



IronMan Barrier



*Portable Safety Barrier System
For Speeds Up To 100 Km/h (TL-3)*

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Installation Manual

IronMan Barrier

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Important Introductory Notes

Proper design, deployment and maintenance of the IronMan Barrier (Vulcan Barrier in U.S.) is essential to assure maximum performance.

It is critical for any users of the IronMan Barrier to be fully familiar with the manufacturer's instructions for use.

Take the time to review this manual including the Limitations and Warnings thoroughly before performing the necessary work.

Do not attempt to install any longitudinal barrier without the proper plans and installation manual from the manufacturer.

If you need additional information, or have questions about the IronMan Barrier, please call **Saferoads P/L Customer Service Department at 1800 060 672.**

System Overview

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

- * Energy-absorbing
- * Quick and easy deployment and retrieval
- * Lightweight
- * Economical
- * Easily repaired after severe impact
- * Variety of deployment and end terminal options

IronMan Barrier is crashworthy and has been thoroughly tested to NCHRP 350 testing procedures.

IronMan Barrier has achieved Test Level 3 (TL-3) as a redirecting longitudinal safety barrier for speeds up to 100 km/h.

Function

IronMan Barrier functions as a portable longitudinal barrier to prevent errant vehicle penetration, vaulting, or underriding. Traffic is kept from entering the work area or from hitting exposed objects or excavations. Unlike cones or barricades, IronMan Barrier provides positive protection for roadside workers.

Impacting vehicles are redirected at a shallow angle in the vicinity of the impact area, thereby reducing the potential for dangerous secondary impacts. IronMan Barrier absorbs impact energy and cushions vehicular impacts while significantly reducing the risk to occupants of the impacting vehicle.

IronMan Barrier

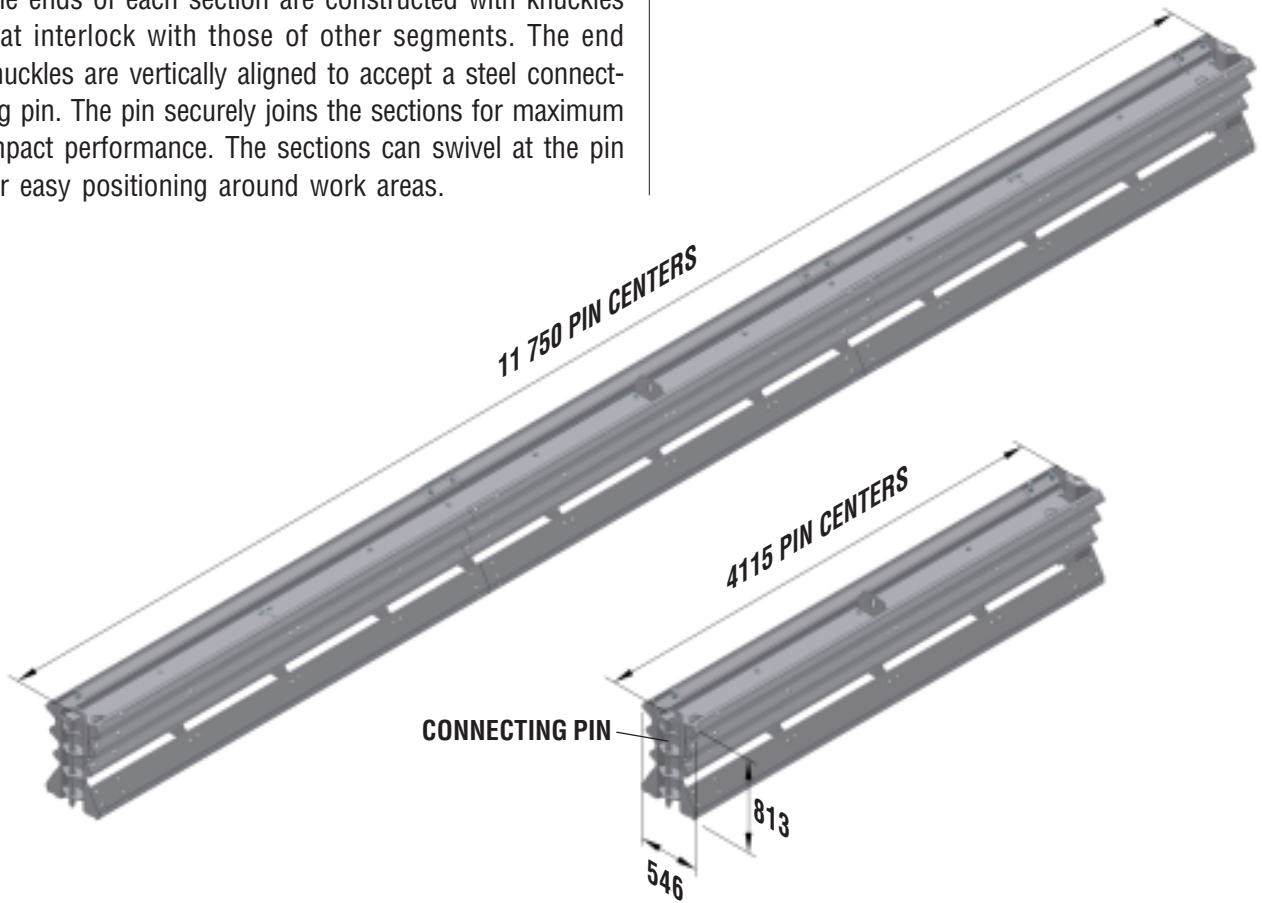
System Design

Construction

An IronMan Barrier installation is constructed from a series of individual barrier sections. See Figure 1 for approximate physical dimensions and items included with each section.

The ends of each section are constructed with knuckles that interlock with those of other segments. The end knuckles are vertically aligned to accept a steel connecting pin. The pin securely joins the sections for maximum impact performance. The sections can swivel at the pin for easy positioning around work areas.

IronMan Barrier is constructed in a unique shape. The inwardly sloping ribbed side walls interact with an impacting vehicle in a way that resists penetration, vaulting, and underriding. Sections are also stackable to reduce shipping and storage space.



RECOMMENDED MAXIMUM TAPER ANGLE:

- 70 km/h 9:1 (6 Degrees)
- 100 km/h 13:1 (4 Degrees)

| | 4 M | 12 M |
|--------------------------|--------------|--------------|
| INSTALLED LENGTH | 4.115 Metres | 11.75 Metres |
| SYSTEM HEIGHT | 813 mm | 813 mm |
| SYSTEM WIDTH | 546 mm | 546 mm |
| WEIGHT PER MODULE | 395 kg | 1200 kg |

Figure 1
IronMan Barrier

IronMan Barrier

System Design (cont'd.)

Application

The IronMan Barrier can be used in many applications. Some examples are:

- * 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 installations
- * Median or verge installations

In order to design the most appropriate IronMan Barrier System for a given site, this manual helps to answer the following questions:

- * Is the IronMan Barrier appropriate for my site?
- * What is the application? What warrants the use of the IronMan Barrier?
- * How long must the barrier be? Refer to the length of need and beginning of length of need for IronMan Barrier installation options.
- * How much clear zone is available, and how much is required for the correct functioning of the System?
- * Are there curves, slopes or kerbs present which may not suit the IronMan Barrier?
- * Is a fully tested end treatment 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 IronMan Barrier and to detail its performance when tested to NCHRP 350.

If you would like further assistance, please contact **Saferoads P/L Customer Service Department on 1800 060 672.**

IronMan Barrier

System Design (cont'd.)

