## GENERAL WIRELINE PROCEDURE GUIDES.

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GENERAL

Safety is ultimately the responsibility of the individual and his company. Shell Petroleum Development Company Safety Regulations and Procedures are drawn up to assist you in your day to day operations, and all company and contractor personnel must comply with them.

Well Servicing Operations are Potentially hazardous and can result in loss of well control equipment and injury to personnel if Correct procedures are not followed.

In order to work safely, ensure the following:-

a) Maintain equipment in safe condition,
b) Make Safe work practice a habit.
c) Be aware of and look for unsafe conditions, and eliminate such
d) Protect your colleagues.
e) while driving to location, do not exceed maximum speed of 80km.

Improved safety performance can Only be achieved by personnel being fully aware of potential problems and by other proper training in the use of correct protective and operational equipment.

1. PERSONAL SAFETY AND SAFETY EQUIPMENT

1.1 During Wireline and Well Services related operations, Safety Shoes, Safety Helmets, Coveralls and Hand Gloves must be won.

1.2 During Wireline and Well Services operations on barges and platforms without guard rails, work vests must be worn

1.3 Ear protectors, to prevent damage to hearing must be worn while bleeding the lubricator through a needle valve

1.4 Work vest must be worn while moving from barges/crafts Onto the wellhead jacket/platform and vice versa.
2.0 WATERBORNE OPERATIONS, DISCIPLINE AND SMOKING

2.1 WATERBORNE OPERATIONS

2.1.1 Any personnel who is deployed to work OFFSHORE or in the SWAMPS even if only occasionally, must be able to swim to survival level.

2.1.2 Every such person is to be swim-tested and certified as a swimmer prior to being deployed for water-borne operations.

2.2 DISCIPLINE

2.2.1 Discipline behaviour on the part of personnel exposed to water hazards is essential in order to prevent drowning incidents.

2.2.2 Drinking of alcohol or drugs is not allowed and will attract strong discipline action.

2.3 SMOKING

2.3.1 A "NO SMOKING" Sign should be placed conspicuously facing the operator and wellhead simultaneously on Wireline and Well Services trucks and barges.

2.3.2 Smoking is not allowed within any wellhead location, except in designated areas of living quarters of swamp Well Services barges.

3.0 ENTERING AND MOVEMENT AT A WELL LOCATION

3.1 EQUIPMENT MOVEMENT AT WELL LOCATION

3.1.1 Vehicles moving in and out of well locations should not exceed a speed of 5km/hr. and not nearer than 15 meters to the wellhead.

3.1.2 Barges and boats moving in and out of wellhead slots should not exceed a speed of 0.5 knots/hour.
3.1.3 It is not allowed under any condition for a barge or tug boat to be tied up to the wellhead.

3.1.4 Ensure that all rotating parts are properly guarded on Well Services trucks and barges.

3.2 ENTERING A WELL LOCATION

3.2.1 Check wellhead and cellar with an explosimeter to confirm area is gas-free. No vehicle is permitted to enter the location when gas or oil leaks are found.

3.2.2 Ensure access road into and around location is free for vehicle movement.

3.2.3 Before permitting any vehicle to enter a location, ensure that the exhaust system is not leaking, and is equipped with an effective spark arrestor. No vehicle is permitted to enter a location with from the exhaust pipe.

3.2.4 WARN drivers of vehicles that naked lights and smoking are TOTALLY PROHIBITED at the location.

3.2.5 Instruct all vehicle drivers not to exceed 5km/hr. driving speed inside the well location.

3.2.6 All motor vehicles must be positioned at least 50 ft. or more away from the wellhead. Contact base supervisor if this is not possible.

3.2.7 Where possible, position the motor vehicle up wind of the wellhead, in the direction of the prevailing wind.

3.2.8 For swabbing operations, position the swab tank at least 50 ft. away from both the wellhead and the wireline unit. Ensure the swab tank is equipped with a flame arrestor on the vent stack.

3.2.9 Ensure there are 2 full multi-purpose (dry-powder) fire extinguishers available on the location at all times.
3.2.10 Once the wireline truck is in final position, apply parking brakes and place anti-roll blocks against the wheels.

3.3 ENTERING A SWAMP LOCATION

3.3.1 Prior to entering a well location with a wireline barge, send a scouting crew with the speed boat to check the well slot, and ensure that it is accessible, and not silted up.

3.3.2 At approximately 50 ft. from the wellhead shut off the speedboat engine and paddle the boat to the wellhead jacket. Confirm the area is gas free with an explosimeter. Entry of the wireline barge is not permitted when oil or gas leaks are found.

3.3.3 Function test the emergency shutdown system of the barge.

3.3.4 Ensure the gas detector is switched on and operational.

3.3.5 Check that there are four fully operative multi purpose fire extinguishers available on board at all times, and ensure the marine and wireline crew are able and ready to operate them.

3.3.6 Ensure that all engines' exhaust systems are not leaking, and are properly equipped with effective spark arrestor attachments. No engine must be allowed to run with leaking exhaust lines.

3.3.7 Ensure visibility is very good before approaching the wellhead. Entry and exit from locations are permitted only during daylight hours.

3.3.8 Switch off all electrical and other non-explosion proof equipment within 50 ft. from the bow of the barge prior to final approach, and ensure that this equipment remains switched off during the period the barge is on location.

3.3.9 Approach wellhead very slowly and cautiously with the wireline barge, with a speed not exceeding 0.5 knots.
3.3.10 Ensure all personnel on deck are wearing life jackets or work vests, safety shoes and helmets.

3.3.11 DO NOT allow the barge to knock against the conductor or final approach to the wellhead.

3.3.12 As soon as the bow of the barge contacts the ladder fender of the wellhead jacket, lower the spud legs to secure the barge in that position.

3.3.13 Under no circumstances should the barge be tied to the wellhead jacket.

3.3.14 Smoking and use of any naked lights or open fires are TOTALLY PROHIBITED.

3.3.15 If the swab tank is to be used, ensure that the flame arrestor attachment on the vent stack is effective and operative.

3.3.16 The swab tank must be emptied of all crude oil before the barge is permitted to move.

3.3.17 Petrol and other highly flammable liquids should not be stored on the barge.

3.4 ENTERING CLUSTER WELLS

3.4.1 Approximately one week before entry to any cluster, check the seabed around each cluster for any debris or obstruction.

3.4.2 After successful seabed inspection, drop marker buoys to indicate the flow lines routes.

3.4.3 One day before entry, function test cluster emergency shut down system. Check wellheads with explosimeter to confirm area is gas-free. No entry is permitted when oil or gas leaks are found.

3.4.4 Ensure fire-fighting and foam-making equipment on the "Sewop" are ready and operative prior to sailing.
3.4.5 Ensure no flammable liquids are stored on deck of the vessel, and the swab tank empty prior to sailing.

3.4.6 Approach the cluster only when visibility is good and clear.

3.4.7 Ensure the vessel approaches the cluster for final jack-up only against the tide/current. NEVER move into the location when the current is running towards the cluster.

3.4.8 Entry into the location, and jacking up and down on location must be carried out only during daylight hours.

3.4.9 Only the marine crew responsible for the entry are permitted on the deck.

3.4.10 Switch off all non-explosion proof equipment within 50ft. from the bow of the vessel, and ensure that they remain switched off during the period the vessel is on location.

3.4.11 Approach the cluster very slowly and cautiously, with a speed not exceeding 0.5 knots.

3.4.12 Move in the "sewop" until the bow is at a minimum distance of 30ft, from the cluster jacket. DO NOT permit the ship's bow to be less than 20 ft. from the edge of the cluster jacket.

3.4.13 Jack up the "Sewop" initially to 1 ft. air-gap to check for stability prior to jacking.

3.4.14 Under no circumstances must jacking up be carried out on the flowline side of the cluster.

3.4.15 The ship's captain is responsible for the safety of the vessel and its crew and for all its movements, including jacking up and down at the clusters.
3.5 POSITIONING OF WIRELINE TRUCK

3.5.1 The wireline unit should be positioned at least 50 feet away from the wellhead.

3.5.2 The wireline truck should be positioned with the hand brakes on and anti-roll blocks placed to wedge the tyres.

3.5.3 No one should be in the vicinity of the wire and rotating parts especially during running/pulling out and jarring operations.

4.0 TESTING LUBRICATOR ASSEMBLY

4.1 LUBRICATORS

4.1.1 Lubricators are pressure vessels and as such the working pressure rating and type of service (Sour or standard service) must be marked on each lubricator piece.

4.1.2 Each section of lubricator has to be provided with a stainless steel band bearing the working pressure, test pressure, type of service, date last pressure tested and identification number. Lubricators without band and not pressure tested more than half a year ago are not allowed to be used. Lubricator will be subjected to radiographic tests once a year.

4.1.3 Any lubricator whose body features are deformed should be considered damaged and rejected and formal report made to base about same lubricator. Remember human life and safety of the well depends on the integrity of the lubricators.

4.1.4 The bleed off valve on the lubricator must be in good condition. Damaged bleed off valves have to be replaced at base only and the system pressure tested.
4.2 WIRELINE BLOWOUT PREVENTER

4.2.1 The wireline B.O.P. is a secondary safety device on the wellhead during wireline work, designed to close off the well with or without wire in the well.

4.2.2 The wireline B.O.P. must be pressure tested from below with well pressure before starting any wireline operation. After testing, close the swab valve and bleed pressure below the B.O.P. rams through the bypass valve (equalizing valve).

4.2.3 A B.O.P. that fails the pressure test on the sealing surface must be used. This B.O.P. must be returned to base for repairs.

4.2.4 The B.O.P. has to be provided with a stainless steel band containing the serial number, type of service, maximum working pressure, test pressure and date last hydro-pressure tested. B.O.P.s with a test date last more than a year old are not to be used.

4.2.5 The handles of the B.O.P. should be installed on the spindles at all times during wireline operations.

4.3 STUFFING BOX

4.3.1 During wireline operations, the stuffing box is the first line (primary) safety device, which controls the well and allows the wire to pass through.

4.3.2 During wireline operations pour lubrication oil on the wire to reduce wear on the gland packings in the stuffing box. This will reduce the leak through the wire path to a minimum and therefore prevent pollution of the location and possible escape of explosive mixture box.

4.3.3 The stuffing box should be handled with care to avoid any damage to the sealing surfaces and thread but if damaged should not be used and further should be returned to base for repairs. Remember that life and well control depends on the integrity of the stuffing box.
4.3.4 The stuffing box has to be provided with a stainless steel band containing the serial number, type of service, maximum working pressure, test pressure and date last hydro-pressure tested stuffing box with a test date more than a year old must not be used.

4.4 CROSS-OVERS

4.4.1 This is used to make up the wireline B.O.P. to Xmas tree and it is considered a part of the pressure vessel, of the lubricator assembly.

4.4.2 The cross-over should be handled with care to avoid any damage to the sealing surfaces and thread but when damaged should not be used but replaced with one of proper specification.

4.4.3 The cross-over has to be provided with a stainless steel band containing the serial number, type of service, maximum working pressure, test pressure and least date hydro-pressure tested. Cross-overs without this band or with the test date more than one year old must not be used.

5. SERVICING AND TESTING OF WIRELINE LUBRICATOR COMPONENTS

5.1 LUBRICATOR/WELLHEAD ADAPTORS/BOPS

5.1.1 All lubricator components belonging to both SPDC and service companies must be inspected once every 12 months for surface cracks by means of magnaflux method, and internal defects by ultra-sonic equipment, paying particular attention to the weldments.
5.1.2 After inspection, all lubricator components must be pressure tested to the maximum test pressure and held for at least 15 minutes. All pressure test to be recorded on charts.

5.1.3 Each component must then be fitted with a stainless steel band strapped around the neck of the box end connection, and marked with the date and test pressure applied.

5.1.4 All inspections and pressure test of the lubricator components are to be carried out under the direct supervision of the Well Services Workshop Supervisor.

5.1.5 All inspection certificates must be approved by MTCX Inspection Section.

5.1.6 All inspection certificates and pressure test recorder charts must be filled at the PRDX/2 workshop office, and to be available for inspection and reference by anyone concerned.

5.1.7 Any lubricator component without a valid inspection and pressure test certificates must not be used for field operations.

6. TEST PROCEDURE FOR WIRELESS WELLHEAD EQUIPMENT

6.1 Wellhead equipment consisting of cross overs, wireline B.O.P.s, lubricators and stuffing boxes must be hydro pressure tested twice a year and radiographic tested once a year.

6.2 The set of cross-over, wireline B.O.P., lubricators, and stuffing box will be hydro-tested to one and a half times the working pressure up to a maximum of seven hundred bars and 1.5 time the working pressure for working pressures above 700 bars.

6.2.1 EXAMPLE

Work pressure 350 bars – Test Pressure 525 bars
Working Pressure 700 bars – Test Pressure 1050

6.3 The set of cross-overs, wireline BOPs, lubricators and stuffing boxes must be non-destructive tested for cracks once a year by reputable companies like Vetco Willisco.

6.4 The above test in items 6.1, 6.2 and 6.3 have to be witnessed by a PRDX/2 representative.
6.5 All equipment tested and certified by PRDX/2 representative will be provided with a stainless steel band with relevant data such as serial number, test date, working pressure, test pressure and type of service.

7. **RIGGING UP & DOWN OF WIRELINE LUBRICATORS (PRE-OPERATIONAL TEST)**

7.1a Ensure the cellar is adequately covered with grating.

NOTES

- NO LOOSE BOARDS OR PIECES OF TIMBER PLANKS ARE TO BE USED TO COVER CELLAR TOP.

- ON SWAMP WELLS, ENSURE ALL DECK GRATINGS ARE IN PLACE.

7.1b Ensure work area is safe and free to work.

7.1c Ensure all lubricator and BOP components have valid test tag band.

7.1d Check that gin pole, chain binders, rope-and-tackle, lubricator clamps, wire rope slings and chains, shackles, etc. are safe and in proper working condition.

7.2 **STUFFING BOX (STANDARD)**

7.2.1 Check pin end for any damage and ensure quick union collar threads are clean. Renew O-ring if necessary.

7.2.2 Check that the sheaves rotates freely and does not wobble. Replace the sheaves bearing if worn.

7.2.3 Check that sheaves bearing is free to swivel.

7.2.4 Ensure the sheaves beating is securely in place.

8. **BLEEDING WIRELINE LUBRICATORS**

8.1 Before bleeding off the lubricator, ensure that the engines are switched off and that gas is not blown toward the hot exhaust pipes.

8.2 Additionally on wireline barges, ensure that all the
windows and doors are shut before bleeding off the
lubricators, as cooking may be going on in the barge
accommodation.

9. For all wireline work were maximum pull on the line is expected
to be more than 500 pounds.

9.1a The type of stranded line to be used is the conventional 3/16 CABLE WHICH COMPRISLES OF 9+6+1 IS STRANDS, using right and left lay to prevent the twisting tendency under load.

9.1b For higher pressure wells the British Rope subsidiary DY FORM cable could be used due to the smooth external periphery and closer to tolerance of outside diameter, reducing leakage at the stuffing box.

NOTE: DY FORM SHOULD NOT BE USED IN CONJUNCTION WITH FLOWTUBES.

9.2 SEE 2.1 0.092 WIRE

9.3 SEE 2.2 0.092 WIRE

9.4 The spooling tension on the cable is between 2000 and 300 pounds when transferred from shipping drum.

9.5 The layers have to be spooled on the reel in an even level way, to avoid undercutting when pulling a heavy load.

9.6 OPERATIONS

a. Before rigging up always visually check the integrity of the cable for lose strands, pitting, corrosion, kinks and deformation. Inform base supervisor immediately if any of the above faults is detected.

b. Ensure that before making up rope socket to the cable 10 to 50 ft. is cut from the end, depending on tension forces and jarring applied on previous job.

c. Ensure cable is lubricated/greased before running in hole,

d. SEE 3.5 0.092 WIRE.
10. For all wireline work where maximum pull on the wire is expected to be no more than 500 pounds.

10.1 The type of wire to be used is "IMPROVED PLOW STEEL" (TPS) which has a minimum "APT SPRC 9A" specification a minimum length of 15000 feet.

10.2 SPOOLING OF NEW WIRE ON REEL UNIT.

a. A specialised hydraulic spooling unit which incorporates tension system has to be used.

b. Spooling from the shipping spool onto the reel unit has to be done in such a way that the curvature of the wire is not reversed.

c. The spooling tension on the wire has to be between 600 and 800 pounds to avoid undercutting of the wire.

d. The first 7 to 8 layers of wire on the reel have to be spooled very carefully and have to be in perfect line as to avoid undercutting and sharp bending of the wire on the initially small diameter of reel.

10.3 OPERATIONS

a. Before rigging up, always visually check the integrity of the wire for pitting-corrosion-kinks-deformation flexibility etc. if any of above fault is detected, inform base supervisor immediately.

b. Ensure that before making the rope socket 10 to 50 feet of wire has been cut depending on jarring forces inflicted on the wire on previous job.

c. Ensure when making up the rope socket, that if the wire breaks during wrapping, a maximum of 25 feet of wire is cut off the end of the wire before trying again.

d. Ensure that the wire is lubricated with oil while running in hole.

e. Ensure that a logbook is kept up to date with the following information:
i. Total length of wire left on reel.
ii. Total runs made on a job (per day).
iii. Maximum depth reached, maximum pull on wire.
iv. Prolonged heavy jarring.
v. Runs made in acid - H2S or corrosive environment.

f. After prolonged jarring do the following:
   i. Move W/I, unit 10 to 25 feet further away from Xmas tree.
   ii. Remove loupe from counter wheel.
   iii. Do not keep on jarring till the wire breaks but run a wirecutter to avoid fishing.

NOTE:

1. CONGRATULATIONS! YOU HAVE GONE THROUGH THIS SAFETY GUIDE.

2. MAKE SAFETY YOUR TALK AND BUSINESS AT ALL TIMES IN AND OUTSIDE WORK LOCATIONS FOR IT PAYS TO WORK SAFELY.

3. IF IN DOUBT, STOP IN ERROR, RATHER THAN BE STOPPED BY ERROR.
1.0 **PRE-OPERATIONAL CHECKS PRIOR TO RIG UP.**

1.1 Ensure the cellar top is adequately covered with grating.

   **NOTE:** NO LOOSE BOARDS OR PIECES OF TIMBER PLANKS ARE TO BE USED TO COVER CELLAR TOP.

   ON SWAMP WELLS, ENSURE ALL DECK GRATINGS ARE IN PLACE.

1.2 Ensure work area is safe and free to work.

1.3 Ensure all lubricator and BOP components have valid test tag bands on.

1.4 Inspect the hydraulic gin pole assembly, chain binders, rope-and-tackle, lubricator clamps, wire rope slings and chains, shackles, etc. are safe and in proper working condition.

   **NOTE:** A hydraulic gin pole is to be used for all well rig-ups except gas wells where a crane is to be used (see OPG No. 4C.1003, Page 2, Item 10.1)

2.0 **STUFFING-BOX (STANDARD)**

2.1 Check pin end for any damage and ensure quick union collar threads are clean. Renew O-ring if necessary.

2.2 Check that the sheave rotates freely and does not wobble. Replace the sheave bearing if worn.

2.3 Check that the sheave staff is free to swivel.

2.4 Ensure the sheave guard is securely in place.

2.5 Remove the packing nut, upper gland, plunger-stop, plunger and lower gland. Remove all used packings with a packing extractor.

2.6 Check the upper and lower glands and plunger for wire-cut wear. Replace any worn items.
2.7 Re-fit the lower gland.

2.8 Place the packing nut, upper gland, and the required number of packing pieces over the end of the wire, and feed the wire through the stuffing box.

2.9 Push the packings into the packing bore with the packing gland and lightly screwing down the packing nut.

2.10 Pull wire through the packings assembly to and fro several times in order to minimise friction over the packings. Putting some lube oil on the wire will also help.

2.11 Pull enough length of wire through the lower end of the stuffing box and make a rope socket knot as follows:-

   a) Insert wire into hole from fishing neck end of rope socket body, passing wire through spring and spring support.

   b) Loop wire around the disc groove firmly and make a wireline knot of 12 to 16 turns.

3.0 WIRELINE LUBRICATOR.

3.1 Check that sufficient length of lubricator is available to accommodate the total length of the toolstring plus the down-hole tool to be run or pulled.

3.2 Check that the pin and box sealing surfaces and threads are in good condition.

3.3 Check O-rings and replace if necessary.

3.4 Check bleed-off valves on the lower lubricator section are operative and in good condition.

3.5 Assemble the required number of lubricator sections for use above the blowout preventer (BOP), such that the section with the smallest i.d. will be at the top, and the section with the largest i.d. at the lubricator assembly.
4.0 **WIRELINE BLOWOUT PREVENTOR (BOP), MANUAL.**

4.1 Remove thread protectors (if any) from the pin and box ends, and check sealing surfaces and threads for any damage.

4.2 Replace the quick union o-ring if necessary.

4.3 Close BOP rams and inspect condition of the rams' inner seals. Check rams are correct for size of wire to be used.

4.4 Check that the BOP rams can be closed and opened freely.

4.5 Ensure rams operating handles are firmly installed on the stems.

**NOTE:** THE RAMS OPERATING HANDLES ARE OF PRIME IMPORTANCE DURING AN EMERGENCY. NEVER RIG UP A BOP WITHOUT THEM BEING INSTALLED.

5.0 **WIRELINE BLOWOUT PREVENTOR. HYDRAULIC.**

5.1 Carry out as per steps 4.1, 4.2, and 4.3 above.

5.2 Check that the two outside hydraulic connections (closing connections) have either two female or male connections. If the outside connections are female, the two inside connections (opening connections) should be male connections, or vice-versa. This eliminates any possibility of mixing up the hose connections.

5.3 Fill the hydraulic hand pump with hydraulic oil and connect the hoses to the pump. Flush through the hoses until all air is displaced.

5.4 Connect the hoses to the BOP open and close connections. Operate the hand pump to fully close BOP rams. If the BOP hydraulic cylinders are not completely full with hydraulic oil, it will be necessary to replenish the hand pump with hydraulic oil. Do not apply any hydraulic pressure at this stage.
5.5 Switch over the 4-way valve on the hand pump and operate the pump to fully open the BOP rams.

6.0 **WIRELINE CLAMP.**

6.1 Examine wire groove on the clamp for signs of burrs and wear.

6.2 Function test wireline clamp on wire to check clamping integrity.

6.3 Inspect clamp chain for sign of defects.

7.0 **WEIGHT INDICATOR.**

7.1 Ensure the weight indicator was calibrated in the last 3 months.

7.2 Check that the load cell capacity is suitable for the intended application.

7.3 Ensure that load cell and hose are located in a position to move freely, taking into account any obstruction that might interfere with the load to be measured.

7.4 Determine the hydraulic hose is of sufficient length (min. 75 ft.) for routing from the wireline unit to the X-mas tree, and still allow ample slack in the hose to avoid pulling hose taut. Tension in the hose could cause fitting or connector failure.

7.5 Check hose fittings and connections integrity to ensure no fluid leakage.

7.6 Ensure that the load cell gap (the distance measured between the load plate and the load cell retaining ring) is between 3/8" to 7/16", and is free of obstructions. (The nominal gap is usually stamped on the load cell pipe plug).

7.7 Ensure the system is full of hydraulic fluid at all times to accurately indicate hosted weight or load. A quick check for adequate fluid in the system is to measure the gap difference. Use only the correct type of weight indicator fluid if loading the system to attain the right load cell gap.
8.0 WIRELINE HAY PULLEY.

8.1 Check the sheave bearing. If worn, replace.

8.2 Check that the sheave is free to rotate.

8.3 Check wire protective guard for any wear or abnormalities.

8.4 Ensure that the safety latch on the hook is functioning properly.

9.0 PREPARE LUBRICATOR FOR RIG UP.

9.1 Lay the made-up lubricator assembly (refer item 3.5 of this OPG) close to the X-mas tree. Insert the standard wireline toolstring through the upper box end into the lubricator, with approximately 1 ft. of stem left protruding.

9.2 Run out sufficient wire and take stuffing box complete with rope socket to the lubricator box end, taking care not to bend or kink the wire.

9.3 Make up tight the rope socket to the protruding stem.

9.4 Push the complete toolstring down into the lubricator.

9.5 Pull wire from sheave wheel end and at the same time push pin end of stuffing box into the box end of the lubricator, ensuring that wire between rope socket and stuffing box is kept taut. When connection is shouldered, make up the self-aligning quick union by hand.

9.6 Pull wire taut from stuffing box down along the length of the lubricator and clamp wire by means of a wireline clamp held onto the needle valve at the lower end of the lubricator. The lubricator assembly is now ready to be picked up for installation on the X-mas tree.
10.0 RIG UP - (USE MAST TRUCK OR CERTIFIED Crane AS PER SPDC REGULATION)

NOTE:- SITE SUPERVISOR TO INSPECT AND APPROVE INSTALLATION IS SAFE FOR USE.

10.1 Ensure X-mas tree swab valve is closed, and bleed off any trapped pressure above the swab valve to zero through needle valve on the tree cap.

10.2 Remove the X-mas tree cap.

10.3 Install wellhead adaptor and BOP onto X-mas tree.

NOTE:- CONNECT HYDRAULIC HOSES TO THE BOP AND PLACE HYDRAULIC HAND PUMP AS FAR AWAY FROM THE WELLHEAD AS POSSIBLE, BUT CLOSE TO THE WIRELINE OPERATOR.

11.0 BOP TESTING ON WELLHEAD

11.1 Close flowline valve (if well is flowing) and record the CITHP.

11.2 Open the well to the BOP/lubricator slowly and observing for any leaks. If no leaks, open swab valve fully to pressure test the BOP, tree connection and lubricator with full well pressure for 15 minutes.

11.3 Lower the toolstring + 30 feet below the Xmas tree and close the BOP rams against the wire; making sure that the equalising valve is closed.

11.4 Bleed pressure above the BOP to zero psi to check the integrity of BOP rams, if okay, equalise the pressure above and below BOP rams by opening the equalising valve on the BOP before opening the BOP rams fully.
12.0 **LUBRICATOR RIG UP.**

12.1 Fit a 1/2" diameter rope x 75ft long to the body of the stuffing box on the lubricator assembly, and tie a two-and half round knot such that the rope is still free to swivel.

This rope is to be used to align the lubricator when making/breaking quick unions, loading/unloading tools into or out of the lubricator, and to counter-act the high pull during heavy jarring work which tends to bend the lubricator towards the direction of pull.

12.2 Pick up the lubricator assembly with the hydraulic gin pole until the lower pin end is level with the top of the BOP. Secure the free line of the rope block to suspend the lubricator in this position.

12.3 Chain foot-block with load cell of weight indicator at a point on the X-mas tree close to the lubricator and level with the wireline winch reel.

12.4 Run wire around foot-block and take up slack on wire slowly and carefully using the wireline winch. Ensure angle of wire around the hay pulley is as close to 90 deg. as possible, otherwise accuracy of the weight indicated will be affected if this angle is not true.

12.5 Pick up weight of wireline toolstring in the lubricator by pulling gently on the wire, and then release the wireline clamp.

12.6 Lower wireline toolstring from lubricator until the box connection is at a suitable working height above the deck gratings.

12.7 Attach down-hole tool to be run to the toolstring and tighten connection.

12.8 Lower or pick up tools until bottom is level with the tubing hanger flange. ZERO the depth counter.

12.9 Pull toolstring carefully into the lubricator.
12.10 Lower lubricator pin end into BOP box end and make up the quick union hand-tight.

12.11 Pull wire and pick up toolstring very carefully until rope socket contacts the stuffing box plunger-stop.

12.12 Install appropriate range pressure gauge on the needle valve on the lower lubricator section.
1.0  **PRE-OPERATIONAL CHECK PRIOR TO RIG UP.**

1.1 Repeat items 1.1 through 1.4 of OPG NO:4C.1002.

2.0  **STUFFING BOX WITH HYDRAULIC PACKING NUT ASSEMBLY.**

2.1 Repeat steps 2.1 through 2.7 of OPG NO:4C.1002.

2.2 Test the hydraulic packing nut assembly by applying 3,000 psi pressure through the 1/4” NPT inlet with a hydraulic hand pump. Ensure the piston is pushed back into the housing after the test.

2.3 Place the hydraulic packing nut assembly upper gland and required number of packing pieces over the end of the wire to be used, and feed wire through the stuffing box.

2.4 Push the packings into the packing bore. When the packings and upper gland are fully in place, make up the hydraulic packing nut directly onto the stuffing box body.

2.5 Repeat steps 2.10, 2.11 and 2.12 of OPG NO:4C.1002.

3.0  **WIRELINE LUBRICATOR.**

3.1 Repeat as per steps 3.1 through 3.5 of OPG NO:4C.1002.

4.0  **WIRELINE BLOWOUT PREVENTOR, MANUAL.**

4.1 Repeat as per steps 4.1 through 4.5 of OPG NO:4C.1002.

5.0  **WIRELINE BLOWOUT PREVENTOR, HYDRAULIC.**

5.1 Repeat as per steps 5.1 through 5.5 of OPG NO:4C.1002.

6.0  **WIRELINE CLAMP.**

6.1 Repeat as per steps 6.1 through 6.3 of OPG NO:4C.1002.
7.0 WEIGHT INDICATOR.

7.1 Repeat as per steps 7.1 through 7.7 of OPG NO:4C.1002.

8.0 WIRELINE HAY PULLEY.

8.1 Repeat as per steps 8.1 through 8.4 of OPG NO:4C.100.

9.0 PREPARE LUBRICATOR FOR RIG UP.

9.1 Repeat as per steps 9.1 through 9.6 of OPG NO:4C.1002, using the following lubricator configuration as from the X-mas tree cap upwards:-

a) 4" Wellhead adaptor
b) 4" hydraulic BOP
c) 4" x 8' lubricator section
d) 4" x 3" quick union cross-over
e) 3" x 8' x 2 pc lubricator sections
f) 3" hydraulic BOP
g) 3" hydraulic stuffing box assembly

10.0 GIN POLE RIG UP

10.1 No gin pole should be used to rig up on a gas well. A suitable crane with the right boom height and capacity should be used.

10.2 Wireline supervisor on site to inspect and ensure all lifting equipment are safe and up to SPDC standards and specifications prior to use.

11.0 BOP TESTING ON WELLHEAD

11.1 Repeat as per steps 11.1 through 11.7 of OPG NO:4C.1002.
12.0 LUBRICATOR RIG UP.

12.1 Repeat as per step 12.1 of OPG NO:4C.1002.

12.2 Pick up the lubricator assembly very carefully with the crane until the lower pin end is level with the top of the BOP quick union box, and suspend the lubricator in this position.

12.3 Repeat as per steps 12.3 through 12.12 of OPG NO:4C.1002.

12.4 Lower crane hook carefully, remove lifting sling from hook and move crane boom to a safe distance or position away from the lubricator assembly.
1.0 PRE-OPERATIONAL CHECK PRIOR TO RIG UP.
   1.1 Repeat as per steps 1.1 through 1.4 of OPG NO:4C.1002.

2.0 STUFFING BOX WITH HYDRAULIC PACKING NUT ASSEMBLY.
   2.1 Repeat as per steps 2.1 through 2.5 of OPG NO:4C.1003.

3.0 WIRELINE LUBRICATOR.
   3.1 Repeat as per steps 3.1 through 3.5 of OPG NO:4C.1002.

4.0 WIRELINE BLOWOUT PREVENTOR, HYDRAULIC.
   4.1 Repeat as per steps 5.1 through 5.5 of OPG NO:4C.1002.

5.0 WIRELINE CLAMP.
   5.1 Repeat as per steps 6.1 through 6.3 of OPG NO:4C.1002.

6.0 WEIGHT INDICATOR.
   6.1 Repeat as per steps 7.1 through 7.7 of OPG NO:4C.1002.

7.0 WIRELINE HAY PULLEY.
   7.1 Repeat as per steps 8.1 through 8.4 of OPG NO:4C.1002.

8.0 PREPARE LUBRICATOR FOR RIG UP.
   8.1 Repeat as per steps 9.1 through 9.6 of OPG NO:4C.1002, using the following lubricator configuration as from the X-mas tree cap upwards:
       a) Suitable size wellhead adaptor
       b) 4" or 3" hydraulic BOP
c) 4" x 8' lubricator section c/with 4" x 3" quick union cross-over on a gas well.  
   OR  
   3" x 8' lubricator section on an oil well.  

10.0 GIN POLE RIG UP.  
10.1 Repeat as per steps 10.1 through 10.2 of OPG NO:4C.1003.  
   NOTE:– Crane is also to be used to rig up on an oil well due to the long lubricator assembly.

11.0 BOP TESTING ON WELLHEAD.  
11.1 Repeat as per steps 11.1 through 11.7 of OPG NO:4C.1002.  

12.0 LUBRICATOR RIG UP.  
12.1 Repeat as per steps 12.1 through 12.4 of OPG NO:4C.1003.
1.0 PRESSURISING LUBRICATOR.

(A) WELLS WITH PRESSURE.

1.1 Ensure the wireline toolstring is right at the top such that the rope socket is butted up against the stuffing box plunger stop.

1.2 Install a 1/4" needle valve manifold with pressure gauge to the 1/2" cock valve on the bean box, and connect a flexible line (1/4" control line or Martin Decker HP hose) from the manifold to the 1/2" cock valve on the lower lubricator section.

1.3 With the 1/211 cock valve on the lower lubricator section open, slowly open the 1/2" cock valve on the bean box to pressurise the lubricator to maximum CITHP, while observing for any leaks.

1.4 Open swab valve fully and close the wing valve.

1.5 Depressurise and disconnect the flexible line.

1.6 The wireline toolstring is now ready to be run in hole.

(B) WELLS WITHOUT PRESSURE.

1.7 Repeat as per step 1.1 above.

1.8 Ensure flowline and wing valves are closed, and the master valve fully open.

1.9 Open the swab valve slowly and fully.

NOTE:- ALWAYS OPEN AND CLOSE X-MAS TREE VALVES SLOWLY AND CAREFULLY, AND COUNT THE NUMBER OF TURNS ON EVERY CYCLE.

2.0 DEPRESSURISING LUBRICATOR.

2.1 When wireline tools are pulled back into the lubricator, close swab valve fully, counting the number of turns.
2.2 Ensure wing valve is closed.

2.3 Open the flowline valve.

2.4 Close the 1/2" cock valve on bean box and bleed off remaining pressure in lubricator to the atmosphere.

NOTE:- IF FLOWLINE IS NOT INTACT, OR IS CLOSED IN AT THE FLOWSTATION, THEN BLEED OFF LUBRICATOR PRESSURE DIRECTLY TO THE ATMOSPHERE VERY CAREFULLY.
1.0 STANDARD TOOLSTRING MAKE-UP FOR OIL WELLS.

1.1 Rope socket, size: 1.1/2"
1.2 Weight stem, size: 1.1/2" or 1.7/8" x 5'
1.3 Weight stem, size: 1.1/2" x 3'
1.4 Knuckle joint, size: 1.1/2"  )
1.5 Hydraulic jar, size: 1.1/2"   ) Optional
1.6 Link jar, size: 1.1/2" x 20" stroke.

2.0 STANDARD TOOLSTRING MAKE-UP FOR GAS WELLS.

2.1 Rope socket, size: 1.1/2"
2.2 Weight stem, size: 1.1/2" or 1.7/8" x 5'
2.3 Weight stem, size: 1.1/2" x 3'
2.4 Knuckle joint, size: 1.1/2"
2.5 Link jar, size: 1.1/2" x 20" stroke.

