

# Well Casing Design Concepts & Techniques



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## Introduction:

Casing design is an integral part of a drilling engineer's work scope. This course focuses on casing design, both from engineering and operational perspective. Design concepts are provided for a wide range of straightforward and hostile environments. It examines the nomenclature of casing design, manufacturing processes, materials and properties. The theory of burst, collapse and axial loading is discussed along with design policies and procedures.

A thorough review of API specifications is performed along with a review of the theory behind these specifications and their limitations. Connections and special cases, including HPHT and sour service are discussed.

**This course provides** an overview of the design process, emphasizing the working stress approach currently used in the industry. On completion of this course, successful candidates will be able to select casing points, identify tubular requirements and loads, design and specify the required casing string.


## Objectives:

By the end of this course delegates will be able to:

- Select casing setting depths based on pore and fracture pressure data as well as other criteria
  - Determine casing and bit sizes, and alternatives for contingencies and special clearance situations
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- Identify and define load cases to meet specific design requirements
  - Apply standardized design factors to meet specific design requirements and identify the controlling design load for each string in the well
  - Use and understand casing and connection specifications and select casing to satisfy the controlling design requirements
  - Understand the limits of single load specifications and adjust the basic design for combined loading effects
  - Design casing for high pressure fracturing in horizontal wells
  - Apply practical safe handling, running, and hanging

## Who should attend?

Drilling Engineers, Senior Drilling Engineers, Drilling Supervisors, Workover Engineers, Petroleum Engineers, Completion Engineers, Tool Pushers, Reservoir and Senior Reservoir Engineers, Geologists, Production Engineers, Wellsite Engineers, Foremen, Industry Personnel



## Course Outline:

### Introduction

### Material and mechanical properties of steel

### Stress-strain and deformation

### Oilfield tubular nomenclature

### API/ISO ratings and formulas

- API Yield Stress
- Barlow Equation for tubular burst
- Internal yield of couplings
- Casing thread dimensions
- Thread leak resistance
- Collapse formulas
- Collapse with axial load
- Collapse with internal pressure
- Tension yield of pipe body
- Tension strength of threaded connections

## **Steel Testing**

### **Tubular manufacturing specifications**

- Chemistry
- Material properties
- Heat treating
- Testing

**Introduction to sour service considerations**

**Design concepts**

**Design philosophy**

**Design factors**

**Life of well considerations in design decision**

**Wear**

**Corrosion**

**Triaxial Loading**

**Formulas and calculations**

## **Casing Design Concepts**

- Temperature
- Bending
- Corrosion
- Sulfide stress cracking
- NACE guidelines for sulfide stress cracking

**Corrosion resistant alloys**

**Tubular Failures Buckling**

**Connections**

**Thread design**

**Thread types API and proprietary**

**Thread leak resistance**

**Connection make-up**

**Casing setting depth determination**

**Pore pressure and fracture gradient importance**

**Kick tolerance**

**Casing setting depth for kick tolerance**



**Base Case**

- Develop load cases for burst, for collapse, for axial

**Service life models**

**Load cases**

- Load types
- Axial
- Burst
- Collapse

**Procurement**

- Planning
- Specifications
- Quality assurance

**Inspection**

- Inspection types
- Marking
- Acceptance criteria



**Load design for burst**

**Load design for collapse**

**Load design for axial load**

**Storage and handling**

**Thread compounds**

**Storage compounds**

**Pipe storage facility**