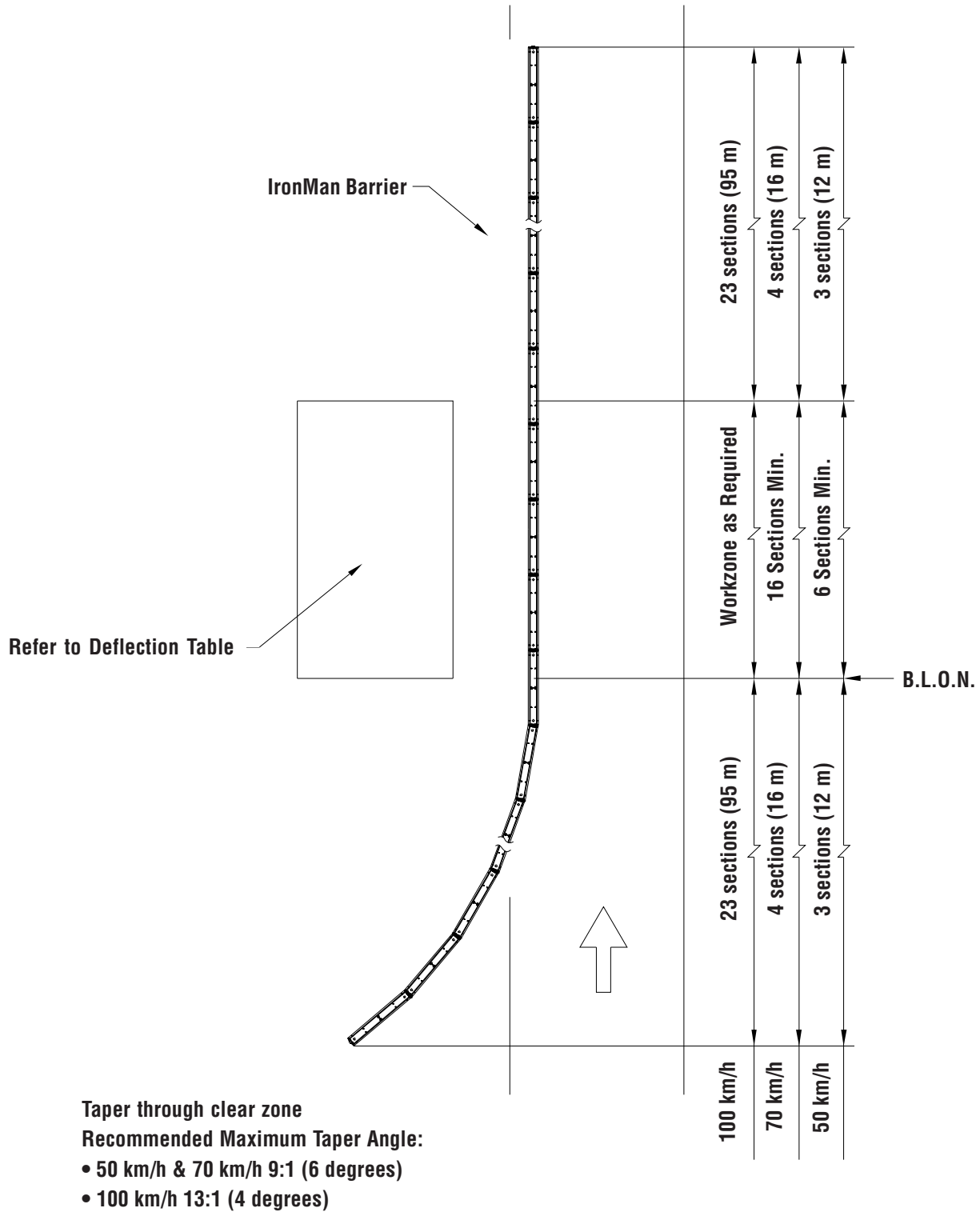


Figure 2

IronMan Barrier

System Design (cont'd.)

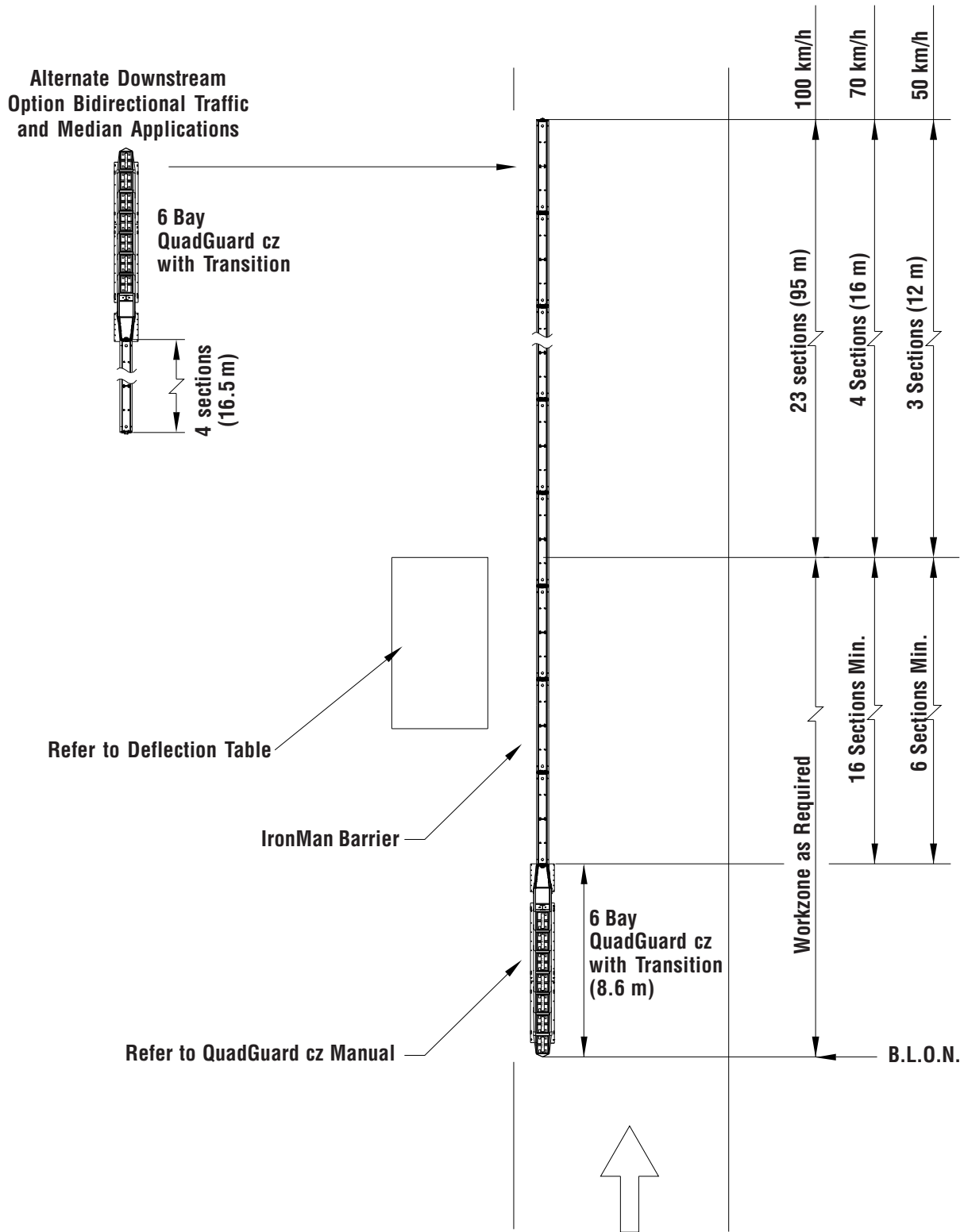


Figure 3

IronMan Barrier

System Design (cont'd.)

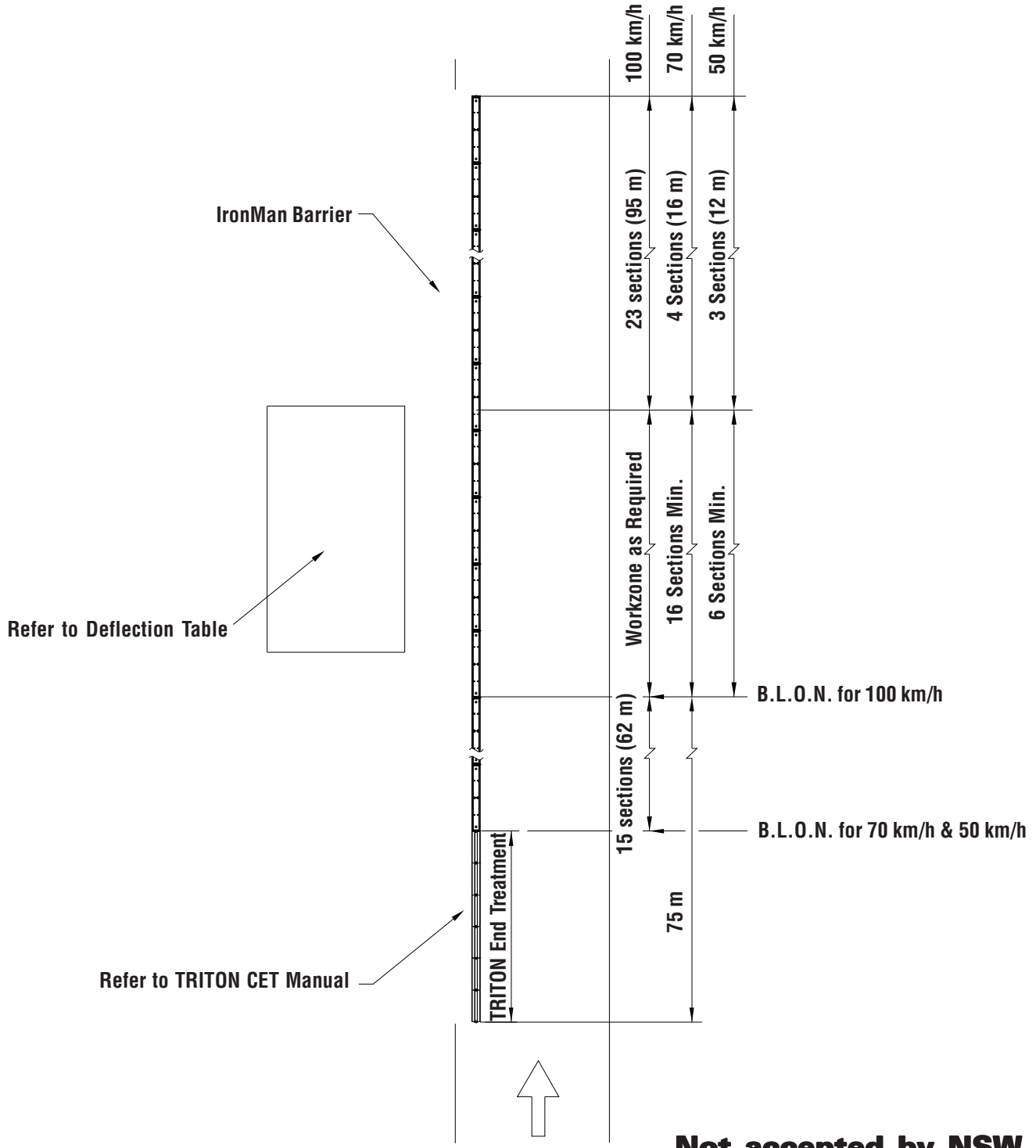


Figure 4

IronMan Barrier

System Design (cont'd.)

