

BAHAMAS BUILDING CODE

Third Edition - 2003



**Ministry of Works & Utilities
Government of The Bahamas**



*Celebrating 30 years of
Independence*

*

*Scenes from
The Built Environment*



A collection of government buildings throughout New Providence.

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All additions and revisions to the previous edition are printed in italics and bold throughout this edition of The Bahamas Building Code.

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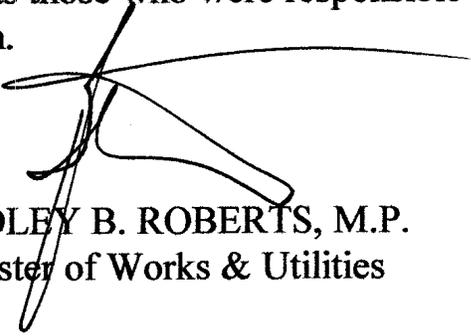
FOREWORD

On the occasion of the Thirtieth Anniversary of Independence of The Bahamas, It is an honour to introduce the Third Edition of The Bahamas Building Code. This document has been the standard for the regulation of building construction in The Bahamas since its inception in 1971.

Over the past thirty years we have seen rapid changes in technology, advancement in construction methods, revolutionary building materials and also vast maturation of our built environment. This edition of the Building Code was produced in an attempt to keep current with the progressive advancements in the construction industry while at the same time maintain minimum building standards to ensure the health, safety and welfare of the people of our Bahamaland.

This Building Code will serve as a reference guide for all and sundry in the building construction industry; from obtaining a building permit, to receipt of an occupancy certificate. The Code will also include, for the first time, a comprehensive chapter on design guidelines to accommodate the physically challenged in our community.

I should like to take this opportunity to offer my heartfelt thanks to each and every one who has contributed to the production of this document, particularly those from the construction community. In this regard, special mention is made of Mr. John Steer, our first Buildings Control Officer who was responsible for the initial draft revision; the officers of the Ministry of Works and Utilities, particularly the hard working officers of the Buildings Control Division as well as those who were responsible for reediting to produce this Third Edition.



BRADLEY B. ROBERTS, M.P.
Minister of Works & Utilities

5th June 2003

THE BAHAMAS BUILDING CODE

THIRD EDITION

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Department of Environmental Health Services

Fire Branch, Royal Bahamas Police Force

Bahamas Association for the Physically Disabled

Bahamas Institute of Professional Engineers

Bahamas Society of Engineers

Institute of Bahamian Architects

DTP Services

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THE BAHAMAS BUILDING CODE
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TITLE INDEX

PART I - TITLE AND DEFINITIONS

CHAPTER 1	TITLE AND PURPOSE	
Paragraph No.	Paragraph Title	Page No.
101	Title	1-1
102	Purpose	1-1
103	Scope	1-1
104	Application to Existing Buildings	1-1
105	Motion Picture and Television Production Sets	1-3
106	Connected Legislation	1-4
CHAPTER 2	DEFINITIONS	

PART II – ADMINISTRATION

CHAPTER 3	APPLICATION TO BUILD-NOTICES AND INSPECTIONS	
Paragraph No.	Paragraph Title	Page No.
301	General	3-1
302	Application to Build	3-1
303	Presentation of Plans	3-4
304	Alterations to and Extensions of Buildings	3-5
305	Application to Make Alterations to and Extensions of Buildings	3-5
306	Materials Used for Construction	3-6
307	Plumbing Work and Fittings	3-6
308	Exemptions	3-7
309	Material Change of Use	3-8
310	Fees Payable for Building Permits	3-8
311	Pre-Engineered Buildings	3-8
312	Mandatory Inspections	3-8
313	Taking Samples	3-10
314	Compliance With Code	3-10
315	Notice of Compliance	3-11
316	Notice of Completion	3-11
317	Approved Products	3-11

PART III - REQUIREMENTS BASED ON OCCUPANCY

CHAPTER 4	CLASSIFICATION AND GENERAL REQUIREMENTS	
Paragraph No.	Paragraph Title	Page No.
401	General Requirements	4-1

402	Occupancy Classified	4-1
403	Change in Use	4-2
404	Occupant Content	4-2
405	Adjoining Occupancy	4-2
406	Fire Divisions	4-2
407	Party Walls	4-3
408	Occupancy Separations	4-5
409	Special Hazard Protection	4-6
410	Exit Facilities for Mixed Occupancies	4-7
411	Location on the Property	4-8
412	Sanitation	4-8
413	Ceiling Heights	4-10
414	Allowable Area	4-10
415	Facilities for Physically Handicapped	4-11

CHAPTER 5 REQUIREMENTS OF GROUP A OCCUPANCIES

Paragraph No.	Paragraph Title	Page No.
501	Group A Occupancy Defined	5-1
502	Construction, Height and Area Allowable	5-1
503	Location on Property	5-2
504	Exit Facilities	5-3
505	Light and Ventilation	5-7
506	Enclosure of Vertical Openings	5-8
507	Stages, Platforms and Rostrums	5-8
508	Projection Booths	5-12
509	Fire Protection and Hazards	5-14
510	Plumbing and Toilet Facilities	5-14
511	Exceptions and Deviations	5-15
512	Mixed Occupancies	5-15
513	Elevator Lobbies in High Rise Buildings	5-15
514	Minimum Kitchen Sizes for Catering Establishments	5-15
515	Atriums	5-16
516	Accessibility for The Physically Handicapped	5-17

CHAPTER 6 REQUIREMENTS OF GROUP B OCCUPANCIES

Paragraph No.	Paragraph Title	Page No.
601	Group B Occupancy Defined	6-1
602	Construction, Height and Area Allowable	6-1
603	Location on Property	6-2
604	Exit Facilities	6-3
605	Light and Ventilation	6-4
606	Enclosure of Vertical Openings	6-4
607	Stages, Platforms and Rostrums	6-4
608	Motion-Picture Machine Booths	6-4
609	Fire Protection and Hazards	6-5
610	Plumbing and Toilet Facilities	6-5
611	Mixed Occupancy	6-5
612	Elevator Lobbies in High Rise Buildings	6-5

613	Minimum Kitchen Sizes for Catering Establishments	6-6
614	Atriums	6-6
615	Accessibility for The Physically Handicapped	6-6
CHAPTER 7	REQUIREMENTS OF GROUP C OCCUPANCIES	
Paragraph No.	Paragraph Title	Page No.
701	Group C Occupancy Defined	7-1
702	Construction, Height and Area Allowable	7-2
703	Location on Property	7-2
704	Exit Facilities	7-3
705	Light and Ventilation	7-6
706	Enclosure of Vertical Openings	7-6
707	Stages, Platforms and Rostrums	7-6
708	Motion-Picture Machine Booths	7-6
709	Fire Protection and Hazards	7-6
710	Plumbing and Toilet Facilities	7-7
711	Exceptions and Deviations	7-7
712	Mixed Occupancy	7-7
713	Minimum Kitchen Sizes for Catering Establishments	7-7
714	Atriums	7-7
715	Accessibility for The Physically Handicapped	7-7
CHAPTER 8	REQUIREMENTS OF GROUP D OCCUPANCIES	
Paragraph No.	Paragraph Title	Page No.
801	Group D Occupancy Defined	8-1
802	Construction, Height and Area Allowable	8-1
803	Location on Property	8-2
804	Exit Facilities	8-2
805	Light and Ventilation	8-4
806	Enclosure of Vertical Openings	8-4
807	Fire Protection and Hazards	8-4
808	Plumbing and Toilet Facilities	8-5
809	Mixed Occupancy	8-5
CHAPTER 9	REQUIREMENTS OF GROUP E OCCUPANCIES	
Paragraph No.	Paragraph Title	Page No.
901	Group E Occupancy Defined	9-1
902	Construction, Height and Area Allowable	9-1
903	Location on Property	9-3
904	Exit Facilities	9-3
905	Light and Ventilation	9-5
906	Enclosure of Vertical Openings	9-5
907	Fire Protection and Hazards	9-6
908	Plumbing and Toilet Facilities	9-6
909	Mixed Occupancy	9-6
910	Minimum Kitchen Sizes for Catering Establishments	9-6

CHAPTER 10	REQUIREMENTS OF GROUP F OCCUPANCIES	
Paragraph No.	Paragraph Title	Page No.
1001	Group F Occupancy Defined	10-1
1002	Construction, Height and Area Allowable	10-1
1003	Location on Property	10-2
1004	Exit Facilities	10-2
1005	Light and Ventilation	10-6
1006	Enclosure of Vertical Openings	10-6
1007	Fire Protection and Hazards	10-6
1008	Plumbing and Toilet Facilities	10-6
1009	Mixed Occupancy	10-7
1010	Elevator Lobbies in High Rise Buildings	10-7
1011	Minimum Kitchen Sizes for Catering Establishments	10-7
1012	Atriums	10-7
1013	Accessibility for The Physically Handicapped	10-7
CHAPTER 11	REQUIREMENTS OF GROUP G OCCUPANCIES	
Paragraph No.	Paragraph Title	Page No.
1101	Group G Occupancy Defined	11-1
1102	Construction, Height and Area Allowable	11-1
1103	Location on Property	11-2
1104	Exit Facilities	11-2
1105	Light and Ventilation	11-6
1106	Enclosure of Vertical Openings	11-7
1107	Fire Protection and Hazards	11-7
1108	Plumbing and Toilet Facilities	11-8
1109	Mixed Occupancies	11-8
1110	Elevator Lobbies in High Rise Buildings	11-8
1111	Minimum Kitchen Sizes for Catering Establishments	11-9
1112	Atriums	11-9
1113	Accessibility for The Physically Handicapped	11-9
CHAPTER 12	REQUIREMENTS OF GROUP H OCCUPANCIES	
Paragraph No.	Paragraph Title	Page No.
1201	Group H Occupancy Defined	12-1
1202	Construction, Height and Area Allowable	12-1
1203	Location on Property	12-2
1204	Exit Facilities	12-2
1205	Light and Ventilation	12-3
1206	Enclosure of Vertical Openings	12-4
1207	Fire Protection and Hazards	12-4
1208	Plumbing and Toilet Facilities	12-5
1209	Mixed Occupancy	12-5
CHAPTER 13	REQUIREMENTS OF GROUP I OCCUPANCIES	
Paragraph No.	Paragraph Title	Page No.
1301	Group I Occupancy Defined	13-1

1302	Construction, Height and Area Allowable	13-1
1303	Location on Property	13-2
1304	Exit Facilities	13-2
1305	Light and Ventilation	13-3
1306	Enclosure of Vertical Openings	13-3
1307	Fire Protection and Hazards	13-3
1308	Plumbing and Sanitation	13-4
1309	Mixed Occupancy	13-5

PART IV - TYPES OF CONSTRUCTION

CHAPTER 14 CLASSIFICATION BY TYPES OF CONSTRUCTION		
Paragraph No.	Paragraph Title	Page No.
1401	Classification	14-1
1402	Existing Buildings	14-2
CHAPTER 15 TYPE I BUILDING (Fire-Resistive)		
Paragraph No.	Paragraph Title	Page No.
1501	Definition	15-1
1502	General	15-1
1503	Structural Framework	15-1
1504	Walls and Partitions	15-2
1505	Floors	15-5
1506	Roofs	15-6
1507	Enclosure of Vertical Openings	15-7
1508	Stairways	15-10
1509	Doors and Windows	15-11
1510	Projections From the Building	15-11
1511	Roof Structures and Skylights	15-11
1512	Combustible Materials Regulated	15-12
CHAPTER 16 TYPE II BUILDINGS (Semi-Fire-Resistive)		
Paragraph No.	Paragraph Title	Page No.
1601	Definition	16-1
1602	General	16-1
1603	Structural Framework	16-2
1604	Walls and Partitions	16-2
1605	Floors	16-2
1606	Roofs	16-3
1607	Enclosure of Vertical Openings	16-3
1608	Stairways	16-4
1609	Doors and Windows	16-4
1610	Projections From the Building	16-4
1611	Roof Structures and Skylights	16-4
1612	Combustible Materials Regulated	16-5
CHAPTER 17 TYPE III BUILDINGS (Ordinary Masonry)		
Paragraph No.	Paragraph Title	Page No.
1701	Definition	17-1
1702	General	17-2

1703	Structural Framework	17-2
1704	Walls and Partitions	17-3
1705	Floors	17-3
1706	Roofs	17-4
1707	Enclosure of Vertical Openings	17-4
1708	Stairways	17-5
1709	Doors and Windows	17-5
1710	Projections from the Building	17-5
1711	Roof Structures and Skylights	17-5
1712	Combustible Materials Regulated	17-6

CHAPTER 18 TYPE IV BUILDING (Noncombustible)

Paragraph No.	Paragraph Title	Page No.
1801	Definition	18-1
1802	General	18-1
1803	Structural Framework	18-1
1804	Walls and Partitions	18-2
1805	Floors	18-2
1806	Roofs	18-2
1807	Doors and Windows	18-3
1808	Projections from the Building	18-3
1809	Roof Structures and Skylights	18-3
1810	Combustible Materials Regulated	18-3

CHAPTER 19 TYPE V BUILDINGS (Wood Frame)

Paragraph No.	Paragraph Title	Page No.
1901	Definition	19-1
1902	General	19-1
1903	Walls and Partitions	19-1
1904	Floors	19-2
1905	Roofs	19-2
1906	Fireproofing	19-3
1907	Stairways	19-3
1908	Doors and Windows	19-3
1909	Projections From the Building	19-3
1910	Combustible Materials Regulated	19-3

PART V - ENGINEERING AND CONSTRUCTION REGULATIONS

CHAPTER 20 DESIGN LOADS

Paragraph No.	Paragraph Title	Page No.
2001	Scope	20-1
2002	Definitions and Standards	20-1
2003	General	20-4
2004	Minimum Loads	20-6
2005	Special Load Considerations	20-7
2006	Load Combinations	20-10
2007	Roof Live Loads	20-11
2008	Live Load Reductions	20-13
2009	Wind Loads	20-16

2010	Live Loads Posted	20-17
CHAPTER 21 EXCAVATIONS, FOOTINGS AND FOUNDATIONS		
Paragraph No.	Paragraph Title	Page No.
2101	Excavations	21-1
2102	Bearing Capacity of Soils	21-2
2103	Soil Bearing Foundations	21-3
2104	Pile Foundations	21-6
2105	Foundation Walls and Grade Beams	21-15
2106	Retaining Walls	21-16
2107	Seawalls, Bulkheads, and Docks	21-17
2108	Materials	21-17
CHAPTER 22 REINFORCED CONCRETE		
Paragraph No.	Paragraph Title	Page No.
2201	General	22-1
2202	Standards	22-1
2203	Definitions	22-1
2204	Materials and Tests	22-3
2205	Working Stresses and Quality of Concrete	22-3
2206	Mixing and Placing	22-5
2207	Forms and Details of Construction	22-8
2208	Precast Concrete Floor and Roof Units	22-11
2209	Prestressed Concrete	22-13
2210	Pneumatically Placed Concrete	22-14
CHAPTER 23 STEEL AND IRON		
Paragraph No.	Paragraph Title	Page No.
2301	General	23-1
2302	Materials	23-1
2303	Design Loads	23-2
2304	Minimum Thickness of Structural Steel	23-2
2305	Connections and Welding	23-3
2306	Tubular Columns	23-4
2307	Protection of Metal	23-4
2308	Open Web Steel Joists	23-5
2309	Light-Gauge Steel Construction	23-7
CHAPTER 24 WOOD		
Paragraph No.	Paragraph Title	Page No.
2401	Design	24-1
2402	Standards	24-1
2403	Definitions	24-1
2404	Quality and Sizes	24-2
2405	Allowable Unit Stresses and Load Tables	24-4
2406	Construction Details	24-9
2407	Heavy Timber Construction	24-23
2408	Protection of Wood	24-25
2409	Fire-Retardant Treated Wood	24-26
2410	Ministry of Works Low Cost Housing Plans	24-27

CHAPTER 25	ALUMINIUM	
Paragraph No.	Paragraph Title	Page No.
2501	General	25-1
2502	Allowable Unit Stresses	25-1
2503	Design	25-6
2504	Construction Details	25-6
2505	Fabrication and Erection Details	25-7
2506	Dissimilar Materials	25-8

CHAPTER 26	REINFORCED GYPSUM CONCRETE	
Paragraph No.	Paragraph Title	Page No.
2601	Design	26-1
2602	Standards	26-2
2603	Stresses	26-2
2604	Tests	26-2
2605	Construction Details	26-2

CHAPTER 27	MASONRY	
Paragraph No.	Paragraph Title	Page No.
2701	Design	27-1
2702	Standards	27-1
2703	Definitions	27-1
2704	Quality, Tests and Approvals	27-2
2705	Allowable Unit Stresses in Masonry	27-7
2706	Construction Details	27-7

PART VI - DETAILED REQUIREMENTS

CHAPTER 28	EXIT FACILITIES AND STAIRS	
Paragraph No.	Paragraph Title	Page No.
2801	General	28-1
2802	Required Means of Egress	28-5
2803	Stairways	28-6
2804	Ramps	28-12
2805	Smokeproof Towers	28-12
2806	Horizontal Exits	28-13
2807	Exit Courts and Exit Passageways	28-14
2808	Railings	28-15
2809	Elevators and Escalators	28-16
2810	Aisles and Corridors	28-17
2811	Doors	28-17
2812	Exit Signs and Lights	28-21
2813	Maintenance	28-21

CHAPTER 29	PRECAUTIONS DURING BUILDING CONSTRUCTION	
Paragraph No.	Paragraph Title	Page No.
2901	General	29-1
2902	Demolition	29-2
2903	Existing Buildings	29-4

2904	Excavation	29-5
2905	Covered Sidewalks and Hoardings	29-5
2906	Storage of Material	29-6
2907	Platform Hoists	29-6
2908	Hoisting Machinery	29-7
2909	Hoist Towers	29-8
2910	Derricks and Cranes	29-8
2911	Cables, Ropes, Chains and Blocks	29-9
2912	Temporary Flooring	29-9
2913	Floor Openings	29-10
2914	Runways and Ramps	29-10
2915	Temporary Stairways or Ladders	29-11
2916	Ladders	29-11
2917	Scaffolds	29-12
2918	Guard Rails and Toe Boards	29-14
2919	Temporary Light and Power	29-14
2920	Accidents	29-14
2921	Sanitation	29-15
2922	Welding and Cutting	29-15
2923	Open Fires	29-16
2924	Fire Protection	29-16
2925	Special Hurricane Precautions	29-17
2926	Inspection	29-17

CHAPTER 30 ROOF COVERING AND APPLICATION

Paragraph No.	Paragraph Title	Page No.
3001	General	30-1
3002	Guidelines for Roofing Applications	30-10
3003	Cement and Clay Roof Tile	30-22
3004	Metal Shingles	30-25
3005	Wood Shingles and Shakes	30-27
3006	Roof Insulation	30-28
3007	Roofing Accessories	30-30
3008	Roof Mounted Equipment	30-34

CHAPTER 31 CLADDING AND GLAZING

Paragraph No.	Paragraph Title	Page No.
3101	General	31-1
3102	Lathing	31-2
3103	Plaster	31-6
3104	Rendering and Stucco	31-11
3105	Plastics	31-14
3106	Asbestos Cement	31-15
3107	Tile	31-15
3108	Glass and Glazing	31-16
3109	Glass Veneer	31-22
3110	Gypsum Board Products and Accessories	31-23
3111	Suspended and Furred Ceilings	31-25
3112	Other Materials	31-25
3113	Storm Shutters	31-26

3114	Curtain Walls & Structural Glazing	31-27
------	------------------------------------	-------

PART VII - FIRE RESISTIVE STANDARDS

CHAPTER 32 FIRE RESISTIVE STANDARDS		
Paragraph No.	Paragraph Title	Page No.
3201	General	32-1
3202	Fire Resistive Materials	32-4
3203	Protection of Structural Members	32-8
3204	Walls and Partitions	32-11
3205	Floor-Ceilings or Roof-Ceilings	32-11
3206	Fire Resistive Assemblies for Protection of Openings	32-13
3207	Fire Retardant Roof Coverings	32-18
3208	Interior Finishes	32-18
3209	Insulating Materials	32-20
3210	Calculations of Fire Resistance	32-21
CHAPTER 33 INTERIOR DECORATIVE FINISHES		
Paragraph No.	Paragraph Title	Page No.
3301	General	33-1

PART VIII – MISCELLANEOUS

CHAPTER 34 FABRIC AWNINGS, CANOPIES, TENTS AND BLEACHERS		
Paragraph No.	Paragraph Title	Page No.
3401	General	34-1
3402	Definitions	34-1
3403	Building Permits and Inspections	34-2
3404	Location and Use	34-3
3405	Construction	34-4
3406	Tents	34-6
3407	Bleachers	34-7
CHAPTER 35 RIGID AWNINGS, CANOPIES, SCREEN ENCLOSURES AND UTILITY SHEDS		
Paragraph No.	Paragraph Title	Page No.
3501	General	35-1
3502	Building Permits and Inspection	35-2
3503	Design	35-2
3504	Location	35-4
3505	Outdoor Theatre Screens and Bandshells	35-5

PART IX - MECHANICAL

CHAPTER 36 PLUMBING		
Paragraph No.	Paragraph Title	Page No.
3601	Administrative	36-1
3602	Definitions	36-13

3603	General	36-26
3604	Materials	36-36
3605	Drainage System and Disposal	36-46
3606	Indirect Waste Piping and Special Wastes	36-60
3607	Joints and Connections	36-63
3608	Traps and Cleanouts	36-68
3609	Hangers and Supports	36-72
3610	Vents and Venting Systems	36-75
3611	Storm Drainage System	36-83
3612	Interceptors and Separators	36-91
3613	Plumbing Fixtures and Requirements	36-96
3614	Water Supply and Distribution	36-112
3615	Sewage and Liquid Waste Disposal Systems	36-130
3616	Supply and Disposal Wells	36-149
3617	Plumbing Code for Small Buildings	36-154

CHAPTER 37 FIRE PROTECTION AND EMERGENCY LIGHTING SYSTEMS

Paragraph No.	Paragraph Title	Page No.
3701	General	37-1
3702	Automatic Fire-Extinguishing Systems	37-2
3703	Automatic-Sprinkler Systems	37-2
3704	Carbon Dioxide, Dry Chemical, Halon, Expanding Foam or Approved Extinguishing Agent	37-7
3705	Standpipes	37-8
3706	Water Supply For Fire Fighting	37-11
3707	Fire-Department Connections	37-13
3708	Yard Hydrants	37-14
3709	Portable Fire Extinguishers	37-15
3710	Inspections and Tests	37-15
3711	Alarm, Fire Detection and Smoke Venting Systems	37-16
3712	Exit & Emergency Lighting Systems	37-24
3713	Auxiliary Stand-By Emergency Service	37-28

CHAPTER 38 HEAT-PRODUCING APPARATUS

Paragraph No.	Paragraph Title	Page No.
3801	General	38-1
3802	Gas-Burning Appliances	38-3
3803	Oil-Burning Appliances	38-3
3804	Fresh-Air Supply	38-3
3805	Space Heaters	38-4
3806	Ranges	38-4
3807	Gas Water Heaters	38-5
3808	Boilers and Unfired Pressure Vessels	38-6
3809	Incinerators	38-8
3810	Solar Heaters	38-8
3811	Building Exits	38-9

CHAPTER 39 SPECIAL HAZARDS

Paragraph No.	Paragraph Title	Page No.
3901	Transformer Vaults	39-1

3902	Flammable and Combustible Liquids	39-3
3903	Ventilation and Exhaust Ducts	39-7
3904	Film	39-11
3905	Explosives	39-11
3906	Air Contaminants	39-11
3907	Radiation Protection	39-11
3908	Paint Spray Booths and Dip Tanks	39-12
3909	Restaurant Hoods, Automatic Fire Extinguishing System	39-13
CHAPTER 40	MECHANICAL VENTILATION	
4001	Scope	40-1
4002	Application	40-1
4003	Requirements Based on Use	40-2
4004	Ventilating Ducts	40-3
4005	Hoods Over Restaurant Equipment	40-3
4006	Exhaust Systems For Flammable Vapours	40-5
4007	Exhaust Systems For Special Hazardous Storage Areas	40-5
4008	Minimum Standards For Public Sanitary Facilities	40-6
4009	Fire Control	40-6
CHAPTER 41	AIR CONDITIONING AND REFRIGERATION	
4101	General	41-1
4102	Standards	41-3
4103	Detailed Requirements	41-4
4104	Fire Control	41-7
CHAPTER 42	SWIMMING POOLS	
4201	Definitions	42-1
4202	Swimming Pools – General	42-2
4203	Swimming Pool – Applications	42-2
4204	Swimming Pool Construction	42-2
4205	Swimming Pool Water Quality	42-4
4206	Swimming Pool Recirculation System Requirements	42-5
4207	Swimming Pool - Piping and Hydraulic Requirements	42-7
4208	Swimming Pool Filtration Systems	42-8
4209	Surface Skimming For Pools	42-11
4210	Piping for Pools	42-12
4211	Swimming Pool - Equipment Rooms	42-13
4212	Swimming Pool - Diving Areas	42-13
4213	Swimming Pool Lighting	42-15
4214	Swimming Pool - Dressing Rooms and Spectator Provisions	42-15
4215	Swimming Pool - Sanitary Facilities	42-15
4216	Hot Tubs and Spas	42-16
CHAPTER 43	ELEVATORS AND ESCALATORS	
4301	Standards	43-1

4302	Definitions	43-2
4303	General	43-2
4304	Elevators	43-6
4305	Escalators, Dumbwaiters and Moving Stairways	43-8
4306	Transporting Assemblies	43-8
4307	Compliance With Other Sections	43-9
4308	Special Requirements	43-9
4309	Fireman Control Elevators	43-10

PART X - ELECTRICAL AND TELEPHONE SERVICES

CHAPTER 44	ELECTRICAL AND TELEPHONE SERVICES	
4401	Electrical	44-1
4402	Telephone Services	44-3
4403	Telephone Switchboard Installations	44-4
4404	Telephone Installations Without Switchboards	44-7
4405	Telephone Installations in Dwelling Houses	44-7

PART XI – ACCESSIBILITY FOR THE PHYSICALLY HANDICAPPED

CHAPTER 45	ACCESSIBILITY FOR THE PHYSICALLY HANDICAPPED	
4501	Application	45-1
4502	General Requirements	45-1
4503	Exceptions for Specific Conditions and Occupancy	45-8

PART XII – APPENDICES

APPENDIX A	Engineering Practice Standards	A-1
APPENDIX B	Mechanical Drawings	B-1
APPENDIX C	Ventilation of Public Sanitary Facilities	C-1
APPENDIX D	Communication Drawings	D-1
APPENDIX E	Rainwater Tank Sizes	E-1
APPENDIX F	Nail and Gauge Sizes	F-1
APPENDIX G	S.I. Unit Conversions	G-1
APPENDIX H	Tenting of Recessed Light Fixtures	H-1

PART XIII – INDEX

A	Index-1
B	Index-5
C	Index-8
D	Index-13
E	Index-16
F	Index-19
G	Index-25
H	Index-28
I	Index-31
J	Index-33
K	Index-34
L	Index-35

M
N
O
P
Q
R
S
T
U
V
W
X
Y

Index-38
Index-41
Index-42
Index-43
Index-49
Index-50
Index-52
Index-56
Index-58
Index-59
Index-60
Index-64
Index-65

BAHAMAS BUILDING CODE
THIRD EDITION
Issued Under
THE BUILDINGS REGULATION ACT, 1971

PART I
TITLE AND DEFINITIONS

CHAPTER 1

101 TITLE

102 PURPOSE

103 SCOPE

104 APPLICATION TO EXISTING BUILDINGS

105 MOTION PICTURE AND TELEVISION PRODUCTION SETS

106 CONNECTED LEGISLATION

101 TITLE

This compilation of requirements shall be known as “The Bahamas Building Code” and may be cited as such, or as The “Building Code” and will be referred to hereinafter as “this Code”.

102 PURPOSE

The purpose of this Code is to provide certain minimum standards, provisions and requirements for safe and stable building design, methods of construction and uses of materials in buildings and/or structures hereafter erected, constructed, enlarged, altered, repaired, moved, converted to other uses or demolished, to regulate the equipment, materials, use and occupancy of all buildings. The provisions of this Code supplement The Buildings Regulations Act 1971 and the Subsidiary Legislation made thereunder and form a condition of the approval of each and every building permit.

103 SCOPE

- 103.1 New buildings and structures hereafter erected in The Commonwealth of The Bahamas, except in the Port Area in Grand Bahama Island, shall conform to the requirements of this Code.
- 103.2 Additions, alterations and repairs in all buildings and structures shall comply with the provisions for new buildings and structures except as otherwise provided in Section 104 of this Chapter.
- 103.3 Any material change of use, or occupancy, of a building shall comply with Rule 4 of The Buildings Regulation (General) Rules 1971.

104 APPLICATION TO EXISTING BUILDINGS

- 104.1 **GENERAL:** Where it is intended to extend, alter or repair any existing building or structure the whole building or structure shall be made to conform to

all the requirements for new buildings or structures of similar area, height, Type of construction or Group of Occupancy except as set forth below: —

104.2 ADDITIONS:

- (a) Where an addition is proposed, or intended to be made, to an existing building and the addition and existing building are to be separated by a fire division wall, the addition shall comply with all the requirements of this Code applicable to a building of the area of the addition.
- (b) *Where an existing building and a proposed, or intended, addition are not to be separated by a fire division wall and the area of the addition is 25 percent or more of the area of the existing building, the existing building and the addition shall be made to comply with all the requirements of this Code for a building with an area equal to the total area of the addition and the existing building.*
- (c) Where an existing building and a proposed, or intended, addition are not to be separated by a fire division wall and the area of the addition is less than 25 percent of the area of the existing building the following shall apply:
 - (1) The addition shall conform to all the requirements of this Code applicable to a building of the combined area of the addition and the existing building.
 - (2) The existing building shall conform to all requirements of this Code applicable to facilities for means of egress for a building of the combined area of the addition and the existing building.
 - (3) An approved smoke detector system shall be provided for all public areas and means of egress within the complete building.

104.3 REPAIRS:

- (a) The Buildings Regulation Act 1971 defines repair as follows:

“repair” in relation to a building, means any repair to or replacement of any part of the building the cost of which either alone or when taken together with the aggregate cost of all other repairs and replacements made to the building during the period of twelve months next preceding the date of commencement of such repairs or replacement, exceeds twenty-five per centum of the current value of the building.
- (b) Under the Act a repair is classed as a ‘building operation’ and as such requires a building permit.

104.4 VALUE DETERMINATION: *For the purpose of this section, the value of a building or structure shall be the estimated cost of constructing a new building of like size, design and materials at the site of the original structure, assuming such site to be clear and deducting therefrom an amount for depreciation, deterioration and damage before such proposed new construction is started. For the purpose of this section, cost of additions, alterations and repairs shall be construed as the total cost of labour, materials and services, based on current prices for new materials.*

104.5 ROOFING: *The specific permit requirements for the repair or replacement of an existing roof covering are set out in Section 3001.5.*

104.6 HISTORICAL BUILDINGS: *Where it is intended to repair or renovate a building of historical interest and compliance with this Code may detract from the historical character of the building, the Minister may, at his discretion, waive certain Code requirements upon written application by the owner or his agent.*

105 MOTION PICTURE AND TELEVISION PRODUCTION SETS

105.1 GENERAL: Where the proposed making of a commercial motion picture or television production has received the approval of the Minister of Tourism, this Code shall not apply to the construction and erection of any temporary sets used in connection therewith provided—

- (a) *The Director of The Bahamas Film and Television Commission shall inform the Buildings Control Officer of the approval of the project and shall also provide the Buildings Control Officer with a shooting schedule indicating the type and location of any sets. The Buildings Control Officer shall be kept informed of any proposed alterations to the schedule.*
- (b) All electrical equipment and materials shall comply with the Standards set forth in Appendix A. Wiring on set shall comply with Section 4401.4 of this Code.
- (c) Toilet facilities and the provision of potable water shall comply with the requirements of the Minister of Health.
- (d) *Where a set involves the use of combustible materials anywhere in the City of Nassau, or is located inside public building, the Director of The Bahamas Film and Television Commission shall so inform the Buildings Control Officer and Chief Fire Officer.*
- (e) Buildings Control Officer shall have access to any set, at all reasonable times, to determine if the electrical installations comply with (b) above and also to determine the extent of the storage and method of handling

any hazardous liquids, gases or materials, or for any other reason related to this Code.

- (f) *Upon the completion of the production, for which the set was erected, the set shall be demolished. The resulting debris shall be disposed of in a manner acceptable to the Minister of Health.*
- (g) *If for any reason the set is required for continuous use or for use other than that for which it was erected, application shall be made to the Buildings Control Officer for a building permit in the normal manner.*

106 CONNECTED LEGISLATION

106.1 GENERAL: *Persons using this Code are advised to examine the following pieces of Legislation: -*

- (a) *The Buildings Regulation Act 1971 and all subsequent revisions made thereto.*
- (b) *The Buildings Regulation (Rules) made under the Buildings Regulation Act 1971 and all subsequent revisions made thereto.*
- (c) *The Town Planning Act Chapter 206 of the Statute Law of the Bahama Islands and all subsequent revisions made thereto.*
- (d) *The Garage Licensing Act 1980.*
- (e) *The Professional Architects Act 1994 and as revised under (d) above.*
- (f) *The Local Government Act 1996, which supersedes any Extension orders to the Out or Family Islands, made under (a), (b) or (c) above.*
- (g) *The Antiquities, Monuments and Museum Act 1998.*

The above documents may be purchased from:

The Government Publication Office
c/o Cabinet Office
P.O. Box N-7147
Nassau, N.P.
Bahamas.

CHAPTER 2 DEFINITIONS

Unless otherwise expressly stated, all words other than herein defined shall have the meaning implied by their context in this code or their ordinarily-accepted meaning in the construction industry; words used in the present tense include the future; words in the masculine gender shall include the feminine and neuter; the singular number shall include the plural; and the plural number shall include the singular.

The word "person" includes a corporation or limited company as well as the individual, "writing" includes printing and typewriting; "signature" includes a mark made by a person who does not write, if his name is written near to such mark.

ACCESSIBLE: -

means having reasonable and adequate clearance on sides and above for inspection, service, repair and replacement, without removing permanent construction; or visible, unobstructed and within physical reach.

ACT: -

means an Act that forms part of the Statute Laws of the Bahama Islands and shall include any subsidiary legislation made thereunder.

ADDITION: -

means an extension or increase in floor area or height of a building.

AGGREGATE: -

means inert material, which is to be mixed with cement and water to produce concrete.

AGGREGATE (Fine): -

means aggregate consisting of particles three-eighths of an inch or less in size.

ALLEY: -

means a pedestrian public way with a minimum horizontal dimension of 10 feet, lined on both sides with buildings and / or groups of buildings housing individual or multiple tenants. It shall not be covered or roofed over for more than 20% of its length. The accesses to the alley shall be to the open air.

ALTERATION: -

means any change or rearrangement in the parts of a building or existing facilities of any such building or structure, or any enlargement thereof, whether by extension on any side or by any increase in height, or the moving of such building or structure from one location or position to another.

APARTMENT: -

means one or more rooms in an apartment building occupied as a home or residence for an individual or a family or a household. The existence of, or the installation of, sink accommodations and/or cooking facilities within a room or suite of rooms shall be deemed sufficient to classify such room or suite of rooms as an apartment.

APARTMENT BUILDING: -

means a building made up of three or more apartment units so arranged that each unit has direct access to a means of egress from the building, which may or may not contain an inner lobby for its tenant.

APARTMENT HOTEL: -

means, in New Providence, a building or group of buildings under the same management in which there are ten or more sleeping accommodations for hire, primarily used by transients, such accommodations may include individual or collective catering facilities. In the Family Islands the minimum number of accommodations shall be five.

APPROVED: -

means approved by the Minister and all other authorities given jurisdiction by this Code. The approval of one authority only is not sufficient.

ARCHITECT: -

means a person so registered as such under the Professional Architects Act 1994.

ARCHITECTURAL TECHNICIAN: -

means a person so registered as such under the Professional Architects Act 1994.

AREA: -

means

- (a) when referring to the whole building, the sum of the areas at each floor level contained by the outside dimensions of the building, including balconies, carports, garages, laundries, porches, servant quarters, verandahs and other similar structures;
- (b) when referring to a corridor, hallway, foyer, room or other similar part of a building, the area contained within the walls enclosing the corridor, hallway, foyer, room or other similar part of the building.

ATRIUM: -

means a vertical opening within a building that communicates between floors, is enclosed by a roof at its highest point and is bounded by enclosing walls. No horizontal dimension between opposite edges of the floor opening shall be less than 20' and the minimum size of the opening shall be 1000 sq. ft.

AUTOMATIC: -

means providing a function without the necessity of human intervention.

BALCONY: -

means

- (a) that portion of a seating space of an assembly room, the lowest part of which is raised four feet or more above the level of the main floor; or
- (b) a platform with a parapet or handrail that projects from the building, the lowest part of which is raised four feet or more above the general ground level.

BASEMENT: -

means that portion of a building which is partly underground, but having at least one-half of its height, measured from the finished floor to the finished ceiling, above the level of the centre of the street front.

BEARING WALL: -

means any wall, which carries any load as well as its own weight.

B.C.O.: -

means Buildings Control Officer, see below.

BUILDING: -

for the purpose of this Code "building" shall be as defined in The Buildings Regulation Act.

BUILDINGS CONTROL OFFICER: -

for the purpose of this Code Buildings Control Officer shall be as defined in The Buildings Regulation Act, (B.C.O.)

BUILDING SEWER: -

means a sewer running from a single building to a private sewer, public sewer, septic tank or treatment plant.

CARPORT: -

means a structure not more than one storey in height, without walls, doors or other enclosure on at least two sides, used exclusively for the storage or parking of motor vehicles, and which is accessory to a private dwelling.

CELLAR: -

means that portion of a building having more than one-half of its height, measured from finished floor to finished ceiling, below the level of the centre of the street front.

COLUMN: -

means an upright compression member the length of which exceeds three times its least lateral dimension.

COMBUSTIBLE: -

means capable of being ignited and continuing to burn or glow with a flame at or below a temperature of 1,200 degrees Fahrenheit.

****COMBUSTIBLE LIQUID: -**

means a liquid having a flash point at or above 100°F (37.8°C).

Combustible liquids shall be further subdivided as follows: —

Class II liquids shall include those having flash points at or above 100°F (37.8°C) and below 140°F (60°C).

Class III A liquids shall include those having flash points at or above 140°F (60°C) and below 200°F (93.4°C).

Class III B liquids shall include those having flash points at or above 200°F (93.4°C).

CONCRETE: -

means a mixture of cement, aggregate, and water.

CORRIDOR: -

means a path of egress connecting more than one room or occupied space on any one floor; a hallway.

CONDOMINIUM: -

is a building in respect of which a Declaration under Section (4) of the Law of Property and Conveyancing (Condominium) Act 1965 has been lodged for record.

COVERED MALL: -

means a covered or roofed interior area having a minimum horizontal dimension of 20 feet, used as a pedestrian public way and connecting buildings and / or groups of buildings housing individual or multiple tenants.

DEAD LOAD: -

means the weight of all walls, floors, roofs, partitions and other similar permanent construction.

DRAIN: -

means any pipe used for the drainage of surface water.

DWELLING: -

means a building occupied in part or in whole for residential purposes and serving not more than two housekeeping units used for cooking, living, or sleeping purposes.

ENGINEER RECOGNISED BY THE MINISTER: -

means for the purpose of this Code a person who by his standard of engineering education, technical experience and professional standing shall be recognised by the Minister as qualified to practice engineering to the standards required by this Code.

EXIT: -

means that portion of a means of egress that is separated from all other spaces of the building or structure by construction or equipment as required by this Code to provide a protected way of travel to the exit discharge.

EXIT ACCESS: -

means that portion of a means of egress, which leads to an entrance of an exit.

EXIT COURT: -

means a yard or court providing egress to a public way for one or more required exits.

EXIT DISCHARGE: -

means that portion of a means of egress between the termination of an exit and a public way.

EXTERNAL WALL: -

means an outer wall of a building but does not include a wall separating buildings.

FAMILY: -

means any number of persons living together under one head as a single house-keeping unit, whether related to each other legally or not and shall be deemed to include servants who live in, but shall not include paying guests.

FIRE ASSEMBLY: -

means the assembly of a fire door, fire window, or fire damper, including all required hardware, anchorage, frames and sills.

FIRE ASSEMBLY, AUTOMATIC CLOSING: -

means a fire assembly which may remain in an open position and which will close automatically if subjected to either of the following:

- (a) *An increase in temperature.*
- (b) *Products of combustion. Unless otherwise specified, the closing device shall be one that is rated at a maximum temperature of 165° F. The closing device shall be operated by the activation of an approved unit type smoke and*

heat-activated detector or approved detection device having an equivalent response to smoke and products of combustion. Unit type smoke detectors shall conform to the Standard for Essential Electrical Systems for Hospitals. NFPA 76A and installation of Air Conditioning and Ventilating Systems (Non-Residential) NFPA 90A, as set forth in Appendix "A" of this Code.

FIRE ASSEMBLY, SELF-CLOSING: -

means a fire assembly, which is kept in a normally closed position and is equipped with an approved device to ensure closing and latching after having been opened for use.

FIRE BARRIER: -

means a continuous membrane, either vertical, such as a wall assembly, or horizontal, such as a floor assembly, that is designed and constructed with a specified fire resistance rating to limit the spread of fire and which will restrict the movement of smoke. Such barriers may have protected openings. See Sections 1504 of this Code.

FIRE DAMPER: -

means an approved device, installed in an air distribution system, designed to close automatically upon detection of heat, to interrupt the passage of flame. A combination fire and smoke damper shall meet the requirements of both.

FIRE DIVISION: -

means a portion of a building so separated from the rest by firewalls that may be erected to a maximum height and area allowed for the governing Occupancy and the Type of Construction, independently of adjoining Occupancies or Types of Construction.

FIRE DOOR: -

means a door and its assembly so constructed and placed as to give protection against the passage of fire.

FIRE EXIT HARDWARE: -

(See PANIC HARDWARE)

FIRE ESCAPES: -

means a single or series of steel framed balconies attached to the exterior walls at windows or doors and connected to each other and to the ground by flights of steel stairs.

FIRE-RESISTIVE RATING: -

means the time in minutes or hours that materials or assemblies have withstood a fire exposure as established in accordance with the test procedures of Standard Methods of Fire Tests of Building Construction and Materials. NFPA 251: or other recognised testing procedures established by UL, Factory Mutual Research Corporation or the ASTM.

FIRE-RETARDANT TREATED WOOD: -

means wood that has been treated to comply with Subsection 2409 of this Code.

FIRE WINDOW: -

means a window assembly, including frame, wired glass and hardware that under NFPA 257, ASTM E163 or UL9 meets the fire protective requirements for the location in which it is used.

FIRST FLOOR: -

means the floor above the ground floor.

FLAMMABLE: -

means easily set on fire.

****FLAMMABLE LIQUID: -**

means a liquid having a flash point below 100°F (37.8°C) and having a vapour pressure not exceeding 40 pounds per square inch (absolute) at 100°F shall be known as a Class I liquid.

