

ASME B31.3-2022
(Revision of ASME B31.3-2020)

Process Piping

ASME Code for Pressure Piping, B31

AN INTERNATIONAL PIPING CODE®



**The American Society of
Mechanical Engineers**

ASME B31.3-2022
(Revision of ASME B31.3-2020)

Process Piping

ASME Code for Pressure Piping, B31

AN INTERNATIONAL PIPING CODE®



**The American Society of
Mechanical Engineers**

Two Park Avenue • New York, NY • 10016 USA

Date of Issuance: January 31, 2023

The next edition of this Code is scheduled for publication in 2024. This Code will become effective 6 months after the Date of Issuance.

ASME issues written replies to inquiries concerning interpretations of technical aspects of this Code. Interpretations are published on the Committee web page and under <http://go.asme.org/InterpsDatabase>. Periodically certain actions of the ASME B31 Committee may be published as Cases. Cases are published on the ASME website under the B31 Committee page at <http://go.asme.org/B31committee> as they are issued.

Errata to codes and standards may be posted on the ASME website under the Committee Pages of the associated codes and standards to provide corrections to incorrectly published items, or to correct typographical or grammatical errors in codes and standards. Such errata shall be used on the date posted.

The B31 Committee Page can be found at <http://go.asme.org/B31committee>. The associated B31 Committee Page for each code and standard can be accessed from this main page. There is an option available to automatically receive an e-mail notification when errata are posted to a particular code or standard. This option can be found on the appropriate Committee Page after selecting "Errata" in the "Publication Information" section.

ASME is the registered trademark of The American Society of Mechanical Engineers.

This international code or standard was developed under procedures accredited as meeting the criteria for American National Standards and it is an American National Standard. The standards committee that approved the code or standard was balanced to ensure that individuals from competent and concerned interests had an opportunity to participate. The proposed code or standard was made available for public review and comment, which provided an opportunity for additional public input from industry, academia, regulatory agencies, and the public-at-large.

ASME does not "approve," "rate," or "endorse" any item, construction, proprietary device, or activity. ASME does not take any position with respect to the validity of any patent rights asserted in connection with any items mentioned in this document, and does not undertake to insure anyone utilizing a standard against liability for infringement of any applicable letters patent, nor does ASME assume any such liability. Users of a code or standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, is entirely their own responsibility.

Participation by federal agency representatives or persons affiliated with industry is not to be interpreted as government or industry endorsement of this code or standard.

ASME accepts responsibility for only those interpretations of this document issued in accordance with the established ASME procedures and policies, which precludes the issuance of interpretations by individuals.

No part of this document may be reproduced in any form,
in an electronic retrieval system or otherwise,
without the prior written permission of the publisher.

The American Society of Mechanical Engineers
Two Park Avenue, New York, NY 10016-5990

Copyright © 2023 by
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
All rights reserved
Printed in U.S.A.

CONTENTS

Foreword		xiv
Committee Roster		xvi
Introduction		xxi
Summary of Changes		xxiii
Chapter I	Scope and Definitions	1
300	General Statements	1
Chapter II	Design	11
Part 1	Conditions and Criteria	11
301	Design Conditions	11
302	Design Criteria	13
Part 2	Pressure Design of Piping Components	22
303	General	22
304	Pressure Design of Components	22
Part 3	Fluid Service Requirements for Piping Components	33
305	Pipe	33
306	Fittings, Bends, Miters, Laps, and Branch Connections	33
307	Valves and Specialty Components	35
308	Flanges, Blanks, Flange Facings, and Gaskets	35
309	Bolting	36
Part 4	Fluid Service Requirements for Piping Joints	36
310	General	36
311	Welded Joints	36
312	Flanged Joints	37
313	Expanded Joints	37
314	Threaded Joints	37
315	Tubing Joints	38
316	Caulked Joints	38
317	Soldered and Brazed Joints	38
318	Special Joints	38
Part 5	Flexibility and Support	39
319	Piping Flexibility	39
320	Analysis of Sustained Loads	44
321	Piping Support	45
Part 6	Systems	47
322	Specific Piping Systems	47
Chapter III	Materials	49
323	General Requirements	49
325	Materials — Miscellaneous	60

