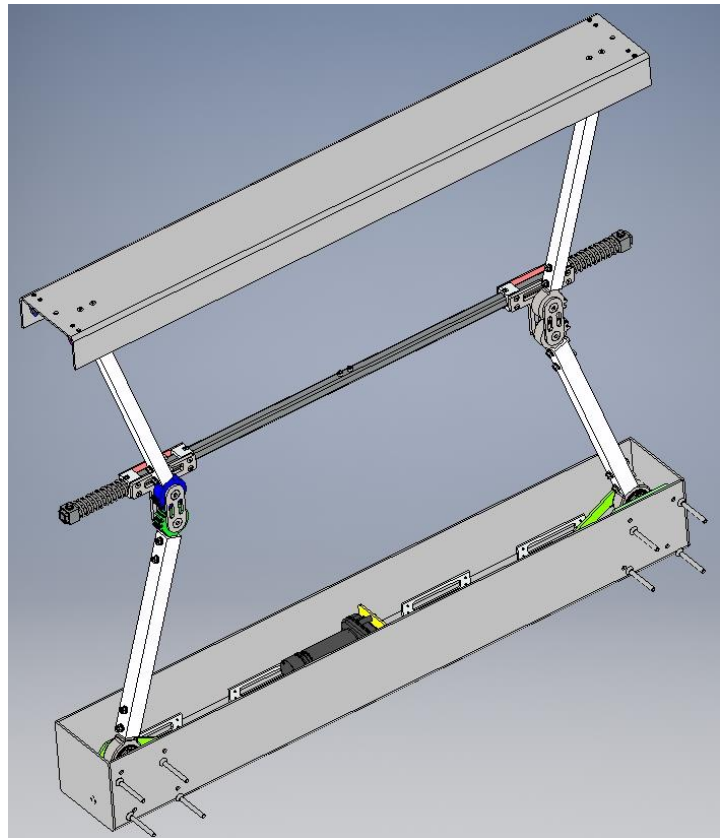
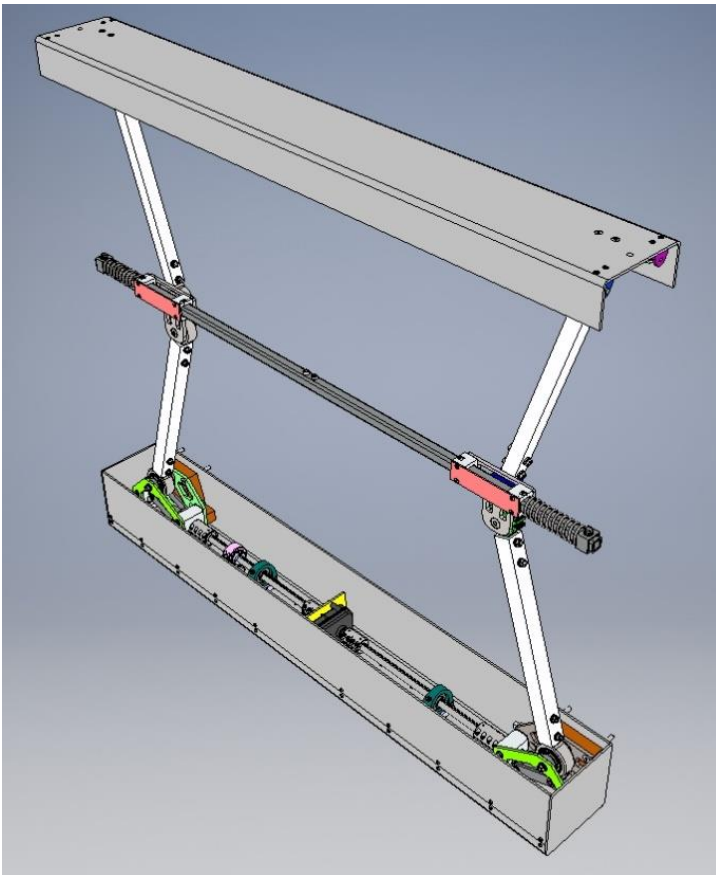


XRAIL POWERED SAFETY HANDRAILS

Electrical or Pneumatic Powered Handrail Fall Protection System

XRail Customer Maintenance Manual



www.cdinw.com

Control Dynamics Inc.





Control Dynamics XRail

Customer Maintenance Manual

Published by Control Dynamics Inc. Everett, WA.

Version 1.2

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Everett, Washington 98201

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Control Dynamics Inc.



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Overview

ABOUT XRAIL

PIRANHA SAFETY'S XRail is the first of its kind, programmable guardrail system that creates a safety barrier that is functional as well as being extremely safe to use. The design of a safety rail is to provide a barrier between you and danger with the ability to easily raise or collapse the rail without harming or endangering the operator and without creating a storage issue with removed rail sections. In its collapsed position the safety rail is flush with the ground or platform, making loading and unloading of equipment and individuals easy. Once raised, the XRail provides a complete safety barrier and handrail.

BENEFITS

- -XRail can raise and lower safely without putting operator at risk
- -Optional Class 1, Div 1 available
- -Debris curtain provides safety from falling objects
- -Rails require no lifting or storing issues
- -Increases usable deck space for efficiency -Power by electric, hydraulic, pneumatic, or manual
- -Operate by remote control, wired, or BlueTooth

APPLICATIONS

- -Aerospace Industries
- -Maritime
- -Loading Docks
- -Tooling Manufacturers
- -Industrial
- -Pharmaceuticals
- -Elevator Maintenance