Length Of Need

Length of need (L.O.N.) is defined as the total length of a longitudinal barrier needed to shield an area of concern. It is also described as that part of a longitudinal barrier or terminal designed to contain and redirect an errant vehicle.

The **beginning of length of need** (B.L.O.N.) differs depending on how the IronMan Barrier is deployed.

If the IronMan Barrier is deployed as a safety barrier which can be tapered through the clear zone without the need for an approved end terminal, the B.L.O.N. is 95 metres from the beginning of the system.

If the IronMan Barrier is deployed longitudinally and incorporates the TRITON CET as an end terminal, then the B.L.O.N. is 75 metres from the beginning of the TRITON end terminal. (Not accepted in NSW)

If the IronMan Barrier is deployed longitudinally and incorporates the QuadGuard cz as an end terminal, which is tethered to the ground, then the B.L.O.N. is at the very beginning of the QuadGuard crash cushion.

The B.L.O.N. sections have greater deflection than the L.O.N. sections.

End Treatment

A terminal is defined by NCHRP 350 as:

"A device designed to treat the end of a longitudinal barrier. A terminal may function by (a) decelerating a vehicle to a safe stop within a relatively short distance, (b) permitting controlled penetration of a vehicle behind the device, (c) containing and redirecting the vehicle, or (d) a combination of (a) ,(b) and (c)."

The IronMan Barrier has been crash tested to NCHRP 350 as a Test Level 3 (TL-3/100 km/h [62 m ph]) redirective longitudinal barrier, and when deployed and tapered through the clear zone, does not require a separate end treatment.

If the site specific conditions require a longitudinal barrier and won't allow tapering of the end, then the following fully tested end terminals may be considered:

The TRITON Concrete End Terminal (CET) is suitable for speeds up to TL-3/100 km/h. As the IronMan Design is based on the TRITON BARRIER profile, TRITON BARRIER will pin directly to the IronMan without the need for special transition hardware. Refer to the TRITON CET manual for specific detail. (Not accepted in NSW)

The QuadGuard cz end terminal is suitable for posted speeds up to TL-3/100 km/h. As this terminal requires tethering to the pavement, it will offer the shortest IronMan deployment. The QuadGuard cz is suitable for use where the length of need occurs at or near the beginning of the terminal. Refer to the QuadGuard manual for specific detail.

IronMan Barrier

System Design (cont'd.)

| Expected Deflection of IronMan Barrier in Meters when Impacted with a 2 Ton Pickup | | | | | | |
|--|-----------|------------|------------|------------|------------|------------|
| | | | | | | |
| IronMan with CZ on Both Ends | | | | | | |
| Speed Zone | 5 Degrees | 10 Degrees | 15 Degrees | 20 Degrees | 25 Degrees | Test Level |
| 50 km/h | 0.25 | 0.25 | 0.25 | 0.50 | 0.75 | TL-1 |
| 60 km/h | 0.25 | 0.25 | 0.50 | 0.75 | 1.00 | |
| 70 km/h | 0.25 | 0.50 | 0.50 | 1.00 | 1.25 | TL-2 |
| 80 km/h | 0.25 | 0.50 | 0.75 | 1.25 | 1.75 | |
| 90 km/h | 0.25 | 0.50 | 0.75 | 1.50 | 2.00 | |
| 100 km/h | 0.25 | 0.50 | 1.00 | 1.75 | 2.10 | TL-3 |
| | | | | | | |
| Unanchored IronMan | | | | | | |
| Speed Zone | 5 Degrees | 10 Degrees | 15 Degrees | 20 Degrees | 25 Degrees | Test Level |
| 50 km/h | 0.25 | 0.25 | 0.50 | 0.75 | 1.00 | TL-1 |
| 60 km/h | 0.25 | 0.25 | 0.75 | 1.00 | 1.50 | |
| 70 km/h | 0.25 | 0.50 | 0.75 | 1.50 | 2.00 | TL-2 |
| 80 km/h | 0.25 | 0.50 | 1.00 | 2.00 | 2.75 | |
| 90 km/h | 0.25 | 0.75 | 1.25 | 2.25 | 3.25 | |
| 100 km/h | 0.25 | 0.75 | 1.50 | 3.00 | 4.00 | TL-3 |
| | | | | | | |
| Anchored IronMan | | | | | | |
| For speeds and angles listed above, the deflection will be less than 0.4 m when properly anchored. | | | | | | |

All deflection calculations are based on the TL-3 BLON

The TL-3 results for the 2000P @ 25 degrees are taken directly from NCHRP 350 test results and represent the maximum dynamic deflection experienced. Deflections shown for smaller impact angles and for lower speeds are calculated values based on nominal impact severities of the lower test speeds. No actual test for this vehicle mass and impact angle was carried out on this system.

Dynamic deflection represents the maximum amount of lateral movement of the system. Testing has confirmed that the permanent static deflection is approximately 10% less than the dynamic deflection.

Actual deflections may vary from expected values due to site conditions.

IronMan Barrier

System Design (cont'd.)

Other Considerations

Certain conditions may effect the performance of the IronMan Barrier. Since every job site is unique, the designer needs to consider the following conditions when incorporating the IronMan Barrier in the design.

Curves

The ends of each section are constructed with knuckles that interlock with those of other segments. The end knuckles are vertically aligned to accept a steel connecting pin. The pin securely joins the sections for maximum impact performance. The sections can swivel up to 6 degrees at the pin for easy positioning around work areas or following road contours. See Figure 5.

IMPORTANT!

In order to limit system deflection in critical areas such as past the work zone or other hazards, installation of the limiting spacers between the barrier segments is required.

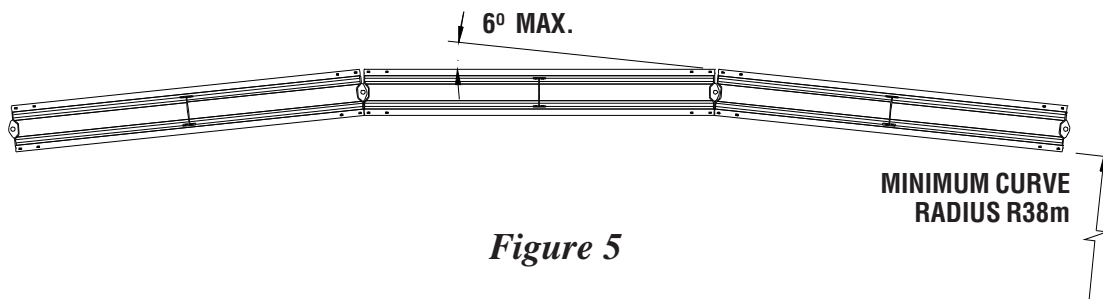


Figure 5

Slopes

Cross slopes

The IronMan Barrier may be placed on cross slopes up to 5% (3 deg.) (Figure 6).

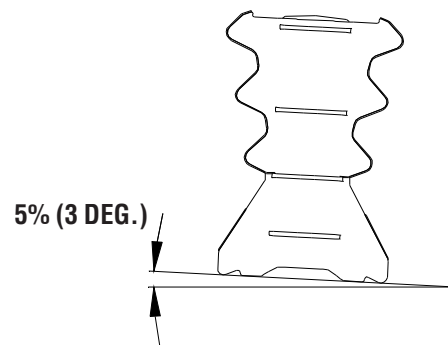


Figure 6

Longitudinal slopes

The IronMan Barrier may be placed on longitudinal slopes up to 5% (3 deg.) (Figure 7).

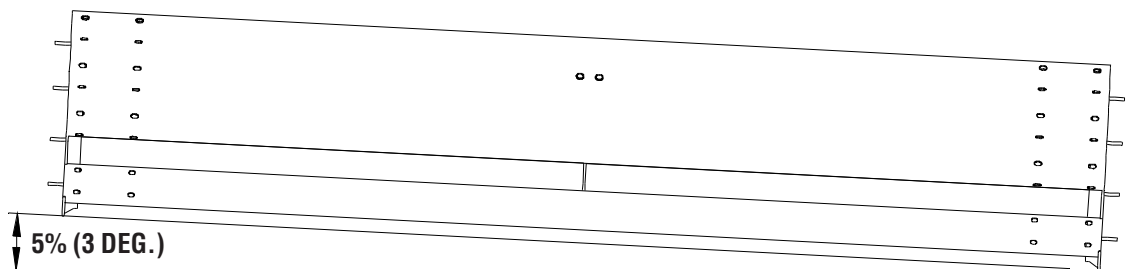


Figure 7

IronMan Barrier

System Design (cont'd.)

Crest

The IronMan Barrier has the ability to conform to a crest up to 20:1 (see Figure 8). Please note the maximum longitudinal slope in Figure 7.

