SHEET 1	1/10/12	G	DK	JME	AVB
SEE SHEET 1, ECO 3435	7/23/12	H	DDW	/	/

SCALE	NTS	QUANTITY	616960	SHEET	3	OF	4	REV	H
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Assembly Drawing 616960 (Sheet 3) Vulcan 12m



ASSEMBLY NO. 616960B

VULCAN™, 12M

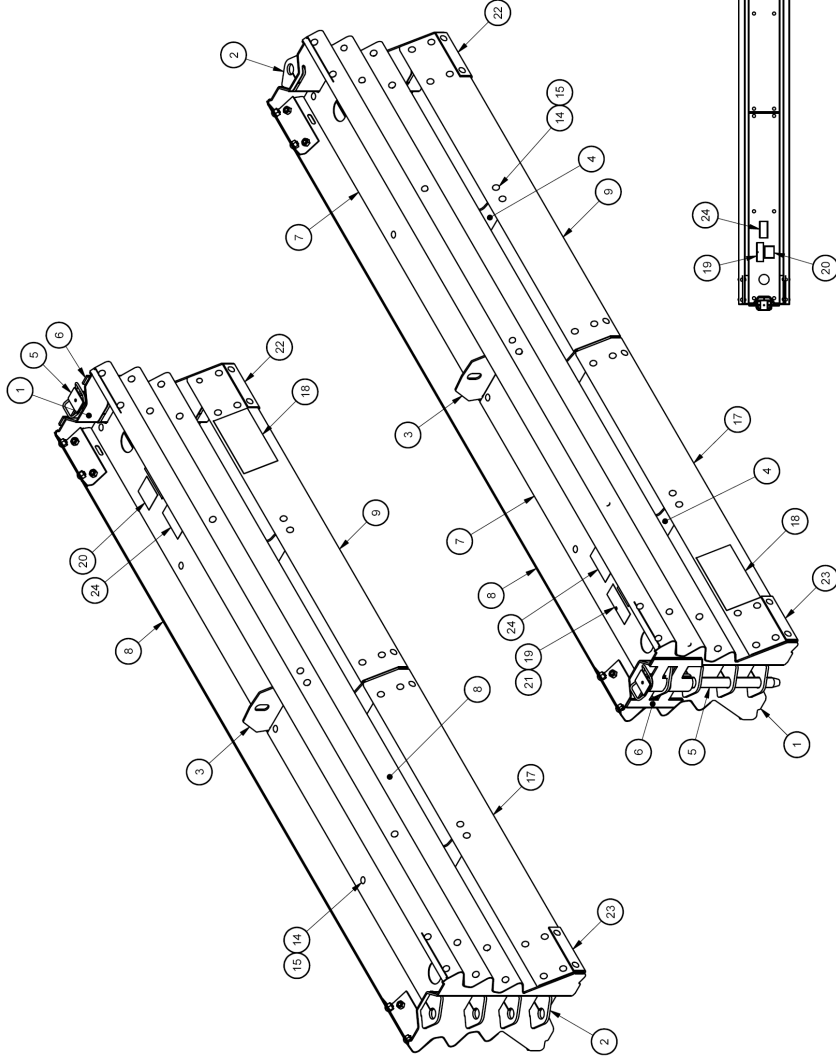
DATE	1/23/2007
DESIGNED BY	D. Hayes Jr
CHECKED BY	K. Looney
DATE	1/15/2007
DESIGNED BY	J. Espinoza
CHECKED BY	K. Looney
DATE	2/8/2007
DATE	2/12/2007
FILE	616960 idw

Revision	Date	Rev	By	Chk	App.
SEE SHEET 1, ECO 3047	2/15/07	F	MMR	/	/
REDESIGNED, SEE SHEET 1	7/10/12	G	DK	IME	AVB
SEE SHEET 1, ECO 3435	7/23/12	H	DDW	/	/

SCALE	NTS	DRAWING NO.	616960	SHEET	4	OF	4	REV	H
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Assembly Drawing 616960 (Sheet 4) Vulcan 12m

PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	QTY.
1	605675G	BULKHEAD END RT VULCAN 4M G	1
2	605672G	BULKHEAD END LT VULCAN 4M G	1
3	605668G	BULKHEAD OTR VULCAN 4M G	1
4	605684G	BULKHEAD OTR VULCAN 4M G	2
5	612031G	PIN CONNECTING VULCAN G	1
6	614655G	SPACER VULCAN VTA 4G	1
7	614660G	STIFFENER VULCAN G	2
8	616603G	THRU-BEAM W/ISLOTS VULCAN G	2
9	613873G	RUB RAIL VULCAN 4M R G	2
14	1003360G	BOLT RAIL 5/8X1 1/4 G	112
15	1003340G	NUT 1/2X 5/8 G RAIL	112
17	613872G	RUB RAIL VULCAN 4M L G	2
18	114461B	DECAL VULCAN BARRIER	2
19	114461B	DECAL CAUTION ALL PRODUCTS	1
20	114660B	DECAL VULCAN BARRIER CONNECTOR AVOID PIN	1
21	116753G	RIVET MONOBOLT 1/4	1
22	617556G	FOOT R VULCAN G	2
23	617554G	FOOT L VULCAN G	2
24	118419B	DECAL OE VULCAN	1



NOTES:
 1. INSERT PIN AND SPACER (ITEMS 5 & 6) TO JOIN ADJACENT BARRIER SEGMENTS DURING INSTALLATION.
 2. CONNECT BULKHEAD ENDS BY PLACING LABEL END TO LABEL END.
 3. LOCATE DECALS APPROXIMATELY AS SHOWN.

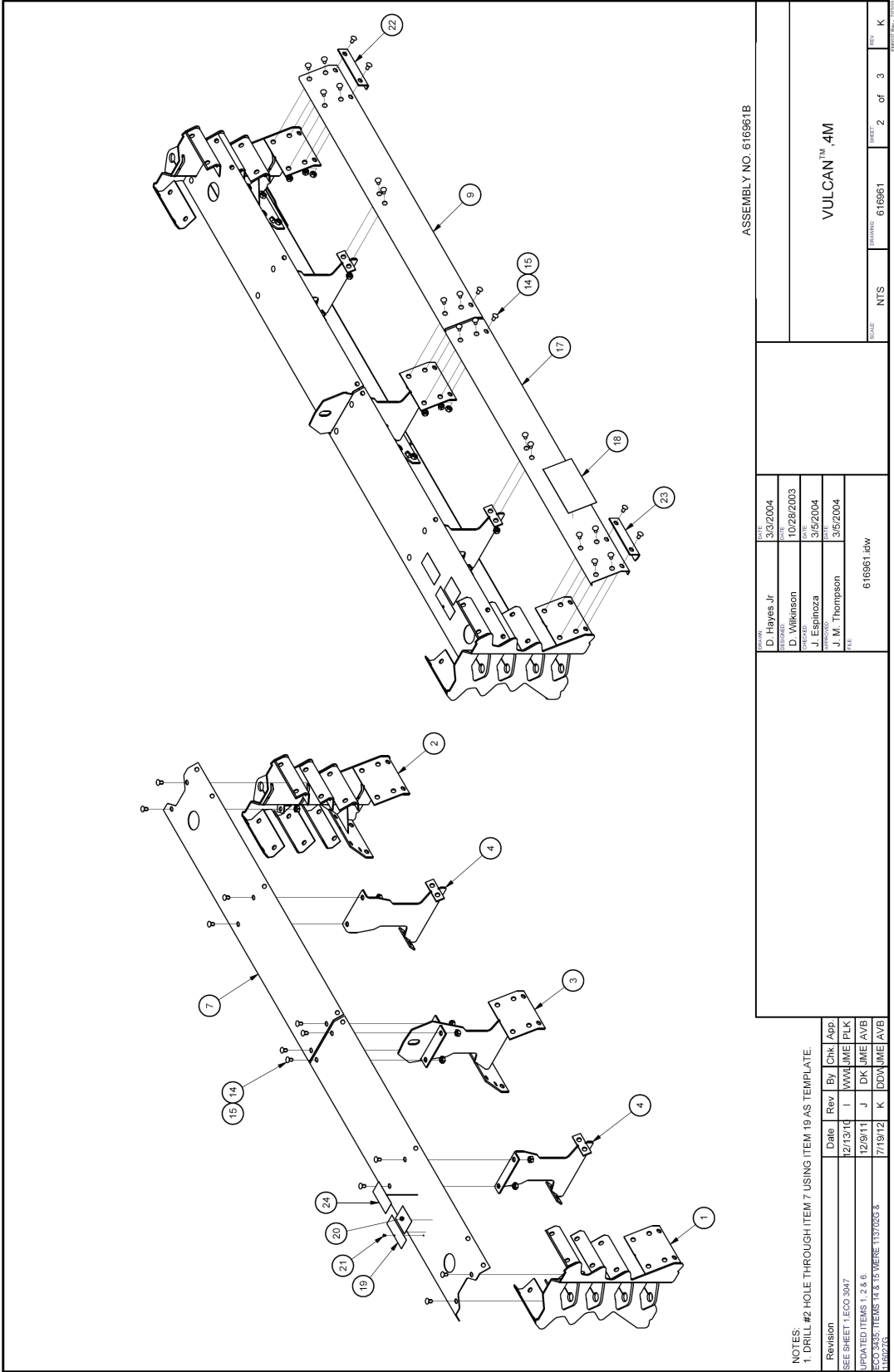
Revision	Date	Rev	By	Chk	App.
ADDED ITEM 24 (ECO-3047)	02/13/16	I	MM	JME	PLK
UPDATED ITEMS 1, 2 & 6.	72/9/11	J	DK	JME	AVB
CHANGES TO ITEMS 17 & 18 WERE 11/30/03 & 11/02/04	7/19/12	K	DDV	JME	AVB