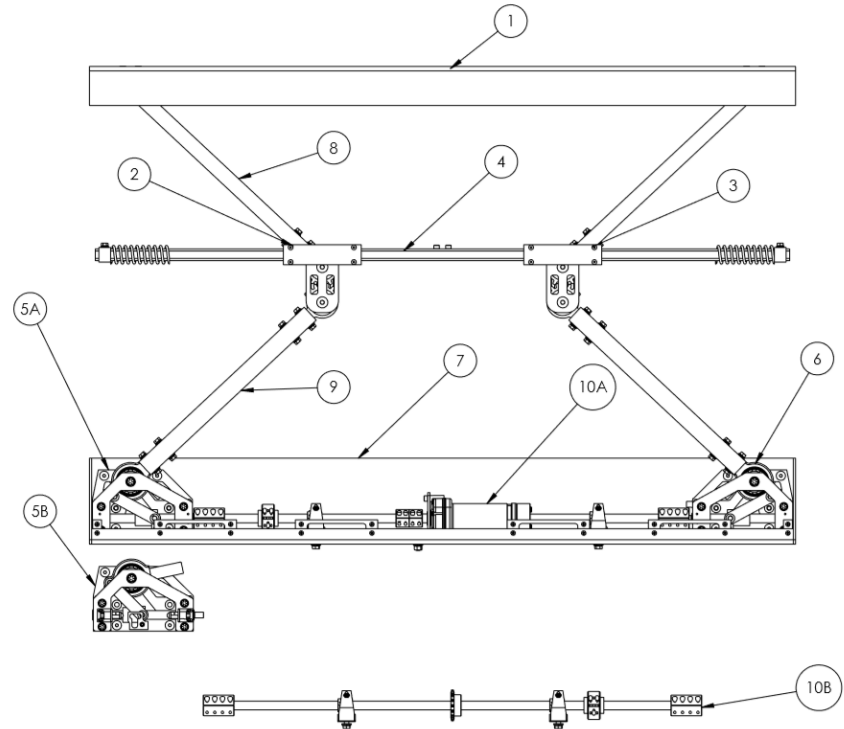


Assembly and Setup

1. Part Listing



ITEM NO.	PART NO.	DESCRIPTION	QTY.
1	CDI-04-811-XXX	TOP RAIL ASSM.	1
2	04-08GEAR L	LEFT MID RAIL GEAR ASSM.	1
3	04-08GEAR R	RIGHT MID RAIL GEAR ASSM.	1
4	04-08CENTERBAR	MID RAIL ASSM.	1
5A	04-08TRANS L	LEFT TRANSMISSION ASSM. ELECTRIC	1
5B	04-08PNEU TRANS L	LEFT TRANSMISSION ASSM. PNEUMATIC	1
6	04-08TRANS R	RIGHT TRANSMISSION ASSM.	1
7	CDI-04-810-XXX	LOWER TROUGH ASSM.	1
8	04-08ARMS UP	UPPER ARM ASSM.	2
9	04-08ARMS DOWN	LOWER ARM ASSM.	2
10A	ELEC. DRIVE	ELECTRIC DRIVE SHAFT ASSM.	1
10B	PNEU. DRIVE	PNEUMATIC DRIVE SHAFT ASSM.	1



<p>UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± 0.01 THREE PLACE DECIMAL ± 0.005</p> <p>PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF CONTROL DYNAMICS, INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF CONTROL DYNAMICS, INC. IS PROHIBITED. PATENTED/PATENT PENDING. DO NOT SCALE DRAWING</p>	<p>DRAWN: Adam M 11/12/2019</p> <p>CHECKED:</p> <p>ENG APPR:</p> <p>MFG APPR:</p> <p>G.A.</p> <p>PART NO.</p>	<p>NAME: Adam M</p> <p>DATE: 11/12/2019</p>	<p>Control Dynamics, Inc.</p> <p>TITLE: X-RAIL MAJOR PARTS</p>	
	<p>INTERPRET GEOMETRIC TOLERANCING PER:</p> <p>MATERIAL:</p> <p>FINISH:</p>	<p>SCALE: 1:8</p> <p>WEIGHT:</p>	<p>SIZE: B</p> <p>DWG. NO.: X-RAIL MAJOR PARTS</p> <p>REV:</p>	<p>SHEET 1 OF 1</p>

Please refer to the standard drawing for Description of major components. This will help identify any parts order with the XRAIL serial number.

Assembly and Setup

2. Proper Installation Requirements



Installation alignment is critical to smooth operation and safe install.

Plate alignment shims may be required depending on the surface to be mounted on.

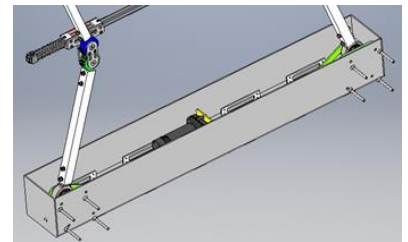
Trained installers carry shim packs in order to mount the XRAIL correctly.

Shim thickness of 1/16" down to 0.020 may be used to provide flatness and vertical alignment.

The vertical 90-degree alignment must be within +/- 0.5 degrees to insure smooth vertical travel of the XRAIL.

In some instances, thicker shim packs are required due to irregularities in the surface or weld beads along the surface frame and sometimes floor decking extends out beyond the mounting surface.

Once alignment is achieved, ALL 8 mounting bolts must be used to secure the XRAIL to the surface it is bolted to.



3. Required Torques and Alignments

Standard 3/8" Bolt Torques are required with witness marks for confirmation.

Bolt Clamping Torque

Bolt required is a 3/8-16 UNC minimum of SAE Grade 5 or optional SAE Grade 8. Below are the clamp and proof loads required for the Grade 5 & Grade 8 3/8-16 UNC bolts.

3/8-16 UNC Grade 5 Clamp Load:	4,950 lbs
3/8-16 UNC Grade 5 Proof Load:	6,600 lbs
3/8-16 UNC Grade 8 Clamp Load:	6,975 lbs
3/8-16 UNC Grade 8 Proof Load:	9,300 lbs

To achieve the proper clamping force, the bolt must be torqued as follows:

3/8-16 UNC Grade 5 Plain:	31 ft-lbs
3/8-16 UNC Grade 5 Galvanized:	39 ft-lbs
3/8-16 UNC Grade 5 Galvanized & Waxed:	15 ft-lbs
3/8-16 UNC Grade 8 Plain:	44 ft-lbs
3/8-16 UNC Grade 8 Lubricated:	22 ft-lbs

Assembly and Setup con't

If thru bolting is not available or access can not be obtained. Then threaded mounting holes are possible. ALL 8 Bolts must be used and installed into a plate with a minimal 1/2" thickness.

Once properly mounted and secured, the XRAIL is ready for functional testing.

4. Function tests

12 Cycles of the XRAIL up and down will verify its proper installation and performance.

Keep in mind, the duty cycle is 50%, therefore due not run continuously without a pause in between in cycle to allow motor cool down.