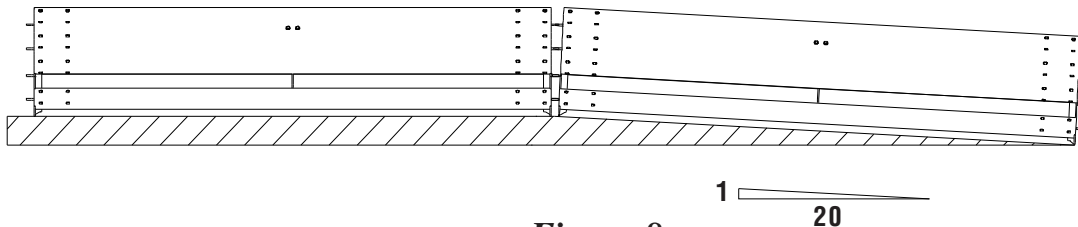


Figure 8

Ditch

The IronMan Barrier has the ability to conform to a ditch up to 20:1 (see Figure 9). Please note the maximum longitudinal slope in Figure 7.

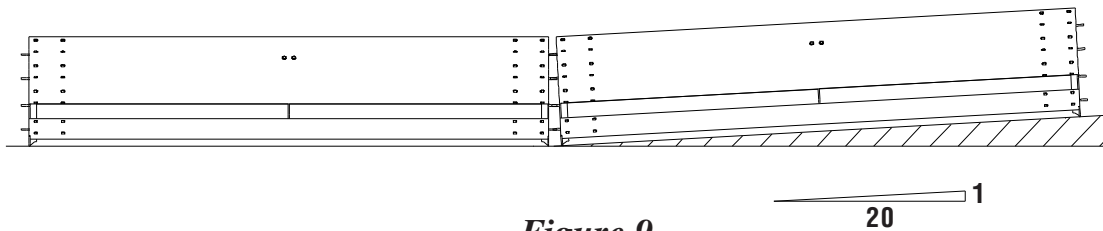


Figure 9

It is important to consider the roadway's cross section as it can affect traffic barrier performance. Curbs, dikes, slopes, shoulders, and stepped medians can cause errant vehicles to vault or submarine a barrier or to strike a barrier so that the vehicle overturns. Optimum barrier performance is provided by relatively level surface in front of and behind the barrier. Where a barrier is to be installed in the vicinity of an existing curb and the cost of removing the curb cannot be justified, the designer should locate the barrier so that the effects of the curb are minimized.

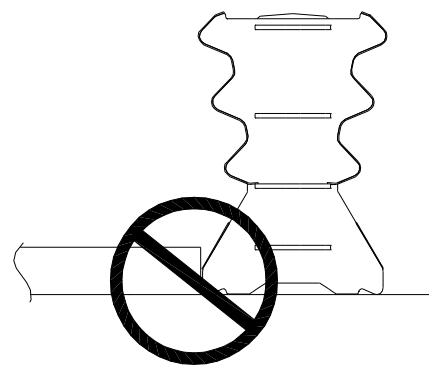


Figure 10

IronMan Barrier

Installation

Preparation

Begin preparing for the installation by thoroughly reviewing the specified barrier location, layout and orientation as per the approved traffic management plan.

Determine the number of segments required for the installation. The installed length of each IronMan segment is 4 metres or 12 metres. Consideration must be given to determine if an end treatment is required and allow for the length of the treatment in determining segments required. A visual inspection should be carried out to confirm the suitability of all segments. Should visible damage be evident in any segments, they should be sent for inspection and refurbishment prior to use.

Caution: Refer to the minimum installed lengths as illustrated in this manual to ensure compliance to NCHRP 350.

WARNING!

The correct safety equipment and approved traffic management must be used as required for any installation using the IronMan Barrier.

Required Tools

For a typical installation, the recommended tools and equipment are:

1. IronMan Installation Manual
2. Traffic control plan and approval (as required)
3. Traffic control equipment (as required)
4. A truck mounted crane or forklift suited to a minimum 1500 kg lift rated to handle the load expected and appropriate slinging gear. Each IronMan Barrier is fitted with a central lifting point, so positioned as to centrally balance the barrier segment. When lifting 12M segments, it is advised to tether the unit at both ends so as to aid stability. See photo.

The IronMan Barrier is designed to stack up to 3 segments in height so provision must be made to lift from a height of 2.4 metres plus the tray height.

Deployment

1. Begin deployment at the upstream traffic end of the site and work downstream. Work from the non-traffic side of the installation whenever possible. Unloading proceeds much faster if one person remains on the truck and two people work on the ground. If site conditions permit, a fourth person can drive the truck so that segments can be unloaded continuously as the installation is progressing.

Note: When deploying 12 metre IronMan units, it is suggested that attention be paid to ensuring the lap of the thrie beam goes with the direction of travel. This is not critical to the redirective properties of the IronMan Barrier. It has been fully crash tested to confirm that panel lap is not relevant to the IronMan Barrier, however, to save confusion, following this advice will prevent unnecessary questions from people confusing IronMan Barrier with Guardrail.

2. Align the segments according to the specified configuration and layout in the traffic control plan.

Caution: Refer to the deflection graph contained in this manual when determining minimum clearance between barrier and hazard.

Caution: The existence of any cross slopes in excess of 5% (3 deg.) or kerbs may create a vaulting effect on the impacting vehicle.

3. Bring the segments together and insert a connecting pin through the overlapping end knuckles at each joint. Push the pin in until it is flush with the top of the segments.

IronMan Barrier

Installation (cont'd.)



IMPORTANT!

Ensure that the deflection limiting spacers are installed between all segments where the minimum deflection of the system is desired i.e. Beginning of Length Of Need (B.L.O.N.).

Caution: When deploying the IronMan Barrier, care must be taken not to exceed the maximum recommended taper angle as detailed in this manual.

4. If an end treatment is specified for the layout, follow the instructions provided by the manufacturer and install it at this time.

Caution: A crashworthy end treatment must be supplied where warranted to ensure proper crash performance.

Deployment is now complete. Take the time to double check the integrity of the system so as to confirm functionality.

Retrieval

Retrieval is a reverse of the instructions for deployment.

Anchoring Instructions

Inspection

A visual inspection of each barrier segment is required prior to shipping.

Barrier segments which show evidence of prior impact should be thoroughly inspected for any sign of distortion or disfigurement.

Should any IronMan segment show signs of damage as listed, it must be refurbished prior to re-use.

Required Tools

1. IronMan Installation 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)
6. Grinder, Hacksaw or Torch (optional)
7. Drill Motor
- * Energy Absorption Systems recommends using two fluted drills to achieve optimum tensile strength when installing the MP-3 anchoring system.
8. 1/2" drive sockets: 1 1/8", 1 1/4"
9. Ratchet for the above sockets
10. Torque Wrench: 200 ft-lbs.
12. Safety Glasses
13. Gloves
14. Nylon bottle brush for cleaning 7/8" drilled holes
15. Rags, Water, and Solvent for Touch-up

Note: The above list of tools is a general recommendation. The actual number of tools required will depend on specific site conditions and the complexity of the installation.

IronMan Barrier

Anchoring Instructions (cont'd.)

Anchored IronMan Foundations

The IronMan Barrier may be installed on any of the following Foundations using the specified anchorage:

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 P.C.C.

Foundation: 75 mm [3"] minimum Asphalt
Concrete (A.C.) over 75 mm [3"] minimum
(P.C.C.)

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

Foundation C: Asphalt over Subbase

Foundation: 150 mm [6"] minimum (A.C.) over
150 mm [6"] minimum Compacted
Subbase (C.S.)

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

Foundation D: Asphalt Only

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

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

Note:

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

Foundation Specifications

for Foundations A, B, C and D mentioned above

A. C. (Asphalt Concrete)

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

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

P.C.C. (Portland Cement Concrete)

Stone aggregate concrete mix

4000 psi minimum compressive strength

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

C.S. (Compacted Subbase)

150 mm [6"] minimum depth 95% compaction

Class 2 aggregate

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

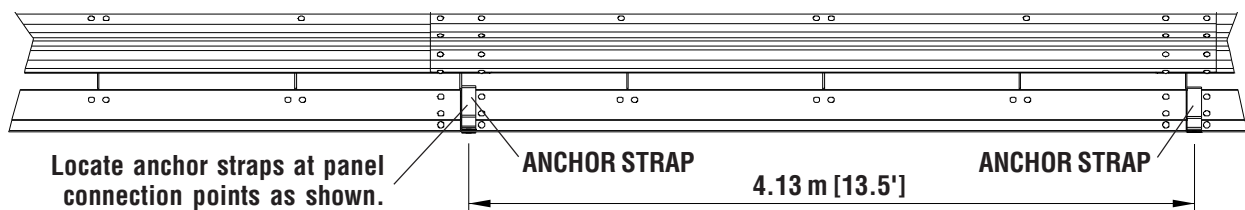


Figure 11
Anchor Strap Locations

IronMan Barrier

Anchoring Instructions (cont'd.)

Use MP-3 Polyester Anchoring System supplied by Energy Absorption Systems, Inc. or approved equal.

IronMan Barrier Sections installed on asphalt must be inspected to ensure the anchors are still properly set following each impact. Re-anchor as necessary.

Position the IronMan Barrier sections.

Locate anchor straps at panel connection points as shown in Figure 11.

