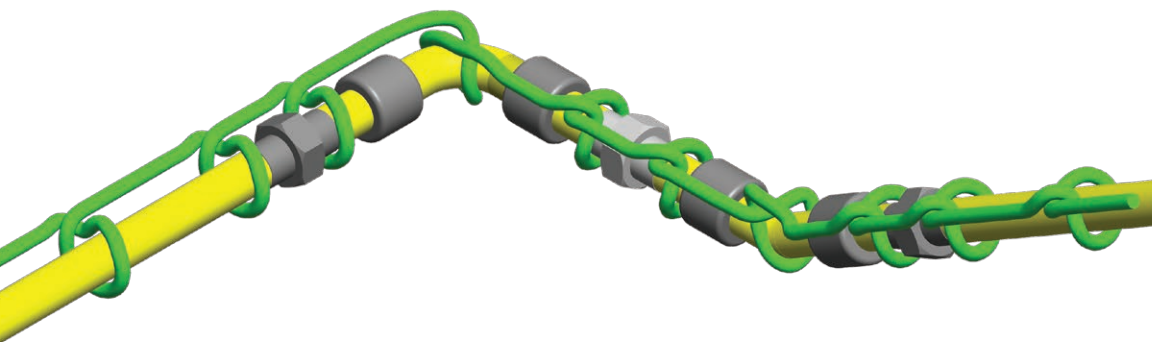


RIG-IT[®]
RESTRAINT

ENGINEERED RESTRAINT SYSTEM

PATENT PENDING



US PATENT NUMBER - 15,427,060

RIGITRESTRAINT.COM

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INTRODUCTION

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. See page 11.

It's imperative to use and maintain this product properly. Any restraints that show signs of damage should be removed from service and replaced. See inspection criteria on page 3.

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.

READ ALL INFORMATION IN THIS MANUAL BEFORE USING.



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 underlying 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

If any of the above is present, the restraint or shackle should be disposed of.



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 (ISO 1817 test liquid F)	RTCA DO160	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

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%

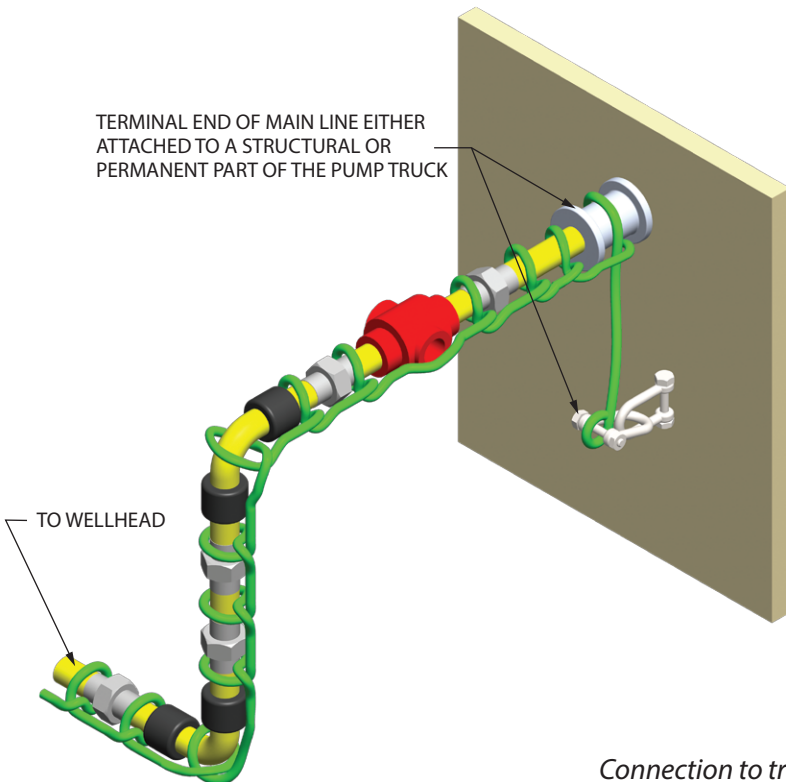
Mechanical		
Free breaking length	378	km
Axial tensile strength	3.6*	GPa
Axial tensile modulus	116*	GPa
Axial compressive strength	0.1	GPa
Axial compressive modulus	116	GPa
Transverse tensile strength	0.03	GPa
Transverse modulus	3	GPa
Transverse compressive strength	0.1	GPa
Elongation at break	3 - 4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

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

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 neutrally buoyant in water. It is lighter and safer to handle with bare hands than steel cable. This is why we use this fibre.