Chapter IV	Standards for Piping Components	61
326	Dimensions and Ratings of Components	61
Chapter V	Fabrication, Assembly, and Erection	65
327	General	65
328	Welding and Brazing	65
330	Preheating	73
331	Heat Treatment	75
332	Bending and Forming	81
333	Brazing and Soldering	81
335	Assembly and Erection	82
Chapter VI	Inspection, Examination, and Testing	84
340	Inspection	84
341	Examination	84
342	Examination Personnel	91
343	Examination Procedures	91
344	Examination Methods	92
345	Testing	93
346	Records	97
Chapter VII	Nonmetallic Piping and Piping Lined With Nonmetals	98
A300	General Statements	98
Part 1	Conditions and Criteria	98
A301	Design Conditions	98
A302	Design Criteria	98
Part 2	Pressure Design of Piping Components	100
A303	General	100
A304	Pressure Design of Piping Components	100
Part 3	Fluid Service Requirements for Piping Components	102
A305	Pipe	102
A306	Fittings, Bends, Miters, Laps, and Branch Connections	102
A307	Valves and Specialty Components	102
A308	Flanges, Blanks, Flange Facings, and Gaskets	102
A309	Bolting	103
Part 4	Fluid Service Requirements for Piping Joints	103
A310	General	103
A311	Bonded Joints in Plastics	103
A312	Flanged Joints	103
A313	Expanded Joints	103
A314	Threaded Joints	103
A315	Tubing Joints	104
A316	Caulked Joints	104
A318	Special Joints	104
Part 5	Flexibility and Support	104
A319	Flexibility of Nonmetallic Piping and Piping Lined With Nonmetals	104
A321	Piping Support	106
Part 6	Systems	106

A322	Specific Piping Systems	106
Part 7	Materials	107
A323	General Requirements	107
A325	Materials — Miscellaneous	108
Part 8	Standards for Piping Components	108
A326	Dimensions and Ratings of Components	108
Part 9	Fabrication, Assembly, and Erection	109
A327	General	109
A328	Bonding of Plastics	109
A329	Fabrication of Piping Lined With Nonmetals	115
A332	Bending and Forming	115
A334	Joining Nonplastic Piping	115
A335	Assembly and Erection	116
Part 10	Inspection, Examination, and Testing	117
A340	Inspection	117
A341	Examination	117
A342	Examination Personnel	117
A343	Examination Procedures	118
A344	Examination Methods	118
A345	Testing	118
A346	Records	118
Chapter VIII	Piping for Category M Fluid Service	119
M300	General Statements	119
Part 1	Conditions and Criteria	119
M301	Design Conditions	119
M302	Design Criteria	119
Part 2	Pressure Design of Metallic Piping Components	119
M303	General	119
M304	Pressure Design of Metallic Components	119
Part 3	Fluid Service Requirements for Metallic Piping Components	119
M305	Pipe	119
M306	Metallic Fittings, Bends, Miters, Laps, and Branch Connections	120
M307	Metallic Valves and Specialty Components	120
M308	Flanges, Blanks, Flange Facings, and Gaskets	120
M309	Bolting	121
Part 4	Fluid Service Requirements for Metallic Piping Joints	121
M310	Metallic Piping, General	121
M311	Welded Joints in Metallic Piping	121
M312	Flanged Joints in Metallic Piping	121
M313	Expanded Joints in Metallic Piping	121
M314	Threaded Joints in Metallic Piping	121
M315	Tubing Joints in Metallic Piping	121
M316	Caulked Joints	121
M317	Soldered and Brazed Joints	121
M318	Special Joints in Metallic Piping	121