Use the Anchor Straps as templates to drill anchor holes. Refer to figures 12 & 13 and instructions contained in the MP-3 Polyester Anchor box supplied with the system for detailed anchoring instructions.

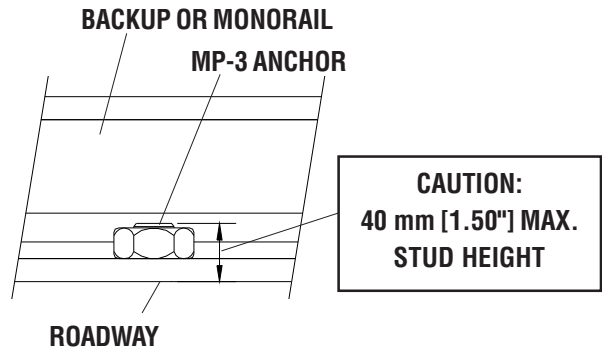
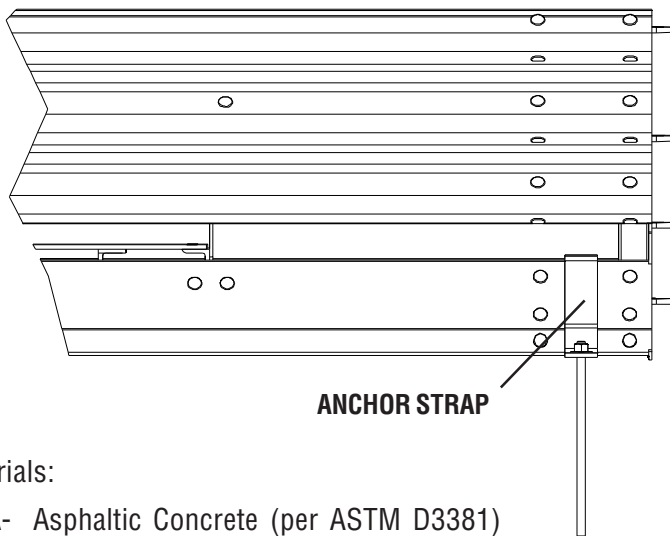
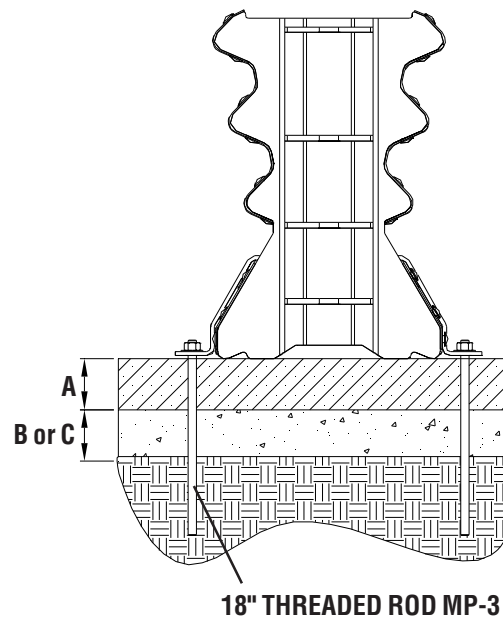


Figure 12
Proper Stud Height



Materials:

- A- Asphaltic Concrete (per ASTM D3381)
Asphalt Binder AR-4000
Asphalt Aggregate 3/4" [19 mm] Max. Med A B
- B- 28 MPa [4000 PSI] P.C Concrete
(Sampling per ASTM C31-84 or ASTM C42-B4A,
testing per ASTM C39-84)
- C- Sub-base, prepared and compacted
Class 2 Aggregate
95% compaction, minimum layer



| A | B | C | REQ'D STUD LENGTH |
|------------|-----------|------------|-------------------|
| 76mm [3"] | 76mm [3"] | --- | 460mm [18"] |
| 152mm [6"] | --- | 152mm [6"] | 460mm [18"] |
| 203mm [8"] | --- | --- | 460mm [18"] |

Figure 13
Anchoring the System

IronMan Barrier

Maintenance and Repair

Each IronMan segment is made up of eleven main components, all of which are fully replaceable as designed to ensure a long service life.

The IronMan Barrier is bolted together using standard guardrail bolts so any individual component can be easily removed and replaced.

Barriers which show evidence of impact will require close inspection of all struts, braces and supports showing particular attention to weld point integrity.

It is not recommended to self-repair any components as this will compromise the integrity of the barrier in regard to its original design specification. Any damaged sections must be replaced with original modular sections supplied by the manufacturer. Failure to do so will negate the manufacturer's guarantees in regard to the tested performance of the IronMan Barrier.

Should the reflective properties of the delineators become markedly reduced due to an accumulation of road grime, it is recommended to wash the delineators using warm soapy water followed by a rinse with clean water. The delineators should be checked for proper alignment and straightened by hand if necessary.

Details and specifications for the IronMan Barrier are contained in the System Assembly Drawings at the end of this manual.

Limitations and Warnings

The IronMan Barrier has been fully tested and evaluated as per the recommendations of NCHRP 350.

The IronMan Barrier is capable of decelerating and redirecting an errant vehicle (820 kg and 2000 kg) at speeds up to 100 km/h (Test Level 3) and angles up to 25 degrees with maximum slope/cross slope of 3 degrees in deployment.

To ensure adequate performance in the event of an impact, the IronMan Barrier must be deployed and maintained in accordance with the manufacturer's instructions, NCHRP 350, and local authority guidelines.

Impacts that exceed the design capabilities described in this manual (vehicle weight, speed and impact angle) may not result in acceptable crash performance as described in NCHRP 350 relative to structural adequacy, occupant risk and vehicle trajectory factors.

Higher than reported deflections can be expected in the BLON section.

Should attachments be added to increase the height of the IronMan Barrier such as Anti Debris Panels or Anti Gawking panels, the following should be considered. If Panels are fitted, Anchor Straps as detailed (Pg13 to Pg15) must be affixed every 48 metres to prevent high winds or impacts from high bumper height vehicles toppling the system. If Shade Cloth is added to provide anti gawking properties, a maximum of 56% light transmission is recommended.

IronMan Barrier

| PARTS LIST | | | |
|------------|----------------|------------------------------------|------|
| ITEM | STOCK NO. | DESCRIPTION | QTY. |
| 1 | PSB BH RIGHT | PSB BH RIGHT | 1 |
| 2 | PSB BH LEFT | PSB BH LEFT | 1 |
| 3 | PSB CTR BH | PSB CTR BH | 1 |
| 4 | PSB QTR BH | PSB QTR BH | 2 |
| 5 | PSB PIN | PSB PIN | 1 |
| 6 | PSB SPACER | PSB SPACER ASSY | 1 |
| 7 | PSB STIFFENER | PLT ST 18 3/4X80 1/2X10 GA. WHOLES | 2 |
| 8 | PSB THRIE-BEAM | THRIE-BEAM/WISLOTS | 2 |
| 9 | PSB RUB RAIL | SHT ST 10GAX11 1/2X160 1/2 W/SLOTS | 2 |
| 10 | | BOLT RAIL M16X32 G | 120 |
| 11 | | NUT, HX, M16, G, RAIL | 120 |
| | | | 12 |

4.135 Metres Pin Centres

NOTE: INSERT PIN AND SPACER (ITEM 5 & 6) TO JOIN LEFT AND RIGHT ENDS OF ADJACENT BARRIER SEGMENTS DURING INSTALLATION.