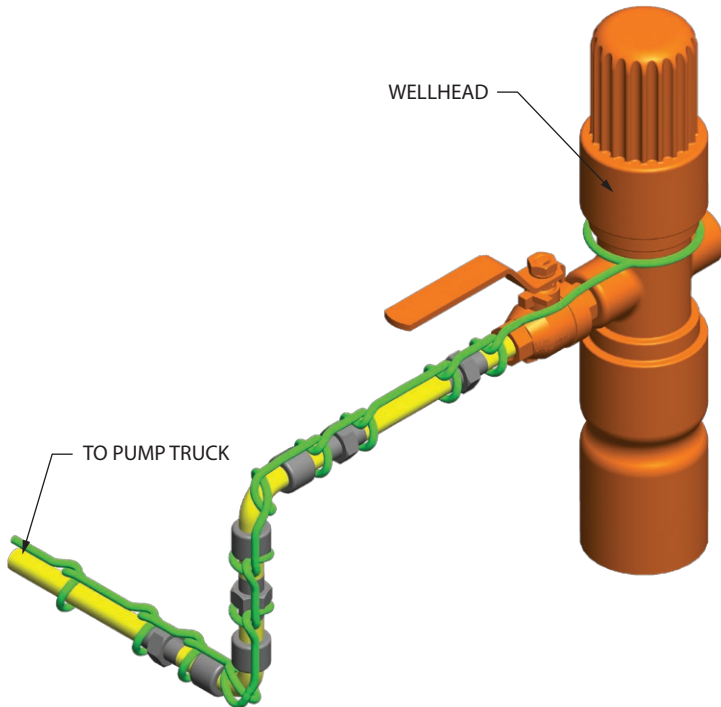
CONNECTION TO THE TRUCK

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

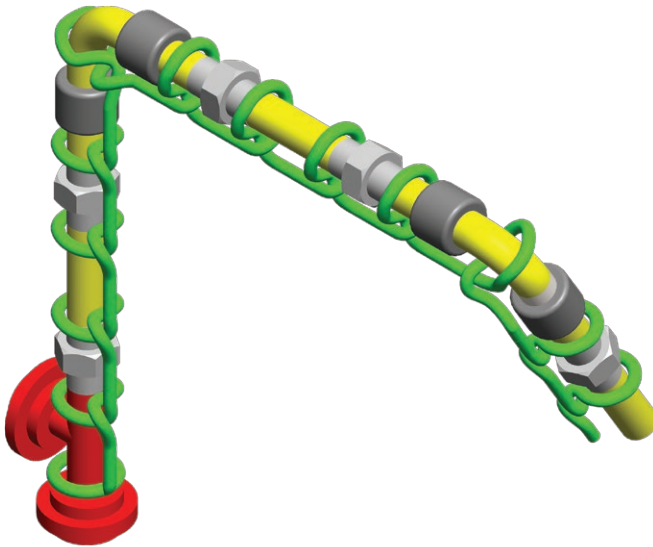
Much like connection to the truck, connect the restraint line to a fixed point on the wellhead. This connection point is required to have a hold strength to be equal or greater than the force projected by a line separation. The connection may be done by wrapping a restraint around the Wellhead in a “basket” 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 form 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.



Connection to well

INSTALLATION ON IRON

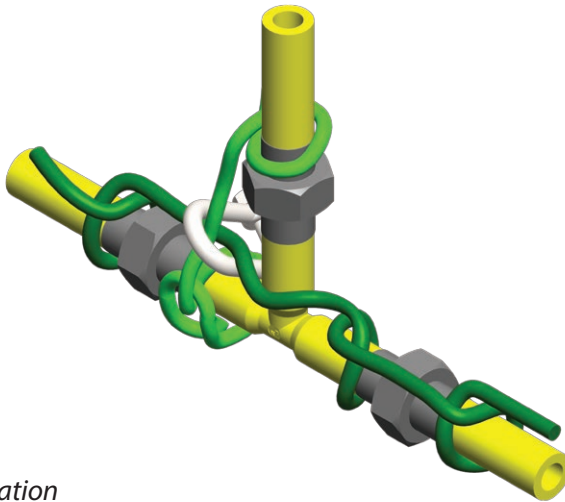
When rigging in restraints on the iron, the restraint will run parallel to the iron. Half hitches can be used after each section of the iron is joined. Hitches are to be installed before and after each hammer union or each potential failure point. Each segment of the chiksan will require individual hitches 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 addition hitch to insure tension and provide a securement around the iron with spacing no longer than 4 feet apart.



Iron installation

"T" INSTALLATION

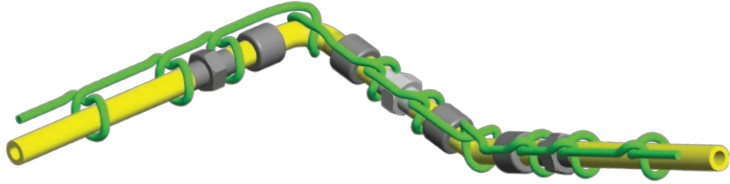
When rigging in a 'T' you will need to introduce a 2nd line. The primary line will be running along the top side of the 'T'. The secondary line can be choked around the top side of the 'T' and then continued down the stem of the 'T'. Keep connection of restraint prior to the 'T' and after the 'T'. This 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

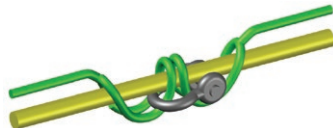
There are 3 recommended ways to connect individual restraints to each other. The 3 techniques are recommended as all three keep the restraints close to the iron. This eliminates trip hazards and also helps prevent the restraints from any damaging ground elements.



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

Product	Iron Size	Figure Number	Line Pressure (PSI)
R 4	2"	206	2,000
R 5	1"	1502, 1002	15,000
R 5	2"	1502, 1002	10,000
R 6	2"	1502	15,000
R 8	3"	1002	10,000
R 9	3"	1502	15,000
R 16	4"	1502	15,000
R 30	6"	1502	15,000

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





NOTES