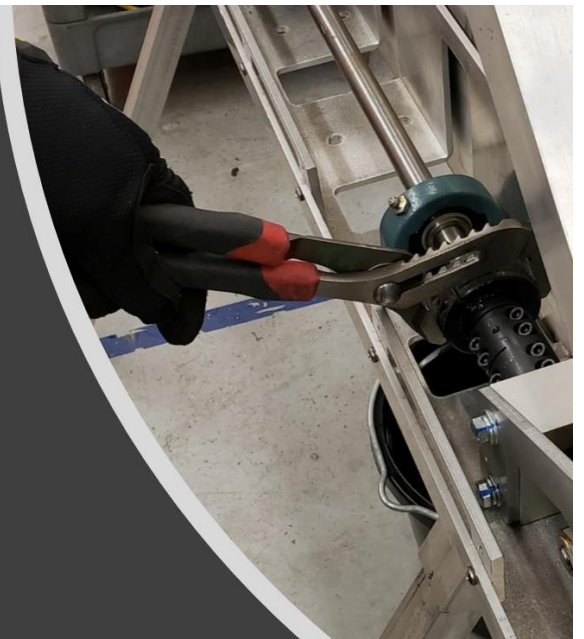
If XRAIL does not operate smoothly, please verify mounting alignment again and check lubrication locations for any binding.

5. Shaft Alignment Indexer



INFINITE INDEXER

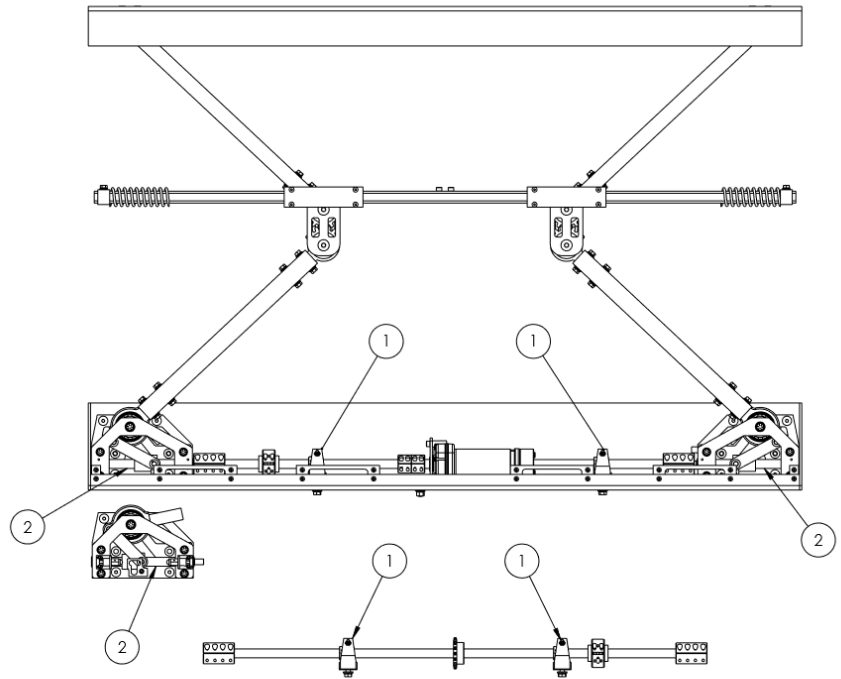
- WHEN HOLDING THE INFINITE INDEXER WHILE RUNNING THE RAIL UP IT WILL RAISE THE RIGHT TRANSMISSION WHICH IN TURN RAISES THE TOP RAIL ON THE RIGHT SIDE AND LOWERS THE LEFT TRANSMISSION WHICH IN TURN LOWERS THE LEFT SIDE OF THE TOP RAIL.
- WHEN HOLDING THE INDEXER WHILE RUNNING THE RAIL DOWN IT WILL RAISE THE LEFT TRANSMISSION WHICH IN TURN RAISES THE TOP RAIL ON THE LEFT AND LOWERS THE RIGHT TRANSMISSION WHICH IN TURNS LOWERS THE RIGHT TOP RAIL.



Assembly and Setup

6. Lubrication Maintenance

NO.	DESC.	GREASE	TIMES / YEAR
1	PILLOW BLOCKS	NLGI GC-LB / NLGI#1	1
2	BALL SCREWS	NLGI GC-LB / NLGI#1	4



<p>Unique Industrial Electrical and Mechanical Solutions</p> <p>PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF CONTROL DYNAMICS, INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF CONTROL DYNAMICS, INC. IS PROHIBITED. PATENTED/PATENT PENDING.</p>	UNLESS OTHERWISE SPECIFIED:	NAME	DATE	Control Dynamics, Inc. TITLE: X-RAIL LUBE POINTS SIZE DWG. NO. X-RAIL LUBE POINTS REV B SCALE: 1:8 WEIGHT: SHEET 1 OF 1	
	DIMENSIONS ARE IN INCHES	DRAWN	Adam M		11/12/2019
	TOLERANCES:	CHECKED			
	FRACTIONAL ±	ENG APPR.			
ANGULAR ±	MFG APPR.				
TWO PLACE DECIMAL ±	G.A.				
THREE PLACE DECIMAL ±	PART NO.				
	INTERPRET GEOMETRIC TOLERANCING PER:				
	MATERIAL				
	FINISH				
	DO NOT SCALE DRAWING				

Please check periodically to add more lubrication when needed or when the XRAIL may look like it is not operating smoothly.

The maintenance intervals are based upon 2 cycles per day and the end user may adjust their lubrication schedules as necessary depending on the XRail's usage.

