

Attachment A – Typical Well Control Equipment

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Well control equipment will provide for prevention, detection and control of undesired formation fluid entry into the wellbore. Described below is typical well control equipment.

A 20" diverter BOP system will be used as described in the following section. The BOP schematics are given in Figure 1 and 2 of this attachment. The diverter, BOP stack, and choke manifold will be designed in accordance with API RP 53 "Recommended Practices for Blowout Prevention Equipment Systems for Drilling Wells".

I. Blowout Prevention Equipment

1. 20" Diverter Blowout Prevention System

- A. Hydril 21-1/4" MSP 2,000 psi WT with H₂S trim studded top x hubbed down (CIW hub) RX73 ring groove.
- B. 1 Diverter Spool 20-3/4" 3000-lb with CIW hubbed end connections and with 2 each 13-5/8" 3000-lb (12" bore) flanged outlets, manufactured to API 6A PSL-1, tempered class U, material class DD, by Woodco U.S.A.
- C. 2 Blind Flange 13-5/8" 3000-lb manufactured to API 6A PSL-1 tempered class U, material class DD, Woodco U.S.A.
- D. 2 Adapter Spool 13-5/8" 3000-lb x 12" ANSI 300-LB (12" bore) API flanges can be manufactures to 6A specification's but this spool cannot be monogrammed.
- E. 1 Woodco Clamp
- F. 2 Stud set for 13-5/8" 3000-lb
2 API ring gasket R-57
3 300-lb SS knife valves
- G. One (1) drilling spool, 20-3/4", 3,000 psi WP hub, RX73 top and bottom, with one (1) 3" 5,000 psi side outlet flange, and one (1) 4" 5,000 psi side outlet flange.
- H. One (1) 20-3/4" 3,000 psi WP riser spool, 30' long with hub RX73 up x 3,000 psi 20-3/4" flange down, with API stamp.
- I. 20" 3,000 psi WP Hydril single gate preventer, hub x hub, CIW #17, RX73, H₂S trim with 3" side outlets (blind flanged), manual locking.

- J. Double gate, 20-3/4" 3,000 psi WP Hydril double gate preventer, CIW #18 hub up, CIW #17 hub down, RX73 up and down, H₂S trim with 3" side outlets (blind flanged), manual locking.
- K. Rams for 20-3/4" 3,000 psi stack:
 - 1. One (1) set of blind rams.
 - 2. Two (2) sets of 5" rams.
 - 3. One (1) set of 13-3/8" rams.
- L. Diverter Valves
Four (4) each SS 12" x 3000-lb knife valves hydraulic actuated with hose and valving.
- M. 12" pipe and fittings to divert flow away from rig in two directions, in compliance with AOGC rules. All flanges to be 12" ANSI 300

2. 13-5/8" BOP

A. Annular BOP (Hub)

Hydril, GK, 13-5/8" ID, 5,000 psi WP, with top 13-5/8" - 5,000 psi stud connection and bottom 13-5/8" - 5,000 psi, hub connection complete with screw top bonnet connection. Includes:

- 1. One (1) HS trim chain sling lifting assembly.
- 2. Two (2) eyebolts to lift piston assembly.
- 3. Two (2) eyebolts to lift latched bonnet assembly.

B. Single Gate (Hub)

One (1) Hydril, 13-5/8" ID 5,000 psi WP, MPL (Multi-position Lock), 13-5/8" hub, 5,000 psi connection top and bottom, 4-1/16", 5,000 psi flanged side outlets H₂S trim.

C. Double Gate (Hub)

One (1) Hydril, 13-5/8" ID 5,000 psi WP, MPL (Multi-Position Lock), 13-5/8" hub 5,000 psi connection top and bottom, 4-1/16", 5,000 PSI flanged side outlets, H₂S trim.

D. Drilling Spool (Hub)

One (1) 13-5/8", 5,000 psi, top and bottom flanged side outlet and one (1) 3-1/16", 5,000 psi flanged side outlet 29" high.