3.0 FISHING TOOLSTRING.

3.1 Rope socket, size: 1.1/2"
3.2 Weight stem, size: 1.1/2" or 1.7/8" x 5'
3.3 Weight stem, size: 1.1/2" x 3'
3.4 Knuckle joint, size: 1.1/2"
3.5 Hydraulic jar, size: 1.1/2"
3.6 Tubular jar (if there is wire in the hole), size: 1.1/2" x 20" stroke,

OR

Link jar (if there is no wire in the hole), size: 1.1/2" x 20" stroke.

NOTE:- FOR DOWN-HOLE OPERATIONS IN 3.1/2" TUBING,
THE OPTIMUM SIZE OF THE TOOLSTRING IS 1.7/8"
THEREFORE, 1.7/8" COMPONENTS SHOULD BE USED
WHERE POSSIBLE.

4.0 PRE-OPERATIONAL CHECK ON TOOLSTRING.

4.1 Examine all pin and box threads for burrs, wear and any other defects.

4.2 Check all fishing neck profiles for cuts or burrs. Redress any burrs, or reject component with damaged fishing necks.

4.3 Inspect rope socket for burrs around the wire hole which may cut or mark the wire, and that the internal parts are not defective.

4.4 Check hydraulic jar can be closed fully and in good working order.

4.5 Ensure mechanical (tubular and link) jars are stroking freely and no defects prior to use.

4.6 Check roll pins are secure in knuckle joints and hydraulic jar connections.

4.7 Inspect knuckle joints for any deformity or cracks.

4.8 Measure and note fishing neck o.d. of every component in the wireline toolstring.

4.9 Use 18" or 24" pipe wrenches to make up toolstring. DO NOT jump on the pipe wrenches, and extensions are not allowed.

4.10 Grip wrench only on wrench recess provided on each tool. DO NOT grip wrench on fishing necks or on the box.
1.0  LUBRICATORS/WELLHEAD ADAPTORS/BOPs

1.1 All lubricator components belonging to both SPDC and service companies must be inspected once every 12 months for surface cracks by means of magnaflux method, and internal defects by ultra-sonic equipment, paying particular attention to the weldments.

1.2 After inspection, all lubricator components must be pressure tested to the maximum test pressure and held for at least 15 minutes. All pressure test to be recorded on charts.

1.3 Each component must then be fitted with a stainless steel band strapped around the neck of the box end connection, and marked with the date and test pressure applied.

1.4 All inspections and pressure test of the lubricator components are to be carried out under the direct supervision of the PRDX/2 workshop supervisor.

1.5 All inspection certificates must be approved by MTCX Inspection Section.

1.6 All inspection certificates and pressure test recorder charts must be filed at the PRDX/2 workshop office, and to be available for inspection and reference by anyone concerned.

1.7 Any lubricator component without a valid inspection and pressure test certificate must not be used for field operations.
1.0 ENTERING A LAND LOCATION.

1.1 Check wellhead and cellar with an explosive-meter to confirm area is gas-free. No vehicle is permitted to enter the location when gas or oil leaks are found.

1.2 Ensure access road into and around location is free for vehicle movement.

1.3 Before permitting any vehicle to enter a well location, ensure that the exhaust system is not leaking, and is equipped with an effective spark arrestor. No vehicle is permitted to enter a location with leaking exhaust system, or with sparks emitting from the exhaust pipe.

1.4 WARN driver of vehicle that naked lights and smoking are TOTALLY PROHIBITED inside the well location.

1.5 Instruct all vehicle drivers not to exceed 5km/hr driving speed inside the well location.

1.6 All motor vehicles must be positioned at least 50 ft. or more away from the wellhead. Contact base supervisor if this is not possible.

1.7 Where possible, position the motor vehicle upwind of the wellhead, in the direction of the prevailing wind.

1.8 For swabbing operations, position the swab tank at least 50 ft. away from both the wellhead and the wireline unit. Ensure the swab tank is equipped with a flame arrestor on the vent stack.

1.9 Ensure there are 2 full multi-purpose (dry-powder) fire extinguishers available on the location at all times.

1.10 Once the wireline truck is in final position, apply parking brakes and place anti-roll chocks against the wheels.
2.0 ENTERING A SWAMP LOCATION.

2.1 Prior to entering a well location with a wireline barge, send a scouting crew with the speed boat to check the well slot, and ensure that it is accessible, and not silted up.

2.2 At approximately 50 ft. from the wellhead, shut off the speed boat engine and paddle the boat to the wellhead jacket. Confirm the area is gas-free with an explosive meter. Entry of the wireline barge is not permitted when oil or gas leaks are found.

2.3 Function test the emergency shut-down system of the barge.

2.4 Ensure the gas detector is switched on and operational.

2.5 Check that there are four fully operative multi-purpose fire extinguishers available on board at all times, and ensure the marine and wireline crew are able and ready to operate them.

2.6 Ensure that all engines' exhaust systems are not leaking, and are properly equipped with effective spark arrestor attachments. No engine must be allowed to run with leaking exhaust lines.

2.7 Ensure visibility is very good before approaching the wellhead. Entry and exit from locations are permitted only during daylight hours.

2.8 Switch off all electrical and other non-explosion proof equipment within 50 ft. from the bow of the barge prior to final approach, and that this equipment remain switched off during the period the barge is on location.

2.9 Approach wellhead very slowly and cautiously with the wireline barge, with a speed not exceeding 0.5 knots.

2.10 Ensure all personnel on deck are wearing life jackets or work vests, safety shoes and helmets.
2.11 DO NOT allow the barge to knock against the conductor on final approach to the wellhead.

2.12 As soon as the bow of the barge contacts the ladder fender of the wellhead jacket, lower the spud legs to secure the barge in that position.

2.13 Under no circumstances should the barge be tied to the wellhead jacket.

2.14 Smoking and use of any naked lights or open fires are TOTALLY PROHIBITED.

2.15 If the swab tank is to be used, ensure that the flame arrestor attachment on the vent stack is effective and operative.

2.16 The swab tank must be emptied of all crude oil before the barge is permitted to move.

2.17 Petrol and other highly flammable liquids should not be stored on the barge.

3.0 ENTERING CLUSTER WELLS (SEWOP)

3.1 Approximately one week before entry to any cluster, check the seabed around each cluster for any debris or obstruction.

3.2 After successful seabed inspection, drop marker buoys to indicate the flowlines routes.

3.3 One day before entry, function test cluster emergency shut down system. Check wellheads with explosive meter to confirm area is gas-free. No entry is permitted when oil or gas leaks are found.

3.4 Ensure fire-fighting and foam-making equipment on the "Sewop" are ready and operative prior to sailing.

3.5 Ensure no flammable liquids are stored on deck of the vessel, and the swab tank empty prior to sailing.

3.6 Approach the cluster only when visibility is good and clear.
3.7 Ensure the vessel approach the cluster for final jack-up only against the tide/current. NEVER move into the location when the current is running towards the cluster.

3.8 Entry into the location, and jacking up and down on location must be carried out only during daylight hours.

3.9 Ensure fire-fighting crews are in readiness and at their respective stations.

3.10 only the marine crew responsible for the entry are permitted on the deck.

3.11 Switch off all non-explosion proof equipment within 50 ft. from the bow of the vessel, and ensure that they remain switched off during the period the vessel is on location.

3.12 Approach the cluster very slowly and cautiously, with a speed not exceeding 0.5 knots.

3.13 Move in the "Sewop" until the bow is at a minimum distance of 20 ft. from the cluster jacket. DO NOT permit the ship's bow to be less than 20 ft. from the edge of the cluster jacket.

3.14 Jack up the "Sewop" initially to 1 ft. air-gap to check for stability prior to jacking up finally.

3.15 Under no circumstances must jacking up be carried out on the flowline side of the cluster.

3.16 The ship's captain is responsible for the safety of the vessel and its crew, and for all its movements, including jacking up and down at the clusters.
1.0 **PREPARATION.**

(A) **"PX/PXN" PLUG ASSEMBLY.**

1.1 Check all fishing neck profiles for cuts or burrs, and any ovality. in internal fishing necks. Measure and note all fishing neck o.d.s. and i.d.s.

1.2 Ensure maximum o.d. of tool is compatible with minimum i.d. of down-hole accessories.

1.3 Check all threaded connections are made up tight.

1.4 Ensure all moving parts have proper freedom of movement.

1.5 Check condition of locating/shifting/engaging profiles for effective function.

1.6 Check all sealing elements are in good condition.

1.7 Ensure vee-packing stack has an overall clearance of 1/32" to 1/16" to allow for expansion of the packings when subjected to pressure and elevated temperatures down-hole.

1.8 Check condition and ability of equalising features.

1.9 Function test running and pulling tools for proper operation.

(B) **"PX" PRONG ASSEMBLY**

1.10 Measure and note fishing neck o.d. Ensure fishing neck has a minimum reach of 3" or more.

1.11 Check fishing neck profile for cuts and/or burrs. DO NOT use prong with damaged fishing neck.

1.12 Function test "SB" or "JDC" pulling tool on fishing neck for proper operation.

1.13 Ensure prong sealing elements are of correct size, and in good condition.
ATTACHING THE "X" RUNNING TOOL TO THE LOCK MANDREL.

1.14 Place the running tool in control position - this is done by pulling downward on the dog retainer while holding the top sub stationary. This allows the tripping dogs to drop into the recess in the main mandrel. At the same time, the lug segments are in line with the recess in the dog retainer which the lug segments to move outward and thereby releasing the core free to slide up and down in the mandrel subassembly of the running tool. With the core in the extended position, insert an alien wrench in the setting shear pin hole and slide the lock mandrel over the running tool core until the top of the packing mandrel shoulders against the boss on the core. Align the shear pin holes in the packing mandrel with that of the core and insert the correct size of brass shear pin (releasing pin).

Remove alien wrench and push the lock mandrel and core up until the fishing neck of the lock mandrel shoulders against the bottom of the dog retainer. Holding the fishing neck of the lock mandrel still butted against the bottom of the dog retainer, grasp the key retainer sleeve with the other hand and pull them apart - this action extends the core downwards and moves the retainer dogs outwardly and into the fishing neck of the lock mandrel. At this point, the lock mandrel is in the control position, which is indicated by the key springs moving the keys outward. Place a screw-driver blade in the gap between the bottom of the top sub on the main mandrel and the spring housing. Pry the top sub and the spring housing further apart with the screw-driver - this relieves the spring load on the tripping dogs. Grasp the heel of the dogs with the thumb and forefinger, and press to expand the dogs, at the same time remove the screw-driver this allows the spring housing to snap back against the top sub on the mandrel subassembly. The lock mandrel is now in the selective position.

Install a steel shear pin to pin the mandrel subassembly and the core in the selective position. Bend the shear pin slightly before pinning to ensure that it stays in place during running in hole and after shearing.
1.15 To ensure proper operation of both the running tool and lock mandrel assembly, the following should be checked:

a) The locating/tripping dogs of the running tool should be able to retract when pushed upwards, and expand fully when released.

b) The keys of the lock mandrel should be fully retracted.

c) All shear pins must be cut and filed flushed with the outside diameter of the assembly.

2.0 SETTING THE "PX/PXN" PLUG.

2.1 Having prepared the assembly ready for running, rig up lubricator and BOP on X-mas tree as per OPG NO: 5101. Make up assembly to the set of standard wireline toolstring.

2.2 Close in well and open X-mas tree swab valve as per steps 1.1 through 1.10 of OPG NO: 5104.

2.3 Lower assembly carefully into the well, tapping through selective seal bores where necessary.

CAUTION: NEVER OPEN THE LINK JAR FULLY TO PREVENT PREMATURE TRIPPING AND SHEARING OF THE TOOL WHEN TAPPING ASSEMBLY THROUGH SELECTIVE SEAL BORES.

2.4 After tapping assembly through the "X" nipple profile where it is to be set (in the case of a PXN plug, it will be the bottom-most "X" nipple profile above the "XN" nipple), raise the assembly slowly until the tripping dogs locate the bottom of the seal bore in the nipple - this is indicated by an overpull, as well as the depth reading corresponding to the depth of the landing nipple.

2.5 Apply an overpull of 200 to 300 Ibs to trip the running tool and bring the lock mandrel into control position (alternatively, the assembly can be lowered to some 10 ft. below the nipple and run up into the nipple bore, thereby creating a jarring action on the tripping dogs to trip the running tool).
2.6 With the lock mandrel in the control position, raise the assembly to approximately 10 ft. above the landing nipple, and then lower the assembly slowly into the nipple. The keys on the lock mandrel will locate the landing nipple recess. (In the case of the PXN plug, lower the assembly past the "X" nipple until the plug is seated on the NO-GO profile of the "XN" nipple).

2.7 Apply downward jarring to shear the steel setting pin in the running tool and move the lock mandrel expander sleeve behind the keys to lock them in the expanded position. When this is done, the assembly is set in the nipple.

2.8 Check the plug is fully locked in the nipple by applying a 200 to 350 lbs Overpull. When satisfied that the plug is properly set in the nipple, jar upward to shear the releasing pin connecting the running tool core to the plug and retrieve the wireline tools from the well.

2.9 Pull the toolstring back into the lubricator. Close swab valve and bleed off lubricator pressure to zero. Remove lubricator and recover the running tool.

3.0 SETTING THE "PX" PRONG.

3.1 Repeat as per step 2.1

   NOTE: Ensure the "SB" or "JDC" running tool is pinned with a brass shear pin.

3.2 Run "PX" prong into hole and locate the PX/PXN plug. Tap prong into sealing bore in the plug, and then jar down some 10 times to shear off and release the running tool from the prong.

3.3 Repeat as per step 2.9.

4.0 LEAK-OFF TEST ON "PX/PXN" PLUGS.

4.1 Disconnect lubricator/BOP/wellhead adaptor and install back X-mas tree cap securely. Fit a pressure gauge in the needle valve on the tree cap.
4.2 Open fully the X-mas tree master valve and swab valve. Record the THP above the plug.

NOTE:- WIRELINE SUPERVISOR ON SITE MUST ENSURE THE X-MAS TREE CAP IS SECURELY FITTED, AND THE MASTER AND SWAB VALVES FULLY OPEN.

4.3 Open wing valve and Clack open the flowline valve, and bleed off in stages 50% of the THP above the plug. Close wing and flowline valves and observe for 15 minutes for any build up in the THP, indicating a leak.

4.4 If the leak test is successful, bleed off the remaining THP above the plug to zero.

5.0 PULLING "PX" PRONG.

5.1 Function test "SB" pulling tool on a dummy fishing neck to check shearing and releasing features. Replace Shear pin (brass) in the pulling tool.

5.2 Ascertain the previous CITHP (prior to installation of the PX/PXN plug) from base operations supervisor.

5.3 Rig up lubricator/BOP and wireline toolstring as per OPG NO: 5010.

5.4 Record the CITHP of the well.

5.5 Run in hole "SB" pulling tool to approximately 50 ft. above the "PX" prong. Check and note pulling weight of the toolstring.

5.6 Lower toolstring slowly to locate the "PX" prong. Pick up toolstring slowly and overpull by 50 to 100 lbs above pulling weight of the toolstring to ascertain that the "SB" pulling tool latched onto the "PX" prong.

5.7 Jar up to pull Prong out from the plug. As soon as the tool comes free, observe immediately the CITHP soon as the tool increase In the CITHP confirms the prong has been pulled out from the plug.
5.8 Pull out of hole the "PX" prong as per step 2.9.

5.9 Wait for well pressure to fully equalise across the PX/PXN plug, Always compare the final CITHP with the previous CITHP prior to installing the plug.

NOTE:- REPORT FINAL CITHP TO BASE OPERATIONS SUPERVISOR IF IN DOUBT

6.0 PULLING PX/PXN PLUGS.

6.1 Prepare the Otis "GS" pulling tool as per steps 1,4 and 1.5 of OPG NO: 5114.

6.2 Make up the "GS" Pulling tool to the wireline toolstring.

6.3 Pressurise lubricator as per steps 1,3 through 1,6 of OPG NO:5104.

6.4 Run in hole Pulling tool to some 50 ft. above the PX/PXN plug. Check and note pulling Weight of the toolstring.

6.5 Lower toolstring Slowly to locate and engage the plug. Raise toolstring slowly and overpull 50 to 100 Ibs to ascertain that the "GS" pulling tool has engaged the fishing neck of the plug.

6.6 Jar upwards to unlock the mandrel and retrieve the plug from the landing nipple - a pulling weight increase of 50 to 100 Ibs indicate the plug has been retrieved from the nipple

NOTE:- Lower the toolstring very slowly to avoid inducing excessive downward force when Closing the mechanical link jar in order not to shear off the "GS" pulling tool.

6.7 Pull out of hole the plug as per step 2.9 of this procedure.
1.0 **PREPARATION.**

1.1 Repeat as per Steps 1.1, 1.2, 1.7, 1.8 and 1.9 of OPG NO.4C.1009.

1.2 Check and ensure Sealing surfaces on the drop and seat insert are smooth and clean and no obstruction or debris to hinder sealing.

1.3 Inspect O-rings, seal rings and vee-packings are of the correct size, type, and in good condition.

1.4 Ensure o.d. of the no-go ring is uniform and compatible with the no-go of the landing nipple down-hole.

1.5 Ensure surface on the adaptor sub (bottom body) above and below the no-go is free of wrench marks and burrs Which may prevent tool entry through seal bores.

1.6 Ensure roll pin is installed in the fishing neck/drop.

**NOTE:-** DO NOT APPLY ANY TORQUE TO THE FISHING NECK/DROP CONNECTION TO AVOID SHEARING THE ROLL PIN.

1.7 Check all threaded connections are made up tight.

1.8 Use appropriate size of "SB" pulling tool for running and tool.

**NOTE:-** Use Otis "H" running tool only when the test tool is to be set in the no-go nipple and left behind after the pressure test.

2.0 **RUNNING PROCEDURE.**

2.1 Repeat as per step 2.1 of OPG NO:4C.1009.

2.2 Run in hole the test tool, tapping through seal bores where necessary.

**NOTE:-** DO NOT JAR OR TAP DOWN TOO HARD TO AVOID SHEARING THE PULLING TOOL, AND TO PREVENT DAMAGE TO THE SEAT INSERT.
2.3 When the test tool is seated in the "XN" no-go nipple, slack off the toolstring weight.

2.4 Test tubing to the required test pressure.

   NOTE:-- AS WIRE IS STILL IN THE HOLE ATTACHED TO THE TEST TOOL, TAKE EXTRA CARE WHEN OPERATING VALVES ON THE CIRCULATING HEAD. CLOSING THE WRONG VALVES (IN THE VERTICAL RUN) WILL CUT THE WIRE AND CREATE A "FISH".

2.5 After the test, pick-up slack and bleed off pressure slowly via the choke line and leave the valves open.

2.6 Slack off wire, then retrieve the test tool by jarring up from the XN - NO GO nipple.

2.7 P.O.H. the test tool.

2.8 Pull out of hole the test tool, taking care when passing through seal bores of similar i.d. to the "XN" nipple on the way to surface.

   NOTE:-- To prevent corrosion from completion fluid, thoroughly clean and service the test tool as soon as possible.

3.0 PULLING PROCEDURE.

   The pulling procedure is necessary in the event that the "SB" pulling tool is inadvertently sheared while running in hole, or when the test tool is set with an "H" running tool.

3.1 Ensure the "SB" pulling tool is re-pinned with a brass pin.

3.2 Run in hole pulling tool to some 50 ft. above the test tool. Check and note the toolstring pulling weight.

3.3 Lower toolstring slowly to locate and engage onto the test tool. Raise toolstring slowly and overpull by 50 to 100 Ibs to ascertain that the "SB" pulling tool has latched on the test tool.

3.4 Repeat as per steps 2.7 and 2.8 of this procedure.
1.0 PREPARATION.

(A) CAMCO "OK-I" KICKOVER TOOL.

Refer to Drawing No: 5380/A.

1.1 Repeat as per steps 1.1, 1.2, 1.4, and 1.5 of OPG NO:4C.1009.

1.2 Remove shear pin (4) in the arm adaptor. Lift arm (15) and check springs (14). Ensure springs are strong enough to kick arm. Weak springs must be replaced. Check and tighten cap screw (13).

1.3 Remove shear pin (4) in the lower adaptor, and check for freedom of movement.

1.4 Replace shear pin (4) in the arm adaptor.

1.5 Back out the alien set screw (10).

1.6 Unscrew and remove the fishing neck (1).

1.7 Remove finger housing (2), release spring (5), and release plunger(7) by fully depressing the locating finger (18) and holding the tool in an inverted position.

1.8 Remove shear pin (20) from the finger housing (2).

1.9 Check finger spring (17) is in good condition, and ensure the spring retaining cap screws (8) are properly tightened.

1.10 Re-pin the locating finger (18) to the finger housing (2) with a brass pin. Ensure the locating finger is free to swivel on the pin. Depress the locating finger against the spring to determine its spring force.

1.11 Remove shear pin (4) from finger housing (2) and release plunger (7), and replace with a new brass shear pin. Ensure the milled flat on the release plunger is at 180 deg. opposite the locating finger.
1.12 Check the release spring (5) is in good condition, and ensure the spring retaining cap screws of the ratchet spring (6) are properly tightened.

1.13 Insert the release plunger with release spring and finger housing into the finger cage (3).

1.14 Depress the arm into the running position and make up the fishing neck (1) onto the finger cage (3) and tighten.

1.15 Make up the running tool with valve to be run (pinned previously) or the pulling tool onto the arm adaptor and tighten.

1.16 Install a brass shear pin (4) in the lower adaptor.

1.17 Depress the arm into the running position and screw down the alien set screw (10). When tight, back off 1/4 turn.

1.18 Check and ensure that the pin on the bottom of the housing (16) is in alignment with the locating finger. If not, slack off the lock ring (9) and rotate the housing for proper alignment, then re-tighten the lock ring.

1.19 The kickover tool is now ready to be made up to the wireline toolstring for running.

(B) TELEDYNE MERLA KICKOVER TOOL.

Refer to Drawing No: 5380/B.

1.1 Repeat as per steps 1.1, 1.2, 1.4, and 1.5 of OPG NO:4C.1009.

1.2 Remove shear pin (5) from the key (3) and trigger (6), and replace with a new brass pin.

1.3 Check for depressing freedom of the trigger (6). It should collapse in completely and flush with the tool body, and return freely when released.
1.4 Clamp the kickover tool on the main housing (2) horizontally in a vice, with the trigger (6) oriented at the 6 o'clock position.

1.5 Make up a running tool pinned with a side pocket dummy-valve to the lower adaptor (18) on the kickover tool hand-tight.

1.6 Apply a downward force on the key (3) to activate tool into the kicked-over position - the pivot arm should swing out and remain locked in the kicked-over position.

1.7 Press down slowly on the dummy until it is parallel with the tool housing, and then release it. The dummy should return to a straight line position with the pivot arm - if not, it indicates a weak knuckle spring (16) or a stiff pivot joint which must be rectified.

1.8 Remove the running tool and dummy from the kickover tool.

1.9 Press down hard on the pivot arm until it snaps back and locks into the running position.

1.10 Check and ensure hoisting plug (1) is made up tight to the main housing (2).

1.11 Make up running tool pinned with valve/dummy to be run, or pulling tool to the lower adaptor (18).

1.12 The kickover tool is now ready to be made up to the wireline toolstring for running.

(C) 1.1/4" CAMCO "JDC" PULLING TOOL.

1.1 Repeat as per steps 1.1, 1.2, 1.4, 1.5 of OPG NO: 5111.

1.2 Inspect the pulling tool skirt closely for any cracks, and ensure the dogs are not worn or deformed.

1.3 Place tool vertically upside down in a vice and grip same on the body of the fishing neck.
1.4 Unscrew spring retainer from the fishing neck and remove the shear pin cover. Sheared portions of the shear pin should fall out from the spring retainer.

1.5 Insert a 7/8 "o.d.x 1'" long spacer into the fishing neck to compress the core spring and move the core till the shear pin holes in the core and in the spring retainer align.

1.6 Knock out the remaining portion of the sheared pin in the core and insert a new shear pin. Cut and file the shear pin flush with the outside diameter of the spring retainer.

1.7 Unscrew spring retainer from the fishing neck and REMOVE the spacer.

1.8 Install shear pin cover over the spring retainer and make up the fishing neck onto spring retainer tight. The pulling tool is now ready to be made up to the kickover tool.

NOTE: NEVER USE A STANDARD "JDC" PULLING TOOL TO RETRIEVE ANY SIDE POCKET VALVES OR DUMMIES WITH INTEGRAL BOTTOM LATCHES, OTHERWISE SHEARING OFF TO RELEASE THE TOOL WILL BE IMPOSSIBLE DUE TO ITS LONG REACH. ENSURE THE "JDC" PULLING TOOL IS FITTED WITH A CORE EXTENSION PRIOR TO PULLING ANY VALVES/DUMMIES WITH BOTTOM LATCHES.

2.0 SETTING PROCEDURE WITH "OK-1" KICKOVER TOOL.

2.1 Repeat as per steps 2.1 and 2.2 of OPG NO: 5111.

2.2 Lower the toolstring downhole to the side pocket mandrel (SPM) at which the valve is to be set. DO NOT pick up the toolstring while running in hole to avoid tripping the kickover tool (KOT), and to allow the KOT to pass through the SPMs above.

2.3 Lower the toolstring some 5 ft. pass the SPM in which the valve is to be set, and then pick up slowly until
the locating finger is located in the orienting sleeve at the top of the SPM. Note the depth reading on the counter.

2.4 Apply an overpull of 200 to 300 Ibs, which will force the finger housing and release plunger to slide downwards with respect to the finger cage, thereby releasing the arm to kick out towards the side pocket valve receiver.

2.5 Lower the toolstring until a loss of weight is observed, indicating the tool has tripped, and the valve is seated on the side pocket. If no loss of weight is observed, it is then an indication that the KOT has not tripped, repeat step 2.4 above.

2.6 With the valve contacted in the side pocket, tap down gently to permit valve entry. Continue with heavier tapping down for some 20 times to fully set and lock the valve in the side pocket. JARRING IS NOT NECESSARY.

2.7 When satisfied that the valve is locked in the side pocket, apply an overpull of 200 to 300 Ibs to check the valve set.

2.8 Release the (JK) running tool from the valve by jarring upward to shear the releasing pins.

NOTE:- No upward jarring is required to release the Camco "GA-2" running tool.

2.9 As the tool is pulled upwards, the locating finger again locates the orienting sleeve in the SPM. Jar upwards to shear the pin between the finger housing and release plunger to allow the finger housing to move downward with respect to the finger cage - this movement causes the locating finger to be depressed into the finger housing away from the orienting sleeve and allowing the KOT to be pulled up the tubing. It will not locate into any orienting sleeve again as it passes other SPMs on the way up to surface.
2.10 Repeat as per step 2.9 of OPG NO: 5111.

3.0 SETTING PROCEDURE FOR MERLA KICKOVER TOOL.

3.1 Repeat as per steps 2.1 and 2.2 of OPG NO: 5111.

3.2 Repeat as steps 2.2 through 2.10 of this procedure.

4.0 PULLING PROCEDURE FOR "OK-I" KICKOVER TOOL.

4.1 Repeat as per step 2.1 of OPG NO: 5111.

4.2 Record the CITHP and CHP. Bleed off CHP (if any) to zero where possible, or till pressure is the same or lower than the CITHP. If the CITHP is zero, inject pressure into tubing from another well/string, or fill up tubing with portable water to prevent a "U-tube" effect, which may otherwise blow up the wireline tools as soon as the side pocket valve or dummy is pulled.

4.3 Run in hole KOT to the SPM in which the valve/dummy is to be pulled.

4.4 Repeat as steps 2.3, 2.4 and 2.5 of this procedure.

4.5 With the pulling tool seated on the valve in the side pocket, apply an over pull of 200 Ibs to confirm pulling tool has engaged fishing neck of the valve dummy.

NOTE:- Weight of the wireline toolstring and KOT is sufficient to activate pulling tool to latch onto the valve/dummy. Tapping down is not necessary.

4.6 When satisfied valve/dummy has been engaged, jar upwards to retrieve it from the side pocket.

4.7 Repeat as step 2.9 of this procedure.

4.8 Repeat as per step 2.9 of OPG NO: 5111.

5.0 PULLING PROCEDURE FOR MERLA KICKOVER TOOL.

5.1 Repeat as per step 2.1 of OPG NO: 5111.
5.2  Repeat as per steps 4.2 and 4.3 of this procedure.

5.3  Repeat as per steps 2.3, 2.4, and 2.5 of this procedure.

5.4  Repeat as per steps 4.5 and 4.6 of this procedure.

5.5  Repeat as per Step 2.9 of this procedure.

5.6  Repeat as per step 2.9 of OPG NO: 5111.

NOTES:- CARRY OUT THE FOLLOWING COMPULSORY OPERATIONS PRIOR TO ANY SIDE POCKET WORK:-

1)  Make an appropriate size drift run to some 50 ft. below the valve catcher setting depth.

2)  Set a valve catcher at some 50 ft. below the bottom-most SPM to be worked on.

3)  For side pocket work in a gas well, set a circulating plug (e.g. NAM "B" plug) in the "X" profile below the SPM to be worked on, to prevent dumping fluid from the annulus onto the formation, and to enable the string to be flowed clean Prior to final flow.
1.0 PREPARATION.

1.1 Repeat as per steps 1.1, 1.2, 1.3, 1.4, 1.5, and 1.9 of OPG NO:4C.1009.

1.2 Ensure junk/valve catcher bore is empty.

1.3 Ensure all loose scales are removed from the exterior of the catcher body.

1.4 Check lower spring force of the "GS" pulling tool by grasping the serrated surface of the dog retainer with the thumb and forefinger, and pushing firmly upwards, thus lifting the dogs off the core end into the release mode. Releasing the dog retainer automatically renders the tool in the engaging mode, as the dogs will be pushed down by the lower spring to sit back on the core bottom shoulder.

1.5 To replace shear pin in the "GS" pulling tool, carry out the following steps:- (Refer to Drawing No: 5377).
   - place cylinder (8) in a vice.
   - unscrew the top sub (4) far enough to expose the shear pin hole. Remove pieces of the sheared pins.
   - if not sheared, replace shear pin with a new one ensuring length and size are of identical type.
   - if pin has sheared, place an adjustable spanner or other suitable tool between the top sub and the bottom of the fishing neck. Move the top sub away from the fishing neck far enough to expose the shear pin hole on the core. Align the shear pin holes and replace sheared pin with a new one.

NOTE:- For ease of installation and replacement of shear pin, align both holes on the top sub and the core, and make two centre punch marks on the bottom of the core during assembly of the "GS" pulling tool. This two centre punch marks, when aligned with the shear pin hole in the top sub, will indicate the thru-bore of the two shear pin holes.
1.6 Ensure socket head set screw is tight.

2.0 SETTING PROCEDURE.

2.1 Repeat as per step 2.1, 2.2 of OPG NO:4C.1009.

2.2 Locate the down-hole control (usually a PX prong or a separation tool) and gently jar down to shear and release the "GS" pulling tool from the valve/junk catcher fishing neck.

2.3 When satisfied "GS" pulling tool is fully released from the catcher by checking the difference in weight, pull out of hole the toolstring.

2.4 Repeat as per step 2.9 of OPG NO:4C.1009.

3.0 PULLING PROCEDURE

3.1 Repeat as per step 2.1 of OPG NO:4C.1009.

3.2 Repeat as per step 6.4 and 6.5 of OPG NO:4C.1009.

3.3 Having checked the pulling tool has engaged the fishing neck by comparing the toolstring weights, retrieve the junk/valve catcher from the setting depth.

3.4 Repeat as per step 2.9 of OPG NO:4C.1009.

NOTE:- ALWAYS USE A BRASS PIN IN THE "GS" PULLING TOOL TO SET/PULL JUNK/VALVE CATCHERS.
TUBING SAFETY VALVES (STORM CHOKES)

The tubing controlled subsurface safety valve is used in conjunction with Otis type "X" lock mandrel assembly and the type "F" equalising sub.

1.0 PREPARATION.

1.1 Repeat as per steps 1.1 through 1.9 of OPG NO:4C.1009.

1.2 Check and note opening and closing pressures of the valve.

1.3 Prepare "X" running tool as per item (C) of OPG NO:4C.1009.

1.4 Prepare "GS" pulling tool as per steps 1.4 through 1.6 of OPG NO:4C.1012.

2.0 SETTING PROCEDURE.

2.1 Check and ensure that the FTHP of the well is at least 100 psi higher than the set opening pressure of the valve.

2.2 Repeat as per steps 2.1 through 2.9 of OPG NO:4C.1009.

3.0 LEAK TESTING OF THE STORM CHOKE.

3.1 Repeat as per steps 4.1 and 4.2 of OPG NO:4C.1009.

3.2 Switch the surface safety valve to manual operation.

3.3 Open wing valve on X-mas tree and flow well fast enough to drop the FTHP to below the valve closing pressure to activate the valve to close. If necessary, increase the bean size to reduce the FTHP.

3.4 When the valve is closed, a rapid drop in the THP will be observed. Stop bleeding and observe the THP for 15 minutes for any build up to check for leaks.
3.5 If the leak test is successful and acceptable, pressure up the tubing and open the storm choke with pressure from another well/string, or equalise pressure across the valve with an equalising prong.

3.6 When valve is fully open and the CITHP has returned to its initial pressure, open up the well slowly, taking care not to let the FTHP drop below the valve operating pressure.

4.0 PULLING PROCEDURE (VALVE OPEN).

4.1 Repeat as per steps 2.1 and 2.2 of OPG NO:4C.1009.

4.2 Repeat as per steps 6.4 through 6.7 of OPG NO:4C.1009.

NOTE:- IF THE VALVE IS CONFIRMED OPEN, IT IS NOT NECESSARY TO USE A PRONG FOR PULLING, BUT IT IS ALWAYS A GOOD PRACTICE TO USE IT AS ASSURANCE.

5.0 PULLING PROCEDURE (VALVE CLOSED).

5.1 Determine the CITHP.

5.2 If possible, pressurise above the closed valve to the original CITHP with pressure from another well/string.

5.3 Repeat as per step 2.1 of OPG NO:4C.1009.

5.4 Run in hole "GS" pulling tool with a pulling prong. Locate lock mandrel with the "GS" pulling tool - the pulling prong will open the equalising sub. Observe for pressure build up.

NOTE:- WHEN THE PULLING PRONG HAS LOCATED AND OPENED THE EQUALISING SUB, AND PRESSURE STARTED TO EQUALISE ACROSS THE VALVE, DO NOT UNLOCK THE FISHING NECK BY PICKING UP THE "GS" PULLING TOOL. THE FISHING NECK MUST ONLY BE UNLOCKED AFTER ENSURING WELL PRESSURE HAS FULLY EQUALISED ACROSS THE VALVE. ANY PREMATURE
UNLOCKING OF THE FISHING NECK UNDER A PRESSURE DIFFERENTIAL WILL RESULT IN THE VALVE BEING BLOWN UP THE HOLE AND CREATING A "FISH".

5.5 When satisfied that pressures have fully equalised across the valve, jar up to release the valve assembly from the nipple.

5.6 Repeat as per step 2.9 of OPG NO:4C.1009.

NOTE:— NEVER PULL AN UNEQUALISED VALVE, OR WHEN EQUALISATION IS DOUBTFUL, WITHOUT FIRST CONSULTING THE BASE SUPERVISOR.
1.0 PREPARATION.