Class I Liquids shall be further subdivided as follows: —

Class I A shall include those having flash points below 73°F (22.8°C) and having a boiling point below 100°F (37.8°C).

Class I B shall include those having flash points below 73°F (22.8°C) and having a boiling point at or above 100°F (37.8°C).

Class I C shall include those having flash points at or above 73°F (22.8°C) and below 100°F (37.8°C).

FLAME SPREAD RATING: -

means the figure obtained from the test described by the National Fire Protection Association, pamphlet no. 255. Method of Test of Surface Burning Characteristics of Building Materials. The result of this test is based on a scale where the flame spread rating for cement asbestos board is 0, and the rating for Red Oak is 100.

FOUNDATION: -

means a structural unit used to distribute loads to the bearing stratum.

FOYER: -

means an area or space within a building and located between a lobby and main entrance and the main floor.

GARAGE: -

means

(a) private garage means an enclosed accessory building or portion of the main

building used for parking automobiles belonging to the occupants of the building.

- (b) public garages means a building other than a private garage used for the care, storage, repair, painting, washing or equipping of motor vehicles.

GROUND FLOOR: -

means the floor whose level is in closest proximity to the average finished ground level.

GUEST: -

means

- (a) in connection with multiple-family occupancies, a person hiring a room for living and/or sleeping purposes;
- (b) in connection with single-family and two-family occupancies, a person sharing single family accommodations without profit on those accommodations.

GUEST HOUSE: -

- (a) as part of multiple-family occupancies means a detached single-family dwelling occupied or intended to be occupied for hire.
- (b) as part of a single-family and two-family occupancies means a detached portion which provides room and necessary appurtenances for the sleeping accommodation and/or entertainment of non-paying guests and their servants; but not provided with means for the general and regular serving of meals.

GUEST ROOM: -

- (a) in connection with multiple-family occupancies means a room in a building, occupied or intended to be occupied for hire.
- (b) in connection with single-family and two-family occupancies means a room in the main or an accessory building occupied or intended to be occupied by non-paying guests.

HABITABLE ROOM: -

means a room in a residential unit used for living, sleeping, eating or cooking, but excluding baths, toilets, storage spaces or corridors.

HEIGHT: -

in relation to building, means the height of the building measured from the mean level of the ground adjoining the outside of the external wall to the level of half the vertical height of the roof or to the top of the walls or of the parapet, if any, whichever is higher.

HIGH HAZARD CONTENTS: -

means those which are liable to burn with extreme rapidity or from which poisonous fumes or explosions may be expected in the event of fire.

HIGH RISE BUILDING: -

means any building having a floor level or floors more than 75' above the level of the adjacent grade.

HOTEL: -

means, in New Providence, a building containing ten or more rooms, intended or designed to be used or which are used, rented or hired out to be occupied, or which are occupied for sleeping purposes by paying guests. Such building shall be entered through a main foyer and shall contain public rooms and maintain communal catering facilities for its guests. In the Family Islands the minimum number of rooms shall be five.

Notwithstanding the above definition, a hotel to be considered under the Hotel Encouragement Act and/or the Hotel Licensing Act shall comply with the requirements of these Acts in every way.

JOISTS: -

means secondary horizontal supporting members in floor, ceiling, or roof construction.

LINTEL: -

means the beam or girder placed over an opening in a wall which supports the construction above.

LIVE LOAD: -

means all loads other than the dead load.

LOT: -

means a portion or parcel of land considered as a unit.

LOT LINE: -

means a line dividing one lot from another or from a street or other public space.

LOW HAZARD CONTENTS: -

means those of such low combustibility that no self-propagating fire therein can occur and that, consequently, the only probable danger requiring the use of emergency exits will be from panic, fumes, smoke, or fire from some external source.

MASONRY: -

means brick, stone, plain, concrete, hollow block, solid block or similar materials or units bonded together with mortar. Reinforced concrete is not classified as masonry.

MEANS OF EGRESS: -

means a continuous and unobstructed way of exit travel from any point in a building, or structure, to a public way and consists of three separate and distinct parts.

- (a) The way of exit access
- (b) The exit
- (c) The way of exit discharge.

MEZZANINE: -

means an intermediate floor placed in any storey or room. When the total area of any such mezzanine floor exceeds 33-1/3 percent of the total floor area in that room or storey in which the mezzanine floor occurs, it shall be considered as constituting an additional storey. The clear height above or below a mezzanine-floor construction shall not be less than seven feet.

MINISTER: -

means the Minister charged with the responsibility for the administration of The Buildings Regulation Act.

NON-BEARING WALL: -

means any wall, which carries no load other than its own weight.

NON-COMBUSTIBLE: -

means a material which, in the form in which it is used, meets the following requirements:

- (a) Material of which no part will ignite and burn when subjected to fire. Any material conforming to the standards set forth in the Method of Test for Determining Non-combustibility of Elementary Materials, ASTM Designation E136 of the American Society for Testing and Materials.
- (b) Material having a structural base of non-combustible material as defined in paragraph (a) above, with a surfacing not more than one eighth inch thick having a flame spread rating not greater than 50 when tested in accordance with the standard set forth in the "Standard Method of Test for Surface Burning Characteristics of Building Materials" ASTM Designation E84 of the American Society for Testing and Materials.
- (c) Non-combustible does not apply to surface finish materials or to materials required to be non-combustible for reduced clearances to flues, heating appliances other materials, or
- (d) No material shall be classed as non-combustible, which is subject to increase in combustibility or flame-spread rating beyond the limits herein established, through the effect of age, moisture or other atmospheric condition.

NON-FLAMMABLE: -

shall mean not easily set on fire.

OCCUPANCY: -

as used in this Code, pertains to and is the purpose for which a building is used or intended to be used. Occupancy is not intended to include tenancy or proprietorship.

OCCUPANT LOAD: -

means the total number of persons that may occupy a building or portion thereof at any one time.

OCCUPIED: -

means as applied to any structure, occupied or intended, designed or arranged to be occupied.

ORDINARY HAZARD CONTENTS: -

means those which are liable to burn with moderate rapidity or to give off a considerable volume of smoke but from which neither poisonous fumes nor explosions are likely to be expected in the case of fire.

OWNER: -

includes his duly authorised agent, a purchaser, devisee, trustee, property holder or any other person, firm or corporation having a vested or contingent interest, or in case of leased premises, the legal holder of the lease contract, or his legal representative, assign or successor.

PANEL LENGTH: -

means the distance in either rectangular direction between centres of two columns of a panel.

PANEL WALL: -

means a non-bearing wall in skeleton construction built between columns or piers and wholly supported at each storey. Windows and other openings shall be included in the wall dimensions.

PANIC HARDWARE AND FIRE EXIT HARDWARE: -

means a type of latching device used on certain doors in means of egress in which the release mechanism is operated by the application of force in the direction of exit travel. The two terms have identical meaning, except that fire exit hardware is required on a fire rated door assembly. See Paragraph 2811 of this Code.

PARAPET WALL: -

means that portion of a wall extending above the roof.

PARKING GARAGE: -

means garage for passenger vehicles involving only the parking or storing of automobiles and not including automobile repair or service work or the sale of gasoline or oil.

PARTITION: -

means a non-bearing interior wall one storey or less in height.

PARTY WALL: -

may take either of the following forms:

- (a) **COMMON PARTY WALL: -** means a wall separating two adjoining buildings which is deemed to belong jointly to the two owners of the buildings, the boundary between the two buildings being the centre of the thickness of the wall.
- (b) **EXTERNAL PARTY WALL: -** means the external wall of a building immediately adjacent to a property boundary and a similar wall located on the contiguous lot. The walls shall either touch, or be so located as to prohibit access between them.

PENTHOUSE: -

means an enclosed roof structure extending not more than 12 feet above the roof of a building and covering not more than 25 percent of the area. A penthouse shall not be considered as a storey if it is used for housing mechanical and electrical equipment only.

PERMIT: -

means a written authorisation by and on behalf of the Minister to proceed with construction, alteration, repair, installation or demolition.

PLATFORM: -

means a portion of an assembly room which may be raised above the level of the assembly floor and which may be separated from the assembly space by a wall and proscenium opening provided the ceiling above the platform shall not be more than 5 feet above the proscenium opening.

PORCH: -

See Verandah.

PREFABRICATED: -

means fabricated prior to installation or erection.

PRIMARY MEMBER: -

means a column, beam, girder or truss spaced more than 4 feet apart or supporting load over spans exceeding 40 feet. Load bearing masonry walls and flat slabs supporting more than 160 square feet of floor or roof deck shall be considered primary members.

PRIVATE SEWER: -

means any pipe used for the drainage of more than one building other than a public sewer.

PRIVATE STAIRWAY: -

means a stairway serving one tenant only and not for general public use.

PROTECTED LOBBY: -

means a lobby that is protected by fire doors.

PUBLIC BUILDING: -

means a building used or intended to be used either ordinarily or occasionally, as a church, chapel or other place of worship, or as a hospital, public institution, college or school not being merely a private dwelling house occasionally used, theatre, public hall, public concert room, public ballroom, public lecture room, or for persons admitted thereto by tickets or otherwise or used or intended to be used either ordinarily or occasionally, for any other public purpose.

PUBLIC WAY: -

means any street, alley or similar public open space, which is at least ten feet wide.

RAFTERS: -

means secondary inclined supporting members in roof construction.

REINFORCED CONCRETE: -

means concrete in which metal is embedded in such a manner that the two materials act together in resisting stresses.

REPAIR: -

means the replacement of existing work with the same kind of material for the purposes of its maintenance, but not including additional work that would affect appearance, structural, sanitary or fire resistive safety or exit facilities.

RESTAURANT: -

means every building or part thereof and all outbuildings used in connection therewith, or any place or location, kept, used, maintained as, advertised as, or held out to the public to be a place where meals or sandwiches are prepared and / or served, either gratuitously or for pay.

RESIDENCE: -

means the usual place of abode of a person or family.

ROOF JOISTS: -

where roof members are nearly horizontal and are supported from bearing to bearing without an intermediate ridge, such members shall be termed roof joists.

ROOF LIVE LOAD: -

means the weight superimposed on a roof structure by the use and occupancy of the building and water during the life of the structure, but not including wind load, load or dead load.

ROOFING: -

means the covering applied to the roof for weather protection, fire resistance or appearance.

ROOM: -

means every compartment in any building, including parlours, dining rooms, sleeping rooms and porches, kitchens, offices, closets, pantries or storage or equipment spaces.

ROSTRUM: -

means a portion of an assembly room, which may be raised above the level of the assembly floor but is not separated there from by any wall.

RUBBLE: -

means masonry composed of unsquared or fieldstones laid in mortar without regular coursing.

SEATING CAPACITY: -

means where seats are fixed, the number of persons for whom seats are provided; where seats are not fixed, or provided, the capacity shall be calculated on the basis of the areas given in this Code.

SECONDARY MEMBER: -

beams or joists spaced not more than four feet apart or not spanning more than 40 feet.

SELF-CLOSING: -

means as applied to a fire door or other opening protector, which is normally in a closed position, that is equipped with an approved device which will ensure closure after having been opened for use.

SERVANTS QUARTERS: -

- (a) as accessory to multiple-family occupancies means accommodations for such number of servants and other employees as are required by the main occupancy and which accommodations may be detached and may or may not include separate cooking facilities;
- (b) as accessory to single-family occupancies means accommodations for such number of servants in personal service and/or for the maintenance of the premises as could be reasonably required and which accommodations may be detached.

SERVICE STATION: -

means a building or portion thereof where gasoline, oil and greases are supplied and dispensed to the motor vehicle trade, also where tire, battery, washing, polishing and lubrication services are rendered and minor adjustments are made. Paint shop and bodywork facilities shall not be included.

SHAFT: -

means a vertical opening or passage through two or more floors of a building through floors and roof.

SMOKE DAMPER: -

means an approved device to resist the passage of smoke which:

- (a) is arranged to operate automatically, and*
- (b) is controlled by a smoke detector, and*
- (c) may be capable of being positioned manually from a fire command station. A smoke damper may be a fire damper or a damper serving other functions, if its location lends itself to multiple functions. A combination fire and smoke damper shall meet the requirements of both. Smoke dampers must meet UL Standard 555S, leakage classification II.*

SMOKE RESERVOIR: -

means an area formed at ceiling level, by means of non-combustible curtains or similar methods, to control the spread of smoke.

SPECIFICATIONS: -

wherever the specifications of governing authorities are mentioned in this Code, the reference shall be to the most recent editions.

STAGE: -

means a partially enclosed portion of an assembly room wherein scenery drops or other effects may be installed and used, and which is cut off from the audience section by a proscenium wall, and where there is more than five feet of open space above and on the stage side of the proscenium opening.

STAIRWAY: -

means one or more flights of steps and the necessary landings connecting them to form a continuous and uninterrupted passage from one storey to another in a building.

STOREY: -

means that portion of a building included between the upper surface of any floor and the upper surface of the floor next above but not including a penthouse used only for the purpose of housing electrical or mechanical equipment. The top-

most storey shall be that portion of a building included between the upper surface of the top-most floor and the ceiling or roof above. If the finished floor level directly above a basement is more than six feet above grade, such basement shall be considered as a storey.

STREET: -

means any thoroughfare such as, but not limited to, street, lane, place and terrace; whether public or private.

STRUCTURE: -

means that which is built or constructed, or any place of work artificially built up or composed of parts joined together in some definite manner, the use of which requires more or less permanent location on the ground. The term shall be construed as followed by the words "or part thereof."

STRUCTURAL FRAME: -

means all the members of a building or structure required to transmit loads to the ground.

THEATRE: -

means a building or part thereof which contains an auditorium having a stage which may be equipped with curtains and/or permanent stage scenery or mechanical equipment adaptable to the showing of plays, operas, performances, spectacles, and similar forms of entertainment, or is such building or portion thereof containing an auditorium having a platform, screen and mechanical equipment adapted to the showing of motion pictures.

VERANDAH (Porch): -

means a covered balcony or open portico with a roof. It can be screened in and/or fitted with louvres.

VERTICAL OPENING: -

means an opening through a floor or roof.

WALLS: -

BEARING: - *means a wall, which supports any vertical load in addition to its own weight.*

EXTERIOR: - *means any wall not protected from fire or wind pressure by enclosure.*

FACED WALL: - *means a wall in which masonry facing and backing are so bonded as to exert a common action under load.*

FIRE PARTITION: - *means a partition for the purpose of restricting the spread*

of fire or to provide an area of refuge but not necessarily vertically continuous from floor to floor.

FIRE WALL: - *means a wall for the purpose of sub-dividing a building or separating building to restrict the spread of fire and which starts at the foundation and extends continuously through all stories to and above the roof, or to the roof if such slab is of concrete.*

FOUNDATION: - *means those exterior walls between the foundations and the ground floor, or any other walls below the ground floor which are in contact with or receive lateral earth pressure.*

INTERIOR: - *means a wall entirely surrounded by the exterior walls of the building.*

NON-BEARING: - *means a wall, which supports no load other than its own weight.*

PANEL: - *means non-bearing wall in skeleton construction built between columns and wholly supported at each storey.*

PARTY WALL: - *may take either of the following forms:*

- (a) **COMMON PARTY WALL:** - *means a wall separating two adjoining buildings which is deemed to belong jointly to the two owners of the buildings, the boundary between the two buildings being the centre of the thickness of the wall.*
- (b) **EXTERNAL PARTY WALL:** - *means the external wall of a building immediately adjacent to a property boundary and a similar wall located on the contiguous lot. The walls shall either touch, or be so located as to prohibit access between them.*

RETAINING: - *means any wall used to resist lateral displacement of any material.*

NOTES

PART II
ADMINISTRATION

CHAPTER 3

APPLICATION TO BUILD - NOTICES AND INSPECTIONS

- 301 GENERAL**
- 302 APPLICATION TO BUILD**
- 303 PRESENTATION OF PLANS**
- 304 ALTERATIONS TO AND EXTENSIONS OF BUILDINGS**
- 305 APPLICATIONS TO MAKE ALTERATIONS TO AND EXTENSIONS OF BUILDINGS**
- 306 MATERIALS USED FOR CONSTRUCTION**
- 307 PLUMBING WORK AND FITTINGS**
- 308 EXEMPTIONS**
- 309 MATERIAL CHANGE OF USE**
- 310 FEES PAYABLE FOR BUILDING PERMITS**
- 311 PRE-ENGINEERED BUILDINGS**
- 312 MANDATORY INSPECTIONS**
- 313 TAKING SAMPLES**
- 314 COMPLIANCE WITH CODE**
- 315 NOTICE OF COMPLIANCE**
- 316 NOTICE OF COMPLETION**
- 317 APPROVED PRODUCTS**

301 GENERAL

A person wishing to erect a building or to carry out a building operation, as defined in the Buildings Regulation Act and Rules made thereunder, shall comply with the requirements of the said Act and Rules and also with the requirements of this Code.

- 301.1 A person who intends to erect a building shall subject to the provisions of Section 308 "Exemptions" furnish the Buildings Control Officer in a manner provided in this Chapter.

302 APPLICATION TO BUILD

- (a) Every application for a permit shall be made in writing on the official application forms obtainable from the offices of the Building Control Division at the Ministry of Works and Utilities building on J.F. Kennedy Drive, Nassau or from the office of the Administrator in the case of a Family Island application, and the application shall contain all the information required to complete the forms. The application shall be signed by the applicant or by his agent.

- (b) *For the island of New Providence, three copies shall be furnished to the Buildings Control Division of all plans and documents accompanying an application and these must be drawn or reproduced in a clear and intelligible manner on suitable and durable material and must conform to all the applicable requirements of the Code.*
- (c) *For the Family Islands, excluding the Freeport Area of Grand Bahama, three copies of all plans and documents accompanying an application shall be furnished to the Administrator. One copy shall be kept by the Administrator and two copies returned to the applicant, on the approval of the application. Should the Local Town Council determine that the application requires the input of the Buildings Control Division in Nassau, an additional copy should be obtained from the applicant and the four copies shall be forwarded, one copy will be kept by the Buildings Control Officer, one copy kept by the Administrator and two copies will be returned to the applicant on the approval of the application.*
- (d) *Persons wishing to build in the Freeport Area of Grand Bahama Island shall apply to the Port Authority, Freeport, Grand Bahama.*

302.1 *All plans required under the Professional Architects Act, 1994 to be prepared by a licensed Architect or Architectural Technician shall be sealed and signed legibly by the said Architect or Architectural Technician whose registration under the Professional Architects Act, 1994 must be current. Any citizen or permanent resident of the Bahamas submitting an application under the conditions of Section 30(4) of the Professional Architects Act shall be required to sign and legibly print their name on all drawings for which they are responsible. The plans shall include every floor, and section of every storey, floor, stairwell, and roof of the building, upon which sufficient details shall be included to show whether the building complies with this Code. Such plans shall include:*

- (a) *The level of the site of the building, the level of the lowest floor of the building and the level of any street adjoining the premises in relation to one another and above some known datum, in low-lying areas the level of the lowest floor should be at least 12" above any known flood level or 18" above crown on adjacent road whichever is the greater.*
- (b) *The position of barriers to moisture, the position from and dimensions to the foundations, wall, windows, floors, roofs and several parts of the building and the intended use of each room.*
- (c) *The level of the invert of the public sewer, if available, into which the building is to connect.*
- (d) *The complete drawings and specifications as required by this Code of all the Plumbing within the building together with the details of*

any septic tank or sewage treatment plant where a sewer is not available.

- (e) The complete drawings and specifications as required by this Code of the electrical system for the building together with the details of any transformer vault or generator plant where these are required.
- (f) The location and construction details of any boundary wall, or fence, fronting onto any public highway, road, alley or similar access.

302.2 A site (lot) plan shall be included, drawn to a scale of 20' to the inch showing:

- (a) *The size and position of the building, and its relationship to property boundaries (all setbacks) and adjoining buildings and the names of adjacent owners.*
- (b) The size and position of every garden, yard and/or open space of the premises, with the dimensions of the boundaries of such premises.
- (c) The name of the subdivision and the land registration number of the lot.
- (d) The width of the adjacent road reservations and the width of the actual road surface together with the size and location of any existing sidewalk, driveway and drainage ditches or wells.
- (e) The mode of disposal for surface water which may originate from any paved area on the site.

302.3 *A location plan to a scale of 1:2500 shall also be included showing the position of the site, or lot in relation to a named thoroughfare, road, street, etc., when it is not sufficiently identifiable from the site plan.*

302.4 When deemed necessary due to the size, or complexity of the project, or to the topography of the site (lot), the Buildings Control Officer may require that the site (lot) plan be prepared by a Surveyor registered under the Land Surveyor's Act 1975.

- 302.5 (a) The Buildings Control Officer may, if he thinks fit, require engineering calculations to be supplied by the applicant in respect of—
- (i) any portion of the structure; or
 - (ii) any portion of the mechanical or electrical installations in-

tended to be placed therein, and in every case such calculations shall bear the name, address and qualifications or professional seal of the person who prepared the same.

- (b) *Where calculations are required under Sub-section (a)(i) they shall be prepared by a licensed Architect or Architectural Technician or an Engineer recognised by the Minister, however, where the preparation has not been done by a person recognised by the Minister as an engineer for the preparation of structural design and the calculations involve computations based on structural stresses, the Buildings Control Officer may require that the preparation be done by a person recognised as an engineer.*
- (c) Where calculations are required under Sub-section (a)(ii) they shall be prepared as the case may require, by a qualified mechanical or electrical engineer or master or licensed plumber or licensed three phase electrical contractor recognised by the Minister.
- (d) The person responsible for the preparation of the calculations, shall also sign, or seal, all drawings that are based upon those calculations.

302.6 Sufficient particulars shall be provided to show whether the building complies with this Code concerning:

- (a) The requirements of the Group of Occupancy for the intended use.
- (b) The requirements of the Type of Construction Classification into which the building falls, and the materials of which it is constructed.
- (c) The mode of sewerage disposal
- (d) The means of water supply; and
- (e) The means of electricity supply.

303 PRESENTATION OF PLANS

303.1 Plans shall be to a scale of not less than one inch to every four feet, or if the building is so extensive as to render a smaller scale necessary, the plan shall be not less than one inch to every eight feet. The scale shall be indicated on all plans, sections and drawings and the north point shall be indicated on all site (lot) and location plans.

303.2 *Every plan, section drawing, notice or other document shall be signed in the manner described in Sub-section 302.1 before submitting them to the*

Buildings Control Officer and if the plans have not been prepared by the applicant then the plans shall state the name and address of the person on whose behalf it has been furnished.

303.3 The maximum size sheet for presentation of drawings shall be 36"x48". Projects requiring larger sheets shall make use of match lines.

The minimum size print shall be the same as a Pica typewriter type (10 spaces to the inch) and shall be clear, bold and legible.

304 ALTERATIONS TO AND EXTENSIONS OF BUILDINGS

- (a) The provisions of this Code for construction and standards of building shall apply to any alteration to, or extension of, any existing building erected after the date of operation of this Code, and the person making any such alterations or extensions shall comply with the requirements of this Code.
- (b) No alteration or extension shall be made to any existing building, or building in the course of erection, which will result in that building being so altered that it would contravene this Code in any respect in which it had not contravened it, or to any greater degree than that to which it had contravened it before the work was carried out.
- (c) All alterations or extensions to any existing building or building in the course of erection shall be subject to the requirements of The Department of Physical Planning with regard to land usage and setbacks, it shall also be subject to the setback requirements rendered necessary by Group of Occupancy and Type of Construction into which it is classed, whichever is the more restrictive. In no case shall any part of any alteration or extension to a building come within 6' of any septic tank.

305 APPLICATION TO MAKE ALTERATIONS TO AND EXTENSIONS OF BUILDINGS

In the event of alterations to, or extensions of, a building the application shall include: -

305.1 Notice of intention to make an alteration to or extension of a building.

305.2 In the case of alterations not involving any extensions to a building, plans and sections as required by Sub-section 302 of this Chapter of the alterations and of the building, so far as such plans and sections are necessary to show whether proposals will comply with this Code.

305.3 In the case of an extension of a building;

- (a) The particulars referred to in Section 302 in relation to the extension

as if the extension were the building therein referred to; and

- (b) Plans and sections as required by Sub-section 302.1 of the buildings so far as affected by extension; so far as such particulars, plans and sections are necessary to show whether the proposal shall comply with this Code.

306 MATERIALS USED FOR CONSTRUCTION

If the building, alteration or extension contains aluminium, steel, reinforced concrete work, structural timber, fiberglass or other similar materials, the application shall include: —

- 306.1 A brief description of materials proposed to be used, including the fire rating for these materials where applicable.

Where the materials are of a more unusual nature the description should be backed up by tests data from a laboratory or organisation approved by the Buildings Control Officer.

- 306.2 A statement as to the 28-day test strength for any poured concrete, pre-cast concrete unit, mortar or concrete block and if necessary the design mix proportions.

For small buildings the design mix proportions will suffice.

- 306.3 Drawings showing details of construction and in particular of any framework and sizes and position of any reinforcing metal together with the details necessary to show clearly the manner in which such framework or reinforcing metal is to be protected to produce the required fire rating.

- 306.4 A statement as to the required strength and general requirements of the reinforcing metal and structural steel.

- 306.5 A statement as to the required strength and general requirements of lumber to be used including the grade of any plywood.

307 PLUMBING WORK AND FITTINGS

The provisions of this Section shall apply to the execution of any plumbing work including a building sewer and the installation of any fittings and the person executing any such works or installing any such fittings shall comply with the requirements of this Code. A person who intends to execute any such works or install any such fittings shall furnish the Buildings Control Officer in the manner provided in this Section.

- 307.1 Notice of intention to execute plumbing work or install fittings in connection with the building, particularly of the works or fittings so far as necessary to show whether they comply with this Code.
- 307.2 Where it is proposed to install a building sewer, or install a water closet, urinal, privy closet, septic tank, settlement tank or well, a plan showing the following particulars, or so many of them as are applicable to the proposal and are necessary to show whether it complies with this Code.
- (a) The position of the installation.
 - (b) The lines of the building sewer, the size, depth and inclination of every pipe, and the means to be provided for the ventilation of the sewer.
 - (c) The position and level of the out-fall of the building sewer; and
 - (d) Where the building sewer is intended to be connected to a public sewer, the position and level of the public sewer and the plan shall, if the works or installations are in connection with the operations to which this Chapter relates, be a site (lot) plan as required in Subsection 302.2.
- 307.3 Where it is proposed to construct or install a water closet, urinal, privy closet, septic tank, settlement tank or well, or water tank or cistern for the storage of rain water for human consumption, plans and sections of the water closet or fittings so far as necessary to show that they comply with the requirements of this Code.

308 EXEMPTIONS

For the purpose of this Code the following only are exempted from the need to obtain a building permit.

- 308.1 Repairs or replacements to a building which do not exceed 25% of its current value during the period of twelve months next preceding the date of commencement of such repair, providing always that these repairs or replacements do not include any alterations to the structure, plumbing or wiring of the building, and that the repairs or replacements shall be carried out in similar materials to those already in use on the building.
- 308.2 Notwithstanding the above, the applicant shall satisfy the requirements of the Town Planning Act and also the restriction requirement on combustible siding within the City of Nassau as set forth in the Buildings Regulation Act.

309 MATERIAL CHANGE OF USE

Where a material change of use takes place in an existing building or part of an existing building or in a building under construction, that building or part of the building, shall comply in all respects with Section 4 of the Rules of the Buildings Regulation (General) Rules 1971.

310 FEES PAYABLE FOR BUILDING PERMITS

310.1 *A BUILDING PERMIT shall be valid for a maximum period of 18 months from the date of issuance of the permit.*

310.2 *BUILDING PERMIT RENEWAL shall be renewed for a maximum of three (3) periods of 18 months from the original expiration date. A building permit that has expired for more than a six month period or a permit that has already been renewed for three periods shall not be renewable. A new application and cost of the entire permit fee will be required.*

There shall be charged and payable for every building permit or renewal a fee according to the scale set out in the Rules made under the Buildings Regulation Act.

311 PRE-ENGINEERED BUILDINGS

Application for buildings making use of pre-engineered components shall be accompanied by calculations and drawings detailing the components, the method of assembly and method of obtaining continuity in design. These shall be prepared by an Engineer recognised by the Minister. Where pre-engineered units are used for multi-floor design, care shall be taken to prevent failure due to progressive collapse arising from the failure of a component part.

Components shall be tested by a testing laboratory or organisation approved by the Buildings Control Officer for both the structural strength and fire rating. The result of such tests shall accompany the application.

312 MANDATORY INSPECTIONS

The Buildings Control Officer upon 48 hours notice exclusive of Saturdays, Sundays and declared Public Holidays from the builder shall make the following inspections and shall either approve the portion of the works completed or shall notify the builder in writing for keeping a log of the pile driving and shall supply a copy to the Buildings Control Officer, where such work does not meet with his approval.

- 312.1 FOUNDATION INSPECTION shall be made when the necessary excavations have been completed, forms erected and the reinforcing steel placed in position. Site (lot) markers shall be clearly identifiable.
- 312.2 PILING INSPECTIONS shall be made during the driving of the piles and after all piles are driven and forms erected and reinforcing steel in place and before any concrete is poured. The builder shall be responsible
- 312.3 TIE COLUMN INSPECTION shall be made when the wall blocks have been laid, the tie columns formed and the reinforcing steel in place but before the concrete is poured.
- 312.4 STRUCTURAL COLUMN INSPECTION shall be made before any blocks are laid, the columns shall be formed up, the reinforcing steel in place, but before the concrete is poured.
- 312.5 TIE BEAM INSPECTION shall be made when the block walls are completed to tie beam level, the tie columns formed and poured, reinforcing steel in place but before the tie beam concrete is poured.

NOTE: For buildings of more than one floor and of bearing wall construction, inspections 312.3 and 312.5 shall be made at each floor.

- 312.6 STRUCTURAL BEAM AND SLAB INSPECTION shall be made when the beams and slabs have been formed up, reinforcing steel in place but before the concrete is poured.
- 312.7 STRUCTURAL FRAMEWORK INSPECTION if the structure is of steel or of other similar materials forming a frame, inspection shall take place on the complete frame for single floor buildings, for larger buildings it shall be by floors before the framework is encased. This inspection or inspections shall include any lightweight floor beam systems.

NOTE: For buildings of more than one floor of structural frame design, inspections, 312.4, 312.6 and 312.7 shall be made in each floor level.

- 312.8 ROOF INSPECTION shall be made when the roof frame is in place, the upper surfaces covered with roof material but before the ceiling is in place.
- 312.9 PLUMBING INSPECTIONS: The following Plumbing inspections shall be made on all buildings and at all floor levels, if the building has more than one floor:
- (a) Roughing-in
 - (b) Plumbing in walls and baths in place for hydrostatic tests
 - (c) Fixtures in place.

- 312.10 SPECIAL INSPECTIONS shall be made of all mechanical installations, immediately on the completion the work or at such intervals during the process of the work as the Buildings Control Officer or this Code may deem necessary.
- 312.11 ELECTRICAL INSPECTIONS: The following electrical inspections shall be made on all buildings, should the building have more than one storey, inspections (b), (c) and (d) shall also be made at each storey.
- (a) Services location
 - (b) Conduit roughing-in
 - (c) Conductors installed and joints made
 - (d) Final.
- 312.12 OTHER INSPECTIONS shall be made if the Buildings Control Officer deems them necessary.
- 312.13 FINAL INSPECTION: To be made upon the completion of the building, or structure, when it is ready for occupancy.
- 312.14 REINSPECTIONS: *Where an inspection for a portion of the construction is required and the work is not ready for inspection or incorrect, a reinspection shall be necessary. In this case, the BCO may require that a reinspection fee be paid prior to carrying out the reinspection.***

313 TAKING SAMPLES

The builder shall permit the Buildings Control Officer to take samples of the materials to be used in construction of a building, or the execution of works, or installations of fittings as may be necessary to enable him to ascertain whether such materials comply with this Code. This taking of samples may be in the form of concrete cylinders or removal of samples of aggregate, timber, steel and other such materials. If deemed necessary, by the Buildings Control Officer cores shall be taken of the concrete already poured at the owner's expense.

314 COMPLIANCE WITH CODE

The issuing or granting of a permit shall not be deemed or construed to be a permit for, or an approval of any violation of this Code. No permit presuming to give authority to violate or cancel any provisions of this Code shall be valid. The issuing of a building permit upon plans and specifications shall not prevent the Buildings Control Officer from there-

after requiring the correction of errors in such plans, specifications or from stopping any part of the building operations when in violation of this Code, or any other regulations applicable thereto. Compliance with this Code is the joint responsibility of the owner and the builder.

315 NOTICE OF COMPLIANCE

If the builder has received a notice in writing from the Buildings Control Officer pointing out any contravention of this Code and as a result shall have corrected such contraventions to comply with this Code, he shall within seven (7) days give notice in writing to the Buildings Control Officer as to the completion thereof.

316 NOTICE OF COMPLETION

The builder shall give the Buildings Control Officer notice in writing of the erection of a building or the execution of works or the installation of fittings within seven (7) days after completion.

317 APPROVED PRODUCTS

- 317.1 (a) Any person or firm wishing to supply any product, materials, equipment, or assembly intended for use in the construction of a building, shall apply to do so in writing, to the Buildings Control Officer.
- (b) Such application shall be accompanied by drawings, documentation, test results (from an independent testing agency approved by the Buildings Control Officer) and/or calculations substantiating that the product, material, equipment or assembly complies with this Code and/or the relevant standards set forth in Appendix A.
- (c) The Buildings Control Officer shall examine the application and: -
- (i) if satisfied, he may approve the use of the product, material, equipment or assembly with or without the imposition of any condition or conditions.
 - (ii) if not completely satisfied, he may require the applicant to submit additional information.
 - (iii) if not satisfied, he may refuse to allow the use of the product, material, equipment or assembly in the construction of a building.

(d) Such approval shall be for technical purposes in connection with this Code only and shall not be construed as to negate the requirements of any other legislation.

(e) Any approval granted under this section shall be for a maximum of three years and the person or firm may then re-apply for approval.

317.2 Where a product, material, equipment or assembly is produced in The Bahamas, the approval may include requirements relating to the provision of—

(a) Shop drawings by an engineer recognised by the Minister.

(b) Tests by a recognised Testing Agency.

(c) Reports at intervals by the relevant Engineer as to the maintenance of standards and/or conditions under which the approval was granted.

(d) Evidence that, where deemed necessary by the Buildings Control Officer, specific items are being fabricated by employees with certain documented levels of skill.

317.3 Should, subsequent to approval, it be determined by the Buildings Control Officer, that the product, material, equipment or assembly is no longer being supplied in compliance with the standards and/or conditions of approval, he may suspend, or revoke, the approval.

PART III
REQUIREMENTS BASED ON OCCUPANCY

CHAPTER 4

CLASSIFICATION AND GENERAL REQUIREMENTS

- 401 GENERAL REQUIREMENTS**
- 402 OCCUPANCY CLASSIFIED**
- 403 CHANGE IN USE**
- 404 OCCUPANT CONTENT**
- 405 ADJOINING OCCUPANCY**
- 406 FIRE DIVISIONS**
- 407 PARTY WALLS**
- 408 OCCUPANCY SEPARATIONS**
- 409 *SPECIAL HAZARD PROTECTION***
- 410 EXIT FACILITIES FOR MIXED OCCUPANCIES**
- 411 LOCATION ON THE PROPERTY**
- 412 SANITATION**
- 413 CEILING HEIGHTS**
- 414 ALLOWABLE AREA**
- 415 FACILITIES FOR PHYSICALLY HANDICAPPED**

401 GENERAL REQUIREMENTS

- 401.1 The intent of this Code is that buildings shall be of the Type of Construction required for the occupancies contained herein.
- 401.2 No building or structure shall be erected nor shall any lot or portion of a lot be subdivided or sold nor any lot line moved by sale of land or otherwise in such a manner as to eliminate, nullify or reduce any required spaces for light and ventilation or for exit purposes or in any way to create violations of any of the provisions of this Code.

402 OCCUPANCY CLASSIFIED

- 402.1 Every building or portion thereof, whether existing or hereafter erected, shall be classified by the Buildings Control Officer according to its use or the character of its occupancy, as a building of Group A, B, C, D, E, F, G, H, or I Occupancy, as defined in Chapters 5, 6, 7, 8, 9, 10, 11, 12, and 13 respectively. Where minor accessory uses do not occupy more than 10 percent of the area of any floor of a building, not more than 10 percent of the basic area permitted by Occupancy, the major use of the building shall determine the Occupancy classification.

402.2 Any Occupancy not specifically mentioned shall be classified by the Buildings Control Officer in the Group it most nearly resembles.

403 CHANGE IN USE

403.1 No change in the character of occupancy of a building shall be made without the approval of the Buildings Control Officer.

403.2 Buildings in existence at the time of the introduction of this Code may have the existing use or occupancy continued, if such use or occupancy is legal at the time of the passage of this Code, provided such continued use is not dangerous to life. Nothing shall be construed to prohibit the Buildings Control Officer from making inspections to see that the minimum standards of safety are maintained.

404 OCCUPANT CONTENT

404.1 The occupant content shall be computed as set forth in Sub-section 2801.5.

405 ADJOINING OCCUPANCY

405.1 Adjoining units of different Occupancies within a fire division shall be separated by a separation at least as fire-resistive as set forth in Section 408.

405.2 Two or more units of different Occupancy may be contained within a fire division, but all such units shall conform to the provisions of Chapters 5 through 13 for the most restricted of the Occupancies so contained except as otherwise set forth in subsection 402.1.

406 FIRE DIVISIONS

406.1 Where in this Code and particularly in Chapters 5 through 13, specific maximum allowable areas are set forth, the building may be separated into fire divisions and each such fire division shall be considered a separate building and be of the maximum allowable area provided the fire division separation walls are as set forth in this Section.

406.2 (a) Fire division separation walls shall be not less than four-hour fire resistive construction in buildings of Type I, three-hour fire resistive construction in buildings of Type II, and two-hour fire-resistive construction in buildings of Types III, IV and V construction.

(b) The total width of all openings in such walls shall not exceed 25 percent of the length of the wall in each storey.

- (c) Openings shall be protected as set forth in TABLE 32-II by a fire assembly having a three-hour fire-rating in four hour and three-hour fire resistive walls. An assembly with one and one half hour fire-resistive rating will be required in two-hour fire-resistive walls.

406.3 Fire division separation walls need not extend to the outer edge of horizontal projecting elements such as balconies, roof over-hangs, canopies, marquees or ornamental projections provided that the exterior wall at the termination of the fire division separation wall and projecting elements are not less than one-hour fire-resistive construction for a width equal to the depth of the projecting elements. Wall openings within such widths shall be protected by not less than three-fourths hour fire-resistive assemblies.

406.4 *Fire division separation walls shall extend from the foundation to a point at least 18" inches above the roof.*

EXCEPTIONS: -

- (a) Four-hour and three-hour fire division separation walls may terminate at the bottom of the roof deck provided the roof deck is of non-combustible construction for the area within 40 feet of each side of the wall.
- (b) Two-hour fire division separation walls may terminate at the underside of roof deck provided that the roof is of at least one-hour fire-resistive construction on each side of the fire division separation wall termination.

406.5 *Where a fire division separation wall separates portions of a building having different heights, such wall shall terminate at a point 30" inches above the lower level provided the exterior wall for a height of 10 feet above the lower roof is one-hour fire-resistive construction with openings protected by three-fourths hour fire-resistive assemblies.*

EXCEPTION: *The fire division separation wall may terminate at the deck of the lower roof provided the lower roof is of at least one-hour fire-resistive construction for the width of 10 feet without openings measured from the wall.*

406.6 Fire dampers in ducts passing through fire division separation walls shall be required as set forth in Chapters 39, 40 and 41.

407 PARTY WALLS

407.1 *GENERAL: Party walls shall extend from the foundation to a point at least 18" inches above the roof.*

EXCEPTION: -

- (a) A party wall may terminate at the bottom of the roof deck provided the roof deck is of noncombustible construction for the area within 40 feet of each side of the wall.

407.2 EXTERIOR WALLS: Subject to the filing of a letter of permission to the Buildings Control Officer from the owner of an existing adjoining building, the exterior walls thereof may be used as party wall when conforming to the following requirements:

- (a) Where the Type or Types of Construction used and/or combined floor areas of an existing and a proposed building are such that a separation into fire division is required, such walls shall meet the requirements for fire walls under the Code.
- (b) Where not required as a fire wall but used to separate Occupancies, such wall shall conform with the requirements for separations of Occupancies under this Code.
- (c) Such wall in all its parts shall conform to the engineering regulations of this Code or shall be made to conform therewith.

407.3 COMMON PARTY WALLS: Shall be of no less than 8" unit masonry or 6" reinforced concrete construction and shall not:

- (a) Contain any opening whatsoever, or
- (b) Be reduced in thickness at any point, or
- (c) Have any metal or wooden beam or joist or any pipe, duct, flue or similar item embedded in or passing through it.

407.4 (a) *WALLS BETWEEN TENANTS: Walls between tenants within Groups F, G and H Occupancies, including walls between tenants and exit corridors common to more than one tenancy in Groups F, G and H Occupancies, shall be of not less than one-hour fire-resistive construction and where partial height partitions in dormitory type use is otherwise accepted herein such partitions shall be of non-combustible material.*

- (b) *Fire-resistive separation between tenants shall be continuous between fire barriers. Where exposed combustible materials are used in an attic or ceiling the separation between tenants shall be continuous to the deck above such space and shall include any eaves or overhangs.*

EXCEPTION: A barrier required for an occupied space below interstitial space is not required to extend though the interstitial space provided the construc-

tion assembly forming the bottom of the interstitial space has a fire resistance rating equal to that of the fire barrier.

408 OCCUPANCY SEPARATIONS

Occupancy separations shall be provided between the various Groups and Divisions of Occupancies as specified herein and in Table No. 4A of this Chapter, but shall be not less fire-resistive than required by the Type of Construction.

**TABLE No. 4A
REQUIRED OCCUPANCY SEPARATIONS IN HOURS,
IN BUILDINGS OF MIXED OCCUPANCY**

GROUP	A	B-1	B-2	C	D	E-1	E-2	F-1	F-2	G	H	I-1	I-2	I-3
A	*	*	*	*	4	4	3	3	3	1	1	2	*	2
B-1		*	*	*	4	3	1	1	1	1	1	1	*	1
B-2			*	*	4	3	1	1	1	1	1	1	*	1
C				*	4	4	1	1	1	1	1	1	*	1
D					*	2	2	2	2	4	4	2	4	1
E-1						*	*	1	1	3	1	*	4	*
E-2							*	1	1	3	1	1	3	*
F-1								*	*	1	*	1	3	*
F-2									*	1	*	1	3	*
G										*	*	1	1	*
H											*	1	1	*
I-1												*	2	*
I-2													*	*
I-3														*

* No general requirement for fire-resistive separation by Group Occupancy. See walls and partitions for Type of Construction.

408.1 FORM OF OCCUPANCY SEPARATION: Separations as specified in this Chapter may be vertical, horizontal or inclined, depending upon the relative position of the portions to be separated, and shall consist of a system of walls, partitions, floors or other construction of such materials and construction, so arranged as to provide a complete, secure and continuous fire break of the required fire-resistive rating between the portions of the building so separated.

