Superior
ENERGY SERVICES

120K CONCENTRIC WORK OVER UNIT

SUPERIOR ENERGY SERVICES (AUSTRALIA) PTY LTD
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SESA 120K 'LONG STROKE' CWU UNIT

120K 'Long Stroke' Unit

The 120k 'Long Stroke' Concentric Work Over Unit (CWU) has been designed for rapid pipe handling, minimal Rig-Up times and low Mobilization costs. Its operational activities include Snubbing and standard Hydraulic Workover activities in both onshore and offshore environments. This type of unit is widely used by Snubbing & Work Over Service Companies around the world on Wells with less than 3000PSI (207bar) Surface Pressure, and is well known for its versatility, cost efficiency and mobility.

The 'Long Stroke', or 'Line Multiplier' Snubbing Unit, was originally developed around 1969. It is self-erecting, thus reducing its dependency upon crane / mast support during operations and is capable of 'Pipe Tripping' rates from 1,000ft to 1,500ft (304.8 to 457.2 m) per hour, which is approximately 30% faster than Short Stroke Jack Units.

The 'Long Stroke' Unit has a 36-foot (11meter) maximum stroke, although 20- 30 Ft (6 meter – 9 meter) strokes are normal. This gives the Unit the capability of running Sand Screens and Long BHA's in 'one stroke'. The 'Long Stroke' Unit handles pipe from ¾" to 2-7/8" (19.05 to 73 mm) diameter and can accommodate 'dual strings' operations.

The 'Travelling Block' is operated through a 'Cylinder & Sheave' combination, which allows the Travelling Block to attain an overall 'stroke' of 36ft (11mt) stroke, while the Main Cylinder only travel's 18ft (5.5mt), which allows the ability to run over 40 joints per hour. The Unit has selective speed options and is equipped with an Integral Rotary Drive contained in the Travelling Block; with bi-directional rotation capability while the Travelling Block is in motion.

With full hydraulic control of the Unit from the Work Basket, the 'Long Stroke' Unit requires only three / four personnel as a crew for standard operation; and the system's 'fail safe' interlock system assures the Unit Operator always has full control.

Below are some of the key features of a 120K Long Stroke self-contained CWU Unit:

- Freestanding and fully mobile package, it requires no Anchors or Guy Lines.
- Quick and efficient Rig Up/ Rig Down times
- Capacity to pull a full +/- 9.5m tubing joint with a single stroke.
- Wellhead weight is only from the BOP Stack, attached to the rig for added stability
- Traveling Slip Bowl Assemblies are built to hydraulically 'push' or 'pull' pipe weight
- Rig Floor and Stairs have handrails for additional safety
- Rig Floor is height adjustable to accommodate BOP configuration. ***Note:*** As the Rig Floor height 'Increases', the Rigs available 'Stroke' correspondingly 'Decreases'
- Trip Rate can be more than 40 joints per hour
- Constant tensioning systems and dual pipe handling winches (Counter-Balance Winch's) ensure a joint of pipe is always at the ready
- Able to run one full joint of pipe when pipe-heavy (36-40ft Stroke)