1.1 Repeat as per steps 1.1 through 1.9 of OPG NO:4C.1009.

1.2 Prepare "X" running tool as per item (C) of OPG NO:4C.1009.

1.3 Prepare "GS" pulling tool as per steps 1.4, 1.5, and 1.6 of OPG NO:4C.1012.

2.0 SETTING PROCEDURE.

2.1 Repeat as per step 2.1 of OPG NO:4C.1009.

2.2 Lower the valve assembly into the well. Running speed should not be more than 60 ft. per minute.

2.3 Approximately 10 ft. before locating the safety valve landing nipple, flush control line until it is completely displaced with hydraulic fluid, and keep flushing at a low rate until the safety valve is fully in place.

2.4 Locate the safety valve landing nipple, and gently tap assembly into place. When the safety valve is properly in place, and the vee-packings sealing, the control line pressure will begin to increase. Allow control line pressure to build up to the operating pressure pre-set in the surface control unit.

2.5 Having established control line pressure integrity, jar down some 30 times to shear setting pin on-the running tool and lock the valve in the landing nipple.

2.6 Take a bind on the wire of approximately +/- 200 Ibs, overpull to make sure that the valve is firmly locked in the nipple.

2.7 Jar up to shear releasing pin and retrieve the running tool and lock the valve in the landing nipple.

2.8 Repeat as per step 2.9 of OPG NO:4C.1009.

3.0 LEAK TESTING THE SCSSV.

3.1 Repeat as per steps 4.1 and 4.2 of OPG NO:4C.1009.
3.2 Bleed off control line pressure to zero to close the SCSSV, and switch surface safety valve to manual operation.

3.3 Crack open flow wing valve on X-mas tree, and bleed off THP above the closed SCSSV in stages of 100 psi till flowline pressure. Close flowline valve and observe for 15 minutes for any build up in THP indicating a leak.

3.4 If the leak test is successful, start up the pump in the surface control unit and pressure up the control line very slowly until the THP begins to increase. Stop pump and maintain the control line pressure at this point until well pressure is fully equalised across the SCSSV.

3.5 When the THP has returned to its original CITHP and stabilised, pump up the control line pressure to the operating pressure as pre-set on the surface control unit to fully open the SCSSV.

3.6 Open slowly flowline valve fully to flow the well close back swab valve, and switch surface safety valve to automatic operation.

NOTE:-
1) If the SCSSV failed to open with a maximum pressure of 4,000 psi in the control line, consult base supervisor for further instructions.

2) In the event that the SCSSV is blown up the hole, notify base supervisor immediately for further instructions. DO NOT attempt to retrieve a blown up safety valve without first getting clearance from the base supervisor.

3) DO NOT carry out leak off test with wire and toolstring still in the hole.

4.0 PULLING PROCEDURE (WITH CONTROL LINE PRESSURE).

4.1 Prepare "GS" pulling tool as per steps 1.4, 1.5, and 1.6 of OPG NO:4C.1012, and install pulling prong.

4.2 Ensure control line pressure can be maintained at the Pre-set operating pressure to hold the SCSSV open.
4.3 Repeat as per steps 2.1 and 2.2 of OPG NO:4C.1009.

4.4 Run in hole and latch onto the SCSSV. Bleed off control line pressure to the CITHP of the well to reduce differential across the packings. Jar up to release SCSSV from the landing nipple.

4.5 Repeat as per step 2.9 of OPG NO:4C.1009.

5.0 PULLING PROCEDURE (WITHOUT CONTROL LINE PRESSURE).

5.1 Determine previous CITHP of the well.

5.2 Repeat as per step 4.1 of this procedure.

5.3 Repeat as per step 2.1 and 2.2 of OPG NO:4C.1009.

5.4 Inject pressure into tubing with a higher pressure from another well/string to equalise pressures across the valve.

5.5 When satisfied that pressure has fully equalised across the SCSSV (i.e. when no change in THP is observed), run in hole the pulling tool.

5.6 Gently locate the SCSSV until the pulling tool engages the fishing neck of the lock mandrel.

   NOTE:- Weight of the toolstring on the prong is sufficient to push open the flapper.

5.7 Apply 200 Ibs overpull to confirm pulling tool has latched onto the SCSSV. Jar up to release SCSSV from the landing nipple.

5.8 Repeat as per step 2.9 of OPG NO.4C.1009.

NOTE:-
1) Never equalise pressure across the SCSSV by tapping on the flapper with the pulling prong.

2) In case where the lower set of vee-packings have failed, and the control line is in communication with the tubing pressure below the SCSSV, equalise pressure into the tubing above the SCSSV from the control line.
3) If circumstances dictate that the SCSSV is to be pulled without proper equalisation, consult the Base Supervisor for instructions and directions before taking any actions.

CAMCO PB-6 FLAPPER VALVES.

6.0 PREPARATION.

6.1 Repeat as per steps 1.1 through 1.9 of OPG NO:4C.1009.

6.2 As the PB-6 valve is an unusually long valve (approx. 6 ft.), ensure sufficient length of lubricator is rigged up to accommodate the valve with the toolstring.

6.3 Prepare the Camco "ZP" running tool as follows:-

- Remove the body of the RZP" lock from the lock adaptor of the valve, and push the expander tube out of the bottom of the body.

- Connect together the two prongs of the running tool but leave the fishing neck off.

- Slide the expander tube over the prong (fingers pointing downward) and pin the expander tube to the lower hole in the prong using a 5/16" brass shear pin.

- Attach the fishing neck to the prong, gripping only the neck and prong. (Gripping the body may result in partially shearing the upper pin).

- Insert the running tool assembly into the valve and make up the lock body to the lock adaptor.

- Tighten securely, gripping the body only. (Gripping the fishing neck may result in partially shearing the upper pin).

6.4 Prepare Camco 3" JDC pulling tool as follows:-

- Place the pulling tool in a vice, gripping on the fishing neck. Back off and remove the pulling assembly from the fishing neck.
- Remove the dog spring from the skirt. The sheared portions of the shear pin should fall out from the skirt.

- Make up the re-pinning tool (Camco P/No: 87071) to the threaded bottom of the core. Move the core with respect to the skirt until the matching shear pin holes align.

- Punch out the remaining shear pin in the core with a pin punch and hammer.

- Install a new shear pin, and cut and file the shear pin flush with the outside edge of the shear pin holes.

- Install the dog spring onto the skirt.

- Make up the fishing neck onto the skirt and tighten.

7.0 SETTING PROCEDURE

7.1 Attach a PB-6 dummy to the set of standard wireline tool string as per step 2.1 of OPG NO:4C.1009.

NOTE:- The PB-6 dummy should be a replica of the actual PB-6 valve.

7.2 Repeat as per step 2.2 of OPG NO:4C.1009.

7.3 Lower PB-6 dummy into the well and locate the Page Nipple. Record depth of the nipple.

7.4 Repeat as per step 2.9 of OPG NO:4C.1009.

7.5 Attach the PB-6 valve/running tool assembly to the set of standard wireline toolstring.

7.6 Repeat as per steps 2.2 through 2.7 of this procedure.

NOTE:- ON JARRING UP TO RELEASE 'THE RUNNING TOOL, THE EXPANDER TUBE WILL MOVE BEHIND THE LOCKING DOGS, AND LOCK THE MANDREL IN THE NIPPLE. TAKE CARE WHEN JARRING NOT TO ALLOW THE JARS TO CLOSE HEAVILY. TAKE EXTREME CARE WHEN THE PIN SHEARS NOT TO ALLOW THE TOOLSTRING TO FALL BACK ON THE VALVE AS THIS COULD PUSH THE EXPANDER TUBE DOWN, THEREBY UNLOCKING THE MANDREL.
8.0 LEAK TESTING THE PB-6 VALVE.

8.1 Repeat as per steps 4.1 and 4.2 of OPG NO:4C.1009.

8.2 Repeat as per steps 3.2 through 3.6 of this procedure.

9.0 PULLING PROCEDURE (WITH CONTROL LINE PRESSURE).

9.1 Prepare 3" JDC pulling tool as per step 6.4 of this procedure.

9.2 Repeat as per step 4.2 of this procedure.

9.3 Repeat as per step 2.1 of OPG NO:4C.1009.

9.4 Repeat as per step 4.4 of this procedure.

9.5 Repeat as per step 2.9 of OPG NO:4C.1009.

10.0 PULLING PROCEDURE (WITHOUT CONTROL LINE PRESSURE).

10.1 Repeat as per step 5.1 through 5.7 of this procedure.

10.2 Repeat as per step 2.9 of OPG NO:4C.1009.

OTIS 2", 2.1/2", 3" DK BALL VALVES WITH `X' LOCK MANDRELS.

11.0 PREPARATION.

11.1 Repeat as per steps 1.1 through 1.9 of OPG NO:4C.1009.

11.2 Prepare appropriate size `X' running tool as per step 1.14 of OPG NO:4C.1009 and attach running prong.

11.3 Connect a hydraulic hand pump to the hydraulic chamber housing of the SCSSV. Pump the `DK' ball valve fully open and maintain the hydraulic pressure to hold the valve open.

11.4 Insert `X' running tool into `X' lock mandrel of the `DK' ball valve as per step 1.14 of OPG NO:4C.1009.
11.5 Bleed off hydraulic pressure in the hand pump and check that the running tool is keeping the ball partially open.

11.6 Place the running tool/lock mandrel assembly in the control position as per step 1.14 of OPG NO:4C.1009.

12.0 SETTING PROCEDURE.

12.1 Repeat as per steps 2.1 and 2.2 of OPG NO:4C.1009.

12.2 Repeat as per steps 2.2 through 2.6 of this procedure.

12.3 Repeat as per step 2.9 of OPG NO:4C.1009.

13.0 LEAK TESTING OF `DK' BALL VALVES

13.1 Repeat as per step 4.1 and 4.2 of OPG NO:4C.1009.

13.2 Repeat as per steps 3.2 through 3.6 of this procedure.

14.0 PULLING PROCEDURE (WITH CONTROL LINE PRESSURE).

14.1 Prepare `GS' pulling tool as per steps 1.4, 1.5, 1.6 of OPG NO:4C.1012, and attach the appropriate pulling prong.

14.2 Ensure control line pressure can be maintained at the pre-set operating pressure to hold the SCSSV open.

14.3 Repeat as per steps 2.1 and 2.2 of OPG NO:4C.1009.

14.4 Repeat as per step 4.4 of this procedure.

14.5 Repeat as per step 2.9 of OPG NO:4C.1009.

15.0 PULLING PROCEDURE (WITHOUT CONTROL LINE PRESSURE).

15.1 Determine previous CITHP of the well.

15.2 Prepare `GS' pulling tool as per steps 1.4, 1.5, and 1.6 of OPG NO:4C.1012.
15.3 Repeat as per step 2.1 and 2.2 of OPG NO:4C.1009.

15.4 Repeat as per steps 5.4 through 5.8 of this procedure.

**OTIS 4" `DK' BALL VALVE WITH 4" `XN' LOCK MANDREL.**

16.0 PREPARATION.

16.1 Repeat as per steps 1.1 through 1.9 of OPG NO:4C.1009.

16.2 Remove leaf spring and check lock pin in the lock mandrel is of the correct size, length and type.

16.3 Prepare the 'RX' running tool as follows:
   (Refer to Drawing No: 5372).
   - Remove top sub (1) and lock ring segment (2) from the tool.
   - Remove alien screws (5) and the two steel shear pins (4) from the bottom sub (7) of the running tool.
   - Move the bottom sub down until stopped by the shoulder bolt (6) and the lugs (8) are located over the lower body of the core. Install lock ring segment (2) over the top end of the core.
   - Install shear pin (10) in the top sub and followed by the alien set screws (5). Make up the top and bottom subs.
   - Using a hydraulic hand pump connected to the hydraulic chamber housing, pump open the `DK' ball valve fully, and maintain pump pressure to hold the valve open.
   - Insert 'RX' running tool into the 'XN' lock mandrel until the lower shear pin hole in the core line up with the matching holes in the lock mandrel.
   - Insert a 5/16" brass pin and rivet it in place.
- Pull up fully fishing neck of the lock mandrel. This causes the lugs to move out onto the larger diameter of the core and engage the fishing neck.

- Install two 3/16" x 1/2" long steel pins through the bottom sub holes into the bottom holes of the core. This will cause the keys of the lock mandrel to be in a tripped position.

- Install two alien set screws over the shear pins as back up.

- Having attached the running tool with prong to the lock mandrel/ball valve assembly, bleed off hydraulic pressure in the hand pump and check that the running prong is keeping the ball partially open.

16.4 Prepare 4" 'GS' pulling tool as per steps 1.4, 1.5, and 1.6 of OPG NO:4C.1012.

17.0 SETTING PROCEDURE.

17.1 Repeat as per steps 2.1 and 2.2 of OPG NO:4C.1009.

17.2 Repeat as per steps 2.2 through 2.6 of this procedure.

17.3 Repeat as per steps 2.9 of OPG NO:4C.1009.

18.0 LEAK TESTING OF 'DK' BALL VALVES.

18.1 Repeat as per steps 4.1 and 4.2 of OPG NO:4C.1009.

18.2 Repeat as per steps 3.2 through 3.6 of this procedure.

19.0 PULLING PROCEDURE (WITH CONTROL LINE PRESSURE).

19.1 Prepare 4" 'GS' pulling tool as per steps 1.4, 1.4, and 1.6 of OPG NO:4C.1012 and attach pulling prong.

19.2 Ensure control line pressure can be maintained at pre-set operating pressure to hold the SCSSV open.
19.3 Repeat as per steps 2.1 and 2.2 of OPG NO:4C.1009.
19.4 Repeat as per step 4.4 of this procedure.
19.5 Repeat as per step 2.9 of OPG NO:4C.1009.

20.0 PULLING PROCEDURE (WITHOUT CONTROL LINE PRESSURE).
20.1 Determine previous CITHP of the well.
20.2 Prepare 4" `GS' pulling tool as per steps 1.4, 1.5, and 1.6 of OPG NO:4C.1009.
20.3 Repeat as per steps 2.1 and 2.2 of OPG NO:4C.1009.
20.4 Repeat as per steps 5.4 through 5.8 of this procedure.

NOTE:- ALWAYS RE-CONFIRM WELL PRESSURE IS FULLY EQUALISED ACROSS THE SCSSV PRIOR TO UNLOCKING FISHING NECK. IF PRESSURE EQUALISATION IS DOUBTFUL, CONSULT BASE SUPERVISOR FOR DIRECTION AND INSTRUCTION BEFORE TAKING ANY ACTIONS. NEVER ATTEMPT TO PULL AND UNEQUALISED SCSSV.

PAGE HHTV/HHTX SAFETY VALVES

21.0 PREPARATION.
21.1 Repeat as per steps 1.1 through 1.9 of OPG NO:4C.1009.
21.2 Prepare running tool as follows:-
   - Remove sheared pin, if any, from the nose adaptor.
   - Insert prepared running tool through the collet lock mandrel. Compress the collet fingers of the valve and slide the cone over the compressed collet fingers and pin the cone to the running mandrel with brass shear screws.
21.3 Prepare pulling tool as follows:-

- Install set screws over shear pin and tighten sufficiently to ensure that the shear screws remain in the cone after shearing. Valve and running tool assembly are ready for running.

- Repeat as per steps 1.1, 1.2, 1.3, 1.5, 1.5 and 1.9 of OPG NO:4C.1009.

- Check roll pin on adaptor nose and ensure that it is properly installed.

- Remove set screw and shear pin from the body, and ensure mandrel slide freely.

- Re-install shear pin and set screw.

- Check fishing neck profile on the skirt. The pulling tool is now ready for running.

22.0 SETTING PROCEDURE.

22.1 Repeat as per steps 2.1 and 2.2 of OPG NO:4C.1009.

22.2 Lower valve assembly into the well. Running speed should not be more than 60 ft. per minute.

22.3 Repeat as per steps 2.3, 2.4, 2.5, and 2.6 of this procedure.

22.4 Repeat as per step 2.9 of OPG NO:4C.1009.

23.0 LEAK TESTING THE PAGE SCSSV.

23.1 Repeat as per steps 4.1 and 4.2 of OPG NO:4C.1009.

23.2 Repeat as per steps 3.2 of this procedure.
23.3 Crack open flow wing valve on the X-mas tree and bleed off THP above the closed SCSSV by 250 psi differential (i.e. if CITHP is 1,000 psi, bleed down above the SCSSV to 750 psi). Close flowline valve and observe for 15 minutes for any build up in pressure.

23.4 Repeat as per steps 3.4 and 3.5 of this procedure.

23.5 Open slowly flowline/wing valve fully and close swab valve. Put surface safety valve back on automatic and return well to its original status.

**NOTE:-**

1) In the event that the SCSSV is blown up the hole, notify base supervisor immediately for further instructions. DO NOT attempt to retrieve a blown up safety valve without first getting clearance from base supervisor.

2) NEVER carry out leak off test with wire and toolstring still in the hole.

3) If the THP is bled off by more than 250 psi, then the valve must be equalised with pressure from another well/string before re-opening the valve, otherwise serious damage to the valve may result.

24.0 PULLING PROCEDURE (WITH CONTROL LINE PRESSURE)

24.1 Ensure control line pressure can be maintained at pre-set operating pressure to hold the SCSSV open.

24.2 Repeat as per steps 2.1 and 2.2 of OPG NO:4C.1009.

24.3 Run in hole pulling tool made up to a dummy rope socket attached to a 'JDC' pulling tool to the top of the valve and jar down to shear the equalising plug. Jar down further to shear the core/body shear pins, and latch the collet with the pulling tool skirt.
24.4 Bleed off control line pressure to CITHP of the well to reduce differential pressure across seals. Jar up to release the SCSSV from the nipple.

24.5 Repeat as per step 2.9 of OPG NO:4C.1009.

25.0 PULLING PROCEDURE (WITHOUT CONTROL LINE PRESSURE)

25.1 Prepare pulling tool as per step 21.3 of this procedure.

25.2 Repeat as per steps 4.2 and 4.2 of this procedure.

25.3 Determine previous CITHP of the well.

25.4 Apply pressure to the tubing from another well/string of a higher pressure to equalise pressure across the SCSSV.

25.5 Run in hole pulling tool made up with a dummy rope socket attached to a 'JDC' pulling tool to top of the valve and tap down to shear the equalising plug. Watch for pressure fluctuation in the THP.

25.6 When pressure has stabilised, jar down on the pulling tool to shear the core/body pin and latch the collet with the pulling tool skirt.

25.7 Repeat as per step 5.7 of this procedure.

25.8 Repeat as per step 2.9 of OPG NO:4C.1009.

PAGE `HHV' (2.3/8") SAFETY VALVE (CASING FLOW).

26.0 PREPARATION.

26.1 Repeat as per steps 1.1, 1.2, 1.3, 1.4, 1.5, and 1.9 of OPG NO:4C.1009.

26.2 Ensure collet is of the right size.

26.3 Prepare running tool as per step 21.2 of this procedure.
26.4 Prepare pulling tool as per step 21.3 of this procedure.

27.0 **SETTING PROCEDURE.**

27.1 Repeat as per steps 2.1 and 2.2 of OPG NO:4C.1009.

27.2 Ensure valve control conduit (tubing string) is maintained at 100 psi or higher.

27.3 Lower valve assembly into the well. Running speed should not be more than 60 ft. per minute. Locate the safety valve nipple slowly, and gently tap assembly into place. Jar down lightly by hand until a solid metallic knock is heard at the wellhead. Jar down a further 15 to 20 times to shear the core/skirt pins and allow the collet to lock in the nipple profile.

27.4 Take an overpull of 200 Ibs on the wire to confirm the valve is locked in the nipple.

27.5 Jar up by hand to shear the running tool nose/valve body pins and thus release the running tool.

27.6 Repeat as per step 2.9 of OPG NO:4C.1009.

28.0 **LEAK TESTING THE SCSSV.**

28.1 Repeat as per steps 4.1 and 4.2 of OPG NO:4C.1009.

28.2 To close the safety valve, slowly depressurise the well control conduit (tubing string) pressure to zero. Observe zero pressure for 30 minutes to confirm, that the valve is locked and sealing.

28.3 Having established valve is fully locked and sealing, bleed down casing pressure by 200 psi to check valve seat seal and observe for 30 minutes for any pressure build up.

**NOTE:** DO NOT BLEED DOWN THE CASING PRESSURE BY MORE THAN 250 PSI TO PREVENT DAMAGE WHEN RE-OPENING THE VALVE UNDER DIFFERENTIAL PRESSURE.
28.4 Fill the control conduit with X-100 hydraulic oil via the X-mas tree cap, allowing sufficient time for the gas to settle out, and continue topping up as required.

28.5 Ensure the well is closed in on the casing flow.

28.6 Open the SCSSV by pressurising the control conduit very slowly until casing pressure begins to rise. Maintain control pressure at this point until well pressure has fully equalised (i.e. CHP has returned to its original pressure), then increase control pressure to the pre-set operating pressure to fully open the SCSSV.

28.7 Slowly open the casing flow valve and produce the well. Depending on the differential pressure, it may be necessary that pressure across the casing valve is equalised prior to opening up the well.

28.8 When flow condition has stabilised, switch both the surface safety valve and control unit to automatic operation.

29.0 PULLING PROCEDURE (WITH CONTROL CONDUIT PRESSURE)

29.1 Prepare pulling tool as per step 21.3 of this procedure.

29.2 Repeat as per steps 4.2 and 4.3 of this procedure.

29.3 Ensure the SCSSV is open.

29.4 Run in hole pulling tool made up with a dummy rope socket attached to a 'JDC' pulling tool; to the top of the valve and tap down to shear the equalising plug. Observe for pressure increase or decrease. When pressures have stabilised, jar down further to shear the core/body shear pins and latch the collet with the pulling tool skirt.

29.5 Ensure control conduit pressure is equal to the CHP. Pressure should slowly equalise through the equalising plug ports. Do not bleed down control conduit pressure to equalise.

29.6 When both THP AND CHP are the same, jar up to release the SCSSV from the landing nipple.
29.7 Repeat as per step 2.9 of OPG NO:4C.1009.

30.0 PULLING PROCEDURE (WITHOUT CONTROL CONDUIT PRESSURE).

30.1 Prepare pulling tool as per step 21.3 of this procedure.

30.2 Determine the previous CITHP/CHP of the well.

30.3 Repeat as per steps 25.3, 25.4, 25.5 of this procedure.

30.4 Repeat as per step 5.7 of this procedure.

30.5 Repeat as per step 2.9 of OPG NO:4C.1009.

NOTE:-

1) As the Page pulling tool cannot be released from the valve, it is imperative that the pulling tool is run on a releasing tool so that the toolstring can be released if the valve is found to be irretrievable.

2) When pulling a Page valve with suspected control line failures, it is imperative that the pressure in the tubing and annulus are equalised before any attempt is made to move the SCSSV from the nipple.

3) If pressure equalisation is doubtful or unsuccessful, consult base supervisor for direction and instructions before taking any actions.

4) The PAGE 'HHTV/HHTX' valves do not have an equalising feature, and as such, the valves should not be operated where the differential pressure is in excess of 250 psi.
1.0 **PREPARATION.**

1.1 Repeat as per steps 1.1, 1.2, 1.3 of OPG NO:4C.1009.

1.2 Ensure knuckle joints have freedom of movement.

1.3 Ensure every connection on the amerada dummy is properly lubricated prior to make up.

1.4 Ensure amerada dummy is of the right size and weight as the actual amerada gauges to be run.

1.5 Use proper amerada wrenches for dummy make up. Do not use pipe wrenches or other similar tools.

1.6 Ensure amerada rope socket is made up correctly with a weak knot (approx. 6 turns).

2.0 **TUBING/AMERADA DRIFT RUN ABOVE TUBING SHOE.**

2.1 Repeat as per step 2.1 and 2.2 of OPG NO:4C.1009.

2.2 Run in hole the drift at 60 to 80 ft. per minute.

   NOTE:- For amerada drift (sinker) run, make up the drift direct to the amerada rope socket on the wire.

2.3 To allow the amerada drift to pass through the SCSSV with the well flowing, close in the well when the drift is at approx. 100 ft. above the SCSSV, and re-open up the well slowly when the drift is 100 ft. below the SCSSV.

   NOTE:- WIRELINE SUPERVISOR ON SITE TO ENSURE THAT THE RIGHT VALVE ON THE X-MAS TREE IS CLOSED (I.E. THE WING VALVE). CLOSING THE MASTER OR SWAB VALVE WILL CUT THE WIRELINE, RESULTING IN A `FISH'!

2.4 On reaching the programmed depth, establish the wireline depth and pull out of hole.
2.5 To enable amerada drift to pass the SCSSV on the way up, close in the well at 100 ft. before reaching the SCSSV, and re-open up the well slowly after the amerada drift has passed the SCSSV by 100 ft.

2.6 Repeat as per step 2.9 of OPG NO:4C.1009.

3.0 **DRIFT RUN BELOW TUBING SHOE.**

3.1 Repeat as per steps 2.1, 2.2, and 2.3 of this procedure.

3.2 Pass drift carefully and slowly through the tubing shoe.

3.3 Immediately after passing the tubing shoe, and before locating the hold-up depth, pick up the drift every 50 ft. to check pulling weight. Abort the drift run if pulling weight shows tendency to increase to an unacceptable level.

3.4 On locating the hold-up, check depth gently. Do not jar or attempt to pass through the hold-up by force.

3.5 Having reached the hold-up depth, pick up drift carefully, taking care in entering the tubing shoe.

3.6 Repeat as per steps 2.5, and 2.6 of this procedure.
OTIS TYPE `BD' COLLET LOCK CHOKE ASSEMBLY.

The `BD' collet lock choke assembly can be run and lock in any API tubing collar recess. The sealing element is mechanically locked in the set position to allow pressure differentials to be held above or below the choke up to 5,000 psi. The choke assembly is commonly run with the `D' collet lock mandrel, a `B' bean plug, and an 'F' or 'H' equalising sub with its appropriate running/pulling prongs.

1.0 PREPARATION.

1.1 Repeat as per steps 1.1, through 1.9 of OPG NO:4C.1009.

1.2 Prepare running tool for running as follows:-

- With shear pin removed from the `D' running tool, extend the core upwards to a point where the dogs on the running tool are collapsed.

- Ensure locking sleeve in the type 'D' lock mandrel is in the down position and is locked to the inner assembly by the collet being placed in the recess in the locking sleeve.

- Test the outer sleeve to be sure it is free to move up or down. Insert running tool with prong into the mandrel until the running tool dogs are below the mandrel's locking sleeve.

- Push the core of the running tool down until the shear pin holes of the running tool are aligned, and the running tool dogs are expanded out beneath the locking sleeve. Pin the shear pin in place, and re-position the protective sleeve to protect the shear pin.

- Check that the running prong is keeping the equalising valve on the sub open.
1.3 Prepare type 'GR' pulling tool as follows:

- Remove shear pin from the Otis 'GU' shear-up adaptor, and move the core nut to the down position.

- Loosen set screw and remove retainer pin. Check retainer pin is in good condition. Re-install retainer pin and tighten set screw.

- Move the core nut to the upper position and install a new shear pin. Rotate shear pin retainer ring to retain the retainer pin.

- Make up a 'GS' pulling tool, WITHOUT SHEAR PIN, into the 'GU' shear-up adaptor and tighten - the bottom of the 'GU' adaptor housing will shoulder up against the top sub of the 'GS' pulling tool and move the cylinder down with respect to the core, thereby extending the dogs to the engaging position.

1.4 Re-pin "GR" pulling tool as follows:

- Place assembly in a vice and clamp on fishing neck of the "GU" adaptor.

- Remove the "GS" pulling tool from "GU" adaptor.

- Rotate shear pin retainer on the "GU" adaptor until holes align with shear pin. remove the sheared pin.

- Install a new shear pin in the "GU" adaptor and rotate shear pin retainer to retain the shear pin.

- Make up "GS" pulling tool to the "GU" adaptor and tighten.

- Check that there is no space between bottom of the "GS" dogs and the square shoulder of the core. The "GR" ("GU/GS" combination) pulling tool is now ready for operation.

NOTE:-NEVER RUN THIS COMBINATION TOOL WITH A SHEAR PIN INSTALLED IN THE "GSR PULLING TOOL. IF THIS SHEAR PIN IS ACCIDENTALLY LEFT IN PLACE, IT WILL BE IMPOSSIBLE TO SHEAR AND RELEASE THE PULLING TOOL FROM THE LOCK MANDREL FISHING NECK IN EITHER DIRECTION.
2.0 **SETTING PROCEDURE.**

2.1 Repeat as per steps 2.1 and 2.2 of OPG NO:4C.1009.

2.2 Lower assembly into the well at 60 ft. per minute running speed. Stop approximately three joints above the desired setting point.

2.3 Pull the subsurface flow control assembly up slowly until a collar recess is located. Do not pull more than 200 Ibs at this point. Note the wireline depth measurement of the reference collar.

2.4 Tap downward slightly and move down hole to approximately 10 ft. below the desired collar recess.

2.5 Pull the assembly up until the collar recess is encountered, and apply a 200 Ibs overpull to confirm collar recess is located. Jar upwards approx. 20 times to expand the seal element and fully lock the collet.

2.6 Tap down slightly to check if the assembly is set. If the assembly is not set, repeat step 2.5 above.

2.7 When satisfied assembly is set, jar upward until the shear pin is sheared and the running tool is free. After having sheared the pin, DO NOT tap down on the assembly again.

2.8 Repeat as per step 2.9 of OPG NO:4C.1009.

3.0 **LEAK TESTING THE PLUG ASSEMBLY.**

3.1 Repeat as per steps 4.1 and 4.2 of OPG NO:4C.1009.

**NOTE:**- WIRELINE SUPERVISOR ON SITE MUST ENSURE BOTH THE X-MAS TREE AND SWAB VALVES ARE FULLY OPEN, AND THE TREE CAP IS FITTED SECURELY.

3.2 Repeat as per step 4.3 and 4.4 of OPG NO:4C.1009.
4.0 **PULLING PROCEDURE.**

4.1 Prepare appropriate pulling tool and attach the proper equalising prong to match the type of equalising sub used.

4.2 Repeat as per steps 2.1 and 2.2 of OPG NO: 4C.1009.

4.3 Locate the plug assembly and tap pulling tool into engage fishing neck, while observing for pressure increase in the tubing. Any increase/decrease in the THP is indicative of the equalising valve being opened and pressure is equalising across the plug.

4.4 When pressure is fully equalised (i.e. THP has returned to its original pressure), jar down further to move locking sleeve downward to free the assembly.

4.5 Pull out of hole the plug assembly as per step 2.9 of OPG NO: 4C.1009

**NOTE:-**

1) IF PRESSURE CANNOT BE EQUALISED FULLY ACROSS THE PLUG, CONSULT BASE SUPERVISOR FOR INSTRUCTIONS.

2) DO NOT MAKE ANY ATTEMPT TO PULL AN UNEQUALISED PLUG.

3) THE "D" COLLAR LOCK IS DESIGNED IN SUCH A WAY THAT THE ASSEMBLY CANNOT BE UNLOCKED WITH A DIFFERENTIAL PRESSURE ACROSS THE UNIT.

(B) **OTIS TYPE "DW" PLUG CHOKE ASSEMBLY.**

The Otis type "DW" plug is designed to lock and pack off in wells which have not been equipped with any Otis landing nipple. It holds pressure from below and above. It can be set in any tubing joint of appropriate size. It is commonly run with a "W" lock mandrel, "D" bean plug, and an "F" or "H" equalising sub, with its appropriate running/pulling prongs.
5.0 **PREPARATION**

5.1 Repeat as per steps 1.1 through 1.9 of OPG NO:4C.1009.

5.2 Prepare the AW" running tool as follows:-

- Remove shear pin from the "W" running tool, and extend prong upwards to a point where the collet on
- the running tool is collapsible. Insert the running tool with running prong into the upper end of the "W" lock mandrel, with the collet located in the internal running recess in the main mandrel.
- Lower prong down to lock the collet against running recess, and to open the equalising valve.
- Install shear pin to hold the collet in the running position.
- Check slips will ride free and the equalising valve is open.

6.0 **SETTING PROCEDURE.**

6.1 Repeat as per step 2.1 and 2.2 of OPG NO:4C.1009.

6.2 Lower the assembly into the well at 60 ft. per minute running speed, until the desired setting depth is reached.

6.3 Pull upward on the wireline to expand the slips into contact with the tubing wall.

6.4 Jar up several times to set the slips and lock the plug in the tubing, and expand the element to effect a seal between the assembly and the tubing wall, at the same time shear the running tool pins and to release the running tool from the assembly.

NOTE:-- DO NOT SET THE TOOLS BACK DOWN ON THE MANDREL AFTER IT HAS BEEN SET. IF THE TOOLS HIT THE TOP OF THE MANDREL, IT MAY UNLOCK THE MANDREL.
6.5 Repeat as per step 2.9 of OPG NO:4C.1009.

7.0 LEAK TESTING THE PLUG.

7.1 Repeat as per steps 4.1, 4.2, 4.3 and 4.4 of OPG NO:4C.1009.

8.0 PULLING PROCEDURE

8.1 Repeat as per step 4.1 through 4.4 of this procedure.

8.2 When plug assembly is fully equalised (i.e. THP has returned to its original pressure), jar upward to retract the slips and free the assembly.

8.3 Pull out of hole the assembly as per step 2.9 of OPG NO:4C.1009.

NOTE:-

1) IF PRESSURE CANNOT BE EQUALISED FULLY ACROSS THE PLUG, CONSULT BASE SUPERVISOR FOR INSTRUCTIONS.

2) DO NOT MAKE ANY ATTEMPT TO PULL AN UNEQUALISED PLUG.
OTIS 'XA' SLIDING SIDE-DOORS

This Otis Sliding Side-Doors (SSD) we generally use are the type 'XA' which is opened by shifting the inner sleeve upwards (jar up to open), and closed by shifting the sleeve downwards (jar down to close). The 'XA' SSD has a type 'X' nipple profile above the inner sliding sleeve, and a polished bore below as an integral part of the assembly.

1.0 PREPARATION

Refer to drawing No. 05.480

1.1 Repeat as per steps 1.1, 1.2, 1.3, 1.4, and 1.5 of OPG No: 40.1009

1.2 Ensure tripping dogs on the slip-ring weld can move freely within the 'J' slot of the main mandrel.

1.3 Ensure the shifting keys are collapsible when compressed against the spring, and expand fully when released.

1.4 Ensure the key springs are sufficiently strong. Replace springs if they are weak.

1.5 Ensure that the tripping dog surface is slightly higher than that of the shifting key by checking with a straight edge. Tripping the tool to a non-shift position may become difficult or impossible otherwise.

1.6 Ensure shifting key shoulders are square, and not rounded off. Rounded or worn key shoulders may give a false indication of the sleeve being fully shifted, and possibly damage the shifting sleeve profiles.

2.0 OPENING THE SLIDING SIDE-DOOR

2.1 Having prepared the shifting tool for running, position the tool such that the shifting shoulders of the keys are facing downwards.

2.2 Repeat as per steps 2.1 and 2.2 of OPG No. 4C.1009

2.3 lower shifting tool into the well, taking extra care when
passing any opened SSD above the SSD to be shifted. Running speed should be reduced as much as possible to prevent inadvertent shifting of the sleeve by the bottom shoulders of the shifting tool.

2.4 When the depth of the SSD to be shifted is reached, lower the 'X' shifting tool approx. 10 ft. pass the SSD, and then pick up slowly to locate the SSD. When the sleeve to be shifted is located, jar up lightly until the THP begins to increase (or decrease) - this indicates the sleeve is in the equalising position. Immediately stop jarring and wait for pressures to equalise. Keep shifting tool engaged on the sleeve.

