



# Live Well Deployment System

LEE NAK GUI  
TCP SERVICE COORDINATOR

APPS-13-003

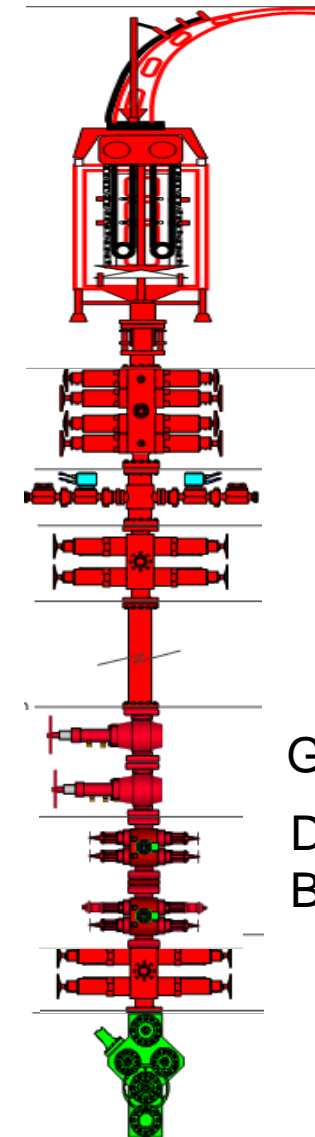
**HALLIBURTON**

## Challenges

- Monobore completion
- High angle wells
- Long perforation intervals
- Underbalanced perforating (static or dynamic)
- Well control barriers
- Retrieve the gun assemblies without killing a producing zone

# Live Well Deployment System

- 2 Gate Valves
  - Isolate well pressure while retrieving guns from the lubricator or deploying guns into the well.
- Deployment BOP
  - Quad BOP for deploying and reverse deploying of Deployment Gun Connectors
- Deployment Gun Connectors
  - Connect gun sections together and provide pressure seal

