



BAUERBERG KLEIN
TRAINING & CONSULTING





Module 2

SYSTEM COMPONENTS AND FUNCTIONS

CONTENT

- *Component characteristics and functions*
- *Wireline (Casing) guns*
- *Completion deployed guns*
- *Thru-tubing systems*
- *Coiled Tubing systems*

COMPONENT'S CHARACTERISTICS

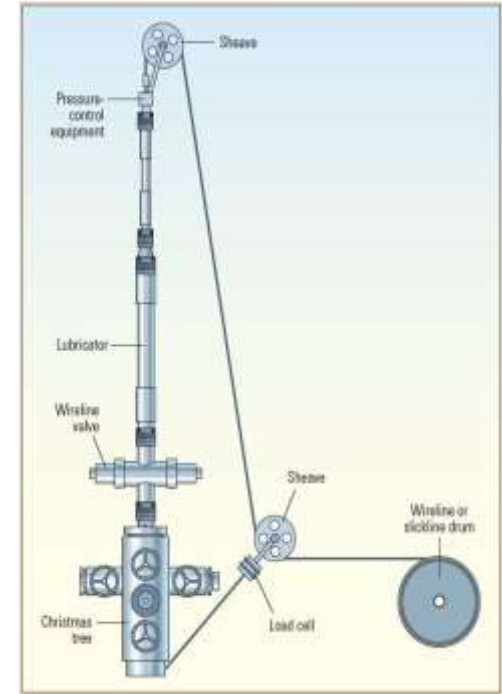
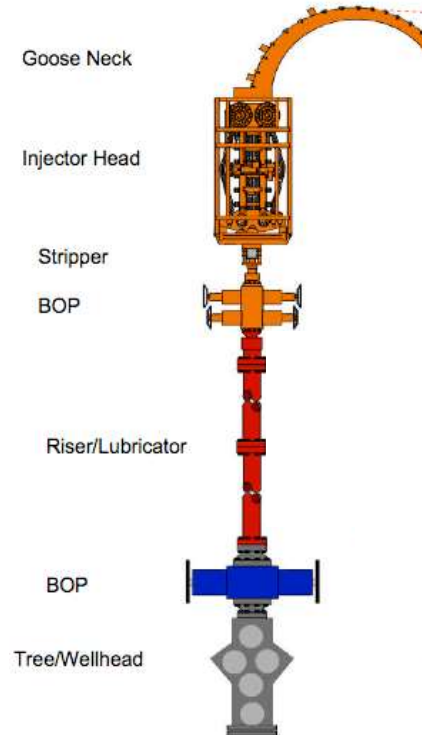
In general terms the main components (Equipment) used in well perforating can be divided by function, there are four (4) as follows:

1. **Control unit** – Guns deployed in wireline and coiled tubing is similar to standard equipment. It is not required for tubing/drill pipe deployed guns
2. **Surface equipment** – These are components such as the winch/Reel, pressure control (BOPs, stuffing boxes, riser) that are required for deployment at surface
3. **Deployment system** – Electric wireline, coiled tubing and steel wire are the most common means of gun deployment. Tubing/DP for TCP systems
4. **Perforating gun** – Carrier with shaped charges and accessories, depending on the type selected and deployment method

COMPONENT'S CHARACTERISTICS (Continued)

Coiled tubing and wireline surface set up composed of:

- Pressure control equipment, BOPs, stripper
- Riser/Lubricator
- Winch (Wireline)
- Injector head
- Goose neck



COMPONENT'S CHARACTERISTICS (Continued)

Gun system and components will depend on the deployment method selected



TCP Gun Carrier and charges
(Courtesy of The Expro Group)



Charge and Shaped liner
(Courtesy of Springer)