2.5 When no further pressure increase (or decrease) is observed, jar up to fully open the SSD. The SSD is fully open when the 'X' shifting tool does not engage the sleeve anymore.

3.0 CLOSING THE SLIDING SIDE-DOOR

3.1 Having prepared the shifting tool for running, position the tool such that the shifting shoulders of the keys are facing downwards, and trip dogs into the non-shift position.

3.2 Repeat as per steps 2.1 and 2.2 of OPG No. 4C.1009

3.3 Lower shifting tool into the well, taking extra care when passing any opened SSD above the SSD to be closed. Reduce running speed as much as possible to prevent inadvertent shifting of the sleeve should the tool engages. If the 'X' shifting tool does engage on any opened SSD and holds up, trip the shifting tool into the non-shift position by picking up the tool 5 to 10 ft. above the SSD, and then slowly lowering it through the SSD.

3.4 When the SSD to shifted is located, jar down until the sleeve is fully closed, and the 'X' shifting tool does not engage sleeve profile anymore. No equalisation is required as the sleeve was originally opened, and therefore equalised.
NOTE:-

1. It is possible that whilst jarring up/down, the tool disengages, This is because the 'X' shifting tool Incorporates an alternative tripping mechanism. To re-engage/disengage, pick up or lower the toolstring by some 10 ft and re-locate again. The sleeve is fully opened or closed when the 'X' shifting tool does not engage anymore.

2. When going in to Open more than one SSD, always open from bottom upwards.

3. DO NOT use a 'B' positive up-shift tool to open an SSD without clearance from base supervisor as it is not Selective. NEVER use the 'B' up-shift tool with a steel shear pin. Always use a brass pin.

4. Ensure tubing/annulus is adequately equalised prior to opening SSD above a top packer.

5. Where possible always carryout a Pressure test ot leak off test to confirm an SSD fully closed and holding pressure,
Wireline and Testing

WELL SERVICES AND SLICKLINE OPERATING PROCEDURES GUIDE FOR SPDC

Date: SEPT 1992

Text Page: 84

SDPC Wireline Procedures

SWABBING A WELL IS ONE OF THE MOST HAZARDOUS ASPECTS OF WIRELINE OPERATIONS, SINCE HYDROCARBONS ARE BEING HANDLED IN OPEN ATMOSPHERE, AND THE RISKS OF TOOLS BEING BLOWN UP THE HOLE AND GETTING STUCK ACROSS THE X-MAS TREE WHEN THE WELL COMES IN SUDDENLY. THEREFORE, EXTREME CARE MUST BE EXERCISED AT ALL TIMES WITH REGARDS TO OPERATIONS AND EQUIPMENT, IN ORDER TO MAINTAIN SAFETY AND PREVENT POLLUTION.

1.0. PREPARATION.

1.1 Repeat as per steps 1.1, 1.2, 1.3, and 1.4 of OPG NO:4C.1009.

1.2 Make up the appropriate size of swab cup onto a compatible swab mandrel, with a washer above and below the swab cup to protect its aluminum sleeve. Ensure the bottom cap is properly tightened, and the swab cup can slide freely on the mandrel.

1.3 Inspect the 3/16" braided wireline closely for any broken strain. NEVER run braided line with a broken strain, as this can cause "bird cages" when pulling out of hole. Additionally, the BOP rams will not be able to seal against the wireline.

1.4 Ensure the BOP is fitted with 3/16" rams assembly and the correct size of inner seals and ram guides.

   NOTE:- If a twin BOP is used, ensure the upper set of rams are fitted for 3/16" wire, and the lower set fitted with blind rams.

1.5 Ensure the line rubbers in the swabbing head are in good condition, and the line bushings and interlocking ring are not worn. Replace any worn items prior to use.

1.6 Pass sufficient length of 3/16" line through the swabbing head, and tighten the gland nut to energise the line rubbers to seal on the wire, but still allow the wire to move pass freely.

1.7 Make up the slip-type rope socket as follows:-

   - Unscrew lower sub from the rope socket body and remove the carrier and slips. Check the slips are of the correct size and rating.
- Remove set screw from the carrier.

  Pass the 3/16" wire through the top end of the rope socket body and through the tapered end of the slip carrier until the wire protrudes out approx. 1/21, at the bottom end of the carrier.

- Insert set screw into the slip carrier and tighten against the wire to hold it in place.

- Insert the slips into the carrier and pull the assembly into the rope socket body by pulling on the wire.

- Connect lower sub to the rope socket body and tighten properly. Rope socket is now ready for making up onto the wireline toolstring.

1.8 Ensure swab tank has a flame arrestor installed in the vent stack, and all hoses and lines between the swab tank and the X-mas tree are in good condition, and of the correct pressure rating.

2.0 **SWABBING OPERATIONS.**

2.1 Having checked and prepared the equipment, rig up swabbing head, lubricator and 3/16" BOP as per OPG NO:4C.1002.

2.2 Record the THP and FLP. Ensure SCSSV (if any) is open.

2.3 Hook up swab tank to bean box cap of X-mas tree with 2" Chiksans or 3,000 psi WP 2" HP hose.

2.4 Open up the well to the swab tank and observe for flow.

  NOTE:- In some cases, a well may come in without swabbing, and this will save much efforts in bringing in a well.

2.5 If the well does not flow, proceed to retrieve the SCSSV (if any) as per pulling procedures in OPG NO:4C.1014.

2.6 Run in hole swab mandrel and tag initial fluid level.
2.7 Lower swab mandrel to approx. 300 ft. below the fluid level, then pull out of hole the swab mandrel fast, taking care in passing the SCSSV landing nipple, and when the toolstring rope socket is at approx. 10 ft. from zero depth, pull toolstring slowly back into the lubricator.

**CAUTION:** KEEP PULLING WEIGHT OF THE TOOLSTRING BELOW 2,000 LBS. AT ALL TIMES, AND ENSURE THE WIRELINE LUBRICATOR DOES NOT BEND DUE TO THE HIGH PULL.

2.8 With the swab mandrel and toolstring safely inside the lubricator, observe the well for 5 to 10 minutes to see if the well will come in.

2.9 If the well does not come in, repeat steps 2.6 through 2.8 until the well comes in.

2.10 As soon as the well comes in, note the fluid level in the swab tank so as to calculate the amount of fluid recovered before the well is swabbed in.

2.11 Flow the well to the swab tank until the flowing pressure is strong enough to switch the flow to the production station.

2.12 If the well quits after flowing a short while, repeat steps 2.6 through 2.11 above.

2.13 After the well has been switched to the flowstation, continue to monitor the flowing pressures for at least one hour to ensure that the well will not quit.

2.14 If required to install the SCSSV, rig down 3/16\" line and lubricator equipment, then rig up 0.092\" wireline and lubricator assembly as per OPG NO:4C.1002.

2.15 Close in the well and install SCSSV as per setting and leak testing procedures of OPG NO:4C.1014.

2.16 After successful leak testing of the SCSSV, re-open the well as before, and switch surface control unit and surface safety valve to automatic operation.

2.17 Record the final FTHP and rig down.
3.0 TO EMPTY THE SWAB TANK.

(A) LAND LOCATION.

3.1 When the swab tank is full, and the well is still dead, empty the swab tank by pumping through the flowline to the flowstation.

3.2 If the well is flowing to the flowstation with strong and stabilised FTHP, close in the well temporarily and empty the swab tank by pumping through the flowline to the flowstation. After emptying the tank, re-open the well as before.

3.3 If the well is flowing to the flowstation with weak pressures, then drive the swab tank truck carefully to the flowstation and pump empty the tank to the saver pit.

(B) SWAMP LOCATION.

3.4 Where applicable, repeat steps 3.1 or 3.2 of this procedure.

3.5 If the well is flowing with weak pressures, it is then advisable not to close in the well. The swab tank may then be emptied by pumping through the flowline of the other string on a dual string installation. Otherwise, the wireline barge may be moved to the next nearest well and use the flowline to discharge contents of the swab tank.

(C) OFFSHORE LOCATION.

3.6 Where applicable, repeat steps 3.1 or 3.2 of this procedure.

3.7 If the well is flowing with weak pressures, then use the flowline of the other string or adjacent well in the same cluster/platform.
SAFETY PRECAUTIONS.

1) UNDER NO CIRCUMSTANCES SHOULD SWABBING BE CARRIED OUT AT NIGHT.

2) DO NOT CARRY OUT ANY SWABBING DURING STORMY WEATHER.

3) DO NOT ALLOW SWAB TANK TO FILL UP AND OVERFLOW TO AVOID POLLUTION OF THE LOCATION AREA.

4) ENSURE ALL LINES AND HOSES BETWEEN SWAB TANK AND WELLHEAD ARE NOT LEAKING TO AVOID POLLUTION.

5) ALWAYS RIG UP WITH TWIN OR STACKED HYDRAULIC BOPs WITH 3/16" RAMS AND LOWER BLIND RAMS FOR ANY EVENTUALITIES.

6) ALWAYS CHECK TOOLSTRING AND SWAB MANDREL TIGHTNESS AFTER EVERY 5 SWAB RUNS.

7) IF LARGE AMOUNTS OF GAS IS RECOVERED WITH THE SWAB FLUID, STOP SWABBING IMMEDIATELY.
1.0 PREPARATION.

1.1 Determine the production rate of the well from the base operations supervisor. Ensure the rate is below the maximum allowable flow rate for safe wireline operations in the corresponding size of tubing. If required, bean down the well prior to the job.

1.2 Ensure wire on the scratcher is securely fastened. Replace any worn pieces of wire.

1.3 Ensure maximum o.d. of the wire scratcher and gauge cutter are compatible with minimum i.d. of down-hole accessories.

1.4 Check all fishing neck profiles are in good condition. Measure and note all fishing neck sizes of all components that will be run into the well.

2.0 CUTTING OF WAX.

2.1 Repeat as per step 2.1 of OPG NO:4C.1009.

2.2 Record the initial flowing tubing head pressure (FTHP) and flowline pressure (FLP).

2.3 Pressurise lubricator and open X-mas tree swab valve as per OPG NO:4C.1005.

2.4 Run in hole a gauge cutter of tubing drift diameter to tag the top of wax (initial hold-up). Note depth and pull out of hole the gauge cutter as per step 2.9 of OPG NO:4C.1009.

2.5 Run in hole wire scratcher to initial wax depth, and allow toolstring to go down under its own weight until resistance is felt, or when it stands up.

2.6 Pull toolstring to surface back into the lubricator and wait for approx. 10 minutes to allow the well to flow out loose pieces of wax.
2.7 Run scratcher to the next depth of resistance/hold-up and repeat as per step 2.6.

2.8 Repeat step 2.7 until the scratcher can go down freely to 3,000 ft. Note the final (wax) depth of resistance prior to the scratcher being able to travel down freely.

NOTE:- The final wax depth encountered in our wells is generally less than 2,000 ft. A wire scratcher is usually run to 3,000 ft. to ensure the tubing is clear of wax below 2,000 ft.

2.9 When the scratcher is able to go down freely to 3,000 ft., run the scratcher up and down 2 to 3 times between the initial and final wax depths to remove as much wax as possible from the tubing wall.

2.10 Remove wire scratcher and make up a gauge cutter of tubing drift size or the SCSSV nipple drift size (if there is an scssv nipple in the tubing string) to the wireline toolstring.

2.11 Run in hole the gauge cutter and repeat as per steps 2.5, 2.6, 2.7 and 2.8 of this procedure.

NOTE:- If difficulty is encountered in running the gauge cutter of tubing or SCSSV nipple drift size, start with a gauge cutter of smaller o.d. and increase the size progressively with each run until the full size gauge cutter can be run down freely.

2.12 When the drift size gauge cutter can be run freely to 3,000 ft., the tubing can be said to be clear of wax, record the final FTHP and FLP.

2.13 Install SCSSV in the well as per OPG NO:4C.1014 where applicable.
NOTE:-

1) IF THERE IS AN SCSSV IN THE WELL, THE TUBING ABOVE THE SCSSV MUST BE CUT CLEAR OF ALL WAX, AND A TUBING DRIFT SIZE GAUGE CUTTER RUN TO THE TOP OF THE SCSSV PRIOR TO RETRIEVING THE SCSSV FROM THE WELL.

2) IN CASES WHERE A WELL BECOMES PLUGGED DUE TO HEAVY WAX BUILD UP, IT MAY BE NECESSARY TO BAIL OUT THE WAX WITH A BAILER UNDER CLOSED-IN CONDITIONS, UNTIL THE WELL HAS BUILT UP SUFFICIENT PRESSURE AND CAN BE FLOWED, THEN RESUME WITH NORMAL WAX-CUTTING. IF THE THP IS TOO WEAK TO PRODUCE THE WELL TO THE FLOWSTATION, THEN FLOW THE WELL INTO A SWAB TANK. UNDER NO CIRCUMSTANCES MUST ANY WELL FLUIDS BE FLOWED INTO THE WELLHEAD CELLAR.

3) WITH VERY LONG FLOWLINES, SUITABLE CHEMICAL INJECTION AT THE WELLHEAD SHOULD BE CONSIDERED IN ORDER TO PREVENT WAX DEPOSITING IN THE FLOWLINE AND POSSIBLY PLUGGING IT.
The Maxwell sand bailer consists of a plunger and traveling valve encased in a tube with a ball check at the bottom. Most common bailer is 4'-11" in length with 2'-9" of stroke. The top section is the suction tube, which is connected to the bottom section (load tube) by a middle sub. On the end of this load tube is a ball bottom which, when the plunger is lifted, will open to let in sand/debris and closes when the plunger is lowered. On the down stroke, the valve lifter moves down ahead of the traveling valve, creating a by-pass and allowing the plunger to move down, at the same time, the check valve (ball) drops back into its seat.

1.0 PREPARATION.

1.1 Check condition of fishing neck profile.

1.2 Check packings on travelling valve for wear, and if necessary, replace.

1.3 Check ball check valve on bottom sub is sealing by topping up with water and observe for leak through the ball.

1.4 Check sucking action of the pump.

1.5 Ensure plunger makes its full stroke freely.

1.6 Check and ensure all components are made up tight.

1.7 Ensure enough lubricator is rigged up to accommodate the bailer with the plunger fully extended.

2.0 SAND BAILING.

2.1 Having checked and prepared the bailer for running, rig up lubricator as per OPG NO:4C.1002.

2.2 Make up bailer to the standard set of wireline toolstring.

2.3 Close in well on the wing valve and flowline valve, open master and swab valves, and lower bailer assembly into the hole until held up at top of sand.
2.4 Operate plunger several times to fill bailer. While working plunger, do not jar down hard. If found necessary, tap down gently to increase recovery load. Since sand and well fluids enter the tube from the bottom, it is imperative that the bailer is not allowed to sit down on the sand for more than one minute. Sitting down could result in a stuck bailer, as the crater created by the bailer would cause the surrounding wall of sand between the tubing wall and the bailer o.d. to fall back on the bailer and hold it fast.

2.5 When satisfied bailer is full, pull out of hole.

2.6 Pull toolstring back into the lubricator, close swab valve and bleed off the pressure in lubricator to zero, and recover bailer from the toolstring.

2.7 Remove ball bottom from the bailer and let the recovered sand drop out into a bucket by tapping on the load tube with a hammer.

2.8 When all sand has been removed from the bailer, wash all parts of the bailer clean and repeat steps 1.2 through 1.6 of this procedure, and re-assemble the bailer.

2.9 Repeat steps 2.2 through 2.8 of this procedure until no further recovery of sand.

NOTE:-
1) Record the initial and final hold-up depths of the sand on every bailing trip.

2) Note the amount of sand recovered on each bailing trip.

3) If bailing on top of PX/PXN plugs, install a suitable size extension to the ball bottom of the bailer in order to bail out sand around 'PX' prong, and later (when the prong is retrieved) to bail inside the plug.

4) Do not apply excessive torque when tightening connections on the sand bailer, since the tubes are thin-walled, and the threads are fine threads.

5) If using a brass travelling valve, measure the o.d. to check for any wear. Replace as necessary.
The main purpose of the 'X' Separation Tool is to blank off the locker zone, and maintain production of the upper zone through the ports of an opened sliding side-door (SSD). The separation tool packs off in the SSD above and below the opened ports. The upper zone flows through the SSD ports into the equalising sub ports of the separation tool, and out via the tubing string.

1.0 PREPARATION

1.1 Repeat as per steps 1.1 through 1.9 of OPG No. 4C.1009.

1.2 Attach the 'X' running tool to the lock mandrel as per step 'C' of OPG No. 4C.1009.

1.3 Prepare the 'GR' pulling tool as per steps 1.3 and 1.4 of OPG No.4C.1016.

2.0 SETTING PROCEDURE

2.1 Open the SSD if not already opened as per OPG No. 4C.1018.

2.2 Set the 'X' separation tool in the opened SSD as per steps 2.1 through 2.9 of OPG No. 4C.1009.

3.0 LEAK OFF TEST

As the separation tool ports are open to the upper zone, it is not possible to carryout a leak off test of the bottom plug of the separation tool.

4.0 PULLING PROCEDURE

4.1 Repeat as per steps 4.1 through 4.3 of OPG No. 4C.1016.

4.2 Lower pulling tool, locate separation tool, tap down to open equalising valve and to engage fishing neck. Observe for pressure fluctuation in the tubing - any increase or decrease in the THP is indicative of the equalising valve is opened, and pressure is being equalising across the bottom plug of the separation tool.
4.3 When pressure across the bottom plug in the separation tool is fully equalised, jar up to release separation tool from the SSD.

4.4 Repeat as per step 2.9 of OPG No. 4C.1009.

NOTE:-

1. IF PRESSURE CANNOT BE EQUALISED ACROSS THE BOTTOM PLUG IN THE SEPARATION TOOL, OR IF EQUALISATION IS DOUBTFUL, CONSULT BASE SUPERVISOR FOR INSTRUCTIONS

2. DO NOT MAKE ANY ATTEMPT TO PULL AN UNEQUALISED SEPARATION TOOL.

3. OBTAIN THE PREVIOUS THP OF THE WELL (PRIOR TO INSTALLATION OF THE SEPARATION TOOL) FROM BASE OPERATIONS BEFORE START OF THE JOB.
HISTORY OF FISH.

Assume the 0.092" wire pulled out of the rope socket when attempting to jar free 'pr' plus from the 'X' landing nipple at approx. 9,000 ft. 'Fish' consists of a set of standard wireline toolstring with .GS' pulling tool still attached to the fishing neck of the 'PX' plug. Wire recovered from the hole approx. 9,000 ft. Amount of wire, if any, left in hole is uncertain.

1.0 PREPARATION.

1.1 Ensure lubricator length is sufficient to accommodate fishing toolstring and the 'fish'

1.2 Check integrity of fishing neck profiles, measure and note fishing neck o.d.s. of fishing toolstring components.

1.3 Ensure all threaded connections on fishing tools are made up tight.

1.4 Ensure all necessary fishing tools are available on site.

1.5 Function test all pulling tools prior to running.

1.6 Ensure lead impression blocks (LIB) and blind box bottom faces are dressed free of any indentations and marks before use.

1.7 Use appropriate tubular jar if fishing for wire.

2.0 FISHING OPERATION.

2.1 Rig up lubricator as per OPG NO:4C.1004.

2.2 Make up appropriate size of lead impression block (LIB) to the standard set of wireline toolstring, open X-mas tree valves and lower the LIB into the well.
2.3 Locate the top of fish (rope socket) gently, and jar down hard once to obtain impression of top of rope socket.

2.4 Pull out of hole the LIB, close X-mas tree valves, remove lubricator and recover the LIB.

2.5 If impression indicate a clear rope socket, run in appropriate size of jar-up shear (Otis 'RS' or Camco 'JUS') pulling tool with a brass shear pin.

2.6 Engage rope socket of fish and jar down to shear and release 'GS' pulling tool from the 'PX' plug fishing neck.

2.7 Pull out of hole wireline toolstring and fish as per step 2.9 of OPG NO:4C.1009.

2.8 After recovering fish from the well run in hole 'GS' pulling tool and retrieve the 'PX' plug as per Step 6.4 through 6.7 of OPG NO:4C.1009.

NOTE:- ALWAYS SHEAR OFF AND RELEASE PULLING TOOL OF THE 'FISH' FROM FISHING NECK OF THE DOWN-HOLE LOCK MANDREL PRIOR TO RETRIEVING THE FISH, AND THEN MAKE A SEPARATE TRIP IN TO RETRIEVE THE LOCK MANDREL/ SUBSURFACE CONTROL ASSEMBLY.

1.0 NOTES OF GUIDANCE FOR WIRELINE SITE SUPERVISOR.

Immediately any wireline operation turns into a fishing operation, the Well Services base supervisor must be contacted and given the following information:-

1) Operation being performed when wireline fish occurred.
2) Depth at which the operation was being performed.
3) Reason why fish occurred.
4) If the wire broke on surface, state where the wire broke, and the amount of wire remaining on surface.

5) If the wire broke down-hole, state the estimated amount of wire retrieved and estimated amount remaining down-hole.

6) The amount of wire available on the drum and the estimated depth of the fish.

7) Fishing tools available on site to commence fishing operations. The Well Services supervisor will then indicate what action should be taken. No set procedure can, be laid down as each fishing operation will depend on individual circumstances.

2.0 PROCEDURE TO REMOVE RECOVERED WIRE FROM THE LUBRICATOR.

2.1 Having recovered the wire from the well using a wire grab, and ensuring the fishing toolstring rope socket is located at the stuffing box, close the BOP rams and bleed off pressure in the lubricator above the BOP to zero.

2.2 Disconnect lubricator at top of BOP and pick up lubricator approx. 3 ft.

2.3 Install special wire clamp across BOP box connection over wire, and fasten clamp to prevent wire from slipping off.
2.4 Lower wire grab till out of lubricator, taking care not to kink the loose end.

2.5 Cut wire on the straight section just below the wire grab, and rig down toolstring. Cut wire on the toolstring rope socket.

2.6 Rig down lubricator, remove extra section of lubricators, and leave one section of lubricator still attached to the stuffing box.

2.7 Thread loose end of recovered wire through the section of lubricator and stuffing box. Draw out sufficient length of wire through the stuffing box sheave.

2.8 Make a knot and join the recovered wire to the wireline from the unit spool.

2.9 Rig up lubricator, tension wire, disconnect special clamp and make up lubricator to the BOP.

2.10 Equalise pressure across BOP rams and open BOP rams fully. Commence pulling out of hole the remaining wire.

NOTE:-OFTEN THERE ARE 2 TO 4 STRAINS OF WIRE IN THE FORM OF A LOOP ACROSS THE BOP RAMS. DO NOT CUT ANY ONE OF THEM. KEEP RECOVERING THE LOOPED WIRE UNTIL A SINGLE WIRE IS LEFT ACROSS THE BOP RAMS. CONNECT THIS WIRE TO THE WIRE FROM THE WIRELINE UNIT AND CONTINUE RECOVERING.

HISTORY OF FISH.

0.092" wire parted at surface while attempting to jar free `Q' test tool from 'XN' nipple at approx. 9,000 ft. Fish consists of standard wireline toolstring with `SB' pulling tool still attached to fishing neck of test tool. Wire left in hole is approx. 9,020 ft.
3.0 PREPARATION.

3.1 Repeat as per steps 1.1, 1.2, 1.3, 1.4, 1.6 and 1.7 of OPG NO:4C.1024.

4.0 FISHING OPERATION.

4.1 Make up an appropriate size of blind box to a standard set of wireline toolstring. Open X-mas tree valves and run in hole very slowly and carefully. If the blind box is held up higher than the expected depth of the fish, DO NOT jar down. Pull out of hole immediately and investigate the hold up. Possibly the blind box is too big to by-pass wire inside the tubing.

4.2 Having successfully run the blind box to bottom, locate top of rope socket gently.

4.3 Jar down very hard 5 to 8 times to cut wire on top of the rope socket.

4.4 Pull out of hole the blind box and inspect its bottom face thoroughly to ascertain that wire is indeed cut from the rope socket. In case of any doubts, re-run the blind box.

4.5 Run a 'Bowen' wirefinder attached to a rope socket on an 'RS' or 'JUS' pulling tool pinned with a brass shear pin. Ensure o.d. of the wirefinder skirt is as close to the tubing drift size as possible.

NOTE:- THE BOWEN WIREFINDER IS DESIGNED TO CATCH THE END OF THE WIRE STICKING UP IN THE TUBING. IT IS THEREFORE POSSIBLE TO LATCH ONTO THE WIRE WHEN THE WIREFINDER LOCATES THE TOP OF WIRE IN THE HOLE. THE WIREFINDER SUPERVISOR ON SITE SHOULD MAKE EVERY EFFORT TO ESTIMATE THE TOP OF WIRE, AND NOTE THE PULLING WEIGHT OF THE TOOLSTRING BEFORE LOCATING THE WIRE. WHEN PULLING OUT OF HOLE THE WIREFINDER, NOTE THE PULLING WEIGHT. IF THERE IS ANY INCREASE IN PULLING WEIGHT, IT IS THEN POSSIBLE THAT WIRE IS RECOVERED WITH THE WIREFINDER. DO NOT CLOSE X-MAS TREE VALVES, BUT CLOSE THE BOP RAMS WHEN THE TOOLSTRING IS BACK IN THE LUBRICATOR.
4.6 Run in hole slowly, checking pulling weight every 50 ft. until the estimated depth of wire is reached. When the top of wire is located, work on wire a little with the wirefinder to enable it to be retrieved with a wire grab later. Pull out of hole the wirefinder.

4.7 Run in hole a wire grab attached to a rope socket on a pulling tool ('RS' or 'JUS') with a brass shear pin. Locate top of wire, engage wire and pull to surface.

4.8 Recover wire as per steps 2.1 through 2.10 of this procedure.

CAUTION:-- DO NOT AT ANY TIME RUN WIRE GRAB BELOW HOLD-UP DEPTH OF WIREFINDER.

4.9 Having satisfied that all wire is recovered from above the fish, run an appropriate size of LIB to the top of rope socket of the fish.

4.10 If impression indicates a clear rope socket, run in hole the appropriate size of jar-up shear pulling tool ('RS' or 'JUS') pinned with a brass pin.

4.11 Engage rope socket of fish and jar down to shear and release 'SB' pulling tool from the 'Q' test tool fishing neck.

4.12 Pull out of hole the wireline toolstring and fish as per step 2.9 OF OPG NO:4C.1009.

4.13 Re-run the 'SB' pulling tool and retrieve the 'Q' test tool as before.
HISTORY OF FISH.

Tools were blown up the hole while opening a sliding side-door at 7700 ft. Lost spang jar action, unable to recover toolstring. Fish consists of a set of standard wireline toolstring with an `X' shifting tool attached. Wire still connected to surface. Size of wire is 0.092".

1.0 PREPARATION.

1.1 Repeat as per steps 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, and 1.7 of OPG NO:4C.1024.

2.0 FISHING OPERATIONS.

2.1 Drop type `A' Go-Devil (weight bar) until it is stopped by the balled up wire above the toolstring. The Go-Devil provides a wireline socket (firm base) above the balled up wire so that the cutter to be dropped will have a base on which it can be activated to cut the wire. Assemble the Go-Devil as follows:-

- Remove the pins and the filler plate from the body of the Go-Devil.
- Provide sufficient slack on the wireline. Close BOP and bleed off pressure from the lubricator above the BOP rams to zero. Disconnect and hoist up the lubricator.
- Install the Go-Devil over the wireline so that the fishing neck is at the upper end, and the wireline is inside the longitudinal groove of the Go-Devil. Insert the filler plate, followed by the pins to fasten the filler plate in place.
- Allow the Go-Devil to rest on the BOP rams. Set the lubricator in place and make up the quick union.
- Equalise pressure across the BOP rams.
- Open the BOP rams fully to permit the Go-Devil to fall into the tubing. There is a possibility that the Go-Devil may lodge in the tubing hanger. By listening as the Go-Devil is dropped, it may be determined whether or not it is falling into the tubing. Allow sufficient time for it to fall, then pull a bind and slack off the wireline once or twice.

2.2 When satisfied Go-Devil has reached its destination, prepare to drop in the 'Kinley Snepper. Assemble the Kinley Snepper as follows:-

- Close the BOP, bleed off pressure from the lubricator above the BOP rams to zero. Provide sufficient slack on the wireline, disconnect and hoist up the lubricator.

- Cut a 1/16" brass filler rod to 4" long and push it through the two length wise holes in the slipper. The upper end of the slipper may be identified by the rounded (crimper) edge where the slot comes to the inclined face.

- Put the slipper on the wireline so that the wireline lies in the back of the slot.

- Put the crimper on the wireline in the same way above the slipper and bring the two pieces together, pushing the 1/16" brass shear pin into the crimper and out the far side just enough so that it can be crimped down into the recess meant for it.

- Screw the set screw into the tapped hole at the top of the crimper until it is tight. Put the knife on the wireline in the same way below the slipper and bring the pieces together, pushing the 1/16" brass shear pin down into the knife. Crimp the end of the shear pin slightly and screw the set screw in all the way.

- Push the body onto the wireline and push the subassembly into it.
- Line up the 1/16" shear pin hole which goes across the knife with the corresponding 1/16" shear pin slot located some 3 to 4 threads at the bottom of the body. Rush another 1/16" shear pin through and cut it off so that it will not interfere with the threads.

- Put the bottom skirt on the wireline below the body and subassembly, and screw it tightly onto the body. The cutter is now ready to be dropped into the well.

2.3 Set the lubricator in place, make up quick union and equalise pressure across the BOP rams.

2.4 Apply sufficient tension on the wireline (usually the pulling weight of the toolstring in the hole). Open the BOP rams fully to permit the cutter to fall into the tubing.

2.5 Allow sufficient time for the cutter to fall, and observe the weight indicator for drop in weight to indicate that the wire is cut. It may be necessary to work on the wireline to effect a cut. The Kinley cutter will cut the wireline when it hits the top of the Go-Devil. Sometimes, it will also crimp the end of the line and clamp onto it at the same time, and hopefully when the wire is pulled out of hole, the cutter will be on the end of it.

2.6 If the cutter fails to cut the wireline, a drop-weight (Go-Devil) may be dropped in onto the top of the cutter to give a still harder blow.

2.7 Recover the cut wire and note the amount of wireline recovered.

2.8 Rig down existing lubricator set-up and rig up fishing lubricator as per OPG NO:4C.1004.

2.9 Run in hole appropriate pulling tool and recover the Kinley Snepper if not recovered with the cut wireline.

2.10 Run in hole appropriate pulling tool and recover the Go-Devil.
2.11 Run in hole impression block and obtain impression of condition of the fish down-hole.

2.12 If impression shows wire on top of rope socket, run in hole appropriate size of blind box with tubular jar and cut wire on top of the rope socket as per step 4.3 of OPG NO:4C.1025.

2.13 Pull out of hole blind box and inspect bottom face carefully to ascertain that wire on top of the rope socket has indeed been cut.

2.14 Run in hole appropriate size of jar-up shear (`RS' or `JUS') pulling tool and recover the fish.

   NOTE:- If upward jarring is required to free the fish, it may then be necessary to use a jar-down shear (`SB' or `JDC') pulling tool. It is also an indication that there is possibly some wire around the fish.

2.15 After the fish has been successfully recovered, continue to fish for remaining wire as per steps 2.1 through 2.10 of OPG NO:4C.1025.

2.16 When no more wire is recovered on the wire grab, make a tubing drift size LIB run to the tubing shoe or top of subsurface control to confirm the tubing is clear of wire. Check LIB for any impression of wire.
1.0 **DISASSEMBLY.**

1.1 Clean inside and outside of the safety valve thoroughly.

1.2 Inspect valve visually and note down any abnormalities.

1.3 Inspect and record condition of the vee-packings.

1.4 Complete Valve Service Data Sheet.

1.5 List of recommended supplies:-

   Solvents such as perchloroethelene should be used as cleaning fluid. As the solvents are sometimes difficult to obtain locally, clean diesel, kerosene or unleaded petrol could be used as temporary substitutes.

   Dow Coming 55M grease or any equivalent Silicone grease should be used to lubricate the O-rings and 'T' seals. If these are not available, any clean light grease will suffice as a temporary substitute. Molykote 'On' Paste which has a Molybdenum Disulphide (MoS2) base with good anti-galling properties must be used on all threaded connections.

   'Loctite' Grade 242 (Blue in colour) or any semi-permanent thread-lock compounds should be used on threaded connections, where specified by the safety valve manufacturer.

2.0 **ASSEMBLY.**

2.1 Wash all metal parts with a solvent and blow them dry with compressed air.

2.2 Lubricate all O-rings and seals with a silicone base lubricant prior to installation.

2.3 Use an MoS2 base lubricant with good anti-galling properties on all threaded connections, except where the use of thread-lock compounds is specified.

2.4 DO NOT put wrench or vise grip on any sealing surfaces.

2.5 Grip lightly the parts for make-up on the vise.
2.6 Always use a strap wrench for make-up of parts.

2.7 Always use jaw protectors (brass) on the vise.

2.8 Dress all visible wrench marks on the body of the valve after assembly.

2.9 Do not use pipe wrench on any parts of the valve.

2.10 Complete Valve Service Data Sheet.
1.0 GENERAL FACTS ABOUT THE FLAPPER VALVE..

The Camco B-6 series Subsurface Safety Valves (SCSSV) are normally closed valves. A coiled spring forces a piston/flow tube upwards allowing the flapper to close and effect a seal. When hydraulic pressure is applied from the surface through the control line, the piston/flow tube is forced downwards, opening the flapper. The initial flow tube movement opens the equalising seat. After equalising is complete, further application of hydraulic pressure will move the flow tube down which in turn swings the flapper to the fully open, and fully protected position. The hydraulic pressure must be sufficient to overcome the compression of the coiled spring and the force generated by the well pressure acting upon the total surface area of the piston. Loss of hydraulic fluid pressure in the control line allows the spring to close the valve. The Valve is run and set by using an Otis 'X' Running Tool, and retrieved with an Otis 'GS' Pulling Tool, with the appropriate running and pulling equalising prongs.

2.0 SEAT HOUSING/FLAPPER HOUSING DISASSEMBLY.

Refer to Drawing No: 5321/C.

2.1 Grip the Lock Adaptor (1) in the vise.

2.2 Disconnect the Lock from the Lock Adaptor.

2.3 Grip the Equalising Seat (15) in the vise.

2.4 Remove the Seat Housing (17) and the Flapper Housing (29) as a unit from the Equalising Seat (15).

2.5 Install the two-piece unit in the vise; the grip of the vise should be located on the centre of the Seat Housing (17). Remove the Nose (30) and the Seal (28) from the lower end of the Flapper Housing (29).

2.6 Insert a wooden rod through the bore of the two pieces to hold the Flapper (27) off the Flapper Soft Seat (24). The wooden rod will prevent the Flapper from possibly scoring the Flapper Soft Seat as the Flapper Housing (29) is removed from the Seat Housing (17).
2.7 Remove the Flapper Housing from the Seat Housing.

2.8 Lay the Flapper Housing (29) on the work bench drive the Flapper pin (25) out through the flapper pin holes in the Flapper Housing. The Flapper (27) and the Flapper Spring (26) will be released from the Flapper housing when the flapper pin is removed. Remove the flapper and flapper spring from the bore of the flapper housing.

2.9 Remove the Soft Seat (24) from the Flapper Seat Insert (22).

2.10 Remove the flapper seat insert from the recess at the end of the seat housing (17).

2.11 Remove the seat housing from the vise.

3.0 VALVE BODY DISASSEMBLY - 2" OB-6.

Refer to Drawing No: 5321/A.

