



Flexfence Tension Unit

with Hand Pump

Product Manual



Release 08/19

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1.0 Safety Precautions



Please also refer to the Risk Assessment on page 8.

1.1 Personal Protection

While operating this equipment it is recommended that the following personal protective equipment be worn;

- Long sleeve shirt and trousers or overalls
- High visibility vest or high visibility component included in clothing
- Gloves
- Face shield
- Steel capped protective footwear

To avoid personal injury keep hands and feet away from moving components during operation.

Read all instructions, warnings and cautions carefully. Follow all safety precautions to avoid personal injury or property damage during system operation.

Ingal cannot be responsible for damage or injury resulting from unsafe product use, or incorrect product and/or system operation. Contact Ingal when in doubt regarding safety precautions and operations.

Observe correct lifting techniques when handling the tension unit. The mass of the tension unit is 22kg. The mass of the pump is 8kg.

Always keep your body to the side of the pump, away from the line of force of the handle.

To reduce pump handle effort at high pressure, take short strokes. Maximum leverage is obtained in the last 5° of stroke.

1.2 Equipment Operation

The Ingal tensioning unit is designed only for the purposes described in this document. All other use is prohibited. Only use the hand pump supplied as the power source for this device. The use of a non-approved power source may cause damage to property or injury to persons.

Do not subject the hoses to any potential hazard such as fire, extreme heat or cold, sharp surfaces or heavy impact.

Do not use the hoses to move the attached tension unit or pump. Stress may damage the hoses and fittings.

Do not allow the hoses to kink, twist, curl or bend so tightly that the fluid flow within the hose is blocked or reduced.

The pump is fitted with a non-vented reservoir. If the reservoir is subjected to high pressure, the casing may rupture causing injury and/or damage to equipment. Do not overfill the reservoir. Instructions for adding fluid are contained in Section 3.3.

Never add extensions to the pump handle. Extensions cause unstable pump operation.

1.3 Site Safety

Identify the area where work is to be completed and clear area of debris so there are no trip hazards or other obstructions which may prevent the work being conducted in a safe manner and ensure suitable traffic control is in place.

All bystanders must keep a minimum safe distance of 2m from the equipment during operation.