Part 5	Flexibility and Support of Metallic Piping	121
M319	Flexibility of Metallic Piping	121
M320	Analysis of Sustained Loads	121
M321	Piping Support	121
Part 6	Systems	122
M322	Specific Piping Systems	122
Part 7	Metallic Materials	122
M323	General Requirements	122
M325	Materials — Miscellaneous	122
Part 8	Standards for Piping Components	122
M326	Dimensions and Ratings of Components	122
Part 9	Fabrication, Assembly, and Erection of Metallic Piping	123
M327	General	123
M328	Welding of Metals	123
M330	Preheating of Metals	123
M331	Heat Treatment of Metals	123
M332	Bending and Forming of Metals	123
M335	Assembly and Erection of Metallic Piping	123
Part 10	Inspection, Examination, Testing, and Records of Metallic Piping	123
M340	Inspection	123
M341	Examination	123
M342	Examination Personnel	124
M343	Examination Procedures	124
M344	Examination Methods	124
M345	Testing	124
M346	Records	124
Parts 11–20	Corresponding to Chapter VII	124
MA300	General Statements	124
Part 11	Conditions and Criteria	124
MA301	Design Conditions	124
MA302	Design Criteria	124
Part 12	Pressure Design of Nonmetallic Piping Components	124
MA303	General	124
MA304	Pressure Design of Nonmetallic Components	124
Part 13	Fluid Service Requirements for Nonmetallic Piping Components	124
MA305	Pipe	124
MA306	Nonmetallic Fittings, Bends, Miters, Laps, and Branch Connections	124
MA307	Valves and Specialty Components	125
MA308	Flanges, Blanks, Flange Facings, and Gaskets	125
MA309	Bolting	125
Part 14	Fluid Service Requirements for Nonmetallic Piping Joints	125
MA310	General	125
MA311	Bonded Joints	125
MA312	Flanged Joints	125
MA313	Expanded Joints	125

MA314	Threaded Joints	125
MA315	Tubing Joints in Nonmetallic Piping	125
MA316	Caulked Joints	125
MA318	Special Joints	125
Part 15	Flexibility and Support of Nonmetallic Piping	125
MA319	Piping Flexibility	125
MA321	Piping Support	125
Part 16	Nonmetallic and Nonmetallic-Lined Systems	125
MA322	Specific Piping Systems	125
Part 17	Nonmetallic Materials	125
MA323	General Requirements	125
Part 18	Standards for Nonmetallic and Nonmetallic-Lined Piping Components	126
MA326	Dimensions and Ratings of Components	126
Part 19	Fabrication, Assembly, and Erection of Nonmetallic and Nonmetallic-Lined Piping	126
MA327	General	126
MA328	Bonding of Plastics	126
MA329	Fabrication of Piping Lined With Nonmetals	126
MA332	Bending and Forming	126
MA334	Joining Nonplastic Piping	126
MA335	Assembly and Erection	126
Part 20	Inspection, Examination, Testing, and Records of Nonmetallic and Nonmetallic-Lined Piping	126
MA340	Inspection	126
MA341	Examination	126
MA342	Examination Personnel	126
MA343	Examination Procedures	126
MA344	Examination Methods	126
MA345	Testing	126
MA346	Records	126
Chapter IX	High Pressure Piping	127
K300	General Statements	127
Part 1	Conditions and Criteria	127
K301	Design Conditions	127
K302	Design Criteria	128
Part 2	Pressure Design of Piping Components	130
K303	General	130
K304	Pressure Design of High Pressure Components	130
Part 3	Fluid Service Requirements for Piping Components	133
K305	Pipe	133
K306	Fittings, Bends, and Branch Connections	134
K307	Valves and Specialty Components	134
K308	Flanges, Blanks, Flange Facings, and Gaskets	135
K309	Bolting	135
Part 4	Fluid Service Requirements for Piping Joints	135
K310	General	135

K311	Welded Joints	135
K312	Flanged Joints	135
K313	Expanded Joints	135
K314	Threaded Pipe Joints	135
K315	Tubing Joints	136
K316	Caulked Joints	136
K317	Soldered and Brazed Joints	136
K318	Special Joints	136
Part 5	Flexibility and Support	136
K319	Flexibility	136
K320	Analysis of Sustained Loads	137
K321	Piping Support	137
Part 6	Systems	137
K322	Specific Piping Systems	137
Part 7	Materials	137
K323	General Requirements	137
K325	Miscellaneous Materials	141
Part 8	Standards for Piping Components	141
K326	Requirements for Components	141
Part 9	Fabrication, Assembly, and Erection	143
K327	General	143
K328	Welding	143
K330	Preheating	145
K331	Heat Treatment	145
K332	Bending and Forming	146
K333	Brazing and Soldering	146
K335	Assembly and Erection	147
Part 10	Inspection, Examination, and Testing	147
K340	Inspection	147
K341	Examination	147
K342	Examination Personnel	148
K343	Examination Procedures	148
K344	Examination Methods	148
K345	Leak Testing	151
K346	Records	153
Chapter X	High Purity Piping	154
U300	General Statements	154
Part 1	Conditions and Criteria	154
U301	Design Conditions	154
Part 2	Pressure Design of Piping Components	154
Part 3	Fluid Service Requirements for Piping Components	154
U306	Fittings, Bends, Miters, Laps, and Branch Connections	154
U307	Valves and Specialty Components	154
U308	Flanges, Blanks, Flange Facings, and Gaskets	154
Part 4	Fluid Service Requirements for Piping Joints	155