408.2 CLASSIFICATION OF OCCUPANCY SEPARATION:

- (a) Separations between occupancies within a fire division shall be classified, each classification designated by the number of hours of fire-rating as set forth herein.
- (b) A four-hour fire-resistive separation shall have no openings therein and shall be of not less than four-hour fire-resistive construction.
- (c)
 - (1) A three-hour fire-resistive separation shall be of not less than three-hour fire-resistive construction.
 - (2) All openings in walls of three-hour fire-resistive separations shall be protected by a fire assembly having a three-hour fire-resistive rating.
 - (3) The total width of all openings in any three-hour fire-resistive separation wall in any one storey shall not exceed 25% of the length of the wall in that storey and no single openings shall have an area greater than 120 square feet.
 - (4) All openings in floors forming a three-hour fire-resistive separation shall be protected by vertical enclosures extending above and below such openings. The walls of such vertical enclosures shall be of not less than two-hour fire-resistive construction and all openings therein shall be protected by a fire assembly having a one and one-half hour fire-resistive rating.
- (d) A two-hour fire-resistive separation shall be of not less than two-hour fire-resistive construction. All openings in such separation shall be protected by a fire assembly having a one and one-half hour fire-resistive rating.
- (e) A one-hour fire-resistive separation shall be of not less than one hour fire resistive construction. All openings in such separation shall be protected by a fire assembly having a three-fourths hour fire resistive rating.

408.3 DESIGN AND MATERIAL OF OCCUPANCY SEPARATION: Walls which form separations between Occupancies or between fire divisions shall also conform with the provisions of PART V as they pertain to design and material.

409 SPECIAL HAZARD PROTECTION

409.1 Protection shall be provided from any area having a degree of hazard greater than that normal to the general occupancy of the building or structure, such

as storage of combustibles or flammables, heat-producing appliances, or maintenance purposes, as set forth in this section.

- (a) Enclosures with construction in accordance with Section 1507 of this Code with a fire resistance rating as specified by the group of occupancy, but not less than 1 hour without windows and with doors of 3/4-hour fire protection rating, or*
- (b) Protection with automatic extinguishing systems in accordance with Chapter 37 of this Code as required for the group of occupancy.*
- (c) Both (a) and (b) above when specified for the group of occupancy by Chapter 37 or 28 both of this Code.*

409.2 *Where hazardous processes or storage are of such a character as to introduce an explosion potential, explosion venting or an explosion suppression system specifically designed for the hazard involved shall be provided as set forth in Chapter 39 of this Code.*

409.3 HAZARDOUS UTILITIES

- (a) GENERAL: Individual feeders and shut-offs shall be provided for every separate fire division in every building.*
- (b) ELECTRIC: Electrical installations shall comply in every detail with the requirements of Chapter 44 of this Code.*
- (c) GAS: Where gas is served to separated fire divisions or occupancies, there shall be individual valves, and valves and meters shall be located on the exterior of the building in a conspicuous and accessible place.*

Installation shall be as set forth in the Liquefied Petroleum Gas Act 1988.

- (d) OTHER: Other utilities which may constitute hazards shall, in general, be governed by the provisions of this Section and shall be subject to such additional requirements as the Buildings Control Officer prescribe.*

410 EXIT FACILITIES FOR MIXED OCCUPANCIES

410.1 *Where two or more occupancies, having exit width based on different occupant contents, occur on the same floor and have common exits, the number of units required for each such occupancy shall be calculated separately, and the units of width combined and proportioned to two or more exits as required by travel distance limitations of the most restricted Occupancy.*

410.2 Where two or more Occupancies, having exit widths based on different occupant contents occur on different floors of the same building, the combined width of exits at any floor, other than the first or ground floor, shall not be less than required for the occupant content of that floor.

411 LOCATION ON PROPERTY

411.1 The location of all building and/or structures shall conform to the requirements of Town Planning and to the protection of certain opening requirements of the Group of Occupancy in which such building is classified in this Code, according to the use or the character of the occupancy, whichever is the more restrictive.

412 SANITATION

412.1 WASTE STORAGE: Adequate permanent enclosures shall be provided as required by the Minister of Health.

412.2 TOILET ROOMS:

(a) Toilet facilities shall be provided on each floor for each sex using that floor and shall be located to be readily accessible except that in a building where the two lower levels, such as a first floor and mezzanine or the first floor and second floor where there is no mezzanine, are occupied by a single tenant and the toilet facilities are not for public use, the combined total toilet facilities required for these two levels may be located on either the first or second level.

EXCEPTION: Toilet facilities for public use in Group A and B Occupancies, restaurants, bars, transportation terminals and similar locations shall be provided on each floor for each sex.

(b) Water closets for public use, except within the residence or apartment of a single family, shall be of an elongated type and shall be equipped with open front seats, and shall be separated from the rest of the room, and from each other, by stalls of impervious materials. Such stalls shall be equipped with self-closing door and shall be opened at the top and at least 12 inches from the floor for ventilation.

(c) The floors and walls of public toilet rooms, to a height of five feet, shall be tile or similar impervious materials.

(d) Toilet rooms connected to rooms where food is prepared or stored or served to the public shall be separated therefrom by an intervening ventilated space with close-fitting doors. Such intervening ventilated space shall not be common to toilet rooms of both sexes.

- (e) Toilet rooms connected to public rooms or passage-ways shall have an intervening ventilated space and shall be arranged or screened to insure decency and privacy.
- (f) Public toilets shall bear signs plainly indicating for which sex and/or group such room is intended.
- (g) Required facilities in public buildings shall be available to employees and the public without charge.

412.3 SCREENING: Food-storage and preparation rooms shall have outside openings screened with 18 mesh-wire screening. Screen doors shall be equipped with self closing devices.

Public dining rooms, restaurants, tearooms and similar places for serving food to the public shall be completely screened; or such places may be equipped with a system of fans, so arranged as to effectively prevent the entrance of insects. This requirement for screening or installation of fans in public dining rooms shall not be construed to prevent the serving of food to the public in outdoor areas.

412.4 WALLS:

- (a) All food preparation areas of restaurants and catering establishments shall be provided with properly rounded corners connecting wall to wall or wall to floor as required by the Minister of Health.
- (b) The wall surfaces of all food preparation areas of catering establishments, shall be tile or similar impervious material to a minimum height of five feet above the adjacent floor level, or as required by the Minister of Health.

412.5 FLOORS:

- (a) The floor surfaces of all food preparation areas of restaurants and catering establishments shall be tile or similar impervious material as required by the Minister of Health.
- (b) Drainage shall be provided as set forth in Chapter 36, and as deemed necessary by the Minister of Health.

412.6 CEILINGS: All food preparation areas of restaurants and catering establishments shall be provided with ceilings of a type approved by the Minister of Health and the Buildings Control Officer.

413 CEILING HEIGHTS

413.1 GENERAL:

- (a) *The minimum ceiling heights for areas of human occupancy in buildings of other than G and H Occupancy shall be not less than eight feet, clear vertical distance.*

EXCEPTIONS: -

- (1) Headroom on stairs may be 7'-6", measured as specified in paragraph 2801.4(e) of this Code.
 - (2) Pipes, ducts and stationary mechanical appurtenances may be permitted to reduce the headroom at a point to not less than 6'-8". For corridors serving as exit access, the term "point" shall be taken to mean a section of the ceiling not exceeding two feet in the direction of exit travel.
 - (3) The headroom under mechanical appurtenances with exposed moving parts, including any ceiling fan, shall be not less than 7'-0".
- (b) *Small storage closets, slop-sink closets, storage space under a stair and similar small areas where persons do not generally walk into shall not be limited to height.*
- (c) *Doors connecting space where minimum ceiling heights are herein regulated shall be of not less than 6'-8" in height.*
- (d) *The minimum height of entrances for pedestrian or vehicular traffic and for parking spaces under or within a building shall be 6'-8".*

EXCEPTION: As otherwise set forth in (b), above.

- (e) *The ceiling height of a limited storage mezzanine or area where persons may infrequently be and only for the purpose of placing or removing stored materials shall not be limited.*

414 ALLOWABLE AREA

- 414.1 GENERAL: The allowable areas as set forth in Chapters 5 through 13 herein may be increased or decreased by the percentages shown, each percentage to be applicable to the base figure and percentages may not be compounded.

414.2 AUTOMATIC FIRE-EXTINGUISHING SYSTEMS

- (i) The basic allowable areas given in Sections 502.1(a), 602.1(a), 702.1(a), 902.1(a), 1002.1(a) and 1102.1(a) may be tripled in single storey buildings and doubled in buildings more than one storey in height, where such buildings are protected with approved automatic fire-extinguishing systems as set forth in Chapter 37.
- (ii) In buildings of Group D Occupancy basic area increases shall not apply where automatic fire extinguishing systems are required.

415 FACILITIES FOR PHYSICALLY HANDICAPPED OR RESTRICTED PERSONS

415.1 REQUIREMENT FOR PUBLIC BUILDINGS: *All plans and specifications for the construction of buildings for use by physically handicapped or restricted persons shall comply with those requirements deemed necessary by the Minister and as set forth in Chapter 45.*

415.2 Provision shall be made in all public buildings for at least one access to the building to be ramped, to facilitate ease of entry by persons in wheel chairs. Furthermore, the door adjacent to the ramped access and at least one toilet cubical for each sex shall be of sufficient width to admit persons so handicapped. The facilities for the handicapped shall be clearly marked by the standard wheel chair symbol.

NOTES

**CHAPTER 5
REQUIREMENTS OF GROUP A OCCUPANCIES**

- 501 GROUP A OCCUPANCY DEFINED
- 502 CONSTRUCTION, HEIGHT AND AREA ALLOWABLE
- 503 LOCATION ON PROPERTY
- 504 EXIT FACILITIES
- 505 LIGHT AND VENTILATION
- 506 ENCLOSURE OF VERTICAL OPENINGS
- 507 STAGES, PLATFORMS AND ROSTRUMS
- 508 PROJECTION BOOTHS
- 509 FIRE PROTECTION AND HAZARDS
- 510 PLUMBING AND TOILET FACILITIES
- 511 EXCEPTIONS AND DEVIATIONS
- 512 MIXED OCCUPANCY
- 513 ELEVATOR LOBBIES IN HIGH RISE BUILDINGS
- 514 MINIMUM KITCHEN SIZES FOR CATERING ESTABLISHMENTS
- 515 ATRIUMS
- 516 ACCESSIBILITY FOR THE PHYSICALLY HANDICAPPED

501 GROUP A OCCUPANCY DEFINED

Group A Occupancy shall include assembly uses such as theatres, auditoria, motion-picture houses, exhibition halls, skating rinks, gymnasiums, bowling centres, pool rooms, restaurants, churches, dance halls, club rooms, discotheques, night clubs, meeting rooms, passenger rooms, casinos, and similar uses having an occupant content of 1,000 or more persons.

502 CONSTRUCTION, HEIGHT AND AREA ALLOWABLE

502.1 GENERAL:

- (a) Buildings or parts of buildings classed in Group 'A' because of use and occupancy shall be limited in height and area as follows:

TYPE	Allowable Height	Area per Floor
I	Not limited	Not limited
II	60' (four storeys)	15,000 sq. ft.

- (b) Areas of buildings located within the limits of the City of Nassau shall be as above. However, in areas outside these limits:
 - (1) Areas of buildings located with public streets on two sides may be increased by 25% and if on three or more sides, may be increased by 50%.
 - (2) A side or rear yard providing means of access of not less than 30' in width to a public street may be considered a public street for the determination of allowable areas where Town Planning or other regulations require that such yard be permanently unobstructed.
 - (3) For the purposes of (1) and (2) above a public street shall be any street with a reserve of no less than 30' in width.
- (c) See Section 414.2 for increase in tabulated basic areas if an approved fire-extinguishing system is installed throughout the building.

502.2 SPECIAL PROVISIONS:

- (a) *A fire-resistive ceiling shall not be required in the assembly space of churches and school gymnasiums in one-storey buildings every part of the roof structure of which is 18 feet or more above any floor or above any balcony or gallery seating 50 or less persons.*
- (b) Assembly rooms shall not be located in a basement.
- (c) In gymnasiums, dance halls and similar occupancies, finish floors and running tracks may be of wood.
- (d) Basements shall be of Type I Construction.

503 LOCATION ON PROPERTY

Buildings with Group A Occupancy shall comply with the requirements of Town Planning and the requirements herein stated, whichever are the more restrictive. Buildings with Group A Occupancy shall front directly upon a public street or on a (clear and permanently unobstructed) yard or court not less than 30 feet in width and connected to such public street.

The main floor shall be located at or near grade.

Exterior walls shall have fire-resistance and opening protection, determined by location on property, as set forth for the Type of Construction in Part IV.

504 EXIT FACILITIES

Exit facilities for Group A Occupancy shall be as set forth in this Section and Chapter 28.

- 504.1 (a) **OCCUPANCY CONTENT:** *The occupant content permitted in any assembly building structure, or portion thereof shall be determined by dividing the net floor area or space assigned to that use by the square footage per occupant as follows:*
- (1) *An assembly area of concentrated use without fixed seats such as an auditorium, church, chapel, dance floor, discotheque or lodge room: 7 sq. ft. per person.*
 - (2) *An assembly area of less concentrated use such as a conference room, dining room, drinking establishment, exhibit room, gymnasium, or lounge: 15 sq. ft. per person.*
 - (3) *Bleachers, pews and similar bench-type seating: 18 linear inches per person.*
 - (4) **FIXED SEATING:** *The occupant load of an area having fixed seats shall be determined by the number of fixed seats installed. Required aisle space serving the fixed seats shall not be used to increase the occupant load.*
 - (5) **LIBRARIES:** *In stack areas: 100 sq. ft. per person; in reading rooms: 50 sq. ft. per person.*

Notwithstanding the above areas required, the occupant content shall be taken as not more than one person per fifteen square feet of aggregate gross area of all floors or parts of the building used for assembly purposes including lobbies, corridors, dressing rooms, toilets, and other commonly used connecting rooms and service areas used in conjunction with assembly occupancy.

- (b) **POSTING OF OCCUPANT LOADS:** *Any room used for assembly purposes and having an occupant load of greater than 50 persons shall have the occupant load posted in a conspicuous place at or near the main means of entrance to the room.*
- 504.2 (a) **WIDTHS OF EXITS:** *Means of egress shall be measured in units of exits width of 22 inches. Fractions of a unit less than 12 inches shall not be counted. Fractions of a unit comprising 12 inches or more, added to one or more full units, shall be counted as a half unit of exit width. The minimum exit width shall be 36 inches in all cases.*

EXCEPTION: Projections not to exceed 3-1/2" on each side shall be permitted at and below handrail height.

- (b) *In determining the units of exit width for a doorway, only the clear width of the doorway when the door is in the fully-open position shall be measured. Clear width shall be the net, unobstructed width of the door opening without projections into such width.*

504.3 CAPACITY PER UNIT WIDTH:* The capacity in number of persons per unit of width of required means of egress shall be as follows:

- (a) Areas served by doors or horizontal exits leading to the outside of the building - 100 for travel in either direction.
- (b) Areas served by stairs or other type of exit not set forth in (a) above - 60 for travel in either direction.

504.4 MAIN FLOOR EXITS:

- (a) Not less than half of the required main floor exit widths shall be to a main entrance and exit, and the remainder shall be proportioned to the side exits. All required exits of Group A Occupancy shall serve no other Occupancy.
- (b) Exits no less in width than the full width of the aisles or gangway leading thereto shall be provided at the rear of the main-floor assembly and such exits shall lead into a foyer or into a passageway to the outside of the building. Any change in elevation from a public footpath to the back of the main floor assembly or foyer shall be made by ramps having a slope of not more than one in ten. The most obvious and direct exit to the public street shall be and remain unobstructed. The width of the foyer at any point shall not be less than the combined width of the aisles, gangways, stairways and passageways leading thereto. The foyer shall be separated from the assembly spaces with partitions having a fire-rating of not less than two hours. There shall be no less than two remote exits from any Group A Occupancy.
- (c) EXCEPTION:* In places of assembly such as churches, stadiums and sports arenas exits may be distributed around the perimeter of the building, provided that the total exit width provides 116-2/3 percent of the width needed to accommodate the permitted occupant load.

504.5 SIDE EXITS:* Each level of places of assembly shall have access to the main exit and shall in addition be provided with side exits of sufficient

width to accommodate two thirds of the total occupant load served by that level. Such exits shall discharge directly to a street or into an exit court, enclosed stairway, outside stairway, or exit passageway leading to a street. All such exits shall be accessible from across aisle or side aisle.

- (a) The number of side exits shall not be less than that required by distance limitations as set forth in the following table.

Persons	Min. number of side exits
200 – 1000	2
Over 1000	4

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No exit shall be less than two exit units wide.

* Places of assembly of 50-200 person capacity shall have at least two means of egress consisting of separate exits or doors leading to a corridor or other spaces giving access to two separate and independent exits in different directions.

- (b) Where one or two side exits each side are required, one of such exits each side shall be located at the front of the assembly space, remote from the main-floor exits and where four or more exits each side are required, the additional exits shall be proportionately spaced along the length of the side walls.

Exits shall be so arranged that the maximum distance as measured along the line of travel to the nearest floor exit from any point shall not exceed 150 feet.

504.6 BALCONY EXITS: Exits from a balcony shall be as specified for main-floor exits except as follows:

- (a) Balconies having an occupancy content of less than thirty persons may be served by one 44 inch stair, and for thirty persons or more at least two exits shall be provided.
- (b) In places of assembly with more than one balcony the total exit width required for each balcony level shall be maintained to the level of discharge in order to provide for the simultaneous evacuation from the building.

504.7 EXIT DOORS:

- (a) *All doors in a means of egress, normally closed and latched, shall be equipped with full sets of panic hardware. No single door shall be more than 3'8" in width and no double door ways shall be less than 3'9" in width.*

504.8 MARKING OF EXIT DOORS:

- (a) Above every exit door there shall be a lighted sign marked "Exit" in letters at least 4" high lit normally by an electric bulb and in addition, fitted with an emergency battery, or power source, to give light in the event of power failure. The letters may be green or red and the background white, and shall provide contrast with decorations and interior finish. Doors which may be confused as leading to exits, shall be clearly marked "Private."
- (b)* A sign reading "EXIT" or similar designation with an arrow indicating the direction shall be placed in every location where the direction of travel to reach the nearest exit is not immediately apparent.

504.9 AISLES AND SEATING:

- (a) Aisles and gangways shall be located so that there are not more than fourteen seats in any row between aisles or gangways nor more than seven seats in any row extending from an aisle to a wall, provided that longer rows up to 11 seats with an aisle or gangway at each end, or rows up to 11 seats with an aisle or gangway at one end may be permitted subject to an increase in the seat-way of 1" per additional seat. Fixed seats shall be securely fastened to the floor; moveable or folding seats for the assembly of five hundred per sons or more shall be fastened together in banks of six or more.
- (b) Spacing of rows or seats shall be not less than thirty-three inches from back to back and there shall be a clear unobstructed horizontal width of not less than twelve inches between the back of one seat and the front of the seat immediately behind.
- (c) No aisle or gangway having seats on both sides shall be less in width than forty inches nor shall any aisle or gangway having seats on one side only be less than thirty-six inches in width. Aisles or gangways in the direction of exit travel towards the foyer or main entrance or exit shall have a unit width of twenty inches per one hundred and fifty seats served thereby, with a minimum width of forty inches.

- (d) At each side exit, there shall be a cross aisle or gangway leading to the centre of the width of the building. Cross aisles or gangways shall be not less than forty-four inches in width.
- (e) Where seating is at tables as in restaurants and night clubs, aisles or gangways shall be located so that there is not more than twenty-eight feet between aisles or gangways nor more than fourteen feet between an aisle or gangway and a wall. At each side exit there shall be a cross aisle or gangway leading to the centre of the width of the building. Aisle or gangway widths shall be rigorously maintained.

504.10 *TURNSTILES: No turnstiles, revolving doors, or other devices to restrict the movement of persons shall be installed in any assembly occupancy in such a manner as to interfere with the egress of occupants.*

504.11 *IMPEDIMENTS TO EGRESS:*

- (a) *Any device or alarm installed to restrict the improper use of a means of egress shall be so designed and installed that it cannot, even in case of failure, impede or prevent emergency use of such means of egress.*
- (b) *Means of egress shall be free of obstructions which would prevent its use.*
- (c) *No obstruction shall be placed in the required width of a means of egress.*

505 *LIGHT AND VENTILATION*

505.1 *GENERAL: All portions of Group A Occupancies customarily used by human beings and all dressing rooms shall be provided with light and ventilation by means of windows or skylights with an area not less than one-eighth of the total floor area, one-half of which shall be openable, or shall be provided with electric light and mechanically operated ventilating system as set forth in Chapter 40. Ducts for the mechanical ventilation system shall serve no other Group of Occupancy.*

505.2 *ARTIFICIAL LIGHTING: Artificial light shall be as set forth in accordance with the requirements of Chapter 44, and emergency lighting shall be provided in all assembly areas and in all means of egress as set forth in Chapter 37.*

- 505.3 HAZARDS: Registers or vents supplying air back stage, supplying a projection booth or passing through a fire wall shall be equipped with automatic closing devices activated by smoke detectors located in the registers or vents, and supplying air fans shall be controlled with a smoke sensing device

506 ENCLOSURE OF VERTICAL OPENINGS

- 506.1 Vertical openings shall be enclosed as set forth in Part IV for the Type of Construction, and in Chapter 28.
- 506.2 Elevators which serve dressing rooms, gridiron and fly galleries need not be enclosed above the stage level.

507 STAGES, PLATFORMS AND ROSTRUMS

Stages, platforms and accessory features thereof shall be designed and constructed as set forth herein.

- 507.1 STAGES:
- (a) STAGE CONSTRUCTION: All parts of the stage shall be designed to support not less than 125 pounds per square foot and shall be of Type I construction or fire retardant timber. The room directly under the stage shall not be used for any purpose other than the working of traps and mechanical apparatus necessary for a performance on the stage.

*Openings through stage floors shall be equipped with tight-fitting trap doors of non-combustible materials or of wood not less than two inches thick. Where such an opening occurs sprinklers spaced 5ft. on centres shall be provided around the opening at the ceiling below the stage, and baffles at least 12 inches in depth shall be installed around the perimeter of the opening.

- (b) GRIDIRONS:* Every stage equipped with fly galleries, gridirons, and rigging for moveable theatre-type scenery shall have a system of automatic sprinklers at the ceiling, under the gridiron, in usable spaces under the stage and in accessory room spaces and dressing rooms, storerooms, and workshops. Where the distance from the back of the stage to the proscenium wall is less than 30 ft. in lieu of sprinklers under the entire gridiron area, complete peripheral sidewall sprinklers with baffle plates may be substituted. Such sidewall sprinklers shall be not more than 30 in. below the gridiron or 6 in. below the baffle plates.

- (c) **ACCESSORY ROOMS:*** Dressing rooms, workshops and store rooms shall be located on the stage side of the proscenium wall and shall be separated from each other and from the stage by two hour fire-resistive construction. Such spaces shall comply with the following:
- (1) No point within any accessory room shall be more than 50 feet from a door providing access to an exit.
 - (2) There shall be at least two exits available from every accessory room space, one of which shall be available within a travel distance of 75 feet. A common path of travel of 20 feet to the two exits shall be permitted.
 - (3) Accessory room spaces shall be equipped with automatic sprinklers.
 - (4) No workshop involving the use of combustible or flammable paint, liquids, or gases or their storage shall open directly upon a stage.
- (d) **PROSCENIUM WALLS:** The proscenium wall separating the stage portion from the auditorium shall be not less than two hour fire-resistive construction and shall extend not less than four feet above the roof. The proscenium wall shall not be finished or covered with combustible materials. Proscenium walls may have in addition to the main proscenium opening, one opening at the orchestra-pit level and not more than two openings at the stage-floor level, each of which shall be not more than 21 square feet in area. Such openings shall be equipped with self-closing fire-resistive doors.
- (e) **PROSCENIUM OPENING PROTECTION:** The proscenium opening shall be protected by either of the following methods: -
- (1) The main proscenium opening shall be provided with a self-closing, tight-fitting, fire-resistive curtain. Such curtain may be of fire retardant material with not more than ten percent of weight of cotton or other combustible materials, with inter-woven wires of monel metal, nickel, brass or equivalent heat and corrosion-resisting metals. Such curtain shall be of one-ply thickness and shall weigh not less than three pounds per square yard and shall be painted with a mineral paint so brushed into the cloth that no light or smoke can come through. Proscenium curtains of non-combustible materials other than fabric may be used, with the approval of the Buildings Control Officer.

Proscenium curtains, 35 feet or less in width, shall have a rigid metal member, not less than the equivalent of a two-inch standard steel pipe, at the top and bottom edges, protected by the fabric on both the stage and auditorium sides. Curtains over 35 feet in width shall have a rigid metal frame, protected on both sides against fire and such frame shall be designed for a wind pressure of not less than 15 pounds per square foot.

The proscenium curtain shall extend into non-combustible and smoke-proof guides at the sides, a distance not less than 12 inches. The curtain shall overlap the top of the proscenium opening not less than 24 inches, and the bottom edge shall have a yielding pad of non-combustible materials not less than four inches deep to form a seal against the floor.

The proscenium curtain shall be rigged and counter-balanced with not less than six three-eighths-inch flexible steel cables and six safety stop chains of one-quarter-inch straight link-welded chain and shall be so arranged that it can be quickly released to descend by gravity and completely close the opening. The releasing device and its location shall be approved by the Buildings Control Officer.

- (2) (i)* A non-combustible opaque fabric curtain so arranged that it will close automatically, and
- (ii)* An automatic dry-pipe system of spray heads on both sides of the curtain. Discharge and spacing shall be such that the entire curtain will be wet. Water supply shall be controlled by a deluge valve and shall be sufficient to keep the curtain completely wet for 30 minutes or until valve is closed by fire department personnel, and
- (iii)* Curtain, spray heads, stage sprinklers, and vents shall be automatically operated in case of fire, by rate-of-rise and fixed temperature detectors. Spacing, number and location of detectors shall be as required by the devices used, with maximum centre-to-centre distance of 10 feet. Detectors shall completely cover the periphery of the sprinkled and protected area, and
- (iv)* Operation of a sprinkler or spray head deluge valve shall automatically activate the emergency ventilating system and close the curtain.

- (f) STAGE VENTILATORS: There shall be one or more ventilators constructed of metal or other non-combustible materials near the centre and above the highest point of any permanent stage, raised above the roof and having a total ventilating area equal to at least five percent of the floor area within the stage walls, doors or covers for ventilators shall open by gravity and shall be held closed and manually operated by means of cords extending to each side of the stage. These cords shall be equipped with three fusible links, one of which shall be placed in the ventilator above the main roof level and the other two at approved points, not affected by sprinkler heads. Such links shall fuse and separate at 160 degrees Fahrenheit. Glass, if used in such ventilators, shall be wire glass.

*Where mechanical ventilation is provided it shall be so arranged that natural ventilation, at least equal to the above, will be available. Makeup air for mechanical ventilation shall not be obtained from the audience (seating) areas.

- (g) FLAME-RETARDING REQUIREMENTS: No combustible scenery, drops, decorations or other combustible effects shall be placed on any stage or enclosed platform unless it is treated with an effective fire-retardant solution and maintained in a non-flammable condition as approved by the Fire Department.
- (h) STAGE EXITS: At least one exit two feet six inches wide shall be provided from each side of the stage opening, directly or by means of a passageway not less than three feet in width, to a street or exit court. An exit stair not less than two feet six inches wide shall be provided for egress from each fly gallery.

Each tier of dressing rooms shall be provided with two remote paths of egress, each not less than two feet six inches wide, and where dressing rooms are provided more than one tier above the stage floor, stairways to all tiers shall be enclosed.

Stage exits shall be as set forth in Chapter 28 except as otherwise required in this Sub-section.

- (i) STANDPIPES:* Each stage shall be equipped with a standpipe located on each side of the stage, equipped with a standard fire department connection, and a 1-1/2 inch hose for occupant use, installed in accordance with Standard for the Installation of Standpipes and Hose Systems, NFPA 14.
- (j) OTHER REQUIREMENTS: There shall be no enclosed structure for human occupancy located above a stage.

507.2 PLATFORMS:

- (a) PLATFORM CONSTRUCTION: The platform shall be constructed entirely of non-combustible materials, except that where the auditorium floor extends under the full area of such platform, construction may be of Type II omitting the fire-proofing on the beams and girders.
- (b) SIZE OF PLATFORM: The platform shall not extend from the rear wall a distance greater than 18 feet, measured to the greatest projection of the platform, nor shall the ceiling over any platform be more than five feet above the screen except that in Group C Occupancies the platform may extend from the rear wall a distance not greater than 25 feet.
- (c) ACCESSORY ROOMS: No store room, no dressing or other rooms for human occupancy shall be located on, under or above such platform unless such rooms shall be completely separated therefrom by not less than two-hour fire-resistive construction.
- (d) SCREEN: The screen shall be rigidly attached to the platform and to the rear wall, and a clear passageway, not less than 20 inches wide, shall be provided between the screen or sound equipment and the rear wall.

507.3 ROSTRUMS: ROSTRUM CONSTRUCTION: A Rostrum may be constructed of combustible materials, where it does not exceed 3 feet in height and does not exceed 10 percent of the assembly room area. There shall be no accessory rooms under, on or above any rostrum.

508 PROJECTION BOOTHS*

Unless otherwise stated the following requirements shall relate to projection booths handling safety film in places of assembly intended for the regular showing of motion pictures.

508.1 Every projection room shall be of permanent construction consistent with the construction requirements for the type of building in which the projection room is located. Openings need not be protected. The room shall have a floor area of not less than 80 square feet for a single machine and at least 40 square feet for each additional machine.

Each motion picture projector, floodlight, spotlight, or similar piece of equipment shall have a clear working space of not less than 30 inches on each side and at its rear, but only one such space shall be required between adjacent projectors.

The projection room and the rooms appurtenant thereto shall have a ceiling height of not less than 7 feet 6 inches.

508.2 Each projection room shall have at least one out-swinging, self-closing door not less than 2 feet 6 inches wide by 6 feet 8 inches high.

508.3 The aggregate of ports and openings for projection equipment shall not exceed 25 percent of the area of the wall between the projection room and the auditorium.

All openings shall be provided with glass or other approved material so as to completely close the opening.

508.4 Projection booth room ventilation shall be not less than the following.

(a) SUPPLY AIR. Each projection room shall be provided with two or more separate fresh air inlet ducts with screened openings terminating within 12 inches of the floor and located at opposite ends of the room. Such air inlets shall be of sufficient size to permit an air change every 3 minutes. Fresh air may be supplied from the general building air conditioning system, providing it is so arranged that the projection booth will continue to receive one change of air every 3 minutes when no other air is supplied by the general air conditioning system.

(b) EXHAUST AIR. Each projection room shall be provided with one or more exhaust air outlets that may be manifolded into a single duct outside the booth. Such outlets shall be so located as to ensure circulation throughout the room. Projection room exhaust air systems shall be independent of any other air systems in the buildings. Exhaust air ducts shall terminate at the exterior of the building in such a location that the exhaust air cannot be readily recirculated into the supply air system. The exhaust system shall be mechanically operated and of such a capacity as to provide a minimum of one change of air every 3 minutes. The blower motor shall be outside the duct system.

The projection room ventilation system may also serve appurtenant rooms, such as the generator room and the rewind room.

508.5 Each projection machine shall be provided with an exhaust duct that will draw air from each lamp and exhaust it directly to the outside of the building in such a fashion that it will not be picked up by supply inlets. Such a duct shall be of rigid materials, except for a continuous flexible connector approved for the purpose. The lamp exhaust system shall not be interconnected with any other system.

- 508.6 No one shall use an electric arc, xenon, or other light source that generates hazardous gases, dust or radiation, in any place of assembly.
- 508.7 No one shall use cellulose nitrate film in any place of assembly without written approval from the Chief Fire Officer.
- 508.8 (a) Each projection room shall be provided with rewind and film storage facilities.
- (b) A maximum of four containers for flammable liquids of not greater than 16 oz. capacity and of a nonbreakable type may be permitted in each projection booth.
- (c) Appurtenant electrical equipment such as rheostats, transformers, and generators may be located within the booth or in a separate room of equivalent construction.

509 FIRE PROTECTION AND HAZARDS

- 509.1 Automatic sprinkler systems, smoke control systems, fire extinguishers, fire alarm systems and standpipes shall be as set forth in Chapter 37.
- 509.2 Chimneys, flues and vents shall be as set forth in Chapter 38.
- 509.3 Heat-producing apparatus shall be as set forth in Chapter 38.
- 509.4 The service of hazardous utilities shall be as set forth in Section 409 and other portions of this Code applicable thereto. Any gas service to the stage portion of the building shall be separated from any other service to the building, and every gas service shall be provided with shut off valve at a convenient and conspicuous place outside the building, and adequately marked.
- 509.5 Electrical installations shall be as required herein and as specified in Part X.
- 509.6 Transformer vaults shall be as set forth in Chapter 39.
- 509.7 The storage of any flammable materials shall be as set forth in Chapter 39.

510 PLUMBING AND TOILET FACILITIES

- 510.1** *Plumbing shall be installed as set forth in Chapter 36 of this Code.*
- 510.2 Sanitation shall be as set forth in Section 412.

510.3 *The toilet units shall be provided as in the tables in Chapter 36 applicable to: -*

- (a) *Theatres, auditoria, motion-picture houses, exhibition halls, gymnasiums, bowling centres, pool rooms, churches, passenger rooms and casinos.*

511 EXCEPTIONS AND DEVIATIONS

Existing buildings not fully complying with the requirements of this Chapter may be used for Group A Occupancies, if the requirements of Sections 502, 504, 509 and 510 are fully complied with and providing there is not less than a two-hour fire separation between such buildings and any other occupancies.

512 MIXED OCCUPANCIES

Separation of Group A Occupancies or Divisions thereof from all other Occupancies or Divisions of Occupancies shall be as set forth in Chapter 4.

513 ELEVATOR LOBBIES IN HIGH RISE BUILDINGS

In all high rise buildings all elevator lobbies shall be protected by one hour fire rated doors across the corridor or corridors leading to the elevator or elevators. These doors shall be recessed in the corridor walls and shall normally be kept in an open position by magnetic catches. These catches shall be activated by the fire alarm system on that floor, or the general fire alarm, or by smoke detectors situated within, or adjacent to the lobby areas. The doors shall be designed to close automatically, when activated, and to open when pressure of 15 pounds is applied to them.

514 MINIMUM KITCHEN SIZES FOR CATERING ESTABLISHMENTS

Serving or Seating Capacity	Minimum Sizes In Square Feet
Twenty-five (25) or less persons	One hundred (100)
Twenty-six (26) to forty-nine (49) persons.	Two hundred and fifty (250)
Fifty (50) to ninety-nine (99) persons	Four hundred and fifty (450)
One hundred (100) to one hundred and ninety-nine (199) persons	Eight hundred and fifty (850)
Two hundred (200) or more	One thousand two hundred (1,200)

515 ATRIUMS

An Atrium may be installed in a Group A Occupancy building provided the following criteria are met:

- 515.1 MINIMUM DIMENSIONS: No horizontal dimension between opposite edges of the floor opening shall be less than twenty feet and the opening shall have a minimum area of one thousand square feet.
- 515.2 MAIN ENTRANCE: Shall be located at the lowest level of the Atrium which shall be at, or about, ground level.
- 515.3 ENCLOSURE: The atrium shall be separated from adjacent occupiable spaces by fire barriers with at least two hours fire resistance rating. The rated walls may be omitted only as follows:
- (a) Where no more than one or two levels of a building open directly to the atrium without enclosure, however the perimeter walls of such levels shall be of two hours fire rating.
 - (b) Glass walls may be used in lieu of the fire rated walls provided automatic sprinklers are placed no more than six feet apart along both sides of the glass wall. Such sprinklers shall be located no more than one foot from the glass. The sprinklers shall be located so that the surface of the glass shall be completely wet upon the operation of the sprinklers. The glass shall be float glass held in place with a gasket system which shall permit the glass framing system to deflect without loading the glass before the sprinklers operate
- 515.4 EXITS: Shall be separately enclosed from the atrium and shall be protected in accordance with section 1507.2. These exits shall be sufficient to provide for the simultaneous egress of all occupants of the following spaces:
- (a) at all levels in the atrium.
 - (b) in those areas opening directly onto the atrium without enclosure.
 - (c) in those areas whose direct access is from the atrium.
- The areas of (a), (b) and (c) above shall be totalled and treated as a single floor area and the exit capacity determined accordingly.
- 515.5 VISIBILITY: The entire atrium space shall be open and unobstructed in such a manner that a fire within any part of the space should be readily obvious to the occupants prior to the time it becomes a hazard to them.

515.6 SPECIAL PROVISIONS:

- (a) A building that includes an atrium shall be protected throughout by an approved automatic sprinkler system.

EXCEPTION: For buildings of Groups C or F Occupancy of no more than two storeys or less than 30 feet in height, ground floor to ceiling of atrium, sprinklers may be omitted provided that separation is provided as required by Section 515.3 (a).

- (b) Sprinklers may be omitted at the top of the atrium only, when the ceiling of the atrium is more than fifty-five feet above the floor.
- (c) An automatic smoke removal system shall be installed in such a manner that the atrium and any levels of the building that open onto the atrium without any enclosures, shall be provided with six complete changes of air per hour in the event of an emergency.
- (d) The automatic smoke removal system shall be activated by all the following:
 - (1) Approved smoke detectors located at the top of the atrium, and adjacent to each return air intake from the atrium, and
 - (2) The required automatic sprinkler system, and
 - (3) The required fire alarm system, and
 - (4) Manual controls which are readily accessible to the Fire Department.

516 **ACCESSIBILITY FOR THE PHYSICALLY HANDICAPPED**

The requirements for the physically handicapped shall be as set forth in Chapter 45.

NOTES

CHAPTER 6 REQUIREMENTS OF GROUP B OCCUPANCIES

- 601 GROUP B OCCUPANCIES DEFINED
- 602 CONSTRUCTION, HEIGHT AND AREA ALLOWABLE
- 603 LOCATION ON PROPERTY
- 604 EXIT FACILITIES
- 605 LIGHT AND VENTILATION
- 606 ENCLOSURE AND VERTICAL OPENINGS
- 607 STAGES, PLATFORMS AND ROSTRUMS
- 608 MOTION-PICTURE MACHINE BOOTHS
- 609 FIRE PROTECTION AND HAZARDS
- 610 PLUMBING AND TOILET FACILITIES
- 611 MIXED OCCUPANCY
- 612 ELEVATOR LOBBIES IN HIGH RISE BUILDINGS
- 613 MINIMUM KITCHEN SIZES FOR CATERING ESTABLISHMENTS
- 614 ATRIUMS
- 615 *ACCESSIBILITY FOR THE PHYSICALLY HANDICAPPED*

601 GROUP B OCCUPANCY DEFINED

- 601.1 GROUP B OCCUPANCY DEFINED: Group B occupancy shall include assembly uses such as:

DIVISION 1: Assembly uses set forth in Section 501 having an occupancy of 200 to 1,000 persons.

DIVISION 2: Assembly uses as set forth in Section 501 having an occupant content of less than 200 persons except that the occupancy of any room or space for assembly purposes of less than 50 persons in a building of other Occupancy and incidental to such other Occupancy shall be classed as part of the other Occupancy and subject to the provisions applicable thereto.

602 CONSTRUCTION, HEIGHT AND AREA ALLOWABLE

- 602.1 GENERAL:
 - (a) Buildings or parts of buildings classed in Group B because of use or occupancy shall be limited in height and area as follows:

Type	Allowable Height	Area Per Floor
I	Not Limited	Not Limited
II	60 feet (4 storeys)	15,000
III Protected	30 feet (2 storeys)	13,500
III Unprotected	20 feet (1 storey)	9,000

- (b) Areas of Group B buildings may be increased in accordance with Sub-section 502.1 (b).
- (c) See Section 414.2 for increase in tabulated basic areas if an approved fire extinguishing system is installed throughout the building.
- (d) A single floor church of Group B Division 2 Occupancy may be of Type IV or V construction.

602.2 SPECIAL PROVISIONS:

- (a) *A fire-resistive ceiling shall not be required in the assembly space of churches, gymnasiums and school-assembly halls in one-storey buildings, every part of the roof structure of which is 18' or more above any floor or balcony or gallery seating 50 or less persons.*
- (b) Group B assembly rooms having an occupant content of 100 or more shall not be located in a basement.
- (c) In gymnasiums, dance halls, and similar occupancies, floors and running tracks may be of wood.
- (d) Balconies, and the exits therefrom, shall be a minimum of Type II construction.
- (e) Basements shall be of Type I construction.

603 LOCATION ON PROPERTY

- 603.1 Buildings with Group B Occupancy shall comply with the requirements of Town Planning and the requirements herein stated, whichever are the more restrictive.
- 603.2 Buildings of Group B Occupancy shall front directly upon a public street or on a clear and permanently unobstructed yard or court not less than 30 feet in width and connected to such public street.

Exterior walls shall have fire-resistance and opening protection, determined by location on property, as set forth for the Type of Construction in Part V.

604 EXIT FACILITIES

Exit facilities for Group B Occupancies shall be as set forth in this Section and in Chapter 28.

The requirements, as specified for exit facilities of Group A Occupancies in Section 504, shall apply to Group B Occupancies unless otherwise specified.

- 604.1 OCCUPANT CONTENT: The occupant content shall be computed as set forth in Sub-section 504.1.
- 604.2 WIDTHS OF EXITS: The total width of all exits shall be as set forth in Sub-section 504.2.
- 604.3 ARRANGEMENT OF EXITS:
 - (a) INTERIOR SPACES: Exits from rooms or spaces of Group B Occupancies shall be as set forth in Section 504 except that exits for Division 2 Occupancies not having a stage, balcony or gallery may be as follows:
 - (1) Such rooms may exit into a corridor, stairway, passageway or court serving another Group of Occupancy in the same building provided the total occupant content of the floor or building includes the Group B Division 2 Occupancy.
 - (2) There shall be not less than two exit doors and such doors shall be remote.
 - (3) The main exit shall be not less than 36 inches in width.
 - (b) FLOORS: Exits from any balcony or gallery shall be as set forth in Section 504.
 - (c) DOORS: Doors in a means of egress, normally closed and latched, and serving more than 50 persons, shall be equipped with panic hardware.
 - (d) TRAVEL DISTANCE: Exits shall be arranged that the maximum travel distance from any point, or from the door of separated spaces less than 600 square feet, to the nearest floor exit shall not exceed 150 feet for buildings of Type I Construction or 100 feet for buildings of other Types of Construction.

- 604.4 SEATING AND AISLES: Where seating is at tables such as in restaurants and night clubs, aisles shall be located so that there is not more than 28 feet between aisles nor more than 14 feet between an aisle and a wall. There shall be a cross aisle leading from the centre aisle or aisles directly to each required side exit. Aisle widths shall be unmistakably maintained, and the Buildings Control Officer may order seats fastened to the floor, or aisles outlined by rails or ropes or by painting on the floor, to maintain the minimum unobstructed aisle widths.