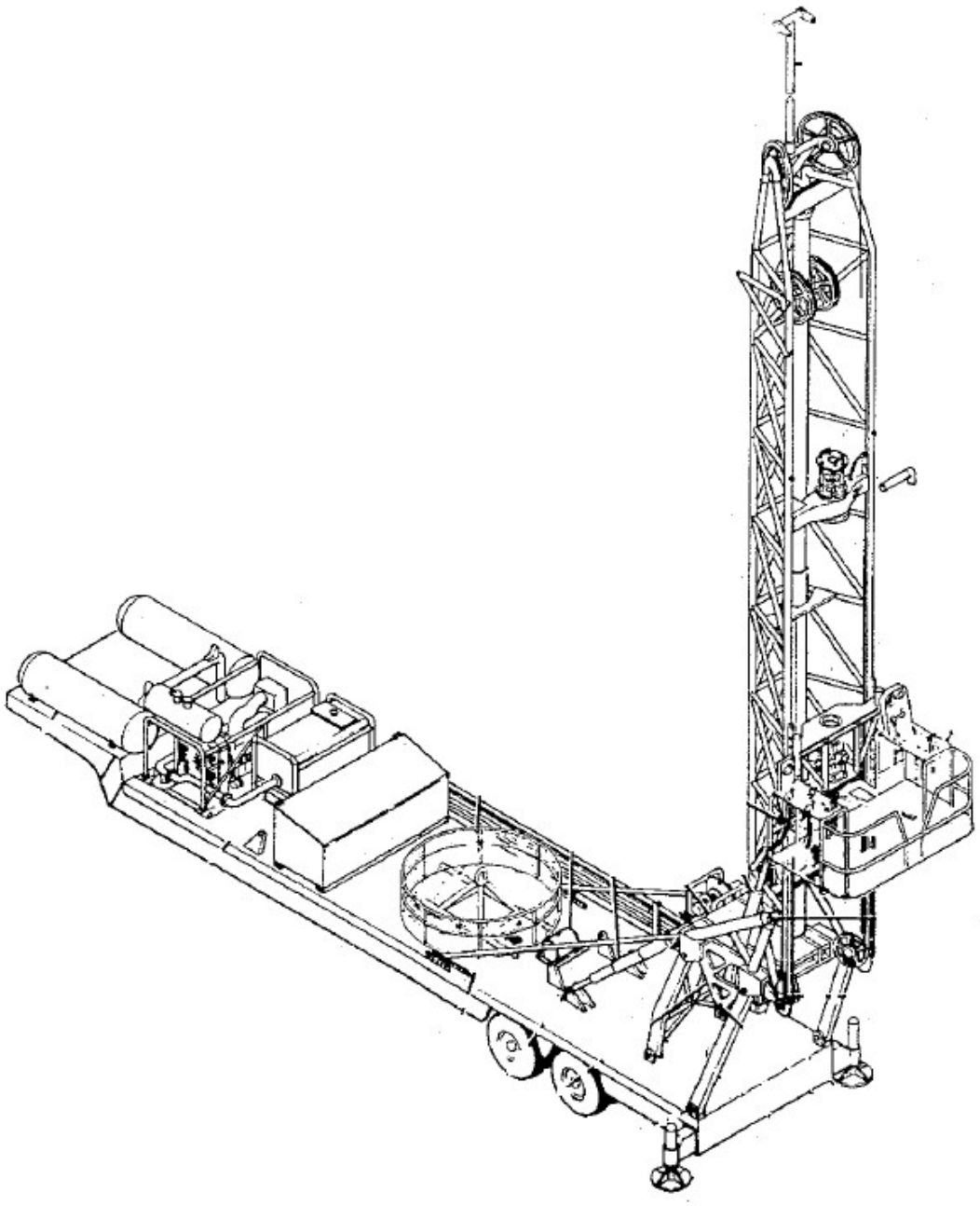


Figure 1: 120k Long Stroke Unit / CWU (Trailer Mount)

