



DE168

Advanced Casing Design

Course Introduction:

The course emphasizes the practical application of casing design principles and theory from a basic level through to advance. It can be tailored for either level. It examines the nomenclature of casing design, the manufacturing processes, materials and properties, the theory of burst, collapse and axial loadings, design policies and procedures, API specifications with review of the theory behind these and their limitations, connections and special cases such as HP/HT and sour service. The course examines the non-API principles of tri-axial design and how this improves upon the limitations of API.

Kick tolerance and its impact on casing seat selection is considered in detail along with the processes of documentation and audit. Substantial emphasis is placed on worked examples beginning with basic practical problems and culminating in a full casing design for a typical well. This is approached from first principles and demands extensive use of mathematics.

Course Objectives:

Upon successful completion of this course, the delegates will be able to:

- ✓ Participants will review the theories of both uniaxial and triaxial pipe strength as per API Bulletin 5C3 and ISO/TR 10400, the implications of manufacturing standards and tolerances as per API Specification 5CT and the impact of downhole environmental conditions.
- ✓ Participants will learn how to optimize preliminary casing design; performing casing seat selection to satisfy a range of well performance parameters and barrier standards, select suitable casing sizes to meet well completion objectives and produce a workable casing scheme utilizing casing strings, liners and expandable tubulars. The impact on casing scheme and cementing program on well abandonment
- ✓ Participants will master the process of detailed casing design, identifying relevant load conditions for the lifetime of the well and producing an optimized casing scheme that can withstand triaxial burst and biaxial collapse loading under downhole conditions.
- ✓ Service Load design challenges such buckling and trapped annular pressures will be addressed as well as managing the impact of corrosion and casing wear
- ✓ Participants will develop an understanding of the how connections are tested using ISO 13679 and how to select suitably pre-qualified connections for use in a well.
- ✓ The use and limitations of spreadsheets for routine design will be reviewed. The capabilities and limitations of casing design software for advanced casing design will be addressed

Who Should Attend?

This course is intended for drilling and completion engineers and service company personnel with a basic knowledge of well design principles through to experienced drilling engineers who desire a more theoretical, detailed knowledge of the subject.

Course Outline:

Day 1:

INTRODUCTION

- Functions of Casing
- Well Construction Standards
- The Casing Design Process
- Casing Design Data requirements

PRELIMINARY CASING DESIGN

- Pore Pressures and Formation strengths
- Kick Tolerance and Casing Seat Selection
- Casing setting depth and sizing for Well Construction (Seat Selection)
- Barriers
- Well Abandonment Considerations

Day 2:

OIL FIELD TUBULARS

- Industry Standards, Specifications and Documentation
- The Manufacturing Process
- API 5CT
 - Steel: Grades, Chemistry, Yield Stress
 - Tolerances, Sizes and Lengths
 - Inspection
 - Supplementary Requirements
- Mechanical properties and Temperature Effects
- Application of ISO 15156 – Materials for use in Sour Service

CASING PERFORMANCE PROPERTIES

- Conventional Casing Strength limits as per API Bulletin 5C3
 - Uniaxial Tensile Yield
 - Uniaxial (Barlow) Burst
 - Uniaxial Collapse, influence of Temperature and Tension
- Alternative Limits proposed in ISO/TR 10400
 - Burst Strength based on von Mises Initial Yield

- Burst Strength based on Full Yield
- Alternative Collapse Strength, Effect of Wear on Collapse
- Resistance
- Burst Strength, Effect of Wear on Burst Strength and Effect of Temperature on Burst Strength
- Modes of Failure, Burst, Collapse, Axial, Tri-axial and Joint Integrity
- Buckling – Resistance and Effective Tension
- Design and Safety Factors

Day 3:

CASING CONNECTIONS

- Introduction to Casing Connections
- ISO 13679 Connection Testing
- Selection of Pre-Qualified connections

CASING LOADS

- Overview of Design Loads
- Fluid Gradients and Applied Pressures
- Critical Internal and External Pressure Scenarios
- Load Case Selection
- Production Casing Loads
- Intermediate Casing Loads
- Surface Casing Loads

MANUAL DESIGN PROCESS

- Uniaxial Pipe Selection
- Installation Loads
- As Cemented Loads

Day 4:

SERVICE LOADS

- Load Identification, Production Thermal Profiles
- Thermal Effects on fluids, pipe strength and tension
- Trapped Annular Pressures
- Impact of Cement on Buckling
- Biaxial Collapse Assessment
- Triaxial Burst Assessment
- Pressure Testing

SPECIAL DESIGN CONSIDERATIONS

- Accounting for Casing Wear and Corrosion
- Deterministic vs Probabilistic Casing Design
- Casing Design for Thermal wells
- Casing Design for HPHT wells
- Casing Design for Deepwater wells
- Annular Pressure Buildup – Prediction, Management and Mitigation

Day 5:

CASING DESIGN SOFTWARE

- Capabilities and Limitations

Course Certificate:

International Center for Training & Development (ICTD) will award an internationally recognized certificate(s) for each delegate on completion of training.

Course Methodology:

A variety of methodologies will be used during the course that includes:

- (30%) Based on Case Studies
- (30%) Techniques
- (30%) Role Play
- (10%) Concepts
- Pre-test and Post-test
- Variety of Learning Methods
- Lectures
- Case Studies and Self Questionnaires
- Group Work
- Discussion
- Presentation

Course Fees:

To be advised as per the course location. This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Timings:

Daily Course Timings:

08:00 - 08:20	Morning Coffee / Tea
08:20 - 10:00	First Session
10:00 - 10:20	Coffee / Tea / Snacks
10:20 - 12:20	Second Session
12:20 - 13:30	Lunch Break & Prayer Break
13:30 - 15:00	Last Session