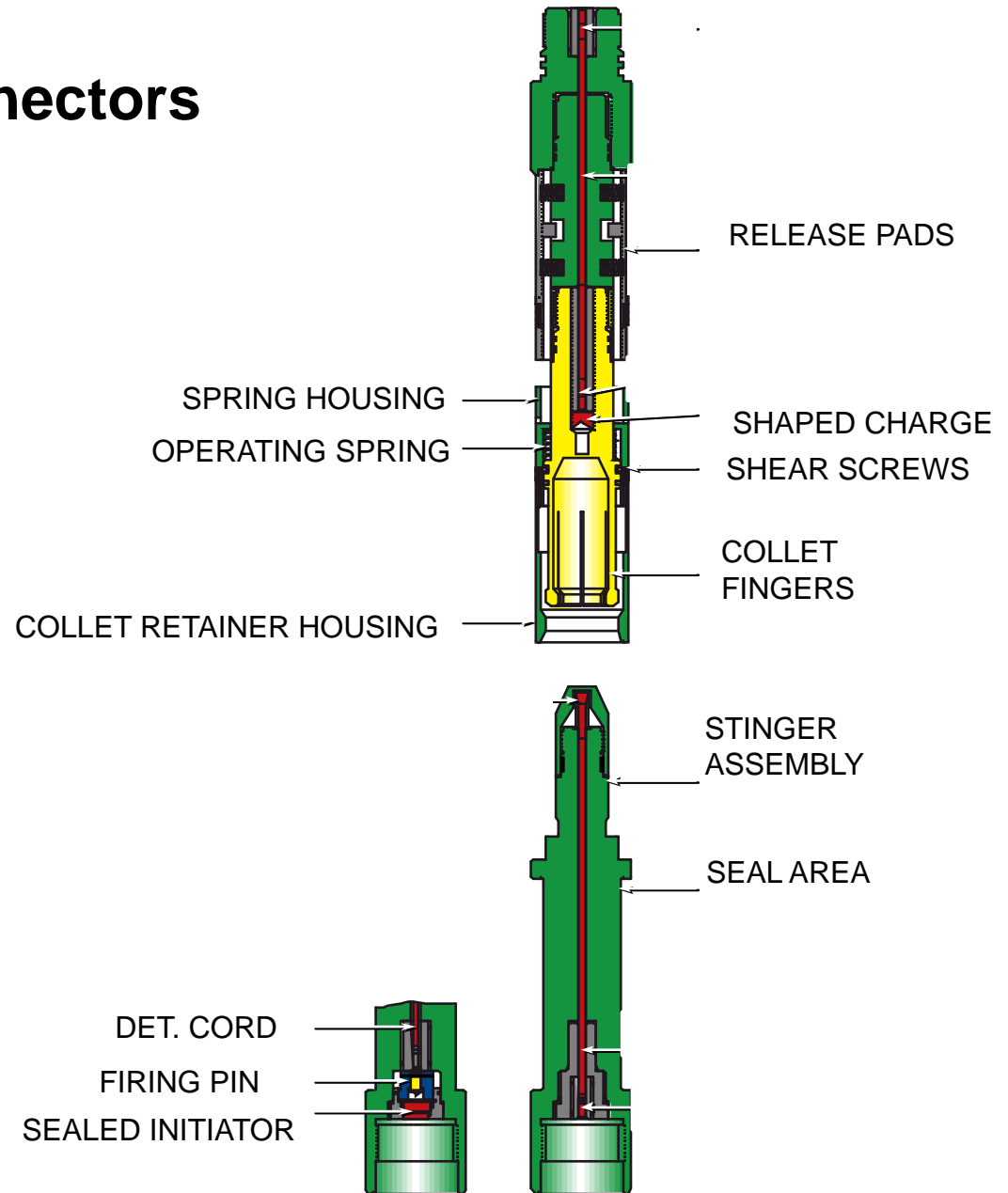


Gate valves  
Deployment  
BOP

# Deployment Gun Connectors

## Benefits:

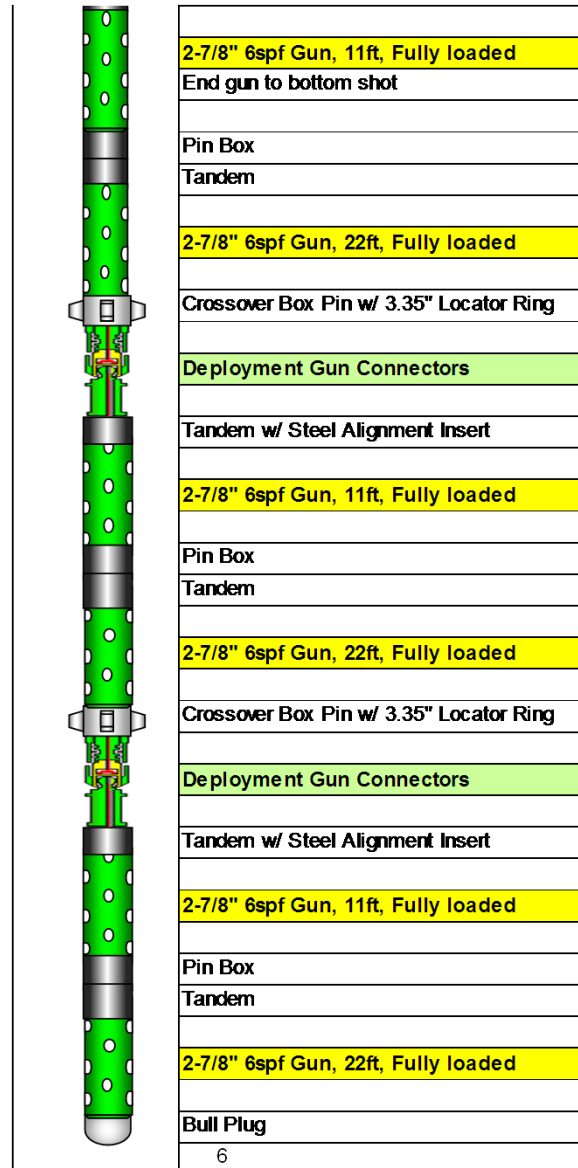
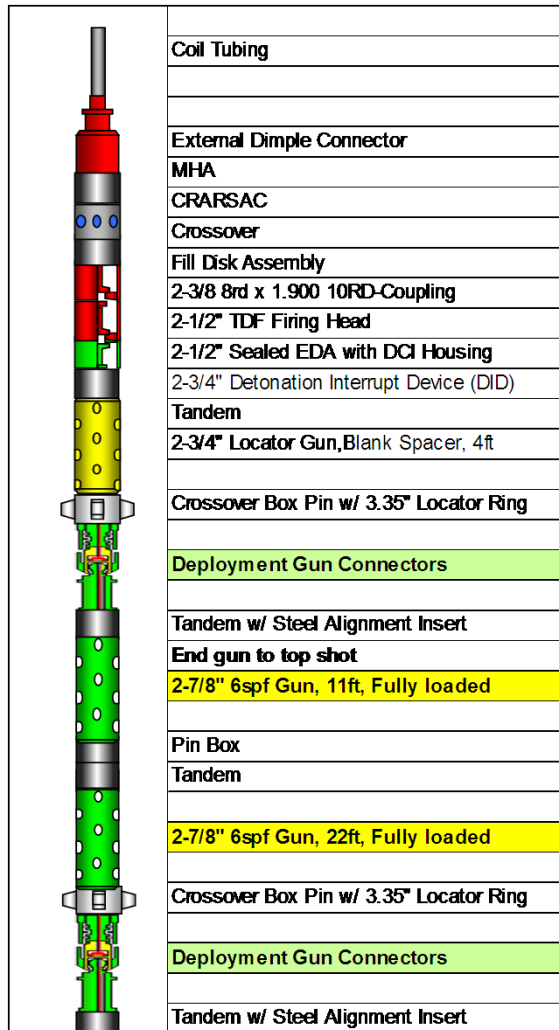
- Can be used to perforate new or existing wells.
- Can deploy and retrieve gun assemblies without killing a producing zone.
- Utilizes standard BOP and can be designed to accommodate different BOP configuration.
- Allow rigless perforating.
- Could be retrieve or deploy using CT, wireline or slickline if limited by lubricator height.