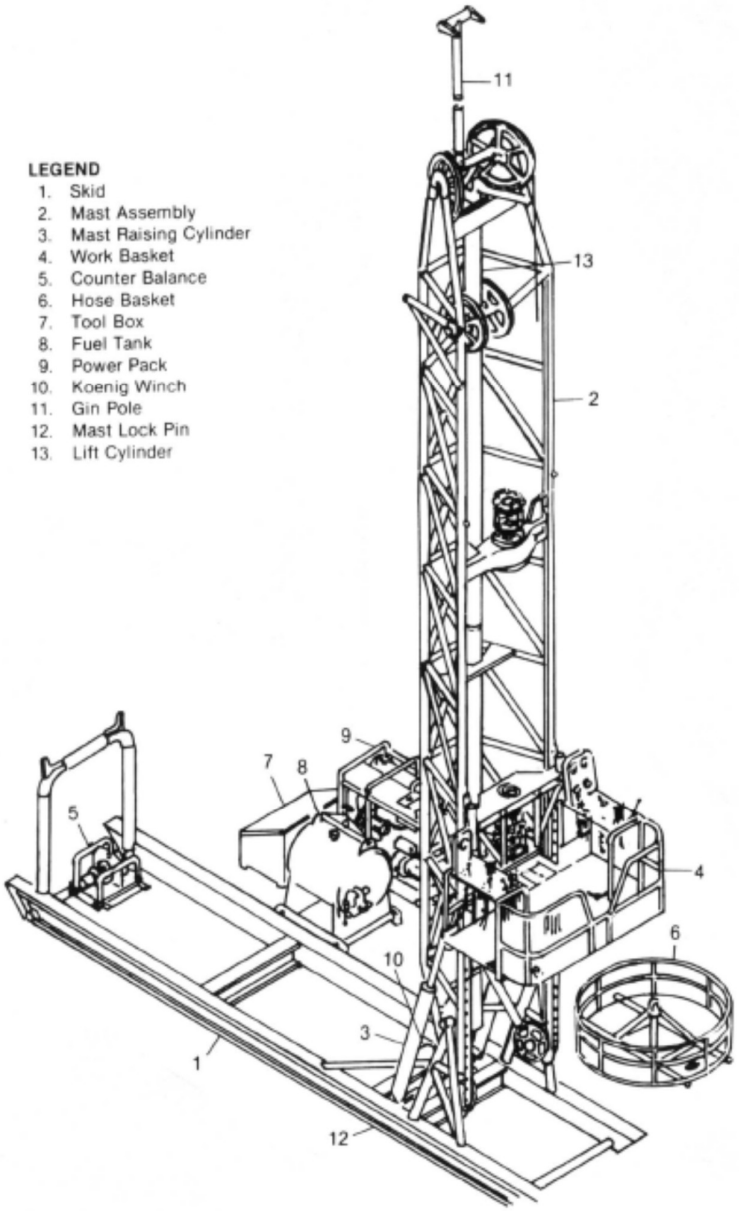
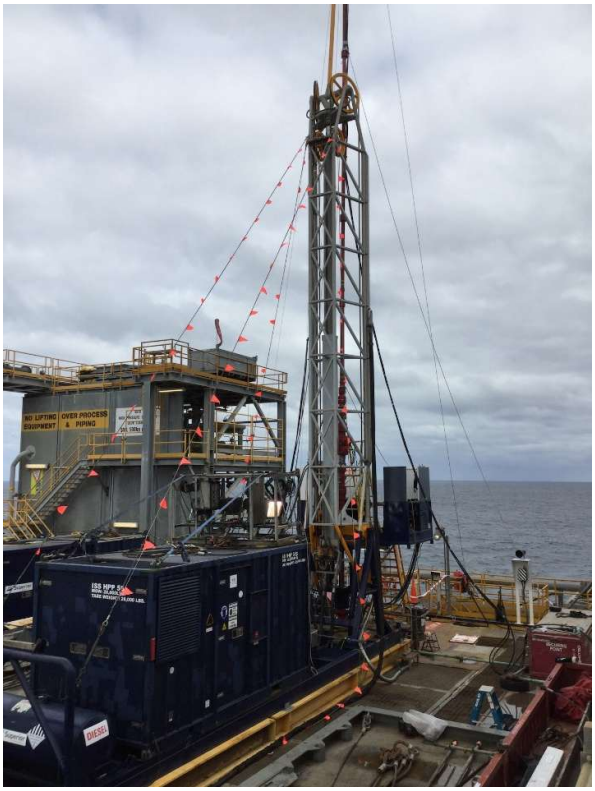


Figure 2: 120k Long Stroke Unit / CWU (Skid Mount)