3.1 Grip the Equalising Seat in a vise.

3.2 Remove the flapper housing (31) and seat housing (23) as a unit from the equalising seat (18), exposing the choke (24). CAUTION: DO NOT REMOVE THE CHOKE YET.

3.3 Remove lock adaptor (1) and hydraulic chamber housing (8) from the spring housing (16), exposing the flow tube (3). Remove the packing set from the packing section of the packing barrel (9).

3.4 Slide disassembly tool top stopper over the flow tube (3) and make up fully the stopper onto the packing barrel (9). NOTE: When top stopper is fully made up, no thread from the packing barrel pin should be visible.

3.5 Having ensured that the stopper is fully made up, remove the choke (24) from the flow tube (3).

NOTE: NEVER place a wrench or attempt to wrench on the polished sealing surface below the base of the choke. Any scouring or deformation of the polished area below the base of the choke will affect the sealing properties.
3.6 Make up tight the bottom stopper onto the equalising seat (18). Ensure the stopper is fully made up.

3.7 Insert disassembly compression rod through the bottom stopper and the flow tube ensuring rod is fully in with the nut and washer located at the bottom stopper.

3.8 Slide disassembly flow tube protector over compression rod and into the flow tube bore.

3.9 Make up compression wing nut with washer onto the compression rod until flow tube protector is located. Make up wing nut hand-tight against washer and flow tube protector.

3.10 Back off packing barrel (9) very carefully from spring housing (16). When packing barrel is completely detached from the spring housing, very carefully start decompressing the spring (17) by backing off the wing nut until the spring is fully relaxed.

3.11 Remove wing nut, washer, flow tube protector and flow tube (3) from the Spring (17), top stopper and packing barrel (9).

3.12 Remove the spring (17) from the flow tube (3).

3.13 Grip top stopper in the vise and back off packing barrel (9) from the top stopper, and remove same by sliding it out from the bottom end of the flow tube.

3.14 Remove top stopper from the vise and recover the flow tube.

3.15 Remove compression rod from the valve body, and bottom stopper from the equalising seat (18).

3.16 Back off spring housing (16) from equalising seat (18) and remove from the vise.

4.0 **VALVE BODY DISASSEMBLY OF 2.1/2" OB-6, 3" XB-6 AND B-6.**

   Refer to Drawing No: 5321/C.

4.1 Grip the equalising seat (15) in the vise.
4.2 Remove flapper seat housing (17) and flapper housing (29) as a unit from the equalising seat (15), exposing the choke (20). DO NOT REMOVE THE CHOKE YET.

4.3 Remove lock adaptor (1), hydraulic chamber housing and packing barrel (8) as a unit from the spring housing (11), exposing the flow tube (14).

4.4 Make up tight the disassembly to top stopper onto the spring housing (11).

4.5 Having ensured that the top stopper is fully made up onto the spring housing (11), remove the choke (20) from the flow tube (14).

   NOTE: NEVER place a wrench or attempt to wrench on the polished sealing surface below the base of the choke. Any scouring or deformation of the polished area will affect sealing properties.

4.6 Make up fully the disassembly tool bottom stopper onto the equalising seat (15).

4.7 Insert the compression rod through the bottom stopper and the flow tube (14). Ensure the rod is fully in with the nut and washer located at the bottom stopper.

4.8 Slide flow tube protector of the disassembly tool over the compression rod and insert it into the flow tube bore.

4.9 Make up the compression wing nut with washer onto the compression rod and drive nut to locate the flow tube protector.

4.10 Make up wing nut hand-tight against the flow tube protector.

4.11 Back off very carefully disassembly tool top stopper from the spring housing (11).

4.12 Back off spring compression wing nut carefully and simultaneously allowing the power spring (13) to relax.

4.13 When the spring (13) is completely relaxed, remove wing nut from compression rod.
4.14 remove washer and flow tube protector and top stopper.

4.15 Recover flow tube (14) and relaxed spring (13) from the spring housing (11). Withdraw compression rod and back off bottom stopper. Back off spring housing from equalising seat (15) and remove equalising seat from the vise.

4.16 Remove wiper rings (21), O-rings and seals from their respective parts.

4.17 Record condition of all parts, wiper rings, O-rings and seals into the Safety Valve Data sheet, paying particular attention to corrosion, deformity, galling, etc.

4.18 Inspect all threads for any signs of damage.

4.19 Report to workshop supervisor any unusual observations. Pay particular attention to the spring, choke, flow tube and flapper assembly.

NOTE:- NEVER ATTEMPT TO DISASSEMBLE THE SAFETY VALVE WITHOUT THE USE OF THE SPRING COMPRESSOR ASSEMBLY. SERIOUS INJURY COULD RESULT IF THE PACKING BARREL IS REMOVED WITHOUT THE USE OF THE SPRING COMPRESSOR TO CONTAIN THE FORCE OF THE COMPRESSED SPRING. STRAP WRENCHES MUST BE USED WHERE REQUIRED ON ALL INTERNAL PARTS OF THE VALVE.

5.0 SEAT HOUSING/FLAPPER HOUSING ASSEMBLY.

Refer to Drawing No: 5321/C

5.1 Install the seat housing (17) in a bench vise and apply a liberal amount of seal lubricant to the flapper seat insert O-ring (23), and install same in the recess at the lower end of the seat housing. The O-ring at the bottom end of the flapper seat insert (22) will offer some resistance as the insert is installed. Once the insert is partially installed, lay a flat board over the insert and knock the board with a hammer to fully seat the insert without damaging the seat line of the insert. Make sure that the flapper seat insert is fully and evenly installed in the insert recess.
5.2 Install the soft seat (24) over the flapper seat insert (22).

5.3 Place the flapper housing (29) on its side on the work bench. the side with the flapper pin holes and window must be on the side facing upward towards the assembler.

5.4 Pick up the flapper (27) and apply a small amount of grease to each side of the flapper hinge and in the spring slots behind the hinge section.

5.5 Install the flapper spring (26) on the flapper hinge; the offset ends of the flapper spring must point outwards from the flapper hinge; the tack of grease will hold the spring in place for installation purposes.

5.6 Insert the flapper (27) into the bore of the flapper housing (29) from the upper end. The spring and hinge section go in first with the smooth machined surface of the flapper facing upwards.

5.7 Align the flapper hinge and the flapper spring (26) with the flapper pin holes in the flapper housing (29). The offset ends of the flapper spring go behind the ridge of metal through which the flapper pin hole is drilled. Insert a 3/16" pin punch through the flapper holes, the flapper spring and the flapper hinge to hold and align the pieces.

5.8 Insert the flapper pin (25) into the flapper pin hole opposite the punch. Withdraw the punch and follow it out from the opposite side with the flapper pin.

**NOTE:** The flapper spring is a torsional spring and the coils will tighten as the flapper is opened. If the spring coils do not tighten as the flapper is opened, the spring is not properly installed.

5.9 When flapper spring (26) is properly installed, centralise the flapper pin (25) in the flapper pin hole. To prevent the flapper pin from working itself loose, deform the flapper pin at both ends of the pin with a small centre punch.

5.10 Install a wooden dowel rod into the flapper housing (29) to keep the flapper in the open position.
5.11 Make up the flapper housing (29) onto the seat housing (17).

5.12 Install the flapper housing seal (28) into the end of the flapper housing (29).

5.13 Make up the nose (30) onto the end of the flapper housing. Wrench all pieces fully tight. Remove the dowel rod.

6.0 VALVE BODY ASSEMBLY - 2" OB-6

Refer to Drawing No: 5321/A.

6.1 Grip the equalising seat (18) in a vise. The grip of the vise should be located on the centre of the equalising seat.

6.2 Make up the spring housing (16) onto the upper end of the equalising seat (18).

6.3 Make up bottom stopper to the equalising seat.

6.4 Insert compression rod through bottom stopper and spring housing (16). Ensure rod is fully in and the nut and washer located at the bottom stopper.

6.5 Slide spring (17) over flow tube (3). The spring is to enter from bottom end of the flow tube, i.e. the threaded end.

6.6 Insert spring and flow tube assembly into spring housing (16), guiding it through the compression rod.

6.7 Slide packing barrel (9) followed by the top stopper over compression rod and flow tube.

6.8 Slide the flow tube protector over compression rod and insert it into the flow tube bore. Slide washer over compression rod and position same on the flow tube protector. Make up wing nut onto compression rod.

6.9 Compress spring (17) by turning the wing nut clockwise. When the spring is compressed sufficiently, make up the packing barrel (9) fully into the spring housing (16).
6.10 Slide top stopper over flow tube (3) and make up same fully into the packing barrel (9).

6.11 Clean the pin threads of the flow tube (3) and the box threads of the choke (24). Apply 'Loctite' grade 242 to the pin threads of the flow tube. Make up the choke onto the end of the flow tube and tighten. DO NOT wrench on the polished surface below the base of the choke and ensure that the back-up wrench on flow tube does not damage the equalising seat.

6.12 Slacken wing nut, drive out and remove it from the compression rod.

6.13 Remove washer and flow tube protector.

6.14 Remove compression rod and back off bottom stopper.

6.15 Install the packing retainer ring, packing and O-ring onto the packing section of the packing barrel (9).

6.16 Make up the hydraulic chamber housing (8) and the lock adaptor (1) to the packing barrel (9).

6.17 Make up the seat housing (23) and the flapper housing (31) as a unit.

6.18 Make up the unit onto the equalising seat (18).

6.19 Ensure all made up parts are wrenched fully tight.

6.20 Install the appropriate safety valve lock mandrel assembly.

7.0 VALVE BODY ASSEMBLY – 2.1/2” OB-6, 3” XB-6 AND 3” B-6.

Refer to Drawing No: 5321/C.

7.1 Grip the equalising seat (15) in a vise. The grip of the vise should be located on the centre of the equalising seat.

7.2 Make up the spring housing (11) onto the upper end of the equalising seat (15).
7.3 Make up bottom stopper to equalising seat (15).

7.4 Insert compression rod through bottom stopper and spring housing (11). Ensure rod is fully in and the nut and washer located at the bottom stopper.

7.5 Insert spring (13) over flow tube (14). The spring is to enter from the bottom end of the flow tube, i.e. the threaded end.

    NOTE:– For 3” XB-6 VALVE, INSERT SPRING STOP (12), FOLLOWED BY THE SPRING (13).

7.6 Insert spring (13) and flow tube (14) assembly into spring housing (11), guiding it through the compression rod.

7.7 Slide packing barrel (8) over the flow tube (14) to as far as it can go.

7.8 Slide flow tube protector over compression rod and insert it fully into the flow tube bore.

7.9 Slide washer over compression rod and make up the wing nut onto compression rod.

7.10 Drive wing nut until it locates the flow tube protector.

7.11 Compress spring (13) by turning the wing nut clockwise. When spring is compressed sufficiently, make up the packing barrel (8) fully onto the spring housing (11).

7.12 Make up choke (20) as per step 6.11 of this procedure.

7.13 Slacken wing nut, drive out and remove it from the compression rod.

7.14 Remove washer and flow tube protector.

7.15 Remove compression rod and back off bottom stopper.

7.16 Install the packing retainer, packing and O-ring onto the packing section of the packing barrel (8).
7.17 Make up the hydraulic chamber housing and lock adaptor (1) to the packing barrel (8).

    NOTE:- FOR 3" XB-6 VALVE, MAKE UP ONLY THE LOCK ADAPTOR (1) TO THE PACKING BARREL (8).

7.18 Make up the flapper housing (29)/seat housing (17) assembly onto the equalising seat (15).

7.19 Ensure all made up parts are wrenched fully tight.

7.20 Install the appropriate safety valve lock mandrel assembly.
1.0 GENERAL FACTS ABOUT THE PB-6 SAFETY VALVE.

Initially, the Forcados Estuary wells were completed with Page Landing Nipples and Page Safety Valves. Various problems arose with the valves and in an effort to overcome them, the Camco PB-6 Flapper type Safety Valve was introduced. Due to dimensional limitations, this was restricted to 3" equipment only. Unlike the Page Valve which diverts the flow through a by-pass port, the Camco PB-6 Safety valve is a flow-through safety valve. The PB-6 flapper valve utilises a Camco ZP lock mandrel assembly and a packing arrangement to pack off the by-pass port. This packing arrangement also allows passage of hydraulic fluid from the control line to the valve by way of the equalising port built into the Page landing nipple. This PB-6 flapper valve has an equalising feature and it is a fail-safe valve. The valve is run and set by using the Camco 'ZP' Running tool and retrieved with Camco 'JDC' Pulling tool, with the appropriate running and pulling equalising prongs.

2.0 SEAT HOUSING/FLAPPER HOUSING DISASSEMBLY.

Refer to Drawing No: 5322.

2.1 Grip the lock adaptor (4) in a vise.

2.2 Disconnect the 3" ZP lock mandrel assembly from the lock adaptor.

2.3 Grip the No-go adaptor (8) in the vise.

2.4 Disconnect the lock adaptor (4) and remove packing set from the no-go adaptor (8).

2.5 Grip the packing spacer (38) in the vise.

2.6 Disconnect the no-go adaptor and remove the packing set.

2.7 Place and grip the equalising seat (22) in the vise.

2.8 Remove the seat housing (24) and the flapper housing (26) as a unit from the equalising seat (22).
2.9 Install the two-piece unit in the vise. The grip of the vise should be located on the centre of the seat housing (24). Remove the nose (37) and the flapper housing seal (35) from the lower end of the flapper housing (36).

2.10 Insert a wooden rod through the bore of the pieces to hold the flapper (34) off the soft seat (31). The wooden rod will prevent the flapper from possibly scouring the flapper soft seat as the flapper housing (36) is removed from the seat housing (24).

2.11 Remove the flapper housing (36) from the seat housing (24).

2.12 Lay the flapper housing on a work bench and drive out the flapper pin (32) through the pin holes in the flapper housing (36). The flapper (34) and the flapper spring (33) are released from the flapper housing when the flapper pin is removed. Remove the flapper and spring from the housing.

2.13 Remove the soft seat (31) from the flapper seat insert (30).

2.14 Remove the flapper seat insert (30) from the recess at the lower end of the seat housing (24).

2.15 Remove the seat housing from the vise.

3.0 PB-6 SAFETY VALVE BODY DISASSEMBLY.

3.1 Grip the equalising seat (22) in the vise.

3.2 If required, remove flapper seat housing (24) and flapper housing (36) as a unit from the equalising seat (22), exposing the choke (27). DO NOT REMOVE THE CHoke YET.

3.3 Remove packing spacer (38) from packing barrel (39) and recover packings.

3.4 Remove packing barrel (39) from the hydraulic chamber housing (15) and recover packings.

3.5 Remove hydraulic chamber housing (15) from the spring housing (18).
3.6 Make up tight the disassembly tool top stopper onto the spring housing (18).

3.7 Having ensured that the top stopper is fully made up on the spring housing, remove the choke (27) from flow tube (21).

    NOTE:- Never place a wrench or attempt to wrench on the polished surface below the base of the choke. Any scouring or deformation of the polished area will affect sealing properties.

3.8 Make up fully the disassembly tool bottom stopper onto the equalising seat (22).

3.9 Insert compression rod through the bottom stopper and flow tube. Ensure rod is fully in with the nut and washer located at the bottom stopper.

3.10 Slide flow tube protector over compression rod and insert it into the flow tube bore.

3.11 Make up compression wing nut with washer onto compression rod and drive nut to locate the flow tube protector.

3.12 Make up wing nut hand tight against the flow tube protector.

3.13 Back off very carefully disassembly tool top stopper from the spring housing (18).

3.14 Back off spring compression wing nut to relax the power spring (20).

3.15 When power spring is completely relaxed, remove wing nut from compression rod.

3.16 Remove washer and flow tube protector and top stopper.

3.17 Remove flow tube (21) and relaxed spring (20) from the spring housing (18). Withdraw compression rod and back off bottom stopper. Back off spring housing from equalising seat (22) and remove equalising seat from the vise.

3.18 Remove wiper rings (28), O-rings and seals from their respective parts.
3.19 Record condition of all parts, wiper rings, O-rings and seals into the Safety Valve Data Sheet, paying particular attention to corrosion, deformity, galling, and other damages or abnormalities.

3.20 Inspect all threads for any damages or galling.

3.21 Report to workshop supervisor of any unusual observations, paying particular attention to power spring, choke, flow tube and flapper assembly.

NOTE:- NEVER ATTEMPT TO DISASSEMBLE THE SAFETY VALVE WITHOUT USE OF THE SPRING COMPRESSOR. SERIOUS INJURY COULD RESULT IF THE PACKING BARREL IS REMOVED WITHOUT THE USE OF THE SPRING COMPRESSOR TO CONTAIN THE FORCE OF THE COMPRESSED SPRING. STRAP WRENCHES MUST BE USED WHERE REQUIRED ON ALL INTERNAL PARTS OF THE VALVE.

4.0 SEAT HOUSING/FLAPPER HOUSING ASSEMBLY.

4.1 Install the seat housing (24) in the vise. Apply a liberal amount of seal lubricant to the flapper seat insert O-ring (29) and install the flapper seat insert (30) into the recess at the lower end of the seat housing (24). The O-ring at the bottom of end of the flapper seat insert will offer some resistance as the insert is installed. Once the insert is partially installed, lay a flat board over the insert and knock it into place; the board will fully seat the insert without damaging the seat line of the insert. Make sure that the flapper seat insert is fully and evenly installed in the recess.

4.2 Install the soft seat (31) over the flapper seat insert (30).

4.3 Place the flapper housing (36) on its side on the work bench with the flapper pin holes and window facing upward towards the assembler.

4.4 Pick up the flapper (34) and apply a small amount of grease to each side of the flapper hinge and in the spring slots behind the hinge section.
4.5 Install the flapper spring (33) on the flapper hinge. The offset ends of the flapper spring must point outward from the flapper hinge. The pack of grease will hold the spring in place for assembling purposes.

4.6 Insert the flapper (34) into the bore of the flapper housing (36) from the upper end. The spring and hinge section go in first with the smooth machined surface of the flapper facing upwards.

4.7 Align the flapper hinge and spring with the pin holes in the flapper housing; the offset ends of the flapper spring go behind the ridge of metal through which the flapper pin hole is drilled. Insert a 3/16" pin punch through the flapper holes, spring and hinge to align the pieces.

4.8 Insert the flapper pin (32) into the flapper pin hole opposite the punch. Withdraw the punch and follow it out from the opposite side with the flapper pin.

**NOTE:** The flapper spring is a torsional spring and the coils will tighten as the flapper is opened. If the spring coils do not tighten as the flapper is opened, the flapper spring is not properly installed then.

4.9 When the flapper spring (33) has been properly installed, centralise the flapper pin (32) in the flapper pin hole to prevent it from working itself loose. Deform the pin at both ends with a small centre punch.

4.10 Install a dowel rod into the flapper housing (36) to keep the flapper (34) in the open position.

4.11 Make up the flapper housing onto the seat housing (24).

4.12 Install the flapper housing seal (35) into the end of the flapper housing.

4.13 Make up the nose (37) onto the end of the flapper housing and wrench all pieces fully tight. Remove the dowel rod.
5.0 PB-6 VALVE BODY ASSEMBLY.

5.1 Grip the equalising seat (22) in the vise. The grip of the vise should be located on the centre of the equalising seat.

5.2 Make up the spring housing (18) onto the upper end of the equalising seat.

5.3 Make up bottom stopper to the equalising seat.

5.4 Insert compression rod through bottom stopper and spring housing (18). Ensure rod is fully in and the nut and washer located at the bottom stopper.

5.5 Insert spring (20) over flow tube (21). The spring is to enter from bottom end of the flow tube, i.e. the threaded end.

5.6 Insert spring and flow tube assembly into spring housing, guiding it through the compression rod.

5.7 Slide hydraulic chamber housing (15) over the flow tube (21) to as far as it can go.

5.8 Slide flow tube protector over compression rod and insert it fully into the flow tube bore.

5.9 Slide washer over the compression rod and make up the wing nut onto the compression rod.

5.10 Drive wing nut until it locates the flow tube protector.

5.11 Compress power spring (20) by turning the wing nut clockwise. When the spring is compressed sufficiently, make up the hydraulic chamber housing (15) fully into the spring housing.

5.12 Make up the choke (27) as per step 6.11 of OPG NO: 5321.

5.13 Slacken wing nut, drive out and remove it from the compression rod.

5.14 Remove washer and flow tube protector.

5.15 Remove compression rod and back off bottom stopper.
5.16 Install packing retainer ring (23), packing M.F. (12), packing J.M. (13) and O-ring (14) onto the packing section of the packing barrel (39).

5.17 Make up the packing barrel (39) to the hydraulic chamber housing (15).

5.18 Make up the flapper housing (36)/seat housing (24) assembly onto the equalising seat (22).

5.19 Ensure all made UP parts are wrenched fully tight.

5.20 Install the Camco 3" ZP lock mandrel assembly to the safety adaptor.
1.0 GENERAL FACTS ABOUT THE PAGE SAFETY VALVES.

There are three basic types of the Page surface-controlled Subsurface Safety Valves, namely: HHTV, HHTX and HHV. They are mainly used in the Forcados Estuary Field. The Page safety valve type HHTV and HHTX are used for tubing flow application in single and dual completions. The HHTX is only found in the 2.3/8" tubing size, and is a modified version of the 2.3/8" HHTV. The 2.3/8" HHTV safety valve is for landing nipple with 1.750" internal diameter, and the HHTX is for landing nipple with 1.875" i.d.

The 'HHV' safety valve is used for casing flow applications. The valve is installed in a 2.3/8" landing nipple equipped with 'deflectors' for diverting the flow into the casing. The 2.3/8" tubing above the valve is used as the control conduit for maintaining pressure on the valve to keep it in the open position.

The Page safety valves do not incorporate any equalising features for re-opening. Due to initial problems on the bottom seal assembly, a modified seal unit is installed on certain valves. Where possible, all redressed valves should be fitted with the modified seal units.

The safety valves are run and set using the Page 'HH' series Running Tool and retrieved with the 'HH' series Pulling Tool.

2.0 DISASSEMBLY PROCEDURE FOR `HHTX' AND `HHTV' VALVES.

Refer to Drawing No: 5323/A

2.1 While gripping the upper end of the seal retainer (8), unscrew the valve sleeve (13) by gripping it immediately above the seal. At this point, the stop (16) might unscrew from the body and remain inside the valving sleeve. If this happens, the stop must be removed;

2.2 While gripping the valving sleeve (13) immediately above the seat, unscrew the nut (5). Remove the seal (11) and the O-ring (20) from the valving sleeve.

2.3 While gripping the largest diameter on the body (2), unscrew the stop (16) from the body (2). Remove the seal retainer (8) from the body. Remove the side seal (12) from the seal retainer
2.4 Unscrew the body (2) from the sub (1). Remove the inner piston (6) assembly and the valve spring (22) from the body.

2.5 Unscrew the extension (4) from the inner piston (6). Be careful not to damage the small diameter of the extension.

2.6 Remove the check spring (23) and ball (24). Clean the parts and ensure that the small passage in the extension is clear.

2.7 Unscrew the collet (3) from the sub (1).

2.8 Remove the side seal (12), seal sleeve (15), plug spacer and sleeve (14) from the sub (1).

2.9 Remove the equalising plug (7) from the sub.

2.10 Remove all O-rings and seals.

2.11 Carefully clean all parts and remove any burrs. Inspect all parts closely for any sign of damage, dent, wear marks and corrosion.

2.12 All seals must be replaced. At this point, the valve is ready for re-assembly.

3.0 ASSEMBLY PROCEDURE FOR `HHTX' AND `HHTV' VALVES.

3.1 Grip lightly the bottom end of the collet (3) in a vise.

3.2 Screw the sub (1) onto the collet (3) and tighten, taking care not to damage the sealing areas.

3.3 Lubricate the i.d.s. of the top side seal (12) and install it on the sealing area of the sub (1).

3.4 Install the O-ring (17) in the groove provided on the equalising plug (7). Lubricate the equalising plug with light grease and insert it in the hole provided in the sub immediately below the top side seal. Be very careful not to clip the O-ring. After the equalising plug has been installed, inspect its outer edge for any small traces of rubber to ascertain the integrity of the O-ring.
3.5 Install the plug spacer directly behind the equalising plug and then install the sleeve (14) on the sub to retain the equalising plug and plug spacer.

NOTE:- There is no plug spacer for the 2.3/8" HHTX and HHTV, and the 2.7/8" HHTV valves.

3.6 Lubricate and install the middle side seal (12) on the sub located just below the sleeve that retains the equalising plug.

3.7 Install the seal sleeve (15) on the sub.

3.8 Lubricate and install the lower seal (12) on the sub located just below the seal sleeve (15).

3.9 Install the O-ring (21) in the groove provided on the sub (1) and apply a light grease over the O-ring.

3.10 Set ball (24) in the threaded end of the inner piston (6).

3.11 Set check spring (23) and ball (24).

3.12 Position extension (4) over ball and check spring, and tighten into place in the inner piston (6).

3.13 Install O-ring (19) on the inner piston.

3.14 Slip valve spring (22) over the outside of the inner piston.

3.15 From the top end of the body (2), insert the valve spring (22), inner piston O-ring (19), ball and check spring, and extension (4) all made up as one unit, making sure not to clip the O-ring in the process.

3.16 Install and make up tight the body (2) onto the sub (1), taking care not to clip the O-ring.

3.17 Install the O-ring (21) into the seal retainer (8).

3.18 Slip the seal retainer over and all the way to the top of the body.

3.19 Install the seal (12) onto the seal retainer.
3.20 Install O-ring (18) onto the seal retainer, making sure not to clip the O-rings and seals in the process.

3.21 Insert the rod (9) into the bottom of the body and inner piston.

3.22 Install the stop (16) onto the body and tighten in place securely.

3.23 Install O-ring (21) onto the stop.

3.24 Install valving sleeve (13) onto the seal retainer (8) and tighten securely.

3.25 Install snap ring into O-ring groove on valving sleeve.

3.26 Install O-ring into seal.

3.27 Slide seal (11) over valving sleeve.

3.28 Install nut (5) onto valving sleeve and tighten securely.

3.29 Install set screw (30) and tighten.

4.0 DISASSEMBLY PROCEDURE FOR 2.3/8" 'HHV' VALVE.

Refer to Drawing No: 5323/C.

4.1 While gripping the upper end of the seal retainer, unscrew the valving sleeve (4) by gripping it immediately above the seal (26). At this point, the stop (9) might unscrew from the body (3) and remain inside the valving sleeve. If this happens, the stop must be removed.

4.2 While gripping the valving sleeve (4) immediately above the seal, unscrew the nut (7). Remove the seal (26) and the O-ring (27) from the valving sleeve.

4.3 While gripping the largest diameter on the body (3), unscrew the stop (9) from the body. Remove the side seal (23) from the seal retainer (15).
4.4 Unscrew the body (3) from the sub (8). Remove the inner piston assembly (5) and the valve spring (11) from the body.

4.5 Unscrew the extension (6) from the inner piston (5). Be careful not to damage the small diameter of the extension.

4.6 Remove the check spring (12) and ball (13). Clean the parts and ensure that the small passage in the extension (6) is clear.

4.7 Unscrew the collet (2) from the sub (8).

4.8 Remove the equalising plug (10) from the sub.

4.9 Remove the side seal (23) from the sub.

4.10 Remove all O-rings.

4.11 Carefully clean all parts and remove any burrs.

4.12 Replace all seals and O-rings. The valve is ready for re-assembly.

5.0 ASSEMBLY PROCEDURE FOR 2.3/8" `HHV' VALVE.

5.1 Clean collet (2) and screw top end of the sub (8) onto it and tighten.

5.2 Clean the sub and inspect it for burrs, paying special attention to the sealing surfaces and the O-ring grooves.

5.3 Lubricate the side seal (23) and install it on the sealing area of the sub (8).

5.4 Install the O-ring (17) in the groove provided on the equalising plug (10).

5.5 Lubricate the equalising plug (10) and install it in the hole provided in the sub immediately below the top side seal (23), taking care not to clip the O-ring. After the equalising plug has been installed, inspect its outer edge for any small traces of rubber to ascertain the integrity of the O-ring.
5.6 Install the O-ring (19) in the groove provided on the outside of the sub and lubricate.

5.7 Install the O-ring (20) in the groove provided inside the sub and lubricate. Carefully slide the extension (6) through the inside of the sub to make certain that the O-ring is in place and remove the extension.

5.8 Set ball (13) onto the top threaded end of the inner piston (5).

5.9 Set check spring (12) on top of ball and screw extension (6) onto inner piston (5), using proper thread compounds on all threads and tighten securely.

5.10 Lubricate and install O-ring (18) into the groove between extension and inner piston.

5.11 Install valve spring (11) over inner piston (5).

5.12 Lubricate inside of body and from top side, insert valve spring, inner piston, O-ring, ball, check spring the and extension all made up as one unit. Ensure O-rings are not clipped during the assembly process.

5.13 Install body (3) onto sub (8) with the above assembly in place and tighten body securely to the sub.

5.14 Lubricate and install O-ring (16) in its groove inside the seal retainer (15).

5.15 Lubricate o.d. of the body (3) and slide seal retainer (15) over and to the top end of the body with the seal retainer threads facing towards the bottom end of the valve.

5.16 Lubricate and install the second side seal (23) onto the seal retainer.

5.17 Lubricate and install the O-ring (21) into its groove outside on the seal retainer.

5.18 Lubricate and install the rod (25) into the bottom end of the body (3) and into the centre of the inner piston (5).
5.19 Install the stop (9) onto the bottom of the body (3) and tighten securely in place.

5.20 Lubricate and install O-ring (16) in its groove on the stop.

5.21 Install valving sleeve (4) onto seal retainer (15) and tighten securely in place.

5.22 Lubricate and install O-ring (27) into its groove in the o.d. of the valving sleeve.

5.23 Lubricate and install the seal (26) over the O-ring (27) onto the valving sleeve. Ensure the seal is assembled with the sealing bulge side going on first.

5.24 Install nut (7) onto the valving sleeve and tighten securely in place. The valve is now ready for testing.
1.0  GENERAL FACTS ABOUT THE SAFETY VALVE.

The Otis 'DK' Safety Valve is a Surface-Controlled ball type Subsurface Safety Valve (SCSSV) designed to shut in a well at a point below the surface. The valve is an equalising type safety valve. It is located in a predetermined 'XNL' Landing Nipple.

Basically, the valve consists of a piston opposed by a spring which operates a type 'D' ball mechanism. Control line pressure when applied from surface enters through a port in the housing and pushes the piston downward, compressing the spring and rotating the ball to the open position. The ball is contained in the valve body and rotates on a set of pins that are welded inside the sleeve weldment. The sleeve weldment is pinned to the seat and retained by the body. The ball is designed to remain open until control line pressure is released. When control line pressure is released, the compressed spring actuates the ball to close. When the ball is closed, well pressure from below is shut off from the bore of the valve by the ball-and-seat and the secondary seat. Pressure between the safety valve and the tubing is sealed off by the vee-packings. The safety valve is run and set by using an Otis 'RX' Running tool, and retrieved with a 'GS' Pulling tool with the appropriate running and pulling equalising prongs.

2.0  DISASSEMBLY OF THE SAFETY VALVE.

Refer to Drawing No: 5324.

2.1 Place the safety valve in a vise gripping on the valve housing (1).

2.2 Remove the 'XN' lock mandrel assembly from the housing.

2.3 Remove the safety valve and re-install in the vise gripping on the spring housing (12).

2.4 Remove the housing (1).

2.5 Remove the split rings (6) and the packing set.

2.6 Remove the piston (4).
2.7 Remove the body (16) from the sub (13).
2.8 Remove the pins (20).
2.9 Slide the sleeve weldment (18) off far enough to expose the control arms.
2.10 Grasp the control arms and hold them against the seat (19).
2.11 Remove the sleeve weldment (18).
2.12 Remove the control arms and ball. DO NOT DROP THE BALL.
2.13 Remove the sub (13) and attached parts from the spring housing (12). DO NOT REMOVE THE SEAT (19) AT THIS TIME.
2.14 Make up the assembly/disassembly tool cylinder onto the upper end of the sub (13).
2.15 Make up the assembly tool to compress the spring (11).
2.16 Place an Alien wrench or screw driver through the slot in the assembly tool cylinder into the hole in the upper end of the extension (17) as a back-up and remove the seat (19).
2.17 Release the spring compression completely and remove assembly tool from the sub.
2.18 Remove the extension (17) and the spring (11).
2.19 Clean and inspect all parts, and replace all O-rings and seals.

3.0 ASSEMBLY OF THE SAFETY VALVE

3.1 Place the assembly tool cylinder in a vise gripping it in the middle.
3.2 Install the extension (17) and the spring (11).
3.3 Slide the sub (13) over the lower end of the extension (17) and make it up into the assembly tool cylinder carefully to avoid damage to the O-rings.
3.4 Make up the assembly tool and compress the spring (11).

3.5 Place an Alien wrench or screw driver through the slot in the assembly tool cylinder into the hole in the upper end of the extension (17) and make up the seat (19) to the lower end of the extension.

3.6 Remove the assembly tool from the sub (13).

3.7 Make up the spring housing (12) onto the sub (13), making sure not to damage the O-ring.

3.8 Install the piston (4).

3.9 Place the packing set on the polished end of the spring housing (12).

3.10 Place the split rings (6) on the spring housing.

3.11 Make up the housing (1) onto the spring housing, making sure not to damage the O-rings.

3.12 Place the valve in a vertical position in the vise with the bottom end up.

3.13 Place the ball on the seat (19) in a closed position.

3.14 Place the control arms on the ball-and-seat.

3.15 Slide the sleeve weldment (18) over the ball and control arms. Check that the pins (20) in the sleeve weldment are in the slots in the ball.

3.16 Install the pins (20).

3.17 Make up the body (16) onto the sub (13).

3.18 Make up the 4" 'XN' Lock Mandrel assembly to the safety valve.

NOTE:- ANTI-SEIZE THREAD LUBRICANT SUCH AS MOLYKOTE `GN' PASTE OR ITS EQUIVALENT MUST BE USED ON ALL THREADED CONNECTIONS.
1.0 INSTALLING THE RUNNING TOOL.

1.1 With the 'X' Running Tool clamped in the vise on the top sub, put the tool in the control position by pulling the spring housing down and away from the top sub until the dogs catch on a shoulder of the main mandrel. This allows the core to move up and down within the tool.

1.2 Put the locking mandrel in the fully locked position and place it over the core of the running tool as far as it will go. Line up the bottom shear pin holes and pin the lock mandrel to the core of the running tool with a brass pin. Cut and file the shear pin flush with the o.d. of the lock mandrel.

1.3 Holding the fishing neck of the lock mandrel up against the dog retainer, pull the rest of the lock mandrel down as far as it will go. This will line up the top shear pin holes in the running tool core and top sub, and the retainer dogs will be engaged in the internal fishing neck of the lock mandrel. Install a steel shear pin into top pin hole in the running tool and cut the shear pin flush with the o.d. of the tool.

1.4 Place the running tool/lock mandrel assembly in the selective position by compressing the spring and moving the spring housing down slightly with the aid of a screw driver pried against the top sub. Press firmly on the top end of the dogs to free the bottom ends from the shoulder of the main mandrel. Release screw driver and the spring housing will snap back against the top sub - this puts the dogs expanded in a locating position, and the locking keys of the lock mandrel in a retracted position. Check the dogs function by working them up and down several times to ensure they will retract smoothly and that the dog spring will return them to the locating position.

2.0 SETTING THE VALVE IN TEST NIPPLE.

2.1 Having installed and pinned the running tool into the lock mandrel/safety valve assembly, trip the running tool to extend the locking keys in the locating position.
2.2 Insert the valve assembly into the test nipple and tap in slowly with a 1.1/2" spang jar and a 1.1/2" x 5 ft. stem until a solid sound is heard, indicating that the locking keys have located the recess in the test nipple.

