MOSUL UNIVERSITY
PETROLEUM & MINING ENGINEERING COLLEGE

Well Drilling Engineering

DRILL STRING

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DRILL STRING

- Drill string

The drill string is an assemblage of hollow pipes of circular section, extending from the surface to the bottom of the hole. It has three functions:

- ❖ it takes the drilling bit to the bottom of the hole, while transmitting its rotation and its vertical load to it.
- ❖ It permits the circulation of the drilling fluid to the bottom of the hole.
- ❖ it guides and controls the trajectory of the hole.

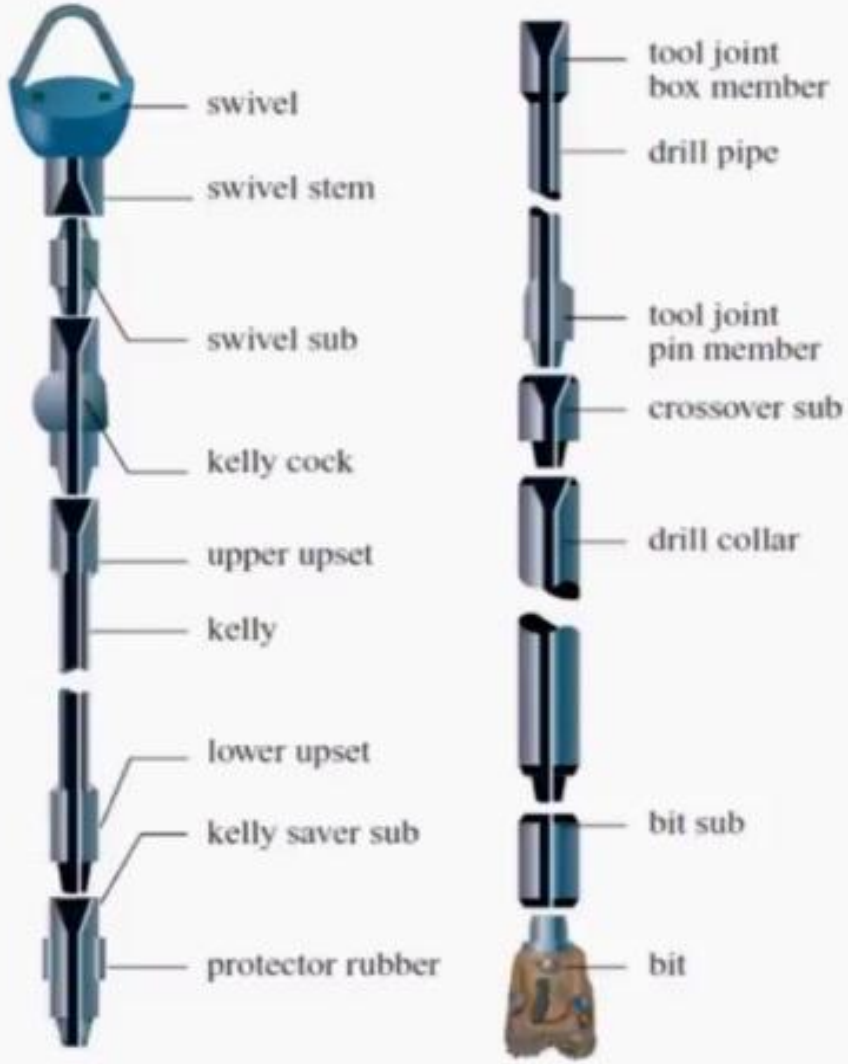
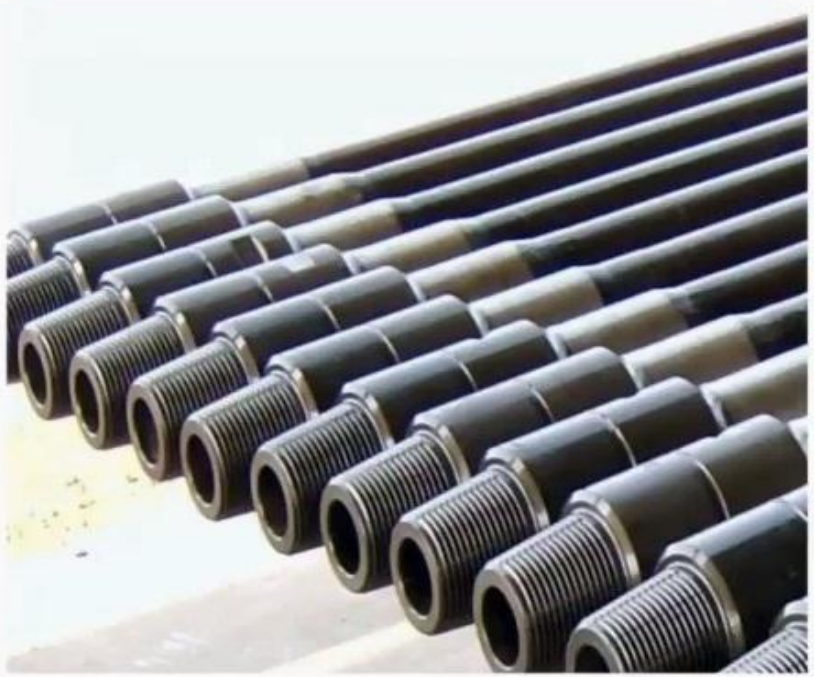


