

RDI

Flow Control | Energy Services | Fabrication

&

RIG-IT[®]

RESTRAINT



ENGINEERED RESTRAINT SYSTEM





About RDI

RDI is a North American manufacturer of high pressure and low pressure piping and manifold systems, with headquarters in Alberta. RDI also offers full-service Inspection and Recertification facilities strategically located throughout Canada and the US. We provide our clients with product sales, custom design and fabrication services, and complete aftermarket service and support for all pressure pumping and flow control equipment.

RDI's Engineering and Design department utilizes the latest technologies in developing and maintaining product standards. RDI is proud to have achieved ISO certification and API licensing, standards critical to meeting our stringent quality objectives. In collaboration with Engineering and Design, RDI's Welding and Fabrication facility manufactures flow control packages, custom skids, and custom orders. Whatever the request, RDI makes it happen.

RDI's Inspection and Recertification facilities are located in Alberta, British Columbia, Pennsylvania, Colorado and North Dakota. All inspections and re-certifications are completed by highly qualified technicians. Once tested, all equipment is entered into our Iron Management System, which allows clients to track asset service histories online.

At RDI, our mission is to provide new and existing clients with on time delivery of quality products and services while continually pursuing customer and employee excellence. When you choose RDI, you are working with the preferred North American manufacturer of flow control products, a company that provides unmatched equipment quality and reliability



About RIG-IT

The RIG-IT® Restraint system is manufactured by Canyon Rigging; a family owned and operated business which started in 1998 in the foothills of Southern Alberta. Their head office is now located in Calgary, Alberta. Owner Gregg Hampton has been in the rigging industry since 1978, bringing 40 years experience to Canyon Rigging. Their company president Daniel Harris together with Gregg believe in employing local people and in turn gain an advantage over the competition when it comes to quality. The staff at Canyon Rigging take pride in what they do. They manufacture and assemble a wide range of rigging products from lifting and pulling to securing. At Canyon Rigging they specialize in custom rigging, and have the ability to make certified rigging to fit your needs. Canyon Rigging manufacture and distribute rigging products across Western Canada and through out the USA. Although their focus is mainly in the energy sector, they service all industries requiring rigging.

RIG-IT is a PROUD MEMBER OF THESE ASSOCIATIONS



About the RIG-IT Engineered Restraint System

The RIG-IT® restraint system is a series of lightweight restraints used to minimize the effects of a catastrophic break with high pressure temporary pipe. This system is used to restrain high pressure flow lines and it is critical that the operators are trained and certified with all aspects of the intended use.

RIG-IT® restraints are engineered and designed for a multiple of pressures and pipe size. It's important to select the correct restraint for the intended purpose. It's imperative to use and maintain this product properly. Any restraints that show signs of damage should be removed from service and replaced.

RIG-IT® restraints are made from a Ultra-High Molecular weight polyethylene fibre. It is comprised of extremely long molecules (chains) of polyethylene oriented in the same direction, which results in large areas of overlap between the molecules. This overlap greatly increases the bond between the molecules and thereby, the strength of the cordage is greatly increased.

RECERTIFICATION

A detailed recertification and inspection are required periodically by the manufacturer or certified distributor. This period shall not exceed 12 months and is recommended every 6 months under high use.

A good practice is to rectify your restraints at the same time the iron is obligated for recertification and inspection. The recertification will include a thorough visual inspection and load testing using a hydraulic pull testing bed.

RDI and RIG-IT have recertification facilities in both Canada and the USA so no matter where you are in North America, we have you covered for all of your new product and recertification needs.



INSPECTION & REJECTION CRITERIA

If 5% or greater damage has occurred, the restraint should be removed from service immediately. Damage may include, rips, tears, cuts, snags, general abrasion or any other defect changing original construction of the cordage.

If restraints have a protective sleeve installed, examine the sleeve for cuts exposing the fibres. If any damage can be seen to the underlaying fibres, remove restraint from service. Protective sleeve may also be slid down the rope making visual inspection on the fibre possible. Sleeve shall then be slid back in place to cover the body of restraints.

A visual inspection for damage shall be performed by the user prior to use each day or shift.

NOTE: visual inspection will require examination of the exterior, looking for any rejection points. Magnification may be required.

A complete and detailed inspection shall be performed periodically by the manufacturer, requiring written records of inspection. This period shall not exceed 12 months and is recommended every 6 months under high use. This inspection will include a thorough visual inspection and load testing using a hydraulic testing bed.