Assembly and Setup

7. Manual Lowering with motor disengagement

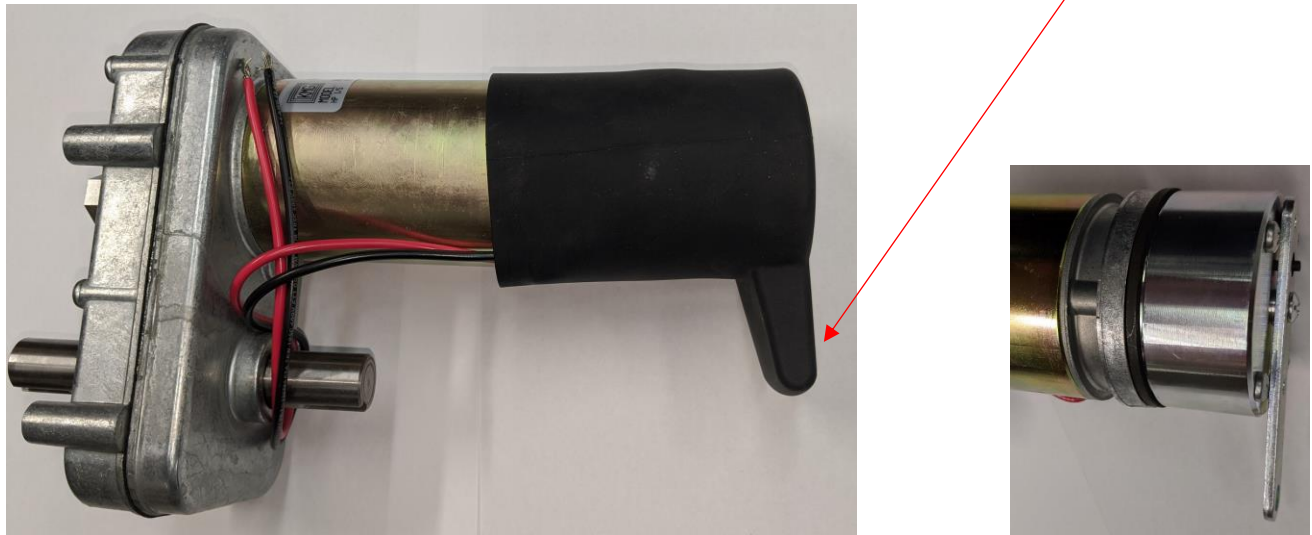


On **electrically powered XRAILs**, a manual disengagement lever is located on the backside of the motor.

You can access the motor by removing the front access panel.

The front panel is the attachment point for the curtain. When the access panel is unbolted, you then slowly lift the panel and let the curtain pull up the front panel and wind itself up. Secure the curtain and panel with clamp or zip tie.

Now you can safely access the electrical motor and the disengagement brake lever.



The purpose of the disengagement is to allow manually lowering of the XRAIL if power or damage caused the unit to fail in the UP position.

IMPORTANT: Use 2 people to support the TOP rail and then disengage the electrical motor brake and begin to lower I slowly and evenly.

On **pneumatic motors**, you can back off the drive clutch sprocket to disengage the motor to the drive chain.

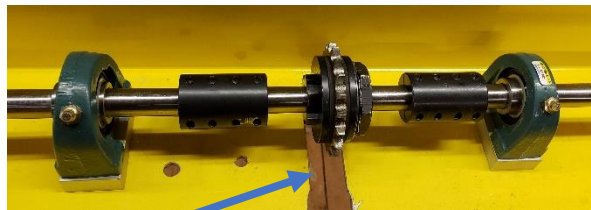
Assembly and Setup

8. Clutch Sprocket for Electrical and Pneumatic XRails

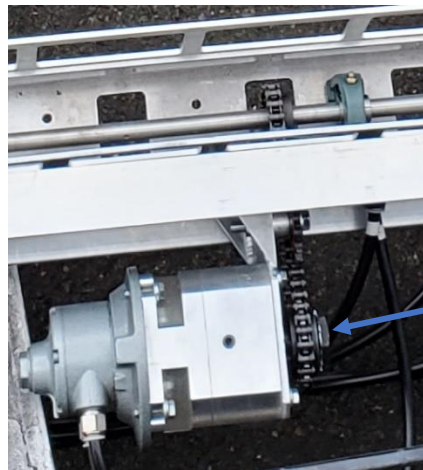


All currently manufactured XRails are required to have a clutch friction sprocket installed in the XRail drive line. This a safeguard to prevent damage to the XRail if the XRail is bound from moving up due to negligence or outside obstacles.

On an electrical XRail the clutch sprocket is attached on the XRail main driveline.



On a pneumatic XRail the clutch sprocket is installed directly on the end of the pneumatic drive motor.



Pneumatic drive
clutch sprocket

Warning! Do not overtighten the clutch.

Clutch is set by hand tightening only and tested at specific weight.



Clutch Calibration

Clutch setting is different on each length of XRail



Best practice is to calibrate the XRail when installed or test during regular maintenance and recalibrate when necessary.

Calibration procedure:

1. Begin with the clutch set by hand tightening only.
2. Test XRail lifting operation by pushing the UP button to raise the XRail.
3. If the XRail raises up, then go to the next step
4. If the XRail does NOT raise up, then increase the clutch compression by turning the nut with wrench 3-4 degrees (small increment).
5. Test the raising again, by pushing the UP button.
6. Now that the unit raise up, lower it back down to bottom position.
7. Place approximately 10lbs of weight on the center of the XRail.
8. Test XRail lifting operation with weight by pushing the UP button.
9. Correct operation, the clutch will slip.
10. If the XRail does not raise up, then the clutch is set correctly.
11. If the XRail does raise up, then the clutch is too tight and must be loosened and tested again.

Repeat this test procedure.

You can validate the system with a 5lb weight for optimum setting.

The system should lift the XRail with 4-5lbs and slip at 10lbs.

Layout and Design

ALL XRail units must be Factory installed or Certified before use.

XRail will be mounted and tested for safe operation and then released for general use.

Please refer to your specific installation drawing for exact product layout and locations.

XRail is designed to provide fall protection Rail Guarding on platforms, walkways and stairs.



Never climb on handrails, during or after assembly.

Handrail systems are not designed to be stepped on or climbed upon in the RAISED UP position. This may cause damage to the handrail drive components. A slip or fall may result in serious injury.

It is your responsibility to communicate this important warning to all who come into the proximity of the handrails. This communication can include training and appropriate signage.

Operation

Please refer to your specific controls drawing for exact product controls.

Available controls – Pneumatic versus Electrical versus Fully Integrated



Pneumatic System in Hazardous Paint Environment

Electrical System for
120VAC to 480VAC



Fully Integrated, with PLC and HMI controls.

