

PREFACE TO THE FIRST EDITION

What are the necessary requirements to move from a piping or pipeline system idea to its completion? The basic premise of this book is that at the heart of those requirements are a series of calculations, which cover a wide range of subjects.

In any pipeline system, the core of the system itself is the piping, which is its skeleton. However, as with any skeleton, there must be other elements to include before the system can become the final entity that was the original idea.

Pipe is basically a transport structure. To determine what that structure requires would involve what it is intended to transport. While it is important to have knowledge of how the medium to be transported is generated, this book does not address that area. Generation of that comes from another field of expertise.

A pipe system has a beginning, an ending, and a path between the two points. To transport the medium—liquid or gas—some definition of temperatures, pressures, amount to be transported per unit of time, and the energy required to accomplish the transport need to be, at least partially, established. Many of these will be considered as a given in this book and the methods of calculating the other elements are discussed and explained.

The base codes for the design of a new system, and the ones used in this book as the reference source, are the B31 piping codes of the American Society of Mechanical Engineers (ASME). The B31 piping codes consist of several sections or books that describe the requirements for systems of a specific type. These can readily be broken into the two basic types—a piping system and a pipeline system.

The differences between the two are that a piping system can be generically defined as being inside a localized area to connect various vessels that are for reaction and/or storage. A pipeline system is more like a pure transport medium between two geographical positions. Within both are elements of the other. There are many pipelines within a plant or localized area, and along the pipelines between distant points are stations that have piping systems necessary for some pipeline element such as a compressor station.

For these reasons, the various sections or books of the B31 codes allow piping system owners to determine which code would apply to their

particular project. In making this decision the owners are also advised to take into account which code the jurisdiction(s) for their projects might consider applicable.

All system requirements basically set standards of calculation to establish a safe end result. Those qualification standards are outlined with specific calculation procedures in the codes. Some things are required to be taken into account without details of how to consider them. Some calculations require base calculations to arrive at the point where the code calculation can be used. In this book, we address many of the grayer areas.

As one goes through the steps of meeting the requirements of particular codes, he or she will also find many other standards included by reference. This is a practical way for the codes to cover many common elements in the design and construction of a system. Any calculations required for the component that are covered by the referenced standard need not be outlined in the code. The use of that component needs no further proof of compliance with the code than its compliance with the standard. Since different standards provide different methods of providing the calculations, those differences are also addressed.

The B31 piping codes are primarily construction codes for new facilities. They can be used successfully in replacing or extending a piping facility. With few exceptions, notably the pipeline sections, there are no maintenance and ongoing requirements. The pipeline sections have relatively extensive detailed requirements for continuous maintenance. There is a growing set of postconstruction requirements, some of which are published, that give methodologies for repairing and assessing the need for repairs. Some small offerings detail the methodology for certain more complex areas of analysis, and these are discussed in this book.

It should be noted that some of the calculations provided are not necessarily required by the codes. However, one must really understand those calculations to have the depth of understanding needed to do a good job when performing the calculations required.

Part I of this book provides an overview of the codes and standards, including what they are and what they aren't. It provides a detailed discussion of the "metric problem." Chapter 3 discusses piping materials, as well as other materials, that might be required to complete a system.

Part II covers some specific calculations and their formulas and has examples of how to do such calculations.

The Appendix contains a set of charts, graphs, and other helpful tables and guides that should make doing some of the calculations easier or faster. In this computer/calculator age, some tables and graphs are still a good way to look at alternative solutions to a problem before going into an in-depth mathematical analysis.

PREFACE TO THE SECOND EDITION

It has been a few years since the first edition of this book was written. One might point out that the amount of time between the draft of a book and the actual publishing of same may take some time. As I read the preface to that first edition I find no major differences in what was written there.

Pipe is still round with a hole in the middle. It still has all the codes and safety requirements of those codes. Stress is still force divided by area. With minor exceptions what was in the first preface still holds as true. If anything some piping systems have become more complex. There are even new editions of the codes that existed then. There are some newer codes.

The technology has changed, particularly in the sense of digital analysis and complex programs to solve the old problems in newer and easier ways. That does not change many of the essential variables. This book is not about the newer digital techniques as much as it is about the base knowledge that the reader must have an understanding to make the engineering judgment required to determine the adequacy of their analysis. The book discusses and recommends those digital approaches as deeper analysis is recognized as required.

The materials may have evolved and some techniques may have changed. These have been reflected in this edition. In some cases we have attempted to clarify that which may have been obscure in the earlier discussions. Where it was found necessary we have added some approaches and explanations to make ones analysis more complete.

As in all efforts the author was not perfect in his description and where errors were detected they have been corrected. The copy editors have been helpful in the need for clarification. The cloud mentioned in the previous acknowledgement has continued to be helpful and supportive. Unfortunately like a true cloud there has been change and movement of that cloud. We do have some new, miss some who have passed on and still thank them all for that is the beauty of sharing ideas and knowledge. It lives on.