VISUAL INSPECTION FOR RESTRAINTS

- Excessive wear
- Broken strands
- Manipulation of rope construction
- Severe abrasion
- Kinking
- Acids or caustic burns
- Melting or charring
- Tears
- Cuts
- Snags
- Splice damage
- Identification tag

SHACKLE REJECTION CRITERIA

- Missing or illegible identification
- 10% or more reduction of original dimensions
- Excessive nicks, gouges, pitting and corrosion
- Loose or missing nuts, bolts or cotter pins
- Heat damage
- Stretching
- Cracks
- Bends
- Twists

HMPE ROPE

HMPE rope is a gel-spun, multi-filament fibre produced from ultra high molecular weight polyethylene. Main characteristics include: high strength, low weight, low elongation at break, and resistant to most chemicals.

Chemical resistance

Resistance to acids		Excellent*
Resistance to alkali		Excellent*
Resistance to most chemicals		Excellent*
Resistance to water		Excellent*
Aviation Jet A fuel	RTCA DO160	Excellent
(ISO 1817 test liquid F)		Excellent
Hydraulic fluid (ISO 1817 test liquid 103)	RTCA DO160	Excellent
Lubricating oil (ISO 1817 test liquid 101)	RTCA DO160	Excellent
Solvents and cleaning fluid (Isopropyl alcohol)	RTCA DO160	Excellent
De-icing fluid (Ethylene glycol)	RTCA DO160	Excellent
Insecticide (Pyrethroid pesticide)	RTCA DO160	Excellent
Fire extinguishant (Protein, Fluoroprotein)	RTCA DO160	Excellent

Thermal

Melting range	144 - 152	°C
Decomposition temperature	> 300 No limit	°C
Advised lowest temperature	7	°C
Advised long duration temperature limit	130	°C
Advised short duration temperature limit (non-constrained fiber)	145	°C
Advised short duration temperature limit (constrained fiber)	- 12 x 10 ⁻⁶	1/K
Coefficient of linear thermal expansion	1850	J/kg.K
Specific heat capacity		
Thermal conductivity (axial)	20	W/m.K
Thermal conductivity (transverse)	0.2	W/m.K

Chemical resistance

Relative to 23°C	-60°C	+23°C	+60°C	+100°C
Tensile strength	110%	100%	80%	55%
Tensile modulus	110%	100%	85%	60%
Elongation at break	90%	100%	100%	105%