2.3 Jar down to shear the top steel setting pin and lock the valve in the test nipple.

2.4 When satisfied that the valve is locked in place, jar up to shear the bottom brass pin to release the running tool from the valve.

2.5 Retrieve the running tool from the test nipple and check visually with the aid of a torch light that the valve is correctly set in the nipple.

3.0 TESTING OF THE VALVE

3.1 Rig up test panel for various tests.

3.2 Pressure up the control line on the test nipple to 3,000 psi for 5 minutes and note if there is any leak. Bleed off the pressure if the test is OK.

3.3 Pressure up the control line to open the safety valve. The valve is fully open when the end of the choke bottoms out on the valve nose - a sudden build up in hydraulic pressure will indicate the valve is in the fully open position. Record the valve fully open pressure.

3.4 Slowly bleed off the control line pressure, As the hydraulic pressure is bled off, the rate of pressure drop will be constant until the valve is fully closed. When the valve is fully closed, a rapid drop in pressure will be noted - this is the valve fully closed pressure. Record the valve fully closed pressure.

3.5 Open the safety valve and fill up the test section below the valve with inhibited water. Close the valve fully when the test section is filled with water.
3.6 Pressure test the safety valve from below to 5,000 psi (100% of the rated working pressure) for 15 minutes. Observe for any leakage through the valve.

3.7 Bleed off pressure to zero and drain out all water from the test nipple. Close needle valve on the test cap.

3.8 Apply 1,000 psi Nitrogen (N2) pressure below the flapper, and pressure up the control line to open the equalising seat in the valve. Record the control line pressure at which equalisation begins.

3.9 Bleed off all pressures to zero and leave all shut off valves open. Remove upper and lower test plugs on the test nipple.

4.0 RETRIEVING VALVE FROM TEST NIPPLE.

4.1 Attach the appropriate 'GS' pulling tool to surface tool string (i.e. 1.1/2" spang jar and 1.1/2(1 x 5 ct. stem).

4.2 Insert 'GS' pulling tool into test nipple and latch onto fishing neck of safety valve lock mandrel.

4.3 Jar up by hand to unlock and retrieve the valve assembly from the test nipple.

4.4 Clean valve and lock mandrel assembly, and inspect packings for any damage. Punch out all sheared pins in the lock mandrel assembly.

4.5 Apply a light grease over the upper and lower packing sets and wrap with paper tape. Store valve in its proper rack in a vertical position.

4.6 Complete and certify the Valve Test Data Sheet.
1.0 INSTALLATION OF RUNNING TOOL.

1.1 Remove the body of the `ZP' lock from the lock adaptor of the valve and drive the expander tube out of the bottom of the body. Connect together the two prongs of the running tool, but leave the fishing neck off.

1.2 Slide the expander tube over the top prong (fingers pointing downward) and pin the expander tube to the lower hole in the prong with a 5/16" brass shear pin.

1.3 Push the expander tube and prong back into the lock body, and pin the body to the upper hole in the prong with a 1/4" brass shear pin.

1.4 Attach the fishing neck to the prong, gripping only the neck and prong. (Gripping the body may partially shear the upper pin).

1.5 Insert the running tool into the valve and screw the lock body to the lock adaptor of the valve; tighten securely, gripping the body only. (This time, gripping the fishing neck may result in partially shearing the upper pin).

2.0 SETTING THE VALVE IN TEST NIPPLE.

2.1 Insert the safety valve assembly into the Page Test Nipple and tap assembly in slowly with a 1.1/2" spang jar and a 1.1/2" x 1 ft. stem until a solid sound is heard, indicating that the No-go adaptor on the valve assembly has located the no-go shoulder in the test nipple.

2.2 Jar down by hand to shear the body/prong shear pin.

2.3 Pressure up the control line on test nipple to 3,000 psi and maintain pressure for 5 minutes. Note if there is any leak.

2.4 Jar up lightly by hand to bring the expander tube up behind the locking dogs and lock the mandrel in the test nipple. Continue jarring up to shear the lower pin and release the running tool from the lock mandrel. Having sheared the lower pin, Do NOT tap or jar down on the running tool as this will push the expander tube down and unlock the mandrel.
3.0 TESTING OF THE SAFETY VALVE.

3.1 Repeat as per steps 3.1 through 3.9 of OPG NO:4C.3006.

4.0 RETRIEVING VALVE FROM TEST NIPPLE.

4.1 Attach 'JDC' Pulling tool to the surface toolstring (i.e. 1.1/2, r spang jar and 1.1/2' x 5 ct. stem).

4.2 Insert the 'JDC' Pulling tool into the test nipple and latch onto the fishing neck of the safety valve lock mandrel.

4.3 Jar up by hand and pull the valve assembly from the test nipple.

4.4 Clean valve and lock mandrel assembly. Punch out all shear pins from the lock mandrel.

4.5 Inspect all packings for any damage. Apply a light grease to all packings and protect with paper tape wrapping.

4.6 Store valve on the proper valve rack in a vertical position.

4.7 Complete and certify the Valve Test Data Sheet.
1.0 INSTALLATION OF RUNNING TOOL.

1.0 Insert assembled running tool through the collet of the lock mandrel.

1.2 Compress the valve collet with the running tool core and pin the core to the running mandrel with brass shear screws.

1.3 Install set screws and tighten sufficiently to ensure that the shear screws remain in the running tool core after shearing.

1.4 Attach running tool and valve assembly to a 1.1/2" spang jar and a 1.1/2" x 5 ft. stem.

2.0 SETTING VALVE IN THE TEST NIPPLE.

2.1 Insert the valve assembly into the Page Test Nipple and tap assembly in slowly until a solid sound is heard, indicating that the No-go shoulder on the valve assembly has located the no-go shoulder in the test nipple.

2.2 Jar down 5 times by hand to shear the body shear pin.

2.3 Pressure up the control line on test nipple to 3,000 psi and maintain pressure for 5 minutes. Note if there is any leak.

2.4 Jar up lightly by hand to shear the lower pin and release the running tool from the valve.

3.0 TESTING OF THE VALVE.

3.1 Repeat as per steps 3.1, 3.2, 3.5, 3.6, and 3.9 of OPG NO: 4C.3006.

4.0 RETRIEVING VALVE FROM TEST NIPPLE.

4.1 Attach pulling tool to the surface toolstring.
4.2 Insert pulling tool into test nipple until it stands up on the fishing neck of the valve.

4.3 Jar down to shear mandrel/body shear pin and latch collet with the skirt.

4.4 Jar up by hand to pull the valve out of the test nipple.

4.5 Store valve on proper rack and complete the Valve Test Data Sheet.
1.0 INSTALLATION OF RUNNING TOOL.

1.1 Remove top sub and lock ring segment from the 4" `RX' Running Tool.

1.2 Remove Alien screws and steel shear pins (2 pcs) from the bottom sub of the running tool.

1.3 Move bottom sub down until stopped by the shoulder bolt, the lugs will be located over the lower body of the core. Install lock ring segment over the top of the core.

1.4 Install brass shear pins into the top sub, followed by the set screws. Make up top sub to bottom sub.

1.5 Insert 'RX' running tool into the `XN' lock mandrel until lower shear pin hole in the core line up with the matching holes in the lock mandrel. Install 5/16" brass pin in the hole to pin the running tool to the lock mandrel. Cut and file shear pin to flush with o.d. of the tool.

1.6 Pull fishing neck of lock mandrel fully up. This causes the lugs to move out onto the larger diameter of the core and engage the fishing neck.

1.7 Install two 3/16" steel shear pins through the bottom sub holes into the bottom holes of the core - this will cause the locking keys of the lock mandrel to be in the control position.

1.8 Install the two Alien screws over the shear pins as back-up.

2.0 SETTING VALVE IN TEST NIPPLE.

2.1 Insert the valve/running tool assembly into the test nipple with bottom plug venting, Tap assembly into the nipple slowly with a 1.1/2' spang jar and a 1.1/2' x 5 ft. stem until a solid sound is heard, indicating that the lower end of the valve has located the no-go shoulder of the test nipple.
2.2 Jar down by hand to shear the top steel pins and to fully lock the valve in place.

2.3 Pressure up the control line on the test nipple to 3,000 psi and maintain this pressure for 5 minutes. Note if there is any leak, and then bleed off to zero.

2.4 Jar up by hand to shear the bottom pin and release the running tool from lock mandrel of the valve. Check visually that the safety valve is properly set in place, and that the top pin in the running tool is sheared.

3.0 TESTING OF THE VALVE

3.1 Repeat as per steps 3.1 through 3.9 of OPG NO:4C.3006.

4.0 RETRIEVING VALVE FROM THE TEST NIPPLE.

4.1 Repeat as per steps 4.1 through 4.6 of OPG NO:4C.3006.
1.0 DISASSEMBLY OF TYPE `X' AND `XN' LOCK MANDRELS.

Refer to Drawing No: 5331.

1.1 Place the upper portion of the key retainer sleeve (4) in a vise.

1.2 Remove the packing set from the packing mandrel (6). Place a pipe wrench or strap wrench on the shear pin section of the packing mandrel and unscrew it from the key retainer sleeve.

1.3 Place the fishing neck (1) and expander sleeve (2) in an unlocked position by pulling them away from the key retainer sleeve (4).

1.4 Remove the locking keys (5) by slipping them from the ends of the key springs (3) and working them through the bore of the key retainer sleeve (4).

1.5 Place the fishing neck (1) in the vise and remove the expander sleeve (2).

1.6 Push the expander sleeve (2) out of the lower end of the key retainer sleeve (4) and the springs (3) will fall out.

1.7 Clean and inspect all parts. Report any abnormalities to workshop supervisor and enter findings into Data Sheet.

2.0 ASSEMBLY OF TYPE `X' AND `XN' LOCK MANDRELS

2.1 After cleaning, ensure all parts are in good condition.

2.2 Ensure locking keys are of the correct type for the lock mandrel to be assembled (type 'X' or 'XW').

2.3 Ensure the serrations on the locking keys (5) and the expander sleeve (2) are clean and in good condition.
2.4 Place the expander sleeve (2) inside the key retainer sleeve (4) and line up the spring slots. Leave approximately 1/2" of the spring slots on the expander exposed. Insert springs (3) in the slots with the hook ends out and toward the top of the expander sleeve (2). Engage the hooks on the springs (3) in the holes provided in the key retainer sleeve (4).

2.5 After all the key springs are in place, push the expander sleeve (2) into the key retainer sleeve (4) and move the sleeve to its upper-most position.

2.6 Screw the fishing neck (1) onto the expander sleeve (2). Place the fishing neck in the vise and tighten connection.

2.7 Slide each key (5) through the bore in the key retainer sleeve (4) onto a spring (3). Ensure the spring is properly installed in the locking key. The spring should pass through a slot inside the key with the lower end over a shoulder near the slot bottom.

2.8 Insert and screw packing mandrel (6) into the bottom of the key retainer sleeve (2).

2.9 Install the packing set (items 7, 8 and 9) onto the polished o.d. of the packing mandrel.
1.0 DISASSEMBLY OF 4" OTIS 'XN' LOCK MANDREL

Refer to Drawing No: 5331.

1.1 Place the lock mandrel assembly in a vise, gripping on the fishing neck (1). Remove the packing set (items 7, 8 and 9).

1.2 Insert a steel rod through the shear pin holes in the packing mandrel (6) and pull down to extend the fishing neck (1) from the key retainer sleeve (2) to expose the expander sleeve (3).

1.3 Place a strap wrench on the expander sleeve and unscrew it from the fishing neck.

1.4 Place the key retainer sleeve in the vise.

1.5 Unscrew the packing mandrel (6) from the key retainer sleeve (2).

1.6 With the expander sleeve (3) in the top position, the keys (5) may be removed from the windows.

1.7 Pull the expander sleeve out of the bottom of key retainer sleeve (2) - this allows the key springs (4) to fall out.

1.8 Remove the retainer screw, leaf spring and the sheared portion of the lock pin from the key retainer sleeve.

1.9 Clean and inspect all parts thoroughly. Check the springs for wear or cracking and deformity.

2.0 ASSEMBLY OF THE 4" OTIS 'XN' LOCK MANDREL.

2.1 Repeat as per steps 2.1 through 2.9 of OPG NO:4C.3010.

2.2 Install the female adaptor (7), new vee-packings (8) and double-male adaptor (9) onto the polished bottom of the packing mandrel (6).

2.3 Place the lock mandrel assembly in the extended position.

2.4 Install a new lock pin, the leaf spring and retainer screw onto the upper end of the key retainer sleeve (2).
1.0 DISASSEMBLY OF THE CAMCO `ZP' LOCK MANDREL

1.1 Grip the lock adaptor in a vise.

1.2 Remove lock body from the lock adaptor.

1.3 Drive the expander tube out from the lock body through the bottom threaded end. The locking dogs will fall out as soon as the expander tube is out of the lock body.

1.4 Clean and inspect all parts thoroughly and ensure that they are in good working condition.

2.0 ASSEMBLY OF THE CAMCO `ZP' LOCK MANDREL

2.1 Ensure the locking dogs are of the correct size and that there are no burrs or dents on them.

2.2 Grip the body in a vise.

2.3 Install the locking dogs through the housing.

2.4 Insert the expander tube through the threaded end of the body.

2.5 Install the lock body to the lock adaptor.
1.0 DISASSEMBLY OF THE CAMCO 'C' LOCK MANDREL.

Refer to Drawing No: 5334.

1.1 Install the lock mandrel assembly in a vise, gripping at the lower end of the lock housing (7).

1.2 Extend the expander tube (14) and remove the fishing neck (1) from the end of the expander tube.

1.3 Remove the expander tube (14) from the lower end of the lock housing (7).

1.4 When the expander tube is removed from the lock housing, the shear dogs (6) and the locking dogs (8) will fall out of the windows and into the bore of the lock housing. Remove the two sets of dogs from the bore of the lock housing.

1.5 Remove the no-go retainer (3) from the lock housing (7).

1.6 Remove the no-go ring (5) from that: lock housing. It may be necessary to punch out the remains of the sheared pins with a 1/8” pin punch if the lock mandrel has been set prior to disassembly.

2.0 ASSEMBLY OF THE CAMCO 'C' LOCK MANDREL.

2.1 Stand the lock housing (7) on the work bench with the bottom end upwards.

2.2 Install the three locking dogs (8) in the lock housing windows. The locking dogs are inserted from inside the bore of the lock housing, and make sure that the chamfered parts are facing upwards in relation to the lock. When properly inserted, the locking dogs will be flush with the inside wall of the lock housing.

2.3 Install the expander tube (14) in the lock housing (7) by inserting the threaded end of the expander tube through the bore of the lock housing until it stands up on the surface of the work bench.
2.4 Lift the lock housing and work the expander tube past the locking dogs.

2.5 While holding onto the threaded end of the expander tube, turn the lock housing right side up. Place the lock housing back down on the work bench with the threaded end of the expander tube pointing upwards.

2.6 Install the two shear dogs (6) in the shear dog windows in the lock housing.

2.7 Install the no-go ring (5) over the shear dogs (6) with the shear pin holes upwards.

2.8 Place the no-go retainer (3) over the threaded end of the expander tube (14) and let it down until contact is made with the lock housing (7). Make up the two pieces hand-tight. M) NOT lift the pieces off the work bench yet - the expander tube is still free to fall out of the bore of the assembled pieces.

2.9 Make up the fishing neck (1) onto the threaded upper end of the expander tube (14). Ensure the fishing neck profile is not damaged or deformed. Apply 'Loctite' Grade 242 thread-locking compound to the threads on the expander tube prior to making up the fishing neck.

2.10 Extend the expander tube and slide the no-go ring (5) down over the shear dogs (6) and line up the shear pin holes with the tangential shear pin grooves on the lock housing (7). Pin the no-go ring in place with two 1/8" brass shear pins.
1.0 **DISASSEMBLY OF CAMCO `BK-2' LATCH.**

Refer to Drawing No: 5335.

1.1 Punch out the 1/8" lock pin (6) from the threaded connection in the latch stop (7).

1.2 Remove the running head (1) from the latch stop (7).

1.3 Remove the Latch ring (5) and the latch spring (4) from the latch body (2).

1.4 Remove Latch body (2) from the running head (1). Knock out the remaining portion of the sheared pin in the running head.

2.0 **ASSEMBLY OF THE CAMCO `BK-2' LATCH.**

2.1 Insert the threaded end of the running head (1) into the upper end of the latch body (2) until the shear pin holes in the two pieces line up.

2.2 Insert a 1/8" brass shear pin (3) to pin the two pieces together. Cut and file the shear pin flush with the edges of the shear pin hole.

2.3 Slide the latch spring (4) over the lower end of the latch body (2) until the latch spring stops against the shoulder near the mid-point of the latch body.

2.4 Slide the latch ring (5) onto the lower end of the latch body (2), such that the end of the latch ring with the larger o.d. is positioned towards the spring for proper operation.

2.5 Make up the latch stop (7) to the running head (1) and align the lock pin holes in the two pieces.

2.6 Install the 1/8" x 1.1/8" long steel roll pin (6) to lock this connection.

**NOTE:** If a steel roll pin is not available, a brass pin of similar dimension may be used in place.

The Flopetrol 'MAK-2' latch is serviced in the same manner.
1.0 DISASSEMBLY OF COLLET LOCK MANDREL.

1.1 Grip the sub in a vise and remove the roll pin.

1.2 Unscrew the collet lock from the sub.

2.0 ASSEMBLY OF COLLET LOCK MANDREL.

2.1 Grip the sub in a vise.

2.2 Screw in the collet into the sub.

2.3 Install the roll pin.

NOTE:- THERE ARE VARIOUS TYPES OF LOCKS FOR THE 'HHTV', 'HHTX' AND 'KIIV' SAFETY VALVES. MAKE SURE THE CORRECT TYPE OF LOCK IS INSTALLED IN THE CORRECT VALVE.
1.0 GENERAL FACTS ABOUT THE CAMCO BKF-6 SIDE POCKET GASLIFT VALVE

The Camco BKF-6 side pocket gaslift valve is a 1.00" o.d. wireline retrievable tubing sensitive gaslift valve designed for use in continuous flow gaslift installations. The valve is spring-loaded and utilizes atmospheric seal bottom dome. The operating pressure of the valve is established by the preset tension of the valve spring. The spring tension is adjusted without the need to disassemble the valve. The seats and stem tips are available in port sizes of 1/8", 3/16" and 1/4".

The valve opens when the tubing pressure at depth acting on the effective area of the bellows less the area of the port, overcomes the preset downward force of the spring. Reverse flow through the valve is prevented by the velocity check disc in the valve nose. The check disc seals tightly against a soft seat and a metal-to-metal seat. The valve scrambling is eliminated primarily because there is no bellows charge pressure, and therefore changes in dome and/or temperature have essentially no effect on the valve operation.

2.0 DISASSEMBLY OF THE BKF-6 GASLIFT VALVE.

Refer to Drawing No: 5341.

2.1 Install a 1" Parmalee wrench with a 1" o.d. girth in a small bench vise. Install the valve in the Parmalee wrench gripping on the upper packing barrel (2) immediately below the upper packing stack. Remove the BK-2 latch from the valve.

2.2 Remove the upper packings (6) and packing adaptor ring (7) from the upper packing barrel (2).

2.3 Remove the tail-plug (1) and copper gasket (3) from the upper packing barrel.

2.4 Remove the 1/4" Alien cup-point screw (4) from the upper end of the upper packing barrel.

2.5 Shake the 3/16n T.C. ball (5) out of the bore of the upper packing barrel.
2.6 Remove the 1/4" Alien set screw (8) from the upper packing barrel. As the set screw is removed, any tension remaining in the valve spring will be released.

   NOTE: THE SET SCREW MUST BE REMOVED BEFORE PROCEEDING WITH THE DISASSEMBLY. IF THE SET SCREW IS NOT REMOVED AT THIS STAGE, THE TENSION IN THE SPRING COULD PROPEL THE BELLOWS ASSEMBLY OUT OF THE OPERATOR'S HANDS.

2.7 Remove the check nose (23) from the lower packing retainer (19).

2.8 Remove the check disc retainer ring (21) and the seat gasket (20) from the check nose (23).

2.9 Remove the lower packing retainer (19) from the lower packing barrel (18) and then remove the lower packings (6) and adaptor ring (7).

2.10 Remove the lower packing barrel (18) from the bellows assembly (12) using a parmalee wrench and a strap wrench or chain wrench.

2.11 Remove the seat retainer (17) from the upper end of the lower packing barrel (18).

2.12 Remove O-ring from its groove in the seat retainer.

2.13 Remove O-ring from its groove in the lower packing barrel.

2.14 Remove the bellows assembly (12) from the upper packing barrel (12). The silicone fluid injected into the upper packing barrel during assembly will spill out of the valve when the joint between the lower packing barrel and bellows assembly is broken.

2.15 Install the bellows assembly in a vise gripping on the port area taking care not to damage the bellows.

2.16 Remove the stem tip assembly (13) from the bellows assembly (12) using a 5/16" deep socket wrench inserted through the lower end of the bellows assembly.
2.17 Remove the spring (11) and spring guide (10) from the bore of the upper packing barrel (2). Remove the 1/8" T.C. ball (9) from the top of the spring guide.

3.0 ASSEMBLY OF THE BKF-6 GASLIFT VALVE.

3.1 Secure the bellows assembly (12) in a vise, gripping at the port area and take care not to damage the bellows. Inspect the stem tip (13) for any damage, and install same with a 5/16" deep socket wrench. Apply Loctite Grade 242 on the threads.

NOTE:- Ensure bellows are not twisted while making up the stem tip.

3.2 Install O-ring into its groove of the seat (15) and apply seal lubricant.

3.3 Install seat into lower end of the bellows assembly, taking care not to damage the O-ring in the process.

3.4 Install O-ring into its groove of the seat retainer (17).

3.5 Install seat retainer (17) into lower packing barrel (18) and make it up with a screw driver.

3.6 Install O-ring into its groove of the lower packing barrel and apply seal lubricant to both O-rings.

3.7 Make up the lower packing barrel (18) to the bellows assembly (12).

3.8 Install set screw (8) into the upper packing barrel (2).

3.9 Apply seal lubricant to the 1/8,1 T.C. ball and place on centre hole of the spring guide (10).

3.10 Place the spring guide (10) into one end of the spring (11) and place both into bore of the upper packing barrel.

3.11 Inject 8.5 cc of Dow Coming 200 and 5000 viscosity silicone fluid into the upper packing barrel using a large hypodermic syringe (THIS IS CRITICAL).
3.12 Install O-ring into its groove of the bellows assembly (12) and apply seal lubricant.

3.13 Make up the bellows assembly (12) to the upper packing barrel (2), taking care not to damage the O-ring when assembling.

3.14 Assemble Packings (6) 3 facing down and 3 facing up with a packing adaptor ring (7) in between onto the lower packing barrel.

3.15 Make up the lower packing retainer (19) to the lower packing barrel (18).

3.16 Install the check disc (22) into the nose (23) with the four prongs pointing downwards, and the rounded dome pointing upwards at the box threads of the nose.

3.17 Install the retainer ring (21) into the nose with the beveled side against the check disc.

3.18 Install the seat gasket (20) into the nose with the beveled side facing upwards. The bottom flat side of the seat gasket should contact the top flat side of the seat retainer.

3.19 Make up the nose (23) to the lower packing retainer (18).
1.0 GENERAL FACTS ABOUT THE FLOPETROL CMI-FS-BK GASLIFT VALVE.

The Flopetrol CMI-FS-BK gaslift valve is a 1.00" tubing sensitive side pocket retrievable gaslift valve designed to be used in any side pocket mandrel with 1.00# valve pockets. It is a spring-operated valve and utilizes atmospheric sealed bellows dome. The valve closes by the preset tension of the valve spring and opens when the tubing pressure at valve depth acting on the area of the bellows less the area of the port overcomes the preset downward force of the spring.

The seats and stem tips are available in port sizes of 8/64", 12/64", 14/64" and 16/64". As there is no pressure charged dome in the valve, changes in down-hole temperature will have no effect on the valve operation. Reverse flow through the valve is isolated by the velocity check disc assembly. The valve is somewhat identical to the Camco BKF-6 gaslift valve.

2.0 DISASSEMBLY OF THE CMI-FS-BK GASLIFT VALVE.

Refer to Drawing No: 5342.

2.1 Install a 1" Parmalee wrench with a 1" o.d. girth in a small bench vise, Install the valve in the Parmalee wrench gripping on the upper body (4).

2.2 Remove the BK-2 or MAK-2 latch from the valve.

2.3 Grip check top with a back-up wrench and remove the check body. Recover the float disc, check baffle and check disc of the check assembly (18).

2.4 Install a back-up strap wrench on the valve head (17) and remove the check stop. Recover the packings and packing adaptor from the check stop.

2.5 Install a back-up strap wrench on the lower body (14) and remove the valve head (17).

2.6 Install a back-up wrench on the spring stop (8).

2.7 Remove the lower body (14) from the spring stop (8).
2.8 Remove the ball stem (12), adjustment nut (11), spring washer (10) and spring (9).

2.9 Remove the spring stop (8) from the upper body (4).

2.10 Remove the packings (5) and adaptor ring (6).

2.11 Remove the bellows assembly (2) from the upper body (4) using an open-ended spanner.

NOTE:- HAVING BACKED OFF THE BELLOWS ASSEMBLY FROM THE UPPER BODY, RETRIEVE THE ASSEMBLY VERY CAREFULLY SO AS NOT TO DAMAGE THE BELLOWS.

2.12 Install the bellows assembly (2) in a small vise gripping on the square shoulder on the bellows top very carefully to avoid damaging the bellows.

2.13 Remove the check stop.

3.0 ASSEMBLY OF THE CMI-FS-BK GASLIFT VALVE.

3.1 Install the float disc into the bore of the check body with the four legs pointing downward, and the rounded dome pointing upwards.

3.2 Install the check baffle into the bore of the check body with the beveled side downwards toward the float disc.

3.3 Install the float disc into the bore of the check body with the beveled side facing upwards. Ensure the flat side of the check disc contacts the top flat side of the check baffle.

3.4 Replace both O-rings on the check stop.

3.5 Make up the check stop onto the check body.

3.6 Assemble the packings and adaptor ring onto the packing section of the check stop.

3.7 Make up the valve head to the check stop.

3.8 Install the guide baffle into the bore of the valve head very carefully to avoid damage to the threads.
3.9 Install new O-rings on the lower body and make up body to valve head tight.

3.10 Replace O-rings on bellows assembly. Slide assembly through the upper body very carefully so as not to damage the bellows. Make up and tighten the connection.

3.11 Assemble the packings and adaptor ring onto the packing section of the upper body.

3.12 Renew O-rings on the spring stop and make up tight to the upper body.

3.13 Install spring, spring washer, adjustment nut and ball stem onto the lower adaptor.

3.14 Check the valve stand-off. Take lower body and re-assemble the spring stop until the ball stem touches the valve head seat. The gap between the spring stop and lower body should be a minimum of 0.05" (1.19 mm) and a maximum of 0.06" (1.59 mm), and can be adjusted by turning the ball stem clockwise or counter-clockwise on lower adaptor thread. When the correct stand-off has been obtained, lock the ball stem in place with the re-locking nut.
1.0 GENERAL FACTS ABOUT THE CAMCO LK-3 CHEMICAL INJECTION VALVE.

The Camco LK-3 chemical injection valve is a spring-loaded differential type injection valve. The valve opens when the differential pressure between the injected chemical pressure and the produced fluid pressure overcomes the preset spring tension, allowing chemical injection into the flow stream in the well. Decrease in differential pressure will cause the valve to close. A wide selection of springs rates allow operating differential pressures up to 3,800 psi. The spring controlled set pressure is easily adjusted from outside without the need to disassemble the valve.

2.0 DISASSEMBLY OF THE LK-3 INJECTION VALVE.

Refer to Drawing No: 5343.

2.1 Install the valve in a 1" Parmalee wrench, gripping on the upper packing barrel (1) immediately below the packing stack. Remove the valve latch from the upper packing barrel. Remove the jam nut (4) from the bore of the upper packing barrel using a large screw driver.

2.2 Remove the pressure screw (6) from the bore of the upper packing barrel (1) using a small screw driver.


2.3 Remove the upper packing (2) and adaptor ring (3) from the upper packing barrel (1).

2.4 Install a parmalee wrench with a In o.d. girth in a bench vise. Place the valve in the wrench with the grip on the seat assembly (13).
2.5 Remove the upper packing barrel from the spring housing (9) using a strap wrench or chain wrench. DO NOT wrench on the polished packing section of the upper packing barrel.

2.6 Remove the spring housing (9) from the seat assembly (13).

2.7 Remove the spring guide (7), spring (8) and stem tip (11) from the bore of the spring housing.

NOTE:- THE STEM TIP AND SEAT HAVE BEEN LAPPED AS A MATCHED PAIR. IT IS THEREFORE ESSENTIAL TO KEEP THE LAPPED PAIR SEPARATE FROM SIMILAR PARTS OF OTHER VALVES WHICH MAY BE SERVICED AT THE SAME TIME. IF EITHER THE VALVE STEM TIP OR SEAT IS DAMAGED, BOTH PARTS MUST BE REPLACED WITH A NEW MATCHED PAIR.

2.8 Remove the nose (16) from the lower packing retainer (15).

2.9 Remove the seat gasket (17), seat retainer (18), check dart (19) and spring (20) from the bore of the nose.

2.10 Remove the lower packing retainer (15) from the lower packing barrel (14).

2.11 Remove the lower packing (21) and adaptor ring (3) from the lower packing barrel.

2.12 Remove the lower packing barrel from the seat assembly (13). DO NOT wrench on the polished packing section of the lower packing barrel.

2.13 Remove the seat (13) from the grip of the parmalee wrench. Remove all O-rings and seals.

2.14 Clean and inspect all parts for any signs of damage, wear and corrosion.

3.0 ASSEMBLY OF THE CAMCO LK-3 INJECTION VALVE.

3.1 Install the check dart spring (20) into the bore of the nose (16).
3.2 Install the check dart (19) into the nose above the spring, with the four prongs pointing downward against the spring, and the rounded dome upwards.

3.3 Install the seat retainer (18) into the nose with the beveled side against the check dart.

3.4 Install the seat gasket (17) into the nose with the beveled side up and the flat side against the top of the seat retainer (18).

3.5 Make up the lower packing retainer (15) to the nose (16).

3.6 Install the lower packings (21) and adaptor ring (3) onto the polished packing section of the lower packing barrel (14) as shown in the assembly drawing.

3.7 Make up the lower packing barrel (14) to the lower packing retainer (15).

3.8 Install O-ring into its groove of the lower packing barrel and apply seal lubricant.

3.9 Make up the seat assembly (13) to the lower packing barrel.

3.10 Install O-ring into its groove located at the base of the pin threads of the seat (13) and apply seal lubricant.

3.11 Make up the spring housing (9) to the seat (13).

3.12 Install the stem tip assembly (11) into bore of the spring housing (9) with the ball of the stem tip towards the seat.

3.13 Install the spring (8) into the bore of the spring housing, encircling the stem of the stem tip.

3.14 Install the spring guide (7) into the bore of the spring housing (9), and into the spring.

3.15 Install o-ring (5) into its groove of the upper packing barrel (1).
3.16 Make up the upper packing barrel to the spring housing (9). DO NOT 
wrench on the polished packing section of the upper packing barrel.

3.17 Install the pressure screw (6) into the bore of the upper packing 
barrel. Rotate the pressure screw clockwise using a small screw driver 
until its top is flush with the top of the upper packing barrel.

3.18 Make up the jam nut (4) onto the pressure screw (6). The jam 
nut fits around the pressure screw and inside the bore of the upper packing barrel. Make up the jam nut until it stops. When fully installed, the jam nut extends approximately 1/8" out of the bore of the upper packing barrel.

3.19 Install the upper packings (2) and adaptor ring (3) onto the 
polished packing section of the upper packing barrel.

3.20 Install a parmalee wrench with a 1" o.d. girth in a bench vise. 
Install the valve in the wrench, gripping on the spring housing. Tighten all threaded connections fully using a strap wrench.
1.0 GENERAL FACTS ABOUT THE CAMCO BKLK-2, CHEMICAL INJECTION VALVE.

The Camco BKLK-2 Chemical injection valve is charged with nitrogen pressure to provide its setting pressure. The valve opens when the injected pressure of the chemical at valve depth is higher than the opening pressure of the valve, allowing injected chemical into the flow stream of the well. The valve closes when the injected pressure of the chemical at valve depth falls below the opening pressure of the valve.

The injection valve is equipped with a spring-loaded reverse flow check-valve to prevent back flow through the valve from tubing to casing.

2.0 DISASSEMBLY OF THE BKLK-2 INJECTION VALVE

Refer to Drawing No: 5344.

2.1 Install valve in a Parmalee wrench gripping on the bellows assembly (7) immediately below the upper packing stack.

2.2 Remove the valve latch from the valve.

2.3 Remove the upper packings (5) and adaptor ring (4) from the bellows assembly (7).

2.4 Remove the tail-plug (1) and the copper gasket (2) from the upper bore of the bellows assembly.

2.5 Release the charge pressure from the bellows assembly using the Camco de-airing tool (P/No: 87424-000-00000), Make up the outer housing of the de-airing tool to the threads of the bellows assembly above the dill valve core (3). Slowly rotate the core of the tool until it contacts the dill valve - charge pressure will begin to escape from the bellows, Continue to depress the dill valve with the tool until all charge pressure has been released.

NOTE:- IT IS EXTREMELY IMPORTANT TO RELIEVE THE NITROGEN CHARGE PRESSURE BEFORE DISASSEMBLING VALVE FURTHER. IF PRESSURE IS NOT RELEASED FROM THE BELLOWS AT THIS STAGE, SEVERE DAMAGE WILL BE INFICTED ON THE BELLOWS WHEN THE BODY IS REMOVED FROM THE BELLOWS ASSEMBLY.
2.6 Remove the lower packing retainer (13) and the check nose (17) as a unit from the seat housing (12).

2.7 Remove the lower packings (5) and adaptor ring (4) from the seat housing (12).

2.8 Insert the cupped stem of the Camco head-lifter (P/No: 87101-000-00000) through the lower end of the seat housing. Make up the body of the head-lifter to the lower o.d. threads of the seat housing. Turn the T-handle of the head-lifter until the end of the cupped stem contacts the ball of the stem tip (8). Turn the T-handle an additional half-turn to lift the ball slightly off the valve seat (11). Reposition the valve in the parmalee wrench gripping on the bellows body (6). Remove the seat housing (12) from the bellows body using a special wrench in the holes provided in the seat housing. DO NOT wrench on the packing section of the seat housing.

2.9 Remove the head-lifter from the seat housing.

2.10 Remove the tru-arc ring (9) from above the seat assembly (II) using a pair of circlip pliers.

2.11 Remove the seat assembly (11) from the upper end of the seat housing (12).

2.12 Remove the bellows body (6) from the bellows assembly (7). DO NOT wrench on the polished packing section of the bellows assembly.

2.13 Remove the lower packing retainer (13) from the check nose (17).

2.14 Remove the seat gasket (14), retainer ring (15), check disc (16) and spring (18) from the bore of the check nose (17).