2.0 Component Identification

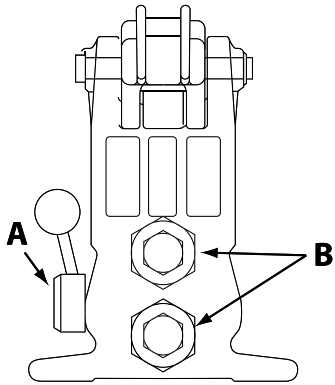


Figure 1: Hand Pump End View

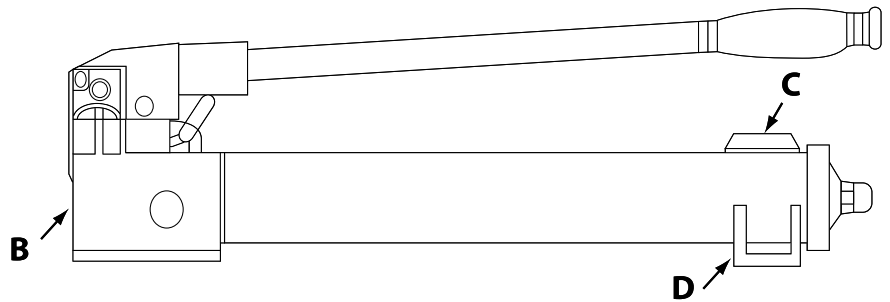


Figure 2: Hand Pump Side View

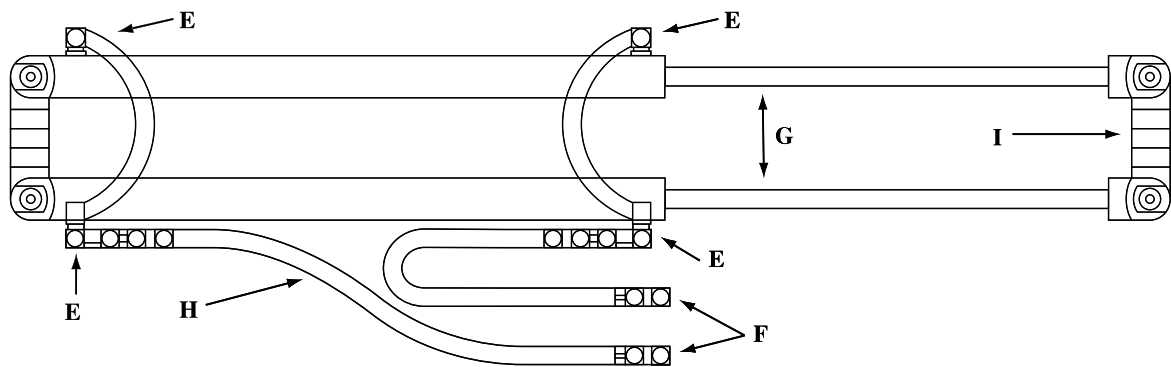


Figure 3: Tension Unit

Table 1: List of Components

Component ID	Description
A	Valve Handle
B	Outlet Ports
C	Vent/Fill Cap
D	Mounting Slots
E	Couplers
F	Hand Pump Couplers
G	Hydraulic Cylinders
H	Hydraulic Hoses
I	Pulling Bar

3.0 Before Use

3.1 Hose Inspections

Before operating the pump, check that all hose connections are tight. If loose, tighten with proper tools. Do not over tighten. Connections need only be tightened securely and leak free. Over tightening may cause premature thread failure or high-pressure fittings to split at pressures lower than their rated capacities

The hydraulic hoses are fitted with protective sheathing to prevent escaping hydraulic fluid from causing injury. Do not operate the pump if the sheathing is damaged or missing.

3.2 Connecting to the Pump

If the tension unit is disconnected from the pump, connect the couplers by pulling the cap of the female backwards and inserting the male connection. Once attached, pull the coupler slightly to ensure correct connection.

3.3 Hydraulic Fluid Level

The tension unit must be fully retracted prior to checking or adding fluid to the system. Failure to fully retract will result in adding more oil than the reservoir can hold. Only use Enerpac hydraulic oil to fill the reservoir.

1. Remove the vent/fill cap from the reservoir.
2. Fill the reservoir only to the mark shown on the pump. Remove air from the system if necessary (refer to section 3.4) and recheck oil level after removing air.
3. Return the vent/fill cap to the proper position and close finger tight only. Using tools can cause damage and pump malfunction.

The hand pump requires air in the reservoir to function properly. If the reservoir is completely filled, a vacuum will form preventing oil flow out of the pump.

3.4 Bleeding Air from the System

Air can accumulate in the hydraulic system during the initial set-up or after prolonged use, causing the cylinders to respond slowly or in an unstable manner. To remove the air;

1. Ensure the tension unit is securely connected to the hand pump. Extend and retract the cylinder several times without applying a load to the system. Air will be released into the pump reservoir.
2. To bleed air from the pump, turn the vent/fill cap ¼ turn counter clockwise to vent.

4.0 Operation

4.1 Two-Stage Pump

Under no load, the pump operates in the high flow first stage for rapid advance. When the load is contacted, the pump automatically shifts to the second stage for building pressure. When the pump pressure reaches approximately 28 bar, you must momentarily stop pumping and raise the handle to shift to the high pressure stage. After the pump shifts, pumping takes less effort.

For best performance, operate pump handle at moderate speed during the high flow first stage. Rapid handle speed in the first stage will prevent the pump from delivering full volume of oil.

4.2 Tension Unit Operation

The pump is to be operated in a horizontal position. To extract the tension unit, push the valve handle into the closed position and operate the pump handle. Extract until the desired measurement is achieved for placement on the wire rope barrier tension bay.

To retract the tension unit, push the valve handle into the open position and operate the hand pump.

Always ensure the tension unit is fully retracted prior to transportation. This will prevent damage to the cylinders.

4.3 Tensioning the Wire Rope

During the fence assembly procedure, the tension bays locations are established throughout the wire rope barrier system. A tension bay is assembled by inserting the end fitting into the tension fitting and securing loosely with the stainless nut. See Figures 5, 6 & 7.

The tension bay may be disassembled prior to using the tension unit to provide easier access at each strand. Prior to disassembly, clamp off each cable to a post. The tension procedure commences at the bottom strand and proceeds upwards.

