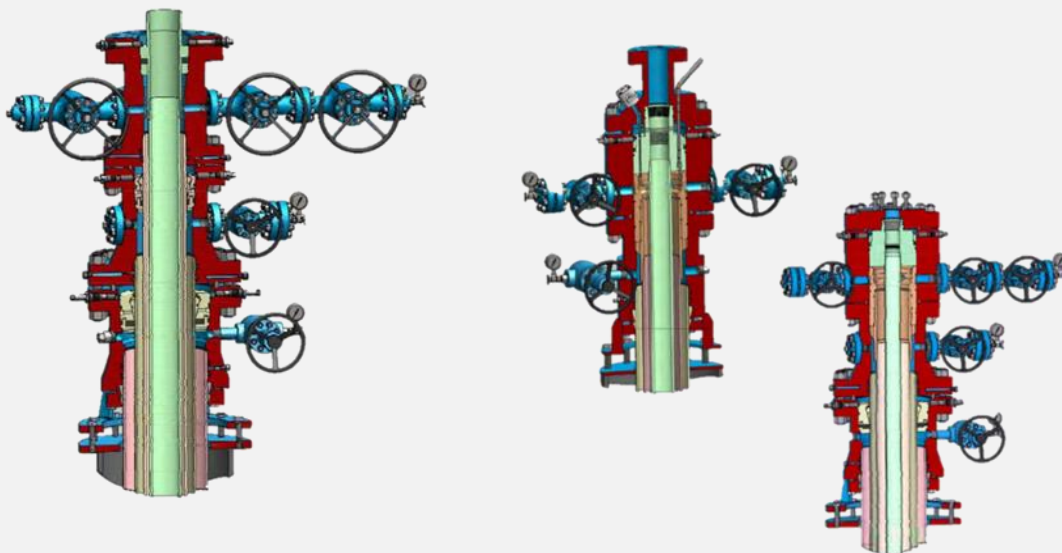


## WELL HEADS ACCORDING TO API 6A

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## 1. Introduction

A wellhead is the component at the surface of an oil, gas (production or storage cavern) or geothermal well that provides the structural and pressure-containing interface for the drilling and production equipment.

The primary purpose of a wellhead is to provide the suspension point and pressure seals for the casing strings that run from the bottom of the whole sections to the surface pressure control equipment.

While drilling the oil well, surface pressure control is provided by a blowout preventer (BOP). If the pressure is not contained during drilling operations by the column of drilling fluid, casings, wellhead, and BOP, a well blowout could occur.

When the well has been drilled, it is completed to provide an interface with the reservoir rock and a tubular conduit for the well fluids. The surface pressure control is provided by a Christmas tree, which is installed on top of the wellhead, with isolation valves and choke equipment to control the flow of well fluids during production.

The design of well head and Christmas trees is defined in the API 6A Specification.

The present description is based on the API 6A 21<sup>o</sup> edition

## 2. Installation conditions

In the API 6A there are defined following conditions:

### 2.1 Pressure classes

Following pressure classes are defined in the API6A, and the maximum operating pressure.

2000 psi	13,8 Mpa	138 bar
3000 psi	20,7 MPa	207 bar
5000 psi	34,5 Mpa	345 bar
10000 psi	69,0 Mpa	690 bar
15000 psi	103,5 Mpa	1035 bar
20000 psi	138,0 Mpa	1380 bar

The API 6A specification defines the characteristics of the materials used for the components in each pressure class.

## 2.2 Temperature class

K	-60°C up to 82°C	-75°F up to 180°F
L	-46°C up to 82°C	-50°F up to 180°F
N	-46°C up to 60°C	-50°F up to 140°F
P	-29°C up to 82°C	-20°F up to 180°F
R	Room temperature	
S	-18°C up to 60°C	0°F up to 140°F
T	-18°C up to 82°C	0°F up to 180°F
U	-18°C up to 121°C	0°F up to 250°F
V	2°C up to 121°C	35°F up to 250°F
X	-18°C up to 180°C	0°F up to 350°F
Y	-18°C up to 345°C	0°F up to 650°F

For the temperature classes X and Y the pressure rating is reduced to

Pressure class	Pressure rate for temp. class X	Pressure rate for temp. class Y
2000	1905 psi / 13,1 MPa / 131 bar	1430 psi / 9,9 MPa / 99 bar
3000	2860 psi / 19,7 Mpa / 197 bar	2145 psi / 14,8 Mpa / 148 bar
5000	4765 psi / 32,8 Mpa / 328 bar	3575 psi / 24,7 Mpa / 247 bar

Temperature classes can be combined, e.g. N/U, so that the minimum temperature is -46°C and the maximum 121°C.

