

CONTENTS

Preface vi

Acknowledgements xi

PART

BASIC BACKGROUND INFORMATION

1 PIPING AND INSULATION 3

History 4
Basic Methods of Manufacturing Pipe 7
Piping Materials 9
American Standards Association 12
Insulation 26
Quiz 30
Problems 30

2 WELDING 32

Welded Pipe Systems 33
Welding Methods 33
Welding Materials 35
Welding Symbols 36
Types of Welds 39
Pipe End Preparation 47
Joint Preparation 47
Service Failures 48
Welded Pipe Fabrication 50
Welded Pipe Supports 52
Quiz 56
Problems 56

3	FITTINGS AND FLANGES	58	6	SYSTEM FLOW DIAGRAMS AND INSTRUMENTATION
	Fittings 58			Schematic Flow Diagrams 164
	Flanges 69			Types of Flow Diagrams 176
	Quiz 76			Instrumentation 187
	Problems 77			Instrumentation Specifications 188
4	VALVES	78		Quiz 203
	Selecting the Right Valve 80			Problems 203
	Construction Materials 85			
	Trim Materials 85			
	End Connections 86			
	Types of Valves 86		/	ISOMETRICS
	Bibliography 105			Models and Isometrics 209
	Quiz 105			Computers and Isometrics 209
	Problems 106			Symbols and Isometrics 209
				Isometric Drawings 215
				Quiz 230
				Problems 231

PART II

PRINCIPLES IN PRACTICE

5	PIPING DRAFTING	109	8	PIPE SUPPORTS
	Drafting Methods 112			Standard Component Supports 233
	Drafting Equipment 116			Pipe Support Service 233
	Basics of Drafting 117			Pipe Support Classifications 234
	Piping Symbols 125			Structural Shapes 254
	Drawings and Scales 133			The Pipe Support Group 257
	Dimensioning 146			Basic Considerations 257
	Detail and Shop Drawings 154			Pipe Support Drafting 263
	Reproduction Methods 155			Models and Pipe Supports 273
	Photo Drafting 155			Reference Drawings 275
	Computer-Aided Drafting 155			Checking for Interference 279
	Quiz 158			Pipe Support Calculations 279
	Problems 159			Specifications 281
				Quiz 291
				Problems 292

9	PIPE FABRICATIONS	294
	Shop Fabrication	296
	Field Fabrication	299
	Codes and Standards	299
	Pipe Fabrication Processes	300
	Drawings for Pipe Fabrication	31
	Piping Intersections	313
	Structural Piping Fabrications	318
	Quiz	324
	Problems	324

PART III

APPLICATION OF PRINCIPLES

10	LAYOUT AND DESIGN OF PIPING SYSTEMS	
	Piping	327
	Piping System Design Factors	330
	Electrical Requirements	343
	Heating, Ventilation, and Air Conditioning	343
	Structural Design	344
	Layout and Arrangement	346
	Designing a Typical Installation	356
	Specification List and Schedules	376
	Quiz	377
	Problems	377

11	PETROCHEMICAL PIPING	378
	Safety and Hazards	381
	Equipment Functions	382
	Process and Auxiliary Equipment	388
	Processes	396
	Piping Layout and Arrangement	408
	Equipment layout and Arrangement	412
	Piping Specifications	414
	Utilities for Refineries	421
	Pipe Support Systems	423
	Stress Analysis	426
	Circular Platforms	426
	Water-Quench Blowdown Systems	451
	Quiz	447
	Problems	447

12	CONVENTIONAL POWER PIPING	448
	Fossil Fuel Power Plants	449
	Fuel	468
	Equipment	469
	Steam Piping Placement	473
	Power Plant Design	475
	Quiz	477
	Problems	477

13	NUCLEAR POWER PIPING	479
	Background	480
	Types of Reactors	481
	Structural and Piping Materials	482
	Fusion in the Future	483
	Nuclear Power Plants and Facilities	483
	Nuclear Piping	506
	Modeling	513
	Quiz	514
	Problems	515

SOLAR POWER PIPING

516

- Solar Energy: Past and Present 516
- The Solar Solution 518
- Types of Systems 519
- Solar Heating and Cooling 522
- Site Planning 523
- Collectors 525
- Circulation Systems 527
- Storage Units 531
- Construction Materials 531
- The Promise of Solar Power 533
- Quiz 535
- Problems 536

MODEL BUILDING

537

- The Uses of Models 537
- Present and Future Procedures 540
- Advantages of Models 541
- Modeling Programs 544
- Drawing and the Model 547
- Types of Models 547
- Design Model Construction 549
- Tools 550
- Model Components 551
- Quiz 555
- Problems 556

APPENDIX A: Standards

**APPENDIX B Tables, Charts,
and Components**

ABBREVIATIONS

GLOSSARY

INDEX