2.15 Install the bellows assembly (7) in a bench vise gripping on the bellows adaptor located immediately below the convolutions of the bellows. Ensure the bellows is not squeezed, twisted or damaged in any way during the disassembly process. Use a small adjustable wrench to remove the stem tip (8) from the bellows assembly.
NOTE:- AS THE STEM TIP AND SEAT ARE INDIVIDUALLY LAPPED AS A MATCHED PAIR, IT IS IMPORTANT TO KEEP THEM SEGREGATED FROM SIMILAR PARTS OF OTHER VALVES WHICH MAY BE SERVICED AT THE SAME TIME. IF EITHER PART OF THE PAIR IS DAMAGED, BOTH PARTS MUST BE REPLACED BY A NEW MATCHED PAIR.

2.17 Remove the bellows assembly from the vise and carefully file off any burrs which may have been formed on the bellows adaptor.

2.18 Clean and inspect all parts for any damage, wear, deformity and galling. Replace all O-rings and packings.

3.0 ASSEMBLY OF THE BKLK-2 CHEMICAL INJECTION VALVE.

3.1 Install the bellows assembly (7) in a small bench vise gripping on the bellows adaptor immediately below the convolutions of the bellows. Ensure the bellows is not squeezed, twisted or damaged in any way during the assembly process.

3.2 Apply Loctite Grade 242 to the threads of the stem tip (8) and make it up to the lower end of the bellows assembly using an adjustable wrench.

3.3 Remove the bellows assembly from the vise and carefully file off any burrs that may have formed on the bellows adaptor. DO NOT contact the bellows with the file at any time.

3.4 Install the bellows assembly in the bench vise gripping on the large o.d. between the bellows and the upper packing section. Make up the upper end of the bellows body (6) to the bellows assembly from below and tighten connection fully with a strap wrench.

3.5 Install the O-ring (10) into its groove around the floating seat (11) and apply seal lubricant to the O-ring.

3.6 Install the seat assembly (11) in the seat recess located in the upper end of the seat housing (12). The end of the seat which is beveled and lapped at the bore must face upwards toward the stem tip (8) for proper operation.
3.7 Install the tru-arc ring (9) above the seat assembly (11) to secure the seat assembly in the seat recess.

3.8 Insert the cupped stem of the Camco head-lifter through the lower end of the seat housing (12). Make up the body of the head-lifter to the external threads of the seat housing and turn the T-handle until the cupped stem is flush with the seating surface of the valve seat.

3.9 Reposition the valve in the parmalee wrench gripping on the bellows body (6). Tighten fully the connection to the seat housing (12). DO NOT wrench on the packing section of the seat housing. The head-lifter keeps the ball of the stem tip from contacting and turning on the seat while the seat housing is being made up to the bellows body.


3.10 Remove the head-lifter from the seat housing (12). Install the packings (5) and adaptor ring (4) onto the polished packing section of the seat housing as shown in the assembly drawing.

3.11 Insert the spring (18) into the bore of the check nose (17).

3.12 Insert the check disc (16) into the bore of the check nose such that the four prongs will be seated on top of the spring (18), and with the rounded dome pointing upwards.

3.13 Install the retainer ring (15) with the beveled side against the dome of the check disc. Insert the seat gasket (14) into the bore of the nose with the flat side against the retainer ring.

3.14 Make up the lower packing retainer (13) onto the check nose and tighten connection fully. Set aside the lower packing retainer, check nose and inserts until the valve setting procedure has been completed.
3.15 Remove and discard the dill valve core (3) if any silicone fluid has been lost from the bellows assembly. Drain off any remaining fluid from the bellows assembly. Hold the valve vertically and inject 6 cc of Dow Coming 200 and 5000 silicone fluid into the bellows assembly using a hypodermic syringe.

3.16 Install a new dill valve core (3) in the opening at the top of the bellows assembly using a valve core wrench. Screw the dill valve core firmly in place, but do not over-tighten.
1.0 GENERAL FACTS ABOUT THE CAMCO DCK-2 DUMP KILL VALVE.

The Camco DCK-2 dump kill valve is a 1.00n O.D. wireline retrievable side pocket valve, its main purpose being to provide a communication path between the casing annulus and tubing to facilitate circulation and killing of a well by straight pumping. In the normal operating mode, the dump kill valve seals off in the side pocket mandrel and acts as a dummy valve until opened.

An internal piston seals off the valve circulating ports until the shear pins are sheared by a higher differential pressure on the annulus side, and the piston moves upward into a locked position. The required shearing pressure (differential) may be selected by the use of various types and number of shear pins which may vary from 930 psi to 7400 psi. It is not possible to shear the valve by a tubing to casing differential pressure.

After shearing with pressure differential from the annulus, the valve stays locked open and must be retrieved to be re-set.

2.0 DISASSEMBLY OF THE DCK-2 DUMP KILL VALVE.

Refer to Drawing No: 5345.

2.1 Secure a Parmalee wrench with 1” o.d. girth in a bench vise. Install the kill valve in the wrench, gripping on the upper packing barrel (1) immediately below the packings. Remove the BK-2 latch from the upper packing barrel.

2.2 Remove the packing back-up ring (15), packings (16) and adaptor ring (3) from the upper packing barrel. Discard all used packings, and the back-up rings and adaptor ring if damaged.

2.3 Remove the body (12) from the upper packing barrel (1).

2.4 If the valve has been sheared, the spring retainer (6) and the piston (8) will be locked in the bore of the upper packing barrel (1). Pull down on the piston to free the piston and spring retainer from the upper packing barrel.
2.5 Remove the O-ring (5) from the bore of the upper packing barrel and discard the O-ring.

2.6 Remove the lock ring (4) from the bore of the upper packing barrel. Discard the lock ring if it is damaged or worn.

2.7 Remove the shear screws (10) from the shear screw holes in the body (12) using a small screw driver. [If the valve has not been sheared, the spring retainer (6) and piston (8) will be in the bore of the body. The removal of the shear screws will make it possible to remove these pieces]. Insert a 3/8" wooden dowel rod through the lower end of the valve until it contacts the lower end of the piston. Push the piston and spring retainer out from the bore of the body.

2.8 Remove the O-rings from the grooves of the piston (8). Discard any pieces of the remaining sheared screws.

2.9 Remove the spring retainer (6) from the piston using a strap wrench on the piston and an adjustable wrench on the spring retainer.

2.10 Remove the C-spring (7) from the spring retainer (6). Discard the C-spring if worn or damaged.

2.11 Unscrew and remove the nose (14) from the body (12).

2.12 Remove the back-up rings (15), packings (16) and adaptor ring (3) from the body (12). Discard all used packings.

2.13 Clean and inspect all parts for wear and any damages.

3.0 ASSEMBLY OF THE DCK-2 DUMP KILL VALVE

3.1 Install the O-rings into their respective grooves on the upper and lower ends of the piston (8). Install the large O-ring into the groove near the mid-point of the piston and push it to the lower side of the groove.

3.2 Install the C-spring (7) around the mid-point of the spring retainer (6) as shown in the assembly drawing. Make up the spring retainer to the piston.
3.3 Apply a liberal amount of seal lubricant to the three O-rings on the piston (8). Insert the lower end of the piston into the upper end of the body (12) and push the spring retainer (6) and piston fully into the body until the piston stops against the shoulder in the body.

3.4 Slide the lock ring (4) into the bore of the upper packing barrel (1). When properly installed, the flat end of the lock ring with the smaller i.d. is positioned toward the pin threads of the upper packing barrel, and the end of the lock ring with the internal bevel is positioned toward the box threads of the packing barrel.

3.5 Apply seal lubricant to the O-ring (5). Slide the O-ring into the bore of the upper packing barrel (1) until it seats in the O-ring groove located immediately above the box threads.

3.6 Make up the body (12) to the upper packing barrel (1).

3.7 Insert a 3/8" wooden dowel rod through the lower end of the valve body (12) until it contacts the lower end of the piston (8). Push the piston upwards through the body until the piston stops - the C-spring (7) will have latched onto the lock ring, thereby locking the spring retainer and the piston in the upper packing barrel. Remove the dowel rod from the body and insert a 1/4" wooden dowel rod into the upper end of the upper packing barrel (1) until the rod contacts the top of the spring retainer (6). Attempt to push the spring retainer and piston down from its locked position. If the valve is assembled correctly, the spring retainer and piston will not move downward. Remove the upper packing barrel from the body and push the spring retainer and piston out from the bore. Push the piston and spring retainer back down into the body until the piston stops. Reassemble the upper packing barrel to the body and tighten the connection.

3.8 Install the back-up rings (Is), packings (16) and adaptor ring (3) onto packing sections of the upper packing barrel (1) and the body (12) as shown in the assembly drawing.

3.9 Install the nose (14) onto the body.

3.10 Secure a 1" parmalee wrench in the vise and grip the wrench on the nose of the valve. Tighten all threaded connections on the valve using a strap or chain wrench. Install the BK-2 latch onto the valve.

3.11 Install the required number and rating of shear screws to the body of the valve to hold the piston in place.
1.0 GENERAL FACTS ABOUT THE CAMCO 'E' DUMMY VALVE.

The 'E' dummy valve is a wireline retrievable 1.00" o.d. non-equalising side pocket isolation device designed to positively shut off communication between tubing and casing through the side pocket ports. The dummy consists of two packing sections installed onto two fitted pieces of machined bar stock and is threaded on top to accept the Camco 'BK-2' latch. The two sets of packings on the dummy straddle and pack off the ports in the side pocket mandrel.

2.0 DISASSEMBLY OF THE 'E' DUMMY VALVE.

Refer to Drawing No: 5346.

2.1 Secure a Parmalee wrench with a 1" o.d. girth in a bench vise. Install the dummy valve in the wrench, gripping on the body (3) immediately below the upper packing stack.

2.2 Remove the 'BK-2' latch from the body.

2.3 Remove the nose (4) from the body (3).

2.4 Remove the packings (1) and adaptor rings (2) from the nose and the body.

2.5 Clean and inspect all parts for any damages. Discard all used packings and replace any damaged adaptor rings.

3.0 ASSEMBLY OF THE 'E' DUMMY VALVE.

3.1 Install lower packings (1) and adaptor ring (2) onto packing section of the nose (4) as shown in the assembly drawing.

3.2 Apply thread lubricant on the nose threads and make up the nose to the body (3).

3.3 Install the packings (1) and adaptor ring (2) onto the packing section of the body.

3.4 Apply Loctite Grade 242 onto the pin threads of the body and make up the 'BK-2' latch on the body.
1.0 CALCULATIONS FOR TEST RACK OPENING PRESSURE OF LK-3 VALVE.

The equation for calculating the pressure setting of the LK-3 chemical injection valve is as follows:-

\[ \text{Tro} = \text{Pc} - \text{Pt} + \text{Ps}, \]

where \( \text{Tro} \) = Test rack opening pressure psig of valve.
\( \text{Pc} \) = Hydrostatic pressure of casing fluids psig at valve depth.
\( \text{Pt} \) = Flowing tubing pressure psig at valve depth.
\( \text{Ps} \) = Desired surface chemical injection pressure psig.

2.0 CALCULATIONS FOR TEST RACK OPENING PRESSURE OF BKLK-2 VALVE.

2.1 Determine the pressure exerted by the injected fluid (hydrostatic head) in the annulus at valve depth, \( \text{Pc} @ \text{L} \) = injected fluid gradient x depth.

2.2 Determine the desired surface operating pressure \( \text{Ps} \) (usually 200 to 300 psi).

2.3 Determine flowing temperature at valve depth: \( \text{Tf} @ \text{L} \).

2.4 Determine flowing tubing pressure at valve depth: \( \text{Pt} @ \text{L} \).

2.5 Calculate bellows charge pressure with flowing tubing pressure and temperature at valve depth \( \text{Pbt} \), using the following formula:-

\[ \text{Pbt} = (\text{Pc} @ \text{L} + \text{Ps}) (1 - \frac{\text{Av}}{\text{Ab}}) + \text{Pt} @ \text{L} (\frac{\text{Av}}{\text{Ab}}). \]

Determine the bellows charge pressure at 60 deg. F \( (\text{Pb} @ 60\text{ deg.F}) \) using the graph "Temperature and Pressure Characteristics of Nitrogen". When it is desired to set the BKLK-1 valve at room temperature \( (\text{Pb} @ \text{Tr deg.F}) \) rather than at 60 deg. F, first obtain the stabilised temperature of the nitrogen to be used to charge the valve (usually the same as room temperature) \( \text{Tr} @ \text{deg.F} \), then refer to the graph "Temperature and Pressure Characteristics of Nitrogen" to
correct the design pressure at 60 deg.F (P_b @ 60 deg.F) to the pressure required to charge the bellows at room temperature (P_b @ T_r deg.F).

2.6 Calculate the valve test rack opening pressure at 60 deg.F (T_o @ 60 deg.F).

\[
T_o @ 60 \text{ deg.F} = \frac{P_b @ 60 \text{ deg.F}}{1 - \frac{A_v}{A_b}}
\]

2.7 When it is desired to test the valve at room temperature rather than at 60 deg.F, make the following calculation for valve test rack opening pressure at room temperature (T_o @ T_r deg.F).

\[
T_o @ T_r \text{ deg.} = \frac{P_b @ T_r \text{ deg.F}}{1 - \frac{A_v}{A_b}}
\]

where, \(A_b\) = Effective bellows area (sq.in.) of the valve
\(A_v\) = Area of port with bevel (sq.in) of the valve.

### TECHNICAL DATA

<table>
<thead>
<tr>
<th>AVAILABLE port sizes I.D. inch</th>
<th>EFFECTIVE Bellows (sq.inch.)</th>
<th>AREA OF port with bevel. (sq.in)</th>
<th>(\frac{A_v}{A_b})</th>
<th>(1 - \frac{A_v}{A_b})</th>
<th>(\frac{A_v}{A_b}) ((1-\frac{A_v}{A_b}))</th>
<th>Tubing Effect Factor</th>
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3.0 CALCULATIONS FOR TEST RACK OPENING PRESSURE OF DCK-2 VALVE.

3.1 To prevent the casing from rupturing, the maximum annulus pressure at valve depth must be within the pressure range of the casing. Determine the maximum expected tubing pressure at valve depth at the time the valve is to be opened (sheared). This pressure plus the valve differential opening pressure must be equal to or less than the maximum allowable casing pressure at valve depth, otherwise the casing may fail.

3.2 Determine the minimum expected tubing pressure at valve depth. The valve differential opening pressure (the pressure required to shear the valve) must exceed the difference between the maximum annulus operating pressure and the minimum tubing pressure to prevent a premature valve opening.

3.3 Determine the available pump output pressure combined with the annulus fluid hydrostatic head at valve depth. This combined value must be greater than the tubing pressure at valve depth plus the valve opening (shear) pressure.

3.4 After determining the desired differential pressure setting for the dump kill valve, select the necessary mixture of shear screws for the desired shear pressure. Refer to the "Shear Screw Pressure Chart" for the correct combination of shear screws.

3.5 Install the shear screws into the valve body to hold the piston in place.

   NOTE:- When using 2 shear screws, install them at 180 deg. apart. When using 3 shear screws, install them at 120 deg. apart, and so on.

4.0 PRESSURE SETTING OF THE BKF-6 GASLIFT VALVE.

4.1 Install the valve gripping on the upper packing barrel in a vise (and remove the BK-2 latch if installed).

4.2 Install the valve assembly into the test fixture.

4.3 Remove the tail plug, copper gasket, Alien cup point screw and ball,
4.4 Adjust the Alien set screw until the desired opening pressure is reached.

4.5 Install back the copper gasket and tail plug into the upper packing barrel.

4.6 Place the valve assembly in an ager and apply 4,000 psi for 5 minutes.

4.7 Bleed off pressure and remove valve from the ager.

4.8 Remove the tail plug and copper gasket from upper packing barrel.

4.9 Place the valve back into the test fixture and check the opening pressure. Note that the opening pressure would have dropped.

4.10 Repeat step 4.4 above.

4.11 Install the 3/16" T.C. ball and Alien cup point screw into the upper packing barrel.

4.12 Repeat steps 4.5, 4.6 and 4.7 above. Use a new copper gasket.

4.13 Repeat steps 4.9 above. Note that the opening pressure should be within 1% of the desired opening pressure.

4.14 When satisfied valve is correctly set, install the Bk-2 latch and the check nose assembly onto the valve.

4.15 Complete the Valve Test Data sheet.

5.0 PRESSURE SETTING OF LK-3 CHEMICAL INJECTION VALVE.

5.1 Install valve in a vise and grip on the spring housing (and remove BK-2 latch if installed).

5.2 Remove the packings and adaptor ring from the upper packing barrel.
5.3 Install the valve in the pressure testing fixture from below so as not to damage the lower packings. Slide the valve into the test adaptor until the two O-rings in the adaptor seal above and below the external choke holes in the valve seat.

5.4 Hold the pressure screw steady with a screw driver and turn the jam nut counterclockwise to loosen.

5.5 Open the test pressure control valve until the valve opens and exhausts, keeping test pressure in a steady low volume stream. Leave the control valve open while setting the valve test rack opening pressure.

5.6 Set the valve test rack opening pressure by adjusting the pressure screw using the screw driver.

   NOTE:- To increase the valve opening pressure, turn the pressure screw counterclockwise.

5.7 Observe the pressure gauge on the test bench while adjusting the pressure screw. When the pointer on the pressure gauge is at the desired test rack opening pressure shut off the pressure control valve, Hold the pressure screw immobile with the screw driver and turn the jam nut clockwise until it is tight.

5.8 Observe the pressure gauge after the test pressure control valve has been shut off and the jam nut tightened. The pointer on the pressure gauge should remain steady at the correct test pressure, Any drop in pressure indicates the Valve is leaking at the valve Seat (an audible hiss occurs with badly leaking seats). If the valve seat is leaking, service the valve as per OPG NO:4C.3018,

5.9 Bleed off pressure from the test fixture and remove the

5.10 Repeat as per Steps 4.6 and 4.7 of this procedure (to age the valve).

5.11 Return the valve to the test fixture and check the valve test rack opening pressure. The valve should open within 1% of the set test rack opening pressure.
5.12 Remove the valve from the test fixture and install back the packing set to the upper packing barrel. Make up the BK-2 latch onto the valve.

5.13 Complete the Valve Test Data Sheet.

6.0 PRESSURE SETTING OF BKLK-2 CHEMICAL INJECTION VALVE

6.1 Install the valve in a parmalee wrench gripping on the bellows assembly immediately below the packing stack. Remove the BK-2 latch (if installed).

6.2 Remove the upper packing stack from the bellows assembly, and the check nose and lower packing retainer as a unit from the seat housing. Remove the lower packing stack.

6.3 Remove the tail plug and copper gasket from the bellows assembly.

6.4 Place the valve in the valve test fixture and connect the charging tool (P/No: 87137-000-00000) complete with an accurate pressure gauge to the upper bore of the bellows assembly.

6.5 Charge the bellows with nitrogen very slowly and continuously to the calculated bellows required pressure at test rack temperature (Pb @ Tr deg.F), while observing the gauge on the charging apparatus.

6.6 Isolate and bleed off charging pressure from the charging tool. Remove charging tool from the valve and install a new copper gasket and tighten the tail plug.

6.7 Place the valve in the ager and apply 4,000 psi for 5 minutes. Bleed off pressure and remove valve from the ager.

6.8 Install valve in the test fixture and check for correct opening pressure of the valve. This should be within 1% of the required test rack opening pressure.
6.9 When satisfied that the valve opening pressure is correct, remove valve from the test fixture. Install back the upper and lower packing stacks, the check nose and lower packing retainer to the seat housing, and the Bk-2 latch to the top of the bellows assembly.

6.10 Complete the Valve Test Data Sheet.


7.0 PRESSURE SETTING OF DCK-2 DUMP KILL VALVE.

7.1 Select the necessary mix of shear screws for the desired shear pressure by reference to the "Shear Screw Pressure Chart". Shear screws of any type of material mix may be combined to attain the desired shear value.

7.2 Install the shear screws into the valve body to hold the piston in place. Ensure the tip of the screws are above the thick O-ring on the piston. When using two shear screws, install them 180 deg. apart. When using 3 shear screws, install them at 120 deg. apart, and so on.

8.0 PRESSURE SETTING OF CMI-FS-BK GASLIFT VALVE.

8.1 Install the valve in a parmalee wrench, gripping on the spring stop of the valve.

8.2 Remove the lower body from the spring stop,

8.3 Check the ball stem is tight by rotating clockwise with hand. If the ball stem is loose, tighten the lock nut and check the stand-off. The stand-off must be accurate to ensure proper function of the valve.

8.4 While backing up on the adjustment nut, loosen the locking nut to free the adjustment nut.
8.5 Rotate the adjustment nut clockwise to increase the valve opening pressure, and counterclockwise to decrease the valve opening pressure. One complete rotation of the nut will increase or decrease the valve opening pressure by approx. 90 psig for the standard spring, and will vary with springs that are used for special applications.

8.6 Having adjusted to the estimated opening pressure, tighten back the locking nut while holding back-up on the adjustment nut.

8.7 Make up the lower body to the spring stop and tighten the connection. Place valve in the test fixture and check its opening pressure. If the test rack opening pressure is not correct, repeat the setting procedure.

8.8 When the desired opening pressure (approx. 5 psig difference is acceptable) of the valve is achieved, apply Loctite Grade 242 on the pin threads of the upper body and make up the MAK-2 or BK-2 latch.

8.9 Complete the Valve Test Data Sheet.
1.0 INSTALLING CAMCO JK RUNNING TOOL ONTO SIDE POCKET VALVES.

1.1 Slide the 'JK' running tool over the '51(-3' latch running head until the two pieces shoulder up internally.

1.2 Install the two pieces of 1/8(tangential shear pins to pin the running head of the 'BK-2' latch in the running tool.

2.0 SETTING VALVE TN THE SIDE POCKET TEST MANDREL.

2.1 Make up the running tool with valve attached to a standard set of 1 1/2 o.d. toolstring with a kick over tool.

2.2 R.I.H. the valve below the side pocket and pull up the toolstring, the orientative sleeve will be encountered the kickover tool will be kicked off. Lower the tool and the tool discriminator will guide the valve into the side pocket.

2.3 When satisfied that the valve is fully in place, jar down a few times to ensure the valve is fully locked in place, this is indicated by a solid sound.

2.4 Jar up to shear the Pins and release the running tool from the running head of the 'BK-2' latch on the valve. Retrieve the toolstring from the test mandrel.

2.5 Fill up the test mandrel with water and install test cap to the top of test mandrel.

3.0 TESTING OF SIDE POCKET VALVES.

3.1 Pressurise the test mandrel internally to 3,500 psi for 15 minutes with the annulus port venting. Observe for any leaks from the mandrel ports.

3.2 Upon successful completion of the tests, bleed off pressure from the test mandrel.

4.0 RETRIEVING OF VALVES FROM TEST MANDREL.
4.1 Position test mandrel with its "belly" facing downwards and remove the test cap from top of the mandrel.

4.2 Make up a 1.1/4" 'JDC' pulling tool to the standard set of 1.1/4" toolstring.

4.3 Insert the pulling tool into the test mandrel until it locates and latches onto the 'BK-2' latch on the valve.

4.4 Jar up to shear pin in the 'BK-2' latch and release the valve from the valve pocket. Recover the valve from the mandrel.

4.5 Re-pin the 'BK-2' latch with a brass pin.
1.0 GENERAL DESCRIPTION.

The Otis type `X' Running tool is a selective running tool used to run, locate and set type `X' Lock Mandrels. The down-hole controls are made selective by the running tool, which is designed with nipple locating and tripping dogs on the running tool. After locating and tripping the running tool in the nipple where the down-hole control is to be set, downward jarring shears the setting pin and moves the lock mandrel fishing down to expand and lock the locking keys in the nipple recess. Upward jarring shears the releasing pin and releases the running tool from the lock mandrel.

2.0 DISASSEMBLY OF THE `X' RUNNING TOOL

Refer to Drawing No: 5371.

2.1 Place the top sub in a vise and put the running tool in the control position by pulling down on the spring housing (6) until the dogs (10) catch on a shoulder of the main mandrel.

2.2 Drive out the retainer pin and remove the retainer (3). The core (7) can now be removed. Take care when removing the core since several of the smaller internal parts are free to fall out. Shake out these parts, namely the lug segments (12) and the retainer dogs (13).

2.3 With the top sub clamped in the vise unscrew the main mandrel from the top sub with a pipe wrench on the lower end of the main mandrel.

2.4 Place the dog retainer (9) in the vise and unscrew the spring housing from the dog retainer.

2.5 Place the lower end of the main mandrel and grip same in the vise. While pressing firmly on the top end of the dogs, work the assembly back and forth until it slides off from the top of the main mandrel. Recover the dogs (10) and split rings (11). To remove the dog spring (8), insert a small screw driver into the end of the coil between the spring o.d. and the dog retainer i.d. Pull and rotate the spring out slowly from the dog retainer.
2.6 Clean and inspect all parts thoroughly for any sign of damage. Replace all defective parts.

3.0 **ASSEMBLY OF THE 'X' RUNNING TOOL.**

3.1 Place the main mandrel in the vise and grip on the lower end.

3.2 Insert the dog spring (8) into the dog retainer (9) by rotating it in the direction of the spring spiral. When the spring is fully in, compress the spring toward the threaded end of the dog retainer and secure it on both sides of the windows with a light string.

3.3 Apply a liberal amount of light grease to the inside of the dog retainer and place the split rings in place just below the spring (the grease will help to hold them in place).

3.4 Place the dogs (10) into the dog retainer with the ears in the slots of the split rings and insert this assembly carefully over the top end of the main mandrel.

3.5 Slowly slide the dog retainer down the main mandrel until the dogs are opposite their matching shoulders on the main mandrel. Remove the light string to release the dog spring. Work the dogs to the expanded and retracted position to ensure the end of the spring is not catching on the dog or split ring.

3.6 Place the spring (5) and spring housing (6) over the main mandrel from the top threaded end. Make up the top sub onto the main mandrel, ensuring the slots are perfectly aligned when the two pieces are fully made up.

3.7 Remove this subassembly from the vise and place it vertically in the vise, gripping on the top sub.

3.8 Insert the two lug segments (12) into the slots of the main mandrel with the chamfered edge facing the bottom of the tool.

3.9 Place the retainer dogs (13) through the bottom of the main mandrel and into the dog retainer (9) which has an internal recess to fit the square shoulder on one end of the dogs.
3.10 Insert the core (7) carefully into the main mandrel until the top end shoulders up against the top sub. Line up the retainer hole in the core with the slot in the mandrel sub assembly (made up of the top sub and main mandrel).

3.11 Install the retainer in the slot and retainer hole of the core. Pin the retainer in place with a steel pin through the retainer hole at 90 deg. to the slot in the top sub and brad the ends of the pin to secure it in place. Work the core up and down with respect to the main mandrel to ensure it can slide up and down freely.

3.12 Make up the spring housing to the dog retainer and tighten connection. The running tool is now completely assembled and ready for use.

1.0 GENERAL DESCRIPTION

The Otis type 'RX' Running tool is designed to run and install Otis type 'X', 'XN', and 'RQ' Lock Mandrels in the respective Otis landing nipples. In our applications, the 'RX' running tool is used to
run and install the 4" SCSSV with 4" 'XN' lock mandrel in the 4.1/2" XNL landing nipples in the gas wells.

The running tool is activated by jarring down to shear a setting pin. The downward travel of the top and bottom subs relative to the core push the lock mandrel fishing neck into the collapsed position, locking the keys in the landing nipple recess. The running tool is released from the lock mandrel by jarring upwards to shear the releasing pin connecting the core to the lock mandrel body.

2.0 DISASSEMBLY OF THE `RX' RUNNING TOOL.

Refer to Drawing No: 5372.

2.1 Place bottom sub (7) in a vise and remove the top sub (1).

2.2 Re-position the assembly in the vise, gripping on the lower end of the core (9).

2.3 Remove set screws (5), shear pin (4) and shoulder bolt (6).

2.4 Slide the bottom sub (7) down on the core (9) far enough to expose the lock ring segment (2).

2.5 Remove the lock ring segment (2).

2.6 Slide the bottom sub (7) off the core (9). As the bottom sub reaches the top end of the core, the lugs (8) can be removed from the bottom sub.

2.7 Remove the sheared portion of the sheared pins from the bottom sub (7) and core (9).

2.8 Remove the core from the vise. This completes the disassembly process.

3.0 ASSEMBLY OF THE `RX' RUNNING TOOL.

3.1 Place the core (9) in the vise, gripping on the lower end.

3.2 Place the lugs (8) in the windows of the bottom sub (7). Use a thick grease to help hold the lugs in place.

3.3 Slide the bottom sub over the core.

3.4 Place the lock ring segment (2) on the upper end of the core.
3.5 Slide the bottom sub up and align the slot in the core with the shoulder bolt hole in the bottom sub.

3.6 Install the shoulder bolt (6).

3.7 Re-position the subassembly in the vise, gripping on the bottom sub (7).

3.8 Make up the top sub into the bottom sub and install the set screws (5). Do not install the shear pins until ready to assemble onto the appropriate lock mandrel. The tool is now ready for use.
1.0 GENERAL DESCRIPTION.

The Camco 'Zp' Running tool is used to run and set the Camco 'ZP' collar lock, in conjunction with the Camco .PB-6' flapper type SCSSV in the Page Safety valve landing nipple. The running tool is activated by jarring down to shear Setting pin and to push the fishing downwards to expand and lock the locking dogs of the collar lock in the landing nipple recess. The running tool is released from the lock mandrel by upward jarring to shear a releasing pin.

2.0 DISASSEMBLY OF THE 'ZP' RUNNING TOOL.

Refer to Drawing No: 5373.

2.1 Place the prong (2) in a vise.

2.2 Unscrew the fishing neck (1) from the prong (2).

2.3 Clean and inspect all parts for any defects. Ensure all threads are in good condition.

3.0 ASSEMBLY OF THE 'ZP' RUNNING TOOL.

3.1 Place the prong (1) in the vise.

3.2 Screw the fishing neck (1) to the prong (2) and make up tight.

3.3 File off any wrench marks and burrs on the running tool.
1.0 GENERAL DESCRIPTION.

The Camco 'D-1' Running tool is used to run and set the Camco 'C' Lock mandrel in conjunction with Camco SCSSVs in the Camco 'B-6' Landing nipples. The tool is activated by jarring downward to push the fishing neck/expander tube down to lock the locking dogs in the landing nipple recess. The tool is released from the lock mandrel by upward jarring to shear the releasing pins.

2.0 DISASSEMBLY OF THE 'D-1' RUNNING TOOL.

Refer to Drawing No: 5374.

2.1 Place the fishing neck (1) in a vise and on the upper end.

2.2 Unscrew the plunger (2) from the fishing neck (1) with a strap wrench.

2.3 Remove the plunger (2) through the bottom of the skirt (3).

2.4 Clean and inspect all parts. Ensure threads on all parts are in good condition.

3.0 ASSEMBLY OF THE 'D-1' RUNNING TOOL.

3.1 Place the fishing neck (1) in the vise and grip on the upper end.

3.2 Insert the plunger (2) through the bottom of the skirt (3) until it stops at the shoulder in the upper end of the skirt.

3.3 Apply Loctite Grade 242 to the threads of the plunger and make up tight into the fishing neck (1) with a strap wrench.

3.4 File off all burrs and wrench/vise marks. The running tool is now ready for use.
1.0 GENERAL DESCRIPTION.

The Camco 'GA-2' Running Tool is used to run and set all 1.00" o.d. side pocket devices equipped with integral bottom latches. Downward jarring on the tool drives the side pocket device into the valve receiver and the bottom latch locks in place, and at the same time shearing the running, releasing and tell-tale shear pins in the running tool simultaneously. Upward jarring is required to release the running tool. The 'GA-2' running tool is run on the Camco 'OK-1' or Teledyne Merla kickover tools.

2.0 DISASSEMBLY OF THE 'GA-2' RUNNING TOOL.

Refer to Drawing No: 5375.

2.1 Grip the tool horizontally in a vise with the shear pin holes in the vertical position.

2.2 Remove the steel roll pins (2) with a pin punch.

2.3 Drive out the stabiliser (4) and adjustable plunger (1) as a unit from the body (5) through the bottom end.

2.4 Remove all remains of shear pins in the body (5).

2.5 Clean and inspect all parts. Ensure the threads on all parts are in good condition. Check that the adjustable plunger (1) can be screwed up and down freely in the stabiliser (4).

3.0 ASSEMBLY OF THE 'GA-2' RUNNING TOOL.

3.1 Insert the stabiliser (4) with adjustable plunger unit into the body (5) by inserting the threaded end of the adjustable plunger into the bottom end of the body. Ensure the shoulder on the stabiliser is facing downwards.
1.0 GENERAL DESCRIPTION

The Page Running Tool is used to run and set the Page SCSSVs in the corresponding Page Landing Nipples. The running tool has a core that retains the collet in a compressed position and is held in the running position by a shear pin that is sheared after the valve reaches the landing position which locates the Safety valve collet in its locking recess.

2.0 DISASSEMBLY OF THE PAGE RUNNING TOOL.

Refer to Drawing No: 5376.

2.1 Grip fishing neck (5) in a vise and remove the roll pin (7).

2.2 Unscrew the set screw (6) from the cone (2) and remove the shear pin (8).

2.3 Unscrew the mandrel (1) from the fishing neck (5) and slide out the cone (2) from the top end of the mandrel, taking care not to damage the threads on the mandrel.

2.4 Grip the nut (3) in the vise and remove the adaptor nose (4). Slide nut out from the mandrel (1).

2.5 Clean and inspect all parts for any defects. Ensure threads on all parts are in good condition.

3.0 ASSEMBLY OF THE PAGE RUNNING TOOL.

3.1 Slide the nut (3) over the mandrel (1) with the internally threaded end towards the bottom shoulder of the mandrel.

3.2 Make up the adaptor nose (4) to the nut and tighten.

3.3 Slide the collapsing cone (2) over the mandrel with the larger end towards the bottom of the tool. Line up shear pin hole in the cone and mandrel and install shear pin (8) and set screw (6) in place and tighten set screw.

3.4 Make up fishing neck (5) onto mandrel (1) tight and install the lock pin (7). Tool is now ready for use.
1.0 GENERAL DESCRIPTION.

The Otis 'GS' Pulling Tool is a shear down to release type pulling tool for pulling Otis locking mandrels with internal fishing necks.

When the pulling tool enters a lock mandrel, the restriction in the fishing neck causes the dogs to move up and retract against the smaller outside diameter of the core, thereby permitting the pulling tool to enter into the fishing neck. The moment the dogs pass this restriction, the compression in the dog spring forces them down onto the enlarged outside diameter of the core immediately above the bottom shoulder. At this point, the pulling tool is engaged in the fishing neck of the lock mandrel.

To release the pulling tool, downward jar action shears the pin and releases the pulling tool. When engaged in the fishing neck of a lock mandrel, the cylinder of the pulling tool contacts the top of the fishing neck. Downward jarring on the tool moves the core downwards in relation to the cylinder, thereby shearing the pin and allowing the cylinder and dogs to move up the core as a unit, causing the dogs to retract against the smaller diameter of the core, and thus unlatching the tool from the fishing neck. The strong cylinder spring keeps the tool in the disengaging position.

To release the pulling tool from a fishing neck without shearing the pin, grasp the dog retainer firmly with the thumb and forefinger, and push the dog retainer upwards against the core - this lifts the dogs enough to allow them to retract against the smaller diameter of the core, and the pulling tool can be removed from the fishing neck.

2.0 DISASSEMBLY OF THE 'GS' PULLING TOOL.

Refer to drawing No: 5377,

2.1 Place the pulling tool in the vise and grip same on the top sub (4).
2.2 Unscrew and back off the cylinder (8) far enough to expose shear pin (5). If the pin is sheared, the sheared portions in the top sub will drop out. If the pin is not sheared, place a crescent wrench in between the top sub (4) and fishing neck (1) as a lever to move the two pieces apart and punch out the shear pin.