1. Extract the tension unit to the desired measurement so that the tension unit is positioned over the tension bay. The orientation of the tension unit is not important.
2. Slowly retract the tension unit until the end fitting properly engages the formed recess in the tension unit pulling bars. Refer to Figure 8.
3. Once each fitting is secure within the tension unit, switch the valve handle to retract and operate the hand pump until the desired pressure is achieved as per table 2, if there is any uncertainty about which system is being tensioned, please contact your Ingal Civil Products representative or road authority representative for confirmation.
4. Position the turnbuckle equally over the thread of each end fitting and hand tighten the nuts. Pressure in the tension unit will be maintained until the valve handle is moved to the release position.
5. Once the nuts are tightened, move the valve handle to the extract position and extract the tension unit until the unit can be disengaged from the fittings and removed from the barrier.
6. Repeat the process for each subsequent strand.

4.4 De-Tensioning the Wire Rope

1. To de-tension repeat steps 1 and 2 as described in Section 4.3.
2. Once each end fitting is secure within the tension unit, switch the valve handle to the retract position and operate the hand pump, increasing the tension in the strand, until the tension fitting can move freely.
3. Fully loosen each nut.
4. Switch the valve handle to the extract position allowing the end fittings to relax within the tension fitting. Once the end fitting comes to its resting position, the cable is now de-tensioned.
5. Repeat the process for each subsequent strand.



Figure 4: Hand Pump & Tension Unit



Figure 5: End Fitting Through Tension Fitting



Figure 6: Attachment of End Fitting Nut

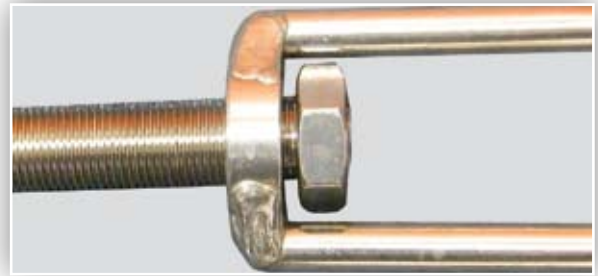


Figure 7: End Fitting with Nut Attached



Figure 8: Tension Unit Connection to Tension Bay

Table 2: Tension Unit Pressure Requirements

Ambient Temperature (°C)	TL3 System (Bar)	TL4 System (Bar)
-10	278 (26kN)	410 (38kN)
-5	263 (24kN)	386 (36kN)
0	247 (23kN)	363 (34kN)
5	231 (21kN)	340 (32kN)
10	215 (20kN)	316 (29kN)
15	200 (18kN)	293 (27kN)
20	184 (17kN)	270 (25 kN)
25	168 (16kN)	247 (23kN)
30	152 (14kN)	224 (21kN)
35	137 (13kN)	201 (19kN)
40	121 (11kN)	177 (17kN)

Note, if there is any uncertainty about which system is being tensioned, please contact your Ingal Civil Products representative or road authority representative for confirmation.

5.0 Troubleshooting

To prevent personal injury, always release the pump pressure & disconnect hoses from the pump prior to undertaking repairs. Repairs must be performed in a dirt-free environment by qualified personnel familiar with this equipment.

Table 3: Troubleshooting

Problem	Cause	Solution
Pump handle rises after each stroke	1. Fluid leaking past outlet seat(s)	1. *Check for dirt. Reseat pump body and/or replace poppet(s) or ball(s)
Pump does not reach full pressure	1. Low fluid level in reservoir 2. System components leaking 3. Directional control valve leaks or not adjusted properly	1. Check fluid level in accordance with Section 3.3 2. Remove reservoir and clean 3. *Repair seats or replace pump body
Pump handle operates with a spongy action	1. Air trapped in system 2. Pump reservoir is over-filled	1. Remove air from system in accordance with Section 3.4 2. Check fluid level in accordance with Section 3.3
Pump handle effort drops significantly after some pressure has been obtained	This is normal operation on twostage hand pumps	
Tension unit does not advance, advances slowly, or advances in spurts	1. Low fluid level in reservoir 2. Release valve open 3. Loose coupler 4. Air trapped in system 5. Tension cylinders binding	1. Check fluid level in accordance with Section 3.3 2. Close the release valve 3. Check all couplers 4. Remove air from system in accordance with Section 3.4 5. *Check for damage to cylinders.
Tension unit advances but does not hold pressure	1. Leaking connection 2. Leaking seals 3. Internal leakage in pump	1. Check all couplers 2. *Locate leak(s) and have equipment serviced 3. *Service pump
Tension unit does not retract, retracts part way or retracts more slowly than normal	1. Release valve closed 2. Pump reservoir is over-filled 3. Loose coupler 4. Air trapped in system 5. Tension cylinders damaged	1. Open release valve 2. Drain oil to full mark 3. Check all couplers 4. Remove air from system in accordance with Section 3.4 5. *Check for damage to cylinders

* Ingal recommends these repairs be performed by an authorised hydraulic service centre.