E. Rams

1. One (1) set blind rams.
 2. Two (2) sets 5" pipe rams.
 3. Two (2) set variable bore rams 3 1/2" to 6".
 4. One (1) set 2-7/8" pipe rams.
 5. One (1) set 9-5/8" pipe rams.
 6. One (1) set 7" pipe rams.
 7. One (1) set 3 1/2" pipe rams.
 8. One (1) set 3 1/2" dual pipe rams.
 9. One (1) set spare VBR element.
- F. One (1) 13-5/8" 5,000 psi riser spool, approximately 27' long, flange x flange, with API stamp.

3. BOP Stack Handling System

- A. One (1) each overhead crane system capable of picking either stack up while landing casing.
- B. One (1) BOP platform which is capable of stumping up both the 13-5/8" stack and the 20" stack simultaneously for moving or other activity.
- C. BOP work platform to facilitate ram changes, nipple up and nipple down. Platform height can be moved up and down easily.

4. Kill and Choke Lines System

- A. Kill line valves to consist of two (2) 3-1/6" 10,000 psi, McEvoy type E gate valve, with one valve being manually operated and one being hydraulically activated.
- B. Kill line is 3-1/6" 5,000 psi Coflexquip Hose 30' which comes off the standpipe manifold, all connections flanged.
- C. Choke valves to consist of two (2) 4-1/6" 10,000 psi, McEvoy type E gate valve, one (1) valve being manually operated and one (1) being hydraulically activated.
- D. Choke line is 4-1/6" 5,000 psi Coflexquip hose 30', which connects from choke line valves to floor mounted choke manifold. All hose connections flanged.

5. Degasser Vessel and Vent Line

- A. Primary degasser built as per drawing, specifications.
- B. Primary degasser vent line to be 10", extends to crown.
- C. Straight through vent line 4", connects into degasser vent and proceeds to crown.

6. Blowout Preventer Control System

NL Koomey Model T40280-3S blowout preventer control unit with 375 gallon volume tank, main energy provided by a 40 HP electric motor driven triplex plunger pump rate at 20.2 GPM at 3,000 psi charging twenty-eight (28) each 11-gallon bladder-type separate accumulator bottles. Second energy charging system consists of Model FA-42 air pumps rated at a combined volume of 23 GPM at 1,200 psi, or 12 GPM at 3,000 psi. Above two energy systems BACKED UP by 12 - 220 cubic feet nitrogen bottles connected to the manifold system. All above system controlled by a Model SU2KB7S"S" series manifold with eight (8) manual control stations at the unit.

- A. Includes two (2) Model MGBK7EH electrically operated remote control panel with two manifold pressure gauges and nine push button controls with lights. One (1) mounted on rig floor, one (1) mounted in pipe rack module.

Controls for:

One (1) annular BOP with pressure regulator control to decrease or increase annular pressure.

Three (3) gates BOP.

One (1) kill line HCR valve.

One (1) choke line HCR valve.

One (1) diverter flow selector valve.

- B. BOP mounted in subbase module such that 1" coflexip, hoses can remain connected when skidding the rig and picking the stack up.

7. Upper Kelly Cocks

Two (2) each. One for top drive, one for conventional kelly drilling Hydril kelly guard, 10,000 psi W.P.

8. Lower Kelly Cocks and D.P. Floor Valve

- A. One (1) for Varco Top Drive 4 ½ IF
- B. One (1) for conventional drilling 4 ½ IF
- C. Two (2) for floor valve-one (1) 4 ½ IF, one (1) 3 ½ IF
- D. All to be Hydril Kelly Guard, 10,000 psi W.P.

9. Inside BOP

One (1) Flocon inside BOP 4 ½ IF

One (1) Flocon inside BOP 3 ½ IF

10. BOP Test Pump

Triton Model 3075 triplex plunger pump rated at 5000 psi working pressure at 6 GPM, driven by a top-mount 20 HP electric motor complete with make-up tank, adjustable relief pressure bypass valve, system gauges with four each 50-ft of 3/8" 5000 psi working pressure test hose with snap-type couplers. This unit is also designed to act as a low volume wash-down pump. Included with the unit are two each NGC 200-2 cleaning lances.