605 LIGHT AND VENTILATION

All portions of Group B Occupancies customarily used by human beings shall have light and ventilation as set forth in Section 505.

606 ENCLOSURE OF VERTICAL OPENINGS

- 606.1 Vertical openings shall be enclosed as set forth in Part IV for the type of construction, and in Section 604 and Chapter 28.
- 606.2 There shall be no openings in required stair or ramp enclosures except entrances, exit and openings for ventilation.

607 STAGES, PLATFORMS AND ROSTRUMS

Stages, platforms and rostrums shall be as set forth in Section 507.

608 MOTION-PICTURE MACHINE BOOTHS

- 608.1 Portable motion-picture machines using slow burning (cellulose acetate or equivalent) type of film may be used without a motion picture machine booth. The slow-burning film shall have a permanent distinctive marker for its entire length, identifying the manufacturer and the slow-burning character of the film stock. Machines shall be marked with the name and/or trademark of the maker and the voltage and current rating for which they are designed, and shall also be plainly marked: "FOR USE OF SLOW-BURNING FILMS ONLY."
- 608.2 In buildings where the showing of motion pictures is the principal use, motion-picture machine booths, as set forth in Section 508, shall be provided.

609 FIRE PROTECTION AND HAZARDS

- 609.1 Automatic sprinkler systems, smoke control systems, fire extinguishers, fire alarm systems and standpipes shall be as set forth in Chapter 37.
- 609.2 Chimneys, flues and vents shall be as set forth in Chapter 38.
- 609.3 Heat-producing apparatus shall be as set forth in Chapter 38.
- 609.4 The service of hazardous utilities shall be as set forth in Section 409 and other portions of this Code applicable thereto. Any gas service to the stage portion of the building shall be separated from any other service to the building, and every gas service shall be provided with a shut-off valve at a convenient and conspicuous place outside the building, and adequately marked.
- 609.5 *Electrical installations shall be as required herein and as specified in Chapter 44.*
- 609.6 Transformer vaults shall be as set forth in Chapter 39.
- 609.7 The storage of flammable materials shall be as set forth in Chapter 39.

610 PLUMBING AND TOILET FACILITIES

- 610.1 *Plumbing shall be installed as set forth in Chapter 36.*
- 610.2 Sanitation shall be as set forth in Section 412.
- 610.3 The number of toilet units shall be provided as in the tables in Chapter 36.

611 MIXED OCCUPANCY

Separation of Group B Occupancies or division thereof from all other occupancies or divisions of occupancies shall be as specified in Chapter 4.

612 ELEVATOR LOBBIES IN HIGH RISE BUILDINGS

Shall be required as set forth in Sub-section 513.

613 MINIMUM KITCHEN SIZES FOR CATERING ESTABLISHMENTS

The minimum sizes for kitchens of catering establishments shall be as set forth in Section 514.

614 ATRIUMS

The requirements for atriums shall be as set forth in Section 515.

615 ACCESSIBILITY FOR THE PHYSICALLY HANDICAPPED

The requirements for accessibility for the physically handicapped shall be as set forth in Chapter 45.

**CHAPTER 7
REQUIREMENTS OF GROUP C OCCUPANCIES**

- 701 GROUP C OCCUPANCY DEFINED
- 702 CONSTRUCTION, HEIGHT AND AREA ALLOWABLE
- 703 LOCATION ON PROPERTY
- 704 EXIT FACILITIES
- 705 LIGHT AND VENTILATION
- 706 ENCLOSURE OF VERTICAL OPENINGS
- 707 STAGES, PLATFORMS AND ROSTRUMS
- 708 MOTION-PICTURE MACHINE BOOTHS
- 709 FIRE PROTECTION AND HAZARDS
- 710 PLUMBING AND TOILET FACILITIES
- 711 EXCEPTIONS AND DEVIATIONS
- 712 MIXED OCCUPANCY
- 713 MINIMUM KITCHEN SIZES FOR CATERING ESTABLISHMENTS
- 714 ATRIUMS
- 715 ACCESSIBILITY FOR THE PHYSICALLY HANDICAPPED

701 GROUP C OCCUPANCY DEFINED

Group C Occupancy shall include all schools having classes more than four hours per day or 12 hours per week and providing facilities for more than ten students or pre-school children.

Accessory uses to schools not exceeding the following maximums may conform to the requirements of this Chapter.

Assembly Halls..... 2100 square feet

Dining Rooms..... 3000 square feet

Gymnasiums..... 3000 square feet

Woodwork Shops having portable or fixed power equipment or tools not exceeding a combined total of 20 HP.

Such accessory uses exceeding the above maximums shall conform to the requirements of the occupancy group, which includes such use.

702 CONSTRUCTION, HEIGHT AND AREA ALLOWABLE

- 702.1 GENERAL:
 (a) Buildings, or parts of buildings classed in Group C because of use or occupancy, shall be limited in height and area as follows:

<u>Type</u>	<u>Allowable Height</u>	<u>Area Per Floor</u>
I	Not Limited	Not Limited
II	60 feet (4 storeys)	18,000
III Protected	30 feet (2 storeys)	15,000
III Unprotected & IV	30 feet (1 storey)	13,500
V	30 feet (1 storey)	8,500

- (b) Areas of Group C buildings may be increased in accordance with Sub-section 502.1 (b).
 (c) See Section 414.2 for increase in tabulated basic areas if an approved fire extinguishing system is installed throughout the building.

- 702.2 SPECIAL PROVISIONS:
 (a) Rooms having an occupancy content of more than 100 persons and rooms used for kindergarten, first, and second grade pupils, shall not be located above the first storey above grade except in buildings of Type I construction.
 (b) Where there is useable space under the first floor of two-storey Type III buildings, basements, including the first floor shall be of Type I construction.

703 LOCATION ON PROPERTY

- 703.1 Buildings with Group C Occupancy shall comply with the requirements of Town Planning and the requirements herein stated, whichever are the more restrictive. Buildings with Group C Occupancy shall front directly

upon a public street or on a clear and permanent unobstructed yard or court not less than 30 feet in width and connected to such public street.

- 703.2 Exterior walls shall have fire-resistance and opening protection, determined by location on property, as set forth for the Type of Construction in Part IV.

704 EXIT FACILITIES

Exit facilities for Group C Occupancies shall be as set forth in this section and in Chapter 28.

- 704.1 **OCCUPANCY CONTENT:** *For determining exit requirements of Group C Occupancy, the occupant content shall be the area within the perimeter of the building, or fire division at any floor level, with no deduction for corridors, divided by the area per person as specified below:*

<i>Occupancy</i>	<i>Area (Sq. Ft. Per Person)</i>
<i>Auditoriums</i>	<i>7</i>
<i>Dining Rooms</i>	<i>10</i>
<i>Gymnasiums-seating areas</i>	<i>6</i>
<i>Classrooms</i>	<i>16</i>
<i>Shops, laboratories</i>	<i>50</i>
<i>School Libraries</i>	<i>40</i>
<i>Other Uses</i>	<i>40</i>
<i>Day care centres</i>	<i>35</i>

- 704.2 **WIDTH OF EXITS:** Exits shall be provided as follows:

- (a) Doors leading directly outside of building at grade level or not exceeding 21 inches above or below grade, one 22 inch unit of exit width for each 100 persons or fraction thereof.
- (b) Doors leading directly outside of building but requiring steps of over 21 inches to reach grade and provided such steps have one-third more units of width than doors, one 22 inch unit of exit width for each 100 persons or fraction thereof.

- (c) Stairs; one 22 inch unit of exit width for each 60 persons or fraction thereof.
- (d) Ramps and horizontal exits; one 22 inch unit of exit width for each 100 persons or fraction thereof.

704.3 ARRANGEMENT OF EXITS:

- (a) **ROOMS:** *Classrooms, shops and similar small rooms occupied by less than 40 persons may have one door thereto, provided such door is not less than 36 inches in width and located at the teacher end of the room. Classrooms, shops and similar rooms occupied by 41 or more persons shall have not less than two exit doors, not less than 36 inches in width, the combined width of which shall be not less than one 22 inch unit of exit width for each 100 persons or fraction thereof. Doors shall be remote from each other. Rooms with occupant content exceeding 300 persons shall have exits as specified for Group A and B occupancy.*

Classroom exits may be to corridors.

Rooms in basements shall have not less than 50 percent of the required means of egress therefrom opening directly to the exterior of the building.

- (b) **CORRIDORS:** Classrooms, assemblies of less than 300 persons, and other subdivisions shall open directly to floor exits or shall connect thereto by means of corridors. Corridors shall have a width of not less than six feet nor less than four inches for every 300 square feet, or major fraction thereof, of floor area served. Room doors or locker doors swinging into corridors shall not at any point in their swing reduce the clear effective width of the corridor to less than six feet, nor shall drinking fountains or other equipment fixed or moveable, be placed to obstruct the required minimum six feet width.
- (c) **BALCONIES,** used as exits shall not be less than five feet in width at any point.
- (d) **FLOORS:** There shall be not less than two remote means of egress from each floor.

Floor exits shall be by means of stairways, ramps, horizontal exits, passageways or smokeproof towers as specified in Chapter 28, or by doors at or near grade, directly to the exterior.

The upper floors of two-storey buildings may have enclosed interior stairways or open exterior stairways.

The upper floors of three-storey buildings shall have enclosed interior stairways for not less than one-half of the required floor exits. Other upper floor exits may be open exterior stairways or enclosed interior stairways.

The upper floor of building exceeding three stories shall have smokeproof towers for not less than one-half the required floor exits. Other upper floor exits shall be enclosed interior stairways.

- (e) **DOORS:** Doors in means of egress, normally closed and latched, shall be equipped with panic hardware except that doors leading from classrooms directly to the outside of the building may be equipped with the same knob-operated schoolhouse type lock as is used on classroom doors leading to corridor with no provision whatsoever for locking against egress from the classroom.

The minimum width of any required door in a means of egress shall be 36 inches.

Doors of classrooms serving as required exits may swing against the direction of exit travel when serving an occupant load of less than 40 persons.

- (f) **TRAVEL DISTANCE:** The exits shall be so arranged that the maximum travel distance from any point or from the door of separated spaces less than 800 square feet, to the nearest floor exit shall not exceed 100 feet except that the travel distance in any room where one exit door is permitted shall not exceed 40 feet.
- (g) **MAXIMUM DEAD END CORRIDOR TRAVEL:** *Exits shall be so arranged that at least 2 separate exits will be available from every floor area. Exits shall be as remote from each other as practicable, so arranged that there will be no pockets or dead ends of the appreciable size in which occupants may be trapped, and in no case shall any dead-end corridor extend more than 20'-0" beyond the stairway of other means of exit therefrom.*
- (h) **MAXIMUM DEAD END BALCONY OR EXTERIOR CORRIDOR TRAVEL:** *Where exterior corridors or balconies are provided as means of egress, they shall open to the outside air except for railings or balustrades with stairs or level exits to grade not over the allowable travel distance apart, so located that an exit will be available in either direction from the door to any individual room*

or space, with dead ends not to exceed 20'-0". If balconies are enclosed by glass or in any other manner, they shall be treated as interior corridors.

705 LIGHT AND VENTILATION

All portions of Group C Occupancies customarily used by human beings shall have light and ventilation as set forth in Section 505.

706 ENCLOSURE OF VERTICAL OPENINGS

Vertical openings shall be enclosed as set forth in Part IV for the Type of Construction, and in Section 704 and in Chapter 28.

707 STAGES, PLATFORMS AND ROSTRUMS

Stages, platforms and rostrums shall be as set forth in Section 507, except that platforms or rostrums constructed as part of classrooms and not occupying more than 15 percent of the area of the floor may be constructed of combustible materials.

708 MOTION-PICTURE MACHINE BOOTHS

Portable motion-picture machines using slow-burning (cellulose acetate or equivalent) type of film may be used in accordance with Section 608.

In buildings where the showing of motion pictures is the principal use, motion-picture machine booths, as set out in Section 508 shall be provided.

709 FIRE PROTECTION AND HAZARDS

- 709.1 Automatic sprinkler systems, smoke control systems, fire extinguishers, fire alarm systems and standpipes shall be as set forth in Chapter 37.
- 709.2 Chimneys, flues and vents shall be as set forth in Chapter 38.
- 709.3 Heat-producing apparatus shall be as set forth in Chapter 38.
- 709.4 The service of hazardous utilities shall be as set forth in Section 409 and other portions of this code applicable thereto. Any gas service to the stage portion of the building shall be separated from any other service to the building, and every gas service shall be provided with a shut-off valve at

a convenient and conspicuous place outside of the building, and adequately marked.

709.5 *Electrical installations shall be as required herein and as specified in Chapter 44 of this Code.*

709.6 Transformer vaults shall be as set forth in Chapter 39.

709.7 The storage of flammable materials shall be as set forth in Chapter 39.

710 PLUMBING AND TOILET FACILITIES

710.1 *Plumbing shall be installed as set forth in Chapter 36.*

710.2 Sanitation shall be as set forth in Section 412.

710.3 The number of toilet units shall be provided as in the tables in Chapter 36.

711 EXCEPTIONS AND DEVIATIONS

Except in buildings of Type I Construction, school classrooms used for kindergarten, first and second-grade pupils shall be located on the ground floor.

712 MIXED OCCUPANCY

Separation of Group C Occupancies or Divisions thereof from all other Occupancies or Divisions of Occupancies shall be as set forth in Chapter 4.

713 MINIMUM KITCHEN SIZES FOR CATERING ESTABLISHMENTS

The minimum sizes for kitchens of catering establishments shall be as set forth in Section 514.

714 ATRIUMS

The requirements for atriums shall be as set forth in Section 515.

715 ACCESSIBILITY FOR THE PHYSICALLY HANDICAPPED

The requirements for the physically handicapped shall be as set forth in Chapter 45.

NOTES

**CHAPTER 8
REQUIREMENTS OF GROUP D OCCUPANCIES**

- 801 GROUP D OCCUPANCY DEFINED
- 802 CONSTRUCTION, HEIGHT AND AREA ALLOWABLE
- 803 LOCATION ON PROPERTY
- 804 EXIT FACILITIES
- 805 LIGHT AND VENTILATION
- 806 ENCLOSURE OF VERTICAL OPENINGS
- 807 FIRE PROTECTION AND HAZARDS
- 808 PLUMBING AND TOILET FACILITIES
- 809 MIXED OCCUPANCY

801 GROUP D OCCUPANCY DEFINED

Group D Occupancy shall include such hazardous uses as the manufacture, storage and use of highly combustible materials or explosives or flammable liquids or gases, combustible film, dry-cleaning plants, grain elevators, distilleries, woodworking shops (schools included), having portable or fixed equipment or tools exceeding a combined total of 20 H.P., paint spraying, and similar uses.

802 CONSTRUCTION, HEIGHT AND AREA ALLOWABLE

802.1 GENERAL:

(a) Buildings, or parts of buildings classed in Group D because of use or occupancy shall be limited in height and area as follows:

<i>Type</i>	<i>Allowable Height</i>	<i>Area Per Floor</i>
<i>I</i>	<i>50 feet (4 storeys)</i>	<i>11,250</i>
<i>II</i>	<i>30 feet (2 storeys)</i>	<i>9,300</i>
<i>III (protected)</i>	<i>20 feet (1 storey)</i>	<i>8,000</i>
<i>IV</i>	<i>20 feet (1 storey)</i>	<i>5,000</i>

802.2 *Attention is drawn to the Statute Law of the Commonwealth of The Bahamas with reference to the following Acts and Rules made under these Acts: -*

- (a) *No. 17 of 1968 - The Explosives Act*
- (b) *Chapter 250 - The Inflammable Liquids Act*
- (c) *Chapter 295 - The Cinematographic Act*
- (d) *No. 14 of 1988 - The Liquefied Petroleum Gas Act*

relating to any special conditions for the storage of hazardous materials.

802.3 SPECIAL PROVISIONS:

- (a) Basements shall not be used for Group E occupancy purposes.
- (b) Floors shall be of non-combustible materials protected against saturation.
- (c) Where a special explosion hazard is inherent to a high-hazard occupancy, no occupancy which is not directly related to the high hazard occupancy shall be permitted in the same building.
- (d) A distance separation of not less than 30 feet from a contiguous building line shall be provided.
- (e) *Notwithstanding (d) above, should any Statute Law listed in Section 802.2 require a greater distance separation than 30 feet that distance shall govern.*

803 LOCATION ON PROPERTY

Buildings with Group D Occupancy shall comply with the requirements of Town Planning and the requirements herein stated, whichever are the more restrictive. Exterior walls of buildings of Group D Occupancy shall have fire-resistance and opening protection determined by location on property as set forth in Type of Construction in Part IV.

804 EXIT FACILITIES

Exit facilities for Group D Occupancies shall be as set forth in this section and in Chapter 28.

- 804.1 OCCUPANT CONTENT: For determining exit requirements of Group D Occupancies, the occupant content shall be the area within the perimeter of the building, or fire division, at any floor level, with no deductions for corridors, divided by an area of 100 square feet per person.

804.2 WIDTH OF EXITS: Exits shall be provided as follows:

- (a) Street floor exits shall be provided based on one 22 inch of exit width for each 100 persons or fraction thereof on the street floor plus one and one half units for each two units of stairway or ramp from upper or lower floor where such floors discharge through the street floor exit.
- (b) Upper or lower floors other than street level floors shall have one 22 inch unit of exit for each 60 persons or fraction thereof except that horizontal exits and smoke towers may serve 100 persons for each 22 unit of exit width.

804.3 ARRANGEMENT OF EXITS:

- (a) INTERIOR SPACES: Occupied rooms including mezzanines, shall have paths of egress so located that travel from such rooms to a floor exit is not subjected to hazardous exposure.

Rooms including mezzanines, 400 square feet or more in area, shall have not less than two remote exits.

- (b) FLOORS:
 - (1) There shall be not less than two remote means of egress from each floor.
 - (2) Floor exits shall be by means of stairways, ramps, horizontal exits, passageways or smokeproof towers, as specified in Chapter 28, or by doors, at or near grade, directly to the exterior.
 - (3) The upper floors of two storey buildings may have enclosed interior stairways or exterior open stairways.
 - (4) The upper floors of three storey buildings shall have enclosed interior stairways for not less than one half the required floor exits. Other upper floor exits may be open exterior stairways or enclosed interior stairways.
 - (5) The upper floors of buildings which exceed three stories shall have smokeproof towers for not less than one half the required floor exits. Other upper floor exits shall be enclosed interior stairways.
 - (6) Where floors are divided into fire divisions, one exit from each such division may be a horizontal exit.

- (c) **DOORS:** *Doors in a means of egress, normally closed and latched, shall be equipped with panic hardware.*
- (d) **TRAVEL DISTANCE:** Exits shall be so arranged that the maximum travel distance from any point to the nearest floor exit shall be not more than 75 feet.

EXCEPTION: The travel distance in any room, including mezzanines, where one exit door is permitted, shall not exceed 25 feet.

805 LIGHT AND VENTILATION

- 805.1 All portions of Group D Occupancies customarily used by human beings shall have light and ventilation as set forth in Section 505. All portions of buildings where flammable liquids are used or stored shall be provided with mechanical ventilation as set forth in Chapter 40.
- 805.2 In all buildings where flammable liquids are used or stored, mechanical exhaust ventilation shall be provided, sufficient to produce one complete change of air every 10 minutes. Such exhaust ventilation shall be taken from a point at or near floor level and shall be in operation when the building is occupied by human beings.

806 ENCLOSURE OF VERTICAL OPENINGS

Vertical openings shall be enclosed as specified in Part IV for the type of construction and in Section 804 and Chapter 28.

807 FIRE PROTECTION AND HAZARDS

- 807.1 *Automatic-sprinkler systems, fire alarm systems, smoke control systems, fire extinguishers and standpipes shall be as set forth in Chapter 37.*
- 807.2 Chimneys, flues and vents shall be as set forth in Chapter 38.
- 807.3 Heat-producing apparatus shall be as set forth in Chapter 38.
- 807.4 The service of hazardous utilities shall be as set forth in Section 409 and other portions of this Code applicable thereto.
- 807.5 *Electrical installations shall be as required herein and as specified in Chapter 44 of this Code.*

- 807.6 Transformer vaults shall be as set forth in Chapter 39.
- 807.7 The storage or use of flammable materials shall be as set forth in Chapter 39 and as required by Section 802.2.
- 807.8 *Combustion heaters shall not be permitted in Group D Occupancies.***
- 807.9 Each machine in dry-cleaning plants which use a flammable liquid shall have an adequate steam line connected to it, so arranged as to automatically fill the machine with steam in case of fire.
- 807.10 Paint spraying and dipping shall comply with the requirements set forth in Chapter 39.

808 PLUMBING AND TOILET FACILITIES

- 808.1 *Plumbing shall be installed as set forth in Chapter 36 of this Code.***
- 808.2 Sanitation shall be as set forth in Section 412.
- 808.3 The toilet units shall be provided as in the tables in Chapter 36.

809 MIXED OCCUPANCY

Separation of Group D Occupancies or Divisions thereof from other Occupancies or Divisions of Occupancies shall be as set forth in Chapter 4.

NOTES

CHAPTER 9 REQUIREMENTS OF GROUP E OCCUPANCIES

- 901 GROUP E OCCUPANCY DEFINED
- 902 CONSTRUCTION, HEIGHT AND AREA ALLOWABLE
- 903 LOCATION ON PROPERTY
- 904 EXIT FACILITIES
- 905 LIGHT AND VENTILATION
- 906 ENCLOSURE OF VERTICAL OPENINGS
- 907 FIRE PROTECTION AND HAZARDS
- 908 PLUMBING AND TOILET FACILITIES
- 909 MIXED OCCUPANCY
- 910 MINIMUM KITCHEN SIZES FOR CATERING ESTABLISHMENTS

901 GROUP E OCCUPANCY DEFINED

Group E Occupancy shall include storage and industrial uses as follows: —

DIVISION 1: Storage Occupancy shall include warehouses, storage buildings, freight depots, public garages of any size where repair work is done, parking garages for more than four cars, gasoline service stations, aircraft hangars or similar uses.

DIVISION 2: Industrial Occupancy shall include factories, assembly and manufacturing plants, processing mills, laboratories, loft buildings and similar uses.

902 CONSTRUCTION, HEIGHT AND AREA ALLOWABLE

902.1 GENERAL:

- (a) Buildings, or parts of buildings classed in Group E because of use or occupancy shall be limited in height and area as follows:

<u>Type</u>	<u>Allowable Height</u>	<u>Area Per Floor</u>
I	Not Limited	Not Limited
II	60 feet (4 storeys)	20,000
III*	30 feet (2 storeys)	18,000
IV	(1 storey)	12,000
III** & V	20 feet (1 storey)	10,000

*Protected

**Unprotected

- (b) Areas of Group E buildings may be increased in accordance with Sub-section 502.1(b).
- (c) See Section 414.2 for increase in tabulated basic areas if an approved fire extinguishing system is installed throughout the building.
- (d) See Section 3701.3 for construction requirements for Group E single storey buildings with specific distance separations.

902.2 *Attention is drawn to the Statute Law of the Commonwealth of The Bahamas with reference to the following Acts and Rules made under these Acts:*

- (a) *No. 17 of 1968 - The Explosives Act*
- (b) *Chapter 250 - The Inflammable Liquids Act*
- (c) *No. 14 of 1988 - The Liquefied Petroleum Gas Act*

relating to any special conditions for the storage of hazardous materials.

902.3 (a) *Motor vehicle service stations shall be Type I, II or III (Protected) or IV Construction. The canopies over the pumps may, at the discretion of the Buildings Control Officer, be of exposed steel columns and beams and sheet metal roofing.*

Motor vehicle service stations shall not be of Type V Construction.

- (b) Aircraft hangars shall be of Type Construction as approved by the Buildings Control Officer and shall comply with the requirements of the Minister charged with the responsibility for the control of Civil Aviation.
- (c) Parking garages used exclusively for parking and storing of passenger motor vehicles shall be of Type I construction, except that garages not exceeding four storeys above grade may have structural framework and floors unprotected and exterior walls of not less than two-hour fire-resistive construction, except as otherwise provided in Section 1504, and garages exceeding four storeys but not exceeding eight storeys may have structural framework and floors protected by one-hour fire-resistive construction.
- (d) Floors in motor service stations, garages and aircraft hangars shall be non-combustible materials protected against saturation.

- (e) *Vehicular ramps shall comply with the following:*
 - (1) *Where discharging to a sidewalk or street grade from below grade, the slope shall not to exceed 1:20 for the last 20'-0" to the point of discharge.*
 - (2) *Where discharging to a sidewalk or street grade from above grade, the slope shall not exceed 1:10 for the last 20'-0" to the point of discharge.*

903 LOCATION ON PROPERTY

Buildings with Group E Occupancy shall comply with the requirements of Town Planning and the requirements herein stated, whichever are the more restrictive. Exterior walls of Group E Occupancy buildings shall have fire-resistance and opening protection, determined by location on property, as set forth for Type of Construction in Part IV.

904 EXIT FACILITIES

Exit facilities for Group E Occupancies shall be as set forth in this Section and in Chapter 28 except that exit facilities for parking garages where no persons other than parking attendants are permitted on upper floors shall be as set forth in Paragraph 904.3(e)2.

- 904.1 OCCUPANT CONTENT: For determining exit requirements of Group E Occupancy, the occupant content shall be the area within the perimeter of the building, or fire division, at any floor level with no deduction for corridors, divided by an area of 100 square feet per person.
- 904.2 WIDTH OF EXITS: Exits shall be provided as follows:
 - (a) Street floor exits shall be provided based on one 22-inch of exit width for each 100 persons or fraction thereof on the street floor plus one and one-half units for each two units of stairway or ramp from upper or lower floor where such floors discharge through the street floor.
- 904.3 ARRANGEMENT OF EXITS:
 - (a) INTERIOR SPACES: Rooms or spaces shall have not less than two remote exits except that where having an occupant content of less than 25 persons having direct exit to public space and with travel distance not exceeding 50 feet a single exit may be provided.
 - (b) FLOORS:
 - (1) There shall be not less than two remote means of egress from

each floor except that floors or mezzanines of buildings not exceeding two stories and having an occupant content of not more than 25 persons, may have a single door, or an enclosed stairway, exiting directly to the exterior.

- (2) Floor exits shall be by means of stairways, ramps, horizontal exits, passageways or smokeproof towers as specified in Chapter 28, or by doors, at or near grade, directly to the exterior.
 - (3) Dead ends in exit corridors, beyond a floor exit or other corridor having two remote exits, shall not exceed 20 feet.
 - (4) The upper floor of two-storey buildings may have interior stairways, enclosed where required under Types of Construction, or open exterior stairways.
 - (5) The upper floors of three-storey buildings shall have enclosed interior stairways for not less than one-half of the required floor exits. Other upper floor exits may be open exterior stairways or enclosed interior stairways.
 - (6) The upper floors of buildings which exceed three storeys shall have enclosed interior stairways, except that buildings which exceed five storeys shall have not less than one-half of the required floor exits by smokeproof towers.
 - (7) Where floors are divided in fire divisions, one exit from each such division may be a horizontal exit.
- (c) **DOORS:** Doors in a means of egress, normally closed and latched, and serving more than 50 persons, shall be equipped with panic hardware.
- (d) **TRAVEL DISTANCE:** The exits shall be so arranged that the maximum travel distance from any point, or from the door of separated spaces having an occupant content of less than 50 persons, to the nearest floor exit shall not exceed 150 feet except as follows: —
- (1) In a building protected throughout by an approved sprinkler system in accordance with Section 3701, travel distance may be increased to 300 feet.
 - (2)* Every area used for the storage of high hazard commodities shall have an exit within 75 feet of any point in the area where persons may be present.

- (3)* If those areas in (2) above are in a building which is protected throughout with an approved sprinkler system installed in accordance with Section 3701, the travel distance may be increased to 100 feet.
- (e) **PARKING GARAGES:**
 - (1) Where persons other than parking attendants are permitted, stairs and exits shall be as otherwise set forth herein.
 - (2) Where no persons other than parking attendants are permitted and a ramp for transporting vehicles is constructed, or where cars are mechanically lifted and parked without attendants or passengers, there shall be not less than one stairway for each 10,000 square feet or fraction thereof. Where cars are mechanically lifted and parked by attendants, one additional exit shall be provided where such ramp is omitted. Such ramps shall be considered an exit, and exits shall be remotely located so that the maximum travel distance from any point to a floor exit shall not exceed 100 feet.
 - (3) Stairs shall be not less than three feet wide and shall be enclosed if more than 50 percent of the periphery of the building is enclosed or if the structure exceeds three storeys in height.
 - (4) Continuous belts or lifts without cages shall be designed to be safe.

905 LIGHT AND VENTILATION

All portions of Group E Occupancies customarily used by human beings shall have light and ventilation as set forth in Section 505. All portions of buildings where flammable liquids are used or stored or where automobiles are stored or handled shall be provided with mechanical ventilation as set forth in Chapter 40, except that the Buildings Control Officer may waive this requirement when the building is provided with unobstructed openings and/or cross ventilation.

906 ENCLOSURE OF VERTICAL OPENINGS

Vertical openings shall be enclosed as set forth in Part IV for the Type of Construction, and in Section 904 and in Chapter 28, except that, unless otherwise required by Type of Construction, interior stair or ramp exits in buildings two stories in height need not be enclosed.

907 FIRE PROTECTION AND HAZARDS

- 907.1 Automatic-sprinkler systems, smoke control systems, fire extinguishers and standpipes shall be as set forth in Chapter 37.
- 907.2 Chimneys, flues and vents shall be as set forth in Chapter 38.
- 907.3 Heat-producing apparatus shall be as set forth in Chapter 38.
- 907.4 The service of hazardous utilities shall be as set forth in Section 409 and other portions of this Code applicable thereto.
- 907.5 *Electrical vaults shall be as set forth in Chapter 44 of this Code.*
- 907.6 Transformer vaults shall be as set forth in Chapter 39.
- 907.7 The storage of flammable materials shall be as set forth in Chapter 39.

908 PLUMBING AND TOILET FIXTURES

- 908.1 *Plumbing shall be installed as set forth in Chapter 36.*
- 908.2 Sanitation shall be as set forth in Section 412.
- 908.3 The toilet units shall be provided as in the tables in Chapter 36.

909 MIXED OCCUPANCY

Separation of Group E Occupancies or Division thereof from all other Occupancies or Divisions of Occupancies shall be as set forth in Chapter 4.

910 MINIMUM KITCHEN SIZES FOR CATERING ESTABLISHMENTS

The minimum sizes for kitchens of catering establishments shall be as set forth in Section 514.

CHAPTER 10

REQUIREMENTS OF GROUP F OCCUPANCIES

- 1001 GROUP F OCCUPANCY DEFINED**
- 1002 CONSTRUCTION, HEIGHT AND AREA ALLOWABLE**
- 1003 LOCATION ON PROPERTY**
- 1004 EXIT FACILITIES**
- 1005 LIGHT AND VENTILATION**
- 1006 ENCLOSURE OF VERTICAL OPENINGS**
- 1007 FIRE PROTECTION AND HAZARDS**
- 1008 PLUMBING AND TOILET FACILITIES**
- 1009 MIXED OCCUPANCY**
- 1010 ELEVATOR LOBBIES IN HIGH RISE BUILDINGS**
- 1011 MINIMUM KITCHEN SIZES FOR CATERING ESTABLISHMENTS**
- 1012 ATRIUMS**
- 1013 ACCESSIBILITY FOR THE PHYSICALLY HANDICAPPED***

1001 GROUP F OCCUPANCY DEFINED

Group F Occupancy shall include mercantile and business uses as follows:

DIVISION 1: Mercantile occupancy, shall include retail stores, shops, sales rooms, markets and similar uses.

DIVISION 2: Business occupancy, shall include office buildings, banks, civic-administration buildings, telephone exchanges, museums, art galleries, libraries and similar uses.

DIVISION 3: Covered Malls.

1002 CONSTRUCTION, HEIGHT AND AREA ALLOWABLE

1002.1 GENERAL:

- (a) Buildings or parts of buildings classed in Group F because of use or occupancy, shall be limited in height and area as follows:

Type	Allowable Height	Area Per Floor
I	Not Limited	Not Limited
II	60 feet (4 storeys)	22,500
III*	30 feet (2 storeys)	20,000
III** & IV	20 feet (1 storey)	18,000
V	20 feet (1 storey)	12,000

* Protected

** Unprotected

- (b) Areas of Group F buildings may be increased in accordance with sub-section 502.1(b).
- (c) See Section 414.2 for increase in tabulated basic areas if an approved fire extinguishing system is installed throughout the building.
- (d) See Section 3701.3 for construction requirements for Group F Division I and III Occupancy with specific distance separation requirements.
- (e) Type V construction shall not be permitted for covered malls.

1002.2 SPECIAL PROVISIONS:

- (a) Basements shall be of Type I construction.
- (b) Buildings on open lots, if used for the dispensing of gasoline, shall be as set forth in paragraph 902.3(a).
- (c) In covered malls, walls dividing stores and other spaces from each other and those protecting exits shall extend from the floor to the underside of the roof deck, or floor deck above. No separation is required between a tenant space and the mall.

1003 LOCATION ON PROPERTY

Buildings with Group F Occupancy shall comply with the requirements of Town Planning and the requirements herein stated, whichever are more restrictive. Exterior walls of buildings of Group F Occupancy shall have fire resistance and opening protection, determined by location on property as set forth for the Type of Construction in Part IV.

1004 EXIT FACILITIES

Exit facilities for Group F Occupancies shall be as set forth in this Section and in Chapter 28.

1004.1 OCCUPANT CONTENT: *For determining exit requirements of Group F Occupancy, the occupant content shall be the area within the perimeter of the building, or fire division, any floor level with no deduction for corridors, divided by the specified area per person as given below:*

<i>Occupancy</i>	<i>Area Sq. Ft. Per Person</i>
<i>Mercantile Basements, Ground Floors and Covered Malls</i>	<i>30</i>
<i>Mercantile Upper Floors</i>	<i>60</i>
<i>Mercantile Offices, Storage and Shipping</i>	<i>100</i>
<i>Business: All Floors</i>	<i>100</i>

- (a) The occupant content of floors or spaces used for assembly purposes shall be computed as set forth in Sub-section 504.1. The occupant content shall be the reasonable maximum capacity based on the intended use as determined by the Buildings Control Officer.
- (b) *In the case of mezzanines or balconies open to the floor below, or unprotected vertical openings between floors, the occupant load (or area) of the mezzanine or other subsidiary floor level shall be added to that of the street floor for the purpose of determining required exits, provided, however, that in no case shall the total number of exit units be less than would be required if all vertical openings were enclosed.*

1004.2 WIDTHS OF EXITS: Street floor exits shall be provided based on 22-inch of exit width for each 100 persons or fraction thereof on the street floor plus one and one-half units for each two units of stairway or ramp from upper or lower floor where such floors discharge through the street floor.

1004.3 ARRANGEMENT OF EXITS:

- (a) **INTERIOR SPACES:**
 - (1) Rooms or spaces shall have not less than two remote exits except where having an occupant content of less than 25 persons, having direct exit to public space and with travel distance not exceeding 50 feet a single exit may be provided.
 - (2) In self service stores, no check out stand or associated railing, turnstile or barrier shall obstruct exits, aisles or approaches thereto.

- (3) Not less than one-half of the required exits from the first or ground floor of a mercantile occupancy shall be to the main entrance and exit.
 - (4) In self service stores where wheeled carts or buggies are used by customers, adequate provision shall be made for the transit and parking of such carts to minimize the possibility that they may obstruct exits.
 - (5) *At least 1/2 of the required exits shall be so located as to be reached without going through check-out stands. In no case shall check-out stands or associated railings or barriers obstruct exits, required aisles or approaches thereto.*
- (b) FLOORS:
- (1) There shall be not less than two remote means of egress from each floor except that floors of buildings not exceeding two stories and having an occupant content of not more than 25 persons may have a single door, or an enclosed stairway, exiting directly to the exterior.
 - (2) Floor exits shall be by means of stairways, ramps, horizontal exits, passageways or smokeproof towers as specified in Chapter 28 or by doors, at or near grade, directly to the exterior. Dead ends in exit corridors beyond a floor exit or other corridor having two remote exits shall not exceed 20 feet.
 - (3) The upper floor of two-storey buildings may have interior stairways enclosed where required under Types of Construction, or open exterior stairways.
 - (4) The upper floors of three-storey buildings shall have enclosed interior stairways for not less than one-half of the required floor exits. Other upper floor exits may be open exterior stairways or enclosed interior stairways.
 - (5) The upper floors of buildings which exceed three stories shall have enclosed interior stairways, except that buildings which exceed five storeys shall have not less than one-half of the required exits by smokeproof towers.
 - (6) Where floors are divided in fire divisions, one exit from each such division may be a horizontal exit.
- (c) DOORS: Doors in a means of egress, normally closed and latched, and serving more than 50 persons, shall be equipped with panic hardware.

- (d) TRAVEL DISTANCE: The exits shall be so arranged that the maximum travel distance from any point or from the door of separated spaces having an occupant content of less than 50 persons, to the nearest floor exit shall not exceed 150 feet except that if high hazard commodities are displayed or handled without protective wrappings or containers the travel distance shall not exceed 75 feet.
- (e) SPECIAL RESTRICTION: Smokeproof towers and enclosed interior stairways shall not be taken down to basement level. Basement exits shall be separate.
- (f) SPECIAL REQUIREMENTS: COVERED MALLS: *A covered mall and all stores and other spaces contained therein shall be treated as a single building for the purposes of calculating the means of egress and shall be subject to the requirements of the appropriate Group of Occupancy.

Notwithstanding the above:

- (1) Any store, or other space, the total floor area of which exceeds 3000 square feet, shall have half its required exit widths leading directly to the outside, without passage through the mall.
- (2) All Group A, Group B, or Group G Occupancies and major department stores or merchandising centres not contained within the covered mall but having direct access to it, shall have all the required means of egress independent of the covered mall.
- (3) The covered mall shall be of sufficient width to accommodate the egress requirements set forth in this and other Chapters of this Code and in no case shall the width be less than 20 feet. This width shall be maintained free of all merchandise, sale stands and similar obstructions at all times.
- (4) The covered mall and all stores and other spaces contained therein shall be protected throughout by an approved sprinkler system installed in accordance with Section 3701.
- (5) *In addition to the approved sprinkler system in (4) above all those areas shall be equipped with an approved smoke control system and approved fire alarm system.*
- (6) Where the covered mall, stores and other spaces contained therein are protected in accordance with (4) and (5) above,

the travel distance within an individual store or space shall not exceed 150 feet. An additional 200 feet shall be permitted for travel through the covered mall to an exit.

- (7) Every floor of a covered mall shall have no less than two exits located remote from each other.

1005 LIGHT AND VENTILATION

All portions of Group F Occupancies customarily used by human beings shall have light and ventilation as provided in Section 505.

1006 ENCLOSURE OF VERTICAL OPENINGS

Vertical openings shall be enclosed as set forth in Part IV for the Type of Construction, and in Section 1004 and in Chapter 28, except that, unless otherwise required by Type of Construction, interior stair or ramp exits in buildings two stories in height need not be enclosed.

1007 FIRE PROTECTION AND HAZARDS

- 1007.1 Automatic-sprinkler systems, smoke control systems, fire extinguishers and standpipes shall be as set forth in Chapter 37.
- 1007.2 Chimneys, flues and vents shall be as set forth in Chapter 38.
- 1007.3 Heat-producing apparatus shall be as set forth in Chapter 38.
- 1007.4 The service of hazardous utilities shall be as set forth in Section 409 and other portions of this Code applicable thereto.
- 1007.5 *Electrical installations shall be as specified in Chapter 44 of this Code.***
- 1007.6 Transformer vaults shall be as set forth in Chapter 39.
- 1007.7 The storage of flammable materials shall be as set forth in Chapter 39.

1008 PLUMBING AND TOILET FACILITIES

- 1008.1 *Plumbing shall be installed as set forth in Chapter 36 of this Code.***
- 1008.2 Sanitations shall be as set forth in Section 412.
- 1008.3 The toilet units shall be provided as in the tables in Chapter 36.

1009 MIXED OCCUPANCY

Separation of Group F Occupancies or Divisions thereof from all other Occupancies or Division of Occupancies shall be as set forth in Chapter 4.

1010 ELEVATOR LOBBIES IN HIGH RISE BUILDINGS

All elevator lobbies in high rise buildings shall be protected in accordance with Sub-section 513.

1011 MINIMUM KITCHEN SIZES FOR CATERING ESTABLISHMENTS

The minimum sizes for kitchens of catering establishments shall be as set forth in Section 514.

1012 ATRIUMS

The requirements for atriums shall be as set forth in Section 515.

1013 ACCESSIBILITY FOR THE PHYSICALLY HANDICAPPED

The requirements for the physically handicapped shall be as set forth in Chapter 45 of this Code.

NOTES

CHAPTER 11 REQUIREMENTS OF GROUP G OCCUPANCIES

- 1101 GROUP G OCCUPANCY DEFINED
- 1102 CONSTRUCTION, HEIGHT AND AREA ALLOWABLE
- 1103 LOCATION ON PROPERTY
- 1104 EXIT FACILITIES
- 1105 LIGHT AND VENTILATION
- 1106 ENCLOSURE OF VERTICAL OPENINGS
- 1107 FIRE PROTECTION AND HAZARDS
- 1108 PLUMBING AND TOILET FACILITIES
- 1109 MIXED OCCUPANCY
- 1110 ELEVATOR LOBBIES IN HIGH RISE BUILDINGS
- 1111 MINIMUM KITCHEN SIZES FOR CATERING ESTABLISHMENTS
- 1112 ATRIUMS
- 1113 *ACCESSIBILITY FOR THE PHYSICALLY HANDICAPPED*

1101 GROUP G OCCUPANCY DEFINED

Group G Occupancy shall include multiple-residential uses such as hotels, motels, apartment-hotels, houses, bungalows courts, rooming houses, dormitories, fraternity houses, monasteries and similar uses which provide accommodations for more than six persons.

EXCEPTION: A single-family residence containing no more than three bedrooms where no more than two bedrooms are rented, said rooms being used to house not more than two persons per bedroom, shall be included in Group H Occupancy.

1102 CONSTRUCTION, HEIGHT AND AREA ALLOWABLE

- 1102.1 (a) Buildings, or parts of buildings classed in Group G because of use or occupancy, shall be limited in height and area as follows:

<u>Type</u>	<u>Allowable Height</u>	<u>Area Per Floor (sf)</u>
I	Not Limited	Not Limited
II	60 feet (4 storeys)	15,000
III (Protected)	30 feet (2 storeys)	13,500
III (Unprotected)	20 feet (1 storey)	9,000

- (b) Areas of Group G buildings may be increased in accordance with sub-section 502.1(b).
 - (c) See Section 414.2 for increase in tabulated basic areas if an approved fire extinguishing system is installed throughout the building.
- 1102.2 **EXCEPTION:** Type III (Protected) buildings may be three storeys in height if the floor level of the third floor is not more than 20 feet above the grade adjacent thereto, but where this exception is used, load bearing walls shall be of non-combustible materials.
- 1102.3 Basements shall be of Type I construction.