SF-NSW-SYD-120 Risk Assessment - INGAL Tension Unit And Pump

Risk Assessment



Manufacturer:	INGAL
Model or Series:	Flexfence Tension Unit & Hydraulic Pump

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Document Control

Risk Assessment #	Contributors			
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Issue Date	Version	Next Review Date		
1st Aug 2019	1.0	31st July 2019		
Creator	Manager Approval	Final Approval		
Kevin Harrold	Andrew Mills	Kevin Harrold		
	Date	1 st Aug 2019	Date	1 st Aug 2019

Purpose & Task

Scope
This document is intended to provide an assessment of possible hazards and risks associated with the installation and "common uses" of the Flexfence Tension Unit and Hydraulic Pump
People at Risk
Persons operating the equipment, co-workers and persons entering the area of work
All Bystanders must keep a minimum safe distance of 2m from the equipment during operation

Prerequisites & Recommendations

Manufacturer Documentation
All operators must be familiar with; Flexfence Tension Unit and Hydraulic Pump "User Manual" document
Standards, Guides & Reference Material
<ul style="list-style-type: none"> Local or State WH&S Acts or Standards and local Policies & Procedures National Code of Practice for Manual Handling (NOHSC:2005[1990])
Training
All operators must be familiar with the equipment safety and operation and/or received competent use training from an experienced operator.
PPE (Personal Protective Equipment) & Safety