U311	Welded Joints	155
U314	Threaded Joints	155
U315	Tubing Joints	155
Part 5	Flexibility and Support	155
U319	Piping Flexibility	155
Part 6	Systems	156
Part 7	Metallic Materials	156
Part 8	Standards for Piping Components	156
Part 9	Fabrication, Assembly, and Erection	156
U327	General	156
U328	Welding	156
U330	Preheating	156
U331	Heat Treatment	157
U332	Bending and Forming	157
U333	Brazing and Soldering	157
U335	Assembly and Erection	157
Part 10	Inspection, Examination, and Testing	157
U340	Inspection	157
U341	Examination	158
U342	Examination Personnel	158
U343	Examination Procedures	159
U344	Examination Methods	159
U345	Testing	160
U346	Records	160
Part 11	High Purity Piping in Category M Fluid Service	160
UM300	General Statements	160
UM307	Metallic Valves and Specialty Components	160
UM322	Specific Piping Systems	160
UM328	Welding of Materials	161
UM335	Assembly and Erection of Metallic Piping	161
UM341	Examination	161
UM345	Testing	161
 Appendices		
A	Allowable Stresses and Quality Factors for Metallic Piping and Bolting Materials	162
B	Stress Tables and Allowable Pressure Tables for Nonmetals	394
C	Physical Properties of Piping Materials	402
D	Flexibility and Stress Intensification Factors	423
E	Reference Standards	424
F	Guidance and Precautionary Considerations	429
G	Safeguarding	436
H	Sample Calculations for Branch Reinforcement	438
J	Nomenclature	447
K	Allowable Stresses for High Pressure Piping	463
L	Aluminum Alloy Pipe Flanges	492

M	Guide to Classifying Fluid Services	495
N	Application of ASME B31.3 Internationally	497
Q	Quality System Program	498
R	Use of Alternative Ultrasonic Acceptance Criteria	499
S	Piping System Stress Analysis Examples	502
V	Allowable Variations in Elevated Temperature Service	517
W	High-Cycle Fatigue Assessment of Piping Systems	520
X	Metallic Bellows Expansion Joints	525
Z	Preparation of Technical Inquiries	529

Figures

300.1.1	Diagram Illustrating Application of B31.3 Piping at Equipment	3
302.3.5	Stress Range Factor, f	19
304.2.1	Nomenclature for Pipe Bends	24
304.2.3	Nomenclature for Miter Bends	24
304.3.3	Branch Connection Nomenclature	26
304.3.4	Extruded Outlet Header Nomenclature	28
304.5.3	Blanks	32
319.4.4A	Moments in Bends	42
319.4.4B	Moments in Branch Connections	43
323.2.2A	Minimum Temperatures Without Impact Testing for Carbon Steel Materials	52
323.2.2B	Reduction in Lowest Exemption Temperature for Steels Without Impact Testing	53
328.3.2	Typical Backing Rings and Consumable Inserts	67
328.4.2	Typical Butt Weld End Preparation	67
328.4.3	Trimming and Permitted Misalignment	68
328.4.4	Preparation for Branch Connections	69
328.5.2A	Fillet and Socket Weld Sizes	69
328.5.2B	Minimum Attachment Weld Dimensions for Double-Welded Slip-On and Socket Welding Flanges	69
328.5.2C	Minimum Attachment Weld Dimensions for Socket Welding Components Other Than Flanges	70
328.5.4A, B, C	Typical Welded Branch Connections	70
328.5.4D	Acceptable Details for Branch Attachment Welds	71
328.5.4E	Acceptable Details for Branch Attachments Suitable for 100% Radiography	71
328.5.4F	Acceptable Details for Integrally Reinforced Branch Connections	72
328.5.5	Typical Details for Fabricated Laps	73
335.3.3	Typical Threaded Joints Using Straight Threads	83
341.3.2	Typical Weld Imperfections	86
A328.5.3	Thermoplastic Solvent Cemented Joint	113
A328.5.4	Thermoplastic Heat Fusion Joints	114
A328.5.5	Thermoplastic Electrofusion Joints	114
A328.5.6	Fully Tapered Thermosetting Adhesive Joint	114
A328.5.7	Thermosetting Wrapped Joints	115
K323.3.3	Example of an Acceptable Impact Test Specimen	140
K328.4.3	Pipe Bored for Alignment: Trimming and Permitted Misalignment	144
K328.5.4	Some Acceptable Welded Branch Connections Suitable for 100% Radiography	145