NO LIFTING OVER PROCESS
EQUIPMENT & PIPING

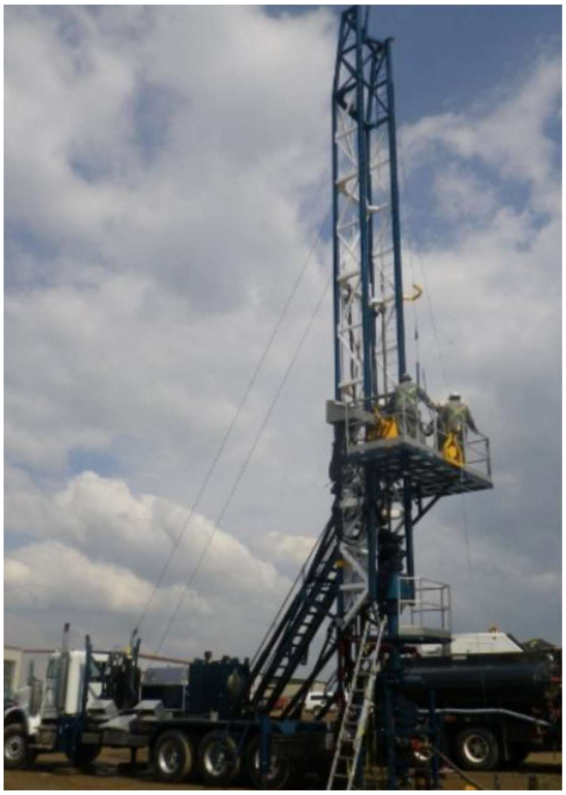


Figure 3: 120k Long Stroke Unit / CWU Work Basket

General Specifications

Description	Data (Imperial)	Data (Metric)
Max. Pull Capacity:	120,000 lbs.	54 ton
Max. Push Capacity:	60,000 lbs.	27 ton
Rotary Torque:	1,000 ft. lbs.	1,356 Nm
Stroke:	36 ft.	11 m.
Through Bore:	7.5"	190 mm
Tubing Range	3/4" to 2-7/8"	19 mm – 73 mm

Typical Operational Activities include

- Pressure Control / Well Kill.
- Removal and Installation of small diameter completion.
- Temp / Perm Packer / Plug Setting & Retrievable.
- Well Bore Clean Out.
- Fishing & Milling Operations.
- Light Remedial Operations (Scale Squeeze, Wax / Paraffin Removal, Sand Washing, Thro Tubing Cement Operations, Gas Lift, etc.)
- Drilling out Cement and Bridge Plugs.
- Circulating Fluids.
- Sand Consolidation
- Squeeze Cement & Plugging Back
- Plug & Abandonment
- Running Macaroni Strings for N2 Jetting
- Installing & Retrieving Kill Strings
- Resetting Weight on Packers
- Running Logging & Perforating Tools

Advantages

Some of the advantages of a 'Long Stroke' Unit, are that

- It transfers the 'String Load' to its Skid / Trailer and not the Well Head / Tree.
- Fast Rig-Up Times
  - It can be rigged up in approximately 8-15 hours, tested and ready to go in 10 hours.
- 'Self-erecting'
  - It can be efficiently rigged up on wells outside the Crane operating radius.
- High operational speed.
- Cost efficiency.
- Highly Mobile.
- Easy to Operate.
- Good visibility over the operation.
- Small number of personnel required.

Long Service Record

- For over 50 years, the 120k Long Stroke Unit is widely used by Work Over & Snubbing Service Companies around the world, and is well known for its verstility, cost efficiency and mobility.

Ease of Transport

- The Units are typically Trailer Mounted (Land Applications) and Skid Mounted (Offshore Applications. Skid Mounted Units can be utilized onshore if required).

Rig-Up Time

- The Rig-Up time varies based on the configuration and the type of operation to be conducted, however between 8 and 18 hours are normal for Equipment Rig Up duration.

Pipe Handling

- The Unit is equipped with a flexible and reliable Pipe Handling System based on the Gin Pole-Lay Down Winch principle. Large flexibility allows for variable operational positions, and easy handling of all types of tubulars.

Auxiliary Equipment

Dependent upon the Scope of Work, the following equipment may be required:

- Data Analysing System (DAS-System).
- Well Control Equipment (Blow-Out Preventers, Flowlines, Choke, etc.).
- Mud Pump & Fluid Tanks.
- BOP Remote Control Unit.
- Electric Generator.
- Air Compressor.
- Sub-Structures as per operational specifications (Well Head Height, BOP Stack Configuration).

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Hydraulic Workover Unit - 120K

The reliable and flexible 120K HWO Unit has been designed for all well situations: live / dead, onshore / offshore.

The jointed work string is handled by means of a hydraulic cylinder. The use of a hydraulic cylinder allows perfect control over work string movements and makes it easy to use all types of downhole tools.