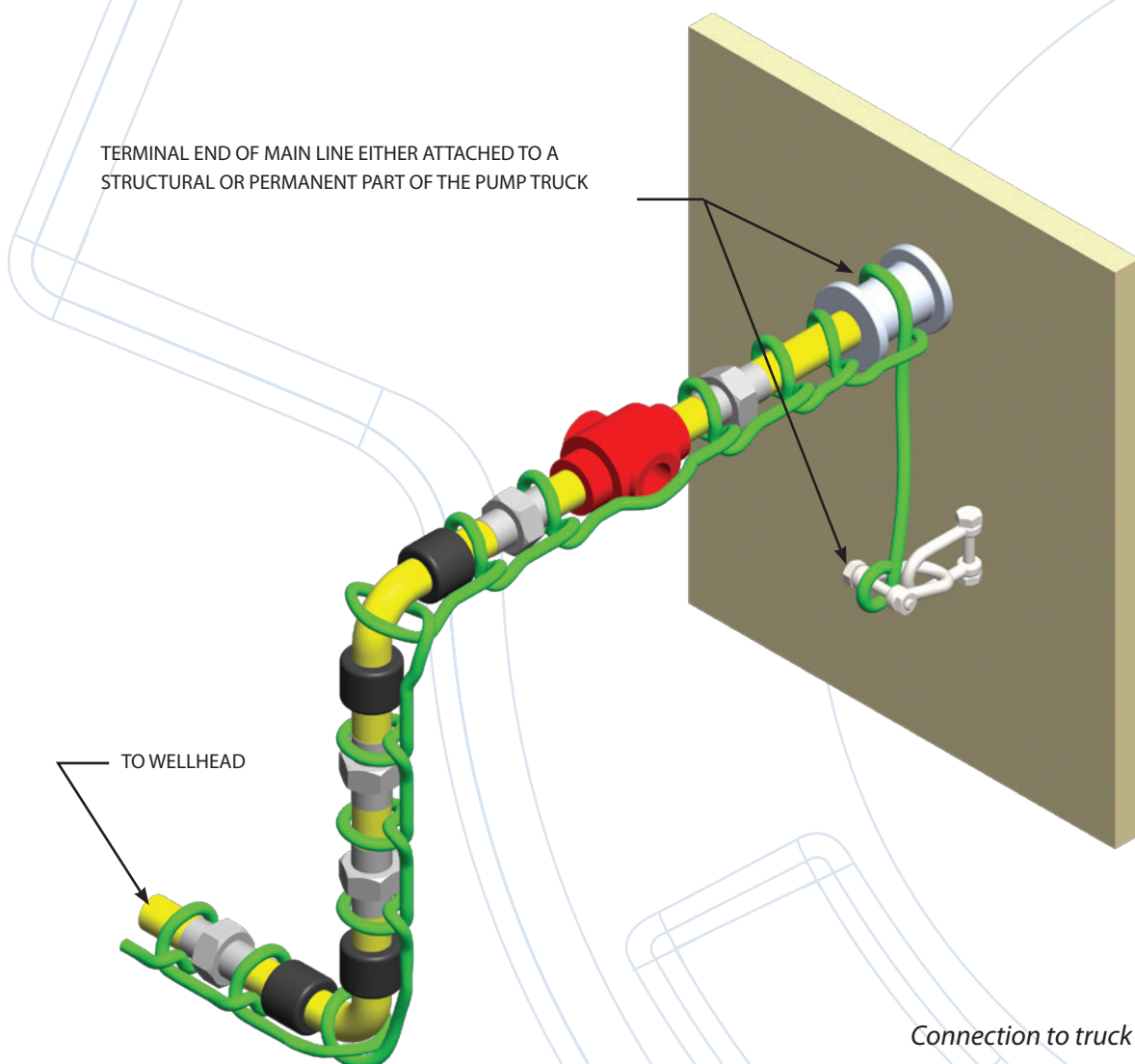
Mechanical

Free breaking length	378	km
Axial tensile strength	3.6*	GPa
Axial tensile modulus	116*	GPa
Axial compressive strength	0.1	GPa
Axial compressive modulus	116	GPa
Transverse tensile strength	0.03	GPa
Transverse modulus	3	GPa
Transverse compressive strength	0.1	GPa
Elongation at break	3 - 4 %	
Work to break	45 - 70	MJ/m3
Creep at 30°C, 300 MPa (Dyneema® SK 75)	0.02*	%/day
Creep at 30°C, 300 MPa (Dyneema® SK 78)	0.006*	%/day

High Molecular Polyethylene in 12 strand rope form is an extremely high strength steel cable replacement, which has very little stretch and is light weight and naturally buoyant in water. It is lighter and safer to handle with bare hands than steel cable. This is why we use this fibre.