2.3 Remove set screw (2) from the fishing neck (1).

2.3 Place the pulling tool vertically in the vise, gripping on the flats on the bottom of the core (3). Unscrew the fishing neck (1) from the core.

2.4 Lift the cylinder (8) and top sub (4) as a unit out of the core (3). Back off the top sub completely from the cylinder and remove the cylinder spring (7), spring retainer (9), dog spring (10), dog retainer (11) and the dogs (12) from the inside of the cylinder.

2.5 Clean and inspect all parts for any defects. Replace any worn or defective part.

3.0 ASSEMBLY OF THE `GS' PULLING TOOL.

3.1 Place the dog retainer (11) in the inverted position on a work bench. Carefully and steadily place the dogs (12) into their slots in the dog retainer.

3.2 Carefully place the cylinder (8) over the dogs and dog retainer, making sure the dogs are not dislodged from the slots in the dog retainer in the process. Slide the cylinder to the edge of the work bench and onto the palm of one hand then invert the cylinder into its right side up position.

3.3 With the core (3) vertically in the vise gripping on the flats at the bottom, place the cylinder with the dogs in place over the core until the dogs are seared on the bottom shoulder of the core.
3.4 Insert the dog spring (10), spring retainer (9) and cylinder spring into the cylinder (8) and over the core. Slip the top sub (4) onto the core until it bottoms out against the internal threads of the cylinder.

3.5 Make up the fishing neck (1) onto the top of the core (3) and tighten the connection. Install the set screw (2) to secure the fishing neck to the core.

3.6 Make up the cylinder to the top sub, leaving the shear pin hole in the top sub exposed.

3.7 Using a shear pin changer, move the top sub downwards in relation to the core until the shear pin holes in them align. Install the correct size and length of shear pin in place and remove tool from the pin changer.

3.8 Make up the cylinder (8) fully to the top sub (4) and tighten the connection.

3.9 Check the bottom of the dogs are seated against the square shoulder on the core and ensure there is no stand off. The pulling tool is now ready for use.

NOTE:- ALWAYS APPLY A THIN COATING OF A LIGHT GREASE TO ALL THE INTERNAL PARTS OF THE TOOL DURING ASSEMBLY - THIS WILL PROTECT THE PARTS FROM CORROSION AND REDUCE ANY FRICTION THAT MAY OCCUR WITH THE TOOL.
1.0 GENERAL DESCRIPTION.

The Camco 'JD' series Pulling tool is wireline service tool designed to remove retrievable subsurface controls on lock mandrels with external fishing necks. The 'JD' series pulling tool is available with different core lengths which permit the tool to retrieve fishing necks of different lengths of reach. This series of pulling tool is a jar down to release tool, as signified by the letters 'JD' in camco's pulling tool nomenclature. The third letter designates the core length of the pulling tool, e.g. a "C" core being a longer core (shorter reach) and an "S" core being a shorter core (longer reach).

When the tool contacts the fishing neck of the down-hole device to be retrieved, the weight on the pulling tool against the fishing neck moves the dogs upwards and out, allowing them to ride over and move down onto the smaller outside diameter below the fishing neck. The compressed dog spring then pushes the dogs downward and inwards into the special profile in the skirt and bring the tool into the engaging position.

The pulling tool is released by downward jarring which shears the pin. When the pin shears, the core moves upward and is held in that position by the heavier core spring. This upward movement is transmitted to the pawls seated on the lower shoulder of the core, which pull the dogs upwards, causing them to ride up an incline in the slots of the Skirt. This incline makes the dogs move outwards, freeing the tool from the fishing neck.

2.0 DISASSEMBLY OF THE CAMCO 'JDC' PULLING TOOL.

Refer to Drawing No: 5378.

2.1 place the pulling tool in a vise, gripping on the fishing neck (1).

2.2 Unscrew and remove the pulling tool assembly from the fishing neck.
2.3 Remove the dog spring (6) from the skirt (10). The sheared portions of the shear pin (5) should drop out from the skirt.

2.4 Remove the set screw (2) from the core cap (3).

2.5 Place the pulling tool assembly in the vise, gripping on the core cap (3). Remove the core cap from the core (8) using a broad blade screw driver on the bottom slots of the core.

2.6 Remove the core spring (4) from the top end of the core (8).

2.7 Slide the core out through the lower end of the skirt (10). The pawls (7) will fall into the bore of the skirt. Remove the pawls from the skirt.

2.8 Place the skirt upside down in a vertical position on the work bench. Grasping on the dogs (9) at the ring, push the dogs down until it shoulders up against the surface of the work bench. Pick up the skirt and pull the dogs free from the threaded end of the skirt.

2.9 Clean and inspect all parts for defects. Ensure the skirt is not cracked (usually at the bottom) and that the dogs are not worn. Check the brazed ends of the dog spring are not broken. Replace any defective parts.

3.0 ASSEMBLY OF THE CAMCO `JDC' PULLING TOOL.

3.1 Insert the threaded end of the skirt (10) into the bore of the dogs (9). Slide the dogs down over the skirt until legs of the dogs are seated properly in the matching slots in the skirt.

3.2 Apply a liberal amount of grease onto the circular part of each pawl (7) and place the larger side on a long bladed screw driver. Insert the pawl into the matching window in the skirt (10) and dogs (9), one at a time. The grease will hold the pawls in place.
3.3 Slide the threaded end of core (8) into the skirt (10) through the lower end, very carefully and slowly until the lower shoulder contacts the pawls. Ensure that the pawls are not dislodged from the skirt at any time. If so, repeat step 3.2 above.

3.4 Align the shear pin holes in the care and in the skirt. Insert a shear pin in place, and cut and file the shear pin flush with the outside edges of the holes.

3.5 Place the core spring (4) over the core (8).

3.6 Make up the core cap (3) to the core hand tight. Check that the groove on the core is opposite the set screw hole in the core cap.

3.7 Insert the set screw (2) into the core cap and tighten fully.

3.8 Work the dogs (9) up and down to ensure that they move freely in the skirt (10).

3.9 Install the dog spring (6) over the threaded end of the skirt until it bottoms up against the top ring of the dogs.

3.10 Make up the fishing neck to the pulling tool assembly and tighten connection. DO NOT grip jaws on the ring of the dogs at any time when making or breaking this connection.

3.11 Function test the pulling tool by shearing the tool on a matching fishing neck, and check that the dogs release fully from the fishing neck. Re-pin the pulling tool as per steps 2.1, 2.2, 2.3, 3.4, 3.9 and 3.10 of this procedure with the appropriate shear pin.
1.0  **GENERAL DESCRIPTION.**

The Page Pulling Tool is a non-releasing type pulling tool, and must therefore be run in conjunction with a shear-up or shear-down type pulling tool leg. Camco 'JDC' Pulling Tool). The pulling tool has an extension on its mandrel to equalise pressure across the safety valve prior to engaging. The adaptor nose is designed to shear the equalising plug in the safety valve. After equalising, a shear pin is sheared by downward jarring to allow the skirt to engage the collet lock. The pulling tool can only be released from the collet lock by compressing the collet to allow enough clearance to free the skirt.

2.0  **DISASSEMBLY OF THE PAGE PULLING TOOL.**

Refer to Drawing No: 5379.

2.1  Grip the body (1) in a vise and drive out the shear screw (5), if not already sheared, from the body.

2.2  Unscrew the skirt (2) from the body (1).

2.3  Grip the mandrel (3) on the middle in the vise.

2.4  Drive out the roll pin (6) and remove the adaptor nose (4) from the bottom end of the mandrel (3).

2.5  Slide the skirt (2) out from the bottom end of the mandrel.

2.6  Clean and inspect all parts for any defects.

3.0  **ASSEMBLY OF THE PAGE PULLING TOOL.**

3.1  Slide the skirt (2) onto the mandrel (3) from the bottom end, with the threaded end facing upwards and make up skirt to the body (1) fully tight.

3.2  Align shear pin hole in mandrel and body, and insert shear screw (5) in place.

3.3  Make up adaptor nose (4) to bottom end of mandrel (3) and install roll pin (6) to lock the connection.
1.0 GENERAL DESCRIPTION

The TELEDYNE MERLA Positioning Tool and CAMCO ‘OK-1’ Kickover Tool (ROT) are used to set and pull side pocket devices in side pocket mandrels, using the appropriate running and pulling tools attached to the KOTs.

The KOT performs three basic functions, namely:-

a) Locates the side pocket mandrel,
b) Orient in the proper azimuth,
c) Offsets the running tool/valve or pulling tool into position over the pocket for setting or pulling valves from the mandrel.

Both makes of the KOTs have a locating finger protruding from the housing which locates into the orienting sleeve in the mandrel, causing the tool to swivel into the tripping slot at the top of the sleeve and aligning the arm of the tool with the side pocket. Further pulling force exerted on the tool activates the arm to kick out towards the side pocket. Upward jarring shears the pin in the locating finger, causing it to retract into the housing and releases the KOT from the slot in orienting sleeve.

The Merla KOT is much shorter in length than the Camco ‘OK-1’ KOT, and has a much simpler shear pin arrangement. However, the Merla KOT is not recommended for use in wells in excess of 35 deg. deviation.

2.0 DISASSEMBLY OF MERLA KICKOVER TOOL.

Refer to Drawing No: 5380/B.

2.1 Place the KOT in a vise with the trigger (6) facing upward, gripping on the flats of the main housing (2).

2.2 Remove the hoisting plug (1) from the main housing (2).

2.3 Drive out the pin (8) and remove the trigger (6) from the lever plunger (9) through the window in the main housing.

2.4 Remove the trigger spring (7) from the lever plunger slot through the window in the main housing.
2.5 Drive out the pin (4) and remove the key (3) from the trigger (6). Remove the sheared portions of the shear pin (5) from the key and trigger.

2.6 Slide the lever plunger (9) out from the top of the main housing.

2.7 Drive out the latch pin (11) and remove the latch (12) from the lever plunger (9). Remove the latch spring guide (13) and latch spring (10).

2.8 Remove set screw and drive out hinge pin (14) in the bottom of the main housing (2), and remove the pivot arm (15).

2.9 Remove main housing from vise and place the pivot arm in the vise, gripping in the middle of the pivot arm.

2.10 Remove set screw and drive out the hinge pin (19), and remove the lower adaptor (18) from the pivot arm (15).

2.11 Remove the T.C. ball (17) and lower adaptor spring (16) from the bottom of the pivot arm.

2.12 Clean and inspect all parts for wear and defects. Ensure all hinge and retainer pins are in good condition, and all springs are sufficiently strong.

3.0 ASSEMBLY OF THE MERLA KICKOVER TOOL.

3.1 Place the pivot arm (15) with the bottom end up vertically in the vise, gripping in the middle.

3.2 Insert the lower adaptor spring (16) followed by the T.C. ball (17) into the bottom end of the pivot arm.

3.3 Place the lower adaptor (18) over the end of the pivot arm and line up the hinge pin holes. Insert the hinge pin (19) into the hole and install the set screw to secure the pin in place. Ensure the T.C. ball is not dislodged at any time.

3.4 Remove pivot arm from the vise and place the main housing (2) with the window facing up in the vise, gripping on the flats of the housing body.
3.5 Insert the top end of the pivot arm into the matching slot at the bottom of the main housing and line up the hinge pin holes.

3.6 Insert the hinge pin (14) into the hole and install the set screw to secure the pin in place. Check that the pivot arm can swing freely on the hinge.

3.7 Insert the latch spring (10) and latch spring guide (13) into the bottom hole in the lever plunger (15). Install the latch (12) and latch pin (11) in the bottom of the lever plunger.

3.8 Apply Dow Coming FS3451 grease on the rounded sides of the lever plunger and insert it into the main housing until it bottoms up against the pivot arm.

3.9 Make up the hoisting plug (1) partially to the main housing until the hole in the lever plunger line up with the hole in the main housing, keeping the pivot arm parallel with the main housing.

3.10 Insert the trigger spring (7) through the window in the main housing into the slot in the lever plunger.

3.11 Install the key (3) in the trigger (6) and pin in place with pin (4). Insert the trigger through the window in the main housing into the slot in the lever plunger (15). Install pin (8) to retain the trigger in place.

3.12 Make up the hoisting plug (1) to the main housing (2) fully tight.

3.13 Install the 3/16a brass shear pin (5) to pin the key in the running position in the trigger. Depress the trigger until flush with the o.d. of the main housing, and ensure it will spring back into the extended position when released.

3.14 Check that the pivot arm will kick out far enough by activating the KOT into the tripped position. To uncork the KOT, press down hard on the back of the tool against the work bench or floor - the tool will snap back into its running position.
4.0 **DISASSEMBLY OF THE CAMCO 'OK-1' KICKOVER TOOL.**

Refer to Drawing No: 5380/A.

4.1 Back off the Alien set screw (10) from the arm adaptor (11).

4.2 Place the KOT in a vise with the arm facing up, gripping on the finger cage (3) of the KOT.

4.3 Unscrew the fishing neck (1) from the finger cage.

4.4 Remove the KOT from the vise and stand it up in an inverted position.

4.5 Depress the locating finger (18) to allow the finger housing (2), release plunger (7) and release spring (5) to slide out of the finger cage (3).

4.6 Remove the locating finger (18) from the finger housing (2). If the pin (20) is not sheared, drive out the shear pin with a pin punch.

4.7 Drive out shear pin (4), if not already sheared, from the finger housing (2) and remove the release plunger (7).

4.8 Drive out the shear pins (4) in the arm and lower adaptor.

4.9 Remove the spring retainer screw (13) and the leaf springs (14) from behind the arm (15).

4.10 Remove the housing (16) and lock ring (9) from the finger.

4.11 Drive out the arm pins (12) from the arm and lower adaptor subassembly (15). Separate the lower adaptor, arm and arm adaptor (11) from the arm subassembly.

4.12 Clean and inspect all parts. Ensure all arm pins (12) are in good condition. Check that the spring retainer cap screws (8) are securely fastened and the finger spring (17) is sufficiently strong. Replace any defective component.
5.0 ASSEMBLY OF THE CAMCO 'OK-1' KICKOVER TOOL.

5.1 Place the finger cage (3) in the vise and grip on the middle of the body.

5.2 Pin the arm adaptor (11) and the arm to the lower end of the finger cage with the arm pin (12). Brad the countersunk end of the arm pin to secure it in place.

5.3 Pin the lower adaptor to the arm as per step 5.2 above.

5.4 Slip the lock ring (9) over the arm subassembly (15) and make up fully by hand onto the threads at the bottom of the finger cage (3).

5.5 Slip the housing (16) over the arm subassembly (15) and make up onto the bottom threads of the finger cage (3). Align the channel in the housing with the arm in the direction in which it kicks out (this is best done by lining up the hole behind the arm with that in the housing), and tighten the lock ring (9) against the top of the housing to lock it in place.

5.6 Install the leaf spring (14) secured with the cap screw (13) to the back of the arm (15). Ensure the leaf spring is sufficiently strong.

5.7 Fit the locating finger (18) into the slot in the finger housing (2) and align the shear pin holes in the two pieces. Install a 1/4" brass shear pin (20) into the pin hole and cut and file the pin flush with the o.d. of the finger housing. Check the finger spring is strong enough by depressing it fully and then releasing it ensuring the finger moves back out freely.

5.8 Insert the release plunger (7) into the bottom end of the finger housing (2) and align the shear pin holes in the two pieces. Install a 3/16" shear pin (4) to pin the release plunger in place. Ensure the flat slotted end of the release plunger is at 180 deg. to the locating finger.

5.9 Slip the release spring (5) over the release plunger (7).
5.10 Slide the finger housing made up with the release plunger and spring into the finger cage until the locating finger springs out through the window of the finger cage.

5.11 Make up the fishing neck (1) onto the finger cage and tighten.

5.12 Install 3/16" brass shear pins (4) into the upper end of the arm and lower adaptor to pin the arm subassembly in a rigid position. Cut and file the shear pins flush with the o.d. of the arm subassembly.

5.13 Install the Alien set screw (10) into the arm adaptor (11) while depressing the arm (15) against the housing (16) until tight, then back off 1/4 turn. The tool is now ready for use.

1.0 GENERAL.

Most of our wells were drilled and completed at least 15 years ago. Due to their age, and the diverse and sensitive locations the wells
are in, it is imperative that the integrity of all the seals and valves in the wellheads are guaranteed. This is done every 6 months by pressure testing of the wellhead seals to their maximum working pressures, and carrying out leak-off tests on the X-mas tree valves. The casing and conductor are also checked for pressures to affirm possible casing or cement bond failures downhole. Wells with abnormally high casing head pressures will be investigated and rectification attempted first by wireline methods. Where such measures fail, and in wells without top packers, such wells with very high casing head pressures will be killed for temporary safeguard pending re-entry to repair the well and rectify the leak.

Well safety is further enhanced with the installation of fail-safe flowline safety valves and surface-controlled subsurface safety valves. The trip settings of this valves are checked during these wellhead maintenance exercises.

Activities when planned according to set schedules are classified under Routine Wellhead Maintenance. However, cases may arise where immediate attention or priority be given over planned maintenance schedules, eg. the tripping of the surface safety valve on a gas well is causing interruption of gas supply, and therefore re-setting of the trip settings are to be carried out without delay. Such activities are classified under Non-Routine Wellhead Maintenance.

2.0 ROUTINE WELLHEAD MAINTENANCE.

Each well is scheduled to be checked and serviced once in every 6 months. The activities carried out are as follows:-

2.1 Checking and recording of wellhead pressures.
2.2 Carrying out valve leak tests.
2.3 Checking and testing of hanger seals, seal sub seals, king-size X-bushing seals and X-bushing seals.
2.4 Checking and re-setting of wellhead safety systems. 2.5 Creasing of gate valves.

2.6 Inspection of surface casing.

2.7 Replace damaged or lost 1/2" cock valves.

3.0 NON-ROUTINE WELLHEAD MAINTENANCE.

These are unscheduled activities carried out as a result of requests made by the districts via the telephone and/or with written job orders. A job order file and a telephone job request book are kept for references. Repair jobs are then planned and carried out within the limit of available resources, but priority is normally given to repair jobs on any gas well. The scope of work may include any of the activities under routine maintenance schedules but are more specific in nature, viz:-

3.1 Change out bean boxes.

3.2 Rectify faulty safety system for emergency shut-in of wells.

3.3 Change out leaking gate valves in x-mas trees.

3.4 Repair inoperable gate valves in X-mas trees.

3.5 Re-set/repair/replace flowline safety valves.

3.6 Change out leaking gate valves on wellheads and plug valves on flowlines.

3.7 Change out X-mas trees.
1.0 GENERAL.

Pressure measurements of a well should be carried out using only pressure gauges recently calibrated with a dead weight tester. The accuracy of the pressures recorded must not be under emphasised, and therefore, every effort should be made to ensure that pressures are read and recorded by competent operators. When recording pressures, the correct range of gauge should be used to give a higher resolution for greater accuracy. Additionally, operators should not attempt to convert pressure recordings from "Bars" to "Psi" and vice versa in the field. All pressures should be reported as read on the pressure gauge, i.e. if pressures are read in "Bars" on the pressure gauge, report measurement in "Bars".

2.0 TUBING HEAD PRESSURES.

The tubing head pressure of a well is measured at the 1/2" cock valve on the bean box cap or X-mas tree cap, depending on the condition of the well. When a well is flowing, pressure may be recorded at either points. If the well is closed in, and the flowline safety valve is in the closed position, the tubing head pressure can then only be recorded from the X-mas tree cap needle valve. The time and date of pressure measurement must be given along with the pressure report.

2.1 When a well is flowing, the pressure measured is the Flowing Tubing Head Pressure (FTHP). If recording the FTHP from the X-mas tree cap, ensure the swab valve is open.

2.2 When a well is closed in, the pressure measured is the Closed-In Tubing Head Pressure (CITHP). If the well has a subsurface safety valve, ensure it is open before recording any pressures. If recording pressure from the X-mas tree cap, ensure the swab valve is open, or if recording from the bean box cap, ensure the wing valve and flowline safety valve are open.
3.0 FLOWLINE PRESSURES.

Whether a well is flowing or not, the flowline pressure must be recorded. The pressure measured at the 1/2" cock valve on the flowline downstream of the bean box is known as the FlowLine Pressure (FLP).

3.1 On a flowing well with a bean installed in the bean box, the FLP must be less than the FTHP. If the FLP is almost the same as the FTHP, it may indicate a cut bean, or the well has been closed in at the flowstation manifold valve, or an obstruction is in the flowline. An investigation should then be carried out.

3.2 On a closed in well the FLP should not be greater than the maximum separation back pressure from the flowstation. If the FLP is the same as the CITHP, but much higher than the flowline back pressure, it can indicate a leaking wing or flowline safety valve, or the X-mas tree valves are still open while the manifold valves are closed. The flowlines should not be subjected to more than 2,000 psi pressure, which may otherwise lead to rupture of the flowline.

4.0 CASING HEAD PRESSURES IN OIL WELLS.

The Casing Head Pressure (CHP) is measured at the 1/2" cock valve on the side valve of the tubing head spool side outlet. Normally, a well should not have any CHP, and attempts should be made to bleed off the CHP where possible, except in the following cases:

4.1 If a well is "not equipped with a top packer, the casing is exposed to the formation pressure. The CHP of such a well will be more or less the same as the FTHP or CITHP.

4.2 If the well is gaslifted, the CHP will be that of the gaslift surface operating pressure. Where possible, the sealing integrity of the check-valve upstream of the casing valve should be ascertained to prevent bleeding off the CHP uncontrolled in the event of a failure of the gaslift supply line.
5.0 CASING HEAD PRESSURES IN GAS WELLS.

Gas wells should not have any CHP, unless continuous downhole corrosion inhibitor chemical injection is taking place. In this case, the CHP represents the surface injection pressure for the inhibitor chemical, and should not be more than 500 psi normally. However, all gas wells are equipped with dump kill valves designed to shear at pressures higher than 500 psi in the annulus as a means of safeguarding the casing and tubing should a leak develop in the tubing near the surface.

Gas wells not equipped with downhole corrosion inhibitor chemical injection should have kill brine in the annulus, and therefore no CHP. However, caution must be exercised during initial opening up of the well, as thermal expansion of the brine would cause a tremendous build up in pressure in the annulus. The CHP should be monitored closely at this stage, and pressures maintained below 500 psi by gradual bleeding off.

6.0 CONDUCTOR PRESSURES.

The Conductor Pressure (CP) is the pressure measured at the 1/2" cock valve on the bull plug on the side outlet of the casing head housing. There should normally be no pressure in the conductor/casing annulus. Whenever pressure is recorded in the conductor, the pressure should be bled off to zero. Where the pressure so recorded cannot be bled down, an abnormal condition exists, and the well should be kept under observation. Samples of fluid bled off from the conductor should be collected and analysed in the lab to check its origin to assist in identifying the leak source.

1.0 "DC-B" AND "DC-FBB" HANGER BODY SEALS.

The "DC-B" tubing head spool and hanger system was designed to receive either the dual segmented "DC-B" hangers or the single "DC-FBB" hanger. Both hanger configurations are locked in place by tie-down screws. The hanger body elastomeric seals require energising with plastic packing to form an annulus seal around the hanger body and tubing head bore.
With the hanger(s) landed in place, locked down and packed off, the DC-B hanger(s) will withstand annulus and tubing pressures equivalent to the full working pressure of the tubing head, regardless of the tubing load. To test the hanger body seals, carry out the following:

1.1 Remove the 1/2" NPT pipe plug from the upper flange of the tubing head spool opposite the plastic packing port on the same level as the tie-down screws.

1.2 Install the check-valve unseating tool, making sure that the unseating stem is fully retracted prior to installation.

1.3 Turn the unseating tool stem handle clockwise until it stops. The 1/4" check-valve is now unseated and will release any trapped pressure.

NOTE:-IF TRAPPED PRESSURE CANNOT BE BLED OFF, RECORD THE TRAPPED PRESSURE AND COMPARE WITH THE THP AND CHP. THIS SHOULD ASCERTAIN THE LEAK SOURCE OF THE TRAPPED PRESSURE.

1.4 Hook up a test pump to the outlet on the check-valve unseating tool after all trapped pressure has been bled off.

1.5 Apply pressure into the test area through the unseating tool with the test pump up to the full working pressure of the tubing head spool, and hold pressure for 15 minutes. Bleed off pressure if the test is satisfactory.

1.6 If the pressure cannot be maintained, bleed off the pressure. Remove the 1" NPT pipe plugs from the packing ports and install plastic packing gun into the packing ports.

1.7 Energise alternatively with plastic packing through both injection ports by rotating the injection screws in a clockwise direction using the proper size of alien wrench. Count the number of plastic sticks injected.

NOTE:- IF THE TORQUE TO INJECT THE PLASTIC REMAINS LOW, IT COULD INDICATE THAT PLASTIC IS BYPASSING THE HANGER BODY SEALS, AND A SEAL FAILURE HAS OCCURRED.
1.8 When torque to inject the plastic increases, stop energising and repeat test on the seals as per step 1.5 above.

1.9 If pressure does not maintain, continue energising until a successful pressure test is achieved.

**NOTE:** IF AFTER INJECTING SUFFICIENT AMOUNT OF PLASTIC PACKING AND STILL NO TORQUE INCREASE IS OBTAINED, STOP ENERGISING AND INSTALL BACK ALL PIPE PLUGS IN THEIR RESPECTIVE PORTS. REPORT ACCURATELY THE NUMBER OF PLASTIC STICKS INJECTED, AND THE RATE OF PRESSURE BLEED OFF DURING THE TESTS. THIS REPORT WILL BE USED FOR SUBSTANTIATING A WORKOVER OR REPAIR JOB ON THE WELLHEAD.

**CAUTION:** ALWAYS BLEED OFF ALL TEST PRESSURES TO ZERO AFTER THE TESTS USING THE APPROPRIATE UNSEATING TOOL. TRAPPED PRESSURES CAN BUILD UP TREMENDOUSLY DUE TO THERMAL EXPANSION WHEN THE WELL IS PRODUCING.

2.0 'DC-B' AND "DC-FBB" TUBING HANGER NECK SEALS

2.1 Carry out as per steps 1.1 through 1.9 of this procedure.

2.2 Should one of the DC-B hanger neck seals fail to seal after re-energising with plastic, report the side which is leaking, i.e. long string or short string.
3.0 **X-BUSHING SEALS.**

The X-Bushing is a easing pack-off device or secondary seal for the bottom of the tubing head and casing head spools which serves the following:-

a) A pressure cross-over by restricting the area exposed to pressure within the spool.

b) Prevents drilling and production fluids from contacting the ring joint gasket.

c) Facilitates testing both the casing slips seal in the spool below' (primary seal) and the ring joint gasket.

The X-Bushing once installed and energised requires periodic (minimum once a year) maintenance in the form of pressure testing, and possibly re-packing of the seals as follows:-

3.1 Carry out as per steps 1.1 through 1.9 of this procedure.

**NOTE:** ENSURE THE CORRECT TEST PRESSURE IS APPLIED BY CROSS-CHECKING THE RATING OF THE SPOOL BOTTOM FLANGE OR HUB.

4.0 **KINGSIZE X-BUSHING.**

This serves the same purpose as the X-Bushing. All testing and re-packing procedures are the same as those for the X-Bushing.
A) ON A FLOWING WELL.

1.0 LEAK TESTING OF WING VALVE AND FLOWLINE SAFETY VALVE.

1.1 Close in the well by closing the plug valve on the flowline downstream of the bean box, and record the CITHP.

1.2 Isolate the pressure sensing line to the Surface Safety Valve (SSV) by closing the 1/2" cock valve on the upstream flange tapping of the SSV. Keep the SSV in the "Auto" position.

1.3 Close the wing valve fully, counting the number of turns. Bleed off to zero the trapped pressure between the wing valve and flowline valve through the 1/2" cock valve in the bean box cap.

1.4 Observe for any leak at the 1/2" cock valve in the bean box cap. If there is any leak, close back the cock valve and install a suitable range pressure gauge. Re-open the cock valve and observe the rate of pressure build up until stabilised. If the final pressure is the same as the flowline pressure, then the flowline valve is leaking. If the final pressure is the same as the CITHP, the wing valve is leaking then.

REPORT THE LEAKING VALVE IN THE WELLHEAD MAINTENANCE RECORD SHEET FOR FURTHER ACTIONS.

1.5 If no leak is observed, the wing valve is in good sealing condition then.

1.6 Open the 1/2" cock valve on the pressure sensing line to trip and close the SSV. Check position of the indicator pin in the pilot to ensure the safety valve is fully closed, and not stuck in the open position as can happen due to deposits in the valve cavity, or failure of the power piston of the SSV.
1.7 Close back the 1/2" cock valve. Open the wing valve and then open the 1/2A cock valve in the bean box cap to bleed off the trapped pressure to zero.

1.8 Observe for any leak at the cock valve in the bean box cap.

1.9 If no leak is observe, close the 1/2" cock valve in the bean box cap and re-open the cock valve on the sensing line to the SSV.

2.0 LEAK TESTING OF MASTER AND SWAB VALVES.

2.1 Ensure the wing valve and swab valve are fully closed.

2.2 Open the 1/2" cock valve on the X-mas tree cap to bleed off the trapped pressure above the swab valve to zero.

2.3 Observe for any leak. If leak is observed, discontinue leak test of the swab valve and note down in the Wellhead Maintenance Report Sheet.

2.4 Close the master valve and open the swab valve. Bleed off the trapped pressure between the swab and master valves to zero through the cock valve in the X-mas tree cap.

2.5 Repeat as per step 2.3 above.

2.6 Close the swab valve and the cock valve on the X-mas tree cap, and re-open the master valve.

2.7 Open the wing valve slowly to activate the SSV to open and pressurise the line up to the flowline valve. Open the wing valve fully.

2.8 Slowly open the flowline plug valve to bring the well back into production as before.
a) DO NOT JAM ANY VALVES IN THE FULLY CLOSED POSITION. BACK OFF THE HAND WHEEL AT LEAST 1/4 TURN IN ORDER TO MAINTAIN A FLOATING GATE.

B) REPORT ALL LEAKING VALVES ACCURATELY IN THE WELLHEAD MAINTENANCE REPORT SHEET SO THAT FOLLOW-UP ACTION MAY BE DULY SCHEDULED TO SERVICE THE LEAKING VALVES.

B) ON A CLOSED-IN WELL.

3.0 LEAK TESTING OF WING VALVE AND SURFACE SAFETY VALVE.

3.1 Check that the flowline valve is closed.

3.2 Ensure the Surface-Controlled Subsurface Safety Valve (SCSSV) is open by pressurising the control line to 4,000 psi using the safety system control unit or with a hand pump.

3.3 Carry out leak tests on the wing valve and SSV as per steps 1.2 through 1.9 of this procedure.

4.0 LEAK TESTING OF MASTER AND SWAB VALVES.

4.1 Carry out as per steps 2.1 through 2.5 of this procedure.

4.2 After leak testing of all the valves are complete, leave all valves in the X-mas tree closed.

4.3 Close the SCSSV by bleeding off the control line pressure to zero.

NOTE:- IF THE WELL IS DEAD (I.E. NO THP), LEAK TESTING OF THE X-MAS TREE VALVES WILL NOT BE POSSIBLE, AND THEREFORE NOT REQUIRED. ALL WELLHEAD PRESSURES MUST BE DULY REPORTED.
1.0 GENERAL.

The Cameron type 'FC' automatic safety valves consist of three basic moving parts:

a) The Power Piston and Gate.
b) The Pilot Valve.
c) The Manually Operated Selector Valve.

The type 'FC' operator utilises line pressure of the well for valve opening and closing. Line pressure is routed pass the cut-off valve in the bonnet flange and up through the cylinder wall to the selector valve. With the selector valve on "Automatic", line pressure is routed to the pilot assembly. With the selector valve in the "Closed" or "Open" position, line pressure is routed directly to or vented from the operating cylinder.

The cut-off valve, when closed, isolates the selector valve and pilot assembly from line pressure, allowing the pilot assembly to be removed and replaced without bleeding off pressure from the valve body. The cut-off pressure allowed may be as high as 3,000 psi.

The pilots in use by SPDC are:

a) 'FC' Pilot.
b) 'FA/FB' Pilot.

The 'FC' pilot is an externally sensing pilot which will automatically close the valve against abnormal line pressures, and automatically re-open the valve upon restoration of normal conditions. The pilot is used for high and low pressure settings.

2.0 TEST PROCEDURE FOR 'FC' PILOT

2.1 Record the FTHP and FLP.

2.2 Work out the HP and LP trip settings for the pilot based on the FTHP and FLP as follows:
a) The HP trip is to be set at 130% of the FLP.

b) The LP trip is to be set at 80% of the FLP.

2.3 Move the selector valve to "Manual" position. This will keep the safety valve open regardless of the value of the line pressure sensed.

2.4 Hook up a manifold and a hydraulic hand pump to the sensing line port on the selector valve body.

2.5 Apply pressure into the sensing line port to the recorded FLP reading.

2.6 Move the selector valve to the "Automatic" position. The safety valve should stay open.

2.7 Bleed down the pressure in the sensing line very slowly via the hand pump to check the LP trip setting of the pilot.

2.8 As soon as the pilot trips and the safety valve closes, stop bleeding and record the pressure at the hand pump. This is the LP trip pressure setting, and should not be less than 80% of the FLP.

2.9 Slowly increase the pressure in the sensing line until the safety valve re-opens - this is the automatic re-opening pressure setting of the pilot. Record this pressure.

2.10 To check the HP trip setting of the pilot, increase pressure in the sensing line with the hand pump until the pilot trips, causing the safety valve to close. This is the HP trip setting of the pilot, and should not be greater than 130% of the recorded FLP.

2.11 Slowly bleed down the pressure in the sensing line until the valve re-opens. Stop bleeding and record this pressure - this is the automatic re-opening pressure set point of the pilot.

NOTE:-REPORT ACCURATELY THE HP AND LP TRIP PRESSURE SETTINGS OF THE SSV IN THE WELLHEAD MAINTENANCE REPORT.
3.0 RESETTING THE 'FC' PILOT.

When the HP or LP trip pressure setting is found to be abnormal, i.e. beyond the extremes of the HP or LP settings for the particular FLP, the pilot should be reset to the correct trip pressure setting as follows:-

3.1 To reset the LP trip, adjust the spring compression in the pilot by turning the low adjust (inner) screw clockwise to increase, or counterclockwise to decrease, until the desired LP trip is obtained.

3.2 Check the LP trip by carrying out steps 2.3 through 2.9 of this procedure.

3.3 To reset the HP trip, adjust the spring compression by turning the high adjust (outer) screw clockwise to increase, or counterclockwise to decrease, until the desired HP trip is obtained.

3.4 Check the HP trip by carrying out steps 2.10 through 2.11 of this procedure.

NOTE:- If the correct trip settings cannot be obtained by adjustments of the springs in the pilot, check the following:-

a) Is the pilot piston size correct in relation to the line pressure.

b) Are the springs of the correct rating for the pressure range.

If necessary, the piston or the springs may have to be changed out to suit the new condition of the well.

4.0 PROCEDURE FOR TESTING AND RESETTING OF 'FA/FB' PILOTS.

The 'FA/FB' pilots may be tested and reset using the same procedure for 'FC' pilots. However, safety valves equipped with 'FA/FB' pilots will not re-open automatically after restoration of line pressures to normal condition. The safety valves have to be re-opened by manual switching.