Operation con't

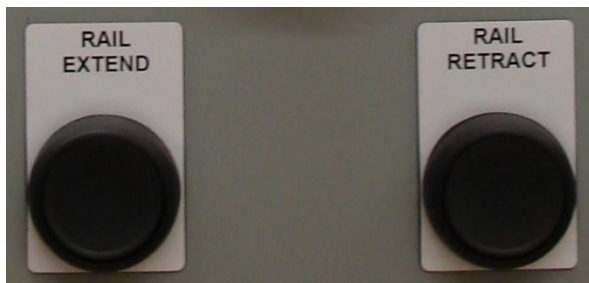
Operation is simple by initiating the XRail to move up or down.

Before beginning, please make sure the area is cleared and no objects are on top or in the travel path of the XRail. XRail is not a lifting device.

If the product does not operate correctly, stop all operations and refer to the Maintenance Manual for troubleshooting.

Operating the UP or EXTEND command

Begin by pushing a button or a lever that is labeled XRail UP or EXTEND



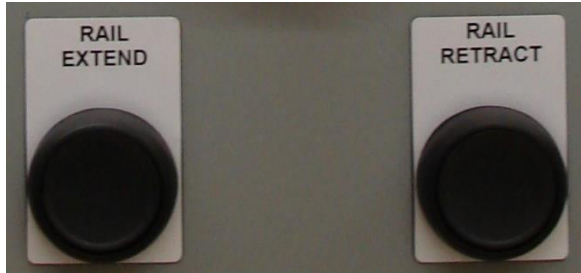
Hold the controls for the UP command until the XRail is in its fully upright or at a safe condition. A limit travel switch will safely stop at the highest travel distance.



Operation con't

Operating the DOWN or RETRACT command

Begin by pushing a button or a lever that is labeled XRail DOWN.



Hold the controls for the DOWN command until the XRail is in it's fully lowered or at a safe condition. A limit travel switch will safely stop at the lowest travel distance.



Please make sure the XRail is fully DOWN and flush with the platform floor.

Only when the XRails is fully DOWN can it support standard floor load of 60 psf.

Flush Mount

The XRail system can lower into a pocket on the floor eliminating tripping hazards, storage issues as well as allowing for workers and equipment to be easily moved in and out of work space.

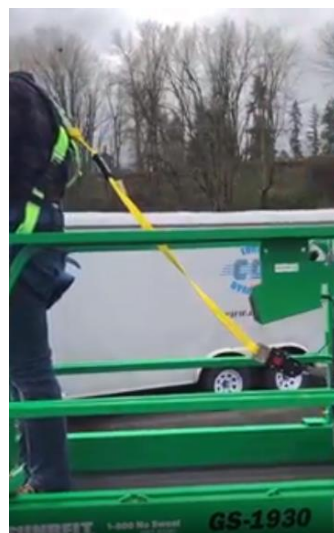


The XRail is in its safest position when in the fully up position to operate as handrail guarding.

When it is lowered it may create an unsafe environment. It is up to the integrators to make sure the environment and the state of the XRail height safe for the operator. At lower positions the Xrail becomes a barrier to help assist in fall protection scenarios.

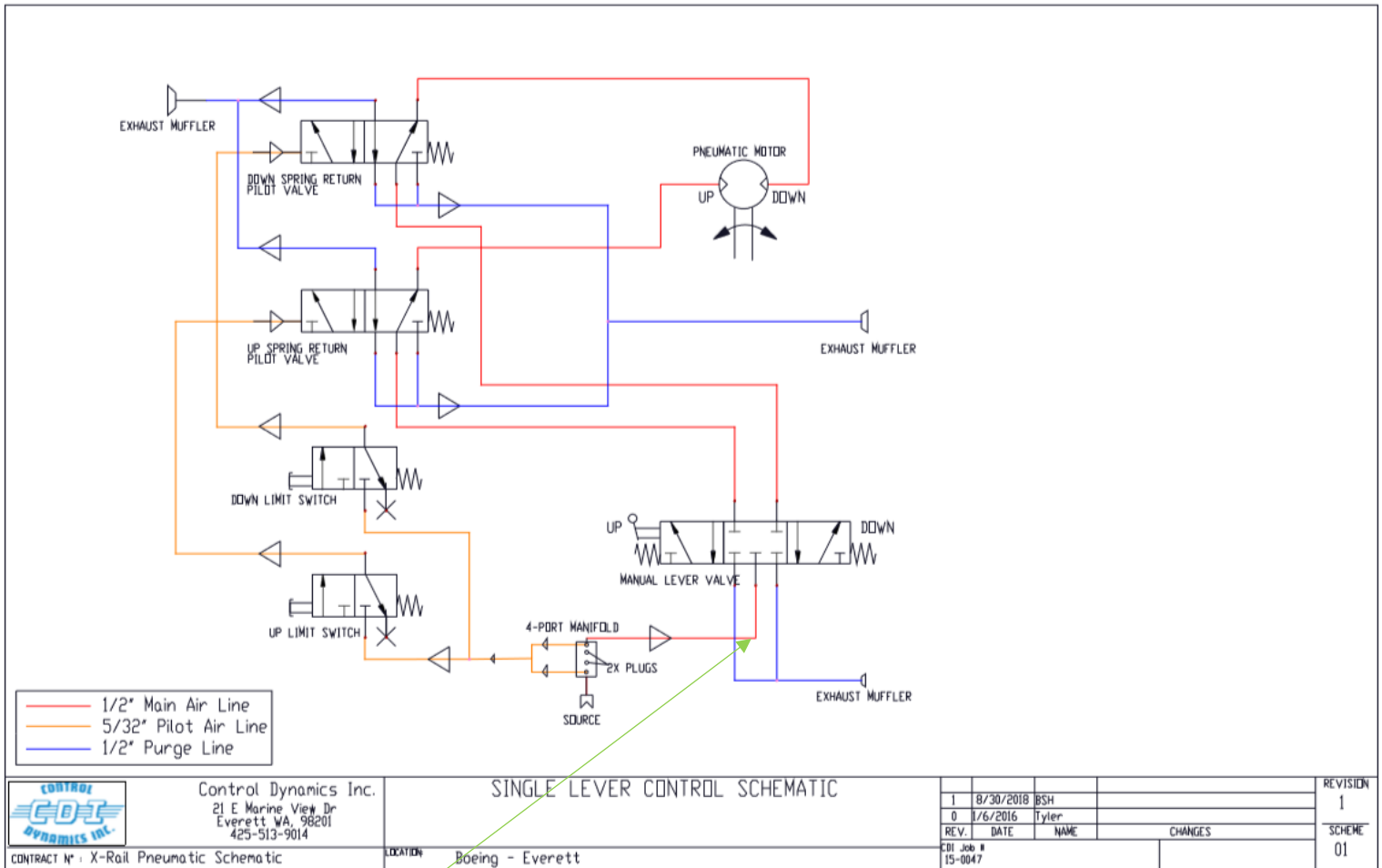
A Dead man's switch or keep alive switch is required to keep the operator from approaching a fall hazard when operating the XRail. See accessories for products to create an electrical or pneumatic safe control system.