1103 LOCATION ON PROPERTY

Buildings with Group G Occupancy shall comply with the requirements of Town Planning and the requirements herein stated, whichever are the more restrictive. Exterior walls of buildings of Group G Occupancy shall have fire-resistance and opening protection determined by location on property as set forth in Type of Construction in Part IV.

1104 EXIT FACILITIES

Exit facilities for Group G Occupancies shall be as set forth in this Section and in Chapter 28.

- 1104.1 **OCCUPANT CONTENT:** For determining exit requirements of Group G Occupancy, the occupant content shall be the area within the perimeter of the building, or fire division, at any floor level, including all floors of residential apartments, with no deductions for corridors, divided by an area of 125 square feet per person, except that dormitory rooms shall be computed at 30 square feet per person.
- 1104.2 **WIDTH OF EXITS:**
- (a) Exits from street or ground floors shall be provided on the basis of one 22-inch unit of exit width for each 100 persons or fraction thereof on the ground floor plus one and one half units of exit width for each two units of exit width exiting through the ground floor from other floors. Exits from upper or lower floors other than the ground floor shall be provided on the basis of one 22-inch unit of exit width for each 60 persons or fraction thereof.
 - (b) All required means of egress from floors shall be not less than 44 inches in width, except that where serving floors having not more than four apartment units or eight hotel rooms, one such required means of egress may be not less than 36 inches in width.

- (c) *The minimum width of exit doors from dwelling units or hotel rooms shall be not less than the following:*

<i>Area of Unit</i>	<i>Exit</i>
<i>(i) Less than 1000 square feet</i>	<i>One 32-inch exit</i>
<i>(ii) 1001 to 2,000 square feet</i>	<i>Two 32-inch exits</i>

The area given in (i) above may be doubled, provided the building is fully protected throughout by an approved sprinkler system installed in accordance with Section 3701. In addition a mains-wired smoke detector system shall also be installed. This system shall be so designed that when activated it shall initiate an alarm which is audible in the bedrooms.

- (d) Residential-apartment units in multiple-apartment buildings, having a second floor or balcony contained wholly within the unit shall have an exit not less than 36 inches in width for upper area not exceeding 1,000 square feet and an additional exit not less than 30 inches in width for upper areas exceeding 1,000 square feet. Width of exits from main floors of residential-apartment units shall be as otherwise set forth in this Section.
- (e) *A single family town house unit not exceeding two stories in height shall be permitted to have a single exit provided:*
- (i) *The unit has an exit door no less than 36" wide opening directly to the street or yard at ground level, or*
 - (ii) *That the unit has direct access to an outside stair that complies with section 2803.9. Such stair shall serve no more than two units located on the same floor and shall not exceed 10' in height from the ground level.*
- (f) *Exit courts on lot lines shall have a clear width, not less than required by Town Planning but not less than 44 inches, and inner courts shall have a clear width of not less than ten feet.*

1104.3 ARRANGEMENT OF EXITS:

- (a) UNIT EXITS: Dwelling units and hotel rooms, 1000 square feet or more in area, shall have not less than two remote exits, except as otherwise provided for the upper floors of residential-type apartments and as provided in 1104.2 (c) above.

The landing on the upper floor of residential apartment units shall be directly accessible from all rooms on such upper floor, and the stairway shall discharge on the main floor of the unit in close proximity to a means of egress from the unit. Where the upper floor of such unit has a gross floor area in excess of 1,000 square feet, not less than two exits shall be provided, one of which shall be enclosed and shall discharge directly to a means of egress from the floor.

- (b) FLOORS: There shall be not less than two remote means of egress from each floor, except for two floor buildings containing only three apartments per floor.

Floor exits shall be by means of stairways, ramps, horizontal exits, passageways or smokeproof towers, as specified in Chapter 28, or by doors, at or near grade directly to the exterior.

Dead ends in exit corridors beyond a floor exit or other corridor having two remote exits shall not exceed 20 feet.

The upper floor of two-storey buildings may have interior stairways, enclosed where required under Types of Construction, or open exterior stairways.

Where access to rooms, or apartments, or a floor is by open balcony and the floor exits by means of open stairways, Section 2803.9 shall apply.

Where access to rooms, or apartments, on a floor is by open balcony and enclosed stairways or by passageway (corridor) and enclosed stairways, the following shall apply: —

- (i) Buildings of four storeys or less in height shall be provided with enclosed stairways.
- (ii) Buildings of five or more storeys shall have not less than one half the required floor exits by smokeproof towers.

EXCEPTION: Where the floor level of the third floor does not exceed 20 feet above grade, all floor exits may be open exterior stairways.

The upper floors of buildings which exceed three storeys shall have enclosed interior stairways, except that buildings which exceed five storeys shall have not less than one-half of the required floor exits by smoke-proof towers.

Where floors are divided in fire divisions, one exit from each such division may be a horizontal exit.

- (c) DOORS: Doors in a means of egress, normally closed and latched, and serving more than 50 persons, shall be equipped with panic hardware.
- (d) TRAVEL DISTANCE: The exits shall be so arranged that the maximum travel distance from any point, or from the door of separated space is less than 1,000 square feet to the nearest floor exit shall not exceed 100 feet except that the travel distance in any room where one exit door is permitted shall not exceed 50 feet.

1104.4 APARTMENTS:

- (a) Exits and means of access thereto shall be so located that it will not be necessary to travel more than 50 feet nor traverse more than one flight of stairs, within any individual living unit to reach the nearest exit, or to reach an entrance door of the apartment.
- (b) Single family town house, or row house apartment units, no more than 3 stories high and separated from adjacent units by 8" masonry walls or 6" reinforced concrete walls may have only one exit per floor. This may be provided by an interior staircase enclosed with a one hour fire resistance rating.
- (c) *Stairway enclosures shall not be required where a 1-storey stair connects two levels within a single dwelling unit or suite.*

1104.5 DOORS AND WINDOWS:

- (a) Every sleeping room below the eighth floor in groups G and H Occupancies shall have at least one openable window or exterior door to permit emergency exit or rescue.
- (b) Where windows are provided to comply with Sub-section 1104.5, such windows shall have a sill height of not more than 48 inches above the floor and shall provide not less than five square feet of openable area with no dimension less than 22 inches.

1104.6 TRANSOMS AND VENTILATING OPENINGS: Buildings more than one storey in height shall not have transoms or ventilating openings from guest rooms to enclosed public corridors.

1104.7 SPECIAL PROVISIONS: Where Group G Occupancy buildings exceed three storeys in height and where the distance between floor exits exceeds 100 feet, smoke doors shall be provided in the corridors. These smoke doors shall be centrally located between the exits and shall take the form

of doors hung in recesses in the corridor walls. The doors, when in the open position, shall be flush with the wall of the corridor. Smoke doors shall be kept in an open position at all times, when not in use, by means of magnetic catches. These catches shall be connected to the fire alarm system in such a manner that the doors will be released when the alarm is activated. When the doors are in a closed position they shall not be secured by any means that impedes easy passage through the doorway. The doors shall be of such size or framed in such a manner that when closed they effectively control the spread of smoke in the corridor. The doors shall be a minimum of 6 feet 8 inches in height and shall be of a width deemed necessary to meet the exit requirements and shall be of 1-3/8 inches solid construction with a 10 inches by 10 inches wired glass panel. These smoke doors shall be tested in the presence of the Chief Fire Officer at six month intervals.

- 1104.8 SPECIAL RESTRICTION: Smoke proof towers and enclosed interior stairways shall not be taken down to basement level. Basement exits shall be separate.

1105 LIGHT AND VENTILATION

1105.1 GENERAL:

- (a) *Other spaces for human occupancy such as lobbies, locker rooms, dining rooms, kitchens, and toilet rooms shall be provided with light by means of windows as herein set forth or shall be provided with electric light as set forth in Chapter 44 and a mechanically operated ventilating system as set forth in Chapter 40.*
- (b) Rooms used for sleeping and living purposes where located as the first-occupied space below a roof, shall be protected from extreme temperatures. The overall coefficient of heat transmission or "U" factor of such roof construction shall not be greater than 0.23.
- (c) The floor area for an apartment shall be not less than required by applicable Town Planning and Ministry of Health Regulations.
- (d) *Emergency lighting shall be provided as set forth in Section 505.*

1105.2 ROOMS:

- (a) (i) SLEEPING ROOMS: Rooms used for sleeping shall have a minimum width of eight feet and a minimum floor area within the immediate enclosing walls, exclusive of closets and toilets, as required by the Minister of Health. Rooms shall not be used for sleeping purposes, where the floor is more than three feet below grade and which depend on natural ventilation. The minimum average height of each

sleeping room shall be eight feet, and the least height shall be seven feet.

(ii) *NOTE: For applicants wishing to make use of the Hotels Encouragement Act, that Act has special requirements for the minimum cubic content of a sleeping room exclusive of toilet facilities and closets. In such cases applicants should contact the Office of the Prime Minister requesting information concerning that Act.*

- (b) LIVING AND DINING ROOMS: Living and Dining rooms shall have a minimum average height of eight feet and a least height of seven feet.
- (c) KITCHENS AND CORRIDORS: Kitchens and corridors shall have a minimum height of seven feet.
- (d) TOILET ROOMS: Toilet rooms shall have a minimum height of seven feet, a minimum width of three feet and a minimum area of 15 square feet.

1106 ENCLOSURE OF VERTICAL OPENINGS

Vertical openings shall be enclosed as specified in Part IV for the Type of Construction, and in Section 1104 and Chapter 28, except that, unless otherwise required by Type of Construction, interior stair and ramp exits in buildings two storeys in height need not be enclosed.

1107 FIRE PROTECTION AND HAZARDS

1107.1 *Automatic-sprinkler systems, smoke control systems, fire alarm systems, fire extinguishers and standpipes shall be as set forth in Chapter 37.*

1107.2 Chimneys, flues and vents shall be as set forth in Chapter 38.

1107.3 Heat-producing apparatus shall be as set forth in Chapter 38.

1107.4 The service of hazardous utilities shall be as set forth in Section 409 and other portions of this Code applicable thereto.

1107.5 *Electrical installations shall be as required herein and as specified in Chapter 44.*

1107.6 The transformer vaults shall be as set forth in Chapter 39.

1107.7 The storage of flammable materials shall be as set forth in Chapter 39 and as required by Section 802.2.

1108 PLUMBING AND TOILET FACILITIES

1108.1 *Plumbing and toilet facilities shall be as provided in Table 11-A and shall be installed as set forth in Chapter 36.*

- 1108.2 (a) Toilet rooms serving a one-family-unit shall have outside openings screened with 18-mesh-wire screening. The minimum openable area shall be 2 square feet.
- (b) For occupancies with an occupant content of ten or more persons, separate facilities shall be provided for employees.
- (c) Separate facilities consisting of water closet, a lavatory, and a bath or shower shall be contiguous thereto and directly accessible from each hotel room.
- (d) Lavatories may be located in rooms provided there is no conflict with minimum requirements otherwise set forth in Table 11-A.

TABLE 11-A

Water Closets	Lavatory Basin	Tubs or Showers	Kitchen Sinks	Laundry Tub or Washing Machine
1 per sleeping or dwelling unit	1 per sleeping or dwelling unit	1 per sleeping or dwelling unit	1 per dwelling unit	1 minimum

NOTE: For sanitary convenience for patrons and employees of catering areas see Section 412.

1109 MIXED OCCUPANCIES

Separation of Group G Occupancies or Divisions thereof from all other Occupancies or Divisions of Occupancies shall be as set forth in Chapter 4.

1110 ELEVATOR LOBBIES IN HIGH RISE BUILDINGS

All elevator lobbies in high rise buildings shall be protected in accordance with sub-section 513.

1111 MINIMUM KITCHEN SIZES FOR CATERING ESTABLISHMENTS

The minimum sizes for kitchens of catering establishments shall be as set forth in Section 514.

1112 ATRIUMS

The requirements for atriums shall be as set forth in Section 515, except that there shall not be any direct access from the atrium to a bedroom.

1113 ACCESSIBILITY FOR THE PHYSICALLY HANDICAPPED

The requirements for the physically handicapped shall be as set forth in Chapter 45.

NOTES

CHAPTER 12 REQUIREMENTS OF GROUP H OCCUPANCIES

- 1201 GROUP H OCCUPANCY DEFINED
- 1202 CONSTRUCTION, HEIGHT AND AREA ALLOWABLE
- 1203 LOCATION ON PROPERTY
- 1204 EXIT FACILITIES
- 1205 LIGHT AND VENTILATION
- 1206 ENCLOSURE OF VERTICAL OPENINGS
- 1207 FIRE PROTECTION AND HAZARDS
- 1208 PLUMBING AND TOILET FACILITIES
- 1209 MIXED OCCUPANCY

1201 GROUP H OCCUPANCY DEFINED

Group H Occupancy shall include: All single-family uses and duplexes, dormitories, fraternity houses and monastery uses when such buildings are used to domicile not more than six persons; buildings classified as Group C Occupancy when such buildings are used to house not more than six students and the appropriate supervisory personnel; and rooming houses, when such rooming houses are operated in a single-family residence containing no more than three bedrooms, where no more than two bedrooms are rented, said rooms being used to house not more than two persons per bedroom.

1202 CONSTRUCTION, HEIGHT AND AREA ALLOWABLE

Buildings, or parts of buildings classed in Group H because of use or occupancy shall be limited in height and area as follows:

<u>Type</u>	<u>Stories</u>	<u>Area Per Floor</u>
I	Not Limited	Not Limited
II	3	15,000
III (Protected)	2	10,000
III (Unprotected), IV & V	1	7,500

EXCEPTION: Where intended as a single-family residence only, Type III (Unprotected) or Type V Construction may be used for buildings two stories high.

1203 LOCATION ON PROPERTY

Buildings with Group H Occupancy shall comply with the Requirements of Town Planning and the requirements herein stated, whichever are the more restrictive. Exterior walls of buildings with Group H Occupancy shall have fire resistance and opening protection, determined by location on property, as set forth for the Type of Construction in Part IV.

1204 EXIT FACILITIES

Exit facilities for Group H Occupancies shall be as set forth in this Section and in Chapter 28.

1204.1 OCCUPANT CONTENT: The occupant content of Group H Occupancy should not be less than 125 square feet per person.

1204.2 WIDTH AND ARRANGEMENT OF EXITS:

(a) FIRST FLOOR EXIT: The minimum number and width of exits shall be as follows:

Ground-Floor Area in Square Feet	Exits (Number and Exits)
1000	One 32-inch
1001 to 2,000	One 32-inch & One 30-inch

(b) SECOND-FLOOR EXITS: Second floors of single-family residences not exceeding 1,500 square feet or other Group H Occupancies not exceeding 750 square feet, may be served by a stairway not less than 30 inches in width, discharging at or near a ground floor exit. Second floors of single-family residences exceeding 1,500 square feet or other Group H occupancies exceeding 750 square feet shall have not less than two stairways, neither of which shall be subject to severe fire exposure.

Duplex units of residential-apartment type shall have exits as set forth in Section 1104.

(c) THIRD-FLOOR EXITS: Third floors which may be used for sleeping purposes shall have stairways as provided for a second floor, except that one such stairway shall be enclosed and shall discharge directly to the exterior.

- (d) **ARRANGEMENT OF STAIRWAYS:** Stairways shall be arranged to provide the greatest accessibility to landings on floors above the first or ground floor and to provide the shortest and safest practical means of egress to a street or other similar public space.
 - (e) **TRAVEL DISTANCE:** The exits shall be so arranged that the maximum travel distance to the nearest exit shall not exceed 75 feet.
- 1204.3 **APARTMENTS:** Exits and means of access thereto shall be so located that it will not be necessary to travel more than 50 feet nor traverse more than one flight of stairs, within any individual living unit to reach the nearest exit, or to reach an entrance door of the apartment.
- 1204.4 **DOORS AND WINDOWS:**
- (a) *Every sleeping room of Group H Occupancies shall have at least one openable window or exterior door to permit emergency exit or rescue.*
 - (b) Where windows are provided to comply with Sub-section 1204.4, such windows shall a sill height of not more than 48 inches above the floor and shall provide not less than five square feet of openable area with no dimension less than 22 inches.
- 1204.5 **SECURITY (BURGLAR) BARS:** *Where security or burglar bars are installed on the windows and/or doors in Group H, one or two windows or exterior doors in the sleeping areas shall be provided with a mechanism which can be operated quickly by any occupant to release the security bar installation so that it does not interfere with the use of the window or door as an emergency exit.*
- 1204.6 **TRANSOMS AND VENTILATING OPENINGS:** *Buildings more than one storey in height shall have no transoms or ventilating openings from guest rooms to enclosed public corridors.*

1205 LIGHT AND VENTILATION

- 1205.1 **GENERAL:** Rooms used for sleeping and living purposes shall be provided with light and ventilation as set forth in Section 1105.
- 1205.2 **SLEEPING ROOMS:** Rooms used for sleeping shall have a minimum width of eight feet, and shall have a minimum floor area within the immediate enclosing walls, exclusive of closets and toilets as set forth in table 12-A. The minimum ceiling height shall be eight feet.

TABLE 12-A

For a house containing the following:

SIZE OF HOUSE	MINIMUM SIZE OF BEDROOMS IN SQUARE FEET			
4 bedrooms	110	100	90	80
3 bedrooms	110	100	90	*
2 bedrooms	100	100	*	*
1 bedroom	110	*	*	*

**NO BEDROOM SHALL BE LESS
THAN 80 SQUARE FEET IN AREA**

In any room, used for sleeping purposes in which there is a sloping ceiling, the minimum ceiling height shall be required in only one half the area thereof. However no portion of the room which measures less than six feet from finished floor to finished ceiling shall be included in the computation of the minimum area.

- 1205.3 LIVING AND DINING ROOMS: Living and dining rooms shall have a minimum average height of eight feet and a least height of seven feet.
- 1205.4 KITCHEN AND HALLWAYS: Kitchens and hallways shall have a minimum height of seven feet.
- 1205.5 TOILET ROOMS: Toilet rooms shall have a minimum height of seven feet, a minimum width of three feet, and a minimum area of 15 square feet and shall be ventilated as set forth in Section 1105.

1206 ENCLOSURE OF VERTICAL OPENINGS

Vertical openings shall be enclosed as set forth in Part IV for the Type of Construction, and in Section 1204 and Chapter 28, except that interior stair or ramp exits in buildings not exceeding two storeys in height need not be enclosed.

1207 FIRE PROTECTION AND HAZARDS

- 1207.1 Chimneys, flues and vents shall be as set forth in Chapter 38.
- 1207.2 Heat-producing apparatus shall be as set forth in Chapter 38.
- 1207.3 *Electrical installations shall be as required herein and as specified in Chapter 44.*

1207.4 The storage of flammable materials shall be as set forth in Chapter 39 and as required by Section 802.2.

1208 PLUMBING AND TOILET FACILITIES

1208.1 Plumbing shall be installed as set forth in Chapter 36.

- 1208.2 (a) Sanitation shall be as set forth in Section 412.
- (b) Toilet rooms floors and base shall be of impervious materials.
- (c) Toilet rooms shall have outside openings screened with 18-mesh-wire screen.
- (d) For each family unit the minimum toilet requirements shall be as follows:
- (i) 1 water closet
 - (ii) 1 wash basin
 - (iii) 1 tub or shower
- (e) Ample provision shall be made for the storage of waste within the lines of the lot or lots occupied.

1209 MIXED OCCUPANCY

Separation of Group H Occupancies or Divisions thereof from all other Occupancies or Divisions of Occupancies shall be as set forth in Chapter 4.

NOTES

CHAPTER 13 REQUIREMENTS OF GROUP I OCCUPANCIES

- 1301 GROUP I OCCUPANCY DEFINED
- 1302 CONSTRUCTION, HEIGHT AND AREA ALLOWABLE
- 1303 LOCATION ON PROPERTY
- 1304 EXIT FACILITIES
- 1305 LIGHT AND VENTILATION
- 1306 ENCLOSURE OF VERTICAL OPENINGS
- 1307 FIRE PROTECTION AND HAZARDS
- 1308 PLUMBING AND SANITATION
- 1309 MIXED OCCUPANCY

1301 GROUP I OCCUPANCY DEFINED

Group I Occupancy shall include:

DIVISION 1: Garages for four or less motor vehicles and carports.

DIVISION 2: Stadiums, reviewing stands, grandstands, bandstands and similar structures.

DIVISION 3: Cabanas and bath or pool houses and similar structures.

1302 CONSTRUCTION, HEIGHT AND AREA ALLOWABLE

1302.1 DIVISION 1: Buildings, or parts of buildings, classed in Group I-1, because of use or occupancy shall be limited to one storey in height and 1,000 square feet in area, except that Type V buildings shall be limited to 500 square feet in area.

1302.2 DIVISION 2:

- (a) *Stadiums, reviewing stands, grandstands, bandstands and similar structures shall conform to the Standards, "Places of Outdoor Assembly" NFPA No. 102 of the National Fire Protection Association which is hereby adopted, excepting that portion in reference to tents, shall supplement, but not supersede, the specific requirements set forth herein and in Chapter 35.*
- (b) Permanent structures shall be constructed of Type I or Type IV construction. Permanent construction of exposed combustible materials

shall not be permitted under public seating. Any enclosed space under public seating not a part of or not actively used in connection with every public assembly in the grandstand shall be separated therefrom as set forth in Section 408.

- (c) *Temporary structures shall be one storey only and may be constructed of unprotected steel or wood and shall be not more than 20 feet in height and not more than 40 feet in width, front to rear.*

1302.3 DIVISION 3: Buildings classed in Division 3 of Group I shall comply to the following specific restrictions:

<u>Type</u>	<u>Allowable Height</u>	<u>Area Per Floor (sf)</u>
I	Unlimited	Unlimited
II	60 feet (4 storeys)	10,000
III (Protected)	30 feet (2 storeys)	5,000
III (Unprotected) & IV	20 feet (1 storey)	3,000
V	10 feet (1 storey)	1,000

1303 LOCATION ON PROPERTY

Buildings of Group I Occupancy shall comply with the requirements of Town Planning and the requirements herein stated, whichever are the more restrictive.

Exterior walls of buildings of Group I Occupancy shall have fire resistance and opening protection, determined by location on property, as set forth for the Type of Construction in Part IV.

1304 EXIT FACILITIES

Exit facilities of Group I Occupancies shall be as set forth in this Section and in Chapter 28.

- 1304.1 DIVISION 1: There shall be not less than two separate remote means of egress from every area of more than 400 square feet, one of which may be the main entrance door or doors.
- 1304.2 DIVISION 2: Exit facilities shall be as set forth in the standard in paragraph 1302.2(a).
- 1304.3 DIVISION 3: There shall be not less than two exits from every room or floor exceeding 450 square feet in area and two separate and remote means of egress from every room or compartment door.

When such buildings are more than one storey in height, exits shall be as set forth in Section 1104.

1305 LIGHT AND VENTILATION

1305.1 DIVISION 1: Closed garages shall be provided with fixed louvres or screened openings through the exterior walls at or near the floor level, the clear area of which shall be not less than 60 square inches per motor vehicle accommodated.

1305.2 DIVISIONS 2 and 3: All portions, customarily used for human occupancy, shall have light and ventilation as provided in the Occupancy most suitably applicable. Exit and emergency lighting may be omitted when such occupancies are used only during daylight hours.

1306 ENCLOSURE OF VERTICAL OPENINGS

Vertical openings shall be enclosed as set forth in Part IV for the Type of Construction, and in Section 1304 and Chapter 28, except that interior stair or ramp exits in buildings not exceeding two storeys in height need not be enclosed.

1307 FIRE PROTECTION AND HAZARDS

1307.1 GENERAL:

- (a) Automatic-sprinkler systems, fire extinguishers and standpipes shall be as set forth in Chapter 37.
- (b) Chimneys, flues and vents shall be as set forth in Chapter 38.
- (c) Heat-producing apparatus shall be as set forth in Chapter 38.
- (d) The service of hazardous utilities shall be as set forth in Section 409 and other portions of this Code applicable thereto.
- (e) *Electrical installations shall be as required herein and specified in Chapter 44.*
- (f) Transformer vaults shall be as set forth in Chapter 39.
- (g) The storage of inflammable materials shall be as set forth in Chapter 39.

1307.2 REQUIREMENT BY DIVISION:

- (a) (1) Where more than three motor vehicles are stored in an enclosed garage, such buildings shall be equipped with an extinguisher or extinguishers providing not less than one unit of fire protection.
 - (2) Floors of carports attached to buildings of other than Group H Occupancies and floors of enclosed garages shall be of non-absorbent and non-combustible material. Asphalt paving shall be permitted in carports of Group H Occupancy. When a carport is enclosed for any purpose, the floor shall conform to the requirements of the proposed use.
 - (3) A garage attached to a residence shall be separated therefrom by one-hour fire-resistive construction. The only openings in such fire separations shall be personnel doors not entering directly into rooms used for sleeping purposes, air conditioning ducts and trap doors to attic spaces. Personnel doors shall be protected on the garage side with not less than 24-gauge sheet metal or shall be one and three-fourths inch solid-core doors, and such doors shall be equipped with automatic closers. No fire dampers will be required in ducts penetrating such wall. Trap doors to attic spaces shall be fire-resistive. The floor of the main occupancy shall be not less than seven inches above the garage floor.
 - (4) *Where any garage or carport is located under another occupancy, there shall be not less than one-hour fire-resistive construction, separating such Group I Division 1 Occupancy from Group H Occupancy and not less than two-hour fire-resistive construction separation from all other occupancies.*
- (b) DIVISION 2: The space under temporary structures of Division 2 of Group I shall not be used for any purpose whatsoever.

1308 PLUMBING AND SANITATION

1308.1 Plumbing shall be installed as set forth in Chapter 36.

1308.2 Sanitation shall be as set forth in Section 412 except that the requirement for sanitary fixtures may be proportionately adjusted for relatively small occupant loads, where Section 412 is not specific and where sanitary standards are suitably maintained.

1309 MIXED OCCUPANCY

Separation of Group I Occupancies or Divisions thereof from all other Occupancies or Divisions of Occupancies shall be as set forth in Chapter 4.

NOTES

PART IV
TYPES OF CONSTRUCTION

CHAPTER 14 CLASSIFICATION BY TYPES OF CONSTRUCTION

1401 CLASSIFICATION

1402 EXISTING BUILDINGS

1401 CLASSIFICATION

- 1401.1 The requirements of TYPES OF CONSTRUCTION, in these chapters, are minimum for the various Types of Construction and are intended to represent varying degrees of public safety and resistance to fire. For the purpose of this Code, Type I shall be deemed to be the most fire-resistive and Type V the least fire resistive Type of Construction.
- 1401.2 (a) All buildings and structures shall be classified by the Buildings Control Officer into one of the Types of Construction set forth in:
- Chapter 15: Type I Buildings (Fire Resistive);
- Chapter 16: Type II Buildings (Semi-Fire Resistive);
- Chapter 17: Type III Buildings (Ordinary Masonry), (Protected and Unprotected);
- Chapter 18: Type IV Buildings (Noncombustible);
- Chapter 19: Type V Buildings (Wood Frame)
- (b) In order that a building or structure may be classified in any specific Type of Construction, it is necessary that all the requirements for that Type shall be at least equalled.
- 1401.3 No building or portion thereof shall be required to conform to the details of a Type of Construction higher than that Type which meets the minimum requirements based on Occupancy even though certain features of such building actually conform to a higher Type of Construction.
- 1401.4 Where specific materials, types of construction or fire resistive protection are required, such requirements shall be the minimum requirements, and any materials, types of construction or fire-resistive protection which will afford equal or greater public safety or resistance to fire, as specified in this Code, may be used, subject to the requirements of the Code covering alternate materials and types of construction.

- 1401.5 Where two or more Types of Construction occur in the same building and are separated by firewalls as required in the Chapters of Occupancy, each portion so separated may be classified as of the Type of Construction to which it conforms. If firewalls are not provided as required in the Chapters on Occupancy, the whole building shall be classified as the least fire-resistive Type of Construction used and shall be subject to the restrictions imposed upon that Type.
- 1401.6 The structural frame shall be considered to be the columns and the girders, beams, trusses, and spandrels having direct connections to the columns and all other members which are essential to the stability of the building as a whole. The members of floor or roof panels which have no connection to the columns shall be considered secondary members and not a part of the structural frame.
- 1401.7 Minor accessory buildings of unprotected noncombustible materials not exceeding 10 percent of the ground floor of the primary building, nor 1500 square feet, whichever is larger, may, where separated from the primary building as required in the Code, be constructed without changing the fire-resistive classification of the primary building based on Type of Construction.

1402 EXISTING BUILDINGS

An existing building which by its construction cannot be definitely classed as Type I, II, III, IV, or V as defined in this Code shall be defined for the purpose of this Code, by the Buildings Control Officer into the least fire-resistive of the two types to which it most nearly conforms.

CHAPTER 15

TYPE I BUILDINGS (Fire-Resistive)

- 1501 DEFINITION
- 1502 GENERAL
- 1503 STRUCTURAL FRAMEWORK
- 1504 WALLS AND PARTITIONS
- 1505 FLOORS
- 1506 ROOFS
- 1507 ENCLOSURE OF VERTICAL OPENINGS
- 1508 STAIRWAYS
- 1509 DOORS AND WINDOWS
- 1510 PROJECTIONS FROM THE BUILDING
- 1511 ROOF STRUCTURES AND SKYLIGHTS
- 1512 COMBUSTIBLE MATERIALS REGULATED

1501 DEFINITION

The structural frame of Type I buildings or structures shall be of steel or reinforced concrete or masonry as noted below. Walls, permanent partitions, roofs and floors shall be of noncombustible fire-resistive construction, except as otherwise set forth herein.

1502 GENERAL

- 1502.1 Allowable height and area shall be as specified in Occupancy Requirements provided that nothing shall be deemed to override the requirements of Town Planning.
- 1502.2 Loads and material stresses shall be as specified in the Chapters on Engineering and Construction Regulations. (Chapters 20-27 inclusive).
- 1502.3 *Buildings exceeding 75'-0" or five stories in height, shall also comply with Chapter 46. A mechanical penthouse shall be considered as an occupiable storey if its area exceeds 25% of the area of the roof on which it is located, or if it is used for any other purpose other than housing electrical or mechanical equipment for the building.*

1503 STRUCTURAL FRAMEWORK

- 1503.1 The primary structural framework shall be of not less than the following fire-resistive construction: exterior frame four hours; interior frame three hours.

EXCEPTION: The exterior frame may have the fire-resistance as set forth for exterior walls in Sub-section 1504.2 of this chapter, for buildings eight storeys or less or 100 feet or less in height, but in no case less than two hours for buildings which exceed four storeys or 50 feet nor less than one hour for buildings not exceeding four storeys or 50 feet.

- 1503.2 Unless specifically designed as a structural frame, the walls shall be considered as load-bearing and shall be constructed of masonry or reinforced concrete except that 8 inch masonry block walls shall be limited to 20 feet in height and 12 inch masonry block walls shall be limited to 30 feet in height. Bearing walls shall be of fire-resistive construction as set forth in Section 1504 but not less than as set forth for the structural frame in Paragraph 1503.1 of this Chapter.

1504 WALLS AND PARTITIONS

- 1504.1 Distance separations shall be measured at right angles from the wall or opening to the building line of a contiguous lot or any building on the same lot. The building line of a contiguous lot shall be taken as that for the use of the contiguous lot which requires the least set back from the property line, and in no case shall this set back be taken as more than five feet from the parallel to the common lot line.
- 1504.2 (a) Main exterior walls shall be of noncombustible four-hour fire-resistive construction except as follows:
- (1) Main exterior bearing walls of buildings having a distance separation of more than ten feet may be of three-hour fire-resistive construction and where having a distance separation of more than 20 feet may be of one-hour fire-resistive construction. The use of exterior bearing walls shall conform to Subsection 1503.2 of this chapter.
 - (2) Main exterior non-bearing walls of buildings having a distance separation of more than five feet may be of three-hour fire-resistive construction and where having a distance separation of more than ten feet may be of two-hour fire-resistive construction and where having a distance separation of more than 20 feet may be of one-hour fire-resistive construction.
 - (3) Main exterior walls of buildings having a distance separation of 30 feet may be of unprotected noncombustible construction with no limit on the area of openings, or such walls may be omitted.

- (b) Openings in main exterior walls shall be as follows:
 - (1) Walls having a distance separation of less than five feet, or walls, except on street fronts, which are less than five feet from the building line of a contiguous lot, shall have no openings.
 - (2) *Openings in walls of buildings having a distance separation of from five to ten feet shall be protected by a fire assembly having a 3/4 hour fire-resistive rating, or in the case of a building with an approved sprinkler system on all floors the window may be protected in accordance with NFPA 13 Section 3-7 Outside Sprinklers for Protection against Exposure Fires. The total area of openings in any storey shall be limited to 30 percent with no single opening more than ten percent of such wall area. Walls having a distance separation of more than ten feet but less than 30 feet shall be protected by ordinary doors or windows not exceeding 50 percent of the wall area in any storey.*
- (c) Buildings having exterior walls without openings shall be provided with access panels along street fronts or walls otherwise accessible for fire-fighting entrance to the building as follows:
 - (1) The access openings in each accessible side of a building not over 65 feet in height shall be not less than one suitably marked access opening not less than 32 inches wide and 48 inches high with sill not over 32 inches above the floor spaced not more than 50 feet apart on each floor each side.
 - (2) The access openings in each accessible side of a building over 65 feet in height shall be not less than
 - (i) windows spaced not more than 50 feet apart and equivalent to 10% or more of the wall area, on each floor of each such side, or
 - (ii) smokeproof towers spaced not over 100 feet apart on each such accessible side. The smokeproof towers may serve as a required exit way.

1504.3 Fire Division walls shall comply with Section 406 herein.

1504.4 Interior bearing walls shall be of three-hour fire-resistive construction.

1504.5 (a) FIXED PARTITIONS

- (1) Fixed partitions shall be a minimum of one hour fire-resistive construction, and of non combustible materials except where required to comply with the requirements set forth elsewhere in this Code for Fire Division Walls, Occupancy Separation, Vertical Enclosures including Atriums and Exit Enclosures.
- (2) Partitions subdividing offices, stores, apartments and similar uses within the area occupied by a single tenant may be constructed without a fire-resistive rating provided the materials of construction are:
 - (i) Noncombustible or
 - (ii) Fire-retardant treated wood or
 - (iii) Of other wood provided a space of not less than 18 inches, as measured down from the ceiling, shall be open or of transparent noncombustible material.

(b) MOVABLE PARTITIONS

Movable partitions of a type and construction approved by the Buildings Control Officer need not be of a fire rated construction provided that:

- (1) Such partitions shall not obstruct access to exits and shall not form a corridor serving as an exit and shall not form a corridor serving as an access to an exit for more than 50 persons.
- (2) Such partitions when in use shall be securely fastened in position by approved means.
- (3) Areas divided by such partitions shall be provided with swinging egress doors where the occupant content of the enclosed area exceeds 25 persons.
- (4) The flame spread rating of the partition shall comply with Section 3208.

1504.6 (a) Underground structures exceeding 2500 square feet in area shall be provided with at least two means of access so located and of such size as to permit their use by firemen at the time of fire.

- (b) Where 10 or more occupants use the underground structure and the required exits involve upward travel, a smoke proof tower shall be provided.

1505 FLOORS

1505.1 MATERIAL:

- (a) Floor systems shall be of noncombustible materials. Poured-in-place concrete slabs shall be not less than 2-1/2 inches thick where removable forms are used nor less than 2 inches thick where tile, metal decking or similar structural-form element is to remain as a permanent component of the structure.
- (b) Where wood floors are laid over concrete slabs, the space between the floor slab and the underside of the finish floor shall be filled with noncombustible materials.

1505.2 FIREPROOFING: Floors for buildings more than eight storeys or more than 100 feet in height shall be of not less than three-hour fire-resistive construction; floors for buildings eight storeys or less or 100 feet or less in height shall be of not less than two-hour fire-resistive construction. The use of bar joists shall be limited to buildings of four storeys.

1505.3 *CEILING PLENUMS: Ceiling plenums shall comply with this Subsection and other applicable provisions of this Code and with the requirements of NFPA 90 Standards for the installation of Air Conditioning and Ventilating Systems.*

- (a) *Plenums and other spaces above a ceiling shall be divided into horizontal areas not exceeding 10,000 sq. ft. by draft stops from the ceiling to the deck above.*
- (b) *Draft stops shall be of 1/2" thick gypsum wall board, 22 gauge sheet metal or 1/4" inch transite and shall be tight-fitted.*
- (c) *Where multiple plenums are used for air movement, openings between plenums shall be protected by a fire damper.*
- (d) (1) *Attic access openings shall be provided in the ceiling of the top floor of buildings with combustible ceiling or roof construction.*

- (2) *Such openings shall be located in a corridor or hallway of buildings of 3 or more stories in height and readily accessible in buildings of any height.*
- (3) *Access openings shall be not less than 20" wide and 4 sq. ft. in area.*
- (4) *30" minimum clear head room shall be provided above access openings.*
- (5) *Attics with a maximum vertical clear height of less than 30" need not be provided with access openings.*

1506 ROOFS

- 1506.1 MATERIALS: Roof systems shall be of noncombustible materials. Poured-in-place concrete slabs shall be not less than 2-1/2 inches thick where removable forms are used nor less than 2 inches thick where tile, metal decking or similar structural-form element is to remain as a permanent component of the structure.
- 1506.2 FIREPROOFING: Roofs for buildings more than eight storeys or more than 100' in height shall be of not less than three-hour fire-resistive construction. Roofs for buildings eight storeys or less, or 100' or less in height, shall be of not less than two-hour fire resistive construction.
- (a) *Roofs, where every part of the structural framework is 20 feet or more above any part of any floor, balcony, or gallery, need not be fireproofed.*
 - (b) *Roofs, where every part of the structural framework is more than 15 feet and less than 20 feet above any part of any floor, balcony or gallery, shall be not less than one-hour fire-resistive construction.*
- 1506.3 ROOF COVERINGS: Roof coverings shall be fire-retardant and as specified in the Chapter on Roof Coverings (Chapter 30).
- 1506.4 ROOF DRAINAGE: Roof drainage and the disposal of rain water shall be as specified in the Chapter on Plumbing (Chapter 36). In general, roof systems not designed to support accumulated water shall be sloped for drainage. Rain water drains or leaders where required shall be used and sized in conformance with the Chapter on Plumbing (Chapter 36).
- (a) Where parapets or curbs are constructed above the level of a roof, provision shall be made, such as by scuppers or similar positive

overflow arrangements, to prevent rain water from accumulating on the roof in the event that the rain water drains or leaders become clogged.

- (b) *Where roofs are not designed in accordance with paragraph (a) above, overflow drains or scuppers shall be placed to prevent an accumulation of more than 3" of water on any portion of the roof.*
- (c) *Drains or scuppers installed to provide the overflow drainage shall not be less in aggregate area than three times the area of tributary downspouts or leaders, but in no case shall be less than 3 inches in diameter or, if rectangular in section, the minimum dimension shall be 2 inches.*
- (d) *All roofs shall be designed with sufficient slope or camber to ensure adequate drainage after the long-time deflection from dead load, or shall be designed to support maximum loads including possible ponding of water due to deflection.*
- (e) *Roofs shall be designed to preclude instability from ponding loads.*
- (f) *Each portion of a roof shall be designed to sustain the loads of all rain water that could accumulate on it if the primary drainage system for that portion is obstructed. Ponding instability shall be considered in this situation. If the overflow drainage provisions contain drain lines, such lines shall be independent of any primary drain lines.*

1506.5 FURRED SPACES ABOVE A CEILING: Access trap doors, not less than 16 inches by 30 inches, shall be provided to all spaces above a furred ceiling having a minimum vertical distance of 36 inches. Such access trap doors shall be from common spaces such as corridors and no part of such furred space shall be more than 100 feet from an access trap door. Walkways shall be provided in such furred spaces about the ceiling.

1507 ENCLOSURE OF VERTICAL OPENINGS

1507.1 GENERAL:

- (a) ENCLOSURE REQUIRED: Any vertical opening within the outer walls of a building which communicates between floors, unless by permitted Sub-section 1507.1 (b), shall be enclosed, or protected to prevent the spread of fire and smoke, except as follows: —
 - (1) Every vent, shaft, chute, pipe chase or other vertical opening

not otherwise specifically mentioned herein shall be enclosed as set forth in Sub-section 1507.2.

- (2) All atriums as defined in Chapter 2 shall be enclosed as set forth in Sub-section 515.
 - (3) Stair wells and ramps shall be enclosed as required in Sub-section 1507.2(b) and in Chapter 28.
 - (4) Elevators shall be enclosed as required in Sub-section 1507.2(b) and in Chapter 43.
 - (5) Escalators and transporting assemblies shall be enclosed as set forth in Chapter 43.
 - (6) A court, any part of which is used as a means of egress from a building shall comply with Sub-section 2807.
- (b) **UNENCLOSED OPENINGS PERMITTED:** In certain low and ordinary hazard occupancies, where it would be an advantage to the utilisation of the site, or function of design, unenclosed openings of up to 3 communicating floor levels may be permitted without enclosure protection between floors provided all the following conditions are met: —
- (1) The Occupancy is either Group A, Group B, Group E Division 1, Group F or Group G—excluding bedroom areas.
 - (2) The whole of the communicating areas at each floor level are fully protected with an automatic sprinkler system.
 - (3) The communicating areas are separated from all other areas of the building with a minimum of two hour fire-resistive construction.
 - (4) The lowest or next to lowest level shall be the street floor.
 - (5) The entire area including all communicating floor levels, shall be sufficiently open and unobstructed so that fire, or other hazardous conditions, in any part will be immediately apparent to the occupants of all such levels and areas.

EXCEPTION: Where fire, or other hazardous conditions, are not immediately apparent to the occupants in the entire area, an early warning smoke detector system shall be installed.

- (6) The exit capacity shall be sufficient to provide simultaneous egress for the occupants of all such communicating levels and areas. All communicating levels in the same fire area shall be considered as a single floor area for the purpose of determining the required exit capacity.
- (7) Each and every floor level shall have at least one-half of its required exit capacity provided by an exit or exits leading directly out of that area without traversing another communicating floor level or being exposed to the spread of fire or smoke therefrom.
- (8) All other requirements of this code with respect to interior finish, protection from other hazards, construction and other provisions shall be fully observed.

1507.2 SHAFT ENCLOSURES

- (a) Except as specified below, enclosures of vertical openings shall be of non-combustible materials and not less than one-hour fire resistive construction, and where such openings exceed eight square feet in area shall be of not less than two-hour fire resistive construction, with fire resistive doors and/or windows.
- (b) Stair wells and elevator shafts shall be protected by a wall of minimum thickness of 8 inches masonry or 6 inches reinforced concrete.
- (c) All vertical pipe shafts shall be enclosed with walls of one-hour fire resistive construction and shall be sealed at each and every floor level in such a manner as to match the required fire resistive construction of that particular floor. All pipes within the shaft shall be sleeved at each floor level, with galvanised steel pipe sleeves of an internal diameter not more than 1 inch greater than the outside diameter of pipe passing through the sleeve. In all cases the space between the outside surface of the pipe and the inside surface of the sleeve shall be thoroughly packed with a non-combustible material. Provision may be made for future pipes by the use of extra sleeves passing through the floor construction, capped both top and bottom by galvanised steel pipe caps.
- (d) Vertical openings for air conditioning or ventilation, shall be protected for their entire height, including between floor spaces, by not less than two-hour fire resistive construction. All access doors, panels and frame assemblies shall bear a 1-1/2 hour Class B Underwriters Laboratories Inc. label. Automatic dampers activated

by both fusible links and smoke detectors shall be located at all floor levels.