## Job Design Criteria

- Depth Correlation: Use of e-coil, memory GR/CCL, or Casing Collar Locator
- Optimize total shots by deploying 2 or 3 guns in a single module to reduce the number of deployment gun connectors.
- Long gross perforation interval – load test with the deployment BOP rams to ensure it would hold the guns.
- Complexity of the job sequences – Develop deployment and reverse deployment matrix and establish line of communication.
- Shaped charge and firing head selection.
- Optimum underbalance based on perforation simulation programs.
- Sour gas in the lubricator during reverse deployment – Ensure personnel is trained with H<sub>2</sub>S and ensure H<sub>2</sub>S monitoring device is available at wellsite.
- Contingency plan to wash out the deployment connectors (sand trapped within the releasing pad) or initiate the secondary shearable system if primary release rams fail.
- Contingency fishing procedure.

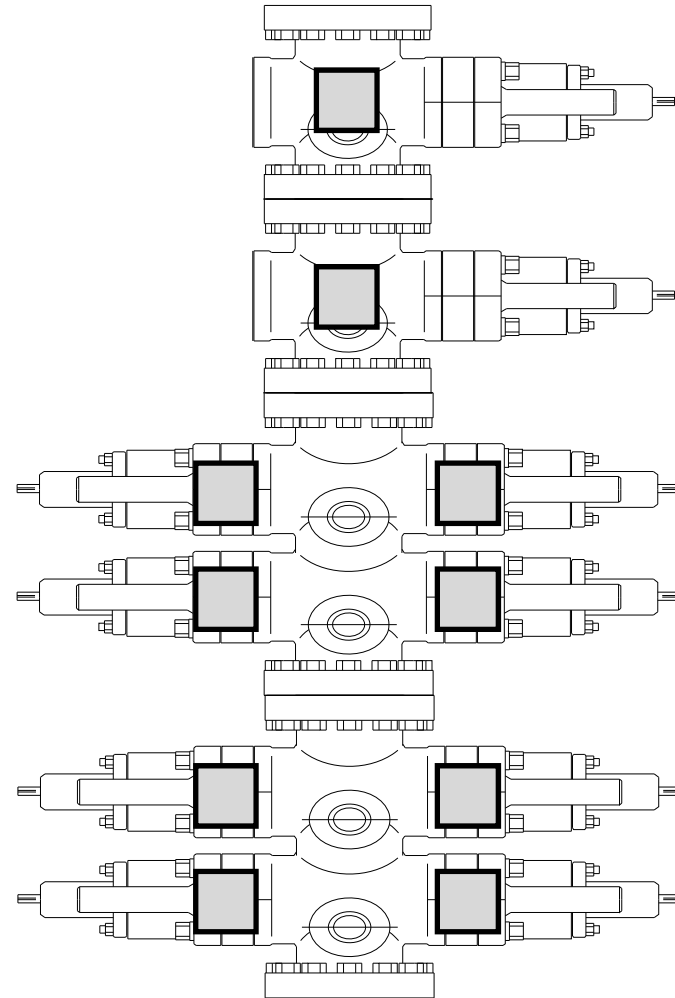
# Sample Bottom Hole Assy Set up



APPS-13-003

# Deployment System

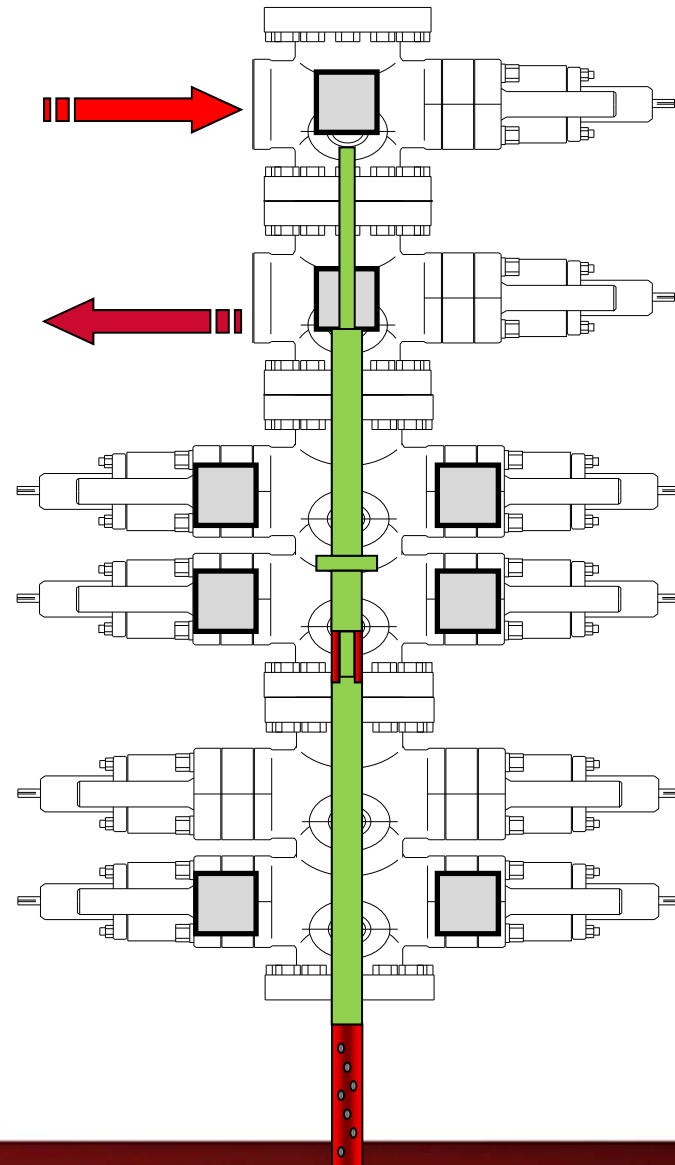
- Rig-up below RKB
- Deployment BOP's
  - Pipe/Slip Rams
  - Shear Rams
  - Stripper Release Rams
  - Locator Rams
- Gate Valves
- Riser above to suit BHA.