DANGER, WARNINGS & CAUTIONS

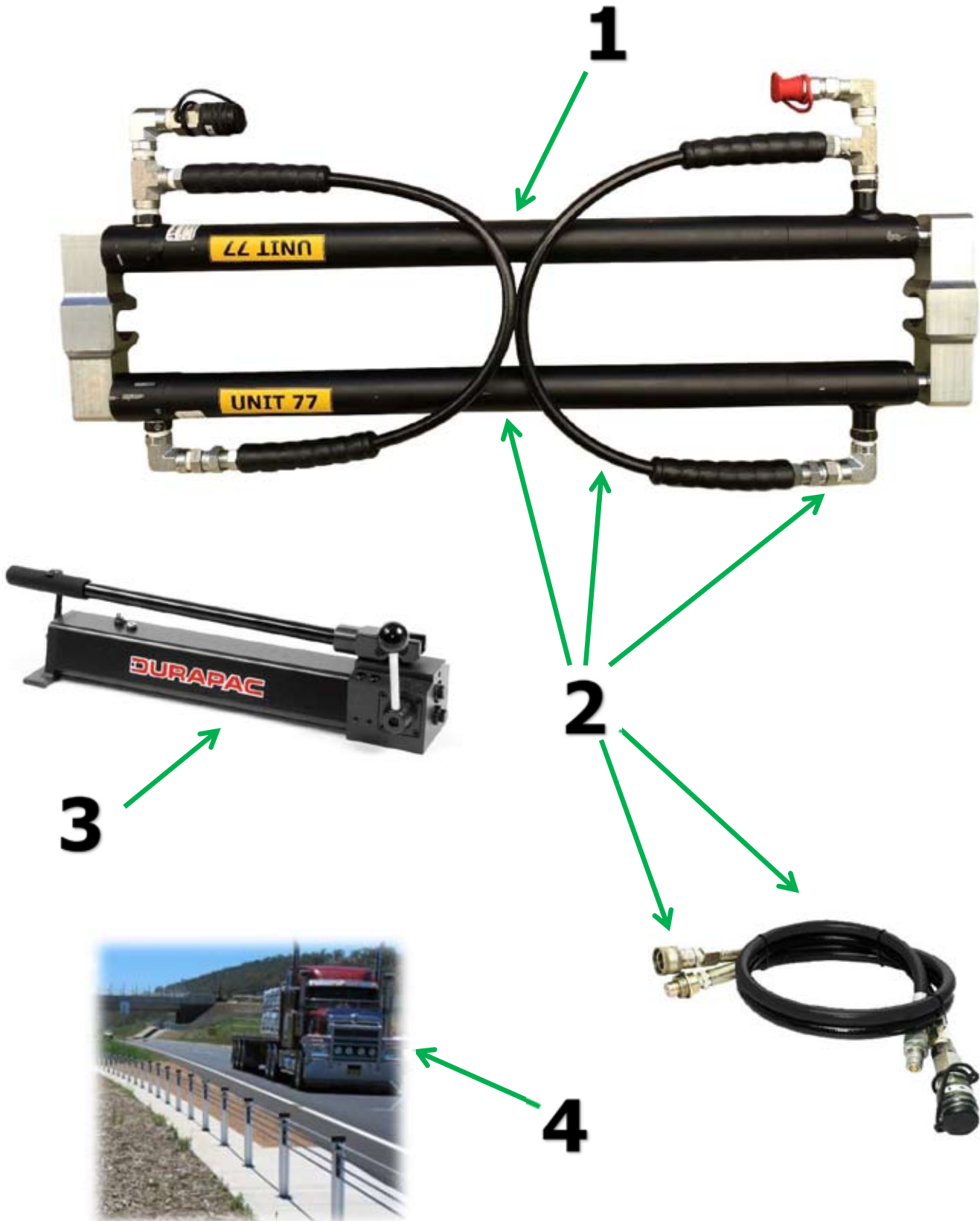
THIS EQUIPMENT IS TO BE USED ONLY FOR THE PURPOSE IT IS INTENDED FOR



Safety, Storage & Accessories

At all times when not in use all equipment and accessories should be stored away safely from contaminants or the elements. Accessories for the safe storage of all equipment are available upon request.

Product Image with Identified Risk Points
Refer to Risk Assessment Table



The **Risk Rating Matrix** is used to assess the likelihood and the severity or consequences of each hazard and to give it a “risk rating”.

Risk Rating Matrix

Impact	Chance or Likelihood				
	Rare	Unlikely	Possible	Likely	Almost certain
Catastrophic	moderate	moderate	high	critical	critical
Major	Low	moderate	moderate	high	critical
Moderate	Low	moderate	moderate	moderate	high
Minor	very low	low	moderate	moderate	moderate
Insignificant	very low	very low	low	low	moderate

Consequence Table

Likelihood (L)	Impact (I)	Rating (L) X (I)	Definition
(5) Almost certain	(5) Catastrophic <ul style="list-style-type: none"> Potential financial impact of \$500,000 (\$50,000)(a) or more Detrimental impact on operations or major projects Sustained loss in reputation , Sustained impact on services or quality Loss of public confidence in the University Contractual, legislative or regulatory non-compliance with certain litigation, prosecution or penalties Life threatening 	Critical > 20	Issue represents a control weakness which could cause a severe disruption to or have a severe adverse effect on operations and objectives
(4) Likely	(4) Major <ul style="list-style-type: none"> Potential financial impact of \$200,000 (\$20,000) or more Major impact on operations or major projects Serious loss in reputation Serious impact on services or quality Probable loss of public confidence in the University Contractual, legislative or regulatory non-compliance with probable litigation, prosecution or penalties Extensive injuries 	High ≥ 13 & ≤ 19	Issue represents a control weakness which could cause a major disruption to or have a major adverse effect on operations and objectives
(3) Possible	(3) Moderate <ul style="list-style-type: none"> Potential financial impact of \$100,000 (\$10,000) or more Moderate impact on operations or major projects Short-term loss in reputation Moderate decline in services or quality Possible loss of public confidence in the University Contractual, legislative or regulatory non-compliance with potential for litigation, prosecution or penalties Minor injuries 	Moderate ≥ 5 & ≤ 12	Issue represents a control weakness which could cause a disruption to or have an adverse effect on operations and objectives
(2) Unlikely	(2) Minor <ul style="list-style-type: none"> Potential financial impact of \$50,000 (\$5,000) or more Minor impact on operations or major projects No loss in reputation Minor impact on services or quality No loss of public confidence in the University Contractual, legislative or regulatory non-compliance but unlikely to result in litigation, prosecution or penalties Potential for injury 	Low ≥ 3 & ≤ 4	Issue represents a minor control weakness which could cause a minimal but reportable effect on operations and objectives
(1) Rare	(1) Insignificant <ul style="list-style-type: none"> Potential financial impact less than \$50,000 (< \$5,000) Impact can be absorbed – insignificant effect on operations and objectives 	Very Low ≤ 2	Issue represents an insignificant control weakness