- (e) Vertical openings for laundry or refuse chutes shall not exceed nine square feet in cross-sectional area and shall be fully protected by a continuous enclosure of not less than two hour fire-resistive construction. All access, in-take and discharge doors and frame assemblies, shall bear a 1-1/2 hour Class B Underwriters Laboratory Inc. label. For normal use, chutes shall be constructed of not less than 18 gauge steel and shall be no smaller than 18" in diameter. They shall be supported at each floor level.
- (f) No laundry or refuse chute shall open into any enclosed means of egress; they may, however, open into an enclosed area room or closet separated from the enclosed means of egress by a self-closing fire assembly or may open onto an exterior balcony. The wall, ceilings, floors and doors forming the enclosed area, room or closet shall be a minimum of one-hour fire resistive construction.
- (g) There shall be installed in every chute, above the uppermost in-take door, a rushing spray and sprinkler head. These shall be readily accessible, by means of an access door.
- (h) All chutes shall extend, at full section, a minimum of 4 feet above the roof level and shall be fitted with glass explosion vents, or spring loaded fire vents, activated by fusible links.
- (i) At the discharge end, chutes shall be fitted with either spring loaded doors, held open by fusible links, or by self closing, self latching doors held open by fusible links.
- (j) In-takes for chutes shall be so sized that any reasonable object placed therein shall not block the chute.
 - (1) Laundry Chutes—shall be loaded horizontally through bottom, or side hinged, self latching in-take doors.
 - (2) Refuse Chutes—In-take doors for refuse chutes shall be of the hopper type and shall provide access to the chute by means of a throat. All in-take doors shall be self latching.

1508 STAIRWAYS

- 1508.1 Stairways shall be as required in Chapter 28, Exit Facilities and Stairs, and the Chapters on Occupancy (Chapters 4 through 13).

- 1508.2 Stairs, stair platforms, treads and risers shall be constructed of noncombustible materials. Unprotected steel or iron stairways may be used only when enclosed.

1509 DOORS AND WINDOWS

- 1509.1 Doors, windows and similar openings in exterior walls, fire walls and enclosure walls shall be protected or entirely prohibited as set forth in this Chapter, the Chapters on Occupancy (Chapters 4 through 13), and the Chapter on Exit Facilities and Stairs (Chapter 28).
- 1509.2 Doors and windows shall not project over public property or restricted areas.

1510 PROJECTIONS FROM THE BUILDING

- 1510.1 (a) Cantilevering projections outside of the main exterior walls of the building shall be of noncombustible materials and of not less than one-hour fire-resistive construction.
- (b) Canopies, awnings and marquees forming part of the construction but outside of the main exterior walls of the building but not cantilevered from the building shall be constructed of noncombustible materials but need not have fire-resistive protection.

1511 ROOF STRUCTURES AND SKYLIGHTS

- 1511.1 Towers, pylons, masts, signs, and similar structures above a roof, when not enclosed, shall be of noncombustible materials.
- 1511.2 Roof structures, including bulkhead areas, shall be limited in total combined area to 30 percent of the area of the roof, shall extend not more than 50 feet above the roof and any enclosure having a floor area of more than 15 square feet, shall be constructed as required for the main portion of the building. The requirements of Town Planning concerning roof structures shall apply if more restrictive in height and area requirements than this code.
- 1511.3 Minor roof structures having an area of 15 square feet or less, housing ventilating shafts or similar openings shall be constructed of noncombustible materials.

- 1511.4 Storage tanks, having a capacity of over 500 gallons, shall not be located over stairways or elevators.
- 1511.5 Skylights shall be constructed of noncombustible materials, and transparent or translucent materials shall be fire-resistive.
- 1511.6 Where required to control rain water runoff, a curb not less than eight inches in height shall be provided.
- 1511.7 Where the public has access to roof areas, a guard rail not less than 36 inches above the roof shall be provided around all open wells or shafts and at all exterior walls.
- 1511.8 Skylights placed over shafts, vent shafts, stair enclosures, and exit ways, shall be glazed with glass or other approved non-combustible material which may be easily pierced by fire-fighting personnel.

1512 COMBUSTIBLE MATERIALS REGULATED

Combustible materials shall be permitted for the following uses unless otherwise specifically prohibited:

- 1512.1 Show-window bulkheads shall be of noncombustible materials but show cases and other movable appurtenances of stores or other buildings may be of wood.
- 1512.2 Trim, picture molds, furniture and permanent seats, chair rails, wainscoting, baseboards, furring strips and blocking, handrails, show window backing, temporary partitions conforming to Subsection 1504.5 of this Chapter, floor finishes and sleepers may be of combustible materials. Wood doors or windows or frames may be used except where fire-resistive protection is required.
- 1512.3 Loading platforms, and roofs over loading platforms, for warehouses, freight depots and buildings of similar use may be of heavy timber construction provided such heavy timber construction does not penetrate the exterior walls.
- 1512.4 Interior finishes shall be as set forth in Chapter 32 on Fire-Resistive Standards.
- 1512.5 In places of public assembly, all draperies, hangings and other decorative materials suspended from walls or ceilings shall be noncombustible or flame-resistant meeting the requirements of the code as herein specified:

Noncombustible — The permissible amount of noncombustible decorative hangings shall not be limited.

Flame-resistant — The permissible amount of flame-resistant decorative hangings shall not exceed ten (10) percent of the total wall and ceiling area.

- 1512.6 (a) (1) Decorative, non-structural materials of wood (including shakes and shingles) and metal, plastic or fiber-glass trim, tile or panels may be applied to the outside of exterior walls, to cornices, architectural appendages, eave overhangs and similar projections. Where an exterior wall is required to be fire-resistive, such materials shall be separated from the interior of the building by the vertical extension of the exterior wall as set forth in paragraph 1512.6 (b). Such materials shall have a distance separation of not less than 60 feet in the City of Nassau and not less than 20 feet in other areas.
- (2) Distance separation shall be measured horizontally from the projection.
- (3) Combustible materials, as set forth in subparagraph 1512.6 (a) (1), shall be limited to 40 feet above grade.
- (4) Notwithstanding sub-section (3) above, such combustible materials shall not be continuous from one floor level to another.
- (b) (1) Combustible exterior trim, cornices, architectural appendages, eave overhangs and similar projections, where an exterior wall is required to be fire-resistive, shall have the fire-resistive rating required for the exterior wall or shall be separated from the interior of the building by the vertical extension of the exterior wall to the bottom of the roof deck, or as a parapet where a parapet is otherwise required herein, with a fire-resistive rating as required for the exterior wall.
- (2) Combustible materials, as set forth in subparagraph 1512.6 (b) (1), shall be limited to 40 feet above grade.
- (3) Notwithstanding sub-section (2) above, such combustible materials shall not be continuous from one floor level to another.
- (4) Structural framework and supports shall be of non-combustible materials where required by Type of Construction.

- (5) An awning, a lean-to, shed roof or similar roof in whole or in part, supported from the surface below may be of combustible materials as set forth in this Sub-section.

CHAPTER 16

TYPE II BUILDINGS (Semi-Fire-Resistive)

- 1601 DEFINITION**
- 1602 GENERAL**
- 1603 STRUCTURAL FRAMEWORK**
- 1604 WALLS AND PARTITIONS**
- 1605 FLOORS**
- 1606 ROOFS**
- 1607 ENCLOSURE OF VERTICAL OPENINGS**
- 1608 STAIRWAYS**
- 1609 DOORS AND WINDOWS**
- 1610 PROJECTIONS FROM THE BUILDING**
- 1611 ROOF STRUCTURES AND SKYLIGHTS**
- 1612 COMBUSTIBLE MATERIALS REGULATED**

1601 DEFINITION

- 1601.1 The structural frame of Type II buildings or structures shall be of steel or reinforced concrete or masonry as noted below.
- 1601.2 Walls and permanent partitions shall be of noncombustible fire-resistive construction except that permanent non-bearing partitions of one-hour fire-resistive construction may use fire-retardant treated wood within the assembly.

1602 GENERAL

- 1602.1 Allowable height and area shall be as specified in Occupancy Requirements provided that nothing shall be deemed to over-ride the requirements of Town Planning.
- 1602.2 Loads and material stresses shall be as specified in the Chapters on Engineering and Construction Regulations (Chapters 20-27 inclusive).
- 1602.3 Required fireproofing shall be as set forth in Chapter 32, Fire-Resistive Standards.

1603 STRUCTURAL FRAMEWORK

- 1603.1 The primary structural framework shall be of not less than three-hour fire-resistive construction for members in exterior walls and of not less than one-hour fire-resistive construction for members in the interior frame.

EXCEPTION: Members in the exterior walls may have the fire protection set forth in Sub-sections 1604.1 of this Chapter and 1504.1 of the Chapter on Type I Buildings, but, where exceeding one storey in height, shall be of not less than one-hour fire-resistive construction.

- 1603.2 Unless specifically designed as a structural frame the walls shall be considered as load-bearing and shall be constructed of masonry or reinforced concrete, except that 8 inch masonry block walls shall be limited to 20 feet in height and 12 inch masonry block walls shall be limited to 30 feet in height.

1604 WALLS AND PARTITIONS

- 1604.1 Exterior walls and openings therein shall be as set forth in sub-section 1504.1 and 1504.2 of the Chapter on Type I buildings.
- 1604.2 Fire walls shall be of the fire-resistive rating as required in the Chapters on Occupancies (Chapters 4-13 inclusive).
- 1604.3 Interior bearing walls shall be of noncombustible one-hour fire-resistive construction.
- 1604.4 Partitions shall be of not less than one-hour fire-resistive construction except as provided in Sub-section 1504.5 of the Chapter on Type I Buildings.

1605 FLOORS

- 1605.1 MATERIALS:
- (a) Floors shall be of noncombustible material or fire-retardant treated wood.

EXCEPTION: Fire retardant treated wood may not be used in buildings exceeding two storeys in height.

- (b) Wood joists shall not be used to support concrete and cement-base tile or terrazzo floor surfaces other than for bathrooms of less than 100 square feet in area.

- (c) Spaces under a ground floor shall have the clearance and ventilation as set forth in the Chapter on Wood. Access openings shall be provided to all space under the building.

1605.2 FIREPROOFING: Floors and all parts thereof shall be of not less than one-hour fire-resistive construction, except that where the space under a ground floor has clearance of less than three feet, such fire protection for the ground floor may be omitted.

1606 ROOFS

1606.1 MATERIALS: Roofs shall be of noncombustible materials or of fire-retardant treated wood.

1606.2 FIREPROOFING: Roofs and all parts thereof shall be of not less than one-hour fire-resistive construction, except as follows:

(a) *Roofs, where every part of the structural framework is 20 feet or more above any part of the floor, balcony or gallery, may be of unprotected non-combustible materials or fire-retardant treated wood.*

(b) Roofs of one-storey open sheds not more than 75 percent enclosed by walls, in which the travel distance to the nearest exit does not exceed 40 feet, may be of unprotected noncombustible materials.

1606.3 ROOF COVERINGS: Roof coverings shall be fire-retardant and as specified in the Chapter on Roof Coverings (Chapter 30).

1606.4 ROOF DRAINAGE: Roof drainage shall comply in all respects to Section 1506.4.

1606.5 ATTIC SPACES: Attic spaces shall not be required, but where attic spaces are provided such spaces shall have a minimum vertical dimension of 18 inches clear distance and where unprotected combustible material is exposed, shall be divided, by firestops, into areas not exceeding 2500 square feet, or less depending on individual occupancy. Access trap doors, not less than 16 inches by 30 inches, shall be provided to all attic spaces. Such access trap doors shall be from common spaces such as corridors, and no part of an attic space shall be more than 100 feet from an access trap door.

1607 ENCLOSURE OF VERTICAL OPENINGS

The enclosure of vertical openings shall be in accordance with Section 1507.

1608 STAIRWAYS

- 1608.1 Stairways shall be as required in the Chapters on Occupancy (Chapters 4-13) and the Chapter on Exit Facilities and Stairs (Chapter 28).
- 1608.2 Stairs, stair platforms, treads and risers shall be constructed of noncombustible materials. Unprotected steel or iron stairways may be used only when enclosed.

1609 DOORS AND WINDOWS

- 1609.1 Doors, windows and similar openings in exterior walls, fire walls and enclosure walls shall be protected or entirely prohibited as set forth in this Chapter, the Chapters on Occupancy (Chapters 4-13) and the Chapter on Exit Facilities and Stairs (Chapter 28).
- 1609.2 Doors and windows shall not project over public property or restricted areas.

1610 PROJECTIONS FROM THE BUILDING

- 1610.1 (a) *Cantilevering projections outside of the main exterior walls of the building shall be of noncombustible construction or fire-retardant treated wood complying with Section 2409 of Chapter 24 - Wood and shall be of not less than one-hour fire-resistive construction.*
- (b) *Canopies, awnings and marquees forming part of the construction but outside of the main exterior walls of the building, but not cantilevered from the building, shall be constructed of noncombustible materials or fire-retardant treated wood complying with Section 2409 of Chapter 24 - Wood.*

1611 ROOF STRUCTURES AND SKYLIGHTS

- 1611.1 Towers, pylons, masts, signs, and similar structures above a roof, when not enclosed, shall be of noncombustible materials. Roof structures extending more than 25 feet above the roof or signs more than 100 square feet in area shall be supported to the ground by a noncombustible frame, unless already incorporated into the building frame design. The requirements of Town Planning concerning roof structures shall control if more restrictive in height and area requirements than this Code.
- 1611.2 Roof structures, including bulkheaded areas, shall be limited in total combined area to 30 percent of the area of the roof, shall extend

not more than 20 feet above the allowable height, and any enclosure having a floor area of more than 15 square feet shall be constructed as required for the main portion of the buildings. The requirements of Town Planning concerning roof structures shall control if more restrictive in height and area requirements than this Code.

- 1611.3 Minor roof structures having an area of 15 square feet or less, housing ventilating shafts or similar openings shall be constructed of noncombustible materials.
- 1611.4 Storage tanks having a capacity of over 500 gallons shall not be located over stairways or elevators.
- 1611.5 Skylights shall be constructed of noncombustible materials, and transparent or translucent materials shall be fire-resistive.
- 1611.6 (a) Parapets shall be required on exterior walls except where the roof is of noncombustible, fire resistive construction.
- (b) Parapets shall be not less than 20 inches above the roof immediately adjacent thereto where located 20 feet or less from the building line of a contiguous lot or any building on the same lot, and shall be constructed as set forth in the Chapter on Masonry.
- (c) Where required to control rain water runoff, a curb not less than eight inches in height shall be provided where parapets are not required.
- 1611.7 Where the public has access to roof areas, a guard rail not less than 36 inches above the roof shall be provided around all open wells or shafts and at all exterior walls.

1612 COMBUSTIBLE MATERIALS REGULATED

- 1612.1 Combustible materials shall be permitted except where specifically prohibited in this Chapter or in the Chapters on Occupancy (Chapter 4-13 inclusive).
- 1612.2 Loading platforms for warehouses, freight depots and similar buildings may be of heavy timber construction, with wood floors not less than one and five-eighths inches thick. Such wood construction shall not be carried through the exterior walls.
- 1612.3 Interior finishes shall be as set forth in the Chapter on Fire-Resistive Standards (Chapter 32).

1612.4 Decorative, non-structural materials may be applied to the outside of exterior walls in accordance with sub-section 1512.6.

CHAPTER 17

TYPE III BUILDINGS (Ordinary Masonry)

- 1701 DEFINITION
- 1702 GENERAL
- 1703 STRUCTURAL FRAMEWORK
- 1704 WALLS AND PARTITIONS
- 1705 FLOORS
- 1706 ROOFS
- 1707 ENCLOSURE OF VERTICAL OPENINGS
- 1708 STAIRWAYS
- 1709 DOORS AND WINDOWS
- 1710 PROJECTIONS FROM THE BUILDING
- 1711 ROOF STRUCTURES AND SKYLIGHTS
- 1712 COMBUSTIBLE MATERIALS REGULATED

1701 DEFINITION

- 1701.1 (a) *Type III buildings or structures shall have an exterior structural frame of steel or reinforced concrete or of fire-retardant treated wood complying with Section 2409 of Chapter 24 - Wood; or shall have exterior loadbearing walls of noncombustible, fire-resistive construction.*
- (b) Type III buildings or structures shall have an interior structural frame of steel, reinforced concrete, wood, or interior loadbearing walls of noncombustible materials or wood.
- (c) Partitions, floors and roof framing may be of wood.
- 1701.2 (a) Type III (protected) buildings shall have all interior bearing walls, partitions, ceilings and floors of not less than one-hour fire-resistant construction, except that the fire protection of floors may be omitted as specified in Sub-section 1705.2 of this Chapter.
- (b) Type III (unprotected) buildings may have interior walls, ceilings and floors of unprotected steel, wood or concrete. Interior bearing walls shall be fire protected as specified in Sub-section 1704.3 of this Chapter. Floors shall be fire protected as specified in Sub-section 1705.2 of this Chapter.

1702 GENERAL

- 1702.1 Allowable height and area shall be as specified in Occupancy Requirements provided that nothing shall be deemed to over-ride the requirements of Town Planning.
- 1702.2 Loads and material stresses shall be as specified in the Chapters on Engineering and Construction Regulations, (Chapters 20-27).
- 1702.3 Required fireproofing shall be as specified in the Chapter on Fire Resis-tive Standards (Chapter 32).

1703 STRUCTURAL FRAMEWORK

1703.1 MATERIALS:

- (a) Unless specifically designed as a structural frame with panel walls, the exterior walls shall be considered as load-bearing and shall be constructed of masonry or reinforced concrete, except that 8 inch masonry block walls shall be limited to 20 feet in height and 12 inch masonry block walls shall be limited to 30 feet in height. Where designed as a structural frame, the materials shall be as set forth in Paragraph 1701.1 (a), of this Chapter, with materials as specified in the Chapters on Steel and Iron, Reinforced Concrete, Masonry and Wood (Chapters 23, 22, 27 and 24).
- (b) The interior structural support shall be of steel, reinforced concrete, wood, or interior bearing walls of noncombustible materials or wood studs.

1703.2 FIREPROOFING:

- (a) Fireproofing shall be as required in the Chapters on Occupancy (Chapters 4-13), or in this Chapter, or in Chapter 32 on Fire-Resis-tive Standards. Where required, or where otherwise referred to in this Code as being protected, the structural framework or supports shall be of not less than one-hour fire-resistive construction except that members in the exterior walls shall have the fire protection as set forth in Sub-section 1704.1 of this Chapter.
- (b) All steel members supporting masonry in buildings over one sto-rey in height shall be fire-protected with not less than one-hour fire-resistive construction.
- (c) Heavy-timber structures, designed and constructed as set forth in Sub-section 1703.3 of this Chapter shall be considered the equiva-lent of one-hour fire-resistive protection.

1703.3 HEAVY TIMBER CONSTRUCTION:

- (a) GENERAL: Heavy timber construction is that type in which fire resistance is attained by placing limitations on minimum sizes of wood structural members including the thicknesses and compositions of wood floors and roofs and by the use of approved fastenings and construction details.
- (b) HEAVY TIMBER FRAMING: Heavy timber columns, floor sizes and framing, roof sizes and framing, and construction details shall be as specified in Section 2407 of the Chapter on Wood (Chapter 24).
- (c) HEAVY TIMBER FLOORS: Heavy timber floors shall be constructed as specified in Section 2407 of the Chapter on Wood (Chapter 24).
- (d) HEAVY TIMBER ROOF DECKS: Heavy timber roof decks shall be constructed as specified in Section 2407 of the Chapter on Wood (Chapter 24).

1704 WALLS AND PARTITIONS

- 1704.1 Exterior walls and openings therein shall be as set forth in Sub-section 1504.1 and 1504.2 of the Chapter on Type I buildings.
- 1704.2 Fire walls shall be of noncombustible materials and shall be of fire-resistive ratings as required in the Chapters on Occupancy.
- 1704.3 Interior bearing walls and partitions shall be of non-combustible materials or of wood studs, and for Type III (protected) buildings, or for Type III (unprotected) buildings where supporting upper floors or where adjacent to common corridors shall be of one-hour fire-resistive construction.

1705 FLOORS

1705.1 MATERIALS:

- (a) *Floors shall be of noncombustible materials or wood.*
- (b) Wood joists shall not be used to support concrete and cement-base tile or terrazzo floor surfaces other than for bathrooms of less than 100 square feet in area.
- (c) *Wood post and girder construction shall not be permitted for a ground floor and spaces under ground floors shall have the clearance and ventilation as set forth in Chapter 24 - Wood. Access openings shall be provided to all spaces under the building.*

1705.2 FIREPROOFING: Floors and all parts thereof of Type III buildings shall be of not less than one-hour fire-resistive construction, except that where a ground floor has clearance of less than three feet, such fire protection may be omitted.

1706 ROOFS

1706.1 MATERIALS: Roofs shall be of noncombustible materials or wood.

1706.2 FIREPROOFING: Roofs and all parts thereof of unprotected Type III buildings and protected Type III buildings shall be of not less than one-hour fire-resistive construction except as follows:

(a) *Roofs, where every part of the structural framework is 18 feet or more above any part of any floor, may be of unprotected non-combustible materials or of heavy timber, as specified in Section 2407 of Chapter 24 - Wood.*

(b) Roofs of one-storey open sheds not more than 75 percent enclosed by walls, and in which the travel distance to the nearest exit does not exceed 40 feet, may be of unprotected combustible materials, except that in areas designated by the Chief Fire Officer such roof shall be of unprotected noncombustible materials or protected combustible materials.

1706.3 ROOF COVERINGS: Roof coverings shall be fire-retardant and as specified in the Chapter on Roof Coverings (Chapter 30).

1706.4 ROOF DRAINAGE: Roof drainage shall comply in all respects to Section 1506.4.

1706.5 ATTIC SPACES: Attic spaces shall not be required, but where attic spaces are provided such spaces shall have a minimum vertical dimension of 18 inches clear distance and, where unprotected combustible material is exposed, shall be divided by fire stops into areas not exceeding 2,500 square feet, or less depending on individual occupancy. Access trap doors shall be from common spaces such as corridors, and no part of an attic space shall be more than 100 feet from an access trap door. Minimum vertical dimension shall not be required for hip or gable roof construction.

1707 ENCLOSURE OF VERTICAL OPENINGS

The enclosure of vertical openings shall be in accordance with Section 1507.

1708 STAIRWAYS

- 1708.1 Stairways shall be as required in the Chapters on Occupancy (Chapters 4-13), and the Chapter on Exit Facilities (Chapter 28).
- 1708.2 Stairways may be constructed of noncombustible materials or wood except where combustible materials are specifically prohibited in the Chapters on Occupancy and the Chapter on Exit Facilities and Stairs (Chapter 28).

1709 DOORS AND WINDOWS

- 1709.1 Doors, windows, and similar openings in exterior walls, fire walls and enclosure walls shall be protected or entirely prohibited, as set forth in this Chapter, the Chapters on Occupancy (Chapters 4-13) or in the Chapter on Exit Facilities and Stairs (Chapter 28), and such protection shall be as specified in the Chapter on Fire-Resistive Standards (Chapter 32).
- 1709.2 Doors and windows shall not project over public property or restricted areas.

1710 PROJECTIONS FROM THE BUILDING

Cantilevering projections outside of the main exterior walls of the building shall be of noncombustible construction and fire-resistive as specified in this Chapter except that the projection of wood roof rafters of residential occupancies over private property shall be permitted.

1711 ROOF STRUCTURES AND SKYLIGHTS

- 1711.1 Towers, pylons, masts, signs, and similar structures above a roof, when not enclosed, shall be of noncombustible materials. Roof structures extending more than 25 feet above the roof or signs more than 100 square feet in area shall be supported to the ground by an incombustible frame unless already incorporated into the building frame design. The requirements of Town Planning concerning roof structures shall control if more restrictive in height and area requirements than this code.
- 1711.2 Roof structures, including bulkheaded areas, shall be limited in total combined area to 30 percent of the area of the roof, shall not extend more than 20 feet above the allowable height, and any enclosure having a floor area of more than 15 square feet shall be constructed as required for the main portion of the building. The requirements of Town Planning concerning

roof structures shall control if more restrictive in height and area requirements than this code.

- 1711.3 Minor roof structures having an area of 15 square feet or less, housing ventilating shafts or similar openings shall be constructed of noncombustible materials.
- 1711.4 Storage tanks, having a capacity of over 500 gallons, shall not be located over stairways or elevators.
- 1711.5 Skylights shall be constructed of noncombustible materials, and transparent or translucent materials shall be fire resistive.
- 1711.6 (a) Parapets shall be required on exterior walls except:
- (1) Where the roof is of noncombustible, fire-resistive construction.
 - (2) Where the walls of buildings for other than residential occupancy are 20 feet from the building line of a contiguous lot or any building on the same lot.
 - (3) Where the building is of residential occupancy.
- (b) Parapets shall be not less than 20 inches above the roof immediately adjacent thereto and shall be constructed as set forth in the Chapter on Masonry (Chapter 27), or Section 1704 of this Chapter.
- (c) Where required to control rain water runoff, a curb not less than eight inches in height shall be provided where parapets are not required.

1712 COMBUSTIBLE MATERIALS REGULATED

- 1712.1 Combustible materials shall be permitted except where specifically prohibited in this Chapter or in the Chapters on Occupancy (Chapters 4-13).
- 1712.2 Loading platforms for warehouses, freight depots and similar buildings may be of heavy timber construction, with wood floors not less than one and five-eighths inches thick. Such wood construction shall not be carried through the exterior walls.
- 1712.3 Interior finishes shall be as set forth in Chapter 32, Fire-Resistive Standards.

CHAPTER 18

TYPE IV BUILDINGS (Noncombustible)

- 1801 DEFINITION**
- 1802 GENERAL**
- 1803 STRUCTURAL FRAMEWORK**
- 1804 WALLS AND PARTITIONS**
- 1805 FLOORS**
- 1806 ROOFS**
- 1807 DOORS AND WINDOWS**
- 1808 PROJECTIONS FROM THE BUILDING**
- 1809 ROOF STRUCTURES AND SKYLIGHTS**
- 1810 COMBUSTIBLE MATERIALS REGULATED**

1801 DEFINITION

All structural and other elements of Type IV buildings shall be of noncombustible materials.

1802 GENERAL

- 1802.1 Allowable height and area shall be as specified in Occupancy Requirements provided that nothing shall be deemed to over-ride the requirements of Town Planning.
- 1802.2 Loads and material stresses shall be as specified in the Chapters on Engineering and Construction Regulations (Chapters 20-27).
- 1802.3 Required fireproofing shall be as specified in Chapter 32 on Fire-Resistive Standards.

1803 STRUCTURAL FRAMEWORK

The structural framework shall be of steel, aluminium, or reinforced concrete, and fireproofing of structural members shall be required only when such members are a part of an exterior wall as set forth in Sub-section 1804.1 of this Chapter.

1804 WALLS AND PARTITIONS

- 1804.1 Distance separations shall be measured at right angles from the wall or opening to the building line of a contiguous lot or any building on the same lot. The building line of a contiguous lot shall be taken as that for the use of the contiguous lot which requires the least set back from the property line, and in no case shall this set back be taken as more than five feet from and parallel to the common lot line.
- 1804.2 Main exterior walls shall be of noncombustible materials and such walls shall be of fire-resistive construction with opening protection where located as follows:
- (a) Main exterior walls having a distance separation of less than five feet, or walls except on street fronts which are less than five feet from the building line of a contiguous lot, shall be of not less than two-hour fire-resistive construction and have no openings therein.
 - (b) *Main exterior walls having a distance separation of from five to ten feet shall be of not less than one-hour fire-resistive construction and openings therein shall be protected by fire assemblies having a 3/4 hour fire resistive rating and shall be limited in area to 30 percent of the wall area with no single opening of more than ten percent of such wall area.*
- 1804.3 Fire walls shall be of noncombustible materials and shall be of the fire-resistive ratings as required in the Chapters on Occupancy (Chapters 4-13).
- 1804.4 Interior bearing walls and partitions shall be of non combustible materials.

1805 FLOORS

Floor construction shall be of noncombustible material, provided, however, that a wood surface or finish may be applied over such noncombustible materials.

1806 ROOFS

- 1806.1 Roofs shall be of any noncombustible material, and fireproofing shall not be required.
- 1806.2 Roof coverings shall be as specified in the Chapter on Roof Coverings (Chapter 30).

- 1806.3 ROOF DRAINAGE: Roof drainage shall comply in all respects to Section 1506.4.

1807 DOORS AND WINDOWS

- 1807.1 Doors, windows and similar openings in exterior walls and fire walls shall be protected or entirely prohibited as set forth in this Chapter, the Chapter on Exit Facilities and Stairs (Chapter 28), or in the Chapters on Occupancy (Chapters 4-13).
- 1807.2 Doors and windows shall not project over public property or restricted areas.

1808 PROJECTIONS FROM THE BUILDING

Projections from the building shall be of noncombustible materials.

1809 ROOF STRUCTURES AND SKYLIGHTS

- 1809.1 Roof structures may extend above the allowable height not to exceed 20 feet and shall be of noncombustible materials. The requirements of Town Planning concerning roof structures shall control if more restrictive in height and area requirements than this code.
- 1809.2 Skylights shall be constructed on noncombustible materials, and transparent or translucent materials shall be fire-resistive.
- 1809.3 Where the public has access to roof areas, a guard rail not less than 36 inches above the roof shall be provided around all open wells or shafts and at all exterior walls.

1810 COMBUSTIBLE MATERIALS REGULATED

A loading platform may be constructed of heavy timber construction with wood floors not less than one and five-eighths inches thick. A Type IV building or structure erected over such platform shall be supported by noncombustible materials to the foundation.

NOTES

CHAPTER 19

TYPE V BUILDINGS (Wood Frame)

- 1901 DEFINITION**
- 1902 GENERAL**
- 1903 WALLS AND PARTITIONS**
- 1904 FLOORS**
- 1905 ROOFS**
- 1906 FIREPROOFING**
- 1907 STAIRWAYS**
- 1908 DOORS AND WINDOWS**
- 1909 PROJECTIONS FROM THE BUILDING**
- 1910 COMBUSTIBLE MATERIALS REGULATED**

1901 DEFINITION

All structural and other elements of Type V buildings shall be of noncombustible materials or wood or any materials allowed by this code.

1902 GENERAL

- 1902.1 Allowable height and area shall be as specified in Occupancy Requirements provided that nothing shall be deemed to override the requirements of Town Planning.
- 1902.2 Loads and material stresses shall be as specified in the Chapters on Engineering and Construction Regulations (Chapters 20-27).
- 1902.3 Required fireproofing shall be as specified in the Chapter on Fire-Resistive Standards (Chapter 32).

1903 WALLS AND PARTITIONS

- 1903.1 Distance separation shall be measured at right angles from the wall or opening to the building line of a contiguous lot or any building on the same lot. The building line of a contiguous lot shall be taken as that for the use of the contiguous lot which requires the least set back from the property line, and in no case shall this set back be taken as more than five feet from and parallel to the common lot line.

- 1903.2 Main exterior walls shall be of noncombustible materials or wood and such walls shall be of fire-resistive construction with opening protection where located as follows:
- (a) Main exterior walls having a distance separation of less than five feet, or walls except on street fronts which are less than five feet from the building line of a contiguous lot, shall be of not less than two hour fire-resistive construction and have no openings therein.
 - (b) *Main exterior walls having a distance separation of from five to ten feet shall be of not less than one-hour fire-resistive construction and openings therein shall be protected by fire assemblies having a 3/4-hour fire-resistive rating and shall be limited in area to 30 percent of the wall area with no single opening of more than ten percent of such wall area.*
- 1903.3 Fire walls shall be of noncombustible materials and shall be of fire-resistive construction as required in the Chapters on Occupancy.
- 1903.4 *Interior bearing walls and all partitions shall be fire-resistive where required based on provisions of this Code for fire division walls, occupancy separation, tenant separation, protection of means of egress and vertical openings where applicable; except that bearing walls shall be of a minimum of one-hour fire-resistive construction.*
- 1903.5 *Where interior walls are non-bearing and are not required to be fire rated by this Code, they may be of non-combustible materials or wood.*

1904 FLOORS

- 1904.1 Floors shall be of steel, concrete or wood.
- 1904.2 *Wood posts shall not be permitted under a girder supporting a ground floor and spaces under ground floors shall have the clearance for ventilation as set forth in Chapter 24 - Wood.*
- 1904.3 Access openings shall be provided to all space under the building.

1905 ROOFS

- 1905.1 Roofs shall be of noncombustible materials or wood.
- 1905.2 Roof coverings shall be as specified in the Chapter on Roof Coverings (Chapter 30).

- 1905.3 ROOF DRAINAGE: Roof drainage shall comply in all respects to Section 1506.4.
- 1905.4 Attic spaces shall not be required, but where attic spaces are provided, such spaces shall have a minimum vertical dimension of 18 inches clear distance and, where unprotected combustible material is exposed, shall be divided by fire stops into areas not exceeding 2,500 square feet or less depending on occupancy. Access trap doors shall be from common spaces such as corridors, and no part of an attic space shall be more than 100 feet from an access trap door. Minimum vertical dimension shall not be required for hip or gable roof construction.

1906 FIREPROOFING

Bearing walls supporting floors shall not be less than one-hour fire-resistive protection except that where a ground floor has clearance of less than three feet, such fire protection may be omitted.

1907 STAIRWAYS

- 1907.1 Stairways shall be as required in the Chapters on Occupancy (Chapters 4-13) and the Chapter on Exit Facilities and Stairs (Chapter 28).
- 1907.2 Stairways may be of noncombustible or combustible materials.

1908 DOORS AND WINDOWS

- 1908.1 Doors, windows and similar openings in exterior walls and fire walls shall be protected or entirely prohibited as set forth in this Chapter, the Chapter on Exit Facilities and Stairs (Chapter 28) and the Chapters on Occupancy (Chapters 4-13).
- 1908.2 Doors and windows shall not project over public property or restricted areas.

1909 PROJECTIONS FROM THE BUILDING

Projections from the building may be of wood.

1910 COMBUSTIBLE MATERIALS REGULATED

- 1910.1 No materials more combustible than wood shall be permitted in the construction of permanent portions of Type V buildings.

NOTES

PART V
ENGINEERING AND CONSTRUCTION REGULATIONS

CHAPTER 20 DESIGN LOADS

- 2001 SCOPE
- 2002 DEFINITIONS AND STANDARDS
- 2003 GENERAL
- 2004 MINIMUM LOADS
- 2005 SPECIAL LOAD CONSIDERATIONS
- 2006 LOAD COMBINATIONS
- 2007 ROOF LIVE LOADS
- 2008 LIVE LOAD REDUCTIONS
- 2009 WIND LOADS
- 2010 LIVE LOADS POSTED

2001 SCOPE

- 2001.1 *This chapter prescribes general engineering design requirements and design loads applicable to all construction regulated by this Code.*
- 2001.2 *APPLICATION: The design of all construction regulated by this Code shall be based upon not less than the minimum loads and design criteria set forth in this Chapter.*

2002 DEFINITIONS AND STANDARDS

- 2002.1 *DEFINITIONS: For the purpose of this Chapter, certain terms are defined as follows:*
 - (a) *ALLOWABLE STRESS DESIGN: A method of proportioning structural members such that the elasticity computed stress does not exceed a specified limiting stress value.*
 - (b) *BEACH: The zone of unconsolidated material that extends landward from the mean low water line to the place where there is a marked change in material or physiographic form, or to the line of permanent vegetation, usually the effective limit of storm waves. "Beach" is alternately termed "shore".*
 - (c) *BREAKAWAY OR FRANGIBLE WALL: A wall independent of supporting structural members that will withstand design wind forces,*

but will fail under hydrostatic wave, and run-up forces associated with the design storm surge. Under such conditions, the wall will fail in a manner such that it dissolves or breaks up into components that will minimise the potential for damage to life or adjacent property. Breakaway wall collapse shall result from a water load less than which would occur during the base flood.

- (d) **BUILDING SUPPORT STRUCTURE:** *Any structure which supports floor, wall, or column loads and transmits them to the foundation, including beams, grade beams or joists, and includes the lowest horizontal structural member exclusive of piles, columns, or footings.*
- (e) **COASTAL BUILDING ZONE:** *The land from the mean high water line to a line 1500'-0" landwards or the entire island in question, whichever is less.*
- (f) **COASTAL OR SHORE PROTECTION STRUCTURES:** *Shorehardening structures, such as seawalls, bulkheads, revetments, rubble mound structures, groins, breakwaters, and aggregates of materials other than beach sand used for shoreline protection, beach and dune restoration, and other structures which are intended to prevent erosion or protect other structures from wave and hydrodynamic forces.*
- (g) **DESIGN STRENGTH:** *The product of the nominal strength and a safety factor.*
- (h) **DUNE:** *A mound or ridge of loose sediments, usually sand-sized, lying landward of the beach, and deposited by natural or artificial means.*
- (i) **FACTORED LOAD:** *The product of the nominal load and a load factor.*
- (j) **HABITABLE MAJOR STRUCTURE:** *Habitable major structures include houses, apartment buildings, condominiums, motels, hotels, restaurants, towers, other types of residential, commercial, or public buildings, and other construction having the potential for substantial impact on coastal zones.*
- (k) **LIMIT STATE:** *A condition in which a structure or component becomes unfit for service and is judged either to be no longer useful for its intended function (serviceability limit state) or to be unsafe (strength limit state).*

- (l) **LOADS:** Forces or other actions that arise on structural systems from the weight of all permanent construction, occupants and their possessions, environmental effects, differential settlement, and restrained dimensional changes. Permanent loads are those loads in which variations in time are rare or of small magnitude. All other loads are variable loads (see also nominal loads).
- (1) **LIVE LOADS** are those loads produced by the use and occupancy of the building or structure and do not include environmental loads such as wind load, rain load, or dead load. Live loads on a roof are those produced during maintenance by workers, equipment and materials, and during the life of the structure by movable objects such as planters, and by people.
- (2) **DEAD LOADS** comprise the weight of all permanent construction, including walls, floors, roofs, ceilings, stairways, and fixed service equipment, plus the net effect of prestressing.
- (m) **LOAD EFFECTS:** Forces and deformations produced in structural members and components by loads imposed upon them.
- (n) **LOAD FACTOR:** A factor that accounts for unavoidable deviations of the actual load from the nominal value and for uncertainties in the analysis that transforms the load into a load effect.
- (o) **MEAN HIGH WATER LINE:** Shall mean the intersection of mean high water with the shore. Mean high water is the average height of high waters as established by the Department of Lands and Surveys.
- (p) **MINOR STRUCTURE:** Shall include, but shall not be limited to dune and beach walkover structures; beach access ramps and walkways; stairways, elevated viewing platforms; gazebos and boardwalks; driveways; parking areas; shuffleboard courts; tennis courts; handball courts; racquetball courts and other uncovered paved areas; earth retaining walls and sand fences; privacy fences; ornamental walls; ornamental garden structures; aviaries and other ornamental construction. It shall be a characteristic of minor structures that they are considered to be expendable under design wave and storm surge forces.
- (q) **NOMINAL LOADS:** The magnitudes of the loads specified in this chapter, e.g. dead, live, soil, wind, rain.
- (r) **NOMINAL STRENGTH:** The capacity of a structure or component to resist the effects of loads, as determined by computations

using specified material strength, dimensions and formulas derived from accepted principles of structural mechanics or by field laboratory tests of scale models allowing for modeling effects and differences between laboratory and field conditions.

- (s) **NON-HABITABLE MAJOR STRUCTURE:** *Includes, but is not limited to, swimming pools, pipelines, docks and piers, canals, lakes, ditches, drainage structures and other water retention structures, water and sewage treatment plants, electrical power plants, transmission lines, distribution lines, transformer pads, vaults, and substations, roads, bridges, streets and highways, and underground storage tanks.*
- (t) **SAFETY FACTOR:** *A factor that accounts for unavoidable deviations of the actual strength from the nominal value and the manner and consequence of failure.*
- (u) **STRENGTH DESIGN:** *A method of proportioning structural members using load factors and safety factors, in such a way that not applicable limit state is reached.*

2002.2 **STANDARDS:** *The standards contained in Appendix A are hereby adopted.*

2003 GENERAL

2003.1 DESIGN:

- (a) *Any system or method of design or construction shall admit of a rational analysis in accordance with well-established principles of mechanics and sound engineering practices.*
- (b) *Buildings and other structures and all parts thereof shall be designed and constructed to be of sufficient strength to support the estimated or actual imposed dead, live, wind, and any other loads both during construction and after completion of the structure, without exceeding the stresses for the various materials as specified in this Code.*
- (c) *The floor and roof systems shall be designed and constructed to transfer horizontal forces to such parts of the structural frame as are designed to carry these forces to the foundation. Where roofs or floors are constructed of individual prefabricated units and the transfer of forces to the building frame and foundation is totally or partially dependent on such units, the units and the attachments shall be capable of resisting applied loads in both vertical and horizontal directions. Where roofs or floors are constructed of individual prefabricated units and the transfer of forces to the building frame and foundation is wholly independent of such units, the*

units and the attachments shall be capable of resisting applied loads normal to the surface in and out.