TECHNICAL DATA	120K HWO UNIT
Max Pull Capacity	120,000 lbs.
Max Push Capacity	60 Kips
Rotary Torque	1,000 ft/lbs.
Stroke	36 ft.
Through Bore	7-1/2"
Gin Pole	500 kg

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Advantages & Characteristics:

- Small footprint
- Flexible
- Mobile
- Excellent cost / quality ratio
- Multi-purpose application
- Skid mounted

Operations Activities:

- Dead well operations
- Well clean outs
- Fishing operations
- Remedial operations
- Installation of velocity strings
- Sand washing
- Through tubing operations
- Running inflatable packers

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TECHNICAL DATA 120K HWO UNIT				
Max. Pull Capacity	**120,000lbs**	Stroke	**36ft**
Max. Push Capacity	**60 Kips**	Through Bore	**7-1/2"**
Rotary Torque	**1,000 ft/lbs**	Gin Pole	**500kg**

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SPN

120K Concentric Work Over Unit (CWU) Equipment

Equipment Specification

Description	*Specification*
Lift Capacity	120,000 lbs
Snub Capacity	60,000 lbs
Hydraulic Lift Cylinder Stroke	18ft on cylinder with 'cable multiplier' to 36 ft
Type	Concentric Workover Unit
Unit Through Bore	7.5"
Rotary Torque	1,000 ft/lbs
Average Trip Speed	900 ft. per hour (with 2-3/8" work-string)
Rig-Up	Skid Mounted hydraulic self - erection system
Gin Pole	Rating 0.5 Tonne, c/w 2 x Counterbalance Winches (584 lbs WLL each)
Well Control (BOP)	Typically, 7-1/16" 3-5K BOP Stack

Operating Limits

These are suggested operating limits. The final decision on whether it is safe to proceed with an operation shall be made by the Rig Supervisor on Site.

Description	*Specification*
Mast	84 Knots
Hook Load	Rated to 120,000 lbs, thou 90,000Lbs is the maximum recommended operating capacity (75%)
Mast Erection	30 Knots
Skidding	30 Knots, with full operating Loads
Tripping	45 Knots, or when Supervisor / Operator agrees that Tripping is Hazardous i.e. fouling Counter-Balance Lines, Kelly Lines etc.

Philosophy for typical Pressure Control for 'CWU' HWO / Snubbing Operations (1,000 – 2,000 PSI Operations)

The requirement to develop and utilise an uncomplicated, undemanding Pressure Control Equipment configuration with adequate levels of redundancy and contingency is paramount, in delivering safe and efficient operations.

Primary and Secondary Pressure Control (Retention) systems

Primary & Secondary Sealing Systems

The ***Primary*** System would normally use a conventional 'Stripping Bowl' and Safety Rams Back Up concept

The S***econdary*** System would be a traditional 'Annular to Ram' or Ram to Ram Stripping system, again with a Safety Ram Back Up

The configuration of the Pressure Control Equipment serves a combination of purposes, the first always being **SAFETY**. There are several assorted components incorporated within the typical Pressure Control Equipment Stack to achieve the required safety and operational objectives.

The objectives used to determine the Pressure Control Stack configuration are Safety and Spacing, for 'Lubrication' of the Tail Pipe / BHA / Tool assembly(s) during tubular recovery and installation, and placement of individual Ram Cavities as it affects the access and over all well security required during periods of maintenance and the replacement of consumable components during Operations.

The following items identify the main reasons for the equipment specifications and in particular, the configuration of Pressure Control Equipment selected for a specific project:

Primary Pressure Control Retention - Stripper Bowl

A 'Stripper Bowl' is the Primary method of pressure retention during Tubular Recovery and Installation, the Stripper Bowl is (as / if required) 'backed up' with the use of a conventional Annular BOP and Cavity Ram BOP

The Stripper Bowl *(Stripper Rubber)* provides an effective barrier against escape of hydrocarbons; also functions as a pipe wiper, and as a 'debris' barrier.

The Stripper Bowl allows for the continuous handling of pipe with either a Tapered Upset or No Upset at all. However, it is normal to change the Stripper Rubber[s] during a job, due to erosion of the Stripper Rubber.