After the XRail is lowered, the environment should be safe from fall hazards, if not we recommend using our Piranha Safety Fall Protection System. See accessories for more information.



Duty Cycle – Recommended 50% in between each Cycle

Typical Pneumatic Schematic

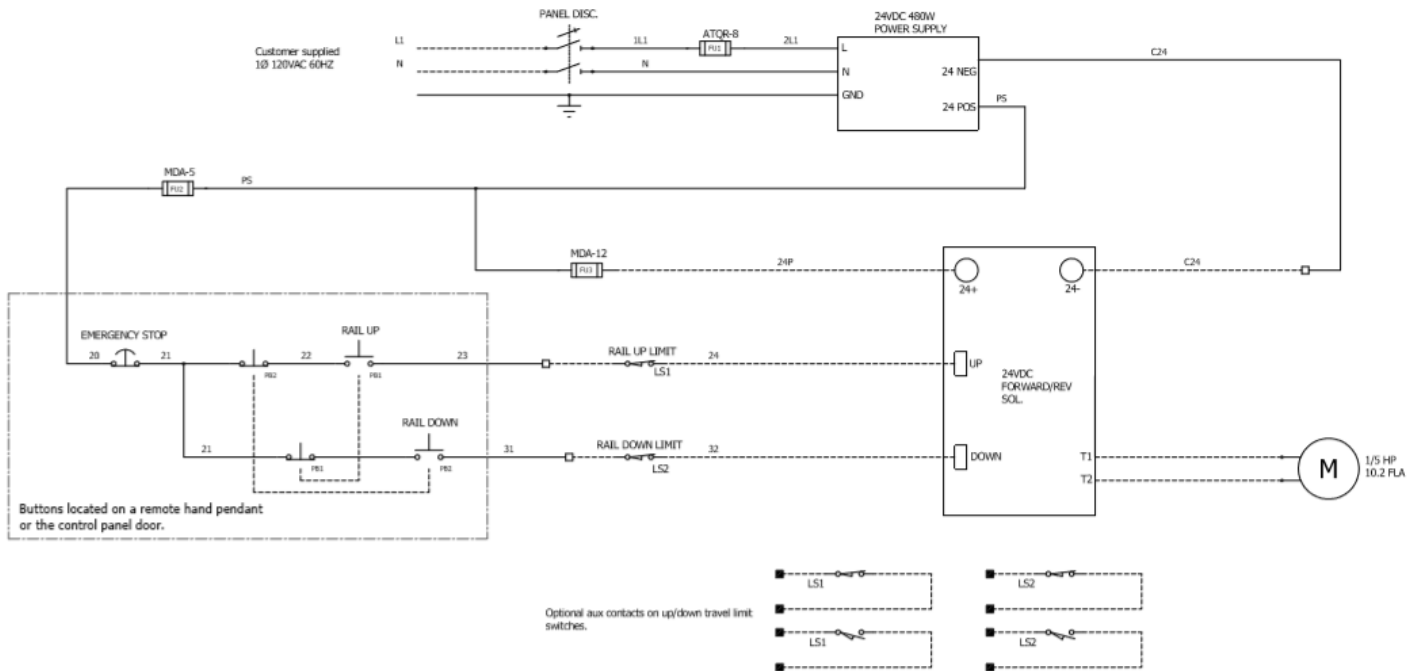


Please check that source air is clean and is powering the Manual Lever Valve.

Drawings and Troubleshooting con't

Typical Electrical Controls Schematic

This drawing is for a general concept of operation and integration only. It shows a basic concept of design for a completed pre-wired rail controller. Either with a pendant or a local control enclosure.
 This drawing is NOT approved for construction purposes!