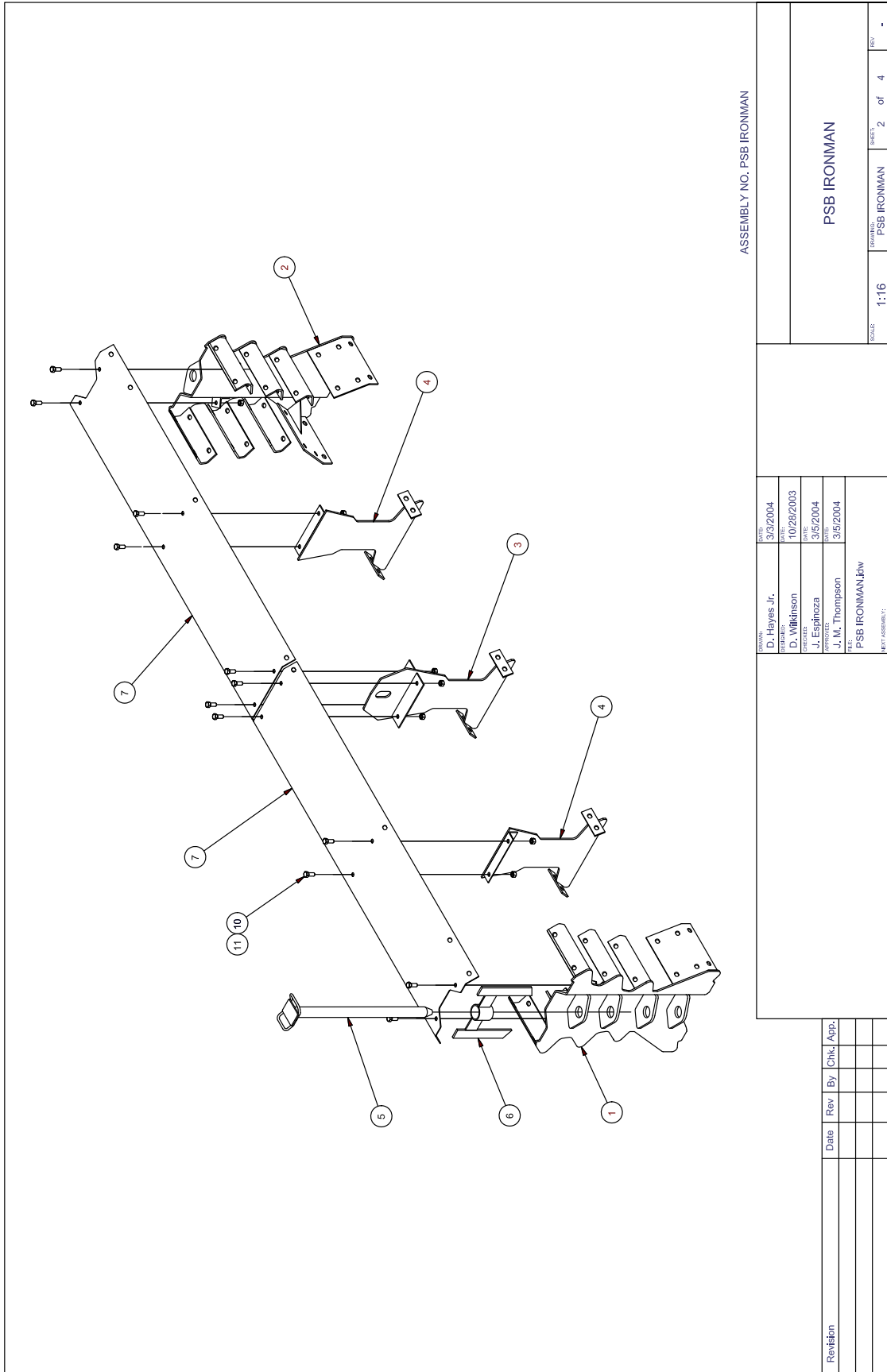
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| | |
|-------------------------|--------------------|
| DRAWING NO. PSB IRONMAN | |
| DATE: 3/5/2004 | BY: D. Paves Jr. |
| DATE: 10/28/2003 | BY: D. Wilkinson |
| DATE: 3/5/2004 | BY: J. Esphoza |
| DATE: 3/5/2004 | BY: J. M. Thompson |
| FILE: PSB IRONMAN.lbw | |
| PLOT ASSEMBLY: | |

| | |
|-------------|----------------|
| SCALE: 1:20 | SHEETS: 1 of 4 |
| PSB IRONMAN | |

| Revision | Date | Rev | By | Chk | App |
|----------|------|-----|----|-----|-----|
| | | | | | |
| | | | | | |
| | | | | | |

IronMan Barrier



ASSEMBLY NO. PSB IRONMAN

| | |
|-----------------------------------|--------------------|
| DESIGNED BY D. Hayes, Jr. | DATE 3/3/2004 |
| DRAWN BY D. Wilkinson | DATE 10/28/2003 |
| CHECKED BY J. Esposito | DATE 3/5/2004 |
| APPROVED BY J. M. Thompson | DATE 3/5/2004 |
| PART ASSEMBLY: PSB IRONMAN.fdw | |

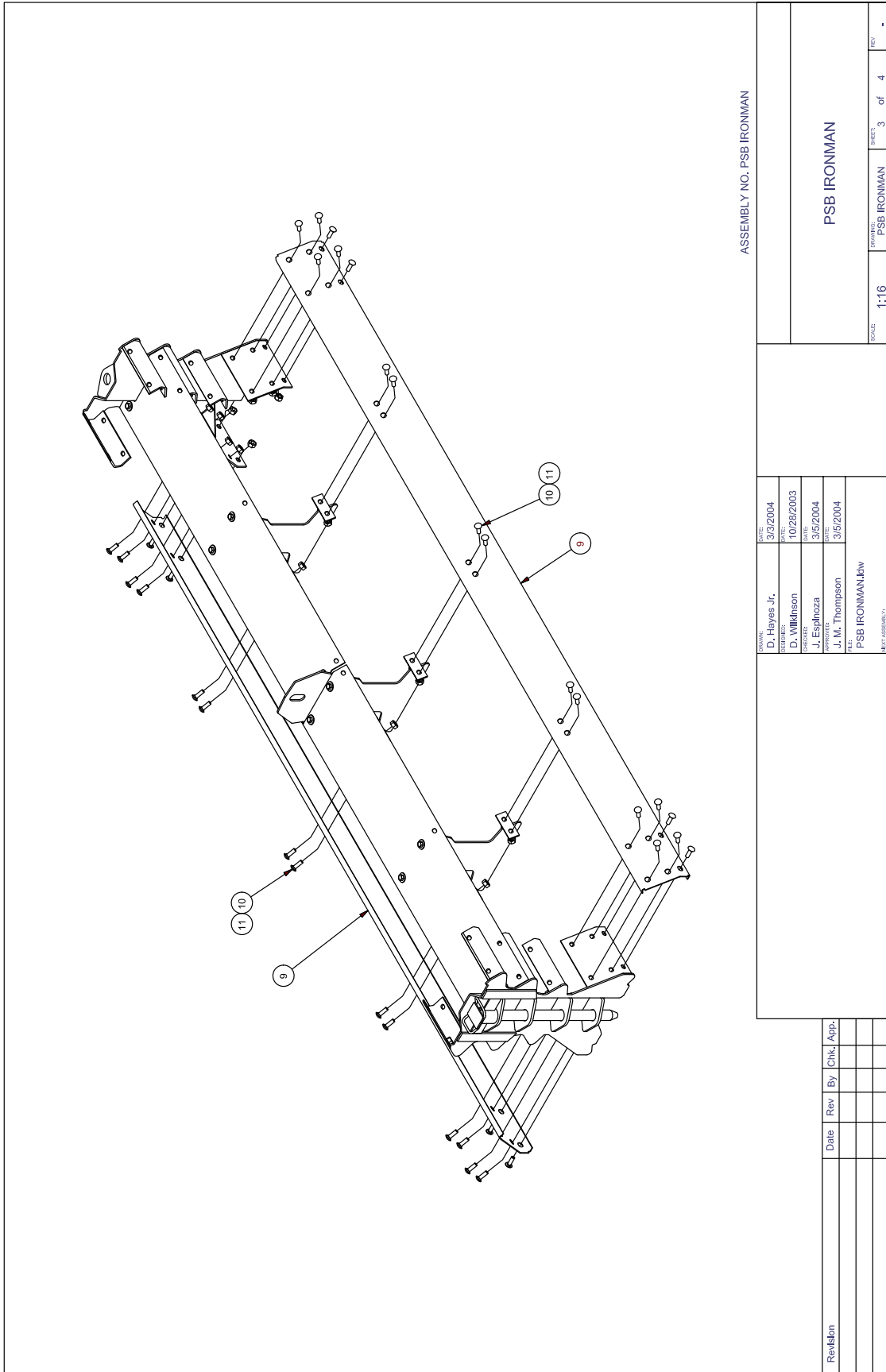
| Revision | Date | Rev | By | Chk. | App. |
|----------|------|-----|----|------|------|
| | | | | | |
| | | | | | |
| | | | | | |