U304.5.3	Blanks	155
U328.4.2	Modified Pipe End Preparations	157
U335.7.1	Face Seal Joints	158
U335.8A	Hygienic Clamp Joint Assembly	158
U335.8B	Hygienic Clamp Types	159
U335.8C	Hygienic Ferrules	159
H301	Illustrations for SI Units Examples in Appendix H	439
H311	Illustrations for U.S. Customary Units Examples in Appendix H	443
M300	Guide to Classifying Fluid Services	496
R307	Surface and Subsurface Flaws	500
S301.1	Example 1: Simple Code-Compliant Model	502
S302.1	Example 2: Lift-Off Model	508
S303.1	Example 3: Moment Reversal Model	511
 Tables		
300.4	Status of Appendices in ASME B31.3	10
302.3.3C	Increased Casting Quality Factors, E_c	16
302.3.3D	Acceptance Levels for Castings	17
302.3.4	Longitudinal Weld Joint Quality Factor, E_j	18
302.3.5	Weld Joint Strength Reduction Factor, W	20
304.1.1	Values of Coefficient Y for $t < D/6$	23
304.4.1	ASME BPVC References for Closures	30
308.2.1	Permissible Sizes/Rating Classes for Slip-On Flanges Used as Lapped Flanges	35
314.2.1	Minimum Schedule of Components With External Threads	38
323.2.2	Requirements for Low Temperature Toughness Tests for Metals	50
323.2.2A	Tabular Values for Minimum Temperatures Without Impact Testing for Carbon Steel Materials	54
323.2.2B	Tabular Values for Reduction in Lowest Exemption Temperature for Steels Without Impact Testing	56
323.3.1	Impact Testing Requirements for Metals	57
323.3.4	Charpy Impact Test Temperature Reduction	58
323.3.5	Minimum Required Charpy V-Notch Impact Values	59
326.1	Component Standards	62
330.1.1	Preheat Temperatures	74
331.1.1	Postweld Heat Treatment	76
331.1.2	Alternate Postweld Heat Treatment Requirements for Carbon and Low Alloy Steels, P-Nos. 1 and 3	77
331.1.3	Exemptions to Mandatory Postweld Heat Treatment	78
341.3.2	Acceptance Criteria for Welds — Visual and Radiographic Examination	87
A323.2.2	Requirements for Low Temperature Toughness Tests for Nonmetals	108
A323.4.2C	Recommended Temperature Limits for Reinforced Thermosetting Resin Pipe	108
A323.4.3	Recommended Temperature Limits for Thermoplastics Used as Linings	108
A326.1	Component Standards	110
A341.3.2	Acceptance Criteria for Bonds	117
K302.3.3D	Acceptable Severity Levels for Steel Castings	130