Risk Assessment Table

Picture Ref #	Location/ Equipment	Hazard Type	Risk	Current Score			Risk Controls Required	Revised Score (Controls)		
				Likely-hood	Impact	TOTAL		Likely-hood	Impact	TOTAL
1	Tension Unit	Strain Or Back Injury	Lifting and positioning the Tension Unit	4	4	16	<ol style="list-style-type: none"> The Tension Unit is 22kg and exceeds maximum single person lift capacity (20kg). The Tension unit is a two (2) person lift Always use the correct lifting procedure when lifting heavy items (NATIONAL CODE OF PRACTICE FOR MANUAL HANDLING [NOHSC:2005(1990)]) 	2	2	4
1	Tension Unit	Limb Injury Crushing or Fracture	Dropping the Tension unit	4	3	12	<ol style="list-style-type: none"> The Tension Unit is 22kg and exceeds maximum single person lift capacity (20kg). The Tension unit is a two (2) person lift Always use the correct lifting procedure when lifting heavy items (NATIONAL CODE OF PRACTICE FOR MANUAL HANDLING [NOHSC:2005(1990)]) PPE Wear Steel Capped Protective Footwear Wear Protective Gloves 	3	2	6
1	Tension Unit	Crushing Cutting Pinching Puncturing	Risk of Injury to Fingers or Hands moving components of Tension unit during operation	4	3	12	<ol style="list-style-type: none"> Only operate the unit in accordance with the Handling Operating Instructions Manual. NEVER Place Hands/Fingers within proximity of the moving components of the Tensioner whilst the equipment is being operated If the Tension Unit components show any sign of damage, DO NOT USE the Equipment and have it inspected and checked for safe operation PPE Always Wear Protective Gloves 	2	2	1

2	Tension Unit, Hydraulic Hose & Couplings	High Pressure/Hot Hydraulic Oil Injection into Eyes or Body Parts	Hydraulic Oil Entering Eyes, Blood Stream or Ingested	3	5	15	<ol style="list-style-type: none"> 1. Inspect the Tension Unit, hydraulic hoses and couplers before every use. Remove the equipment from use if any signs of damage or any hydraulic oil leaks are visible. 2. Ensure hoses are fitted with protective sheathing 3. Do not expose Hoses to any potential hazard, such as fire, extreme heat or cold, sharp surfaces or heavy impact 4. Do not allow hose to kink or twist 5. Ensure couplers are fitted & connected correctly 6. NEVER disconnect the hoses or couplers whilst the unit is in operation 7. ONLY remove the hose in accordance with the Handling and Operating Instructions where necessary when unit is NOT IN USE 8. PPE Wear Protective Face Shield Wear Long Sleeve Shirt & Trousers or Overalls Wear Protective Gloves Wear Protective Steel Capped Footwear 	2	2	4
3	Hydraulic Pump / Oil Plug / Release Valve	High Pressure/Hot Hydraulic Oil Injection into Eyes or Body Parts	Hydraulic Oil Entering Eyes, Blood Stream or Ingested	3	5	15	<ol style="list-style-type: none"> 1. Inspect the pump before every use. Remove the pump from use if any signs of damage or any hydraulic oil leaks are visible 2. NEVER remove the Oil Plug or Release Valve whilst the unit is in operation 3. ONLY remove the Oil Plug or Release Valve in accordance with the Handling and Operating Instructions where necessary when unit is NOT IN USE 4. PPE Wear Protective Face Shield Wear Long Sleeve Shirt & Trousers or Overalls Wear Protective Gloves Wear Protective Steel Capped Footwear 	2	2	4

4	Working Environment Traffic areas	Vehicular Accident causing injury or death	Vehicle Impact of personnel and/or equipment	4	5	20	<ol style="list-style-type: none"> 1. Carryout traffic safety inspection 2. Employ the use of traffic control personnel where necessary 3. PPE Wear approved Hi-Vis Vest or Workwear 	3	4	12
5*	General Working Environment	Sprains & Breaks	Potential for injury when using or carrying Equipment on uneven / unstable surfaces	5	4	15	<ol style="list-style-type: none"> 1. Inspect the work and surrounding area for uneven or unstable surfaces 2. Prepare, clear area of debris and/or stabilise work area or surfaces and remove trip hazards and other obstructions where possible 3. NEVER use the Equipment in WET or RAINY conditions 4. The Tension Unit weighs 22kg and exceeds maximum single person lift capacity (20kg). The Tension unit is a two (2) person lift 5. Always use the correct lifting procedure when lifting heavy items (NATIONAL CODE OF PRACTICE FOR MANUAL HANDLING [NOHSC:2005(1990)]) 6. PPE Wear Long Sleeve Shirt & Trousers or Overalls Wear Protective Gloves Wear Protective Steel Capped Footwear 	2	1	2

*Not related to an Image in "Identified Risk points"



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