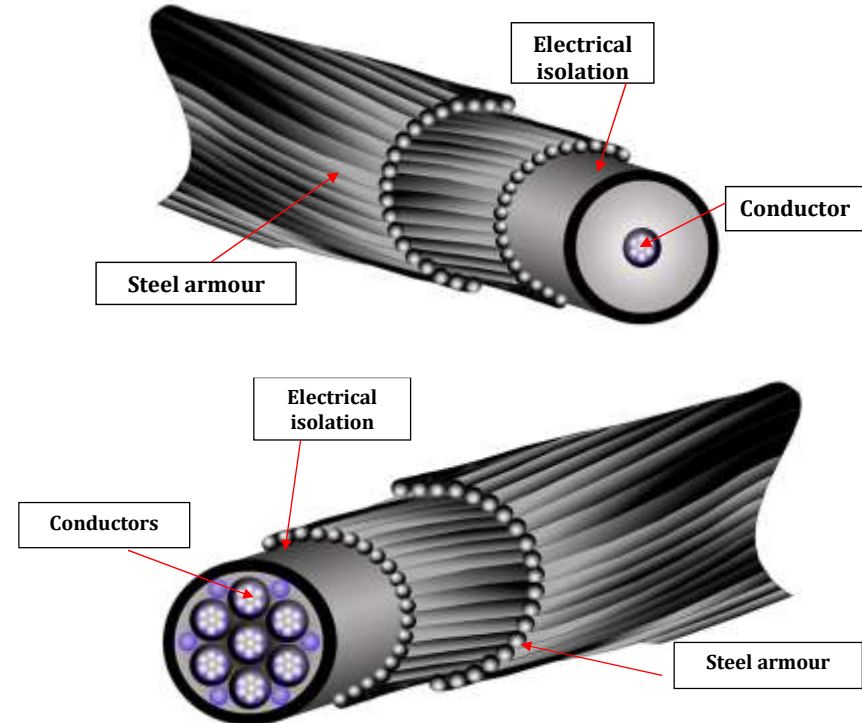


Gun assembly
<https://pmrpresselease.com/perforating>

COMPONENT'S CHARACTERISTICS (Continued)

Cable and wireline specifications

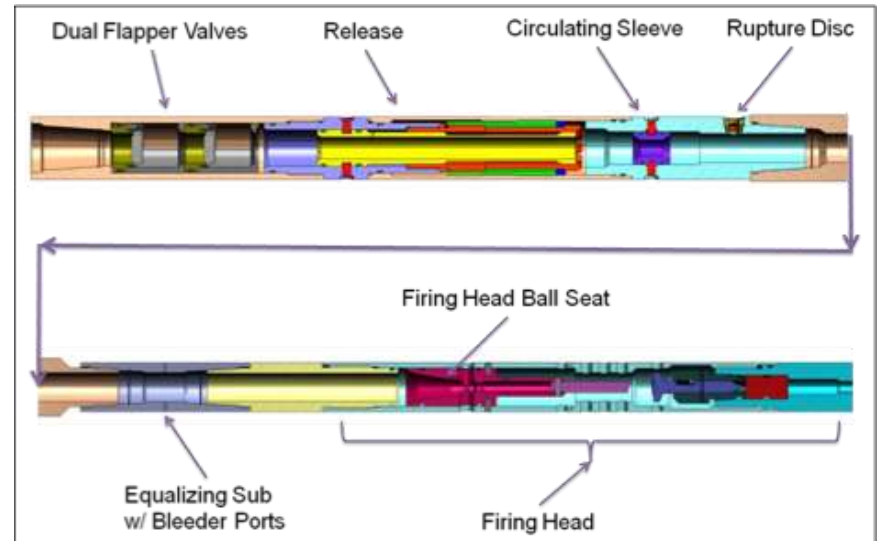
CHARACTERISTICS	ELECTRICAL CABLE	STEEL WIRE (slickline)
Types	Mono conductor, hepta-cable	Braided and solid line
Diameter range (Inches)	7/34"	[0.092 – 0.108]
Weight (Lbs/ft)	-	[0.02 – 0.028]
Tensile load (lbf)	-	[675 – 1800]
Chemical resistance	Limited by rubber elements	Affected by H ₂ S
Pressure containment	Stuffing box and connector seal	Stuffing box
Operational Limitations	Well geometry, gun length/weight, wellbore fluids	Well deviation, tensile load, tubing size, cycling
Depth control	Very good	Good
Main problems	Conductor damage, kinks	Fatigue, mechanical damage
Max. Deviation (degrees)	< 60 ° nominal, extended with accessories (rollers, wt bars)	



COMPONENT'S CHARACTERISTICS (Continued)

Well perforating using Coiled Tubing takes advantage of two (2) key features of the technology:

1. Ability to convey and retrieve heavier/longer gun assembly
2. Fluid circulation from surface allows well control, stimulation and fluid treatments to be carried out