Fig. Main components of drill string.

a) Drill Pipe

- The drill pipes are hollow steel pipes of various types, with two tool joints welded at their ends.
- They are standardized according to API standards and classified on the basis of their length (usually about 9 m), their outside diameter, their linear weight and their steel grade.
- The most common drill pipes are the following: 3.50" (13.30 lb/ft), 4.50'' (16.60 lb/ft) and 5" (19.50 lb/ft),



API Range	Length (ft)
1	18-22
2	27-30
3	38-45

Table 1 Drillpipe Lengths

Size(OD) (inches)	Weight (lb/ft)	ID (inches)
2 3/8	6.65	1.815
2 7/8	10.40	2.151
3 1/2	9.50	2.992
3 1/2	13.30	2.764
5	15.50	4.602
5	16.25	4.408
5	19.50	4.276
5 1/2	25.60	4.000
5 1/2	21.90	4.776
5 1/2	24.70	4.670

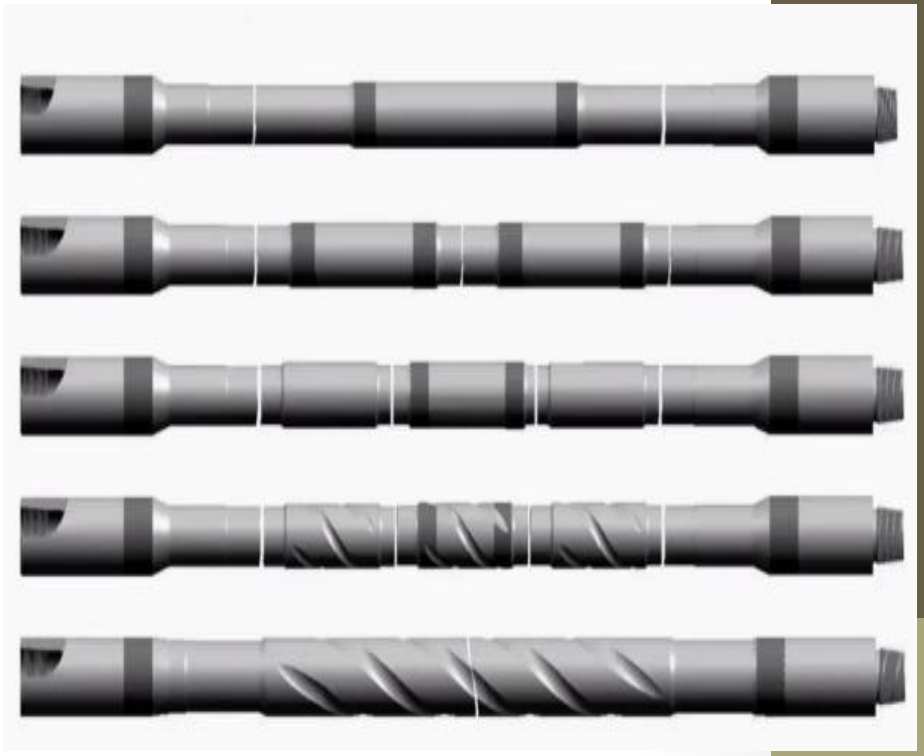
Table 2 Dimensions of Drillpipe

API Grade	Minimum Yield Stress (psi)	Minimum Tensile Stress (psi)	Yield Stress / Tensile Stress ratio
D	55,000	95,000	0.58
E	75,000	100,000	0.75
X	95,000	105,000	0.70
G	105,000	115,000	0.91
S	135,000	145,000	0.93

Table 3 Drillpipe Material Grades

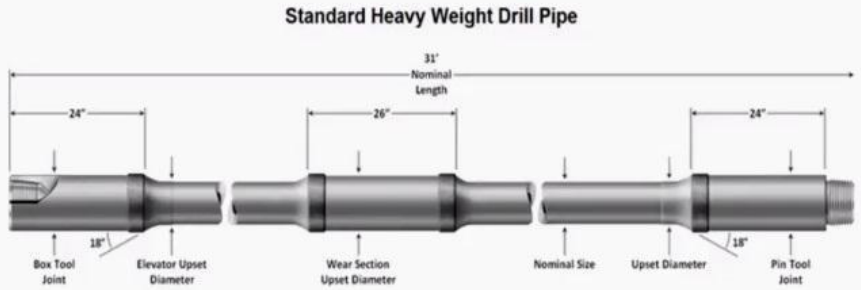
b) Heavy Weight Drill pipe

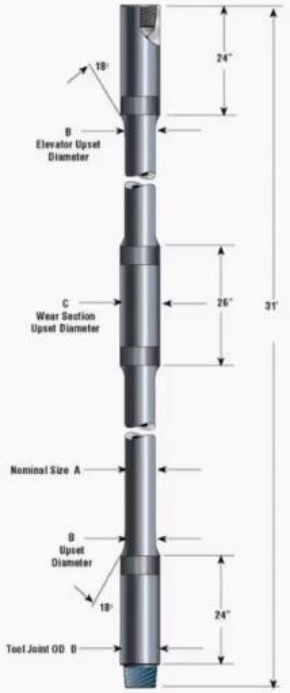