- (d) *Buildings and structural systems and building systems shall provide structural integrity so that the hazard associated with partial or progressive collapse due to severe overloads or abnormal loads not specifically covered in this Chapter are minimised.*

2003.2 LOADS:

- (a) *No building or part thereof shall be designed for live loads less than those specified in this Chapter.*
- (b) *The live loads set forth herein shall be assumed to include ordinary impact but where loading involves unusual impact, provision shall be made by increasing the assumed live load.*
- (c) *Provisions shall be made in designing office floors for a load of 2000 pounds placed upon any space two and one-half feet square wherever this load upon an otherwise unloaded floor would produce stresses greater than those caused by a uniformly distributed load of 50 pounds per square foot.*
- (d) *In designing floors, not less than the actual live load to be imposed shall be used in the design. Special provision shall be made for machine or apparatus, or loads from moving equipment.*
- (e) *Where partition locations are subject to change, floors shall be designed to support, in addition to all other loads, a uniformly distributed load equal to 20 pounds per square foot.*
- (f) *Public garages and commercial or industrial buildings in which passenger cars or loaded trucks are placed, used or stored shall have the floor systems designed to support the maximum concentrated wheel load placed in any possible position.*

2003.3 DEFLECTION: *The deflection of any structural member or component, when subjected to live, wind and other super-imposed loads, excluding dead loads, set forth herein, shall not exceed the following ratios:*

- (1) *Roof and ceiling or components supporting plaster..... $\frac{\text{span}}{360}$*
- (2) *Roof members or components not supporting plaster underneath..... $\frac{\text{span}}{240}$*
- (3) *Floor members or components..... $\frac{\text{span}}{240}$*

- (4) *Vertical and wall members or components with plaster or masonry or brittle backing.....span
360*
- (5) *Vertical and wall members or components without plaster backing.....span
180*
- (6) *Roof and vertical members, wall members, and panels of carports, canopies, marquees, patio covers, utility sheds and similar minor structures not to be considered living areas, where the roof projection is greater than 12'-0" in the direction of the span, for free-standing roofs and roofs supported by existing structures. Existing structures supporting such roofs shall be capable of supporting the additional loading.....SPAN - 180*
- (7) *For Group I Occupancies only, roof and vertical members, wall members and panels of carports, canopies, marquees, patio covers, utility sheds and similar minor structures not to be considered living areas, where the roof projection is 12'-0" or less in the direction of the span and for free standing roofs and roofs supported by existing structures.....SPAN - 80*
- (8) *Members supporting screens only.....SPAN - 80*
- (9) *Storm shutters and fold down awnings, which in the closed position shall provide a minimum clear separation from the glass of 1" but not exceed 2" when the shutter or awnings is at its maximum point of permissible deflection.....SPAN - 30*
- (10) (i) *Roofs and exterior walls of sheds as defined in Chapter 2 of this Code.....SPAN - 80*
- (ii) *Roofs and exterior walls of storage buildings larger than utility sheds.....SPAN - 180*

2004 MINIMUM LOADS

2004.1 LIVE LOADS: *Minimum uniformly distributed live loads shall be not less than as set forth in Table 20-A1.*

2004.2 CONCENTRATED LOADS: *Minimum concentrated loads shall be not less than as set forth in Table 20-A2.*

2004.3 DEAD LOADS:

(a) *Minimum design dead shall be not less than as set forth in Table*

20-A3 unless actual values are substantiated by quantitative information.

- (b) *Minimum design loads for materials shall not be less than as set forth in Table 20-A4.*

2005 SPECIAL LOAD CONSIDERATIONS

2005.1 LIVE LOADS

(a) UNIFORMLY DISTRIBUTED LOADS:

- (1) **REQUIRED LIVE LOADS:** *The live loads assumed in the design of buildings and other structures shall be the maximum loads likely to be produced by the intended use or occupancy, but shall in no case be less than the minimum uniformly distributed unit loads set forth in Table 20-A1.*
- (2) **PROVISIONS FOR PARTITIONS:** *In office buildings or other buildings where partitions might be subject to erection or rearrangement, provision for partition weight shall be made, whether or not partitions are shown on the plans, unless the specified live load exceeds 80 psf.*

(b) CONCENTRATED LOADS

- (1) *Floors and other, similar surfaces shall be designed to safely support the uniformly distributed live loads prescribed by Paragraph 2005.1(a) hereinabove or the concentrated load, in pounds-force (lbf), given by Table 20-A2, whichever produces the greater stresses. Unless otherwise specified, the indicated concentration shall be assumed to be uniformly distributed over an area 2.5 sq. ft. and shall be located so as to produce the maximum stress conditions in the structural members.*
 - (2) *Any single panel point of the lower chord of roof trusses or any point of other primary structural members supporting roofs over manufacturing, commercial storage and warehousing, and commercial garage floors shall be capable of safely carrying a suspended, concentrated load of not less than 2000 lbf in addition to dead load. For all other occupancies, a minimum load of 200 lbf shall be used.*
- (c) **LOADS NOT SPECIFIED:** *For occupancies or uses not designated in Paragraphs 2005.1(a) or (b) hereinabove, the live load shall be*

determined in a manner satisfactory to the Buildings Control Officer.

- (d) **PARTIAL LOADING:** *The full intensity of the appropriately reduced live load applied only to a portion of the length of a structure or member shall be considered if it produces a more unfavourable effect than the same intensity applied over the full length of the structure or member.*
- (e) **IMPACT LOADS:** *The live loads specified in Sub-paragraph 2005.1(a)(1) shall be assumed to include adequate allowance for ordinary impact conditions. Provision shall be made in the structural design for uses and loads that involve unusual vibration and impact forces as follows:*
 - (1) **ELEVATORS:** *All elevator loads shall be increased by 100% for impact, and the structural supports shall be designed within the limits of deflection prescribed by American National Standard Safety Code for Elevators and Escalators ANSI/ASME A17.1.*
 - (2) **MACHINERY:** *For the purpose of design, the weight of machinery and moving loads shall be increased by the following percentages to allow for impact, however, such percentages shall be increased as recommended by the machinery manufacturer:*
 - (i) *Elevator machinery loads shall be increased by 100%.*
 - (ii) *Loads for shaft or motor-driven light machinery shall be increased by 20%.*
 - (iii) *Loads for reciprocating machinery or power driven units shall be increased by 50%.*
 - (iv) *Loads for floor or balcony hangers shall be increased by 33%.*

2005.2 DEAD LOADS:

- (a) **WEIGHTS OF MATERIALS AND CONSTRUCTION:** *In estimating dead loads for purposes of design, the actual weights of materials and construction shall be used, in the absence of definite information, the loads shall be not less than as set forth in Table 20-A3 herein.*
- (b) **WEIGHT OF FIXED SERVICE EQUIPMENT:** *In estimating dead*

loads for purposes of design, the weight of fixed service equipment such as plumbing stacks and risers, electrical feeders, and heating, ventilating and air conditioning systems shall be included whenever such equipment is supported by structural members.

- (c) *SPECIAL CONSIDERATION: Engineers, Architects, and building owners are advised to consider factors that may result in differences between actual and calculated loads.*

2005.3 *COUNTERACTING LOADS: When the effects of design loads counteract one another in a structural member or joint, special care shall be exercised by the designer to ensure adequate safety with regard to possible stress reversals.*

2005.4 *FLOORS: In the design of floors, consideration shall be given to the effect of known or probable concentration of loads, partial load, impact and machine loads. Design shall be based on the load or combinations of loads which produce the higher stresses.*

2005.5 *BELOW GRADE STRUCTURES:*

- (a) *In the design of basements, tanks, swimming pools and similar below grade structures, provisions shall be made for the forces due to hydrostatic pressure and lateral pressure of adjacent soil.*
- (b) *For the lateral loads of soil on below grade structures, unless substantiated by more specific information, the angle of repose of fragmental rock and natural confined sand shall be 30 degrees and the angle of repose of filled soil and much shall be 15 degrees to a horizontal line.*
- (b) (1) *For the hydrostatic pressure on any floor below ground water level, calculations shall be based on full hydrostatic pressure, and such floors shall be designed for live load without uplift, and hydrostatic uplift without live load.*
- (2) *Private swimming pools may be designed with an approved pressure relief device for hydrostatic uplift.*

2005.6 *SAFEGUARDS:*

- (a) *Railings, stair-railings and other similar safeguards shall be designed to resist a load of 50 pounds per lineal foot applied in any direction at the top of such barriers.*
- (b) *Intermediate rails, balusters, pickets and other fillers shall be capable of resisting a uniform horizontal load over the gross area of not less than 25 pounds per square foot, without restriction by*

deflection, but of not less strength than required to resist applicable wind loads as set forth herein.

- (c) *The main supporting members of such vertical barriers shall be designed and constructed to resist the forces set forth in Paragraphs 2005.6(a) and (b) herein, whichever is more critical but the reaction of the specified forces need not be additive.*
- (d) *Handrails shall be designed and constructed to resist a load of not less than 200 pounds applied in any direction and at any point on the rail.*

2005.7 *ORNAMENTAL PROJECTIONS: Ornamental cantilevered projections on the exterior of buildings shall be designed for not less than 60 pounds per square foot live load or 200 pounds per lineal foot applied at the outer edge, whichever is more critical.*

2005.8 *INTERIOR WALLS AND PARTITIONS: Permanent, full-height, interior walls and partitions shall be designed to resist a lateral live load not less than 5 pounds per square foot and if sheathed with lath and plaster, deflection at this load shall not exceed L/360.*

2006 LOAD COMBINATIONS

2006.1 GENERAL:

- (a) *The safety of structures may be checked using the provisions of Sub-section 2007.2 hereinbelow.*
- (b) **SYMBOLS AND NOTATION:** *Certain symbols and notations used in this section are defined as follows:*
 - (1) *D = Dead loads shall be as defined by Section 2002 herein and shall include:*
 - (i) *The weight of all materials of the member itself.*
 - (ii) *The weight of all materials of construction incorporated into the building to be permanently supported by the member, including built-in partitions.*
 - (iii) *The weight of permanent equipment.*
 - (2) *F = Loads due to fluids with well-defined pressures and maximum heights.*
 - (3) *L = Live loads due to intended use due to intended use and occupancy, shall be those defined by Paragraph 2002.1(l)*

herein, and shall include loads due to moveable objects and movable partitions, and loads temporarily supported by the structure during maintenance. The live load, L, includes any permissible reduction. If resistance to impact loads is taken into account in design, such effects shall be included with the live load, L.

- (4) *L_r = Roof live loads. See section 2007 hereinbelow.*
- (5) *H = Loads due to the weight and lateral pressure of soil and water in soil.*
- (6) *P = Loads, forces and effects due to ponding.*
- (7) *T = Self-straining forces and effects arising from contraction or expansion resulting from temperature changes, shrinkage, moisture changes, creep in component materials, movement due to differential settlement, or combinations thereof.*
- (8) *W = Wind load.*

2006.2 COMBINING LOADS:

(a) *BASIC COMBINATIONS: Except when mandatory standards provide otherwise, all loads listed herein shall be considered to act in the following combinations, whichever produces the most unfavourable effect in the building, foundation, or structural member being considered. The most unfavourable effect may occur when one or more of the contributing loads is not acting.*

- (1) *D*
- (2) *D + L + L_r*
- (3) *D + W*
- (4) *D + L + L_r + W*

(b) *OTHER LOAD COMBINATIONS: When the structural effects of F, H, P, or T loads are significant, they shall be considered in design.*

2007 ROOF LIVE LOADS

2007.1 ROOF LIVE LOADS SPECIFIED:

(a) *Roofs shall be design for a live load of not less than 30 pounds per square foot, except as set forth herein.*

EXCEPTIONS:

- (1) *Glass areas of greenhouse roofs shall be designed for a live load of not less than 15 pounds per square foot.*

- (2) *Ordinary pitched and curved roofs, with a slop of 1-1/2:12 or greater, where water in not directed to the interior of the roof, without parapet or other edge of roof drainage obstructions, may be designed for an allowable live load of not less than 20 pounds per square foot.*
 - (b) **SPECIAL PURPOSE ROOFS:** *Roofs used for assembly, roof gardens, promenade or walkway purposes shall be designed for a minimum live load of 100 lbs/ft². Other special purpose roofs shall be designed for appropriate loads as directed or approved by the Buildings Control Officer.*
 - (c) *Roofs of screen enclosures shall be as set forth in Chapter 30 of this Code.*
- 2007.2 ROOF DECKING:** *Roof decking shall be designed to support the live load set forth in Subsection 2008.1 hereinabove or a load of 100 pounds per foot applied as a 1'-0" wide strip perpendicular to, and at the centre of, the span of the decking between supports, whichever is more critical.*
- 2007.3 ROOF DRAINAGE:**
- (a) *Where parapets or curbs are constructed above the level of the roof, provision shall be made to prevent rain water from accumulating on the roof in excess of that considered in the design, in the event the rain water drains or leaders become clogged.*
 - (b) *Where roofs are not designed in accordance with Paragraph 2007.3(a) herein-above, overflow drains or scuppers shall be placed to prevent an accumulation of more than 3" of water on any portion of the roof.*
 - (c) *Drains or scuppers installed to provide overflow drainage shall be not less in aggregate area than 3X the area of tributary downspouts or leaders, but not less than 3" in dimension in any direction.*
 - (d) *All roofs shall be designed with sufficient slope or camber to assure adequate drainage after the long term deflection from dead load, or shall be designed to support maximum loads including possible ponding of water due to deflection.*
 - (e) **PONDING LOADS:** *Roofs shall be designed to preclude instability from ponding loads.*

- (f) **PROVISION FOR DRAINAGE OBSTRUCTIONS:** *Each portion of a roof shall be designed to sustain the loads of all rainwater that could accumulate on it if the primary drainage system for that portion is obstructed. Ponding instability shall be considered in this situation. If the overflow drainage provisions contain drain lines, such lines shall be independent of any primary drain lines.*

2008 LIVE LOAD REDUCTIONS

2008.1 **APPLICATION:** *No reduction in assumed live loads set forth in this section shall be allowed in the design of columns, walls, beams, girders and foundations, except as permitted by the provision of this Section.*

EXCEPTIONS:

- (1) *No reduction of the assumed live loads shall be allowed in the design of any slabs, joists or other secondary members except as set forth herein.*
- (2) *No reduction in live loads shall be permitted for buildings or structures of Group A or B Assembly Occupancy.*
- (3) *No reduction in roof live loads shall be permitted except as set forth by Section 2008 hereinabove.*

2008.2 **ALLOWABLE REDUCTIONS:**

(a) *Subject to limitations given by Subsection 2009.1 herein, members having an influence area of 400 sq. ft. or more may be designed for a reduced live load determined as set forth in this Subsection.*

(b) **LIVE LOAD REDUCTIONS**

- (1) **REDUCTIONS BASED ON LIVE LOAD:** *For live loads of 100 lb/ft² or less, the total live load carried by a column or footing may be reduced by the percentages given by Table 20-B1 herein, except where specifically prohibited by Subsection 2009.1 herein:*

TABLE 20-B1
PERCENTAGE ALLOWABLE LIVE LOAD REDUCTIONS FOR
LIVE LOADS NOT GREATER THAN 100 LBF/SQUARE FOOT

<i>Load Type</i>	<i>Allowable Reduction %</i>
<i>Roof</i>	<i>0</i>
<i>Roof and one floor</i>	<i>0</i>
<i>Roof and two floors</i>	<i>10</i>
<i>Roof and three floors</i>	<i>20</i>
<i>Roof and four floors</i>	<i>30</i>
<i>Roof and five floors</i>	<i>40</i>
<i>Roof and six or more floors</i>	<i>50</i>

(2) **REDUCTIONS BASED ON OCCUPANCY:** *For Groups F and G Occupancies specified herein the total live loads carried by a column or footing may be reduced by an amount not exceeding the given percentages, except that the reduction at any floor or roof shall not be required to be less than the average percentage reduction allowed for tributary members at that floor or roof. The percentages herein set forth shall be applicable to all live load in the building which is tributary to the member.*

(i) *Live load reduction for Group E, Division 1 Occupancy warehouses and storage buildings shall not exceed the percentages allowed by Table 20-B2 hereinbelow.*

TABLE 20-B2
PERCENTAGE ALLOWABLE LIVE LOAD REDUCTIONS FOR
WAREHOUSES AND STORAGE BUILDINGS

<i>Load Type</i>	<i>Allowable Reduction %</i>
<i>Roof</i>	<i>0</i>
<i>Roof and one floor</i>	<i>0</i>
<i>Roof and two floors</i>	<i>5</i>
<i>Roof and three floors</i>	<i>10</i>
<i>Roof and four floors</i>	<i>15</i>
<i>Roof and five or more floors</i>	<i>20</i>

- (ii) *Live load reduction for Group E, Division 1 Occupancy garages; Group E, Division 2 Occupancy manufacturing buildings; and Group F Division 1 Occupancy mercantile uses shall not exceed the percentages allowed by Table 20-B3.*

TABLE 20-B3
PERCENTAGE ALLOWABLE LIVE LOAD REDUCTIONS FOR
MANUFACTURING BUILDINGS, STORES AND GARAGES

<i>Load</i>	<i>Allowable Reduction %</i>
<i>Roof</i>	<i>0</i>
<i>Roof and one floor</i>	<i>0</i>
<i>Roof and two floors</i>	<i>10</i>
<i>Roof and three floors</i>	<i>20</i>
<i>Roof and four or more floors</i>	<i>30</i>

- (iii) *In no case shall the total live load reductions for girders exceed those set forth in Subsection 2009.3 hereinbelow.*

2008.3 MAXIMUM ALLOWABLE REDUCTIONS FOR GIRDERS:

- (a) *A reduction of the total live load used in the design of girders based on a specific tributary floor area shall be permitted as set forth in Table 20-B4 hereinbelow.*
- (b) *This reduction shall not be in addition to the permitted column reduction nor shall such reduction be used in design of buildings to be used or occupied as places or public assembly, warehouses or for other storage purposes.*

TABLE 20-B4
GIRDER LIVE LOAD REDUCTIONS

<i>Tributary Floor Area in square feet</i>	<i>Allowable Reduction %</i>
<i>100</i>	<i>5</i>
<i>200</i>	<i>10</i>
<i>300 or more</i>	<i>15</i>

2009 WIND LOADS

2009.1 GENERAL:

- (a) *Buildings and structures, and every portion thereof, shall be designed and constructed to meet the requirements of Section 6 of Standard 7-88 of the American Society of Civil Engineers (ASCE 7-88) entitled "Minimum Design Loads for Buildings and other Structures", as more specifically defined in this Section based on a fifty-year mean recurrence interval.*
- (b) *All buildings and structures within the Commonwealth of the Bahamas shall be considered to be at the hurricane oceanline for purposes of application of the Importance Factor, I (Windload) contained within Table % of ASCE 7-88.*
- (c) *Buildings and structures in the coastal building zone, as that term is defined in Subsection 2002.1 above, shall be considered to be in Exposure Category D as defined in Section 6.5.3 of ASCE 7-88.*
- (d) *All buildings and structures not in the coastal building zone shall be considered to be in Exposure Category C as defined in Section 6.5.3 of ASCE 7-88.*

2009.2 OVERTURNING MOMENT AND UPLIFT:

- (a) *Computations for overturning moment and uplift shall be based on the building as a whole and shall include appropriate vertical surface shape factors.*
- (b) *Overturning stability of any building, structure or part thereof taken as a whole shall be provided, and shall be not less than 150 percent of its wind load overturning moment.*
- (c) *Uplift stability shall be provided for any building, structure, part thereof or isolated component thereof and shall be not less than 150 percent of the wind load uplift thereof.*
- (d) *Stability may be provided by dead loads, anchors, attachments, the weight of earth superimposed over footings or anchors, the withdrawal resistance of piles or the resisting moment of vertical members embedded in the ground.*

2009.3 STRESSES:

- (a) *For member carrying wind stresses only, and for combined stresses due to wind and other loads, the allowable stresses and the allowable loads on connections may be increased 33-1/3 percent from the maximum set forth in this Code for the materials used.*

EXCEPTIONS:

- (1) *Such increased stresses shall not apply to foundations except as provided in Chapter 21 herein.*
 - (2) *Such increased stresses shall not apply to towers, cantilevered projections or metal sheathing where vibrations or fluttering action could be anticipated.*
 - (3) *Glass areas shall not be increased from those set forth in Table 31-G.*
 - (4) *Such increased stresses shall not apply to glazing materials other than glass.*
- (b) *In no case shall the cross-section properties be less than required for dead load plus live load without wind load.*

2010 LIVE LOADS POSTED

- 2010.1 *The live loads in every building, structure, or part thereof, of Group F or Group G Occupancy approved by the Buildings Control Officer shall be shown on plates supplied by the owner or his authorized agent, in that part of each space to which such loads apply.*
- 2010.2 *Such plates shall be of approved durable materials displaying letters and figures not less than 3/8" in height, and shall be securely affixed to the structure in conspicuous places.*
- 2010.3 *Such notices shall not be removed or defaced and where defaced, removed or lost, it shall be the responsibility of the owner to cause replacement as soon as possible.*

TABLE 20-A1
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS

<u>Occupancy or Use</u>	<u>Live Load (lb/ft²)</u>
<i>Amusement Park Structures</i>	100*
<i>Apartments (See Residential)</i>	
ASSEMBLY	
<i>Auditoriums</i>	
<i>Fixed Seating</i>	75
<i>Moveable Seating</i>	100
<i>Balconies and Galleries</i>	
<i>Fixed Seating</i>	60

<i>Moveable Seating</i>	100
<i>Dance Halls and Ballrooms</i>	100
<i>Gymnasiums</i>	100
<i>Lobbies</i>	100
<i>Platforms used for assembly</i>	100
<i>Projection Rooms</i>	100
<i>Public Rooms</i>	100
<i>Restaurants and Dining Rooms</i>	80
<i>Rinks Ice Skating</i>	250
<i>Roller Skating</i>	100
<i>Theaters Dressing Rooms</i>	40
<i>Stage Floors</i>	150
ATTIC, NON-RESIDENTIAL	
<i>Storage</i>	80+
<i>Non-storage</i>	25
<i>Bakeries (Use Load for Kitchens)</i>	
<i>Balconies, Exterior (See also Assembly)</i>	
<i>Serving private units of Group H or I Occupancy and</i>	
<i>Not used for assembly</i>	60
<i>Others</i>	100
<i>Broadcast Studios</i>	100
<i>Cabanas and Bath Houses</i>	50
<i>Corridors</i>	
<i>First Floor</i>	100
<i>Other Floors</i>	
<i>Same as occupancy served, except as otherwise</i>	
<i>indicated for hospitals, libraries, penal institutions</i>	
<i>and residential occupancies</i>	
<i>Decks, Patio and Roof</i>	
<i>Same as area served, or type of occupancy accommodated</i>	
<i>Dormitories</i>	
<i>Partitioned</i>	40
<i>Non-partitioned</i>	80
<i>Dwellings (See Residential)</i>	
<i>File Rooms (See Offices)</i>	
<i>Fire Escapes</i>	100
<i>Fire Escapes - Single Family dwellings only</i>	40
<i>Garages</i>	
<i>Passenger Cars Only</i>	50
<i>Trucks and Buses</i>	*, ++
<i>Grandstands (See Reviewing Stands and Bleachers)</i>	
<i>Gymnasiums (See Assembly)</i>	
<i>Hospitals (See Footnote)</i>	
<i>Hotels (See Residential)</i>	
<i>Kitchens, other than domestic</i>	150
<i>Libraries</i>	

<i>Reading Rooms</i>	60
<i>Stack Rooms</i>	150
<i>Corridors Above First Floor</i>	80
<i>Manufacturing</i>	
<i>Light</i>	125
<i>Heavy</i>	250
<i>Marquees and Canopies</i>	75
<i>Office Buildings</i>	50
<i>Offices</i>	
<i>File Rooms</i>	
<i>Card</i>	125+
<i>Letter</i>	80+
<i>Lobbies</i>	100
<i>Vaults</i>	250+
<i>Penal Institutions</i>	
<i>Cell Blocks</i>	40
<i>Corridors</i>	100
<i>Public Rooms (See Assembly)</i>	
<i>Ramps</i>	
<i>Driveway (See Garage)</i>	
<i>Pedestrian (See sidewalk)</i>	
<i>Recreational Facilities</i>	75+
<i>Including Bowling Centres, Pool Rooms, and similar uses</i>	
<i>Residential (See also Balconies)</i>	
<i>One and Two-Family Dwellings</i>	
<i>Attics, Habitable</i>	30
<i>Attics, uninhabitable</i>	20
<i>with storage</i>	
<i>without storage</i>	10
<i>Other Areas</i>	40
<i>Multi-Family Dwellings and Hotels</i>	
<i>Private Rooms and Corridors Serving Them</i>	40
<i>Public Rooms and Corridors Serving Them</i>	100
<i>Restrooms and Toilet</i>	40
<i>Rooms</i>	
<i>Restaurants (See Assembly)</i>	
<i>Reviewing Stands and Bleachers</i>	100
<i>Schools</i>	
<i>Classrooms</i>	40
<i>Corridors above Ground floor</i>	80
<i>Stairs and Exitways</i>	100
<i>Storage</i>	
<i>Light</i>	125
<i>Heavy</i>	250+

<i>Stores, Mercantile</i>	
<i>Retail</i>	
<i>Ground Floor</i>	100
<i>Upper Floor</i>	75
<i>Wholesale, All Floors</i>	125
<i>Theatres (See Assembly)</i>	
<i>Walkways and Elevated Platforms (other than exitways)</i>	60+

- * *Use weight of actual equipment when greater*
- + *Increase when occupancy exceeds this amount*
- ++ *See Table 20-A2 for concentrated load requirements*

NOTES:

- (a) *For penal Institutions, Hospitals and other specialized occupancies contact the Buildings Control Officer.*
- (b) *The live loads specified above shall be assumed to include adequate allowance for ordinary impact conditions. Provision shall be made in the structural design for uses and loads which involve unusual vibration and impact forces.*
- (c) *All moving elevator loads shall be increased 100 percent for impact and the structural supports shall be designed within the limits of deflection prescribed by the standards given in Chapter 43 of this Code, Elevators and Escalators.*
- (d) *For the purpose of design, the weight of heavy machinery and moving loads shall be increased not less than 25 percent for impact unless otherwise specified.*

TABLE 20-A2
MINIMUM CONCENTRATED LOADS

<i>Location</i>	<i>Load (lbf)</i>
<i>Elevator machine room grating (on area of 4 in²)</i>	300
<i>Finish light floor plate construction (on area of 1 in²)</i>	200
<i>Garages</i>	*
<i>Office</i>	2000
<i>Floors</i>	
<i>Scuttles, skylight ribs and accessible ceilings</i>	200
<i>Sidewalks</i>	8000
<i>Stair Treads (on area of 4 in² at centre of tread)</i>	300

**Floors in garages or portions of buildings used for the storage of motor vehicles shall be designed for the uniformly distributed live loads of Table 20-A1 or the following concentrated loads: (1) for passenger cars accommodating not more than*

nine passengers, 2000 lbf acting on an area of 20 in²; (2) mechanical parking structures without slab or deck, passengers cars only, 1500 lbf per wheel; (3) for truck or buses, maximum axle load on an area at 20 in².

TABLE 20-A3
MINIMUM DESIGN DEAD LOADS*

<i>Component</i>	<i>Load - lbf/ft²</i>
CEILINGS	
<i>Acoustical fiber tile</i>	<i>1</i>
<i>Gypsum board (per 1/8-inch thickness)</i>	<i>0.55</i>
<i>Mechanical duct allowance</i>	<i>4</i>
<i>Plaster on tile or concrete</i>	<i>5</i>
<i>Plaster on wood lath</i>	<i>8</i>
<i>Suspended steel channel system</i>	<i>2</i>
<i>Suspended metal lath and cement plaster</i>	<i>15</i>
<i>Suspended metal lath and gypsum plaster</i>	<i>10</i>
<i>Wood furring suspension system</i>	<i>2.5</i>
COVERINGS, ROOF AND WALL	
<i>Asbestos-cement shingles</i>	<i>4</i>
<i>Asphalt shingles</i>	<i>2</i>
<i>Cement tile</i>	<i>16</i>
<i>Clay tile (for mortar add 10 lb)</i>	
<i>Roman</i>	<i>12</i>
<i>Spanish</i>	<i>19</i>
COMPOSITION	
<i>Three-ply ready roofing</i>	<i>1</i>
<i>Four-ply felt and gravel</i>	<i>5.5</i>
<i>Five-ply felt and gravel</i>	<i>6</i>
<i>Copper or tin</i>	<i>1</i>
<i>Deck, metal, 20 gage</i>	<i>2.5</i>
<i>Deck, metal, 18 gage</i>	<i>3</i>
<i>Decking, 2-inch wood (Douglas Fir)</i>	<i>5</i>
<i>Decking, 3-inch wood (Douglas Fir)</i>	<i>8</i>
<i>Fibreboard -inch</i>	<i>0.75</i>
<i>Gypsum sheathing, -inch</i>	<i>2</i>
<i>Insulation, roof boards (per inch thickness)</i>	
<i>Cellular glass</i>	<i>0.7</i>
<i>Fibrous glass</i>	<i>1.1</i>
<i>Fibreboard</i>	<i>1.5</i>
<i>Perlite</i>	<i>0.8</i>
<i>Polystyrene foam</i>	<i>0.2</i>
<i>Urethane foam with skin</i>	<i>0.5</i>

<i>Plywood (per 1/8" thickness)</i>	0.4
<i>Rigid Insulation -inch</i>	0.75
<i>Skylight, metal frame, 3/8-inch wire glass</i>	8
<i>Slate, 3/16-inch</i>	7
<i>Slate, -inch</i>	10
<i>Waterproofing membrane</i>	
<i>Bituminous, gravel covered</i>	5.5
<i>Bituminous, smooth surface</i>	1.5
<i>Liquid applied</i>	1.0
<i>Single-ply sheet</i>	0.7
<i>Wood sheathing(per 1-inch thickness)</i>	3
<i>Wood Shingles</i>	3
FLOOR FILL	
<i>Lightweight concrete, per inch</i>	8
<i>Sand, per inch</i>	8
<i>Stone concrete, per inch</i>	12
FLOORS AND FLOOR FINISHES	
<i>Cement Finish (1-inch) on stone-concrete fill</i>	32
<i>Ceramic or quarry tile (3/4-inch) on -inch mortar bed</i>	16
<i>Ceramic or quarry tile (3/4-inch) on 1-inch mortar bed</i>	23
<i>Concrete fill finish</i>	12
<i>Hardwood flooring, 7/8-inch</i>	4
<i>Linoleum or asphalt tile, -inch</i>	1
<i>Marble and mortar on stone-concrete fill</i>	33
<i>Slate (per inch thickness)</i>	15
<i>Solid flat tile on 1-inch mortar base</i>	23
<i>Subflooring, -inch</i>	3
<i>Terrazzo (1 -inch) directly on slab</i>	19
<i>Terrazzo (1-inch) on stone-concrete fill</i>	32
<i>Terrazzo (1-inch) 2-inch stone-concrete</i>	32
<i>Wood Block (3-inch) on mastic, no fill</i>	10
<i>Wood block (3 inch) on -inch mortar base</i>	16
FLOORS, WOOD-JOIST (NO-PLASTER), DOUBLE WOOD FLOOR	

<i>Joist Sizes (inches)</i>	<i>12-inch Spacing (lbf/ft²)</i>	<i>18-inch Spacing (lbf/ft²)</i>	<i>24-inch Spacing (lbf/ft²)</i>
2 x 6	6	5	5
2 x 8	6	6	5
2 x 10	7	6	6
2 x 12	8	7	6

FRAME PARTITIONS

<i>Moveable steel partitions</i>	4
<i>Wood or steel studs, 5/8-inch gypsum board each side</i>	8
<i>Wood studs, 2 x 4, unplastered</i>	4
<i>Wood studs, 2 x 4, plastered one side</i>	12
<i>Wood studs, 2 x 4, plastered two sides</i>	20

FRAME WALLS

<i>Exterior stud walls</i>	
<i>2 x 4 @ 16", 5/8" gypsum, insulated, 3/8" siding</i>	11
<i>2 x 6 @ 16", 5/8" gypsum, insulated, 3/8" siding</i>	12
<i>Exterior stud walls with brick veneer</i>	48
<i>Windows, glass, frame and sash</i>	8

MASONRY WALLS

<i>4-inch concrete block</i>	
<i>8-inch concrete block</i>	
<i>12-inch concrete block</i>	

**Weights of masonry include mortar but not plaster. For plaster, add 5 lbf/ft² for each face plastered. Values given represent averages. In some cases there is a considerable range of weight for the same construction.*

TABLE 20-A4

MINIMUM DESIGN LOADS FOR MATERIALS

<i>Material</i>	<i>Load - lbf/ft³</i>
<i>Bituminous products</i>	81
<i>Asphaltum</i>	135
<i>Graphite</i>	
<i>Paraffin</i>	
<i>Petroleum, crude</i>	55
<i>Petroleum, refined</i>	50
<i>Petroleum, benzine</i>	46
<i>Petroleum, gasoline</i>	42
<i>Pitch</i>	69
<i>Tar</i>	75
<i>Brass</i>	526
<i>Bronze</i>	552
<i>Cast-stone masonry (cement, stone, sand)</i>	144
<i>Ceramic Tile</i>	150
<i>Charcoal</i>	12
<i>Concrete</i>	
<i>Plain</i>	144
<i>Vermiculite and perlite aggregate, nonload-bearing</i>	25-50
<i>Other light aggregate, load bearing</i>	70-105

<i>Reinforced</i>	150
<i>Copper</i>	556
<i>Cork, compressed</i>	14.4
<i>Earth (not submerged)</i>	
<i>Soil</i>	100
<i>Sand and gravel</i>	110
<i>Sand and gravel, and clay</i>	120
<i>Earth (submerged)</i>	
<i>Soil</i>	70
<i>Sand and gravel</i>	60
<i>Sand and gravel, and clay</i>	65
<i>Gravel, dry</i>	104
<i>Gypsum, loose</i>	70
<i>Gypsum, wallboard</i>	50
<i>Ice</i>	57.2
<i>Iron</i>	
<i>Cast</i>	450
<i>Wrought</i>	480
<i>Lead</i>	710
<i>Lime</i>	
<i>Hydrated, loose</i>	32
<i>Hydrated, compacted</i>	45
<i>Masonry, ashlar</i>	
<i>Granite</i>	165
<i>Limestone, oolitic</i>	135
<i>Marble</i>	173
<i>Sandstone</i>	144
<i>Masonry, brick</i>	
<i>Hard (low absorption)</i>	130
<i>Medium (medium absorption)</i>	115
<i>Masonry, rubble mortar</i>	
<i>Limestone. Oolitic</i>	138
<i>Marble</i>	156
<i>Mortar, hardened</i>	
<i>Cement</i>	130
<i>Lime</i>	110
<i>Particleboard</i>	45
<i>Plywood</i>	36
<i>Sand, clean and dry</i>	90
<i>Steel, cold drawn</i>	489
<i>Stone</i>	
<i>Limestone, marble, quartz</i>	95
<i>Tin</i>	459
<i>Water</i>	
<i>Fresh</i>	62.4
<i>Sea</i>	64

<i>Wood, seasoned</i>	
<i>Cypress, southern</i>	34
<i>Fir, Douglas, coast region</i>	34
<i>Hem fir</i>	28
<i>Pine, southern yellow</i>	37
<i>Redwood</i>	28
<i>Spruce, red, white and Sitka</i>	29
<i>Zinc, rolled, sheet</i>	449

NOTES

CHAPTER 21

EXCAVATIONS, FOOTINGS AND FOUNDATIONS

2101 EXCAVATIONS

2102 BEARING CAPACITY OF SOILS

2103 SOIL BEARING FOUNDATIONS

2104 PILE FOUNDATIONS

2105 FOUNDATION WALLS AND GRADE BEAMS

2106 RETAINING WALLS

2107 SEAWALLS, BULKHEADS AND DOCKS

2108 MATERIALS

2101 EXCAVATIONS

2101.1 GENERAL:

- (a) Excavations or fills for any buildings or structure and excavations or fills accessory thereto shall be so constructed or protected that they do not endanger life and property.
- (b) All excavations shall be properly guarded and protected so as to prevent the excavations from becoming dangerous to life and property and shall be sheet piled, braced and /or shored, where necessary, to prevent the adjoining earth from caving in; such protection to be by the person causing the excavation to be made.
- (c) No fill or other surcharge loads shall be placed adjacent to any building or structure unless such building or structure is capable of withstanding the additional loads caused by the fill or surcharge.
- (d) Footings or foundations which may be affected by any excavation shall be underpinned adequately, or otherwise protected against settlement, and shall be protected against lateral movement.
- (e) Fills to be used to support the foundations of any building or structure shall be placed in accordance with the requirements of section 2102 of this chapter.

2101.2 PERMANENT EXCAVATIONS: No permanent excavations shall be made nor shall any construction excavations be left on any lot or lots which will endanger adjoining property or buildings or be a menace to public health or safety. Any such excavations made or maintained shall be properly drained and such drainage provisions shall function properly as long as

the excavation exists. Permanent excavations shall have retaining walls of steel, masonry, concrete or similar approved material of sufficient strength to retain the embankment together with any surcharged loads.

2101.3 ENFORCEMENT: Where, in the opinion of the BCO, an unsafe condition may result or damage may occur as the result of an excavation, he may order the work stopped or may approve the work of excavation subject to such limitations as he may deem necessary.

2102 BEARING CAPACITY OF SOIL

2102.1 SOIL INVESTIGATION:

- (a) Plans for new buildings or additions shall bear a statement as to the nature and character of the soil under the structure. Where the bearing capacity of the soil is not known or is in question, or the load imposed on the soil is unusual, the BCO may require examination of sub-soil conditions such as by borings and other tests.
- (b) The classification of the soil under all portions of every building shall be based upon the examination of adequate test borings or excavations made at the site when required by the BCO. Whenever, in the opinion of the BCO, the adequacy and class of a soil cannot be determined by the test borings or excavations, he may require a special soil investigation by an engineer recognised by the Minister before approving the use of the footings.

2102.2 PRESUMPTIVE CAPACITIES: The allowable bearing capacities on supporting soils shall not exceed those set forth in the following table unless the design bearing capacity is substantiated by recognised tests, analysis and procedure. These values are considered safe in respect to actual failure of the supporting ground but do not necessarily ensure the prevention of excessive foundation movements where any unusual soil or moisture conditions are encountered. All muck, topsoil, organic material and debris shall be removed from the supporting subgrade.

Nature of Soil	Maximum Allowable Soil Pressure (Pounds/Square Foot)
Other than as stated below	0
Rock of sand fill over soil of higher bearing capacity	500
Undisturbed sand, or sand and rock	2500
Solid rock or rock with pot holes cleaned and filled with concrete (Minimum depth of strata 5 feet)	5000

All stumps and roots shall be removed from the soil to a depth of at least 12 inches below the surface of the ground in areas to be occupied by buildings.

Where swampy conditions exist, the BCO may require the use of a Registered Engineer.

2103 SOIL BEARING FOUNDATIONS

2103.1 GENERAL: Footings shall be constructed of reinforced concrete, as set forth in the Chapter on Reinforced Concrete (Chapter 22) and in this Section, and shall, insofar as practicable, be so designed that the soil pressure shall be reasonably uniform to minimise differential settlement.

2103.2 CONTINUOUS FOOTINGS:

(a) Footings under walls shall be continuous or continuity otherwise provided and shall not be less than required to keep the soil pressure within that set forth in Section 2102 of this Chapter nor less than the following minimums:

Allowable Bearing Capacity (Pounds per Square Foot)	No. of Storeys	Depth and Width
500	1	12" x 30"
	2	12" x 36"
2500	1	10" x 16"
	2	10" x 20"
5000	1	*

*One-storey or two-storey dwellings may be constructed directly on the surface only if solid rock exists at the surface, with a minimum depth of rock strata of 5 feet. Footings may be designed as reinforced concrete grade beams for the superimposed loads and may be the thickness of the wall they support, but never less than 8 inches and shall be keyed 6 inches into the rock; rock bearing pressures underneath shall not exceed the allowable bearing capacity of the rock.

(b) Based on soil investigation as set forth in Sub-section 2102.1, of this Chapter, the footing sizes may be reduced considering allowable bearing values and load, but the minimum width of a footing under the main walls of a building shall not be less than 16 inches nor less than eight inches more than the width of the foundation wall, except as indicated above for direct bearing on rock.

- (c) The minimum continuous footings specified in this section shall be reinforced as follows:

Longitudinal Reinforcing (Placed in bottom of footing with 3" concrete cover below reinforcing)	Width of Foundation
2—#5 Bars	16" and 20" Wide
3—# 5 Bars	24" and 30" Wide
4—# 5 Bars	36" Wide
2—# 5 Bars (minimum of one bar in bottom and one bar in top, with 3" concrete cover)	Less than 16" designed as grade beams as indicated in 2103.2 (a) of this Chapter for one-storey and two-storey dwellings directly on rock.

Where footings are 30 inches or more in width, cross bars designed to resist bending at the face of the foundation wall shall be provided.

- (1) Equivalent areas in #4 reinforcing bars may be substituted for the sizes as specified.
 - (2) Splices in reinforcing bars shall not be less than 24 bar diameters and all corners shall be properly tied. When three or more bars are required, the bars shall be held in place and aligned by transverse bars spaced not more than four feet apart.
 - (3) Reinforcing shall be uniformly spaced and shall provide a minimum of three inches of concrete cover.
- (d) Continuous footings on which the centre of gravity of the loads fall outside of the middle one-third shall be considered eccentric and provisions shall be made to limit the soil pressure at the edges to acceptable values by means of counter-balancing or by other approved methods.
- (e) Concrete footings and pads shall not receive superimposed loads until 12 hours or more after the concrete is placed.
- (f) Excavations for footings and foundations which are to serve as forms shall be thoroughly wet prior to the placing of concrete. Standing water shall be removed from excavations prior to placing concrete.

- (g) *Excavations for continuous footings shall be cut true to line and grade and the sides of footings shall be formed, except where soil conditions are such that the sides of the excavation stand firm and square. Excavations shall be made to firm clear bearing soil or rock.*
- (h) *Continuous footings shall be placed level and any changes in the grade of such footings shall be made with a vertical tie of the same cross section and design as the footings, or the smaller of the footings, so joined.*

2103.3 ISOLATED FOOTINGS:

- (a) Isolated footings on which the centre of gravity of the load falls outside the middle 1/3 of any line passing through the centre of gravity of the footings shall be considered eccentric, and provisions shall be made to limit the soil pressure at the edges by means of footing straps or other approved methods.
- (b) Where isolated footings support reinforced concrete columns, dowels equivalent in number and area to the column reinforcing and having a length not less than 20 diameters above and below the joint shall be provided in the footing. Where footing depth does not allow straight dowels, standard hooks will be allowable. Such dowels, or anchor bolts as required for steel columns, shall be held to proper grade and location during the pouring of the footing by means of templates or by other approved methods.

2103.4 GRILLAGE FOOTINGS: When grillage footings of structural steel shapes are used on soils, they shall be completely embedded in concrete with at least 6 inches on the bottom and at least 4 inches at all other points.

2103.5 CONCRETE SLABS ON FILL:

- (a) Concrete floors within buildings where placed directly on the supporting soil shall comply with this Sub-section.
- (b) The minimum thickness of concrete floor slabs supported directly on the ground shall be not less than four inches.
- (c) Concrete floor slabs placed directly on the supporting soil shall be reinforced with not less than 0.029 square inches area of reinforcing per linear foot of slab in each direction (corresponds to 6" x 6" 10 ga. / 10 ga. steel wire. 10 ga. = 3.43 mm diameter).

2104 PILE FOUNDATIONS

2104.1 GENERAL:

- (a) The use of types of piles not specifically mentioned in this Chapter, and the use of piles under conditions not specifically covered herein, shall be permitted, subject to the approval of the BCO, upon submission of acceptable test data, calculations, or other information relating to the properties and load-carrying capacity of such piles.
- (b) All foundations requiring piling shall be designed by an engineer recognised by the Minister and all pile driving shall be supervised by an engineer recognised by the Minister.
- (c) All piles standing unbraced in air, water, or material not capable of lateral support, shall conform with the applicable column formula as specified in this Code. Such piles driven into firm ground may be considered fixed and laterally supported at five feet (d) below the ground surface and in soft material at ten feet (10) below the ground surface unless otherwise prescribed by the BCO after an acceptable foundation investigation has been made.
- (d) Piles used for the support of any building or structure shall be driven to a resistance and penetration in accordance with the plans and /or specifications and as set forth herein.
- (e) *Jetting shall not be used except where and as specifically permitted by the BCO. When used, jetting shall be carried out in such a manner that the carrying capacity of existing piles and structures shall not be impaired. After withdrawal of the jet, piles shall be driven down until the required resistance is obtained, in no case shall this be less than 12".*
- (f) The minimum centre to centre spacing of piles shall be not less than twice the average diameter of round piles or 1-3/4 times the diagonal dimension of rectangular piles but in no case less than 30 inches.
- (g) Reinforced concrete caps shall be provided for all pile clusters and such caps shall extend laterally not less than 6 inches beyond the extreme pile surface and vertically not less than 4 inches below the pile butt. Pile caps may be omitted when piles are used to support grade beams, provided that the spacing of paragraph (f) above is complied with and provided that the portions of the grade beams acting in place of the pile cap shall be computed by a recognised method of analysis to properly carry the loads.