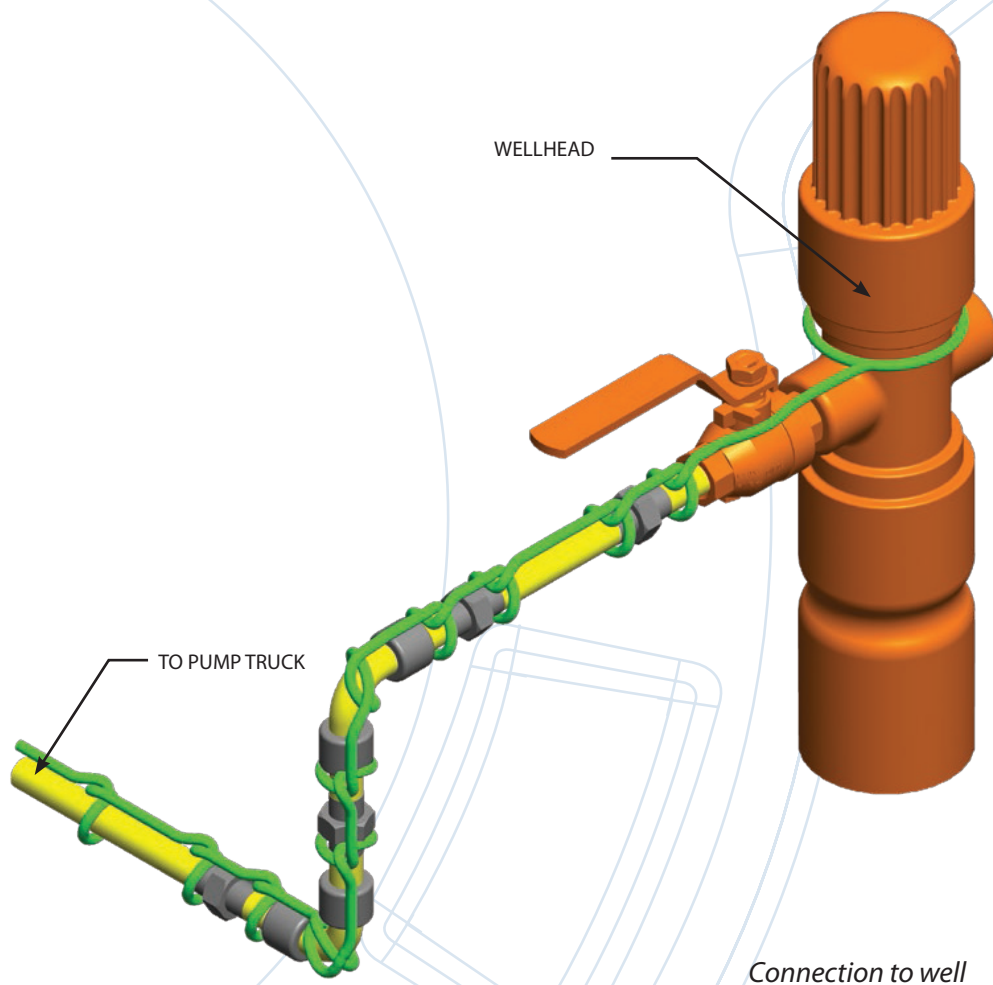
CONNECTION TO THE TRUCK

Connect the restraint line to a fixed point on the pump truck. This connection point is required to have a hold strength to be equal or greater than the force projected by a line separation. Ask in house engineers if the lifting points from the pump are adequate or connecting to the structural truck frame is advised. The connection can be done using an appropriate shackle or by choking the restraint around the object. NOTE: if choking the restraint, the size of the choke may not exceed the length of the restraints eye. For better results keep the restraint connection point close to the iron connection. Keep appropriate tension on the connection and restraint line.