K305.1.2	Required Ultrasonic or Eddy Current Examination of Pipe and Tubing for Longitudinal Defects	134
K323.3.1	Impact Testing Requirements	139
K323.3.5	Minimum Required Charpy V-Notch Impact Values	141
K326.1	Component Standards	142
K341.3.2	Acceptance Criteria for Welds	149
	Criterion Value Notes for Table K341.3.2	150
	Specification Index for Appendix A	163
A-1	Basic Allowable Stresses in Tension for Metals	170
A-1M	Basic Allowable Stresses in Tension for Metals (SI Units)	250
A-1A	Basic Casting Quality Factors, E_c	360
A-1B	Basic Quality Factors for Longitudinal Weld Joints in Pipes and Tubes, E_j	362
A-2	Design Stress Values for Bolting Materials	368
A-2M	Design Stress Values for Bolting Materials (SI Units)	378
	Specification Index for Appendix B	395
B-1	Hydrostatic Design Stresses (HDS) and Recommended Temperature Limits for Thermoplastic Pipe	396
B-1M	Hydrostatic Design Stresses (HDS) and Recommended Temperature Limits for Thermoplastic Pipe (SI Units)	398
B-2	Listed Specifications for Laminated Reinforced Thermosetting Resin Pipe	399
B-3	Listed Specifications for Filament Wound and Centrifugally Cast Reinforced Thermosetting Resin and Reinforced Plastic Mortar Pipe	399
B-4	Allowable Pressures and Recommended Temperature Limits for Concrete Pipe	400
B-5	Allowable Pressures and Recommended Temperature Limits for Borosilicate Glass Pipe	400
B-6	Allowable Pressures and Recommended Temperature Limits for PEX-AL-PEX and PE-AL-PE Pipe	401
C-1	Thermal Expansion Data	403
C-1M	Thermal Expansion Data (SI Units)	406
C-5	Thermal Expansion Coefficients, Nonmetals	411
C-6	Moduli of Elasticity for Metals	413
C-6M	Moduli of Elasticity for Metals (SI Units)	417
C-8	Modulus of Elasticity for Nonmetals	421
	Specification Index for Appendix K	464
K-1	Allowable Stresses in Tension for Metals for Chapter IX	466
K-1M	Allowable Stresses in Tension for Metals for Chapter IX (SI Units)	480
L301.2M	Pressure–Temperature Ratings (SI Units)	493
L301.2U	Pressure–Temperature Ratings (U.S. Customary Units)	493
L303.2	Aluminum Bolting Materials	494
R308.1	Acceptance Criteria for Surface Flaws	501
R308.2	Acceptance Criteria for Subsurface Flaws	501
S301.1	Example 1: Pressure–Temperature Combinations	503
S301.3.1	Example 1: Generic Pipe Stress Model Input	503
S301.3.2	Example 1: Element Connectivity, Type, and Lengths	504
S301.5.1	Example 1: Operating Load Case Results: Internal Loads and Deflections	505
S301.5.2	Example 1: Operating Load Case Results: Reactions on Supports and Anchors	505

S301.6	Example 1: Sustained Forces, Moments, and Stresses [Allowable $S_h = 130.8$ MPa (19.0 ksi)]	506
S301.7	Example 1: Displacement Stress Range [Allowable, Eq. (1a), $S_A = 205.2$ MPa (29.75 ksi)]	507
S302.2	Example 2: Pressure–Temperature Combinations	508
S302.3	Example 2: Generic Pipe Stress Model Input: Component Connectivity, Type, and Lengths	509
S302.5	Example 2: Results for Operating Case: Reactions on Support and Anchors	509
S302.6.2	Example 2: Sustained Load Condition Listing	510
S302.6.3	Example 2: Sustained Forces, Moments, and Stresses for Sustained Condition 3 With Node 50's Y+ Support Inactive [Allowable $S_h = 127$ MPa (18.4 ksi): Fails]	511
S303.1	Example 3: Pressure–Temperature Combinations	512
S303.3	Example 3: Generic Pipe Stress Model Input: Component Connectivity, Type, and Lengths	513
S303.7.1	Example 3: Operating Case 1: Displacement Stress Range [Eq. (1b) Allowable $S_A = 364$ MPa (52.7 ksi): Passes]	514
S303.7.2	Example 3: Operating Case 2: Displacement Stress Range [Eq. (1b) Allowable $S_A = 364$ MPa (52.7 ksi): Passes]	515
S303.7.3	Example 3: Moment Reversal Load Combination Considering Operating Cases 1 and 2, Total Strain Based: Displacement Stress Range [Eq. (1b) Allowable $S_A = 364$ MPa (52.7 ksi): Fails]	516
W301-1	Gamma Function Evaluation	521
W302.1-1	Fatigue Material Coefficients (-3σ)	522
W302.1-2	Fatigue Material Coefficients (-2σ)	522
W302.1-3	Optional Fatigue Material Coefficients When $N_{ti} > 10^7$	523
W302.1-4	Environmental Fatigue Factors for Carbon Steel Piping, $T \leq 93^\circ\text{C}$ (200°F)	523
Index	530
Notes for Index	546