- Similar in appearance to a drill pipe, HWDP has the following different dimensional characteristics; the tube wall is heavier about 1"thick in most sizes, the tool joints are longer, and the tube section has a larger diameter at mid length to protect the pipe from wear.



b) Heavy Weight Drill pipe

- To avoid the danger of breaks in the drill string, a short stretch of intermediate heavy-wall or heavy-weight drill pipes is inserted.





C) Drill Collar

The drill collars have a thick wall, are made out of solid steel bars, rounded externally, bored on the inside and with threaded ends directly on the body, with threading analogous to that used for ordinary pipes.

The drill collars are 9 to 13 m in length and their outside diameter is between 3.125" and 14".

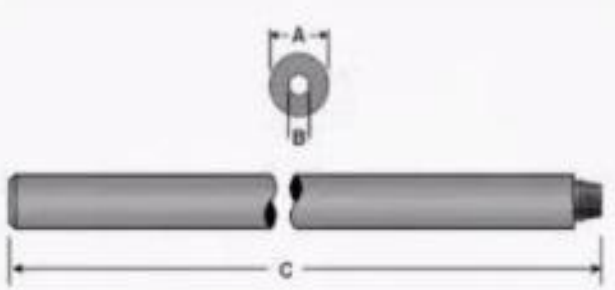
They are also standardized (API), with the most common diameters being 9.50", 8" and 6.50".

Drill collars made of nonmagnetic steel also exist, and are used in directional drilling so as not to influence the sensors that measure the earth's magnetic field.

They are manufactured with stainless steels (alloys of K-Monel type) or with chrome-manganese steel alloys.

C) Drill Collar

- The heavy, thick-walled tube steel, used between the drill pipe and the bit in the drill stem to provide pendulum effect to the drill stem and to provide weight on bit.