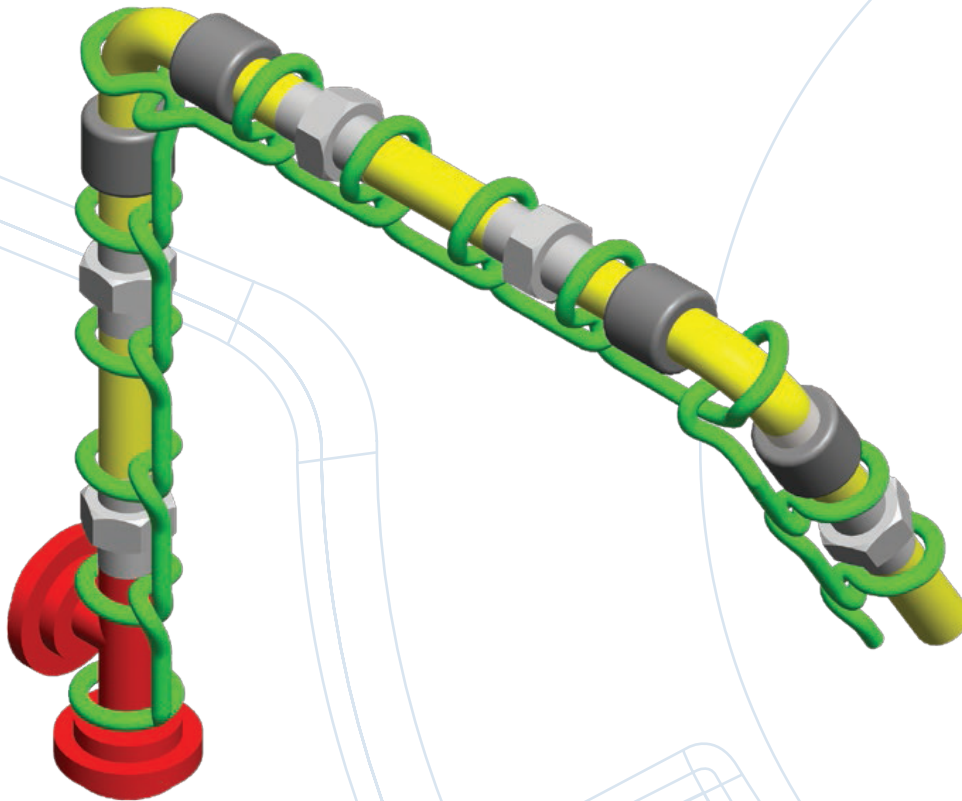
CONNECTION TO THE WELLHEAD

Much like connection to the truck, connect the restraint line to a fixed point on the wellhead. This connection point is required to have a hold strength to be equal or greater than the force projected by a line separation. The connection may be done by wrapping a restraint around the Wellhead in a “basket” application and connecting both eyes into the proceeding restraint end. NOTE: This can only be done if there is no risk of the restraint becoming removed from the wellhead. If choking the restraint to an appropriate connection point, the size of the choke may not exceed the length of the restraints eye. For better results, keep the restraint connection point close to the iron connection. Keep appropriate tension on the connection and restraint line.



INSTALLATION ON IRON

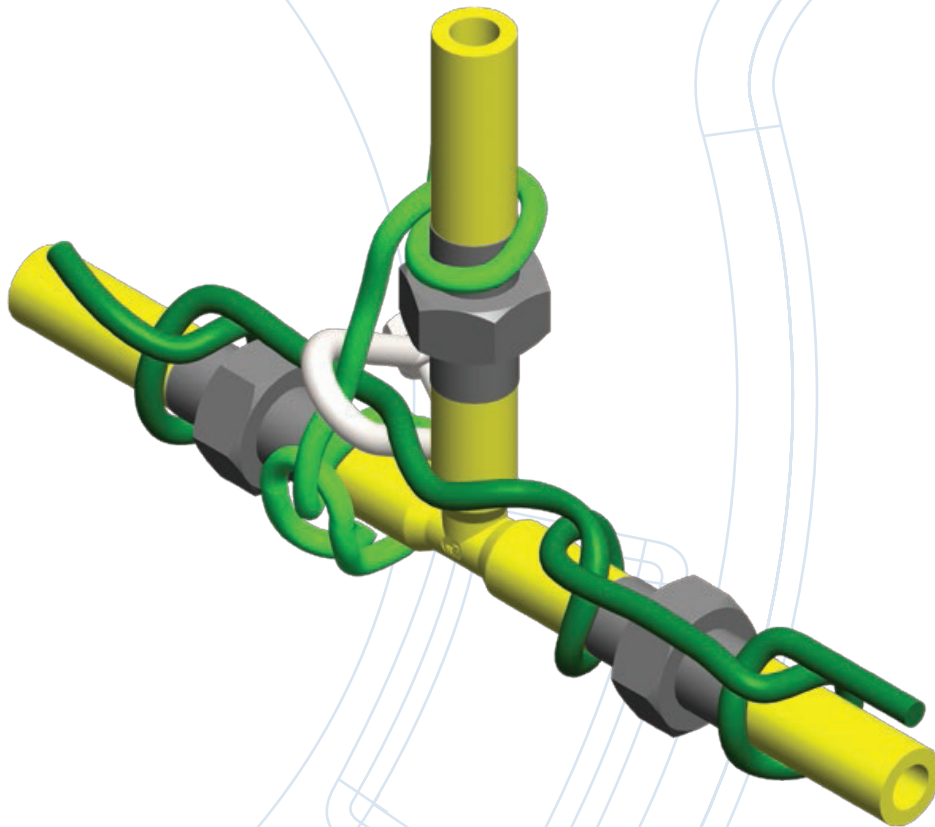
When rigging in restraints on the iron, the restraint will run parallel to the iron. Half hitches can be used after each section of the iron is joined. Hitches are to be installed before and after each hammer union or each potential failure point. Each segment of the chiksan will require individual hitches for accurate installation. Keep the tension throughout the restraint system to provide tight half hitches. Each section of iron should have a half hitch, or one of the three connection secured around it. See connecting restraints for connection options. Long joints may require additional hitch to insure tension and provide a securement around the iron with spacing no longer than 4 feet apart.