## Deploy in Gun Assemblies

### Deploy in 1<sup>st</sup> Gun Section (s)

- Install BHA section (s) in riser
- Pressure test/equalise.
- Open Gate Valves
- RIH w/ Gun BHA below Locator Rams
- Close Locator Rams
- P/U & tag Locator Rams with 5,000lbs overpull above the P/U weight
- Close Pipe/Slip Rams to hold BHA
- Bleed off riser pressure
- Open Locator Rams
- Overpull 10,000lbs above the P/U weight to confirm Pipe/Slip rams are holding the string.
- Function Release Rams
- Pick up upper BHA
- Close Gate Valves to isolate
- Install next BHA section (s) in riser

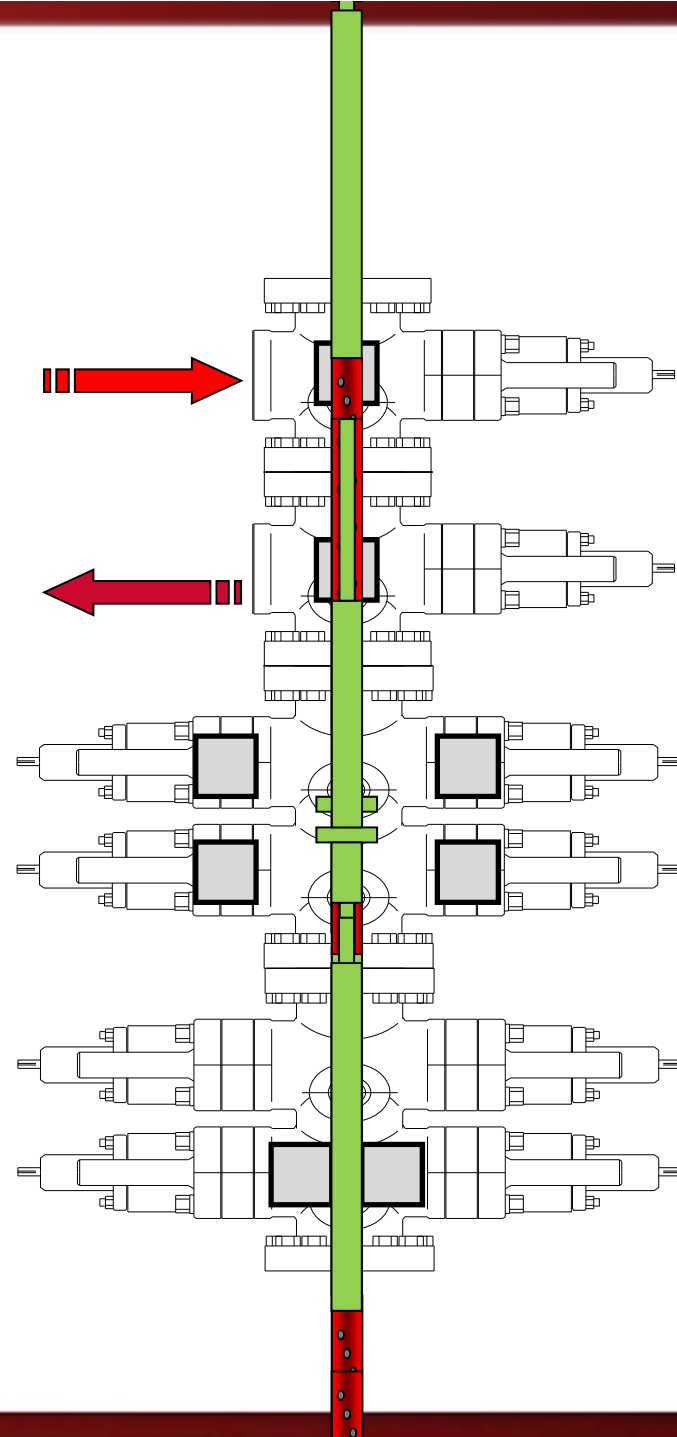




## Deploy in Gun Assemblies - Cont

Deploy in subsequent Gun Section (s)