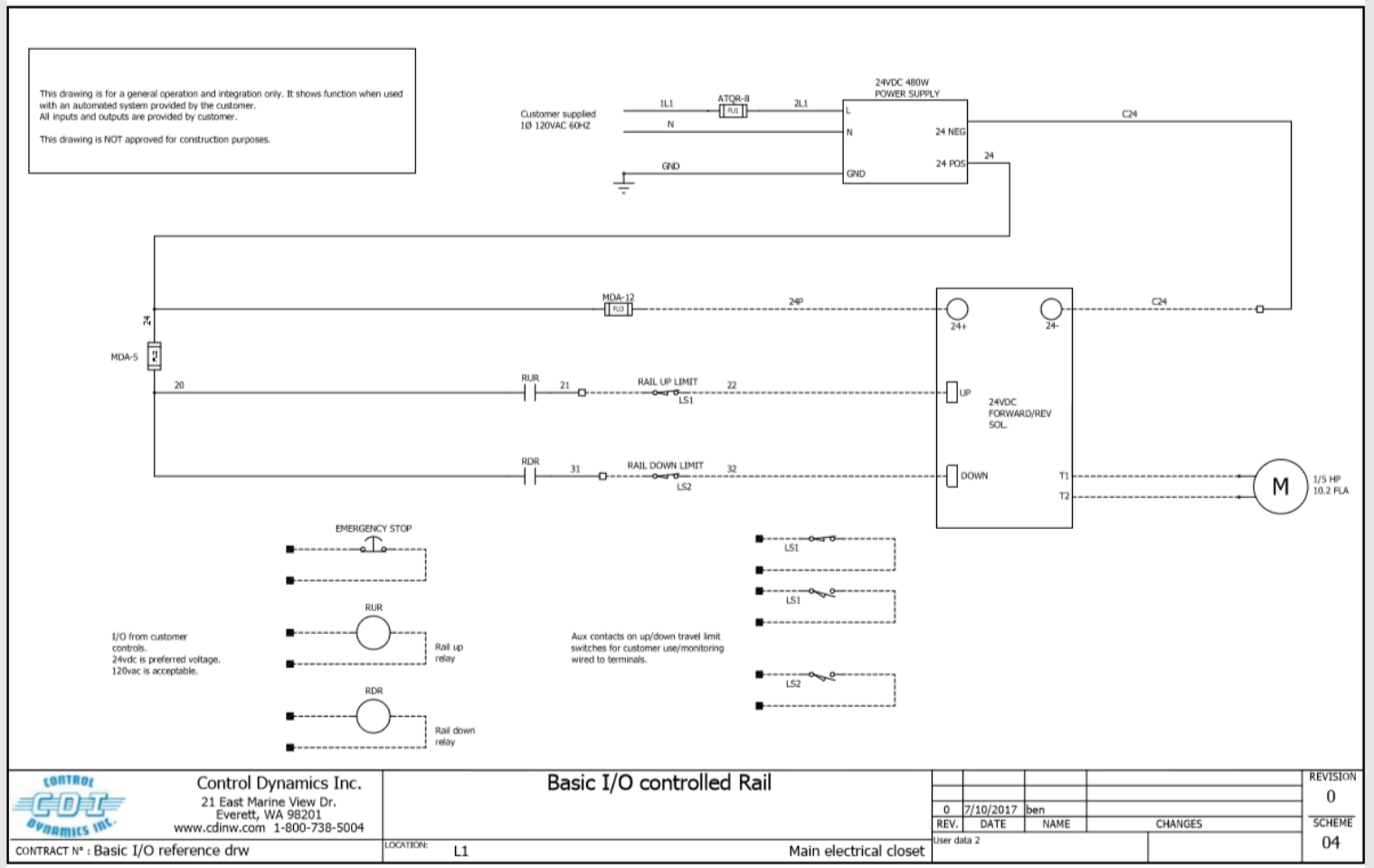
	Control Dynamics Inc. 21 East Marine View Drive Suite G Everett, WA 98201 1-800-738-5004 cdinw.com	Basic pre-wired rail	LOCATION: L1	Main electrical closet	Drawing #	REVISION 0 SCHEME 04
	CONTRACT N° : Local controls reference drawings	REV. 0 DATE 12/16/2017 NAME Ben	CHANGES	Drawing #	Drawing #	Drawing #



Please check the inline fuses are still good and power is still on.

Drawings and Troubleshooting con't

Typical Electrical I/O Schematic



Please check the inline fuses are still good and power is still on.

Accessories

Available Accessories that can be added to a standard XRAIL

Pneumatic, Electrical, PLC integrated Auto Controls. See [Appendix C](#) for more details



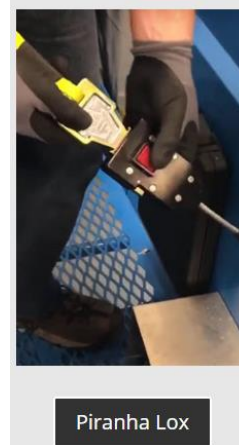
XRAIL Xtreme lightweight model. Maximized for minimum weight, but still with the same safe attributes. Professional Engineered Stamped Stress Documents Available for Purchase. See [Appendix D](#) for Cover page



XRAIL Curtains – Provide FOD Protection to the area directly behind or in front of the XRail. See [Appendix E](#) for more details



Piranha Safety Fall Protection System See [Appendix F](#) for more details



Piranha Lox



Final Inspection and Maintenance

Listing of installer's names and dates

DATE IN-SERVICE:	
ASSEMBLED BY: (PRINT NAME)	
SIGNATURE:	
COMPANY:	
INTENDED USE OR OTHER RELEVANT DETAILS:	

DATE:	
INSPECTED BY:	
NOTE CONDITION OF:	
UPRIGHTS:	
UPRIGHT RAIL CONNECTORS:	
RAILS:	
OTHER MISC PARTS:	
NOTES:	

DATE:	
INSPECTED BY:	
NOTE CONDITION OF:	
UPRIGHTS:	
UPRIGHT RAIL CONNECTORS:	
RAILS:	
OTHER MISC PARTS:	
NOTES:	

Appendix A

Patent



US009745762B2

(12) **United States Patent**
Moran

(10) **Patent No.:** US 9,745,762 B2
(45) **Date of Patent:** Aug. 29, 2017

(54) **VERTICALLY RAISING SAFETY RAIL**
(71) Applicant: **Control Dynamics, Inc.**, Everett, WA (US)
(72) Inventor: **Eric M. Moran**, Camano Island, WA (US)
(73) Assignee: **Control Dynamics, Inc.**, Everett, WA (US)
(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 26 days.

USPC 182/113
See application file for complete search history.

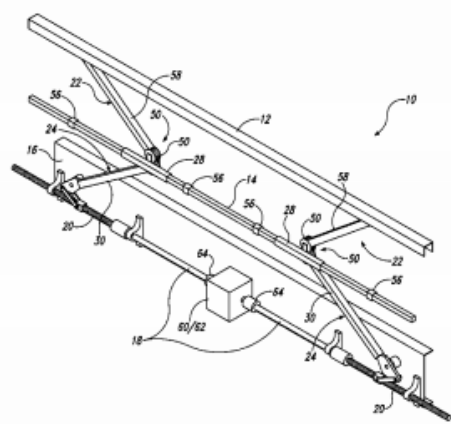
(56) **References Cited**
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984,063 A 2/1911 Berg
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3,160,228 A * 12/1964 De Witt Steed E04G 1/22
108/147
3,309,086 A * 3/1967 Viets A63D 5/04
14/45

(21) Appl. No.: **14/689,970**
(22) Filed: **Apr. 17, 2015**
(65) **Prior Publication Data**
US 2016/0145881 A1 May 26, 2016

(Continued)
FOREIGN PATENT DOCUMENTS
FR 2699208 6/1994
NL 1031600 10/2007
WO WO 2012103579 * 8/2012
Primary Examiner — Daniel Cahn
(74) *Attorney, Agent, or Firm* — Lane Powell, P.C.