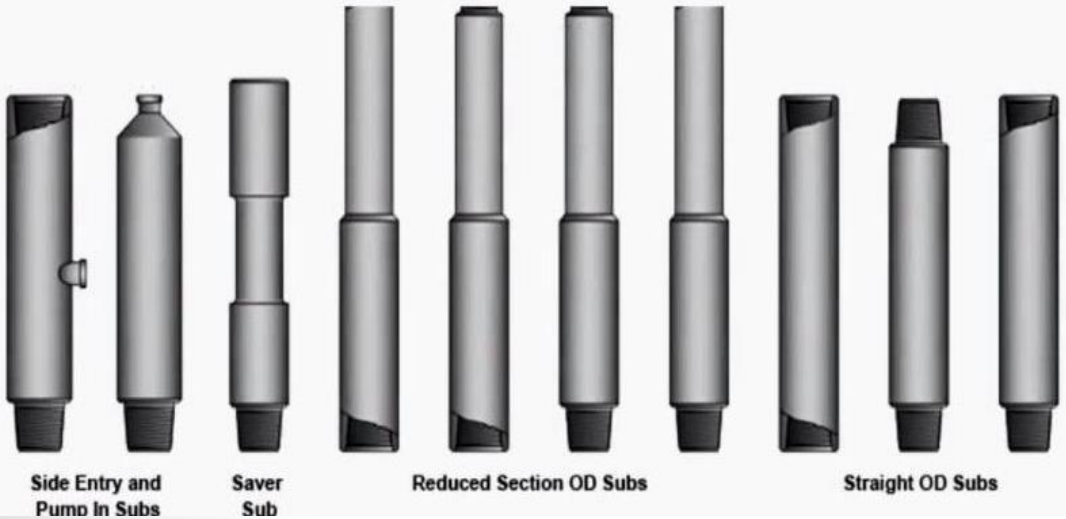


An 8" OD drill collar weighs 150 lbs/ft or 4500 lbs each

D) Sub

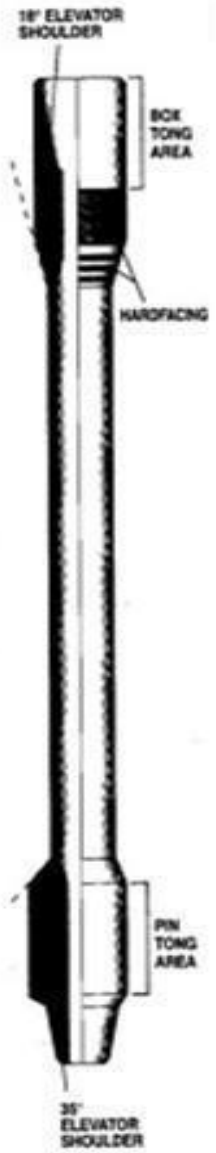
- A short, threaded piece of pipe used to adapt parts of the drilling string that cannot otherwise be screwed together because of difference in thread size or design.
- These consist of:

1. Bit Sub
2. Crossover Sub
3. Kelly Saver Sub
4. Lifting Sub
5. Bent Sub



Main Components of the Drill String

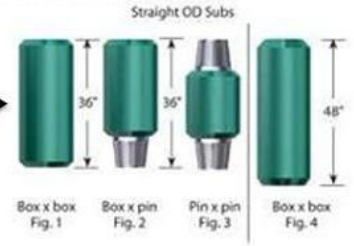
- Kelly or Top Drive
- Drill Pipe (DP)
- Heavy Weight Drill Pipe (HWDP)
- Drill Collars
- Bottom Hole Assembly (BHA)
- Drill Bit



Other BHA Components & Accessories

- **Stabilizers – Near Bit Stabilizer, NBS**
- In some directional drilling applications the NBS is required to be "Under Gauge", UG
- One Roller Reamer connected directly to the bit performs the same function as one NBS.

- **Cross Over Subs** →



- **Drilling Jars** • Tubular accessory conveniently positioned in the BHA capable to develop tremendous longitudinal impact forces that are transmitted below it to free the drilling string stuck in the hole

Other BHA Components & Accessories

Thanks!