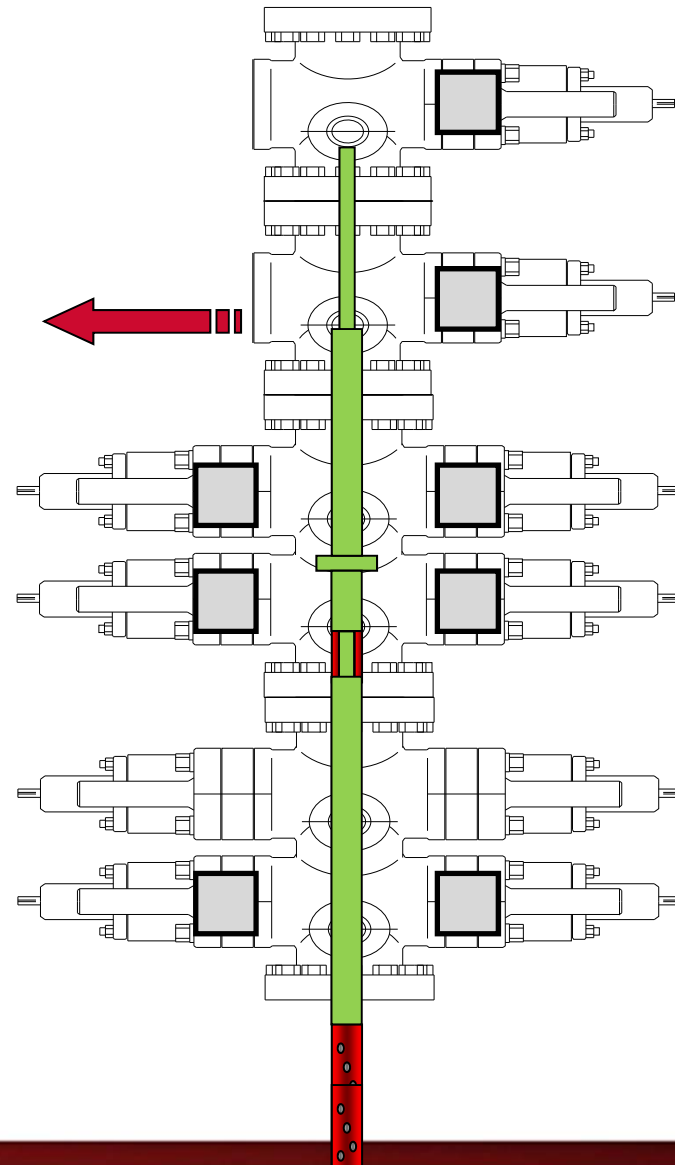
- Install BHA section (s) in riser.
- Pressure test/equalise.
- Open Gate Valves
- RIH w/ Gun BHA to latch – set down weight 4000lbs below the RIH weight.
- Pull/Push test to confirm position
- Open Pipe/Slip Rams
- RIH w/ Gun BHA below Locator Rams
- Close Locator Rams
- P/U & tag Locator Rams with 5,000lbs overpull above the P/U weight
- Close Pipe/Slip Rams
- Bleed off riser pressure
- Open Locator Rams
- Overpull 10,000lbs above the P/U weight to confirm Pipe/Slip rams are holding the string.
- Function Release Rams
- Pick up upper BHA
- Close Gate Valves to isolate



## Deploy out Firing Head BHA Section

Deploy out Firing Head BHA Section.