SCALE: 1:16

DRAWING: PSB IRONMAN

SHEET: 2 of 4

IronMan Barrier



ASSEMBLY NO. PSB IRONMAN

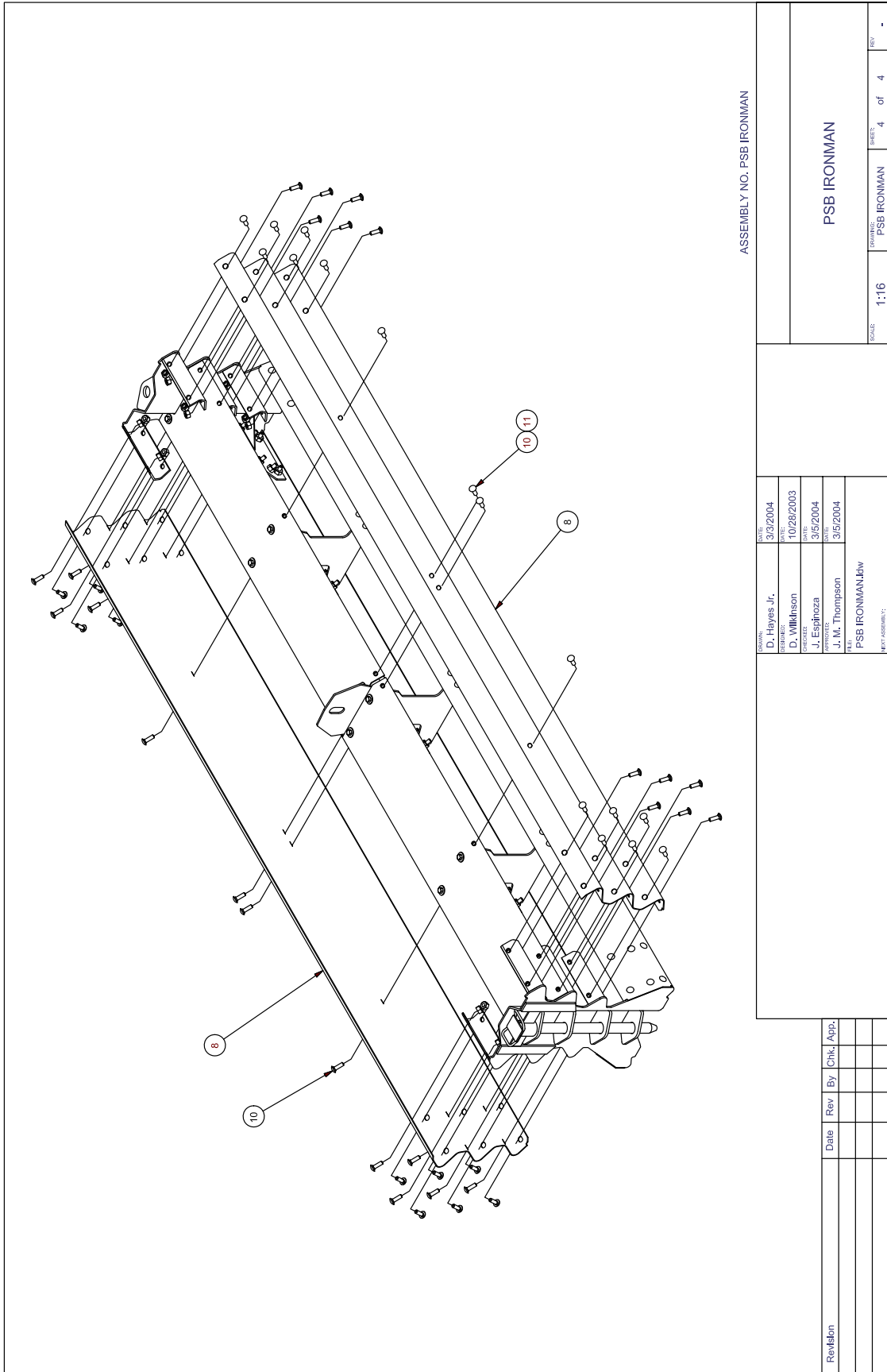
PSB IRONMAN

SCALE: 1:16 DRAWING: PSB IRONMAN SHEETS: 3 of 4 REV: -

| | | | |
|-------------------------------|----------------|-------|------------|
| DESIGNER: | D. Hayes Jr. | DATE: | 3/3/2004 |
| CHECKER: | D. Wilkinson | DATE: | 10/28/2003 |
| APPROVER: | J. Espinoza | DATE: | 3/5/2004 |
| APPROVER: | J. M. Thompson | DATE: | 3/5/2004 |
| PART ASSEMBLY: PSB IRONMAN.BW | | | |

| Revision | Date | Rev | By | Chk. | App. |
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IronMan Barrier



ASSEMBLY NO. PSB IRONMAN

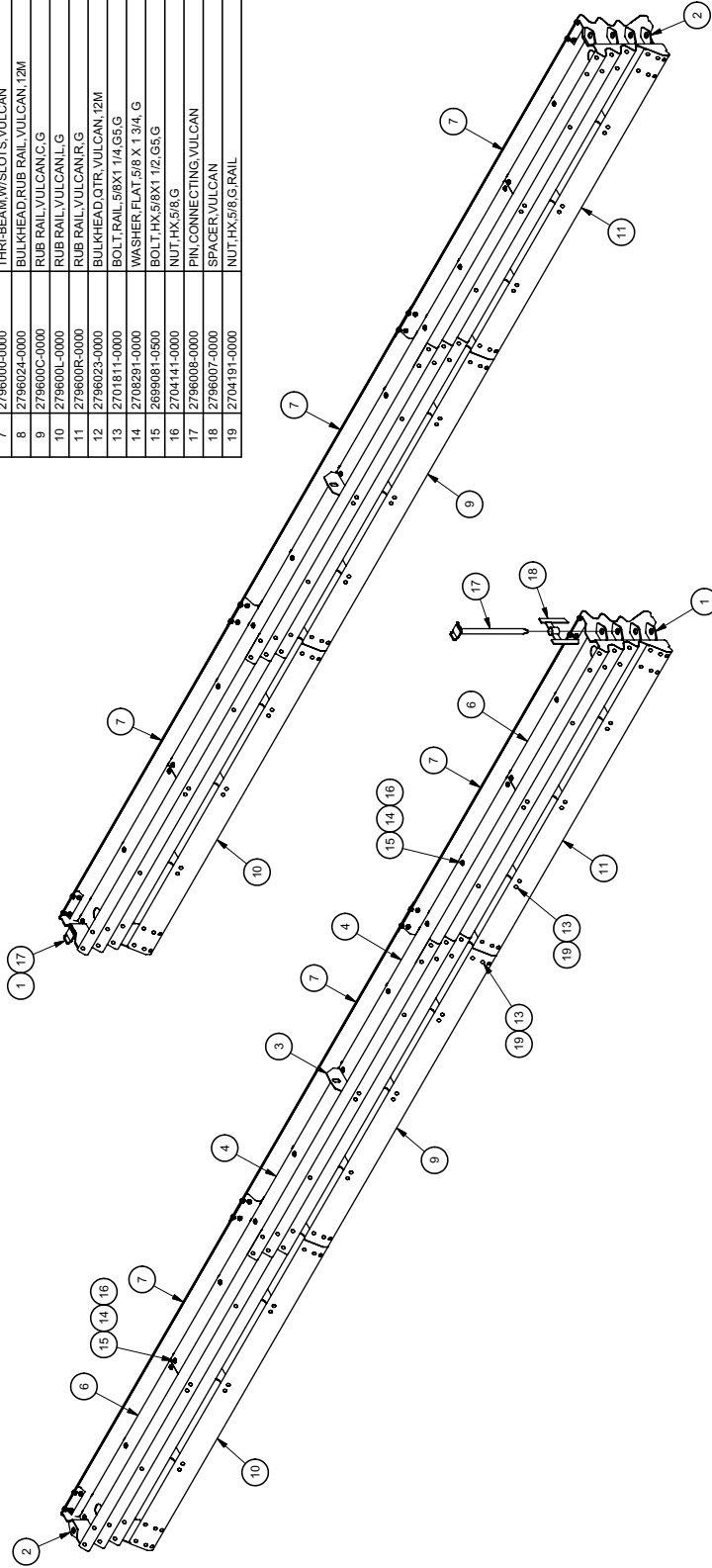
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|-------------|------|---------|-------------|-------|---|----|---|-----|---|
| SCALE | 1:16 | DRAWING | PSB IRONMAN | SHEET | 4 | OF | 4 | REV | - |
| PSB IRONMAN | | | | | | | | | |

| | | | |
|-----------------|----------------|------|------------|
| DESIGNER | D. Hayes, Jr. | DATE | 3/9/2004 |
| ENGINEER | D. Wilkinson | DATE | 10/28/2003 |
| CHECKER | J. Espinoza | DATE | 3/5/2004 |
| APPROVER | J. M. Thompson | DATE | 3/5/2004 |
| PART ASSEMBLY: | | | |
| PSB IRONMAN.lhw | | | |

| Revision | Date | Rev | By | Chk. | App. |
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IronMan Barrier

| PARTS LIST | | | |
|------------|---------------|---------------------------------|------|
| ITEM | STOCK NO. | DESCRIPTION | QTY. |
| 1 | 2796004-0000 | BULKHEAD END, RT, VULCAN | 1 |
| 2 | 2796003-0000 | BULKHEAD END, LT, VULCAN | 1 |
| 3 | 2796005-0000 | BULKHEAD, CTR, VULCAN | 1 |
| 4 | 2796022-0000 | STIFFNER, VULCAN, 12M, G | 2 |
| 5 | 2796006-0000 | BULKHEAD, QTR, VULCAN | 6 |
| 6 | 2796001-0000 | STIFFNER, VULCAN | 2 |
| 7 | 2796000-0000 | THRU-BEAM W/SLOTS, VULCAN | 6 |
| 8 | 2796024-0000 | BULKHEAD, RUB RAIL, VULCAN, 12M | 2 |
| 9 | 2796000-0000 | RUB RAIL, VULCAN, C, G | 2 |
| 10 | 2796001-0000 | RUB RAIL, VULCAN, L, G | 2 |
| 11 | 2796000R-0000 | RUB RAIL, VULCAN, R, G | 2 |
| 12 | 2796023-0000 | BULKHEAD, QTR, VULCAN, 12M | 2 |
| 13 | 2701811-0000 | BOLT, FLAT, 5/8X1 1/4, G5, G | 204 |
| 14 | 2708291-0000 | WASHER, FLAT, 5/8 X 1 3/4, G | 32 |
| 15 | 2699081-0900 | BOLT, HX, 5/8X1 1/2, G5, G | 32 |
| 16 | 2704141-0000 | NUT, HX, 5/8, G | 32 |
| 17 | 2796008-0000 | PIN, CONNECTING, VULCAN | 1 |
| 18 | 2796007-0000 | SPACER, VULCAN | 1 |
| 19 | 2704191-0000 | NUT, HX, 5/8, G, RAIL | 204 |