Iron installation

"T" INSTALLATION

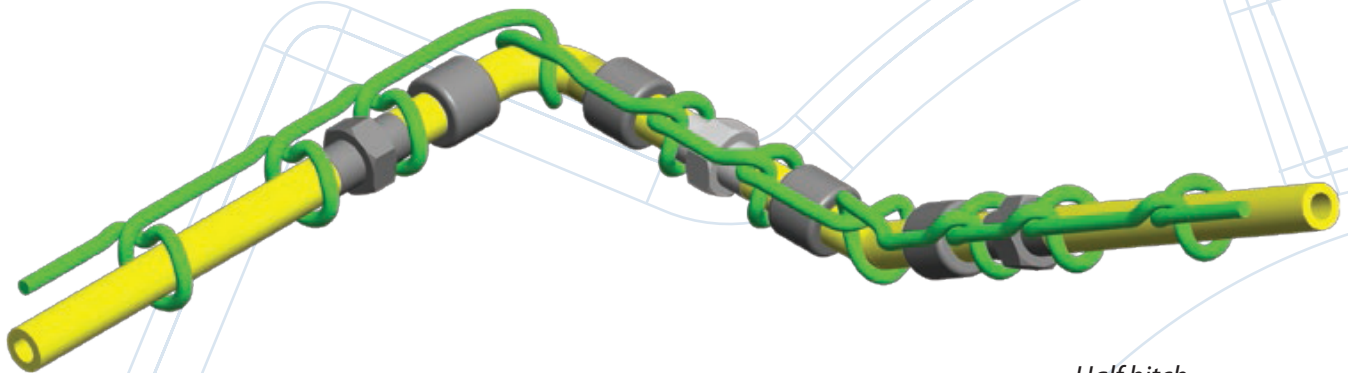
When rigging in a 'T' you will need to introduce a 2nd line. The primary line will be running along the top side of the 'T'. The secondary line can be choked around the top side of the 'T' and then continued down the stem of the 'T'. Keep connection of restraint prior to the 'T' and after the 'T'. This will allow for more space to rig in the 2nd line without being congested by the eye of a restraint and additional shackle. Secure the iron on both side of the flanged joints and one side of the top of the 'T'. Introduce the 2nd restraint on the other top side of the 'T' by choking around the top side. The 2nd restraint can be run down the stem of the 'T'. Secure the union on the joining side of the stem and continue rig in. Use appropriate shackle to connect the two restraints. Do not rig from one side of the 'T' and continue down the stem as it will not result in an accurate connection of the 2nd restraint.



"T" installation

HALF HITCH

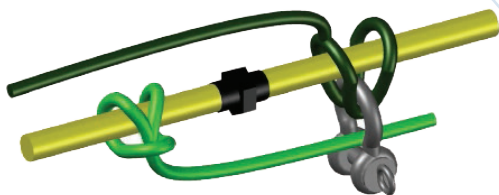
Form a loop around the object. Pass the end around the standing end and through the loop. Tighten into a half hitch.



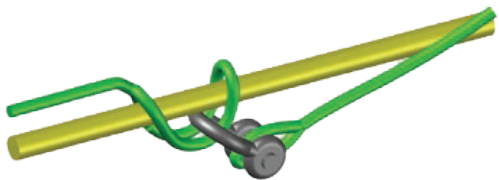
Half hitch

CONNECTING RESTRAINTS

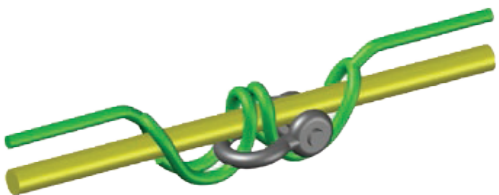
There are 3 recommended ways to connect individual restraints to each other. The 3 techniques are recommended as all three keep the restraints close to the iron. This eliminates trip hazards and also helps prevent the restraints from any damaging ground elements.



Choke overlapping saddle



Shackle to saddle and eye



Shackle to saddle saddle

STORAGE & MAINTENANCE

As the restraint system may be used in extreme environments, correct storage and maintenance is critical in the preservation of the restraints.

After use, and the individual restraints have been rigged out, keep the restraints packaged together. This will help eliminate theft, misplaced restraints and improper use of the restraints. In a clean environment or wash bay, you may use a pressure washer to remove any debris from the restraints. It is important not to place the nozzle too close to the restraints as the high pressure will damage the HMPE rope. Recommended distance is 36" to 48" depending on water pressure and stream. Soap and heated water can be used without harming the HMPE fibre as long as temperature does not exceed 140 degrees Fahrenheit (60 degrees Celsius).