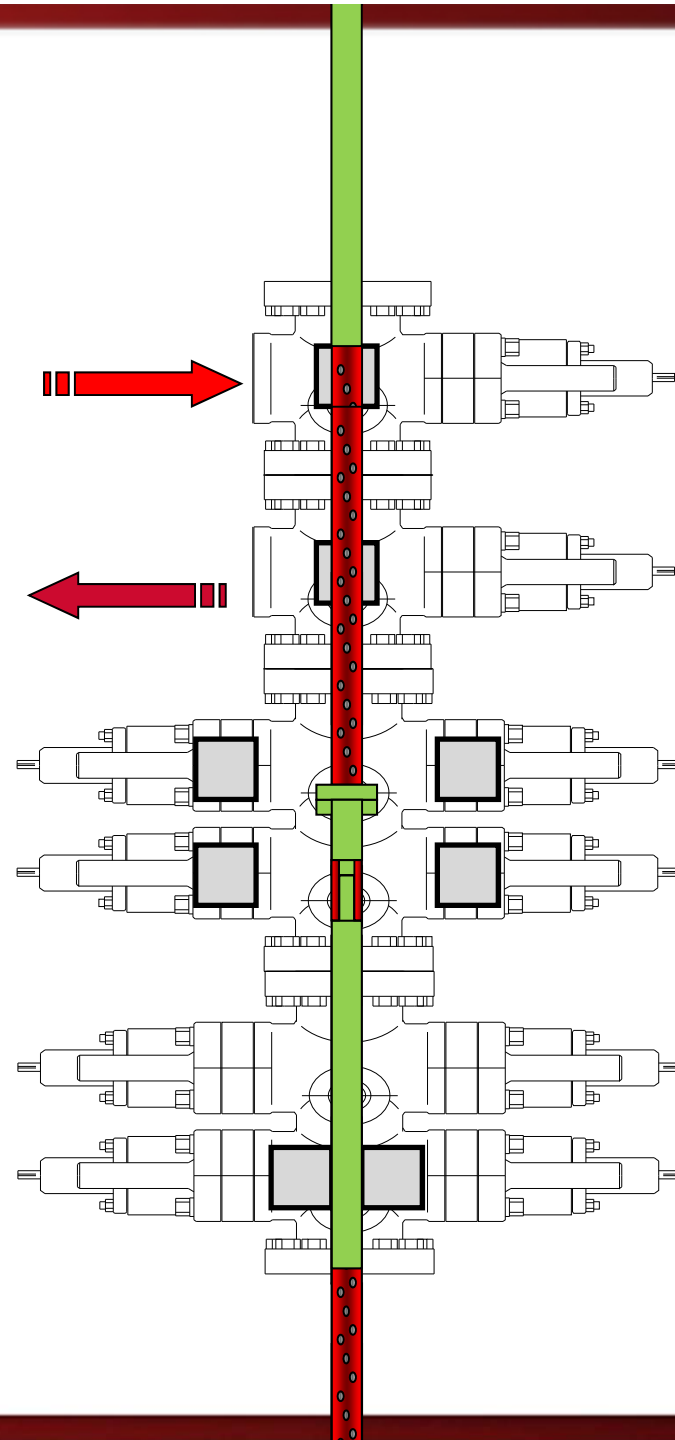
- POOH w/ Gun BHA below Locator Rams
- Close Locator Rams
- P/U & tag Locator Rams with 5,000lbs overpull above the P/U weight
- Close Pipe/Slip Rams
- Bleed off riser pressure
- Open Locator Rams
- Overpull 10,000lbs above the P/U weight to confirm Pipe/Slip rams are holding the string.
- Function Release Rams
- Pick up upper BHA
- Close Gate Valves to isolate
- Remove Firing Head BHA from riser



## Deploy out Gun Assemblies

Deploy out Gun section (s).

- Pressure test/equalise.
- Open Gate Valves
- RIH w/ Running BHA to latch – set down weight 4000lbs below the RIH weight.
- Overpull 10,000lbs above the P/U weight to confirm Pipe/Slip rams are holding the string.
- Open Pipe/Slip Rams
- POOH w/ Gun BHA below Locator Rams
- Close Locator Rams
- P/U & tag Locator Rams with 5,000lbs overpull above the P/U weight
- Close Pipe/Slip Rams
- Bleed off riser pressure
- Open Locator Rams
- Overpull 10,000lbs above the P/U weight to confirm Pipe/Slip rams are holding the string.
- Function Release Rams
- Pick up upper BHA
- Close Gate Valves to isolate
- Remove Gun BHA from riser