ASSEMBLY NO. 616961B

DATE: 3/5/2004	DATE: 10/29/2003	DATE: 3/5/2004	DATE: 3/5/2004
BY: D. Hayes Jr	BY: D. Wilkinson	BY: J. Espinoza	BY: J. M. Thompson
CHECKED: D. Wilkinson	CHECKED: J. Espinoza	CHECKED: J. M. Thompson	CHECKED: J. M. Thompson
SCALE: NTS	SCALE: 616961	SCALE: 1	SCALE: 3
VULCAN™ 4M		K	

VULCAN™ 4M Drawings

Assembly Drawing 616961 (Sheet 1) Vulcan 4m



ASSEMBLY NO. 616961B

VULCAN™ 4M

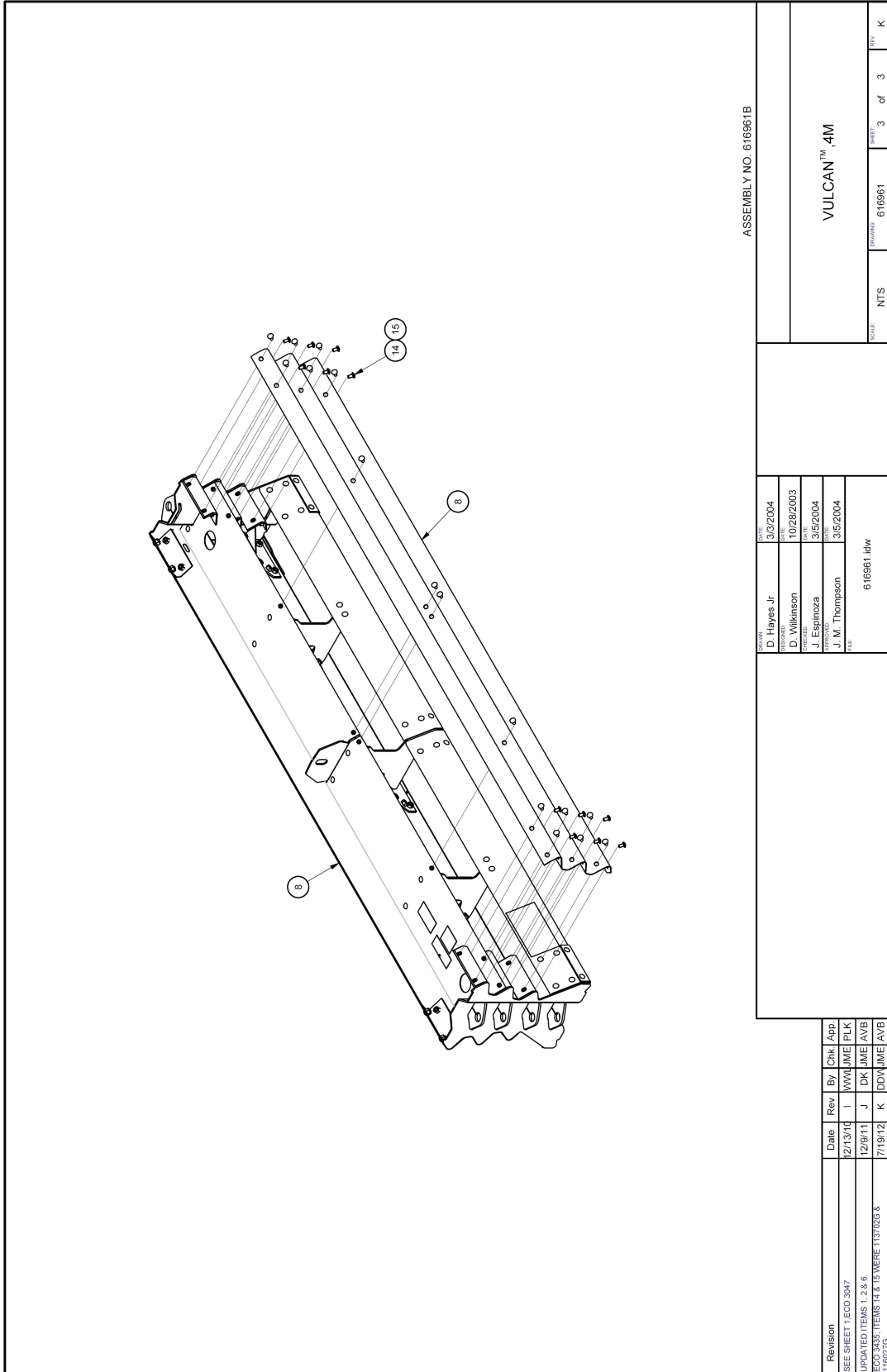
SCALE: NTS PARTS: 616961 SHEET: 2 of 3 REV: K

DATE:	3/5/2004
BY:	D. Hayes Jr.
DATE:	10/28/2003
BY:	D. Wilkinson
DATE:	3/5/2004
BY:	J. Espinoza
DATE:	3/5/2004
BY:	J. M. Thompson
FILE:	616961.kdw

NOTES:
1. DRILL #2 HOLE THROUGH ITEM 7 USING ITEM 19 AS TEMPLATE.

Revision	Date	Rev	By	Chk	App.