Related U.S. Application Data
(60) Provisional application No. 62/085,147, filed on Nov. 26, 2014.
(51) **Int. Cl.**
E04G 5/14 (2006.01)
E04F 11/18 (2006.01)
E04G 21/32 (2006.01)
(52) **U.S. Cl.**
CPC *E04G 21/3228* (2013.01); *E04F 11/1865* (2013.01); *E04G 5/142* (2013.01); *E04F 2011/1876* (2013.01); *E04G 21/3266* (2013.01)
(58) **Field of Classification Search**
CPC E04G 21/32; E04G 5/14; E04G 5/142; E04G 21/3228; E04G 2005/148; E01F 13/00; E01F 13/04; E01F 13/046; E01F 13/048; E04H 5/06; E04F 11/1865

(57) **ABSTRACT**
A vertical raising safety rail having a moveable top rail, a base, a movable center rail assembly positioned above the base and below the top rail, a drive shaft, and a motor that provides rotational power to the drive shaft. The safety rail further includes a pair of spaced apart lower linkage arm assemblies that is operatively connected to the base and to the center rail assembly and configured to raise or lower the center rail assembly relative to the base when a rotational force is applied to the drive shaft. The safety rail also includes a pair of spaced apart upper linkage arm assemblies that is operably connected to the center rail assembly and to the top rail. The upper linkage arm assemblies are operably connected to corresponding lower linkage assemblies and are configured to move the upper rail relative to the center rail assembly. When the rotational force is reversed, the safety rail collapses into a compact footprint.
26 Claims, 14 Drawing Sheets





Appendix B

Specific Customer Drawing Layout

Will be available if requested, but may be a part of the Integrator's Layout

Appendix C
Specific Controls



Pneumatic controls for Class 1 Div. 1 environment. And cut out decals.



Electrical controls for factory environment with keyed supervisor override switch.



Automated controls with integrated PLC or HMI with Display



Appendix D

Signed Stress Book Cover Page

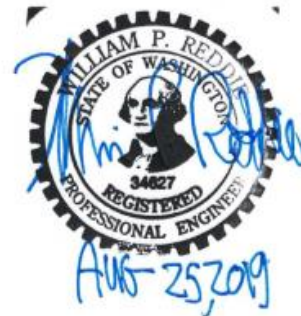
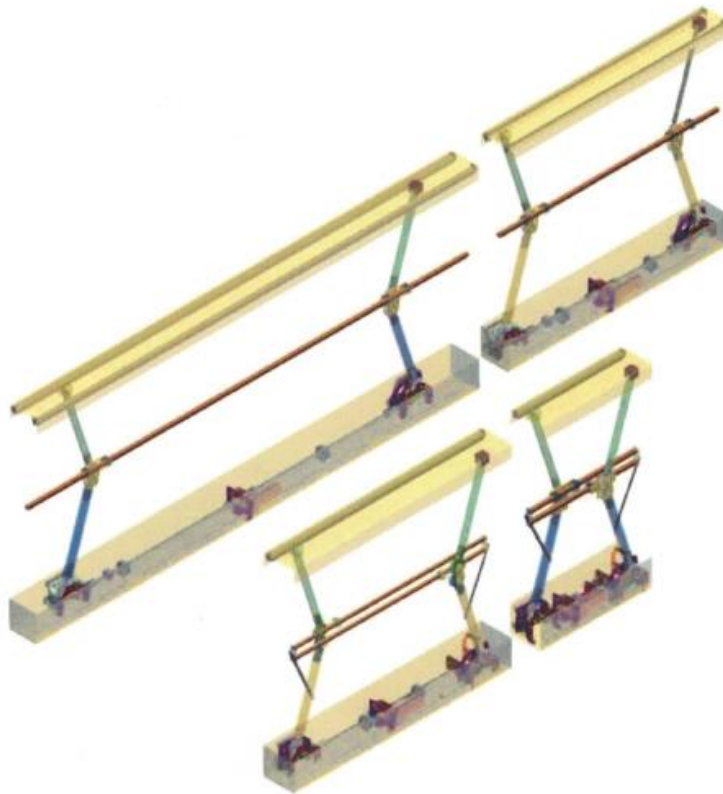


X-Rail 30" thru 120" Standard (Electric Gearmotor)

SAR-CDI-04-0901-030_120

Stress Analysis Report

PREPARED BY:	W. Reddie	08/25/2019
CHECKED BY:	C.Vando	10/30/2019
APPROVED BY:	W. Reddie	08/25/2019



Data Specification

The XRail curtains purpose is to provide FOD protection to the area directly behind or in front of the XRail.



Technical Specifications

DETAIL	DATA
Product Name	180z PVC Polyester FR
Type of Good	1000 x 1300 Denier Polyester
Coating	PVC 60/40 Front/Back
Finish	Dyed
Fire Retardant Rating	NFPA 701-2
CHARACTERISTICS	DATA
Total Weight (oz/sq yd)	18+/-1.0 OSY
Fabric Thickness (inches)	0.02
Tensile Grab Strength	
Warp (lbs/in ²)	480
Fill (lbs/in ²)	500
Tongue Tear Strength (ASTM D2261)	
Warp (lbs/in ²)	90
Fill (lbs/in ²)	70
Adhesion Strength (ASTM D2724) (lbs/in ²)	18
Temperature Resistance	-40 to 150 °F
UV Resistance	Excellent for exterior applications

PIRANHA SAFETY FALL PROTECTION SYSTEM



PIRANHA LOX® is the first of its kind, patent pending intelligent fall protection system that dramatically reduces operating safety concerns. The Piranha Lox true interlocking system communicates with all MEWP (mobile elevated work platforms) such as boom and scissors lifts, with the use of Bluetooth® technology, or by being hard wired directly to the foot switch or E-Stop operator. The Piranha Lox system is the only fall protection product that identifies the proper and safe connection of a worker to an approved anchor point, before allowing the operation of the MEWP.

AWARD WINNING

In partnership with The Boeing Company, the Piranha Lox was the Recipient of the 2017 National Safety Green Cross Award for Innovation.



Secure Connection

With our patent pending technology, The Piranha Lox is the only fall protection system in the world that is designed to prevent the operation of a MEWP without a proper connection.



Intelligent System

Quickly convert a boom or scissor lift into a safer elevated work platform by easily attaching either our Hardwired or Bluetooth Piranha Lox system.





Appendix G

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