# Deployment Matrix

DEPLOY FIRING HEAD AND LOCATOR GUN OUT OF LIVE WELL			
STEP	EVENT DESCRIPTION	TIME	Comments
1	POOH and tag stripper. Zero depth counter		
2	CT to clean and check depth counter		
3	RIH _____meters to position locator gun across locator rams (NOTE depth and weight)		
4	Close locator rams and confirm		
5	POOH to tag locator rams, tag @ _____mts +/- (NOTE DEPTH & WEIGHT)		
6	Overpull 5,000 lbs above P/U weight		
7	Close Pipe/ Slip ram with 1000 psi, confirm indicator pins travel		
8	Increase Pipe/ Slip ram pressure to 2000 psi		
9	Close manual locks on Pipe/ Slip ram. NOTE: Count Turns		
10	Set down 4000 lbs below RIH weight		
11	Open locator rams and confirm		
12	Overpull 10,000 lbs above P/U weight to confirm Pipe/Slip ram holding string.		
13	Set down to neutral weight		
14	Bleed off pressure in riser and coil to +/- 0 psi -as per CT Supervisor instructions - monitor inflow for 10 min		
15	Overpull 10,000 lbs above P/U weight to confirm still latching prior to functioning release rams		
16	Set down 4000 lbs below RIH weight		
17	Confirm 0 psi above Pipe/Slip rams		
18	Close release rams using accumulator pressure (AUDIBLE INDICATION WHEN RELEASE)		
19	Open release rams		
20	POOH slowly to confirm release		
21	Tag strippers		
22	Close gate valves and confirm indicator pins – Lower gate 1 <sup>st</sup> Upper Gate 2 <sup>nd</sup>		
23	Confirm 0 psi in the riser		
24	Conduct H2S test and confirm 0 ppm		
25	Break QTS		
26	Pick up on main blocks to create 'work window'		
27	RIH to position gun connection at QTS		
28	Install support plate across grooved tandem and hang off the locator gun		
29	Set down and break connection between the locator gun and firing head		
30	Retract the blocks off center		
31	Lay down firing head from MHA		
32	Confirm that the firing head has detonated		
33	Make up retrieval BHA to MHA and pull up into the riser		
34	Install lifting cap on the locator gun and lay it out with the tugger line		
35	Position blocks over the riser		
36	Make up QTS		
37	Pressure test QTS to 5000 psi		

DEPLOY GUN SECTIONSS OUT OF LIVE WELL							
STEP	EVENT DESCRIPTION	#1	TIME	#2	TIME	#3	TIME
1	POOH and tag stripper, zero depth counter						
2	OPEN gate valves and confirm indicator pins, Upper 1 <sup>st</sup> and Lower 2 <sup>nd</sup>						
3	RIH to latch onto guns, Tag @ _____ +/- (NOTE DEPTH)						
4	Set down 4000 lbs below RIH weight - audible indication when latched						
5	Overpull 10,000 lbs above P/U weight to confirm latching						
6	Set down to neutral weight						
7	Confirm WHP is still at Zero PSI (If WHP noted pressure up riser and CT to equalize pressure)						
8	Open manual locks on pipe/slip rams and count turns						
9	Open pipe/slip rams						
10	POOH _____mts. NOTE pick up weight						
11	Close locator rams and confirm						
12	Pick up to tag locator rams, tag @ _____mts +/- (NOTE DEPTH & WEIGHT)						
13	Overpull 5,000 lbs above P/U weight						
14	Close pipe slip rams with 1000 psi, confirm indicator pins travel						
15	Increase pipe slip ram pressure to 2000 psi						
16	Close manual locks on pipe/slip rams. NOTE: COUNT Turns						
17	Set down 4000 lbs below RIH weight						
18	Open locator rams and confirm						
19	Overpull 10,000 lbs above P/U weight to confirm Pipe/Slip ram holding string.						
20	Set down to neutral weight						
21	Bleed off pressure in riser and coil as per CT supervisor instructions to 0 psi - monitor inflow for 10 min						
22	Overpull 10,000 lbs above P/U weight to confirm still latching prior to functioning release rams						
23	Set down 4000 lbs below RIH weight						
24	Confirm 0 psi above Pipe/Slip rams						
25	Close release rams using accumulator pressure (audible indication when release)						
26	Open release rams, confirm						
27	POOH slowly to confirm release						
28	POOH and tag strippers						
29	Close gate valves and confirm indicator pins – Lower gate 1 <sup>st</sup> Upper Gate 2 <sup>nd</sup>						
30	Confirm 0 psi in the riser						
31	Conduct H2S test to confirm 0 ppm						
32	Break QTS						
33	Pick up on blocks to create a working window						
34	Lower BHA to position gun connection at QTS						
35	Land off gun assemblies on support plate						
36	Break out retrieving BHA from gun section						
37	Retract injector head to allow access to guns						
38	Install lifting cap and lay down gun section with tugger line						
39	Redress retrieving BHA and pick up into the riser						
40	Lower injector and reconnect QTS						
41	Pressure test QTS to 5000 psi						

## Summary

Coil Tubing Conveyed Perforating with Live Well Deployment System enables:

- Single perforation run with static or dynamic underbalance across the whole perforation intervals.
- Optimize production by preventing formation damage due to plugged perforation tunnels from the kill fluid.
- Avoid multiple wireline perforation runs especially in monobore wells.



**Thank You**

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