## 2.3 Material classes

Material Class		Body, bonnet, end and outlet connections	Mandrel hangers, valve bore, sealing mechanisms, choke trim and stems
AA	General service	Carbon or low alloy steel, or stainless steel or CRA <sup>d</sup>	Carbon or low alloy steel, or stainless steel or CRA <sup>d</sup>
BB	General service	Carbon or low alloy steel, or stainless steel or CRA <sup>d</sup>	Stainless steel or CRA <sup>b,d</sup>
CC	General service	Stainless steel or CRA <sup>d</sup>	Stainless steel or CRA <sup>b,d</sup>
DD	Sour service <sup>a</sup>	Carbon or low alloy steel, or stainless steel or CRA <sup>b,d</sup>	Carbon or low alloy steel, or stainless steel or CRA <sup>d</sup>
EE	Sour service <sup>a</sup>	Carbon or low alloy steel, or stainless steel or CRA <sup>b,d</sup>	Stainless steel or CRA <sup>b,d</sup>
FF	Sour service <sup>a</sup>	Stainless steel or CRA <sup>b,d</sup>	Stainless steel or CRA <sup>b,d</sup>
HH	Sour service <sup>a</sup>	CRA <sup>b,c,d</sup>	CRA <sup>b,c,d</sup>
ZZ	Sour service	To be defined between user and manufacturer	

<sup>a</sup> as defined by NACE MR0175 / ISO 15156

<sup>b</sup> in accordance with MR0175 / ISO 15156

<sup>c</sup> CRA (Corrosion Resistance Alloy) required on retained fluid-wetted surfaces only, CRA cladding of low alloy or stainless steel is permitted

<sup>d</sup> CRA as defined in the chapter 3.1.22; NACE MR 0175 / ISO 15156 definition of CRA does not apply



Selection of the material class depending on the application. The material classes DD, EE, FF and HH require compliance to NACE MR0175 / ISO 15156 and responsibility for the choice rests with the purchaser.

- AA For essentially non-corrosive liquids or gases
- BB Basically the same as above but where corrosion resistance of the internal parts is desirable  
Recommended when partial pressure of CO<sub>2</sub> is greater than 30
- CC For any liquid or gaseous product for which the Cr 13 SS corrosion resistance is adequate.  
Recommended when partial pressure of CO<sub>2</sub> is greater than 30
- DD Primarily for sour gas and oil where resistance against H<sub>2</sub>S is required.  
Can be used when CO<sub>2</sub> is present in smaller amounts than H<sub>2</sub>S
- EE Predominantly for sour gas and oil where resistance against H<sub>2</sub>S is required  
Can be used when CO<sub>2</sub> is present in smaller amounts than H<sub>2</sub>S
- FF Primarily for sour gas and oil when the CO<sub>2</sub> exceeds the H<sub>2</sub>S content
- HH Primarily for use of raw and untreated saline produced water.
- ZZ Special applications, the material selection depends on the fluid.

#### **Examples of additional designations of material class**

Class FF-1.5 means:

Material class FF

Rated at 1.5 psia H<sub>2</sub>S maximum allowable partial pressure

Where no limits of H<sub>2</sub>S is defined by NACE, no partial pressure shall be marked.



## 2.4 Product specification levels (PSL)

The product specification level (PSL) applies, according to API 6A specification, to primary equipment like:

Tubing heads

Tubing hangers, hanger couplings

Tubing head adaptors

Lower master valves

All other components of the well head is classified as secondary. The PSL level for secondary equipment may be the same or lower than the one for primary equipment.

The PSL level of each component should be defined by the user, or according to the API 6A Specification guidelines.

Minimum PSL level according to API 6A

Material class	Rated working pressure					
	2000	3000	5000	10000	15000	20000
AA, BB, CC	PSL 1	PSL 1	PSL 1	PSL 2	PSL 2	PSL 3
DD, EE, FF	PSL 1	PSL 1	PSL 1	PSL 2	PSL 3	PSL 3
HH, ZZ	PSL 3	PSL 3	PSL 3	PSL 3	PSL 3	PSL 4

The test requirements for each PSL level are defined in the API 6A specification 21<sup>st</sup> edition.