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1: Introduction

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1.1 GENERAL

The circular cylindrical members are used extensively in the construction of offshore oil-production platforms (Fig. 1.1). This is because cylindrical members have larger torsional rigidity than open section members and show a superior behavior for structural stability. In addition to the stability strength, the circular shape reduces the flow resistance more than any other shape. Hence, it is the best shape for structural members used in offshore structures.

There are several design specifications written specifically for offshore platforms, including the one issued by the American Petroleum Institute (API) and the others by the bureaus of shipping industries such as the American Bureau of Shipping (ABS) and Det Norske Veritas (DNV) in Norway. These specifications dictate the strength of circular tubes and provide the design guidelines for engineers. Furthermore, the circular tubes with small diameter are often used for roof truss of inland framed structures. In many countries, the building codes also provide the rules for the design of cylindrical members.

This book provides the analytical means for the study of circular tube members as used in offshore structures. Many different analytical procedures will be described in the book, ranging from very sophisticated analytic methods to a rather crude approximate procedure for the monotonic loading, including the post-buckling behavior and the cyclic loading. These methods are useful for the study of the structural behaviors of cylindrical members.

Recently, square-shaped cylindrical members with thick walls have become common in onshore building structures due to their superiority in structural properties and constructional convenience. However, only the circular tubes are described in this book.

The strength of steel frames with cylindrical members is often controlled by the connections. The connections are usually the weak spots of the structures, but the proper design of these connections is beyond the scope of this book.

1.2 CIRCULAR CYLINDRICAL MEMBERS

Circular tubes can be categorized by their manufacturing process. They are: (1) hot-rolled cylindrical members, also called "seamless pipe," made in a similar manner