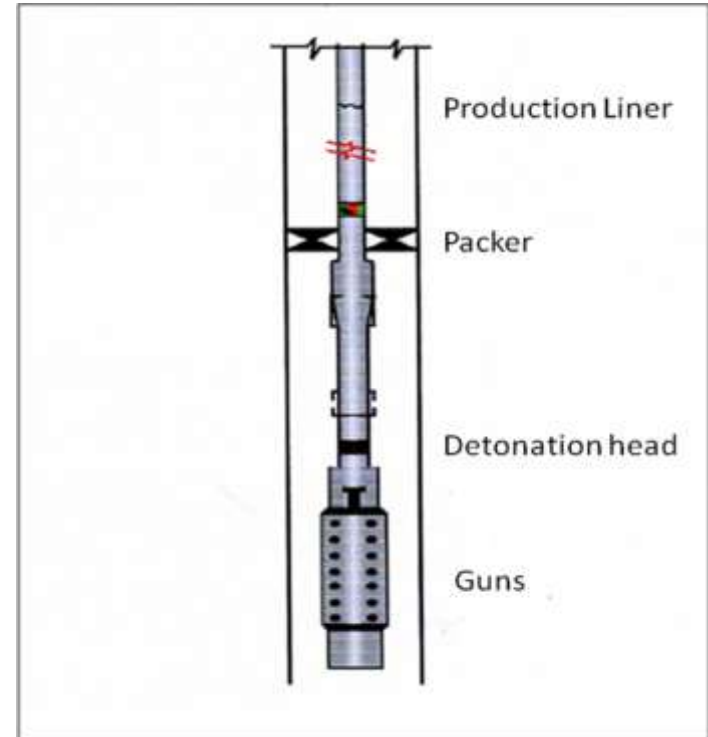


CT – Perforating gun interface
(Courtesy of Halliburton)

COMPONENT'S CHARACTERISTICS (Continued)

Tubing conveyed perforating - TCP

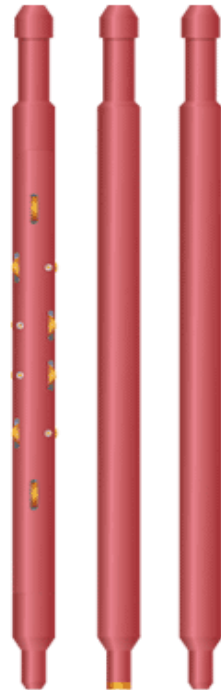
- Deployed w/completion as the deployment system
- Large (Long) size guns & charges are possible
- Accessories include firing and release mechanisms, circulating subs...



COMPONENT'S CHARACTERISTICS (Continued)

Types of firing mechanisms for TCP

- Mechanical (Drop bars)
- Hydraulic (Fluid pressure)
- Electrical (Cable)



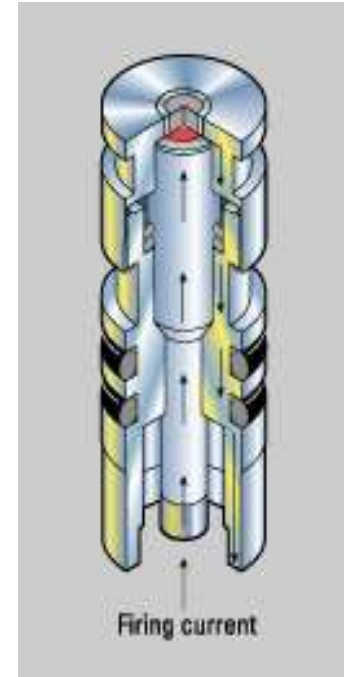
Drop Bars



Mechanical F.H



Hydraulic FH



Firing current

MODULE 2 – SUMMARY

Equipment characteristics vary among perforating systems depending on the deployment method and supplier

Four (4) main components are common: Control unit, surface equipment, deployment system and perforating gun. Not required in all methods

Gun systems are very similar for all four (4) techniques however, obvious differences remain such as between Coiled tubing and through tubing perforating.


Advantages and disadvantages exist for each system but in general they cover the most common requirements for most types of reservoirs and well conditions

Systems that provide accurate pressure and depth control, rapid deployment and retrieval are very common

MODULE 2 – SUMMARY (Continued)

Variations between systems include mostly accessories that improve compatibility and functionality (i.e. firing heads, connectors)

The ability to be able to circulate fluids is very useful making CT perforating a suitable method





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