Although the HMPE fibre can withstand prolonged durations of saturation without damaging the integrity of the rope, it is recommended that restraints are hung to air dry before being placed in storage. Once dried, store the restraint package together in a convenient location away from extreme high temperature and strong acids. Ask manufacturer for weatherproof storage bags.

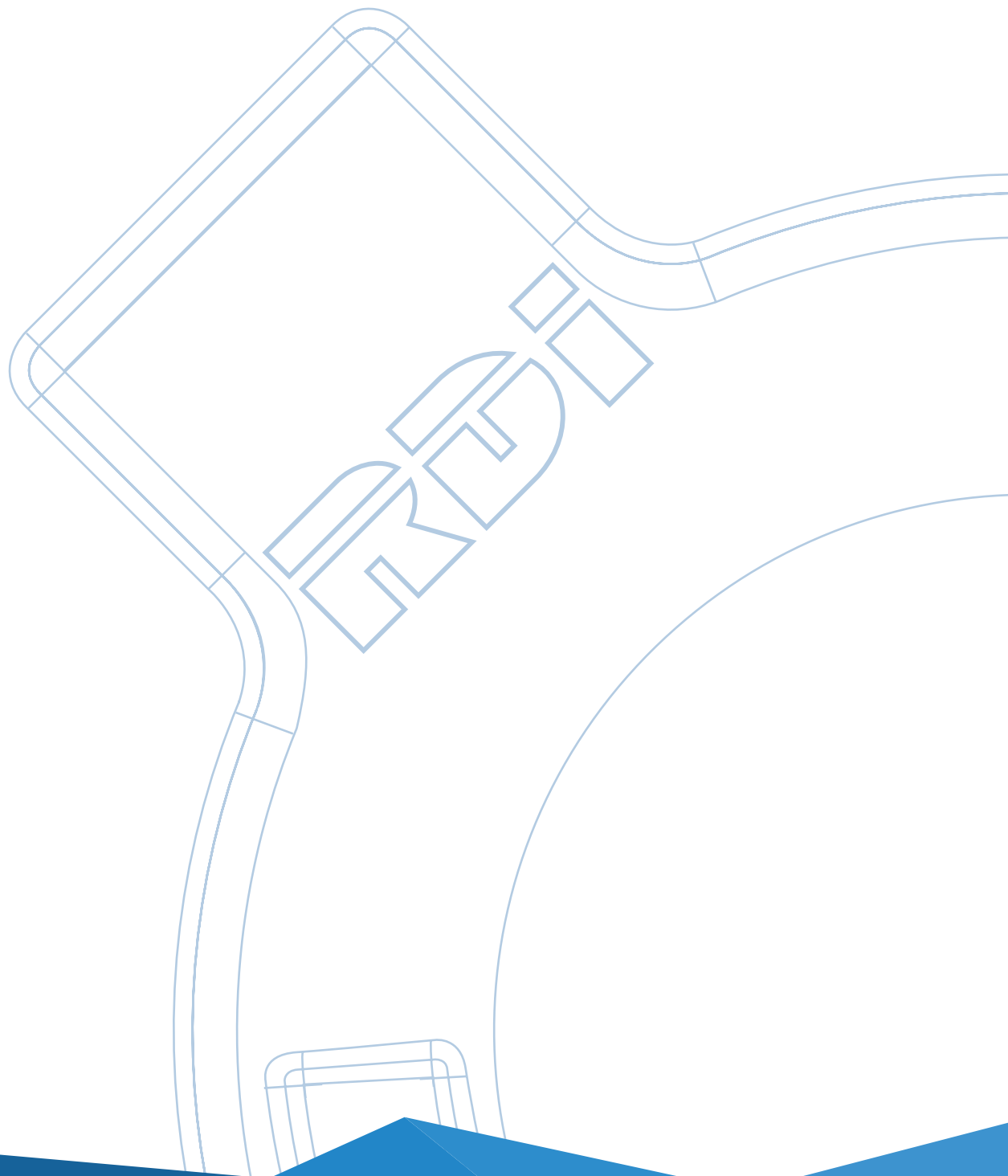


RESTRAINT SELECTION

Iron Size	Figure Number	Line Pressure (PSI)
2"	206	2,000
1"	1502, 1002	15,000
2"	1502, 1002	10,000
2"	1502	15,000
3"	1002	10,000
3"	1502	15,000
4"	1502	15,000
6"	1502	15,000

For situations exceeding the parameters of these figures, contact Canyon Rigging for further information. Larger systems are available.



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