SEE SHEET 1, ECO 3047	12/13/11	1	JMM	JME	PLK
UPDATED ITEMS 1, 2 & 6	12/9/11	J	DK	JME	AVB
ECO 3335: ITEMS 14 & 15 WERE 1137/033 & 1137/041	7/19/12	K	DDW	JME	AVB

Assembly Drawing 616961 (Sheet 2) Vulcan 4m



ASSEMBLY NO. 616961B

VULCAN™ 4M

SCALE: NTS 3 of 3

REV: K

DESIGNED BY	D. Hayes Jr.	DATE	3/5/2004
DESIGNED BY	D. Wilkinson	DATE	10/28/2003
APPROVED BY	J. Espinoza	DATE	3/5/2004
APPROVED BY	J. M. Thompson	DATE	3/5/2004
FILE	616961.dwg		

Revision	Date	Rev	By	Chk	App
SEE SHEET 1 ECO 3047	12/13/11	1	MM	JME	PLK
UPDATED ITEMS 1, 2 & 6	12/9/11	J	DK	JME	AVB
ECO 3052 ITEMS 14 & 15 WERE 1137002 & 1139243	7/19/12	K	DD	JME	AVB

Assembly Drawing 616961 (Sheet 3) Vulcan 4m

Notes:

Notes:



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