Wear on the Stripper Element is affected (much like Stripper Rams) by:

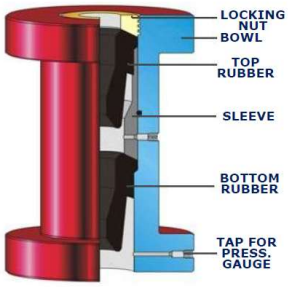
- **Pipe External Condition**
- **Lubrication at the Element**
- **Speed of Stripping / Snubbing Pipe**
- **Wellbore Pressure**
- **Wellbore Fluids**

NOTE: Although rated to 3,000 PSI, in practice one would not rely on the Stripper Rubber as the primary well containment device above 2,000 psi Wellhead Pressure

Energising and sealing the Stripper Element requires some [well] pressure to properly pack off against string when run in hole; ***Well Pressure will 'assist' sealing***

The Stripper Element is usually short in 'life span' due to pressure limitation [usually up to ***2,000 PSI],*** although max. pressure rating is up to ***3000 PSI,*** and friction generated from the Pipe travelling through the Packing Element.

Single Stripper



Duel Stripper

Typical Stripper Rubbers

The Stripper Bowl Rubber functions as a 'passive' sealing element in that it relies on the well bore pressure to assist in the sealing action of the 'rubber' against the external diameter of the work-string being run through it.

The Stripper Rubber is normally placed below the Window. It is a low pressure (under 3,000 psi [206.85 bar]) preventer used for running tubing in or out of the hole without using Stripper Rams.

This allows more efficient trip time, when compared to 'conventional' Ram to Ram Stripping.

- Operating pressure higher than 207 Bar may be accepted for the 2 3/8" and 2 7/8" pipe size Stripper Rubber. This will depend on the type of operation to be performed and stripper element type. Considerations require to be clearly stated in the operations program.

- Pressure rating is also based on type / brand / quality of Stripper Elements and Tubing used. It is recommended that the max operational rating be no more than 207 Bar/3000 psi.

- The Stripper Bowl ***housing*** (Body) is normally designed for pressure rating of 690 Bar/10,000 psi to be compatible with other ancillary equipment e.g. wire line lubrication equipment or pressure rating on the Xmas Tree.

- When stripping in high GOR type wells it is a 'recommended practice' to lubricate the Stripper Rubbers by either displacing the well with a diesel buffer or preferably water/glycol due to hydrate (water does not release gas when depressurised) and vent off gas that accumulates below the Stripper Bowl at regular intervals.

- When 'stripping' in dry gas wells it is recommended practice to lubricate the Stripper by injecting / applying lubricating and friction reducing chemicals / oils.

- If flowing the well while POOH / RIH it is recommended to reduce the working pressure by approximately 35 bar due to temperature increase.

In the **Dual Element Stripper System**, circa 50% of the Wellhead Pressure would be kept between the two elements by applied Hydraulic Fluid, i.e. 'Liquid Seal'. This halves and thus reduces the pressure applied to each Element and keep them within their working range, and further, provide lubrication to the Elements / Pipe OD while pipe travels through the Packing Element.

However, more recently, Low Pressure Snubbing operations tend to have 'single element' Stripper Bowls, as 'Dual Element' Stripper Bowls are becoming less common.

Secondary Sealing System – For Annular to Ram, or Ram to Ram Stripping Capability (1,000 – 2,000 PSI Operations)

This is defined as having the following components:

- A minimum of two 'Stripping / Working' BOPs, usually one Ram and one Annular
  - The Annular BOP requires the use of a Surge (Stripping) Bottle
  - A Surge (or Stripping] Bottle) is installed to accommodate expansion & contraction of the Annular Packing Element, to ease the passage of Tool Joints through the Annular Element
- Equalize and Bleed Assembly to allow transition of 'Tool Joints' through the Stripping / Working BOP Package
- A minimum of one 'Safety' BOP (Blind Ram)
  - Good working practice would utilise a Blind / Shear Ram
  - Consideration for the installation of a 'Safety' Pipe Ram
- One or more Work Spools with ports for bleeding off and equalizing wellbore pressure between BOPs

Typical Secondary Pressure Control Equipment

Annular BOP

Equalize Loop

Dual Ram BOP

Flanged Spool

Single Ram BOP

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