ASSEMBLY NO. 3596007-0000



VULCAN™, 12M

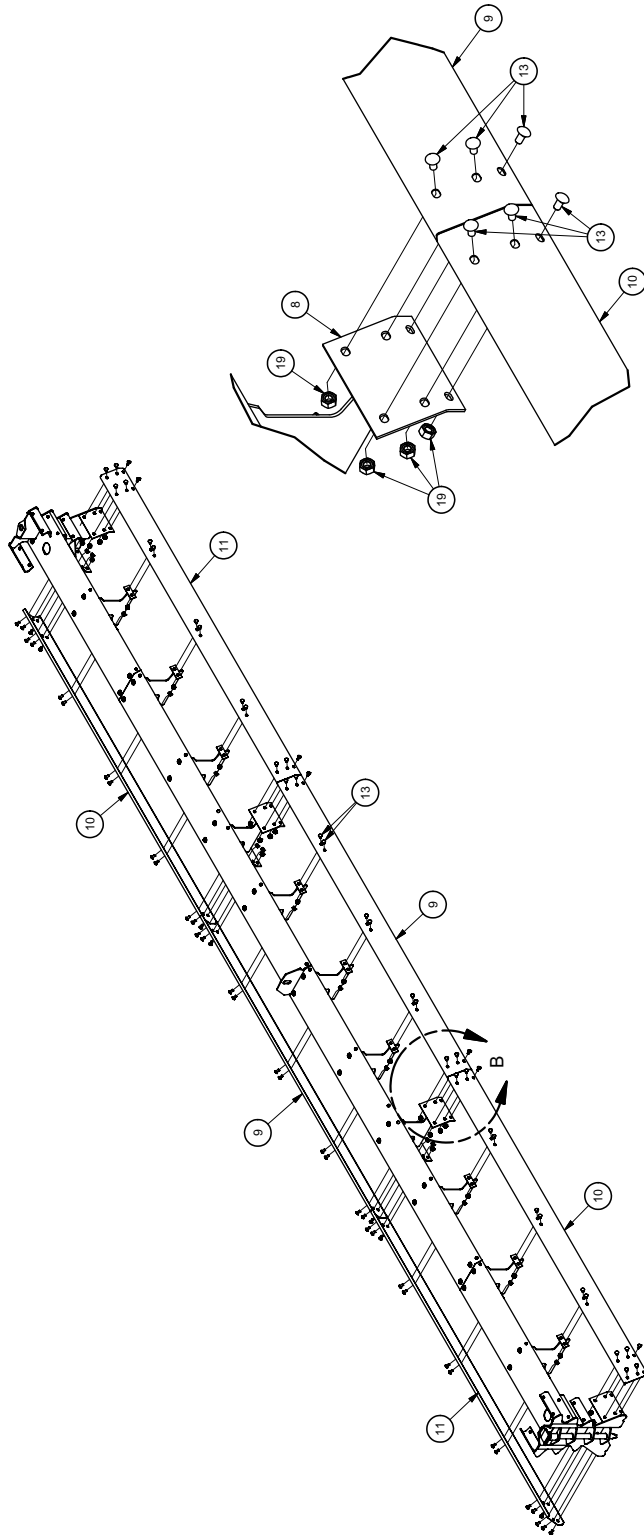
| | |
|----------------|------------------|
| DATE | 1/23/2007 |
| DESIGNED BY | D. Hayes Jr |
| DATE | 1/15/2007 |
| CHECKED BY | K. Looney |
| DATE | 2/8/2007 |
| APPROVED BY | J. Espinoza |
| DATE | 2/12/2007 |
| FILE | 3596007-0000.dwg |
| PROJECT NUMBER | |

NOTE:
1. WHEN CONNECTING MULTIPLE SYSTEMS, INSERT PIN AND SPACER (ITEMS 17 & 18) TO JOIN LEFT AND RIGHT ENDS OF ADJACENT BARRIER SEGMENTS DURING INSTALLATION.

| Revision | Date | Rev | By | Chk | App |
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| SCALE | 1:40 | DRAWING | 3596007-0000 | SHEET | 1 of 4 | REV | - |
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IronMan Barrier



DETAIL B
SCALE 3/10
1:1

ASSEMBLY NO. 3596007-0000



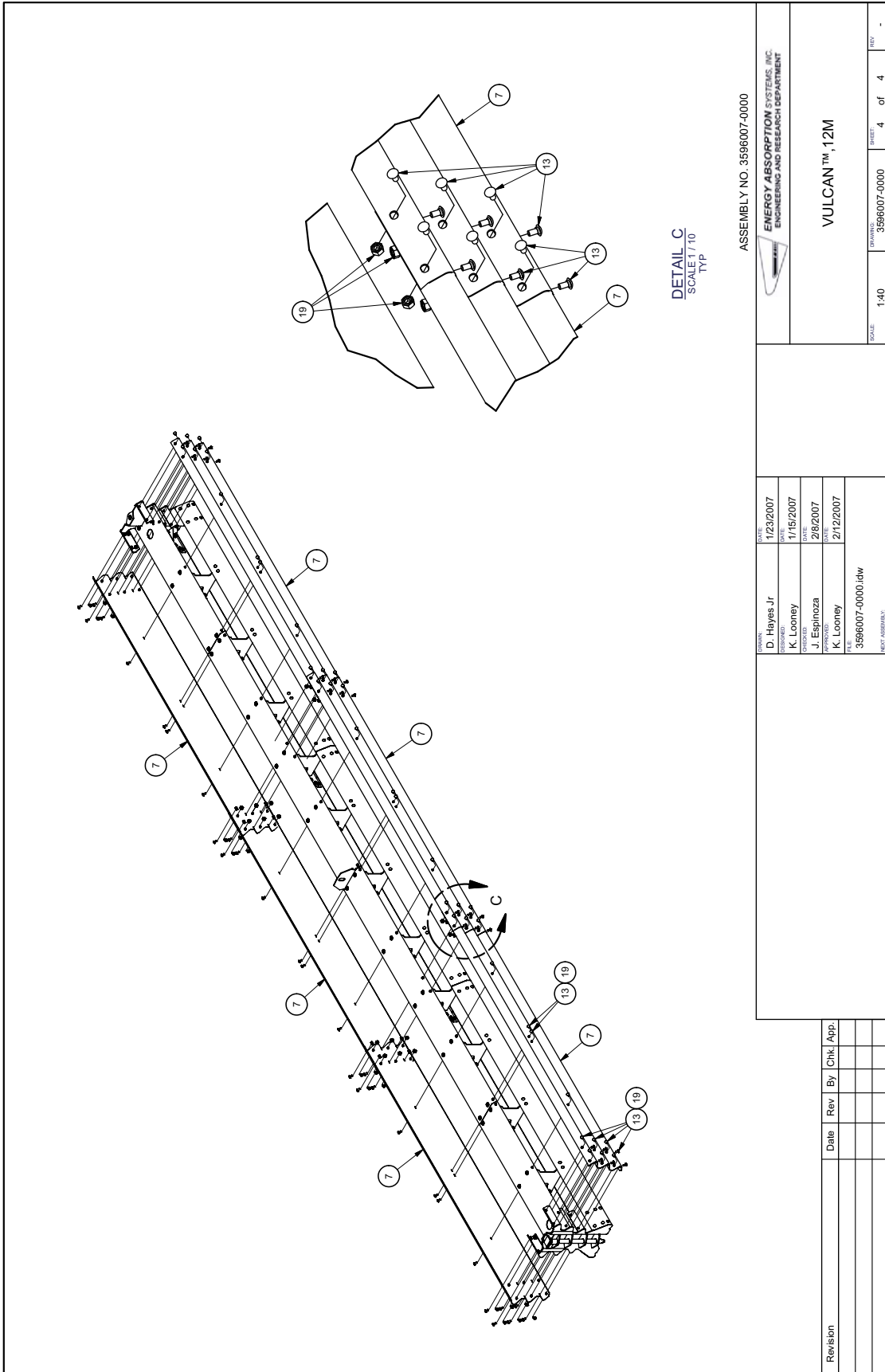
VULCAN™, 12M

| | | | |
|-------------|------------------|------|-----------|
| DESIGNED BY | D. Hayes Jr | DATE | 1/23/2007 |
| CHECKED BY | K. Looney | DATE | 1/15/2007 |
| APPROVED BY | J. Espinoza | DATE | 2/8/2007 |
| FILE | K. Looney | DATE | 2/12/2007 |
| FILE | 3596007-0000.dwg | | |
| PROJECT | VULCAN | | |

| Revision | Date | Rev | By | Chk | App. |
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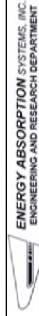
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| SCALE | 1:40 | SHEET | 3 | of | 4 | REV | - |
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IronMan Barrier



DETAIL C
SCALE 7/10
TYP

ASSEMBLY NO. 3596007-0000



VULCAN™, 12M

| | | | |
|-------------|------------------|------|-----------|
| DESIGNED BY | D. Hayes Jr | DATE | 1/23/2007 |
| CHECKED BY | K. Looney | DATE | 1/15/2007 |
| APPROVED BY | J. Espinoza | DATE | 2/8/2007 |
| FILE | K. Looney | DATE | 2/12/2007 |
| FILE | 3596007-0000.dwg | | |
| PROJECT | VULCAN | | |

| Revision | Date | Rev | By | Chk | App. |
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| SCALE | 1:40 | SHEET | 4 | of | 4 | REV | - |
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IronMan Barrier

Notes



IronMan Barrier

Notes

IronMan Barrier

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Rev. 12/20/2007