Figure 1 Example Class III BOPE Installation, API Arrangement SRRA or SRdA

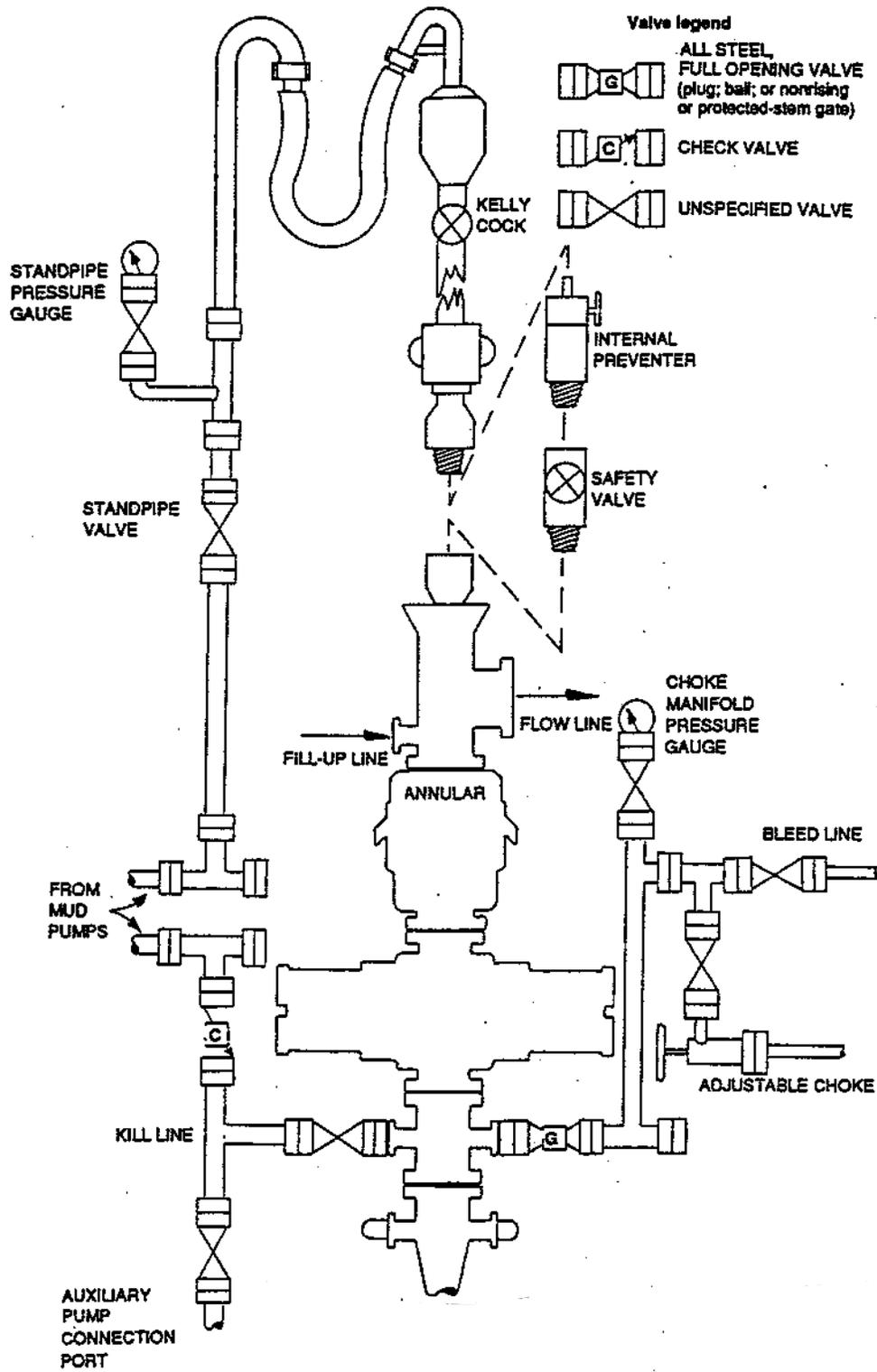


Figure 2 Example Class IV BOPE Installation, API Arrangement RSRR or RSRdA