- (h) Piles shall be driven using an approved cushion block consisting of material so arranged as to provide transmission of hammer energy equivalent to one-piece hardwood with the grain parallel to the axis of the pile and enclosed in a metal housing to prevent its lateral deformation between the hammer ram and the top of the pile.
- (i) *Diesel hammers may be used for driving piles if provided with one of the following means of determining the energy of the hammer's blow.*
 - (1) *Closed top diesel hammers shall be used with a rating instrument and charts to measure the equivalent Watt hour (Wh) energy per blow of the hammer. The equivalent Wh energy as measured by the instrument shall be the ram's weight times the equivalent ram stroke which is the actual ram stroke plus an added value obtained from the energy stored in the bounce chamber. The energy per blow shall be the equivalent Wh energy for the closed top diesel.*
 - (2) *Open top diesel hammers shall be equipped with a ram stroke indicator rod which is striped in increments above the hammer body and fastened to the body of the hammer. The energy per blow for the open top diesel shall be computed as the ram's working stroke times the ram's weight.*
 - (3) *The load bearing formula applicable for single-acting pile hammers shall be used to compute the bearing capacity of the driven pile.*
- (j) Followers shall be used only upon permission of the recognised engineer and only where necessary to effect installation of piles. A follower shall be of such size, shape, length, material and weight as to permit driving the pile in the desired location and to the required depth and resistance, without loss of hammer energy in the follower.
- (k) Splices shall be avoided as far as practicable. Splices shall be so constructed as to provide and maintain true alignment and position of the component parts of the pile during installation and subsequent thereto. Splices shall develop the required strength of the pile.
- (l) Pile driving hammers shall develop a minimum of one foot-pound of energy per pound of pile or mandrel, but not less than 7,000 foot-pounds of energy per blow.

- (m) Piles may be driven with drop or gravity hammers provided the hammer shall weigh not less than 3,000 pounds and the fall of the hammer shall not exceed 6 feet.
- (n) Piles shall be driven with a variation of not more than 1/4 inch per foot from the vertical, or from the batter line indicated, with a maximum variation of the head of the pile from the position shown on the plans of not more than three inches.
- (o) The recognized engineer shall be required to keep an accurate record of the material and the principal dimensions of each pile; of the weight and fall of the hammer, if a single-acting hammer or drop hammer; the size and make, operating pressure, length of hose, number of blows per minute and energy per blow, if a double-acting hammer; together with the average penetration of each pile for at least the last five blows, and the grades at tip and cut-off. A copy of these records shall be filed with the Buildings Control Division and kept with the plans.
- (p) Where piling must penetrate strata offering high resistance to driving or where jetting could cause damage, the recognized engineer may require that the piles be set in pre-drilled or punched holes. The equipment used for drilling or punching must be approved by the recognized engineer. The piles shall reach their final penetration by driving.
- (q) The maximum load permitted on any pile shall not exceed 50 tons unless substantiated by load test performed at the site as set forth in Sub-section 2104.2 (c) of this Chapter. The BCO may require tests on any pile where its performance is questionable.
- (r) Piles shall be designed and driven to develop not less than 10 tons safe bearing capacity.
- (s) In soils in which the installation of piles caused previously installed piles to heave, accurate level marks shall be put on all piles immediately after installation and all heaved piles shall be reinstalled to the required resistance.
- (t) Piles shall not be driven closer than two feet nor jetted closer than ten feet to an existing building or structure unless approved by the recognized engineer.

2104.2 ALLOWABLE PILE LOADS:

- (a) GENERAL: The allowable axial and lateral loads on piles shall be determined by an approved driving formula, by load tests, or by a foundation investigation by a recognized engineer. A foundation investigation shall be made if required by the BCO.
- (b) ALLOWABLE LOADS BY DRIVING FORMULA: The allowable axial load on a pile shall not exceed the value given by the following formulas, unless such load is otherwise determined as specified in 2104.2(c):

Drop Hammer:	$R = \frac{2 Wh}{S + 1}$
Single Acting Hammers:	$R = \frac{2 Wh}{S + 0.1}$
Double Acting or Differential Hammers:	$R = \frac{2(W + AP) h}{S + 0.1}$

In Which:

- A = area of piston in square inches
- P = pressure in pounds per square inch at the hammer
- R = allowable total load in pounds
- W = weight of striking part of hammer in pounds
- h = height of fall of striking part of hammer in feet or stroke in feet
- S = average penetration, in inches per blow, of not less than the five final blows
- E = actual energy delivered by hammer per blow in foot pounds

- (c) STATIC LOAD TESTS:

When the allowable axial load of piling is determined by load test, the following method shall be used:

The safe load-carrying capacities may be determined by means of loading tests performed on not less than 2 typical piles of an installation and, where deemed necessary by the BCO, on not less than one pile for each 15,000 square feet of building area. The test load shall be twice the proposed load value of the pile and shall be applied in 6 equal increments starting with 1/2 the proposed working load. After the proposed working load has been applied and for each increment thereafter, the test load shall remain in place until there is no settlement in a 2-hour period. The total test load shall remain in place until settlement does not exceed 1/1000 of a foot in 48 hours. The total test load shall be removed in decrements not exceeding 1/4 of the total test load with intervals of not less than one hour. The rebound shall be recorded after each decre-

ment is removed, and the final rebound shall be recorded 24 hours after the entire test load has been removed. The maximum allowable pile load shall be 1/2 that which causes a net settlement after deducting the rebound of not more than 1/100 of an inch per ton of total test load or shall be 1/2 that which causes a gross settlement of one inch, whichever is less. Elastic shortening of the pile shall not be included in the gross settlement.

2104.3 WOOD PILES:

- (a) Wood piles shall be in one piece of approved timber containing no evidence of decay, free from short kinks or reverse bends and having uniform taper from butt to tip. A straight line drawn from the centre of the butt to the centre of the tip shall lie wholly within the body of the pile. The diameter of wood piles shall be not less than 6 inches at the tip and not less than 10 inches three feet from the butt for piles which are 25 feet or less in length; or 8 inches at the tip and 12 inches three feet from the butt for piles which exceed 25 feet in length. No piles which have a spiral grain exceeding one complete turn in 40 feet shall be used.
- (b) Untreated wood piles in all cases shall be cut off not higher than mean low water and shall be capped with concrete.
- (c) Untreated piles used in permanent construction, except where used for light frame structures over water or marsh lands, shall be cut off below permanent water level.
- (d) Piles of southern pine, Norway pine, Douglas fir or red oak when pressure treated by an empty cell process, with coal tar creosote to a net final retention of not less than 12 pounds of creosote per cubic foot of wood, may be used as follows: Where the upper portion of the pile is exposed and accessible for inspection, the cut-off may be above ground level or water level; where the upper portion of the pile will not be readily accessible for inspection, the cut-off shall be below the ground level but may be above the ground-water level provided the tops are encased in masonry footings so that no part of the pile will be exposed to the air. The tops of the cut-off piles shall be treated with three coats of hot creosote.
- (e) The treatment of other species of wood for piles to extend above permanent ground-water level, and the use of other preservative materials or methods, may be used subject to written approval of the BCO.
- (f) Wood piles shall be driven with a protective driving cap or ring when necessary to prevent brooming or splitting of the butt. When

brooming or splitting occurs, such piles shall be cut back to solid wood before the final resistance to penetrations is measured.

- (g) If required, when driving through or to hard material or to rock, wood piles shall be fitted with a metal protective drive shoe satisfactory to the BCO.
- (h) In the absence of load tests, the total load on any wood pile shall not exceed these values:

Tip Diameter	Butt Diameter	Maximum Load (Tons)
6"	10"	15
8"	12"	20
10"	14"	25

2104.4 PRECAST REINFORCED CONCRETE PILES:

- (a) *Precast concrete piles shall be cast of concrete having a compressive strength of not less than 4,000 pounds per square inch at time of driving based on standard 6 x 12 inch test cylinder.*
- (b) The piling shall be reinforced with a minimum of four longitudinal steel bars having an area of not less than .01 nor more than .04 of the gross concrete area. The longitudinal reinforcement in driven precast concrete piles shall be laterally tied with steel ties or wire spirals, of not less than 3 inches centre to centre spacing for a distance of 18 inches from the ends and not more than 8 inches elsewhere.
- (c) All reinforcement shall be protected by 2 inches or more of concrete, except that for piles subjected to the action of open water, waves, or other severe exposure a 3 inch protective covering shall be furnished in the zone of such exposure.
- (d) Piling shall be designed to resist stresses induced by handling and driving as well as loads.
- (e) Piling shall have their date of manufacture and the lifting points clearly marked on the pile.
- (f) In the absence of load tests, the maximum allowable load per pile shall not exceed the values set forth in the following table:

Size (Inches)	Maximum Load (Tons)
10 x 10	17
12 x 12	25
14 x 14	35

2104.5 PRECAST PRESTRESSED CONCRETE PILES (PRETENSIONED):

- (a) Precast prestressed concrete piles shall develop a compressive strength of not less than 4000 pounds per square inch before driving based on standard 6 x 12 inch test cylinder. The piles shall develop an ultimate compressive strength at 28 days after pouring of not less than 5000 pounds per square inch based on standard 6 x 12 inch test cylinder.
- (b) The longitudinal reinforcement shall be high tensile seven wire strand laterally tied with steel ties or wire spirals. Ties or spiral reinforcement shall be spaced not more than 3 inches apart centre to centre for a distance of 18 inches from the ends, and not more than 8 inches elsewhere.
- (c) Longitudinal reinforcing shall be protected by 2 inches of concrete.
- (d) Precast prestressed piling shall be designed to resist stresses induced by handling and driving as well as by loads. The effective prestress in the pile shall not be less than 400 pounds per square inch for piles up to thirty feet (30') in length, 550 pounds per square inch for piles up to fifty feet (50') in length, and 700 pounds per square inch for piles greater than fifty feet (50') in length.
- (e) The allowable compressive stress in the concrete due to externally applied load shall not exceed 0.20 of the 28 day 6 x 12 inch test cylinder strength.
- (f) If the compressive stress due to effects of prestressing exceeds 0.20 of the 28 day 6 x 12 inch test cylinder strength, the allowable compressive stress due to externally applied loads as permitted above, shall be reduced accordingly.
- (g) Effective prestress shall be based on an assumed loss of 30,000 pounds per square inch in the prestressing steel.
- (h) The allowable stress in the prestressing steel shall not exceed the values specified in the Chapter on Reinforced Concrete. (Chapter 22).
- (i) Maximum allowable loads per pile, in the absence of load tests, shall not exceed the values set forth in the table on Precast Reinforced Concrete Piles, Section 2104.4 of this Chapter.

2104.6 CONCRETE FILLED STEEL PIPE PILES:

- (a) Concrete filled steel pipe piles driven open ended shall have a nominal outside diameter of not less than 10 inches and a nominal wall thickness of not less than 0.25 inch except that pipes having a nominal outside diameter 14 inches or over shall have a nominal wall thickness of not less than 0.375 inch. Concrete filled steel tubular piles driven with ends closed may be of smaller sizes and wall thickness but no tapered pile shall have a diameter of less than 8 inches at the top nor 6 inches at the foot, and no such pile of uniform section shall have a diameter of less than 8 inches.
- (b) A forged, cast steel or flat plated end of approved design shall be used on concrete-filled steel pipe piles driven with a closed end.
- (c) The compressive stress on any cross section of a concrete-filled steel pipe shall not exceed .225 of the specified strength of the concrete which shall have an ultimate compressive strength at the end of 28 days of not less than 2,500 pounds per square inch, based on the standard 6 x 12 inch test cylinder, plus .35 of the specified minimum yield strength of the steel when such steel shell is 1 / 10 of an inch or greater. No compressive stress shall be permitted on steel shells less than 1 / 10 of an inch thick. The minimum specified yield strength of steel shells shall not be assumed greater than 36,000 pounds per square inch for computation purposes.
- (d) The concrete shall be deposited in a continuous operation so as to insure a full sized pile without voids or separation. Concrete shall be placed in the dry. The pile may be sealed by depositing concrete by tremie or other approved method.

2104.7 ROLLED STRUCTURAL STEEL PILES:

- (a) *Rolled structural steel piles shall conform to the Standards for General Requirements for Hot-Rolled and Cold-Finished Carbon and Alloy Steel Bars, ASTM A29, and Carbon Steel Bars Subject to Mechanical Property Requirements, ASTM A306, set forth in Section Appendix 'A' of this Code, except that copper may be added to increase the corrosion-resistant properties of the material.*
- (b) *Sections of such pile of H form shall have flange projections not exceeding 14X the thickness of web or flange and total flange width not less than 85% of the depth of the section.*
- (c) *No section shall have a nominal thickness of metal less than 3/8".*

- (d) *For end-bearing piles, the allowable stress may be determined on the basis of an allowable stress of 25% of the yield value of the steel.*
- (e) *In the absence of adequate corrosion protection, 1/16" shall be deducted from each face in determining the area of the pile section.*
- (f) *The allowable load, when used as friction piles, shall be determined by load tests at the Site.*

2104.8 SPECIAL PILES OR SPECIAL CONDITIONS: *The use of types of piles or conditions not specifically covered herein may be permitted, subject to the approval of the Buildings Control Officer, upon submission of acceptable test data, calculations or other information relating to the properties and load-carrying capacity of such piles.*

2104.9 LOAD TEST ON PILES:

- (a) *Single piles tested shall be loaded to at least twice the desired design load and should pile groups be tested, the test load shall be not less than 1-1/2 times the total desired load for the group.*
- (b) *The apparatus for applying known vertical loads to the top of the pile shall maintain constant load under increasing settlement, and shall apply the loads in such a way that no lateral forces or impact will occur. Hydraulic jacks when used, shall be equipped with a calibrated pressure gage. Uplift piles used to provide the jacking resistance shall be a sufficient distance from the test pile so as not to influence its behaviour under test.*
- (c) *The test load shall be applied in increments of not more than 25% of the design load until the total test load has been applied.*
- (d) *The method for determining vertical movement shall be subject to the approval of the BCO. Readings shall be sufficient in number to define the time settlement and rebound curve.*
- (e) *Each load increment shall be maintained for a minimum of 1 hour, and until the rate of settlement is less than 0.01" per hour. The total load shall be maintained until settlement does not exceed 0.01" in 24 hrs. Settlement readings shall be taken at regular intervals during the test period.*
- (f) *After the maximum load has remained on the pile for 24 hrs and final settlement readings have been taken, the pile shall be unloaded in 50% decrements of design load. Re-bound readings shall*

be taken at regular intervals during the unloading period, and final reading taken approximately 12 hrs after the entire load has been removed.

- (g) *The maximum allowable pile load shall be 1/2 of that load which causes a net settlement of not more than 0.005" per ton of test load, a gross settlement of 1", whichever is less, or a disproportionate increase in settlement.*
- (h) *Control test piles shall be tested in accordance with ASTM D1143, Method of Testing Piles Under Axial Compressive Load. If quick load test procedures are used, then the applied test load shall be not less than 3 times the working pile capacity and in accordance with the standard.*

2105 FOUNDATION WALLS AND GRADE BEAMS

2105.1 EXTERIOR FOUNDATION WALLS:

(a) GENERAL:

- (1) Exterior foundation walls of buildings, where the character of the soil is such that allowable soil loads of 1,500 pounds or less per square foot are used for design, shall be poured-in-place reinforced concrete from the footing to the bottom of the ground floor construction.
- (2) Exterior foundation walls of buildings, where the character of the soil is such that allowable soil of more than 1,500 pounds per square foot are used for design, may be of unit masonry or concrete on continuous concrete footings.
- (3) Under the exterior walls of buildings of Type V (Wood Frame) construction, in locations where extreme dampness exists, the BCO may approve isolated piers, provided such piers are as otherwise set forth in Paragraph 2105.2 (b) of this Chapter.

(b) DETAILED REQUIREMENTS:

- (1) The thickness of the foundation wall shall be not less than 8 inches.
- (2) Where wood joist construction is used for the ground floor, the thickness of the exterior foundation walls shall be not less than 8 inches plus 4 inches for the bearing of joists.

- (3) Foundations of unit masonry supporting joists shall be capped with 4 inches of concrete.

2105.2 INTERIOR FOUNDATION WALLS: Interior foundation walls shall be of the material and design as specified in Section 2505.1 of this Chapter, except as follows:

- (a) Interior foundation walls which support stud walls shall be exempted from the additional 4 inches of width required for the bearing of joists.
- (b) For wood frame buildings not exceeding one-storey in height, isolated piers may be substituted for interior foundation walls where such piers do not exceed 24 inches in height, are a minimum of 12 inches by 12 inches in cross-sectional dimension, and are located at corners and points of concentration, but not more than six feet apart. Where such piers rest on rock they shall be keyed 6 inches into the rock.

2105.3 GRADE BEAMS:

- (a) Grade beams, supporting loads between piles or piers, shall be reinforced concrete, or structural steel protected by 2 inches of concrete cover.
- (b) Grade beams shall be the thickness of the wall they support but never less than 8 inches nor less than set forth for foundation walls herein.
- (c) Grade beams shall be suitably designed and reinforced around access openings and vents.

2106 RETAINING WALLS

- (a) Walls built to retain or support the lateral pressure of earth or water or other superimposed loads shall be designed and constructed of approved masonry, reinforced concrete, steel sheet piling or other approved materials within allowable stresses conforming to this code.
- (b) Retaining walls shall be designed to resist the pressure of the retained material including both dead and live load surcharges to which they may be subjected, and to insure stability against overturning, sliding, excessive foundation pressure and water uplift.
- (c) Unless drainage is provided, the hydrostatic head of water pressure shall be assumed equal to the height of the wall.

- (d) All masonry retaining walls other than reinforced concrete walls shall be protected with an approved coping.

2107 SEAWALLS, BULKHEADS, AND DOCKS

All dredging, waterfront filling and excavation, and waterfront construction such as docks, piers, wharves, badges, groins, jetties, moles, break-waters, seawalls, revetments, and causeways, shall be planned and designed by an engineer recognized by the Minister.

2108 MATERIALS

The quality and design of materials used structurally in excavations, footings, foundations, retaining walls, seawalls, bulkheads and docks, shall conform to the requirements specified in the Chapters forming the Engineering and Construction Requirements of this Code. (Chapters 20-27).

NOTES

CHAPTER 22

REINFORCED CONCRETE

2201 GENERAL

2202 STANDARDS

2203 DEFINITIONS

2204 MATERIALS AND TESTS

2205 WORKING STRESSES AND QUALITY OF CONCRETE

2206 MIXING AND PLACING

2207 FORMS AND DETAILS OF CONSTRUCTION

2208 PRECAST CONCRETE FLOOR AND ROOF UNITS

2209 PRESTRESSED CONCRETE

2210 PNEUMATICALLY PLACED CONCRETE

2201 GENERAL

Structures in concrete of cast-in-place or precast construction, plain, reinforced or prestressed shall be of the materials, proportions, strength and consistency as set forth in this chapter and shall be designed by methods admitting of rational analysis according to established principles of mechanics and in accordance with the standards adopted by this Code and set forth in the Appendices.

2202 STANDARDS

The standards listed in Appendix A are hereby adapted as a part of this Code and supplement, but do not supersede, the specific requirements as set forth herein.

2203 DEFINITIONS

The following words and terms shall for the purpose of this Code, have the meanings set forth in this section:

ADMIXTURE, a material other than Portland cement, aggregate, or water added to concrete to modify its properties.

AGGREGATE, inert material which is mixed with Portland cement and water to produce concrete.

COLUMN, an upright compression member the length of which exceeds three times its least lateral dimension.

COMPRESSIVE STRENGTH OF CONCRETE, specified compressive strength of concrete in pounds per square inch. Compressive strength shall be determined by tests of standards 6 x 12 inch cylinders made and tested in accordance with ASTM Standards at 28 days or such earlier age as concrete is to receive its full service load or maximum stress.

CONCRETE, a mixture of Portland cement, fine aggregate, coarse aggregate, and water.

CONCRETE, STRUCTURAL LIGHTWEIGHT, a concrete containing lightweight aggregate.

GROUT, a large amount of cement paste to which has been added a small amount of fine aggregate to produce a mixture of fluid consistency. When the amount of fine aggregate is increased so that the mixture loses its fluidity and behaves as a cohesive plastic, the mixture is termed MORTAR.

PLAIN CONCRETE, concrete that does not conform to the definition of reinforced concrete.

PRECAST CONCRETE, a plain or reinforced concrete element cast in other than its final position in the structure.

PRESTRESSED CONCRETE, reinforced concrete in which there have been introduced internal stresses of such magnitude and distribution that the stresses resulting from service loads are counteracted to a desired degree.

REINFORCED CONCRETE, concrete containing reinforcement and designed on the assumption that the two materials act together in resisting forces.

SHOTCRETE: Mortar or concrete pneumatically projected at high velocity onto a surface.

SUPERPLASTICIZER: a chemical or a mixture of chemicals that, when added to normal concrete.

- (a) imparts extreme workability
- (b) allows a large water reduction to be made beyond the limits or normal plasticizing admixtures.

2204 MATERIALS AND TESTS

2204.1 MATERIALS: Portland cement, concrete aggregates, both coarse and fine, and reinforcing steel shall conform to the requirements of the standards listed in Appendix A.

2204.2 TESTS:

- (a) The BCO may order or make a test of any material entering into concrete or reinforced concrete to determine its suitability for the purpose; may order or make a reasonable number of tests of the concrete from time to time to determine whether the materials and methods in use are such as to produce concrete of the necessary quality; and may order or make a test under load of any portion of a completed structure, when conditions have been such as to leave doubt as to the adequacy of the structure to serve the purpose for which it is intended.
- (b) When cylinders are made at early ages to obtain advance information on 28 day strengths, and these cylinders are lower than the age-strength relationship generally established for the materials and proportions used, the BCO may serve notice on the contractor or owner that the concrete is suspect. The BCO may also order changes in the concrete sufficient to increase the strength requirements and may order load tests for that portion of the structure where the questionable concrete has been placed.
- (c) To conform to the requirements of these specifications, the average strength of the laboratory cured cylinders representing each class of concrete as well as the average of any five consecutive strength tests representing each class of concrete shall be equal to, or greater than the specified strength and not more than 1 strength test in 10 shall have an average value of less than 90% of the specified strength.
- (d) Where earlier tests than 28 days are used the relationship between the early tests and the 28 day strength of the concrete shall be established by tests for the materials and the proportions used.

2205 WORKING STRESSES AND QUALITY OF CONCRETE

2205.1 WORKING STRESSES: The allowable working stresses in concrete shall not exceed those set forth in the standards adopted as part of this Code in Appendix A for the value of specified compressive strength of concrete used.

2205.2 CONCRETE QUALITY:

- (a) For the design of reinforced concrete structures, the specified compressive strength used for determining the allowable stresses shall be based on the 28-day compressive strength of the concrete or the specified minimum compressive strength at the earlier age at which the concrete may be expected to receive its full load. All plans, submitted for approval or used on the job, shall clearly show the assumed strength of concrete at a specified age for which all parts of the structure were designed.
- (b) The normal minimum quality of structural concrete recognized by this Code shall be concrete having a design strength of 2,000 pounds per square inch in 28 days based on 6 x 12 inch cylinders. The minimum strength of light weight aggregate concrete, used structurally, shall be not less than 500 psi based on 6 x 12 inch cylinders.
- (c) The BCO may in particular cases accept concrete mixed in the proportion of one cubic foot or one 94 lb. sack of Portland cement, two cubic feet of sand and 3 cubic feet of coarse aggregate when machine mixed with sufficient water to make a plastic mix with no free water, provided the use of concrete so proportioned and mixed is limited to minor building components.
- (d) The determination of the proportions of cement, aggregate, and water to attain the required strengths shall be made by one of the following methods:

Method 1—Without preliminary tests

Where preliminary test data on the materials to be used in the concrete have not been obtained, the water-cement ratio for a given strength of concrete shall not exceed the values shown in the following table.

Method 2 — For combinations of materials previously evaluated or to be established by trial mixtures.

Water-cement ratios or strengths greater than shown in the following table may be used provided that the relationship between strength and water-cement ratio for the materials to be used has been previously established by reliable test data and the resulting concrete satisfies strength requirements.

MAXIMUM PERMISSIBLE WATER-CEMENT RATIOS
FOR CONCRETE (METHOD NO. 1)¹
(Without Preliminary Tests)

MAXIMUM PERMISSIBLE WATER-CEMENT RATIO²
NON AIR-ENTRAINED CONCRETE³

Specified Compressive Strength at 28 Days, P.S.I., 6"x12"Cylinder	U.S. Gal Per 94-lb. Bag of Cement	Absolute Ratio by Weight
2,000	7-1/2	0.663
2,500	7-1/4	0.642
3,000	6-1/2	0.576
3,500	5-3/4	0.510
4,000	5	0.443

1. The minimum cement content shall be not less than five bags per cubic yard (a bag weighing not less than 94 pounds) unless the mix is designed specifically for the project.
 2. Including free surface moisture on aggregates.
 3. Reduce water content for air-entrained concrete.
- (e) When the structural design is based on a 28 day compressive strength in excess of 2,500 psi (by 6" x 12' cylinder) proportioning and mixing shall be approved by, and placing shall be under the competent supervision of an engineer, recognized by the Minister.
- (f) Concrete that will be exposed to sulfate-containing or other chemically aggressive solutions shall be proportioned in accordance with the concrete proportions given in the Standards listed in Appendix A.

2206 MIXING AND PLACING

2206.1 FORMS AND EQUIPMENT:

- (a) Before placing concrete, all equipment for mixing and transporting the concrete shall be cleaned, all debris removed from the spaces to be occupied by the concrete, forms shall be thoroughly wetted or oiled, masonry filler units that will be in contact with concrete shall be well drenched, and the reinforcement shall be thoroughly cleaned.
- (b) Water shall be removed from place of deposit before concrete is placed unless otherwise permitted by the BCO.

2206.2 MIXING OF CONCRETE:

- (a) Unless otherwise authorised by the BCO, the mixing of concrete shall be done in a batch mixer of approved type.
- (b) All concrete shall be mixed until there is a uniform distribution of the materials and shall be discharged completely before the mixer is recharged.
- (c) For job mixed concrete, the mixer shall be rotated at a speed recommended by the manufacturer and mixing shall be continued for at least 1-1/2 minutes after all materials are in the drum. For batches larger than one cubic yard, mixing time shall be increased 15 seconds for each additional cubic yard or fraction thereof.
- (d) Ready-mixed concrete shall be mixed and delivered in accordance with the requirements set forth in the Standards adopted in the Appendices to this Code.
- (e) Retempering concrete with the addition of water after the concrete has taken an initial set shall not be permitted.
- (f) No concrete shall be deposited in forms or used more than 1-1/2 hours after the mixing of that particular batch has been commenced, or after water has been added to the batch. The BCO has the right to reject all such concrete or order any such mobile equipment off the job site, if in his opinion, mixing has taken place longer than 1-1/2 hours.

2206.3 (a) SUPERPLASTICIZERS: Shall only be used where specified and supervised by an engineer recognised by the Minister.

- (b) The concrete shall exhibit a slump of approximately 2-1/2" prior to the addition of the superplasticizing agent and approximately 8" after: Such concrete shall not exhibit excess bleeding or segregation, abnormal retardation and air entrapment shall also be absent.
- (c) All concrete to which a superplasticizer been added shall be placed within (30) minutes.

2206.4 CONVEYING:

- (a) Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent separation or loss of the materials.

- (b) Equipment for chuting, pumping and pneumatically conveying concrete shall be of such size and design as to insure a practically continuous flow of concrete at the delivery end without separation of the materials.

2206.5 DEPOSITING:

- (a) Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. The concreting shall be carried on at such a rate that the concrete is at all times plastic and flows readily into the spaces between the bars. No concrete that has been contaminated by foreign materials shall be deposited in the structure.
- (b) When concreting is once started, it shall be carried on as a continuous operation until the placing of the panel or section is completed.
- (c) All concrete shall be thoroughly consolidated by suitable means during placement, and shall be thoroughly worked around the reinforcement and embedded fixtures and into the corners of the forms. Where concrete is placed in columns or walls, the placing shall be so conducted that the concrete will not pass reinforcement for more than 8 feet. Separate lifts shall be thoroughly compacted. Vibrators may be used to aid in the placement of the concrete, provided that they are used under experienced supervision, that the forms are designed to withstand their action, and that their action is not directed to bars any part of which is in contact with concrete which started to take its initial set.
- (d) Where conditions make consolidation difficult, or where reinforcement is congested, batches of mortar containing the same proportions of cement to sand as used in the concrete, shall first be deposited in the forms to a depth of at least 1 inch.

2206.6 CURING: In all concrete structures, concrete made with normal Portland cement shall be maintained in a moist condition for at least the first seven days after placing and high-early-strength concrete shall be so maintained for at least the first three days. Other curing periods or methods of curing may be used if the specified strengths are obtained.

2206.7 BONDING:

- (a) Before new concrete is deposited on or against concrete which has set, the forms shall be retightened, the surface of the set concrete shall be cleaned of all foreign matter and laitance, and wetted. The cleaned and wetted surfaces of the hardened concrete shall first be slushed with a coating of neat cement against which the new concrete shall be placed before the mortar has attained its initial set.

- (b) *Where bonding of fresh to hardened concrete is necessary, construction joints and joints between footings and walls or columns and beams or floors they support, and joints in unexposed walls shall be accomplished by reinforcement, dowels, adhesives, mechanical connectors, or other approved methods. Hardened concrete at joints shall be dampened, but not saturated, immediately prior to the placement of fresh concrete.*

2206.8 HOT WEATHER: During hot weather (temperature in excess of 85°F.), steps shall be taken to reduce concrete temperature and water evaporation by proper attention to ingredients, production methods, handling, placing, protection and curing.

2207 FORMS AND DETAILS OF CONSTRUCTION

2207.1 DESIGN OF FORMS:

- (a) Forms shall conform to the shape, lines and dimensions of the members as called for on the plans, and shall be substantial and sufficiently tight to prevent leakage of mortar. Forms shall be properly braced or tied together so as to maintain position and shape. Temporary openings at the bottom of columns shall be provided to facilitate cleaning and inspection before depositing concrete. When the concrete has attained sufficient strength, forms shall be removed from at least two faces of all reinforced members, other than where placed in contact with the soil or for slabs or joists, to facilitate inspection of placing operations. Temporary openings shall be provided at the base of column and wall forms to facilitate cleaning and inspection.
- (b) Design of formwork shall include consideration of the following factors:
 - (1) Rate and method of placing concrete.
 - (2) Loads, including live, dead, lateral and impact.
 - (3) Selection of materials and stresses.
 - (4) Deflection, camber, eccentricity and uplift.
 - (5) Horizontal and diagonal shore bracing.
 - (6) Shore splices.
 - (7) Cross grain compression.
 - (8) Loads on ground or on previously placed structure.
- (c) The Buildings Control Officer may require that formwork systems for reinforced concrete structures shall be designed and the system examined and approved by an engineer recognised by the Minister before concrete is placed therein.

- 2207.2 (a) REMOVAL OF FORMS: The removal of forms shall be carried out in such a manner as to insure the complete safety of the structure. Vertical forms may be removed in 24 hours, provided that the concrete has hardened sufficiently so that it is not injured. 14 days; except that where tests indicate that the concrete has attained Bottom forms and shoring for slabs, beams and girders shall not be removed in less than sufficient strength to safely support itself and any imposed loads in less time, adjustments in the above waiting periods may be made by the BCO in conformance with the results obtained.
- (b) *No construction loads exceeding the combination of superimposed dead load plus specified live load shall be supported on any unshored portion of the structure under construction, unless analysis indicates adequate strength to support such additional loads.*
- 2207.3 PLACING AND REINFORCEMENT: Metal reinforcement and welded wire fabric shall be accurately placed and adequately secured in position by concrete or metal chairs or spacers or other acceptable methods. The minimum clear distance between parallel bars, except in columns, shall be equal to the nominal diameter of the bars. In no case shall the clear distance between bars be less than one inch, nor less than one and one-third times the maximum size of the coarse aggregate. When reinforcement in beams or girders is placed in two or more layers, the clear distance between layers shall not be less than one inch nor less than the diameter of the bars, and the bars in the upper layers shall be placed directly above those in the bottom layer.
- 2207.4 SPLICES IN REINFORCEMENT: In slabs, beams, and girders, splices in reinforcement at points of maximum stress shall be avoided wherever possible. Such splices where used shall be welded, lapped or otherwise fully developed, but in any case, shall transfer the entire stress from bar to bar without exceeding the allowable bond and shear stresses. The minimum overlap for a lapped splice shall be 24 bar diameters, but not less than 12 inches for bars. The clear distance between bars shall also apply to the clear distance from a contact splice and adjacent splices or bars.
- 2207.5 CONCRETE PROTECTION FOR REINFORCEMENT:
- (a) The reinforcement of footings and other principal structural members in which the concrete is deposited against the ground shall have not less than 3 inches of concrete between it and the ground contact surface. If concrete surfaces after removal of the forms are to be exposed to the weather or be in contact with the ground, the reinforcement shall be protected with not less than 2 inches of concrete.

- (b) The concrete protective covering for reinforcement at surfaces not exposed directly to the ground or weather shall be not less than 3/4 inch for slabs and walls; and not less than 1-1/2 inches for beams, girders and columns. In concrete ribbed or joist floors in which the clear distance between ribs or joists is not more than thirty inches, the protection of reinforcement shall be at least 3/4 inch. Cover is to main bars.
- (c) Concrete cover for reinforcement shall in all cases be at least equal to the diameter of round bars, and one and one-half times the side dimension of square bars.
- (d) Exposed reinforcement bars intended for bonding with future extensions shall be protected from corrosion by concrete or other adequate covering.
- (e) The above protective coverings are minimums but protection shall not be less than elsewhere set forth for required fire-resistive ratings.
- (f) *For structures located in corrosive atmospheres such as along the coastal shore line, slab reinforcement shall be epoxy-coated in accordance with the standard specification for Epoxy-Coated Reinforcing Steel Bars, ASTM A775.*
- (g) *Exposed reinforcement, inserts and plates intended for bonding with future extensions shall be protected from corrosion.*

2207.6 CONSTRUCTION JOINTS:

- (a) Joints not indicated on the plans shall be so made and located as to least impair the strength of the structure. Where a joint is to be made, the surface of the concrete shall be thoroughly cleaned and all laitance removed. Vertical joints shall be thoroughly wetted, and slushed with a coat of neat cement grout immediately before placing of new concrete.
- (b) A delay of at least one day must occur in columns or walls before concreting beams, girders, or slabs supported thereon. Beams, girders, brackets, column capitals, and haunches shall be considered as part of the floor system and shall be placed monolithically therewith.
- (c) Construction joints in floors shall be located near the middle of the spans of slabs, beams, or girders unless a beam intersects a girder at this point, in which case the joints in the girders shall be offset a distance equal to twice the width of the beam. Provision shall be

made for transfer of shear and other forces through the construction joint.

2208 PRECAST CONCRETE FLOOR AND ROOF UNITS

2208.1 GENERAL:

- (a) Precast concrete units shall comply with the minimum requirements set forth in this Chapter, and the Standards set forth in the Appendices.
- (b) All precast structural items shall be designed by an engineer recognized by the Minister.
- (c) Only the material cast monolithically with the units at the time of manufacture shall be used in computing stresses unless adequate and approved mechanical shear transfer is provided.
- (d) The BCO may require tests to be made by an approved testing laboratory, as he may consider necessary to insure compliance with this Code or uniformity of the products produced. The quantity of tests shall be based on consideration of safety or volume of output.
- (e) The BCO shall have free access to the plant of any producer at all hours of normal operation, and failure to permit such access shall be cause for revocation of approval.
- (f) Failure of any product to satisfy in every respect the quality prescribed, or failure to conform with plans and specifications, shall be cause for rejection of the products.

2208.2 STRENGTH OF CONCRETE: Concrete for precast structural units made of crushed stone or other heavy aggregate shall have a compressive strength of not less than 2500 psi at 28 days based on 6 x 12 inch standard cylinder.

2208.3 WORKMANSHIP:

- (a) The mix, the gradation of the aggregate and the workability shall be such as to insure complete filling of the form and continuous intimate bond between the concrete and all steel.
- (b) The use of precast structural units not complying with the Standards listed in the Appendices, or having visible cracks, honey comb, exposed reinforcing except at ends or, with a compressive section dimension more than one-eighth inch less than specified dimension shall not be permitted.

- 2208.4 IDENTIFICATION AND MARKING: All joists, beams, girders, and other units shall show some mark plainly indicating the top of the unit and its location and orientation in the structure. Identification marks shall be reproduced from the placing plans. This mark or symbol shall also indicate the manufacturer, the date of the manufacture and the length, size and type of reinforcing.
- 2208.5 CUTTING OF HOLES: No openings not provided for in the structural design shall be made on the job without the specific approval of the recognized engineer and in accordance with his written, detailed instructions covering such work.
- 2208.6 ANCHORAGE: Anchorage of all precast concrete units shall be designed, based on rational analysis to transmit loads and other forces to the structural frame.
- 2208.7 BRIDGING: Joists shall be secured against lateral displacement by cast-in-place bridging, and such bridging shall be spaced not to exceed 32 times the width of the compression flange of the joist except that for roof systems, cast-in-place Portland-cement concrete slabs embedding the top flanges not less than 1/2 inch, or steel inserts cast in the joist heads to which bulb-tees supporting gypsum decks are welded, shall be accepted in lieu of bridging.
- 2208.8 CONNECTIONS: All joints and connections will perform their function at all stages of loading without overstress and with proper safety factors against failure due to overload. Loading conditions to be considered in the design of joints and connections are service loads, including wind forces, volume changes due to shrinkage, creep, and temperature change, erection loads, and loading encountered in stripping forms, shoring and removal of shores, storage, and transportation of members.
- 2208.9 TRANSPORTATION, STORAGE AND ERECTION:
- (a) Units shall be so stored, transported, and placed that they will not be overstressed or damaged.
 - (b) Precast concrete units shall be adequately braced and supported during erection to insure proper alignment and safety and such bracing or support shall be maintained until there are adequate permanent connections.

2209 PRESTRESSED CONCRETE

2209.1 GENERAL:

- (a) The term "prestressed concrete" refers to pretensioned concrete in which the reinforcing is tensioned before hardening of the concrete; or to post-tensioned concrete in which the reinforcing is tensioned after hardening of the concrete; or combinations of both pre-tensioning and post-tensioning. The internal stresses introduced are of such magnitude and distribution to counteract the stresses resulting from service loads.
- (b) All prestressed structural items shall be designed by an engineer recognized by the Minister. Openings not provided for in the structural design shall not be made on the job without the specific approval of the recognized engineer.
- (c) Allowable stresses, temporary, and at design loads, shall not exceed the allowable stresses set forth in the Standards listed in Appendix A. Stresses and ultimate strength shall be investigated at service conditions and at all load stages that may be critical during the life of the structure from the time prestress is first applied.
- (d) The BCO may require tests to be made by an approved testing laboratory, as he may consider necessary to insure compliance with these Standards or uniformity of the products produced.
- (e) The BCO shall have free access to the plant of any producer at all hours of normal operation, and failure to permit such access shall be cause for revocation of approval.
- (f) Failure of any product to satisfy the quality prescribed or failure to conform with plans and specifications shall be cause for rejection of the product.

2209.2 DESIGN AND CONSTRUCTION:

- (a) Deflection under live load shall not exceed $L/240$ and where plaster ceilings are to be applied shall not exceed $L/360$, where L = the span length of the member.
- (b) Calcium chloride shall not be used in concrete for prestressed members.

2209.3 HANDLING AND INSTALLATION: Prestressed members must be maintained in an upright position at all times and must be picked up from points near the ends as shown on the approved plans or as approved by the recognized engineer. (Note: Disregard of this requirement may lead to collapse of the member.)

2210 PNEUMATICALLY PLACED CONCRETE

- 2210.1 (a) Pneumatically placed concrete is a proportioned combination of fine aggregate, Portland cement and water which, after mixing, is pneumatically projected by air directly on to the surface to which it is to be applied.
- (b) Pneumatically placed concrete shall be proportioned and applied as set forth herein.
- 2210.2 MATERIALS:
- (a) Portland cement shall comply with the Standard Specifications for Portland Cement, as set forth in Appendix A.
- (b) (1) Aggregate shall comply with the Standard Recommended for Shotcreting, as set forth in Appendix A.
- (c) All reinforcement shall be clean and free of loose rust or other coatings harmful to bond. Only round bars or wire mesh shall be used.
- 2210.3 PROPORTIONS:
- (a) Unless otherwise specified, all pneumatically placed concrete shall be mixed in the proportions of one part of cement to four and one-half parts of sand based on loose, dry volume.
- (b) (1) The Building Control Officer may require that core tests shall be made to determine the strength of the material placed.
- (2) Not less than two test cylinders shall be made of each day's operation.
- (3) Test cylinder shall be furnished by the person or company doing or causing the work to be done, and shall be six inches in diameter and 12 inches in height.
- (4) Forms for cylinders shall be of one quarter inch hardware cloth, shall be shot with the same air pressure, nozzle tip and hydration as the mortar in the structure and the hardware cloth form shall be removed in 24 hours.
- (5) Cylinders shall be cured and tested in accordance with the Standard Method of Test for Compression Strength of Molded Concrete Cylinders, as set forth in Appendix A.
- (6) One cylinder shall be tested at seven days and shall develop a compressive strength of not less than 2400 p.s.i. and one

cylinder shall be tested at 28 days and shall develop the specified strength but not less than 3000 p.s.i. based on 1:4-1/2 mix.

- 2210.4 CONSTRUCTION JOINTS: Construction joints shall be sloped to a thin edge. No square joints will be allowed.
- 2210.5 CURING: A light spray of water shall be applied as soon as possible without damage to the surface and the surface shall be kept moist for a period of not less than five days.
- 2210.6 FORMS: Forms shall be true to line and level, shall be substantially braced to avoid excessive vibration and shall be adequately supported to avoid deflection. Forms for columns shall, where practicable, be on two sides only. Forms for beams shall be a soffit and one side or may be a soffit only with vertical backing of fine wire mesh near the centre. Forms shall be clean and thoroughly wetted before application of mortar.
- 2210.7 PREPARATION OF SURFACES:
- (a) Old concrete or masonry surfaces shall be thoroughly cleaned by sand blasting. Sand blasting shall be done using approved equipment and sand shall be clean, sharp, hard and uniform.
 - (b) All concrete and masonry surfaces shall be cleaned of dust and loose particles by compressed air and water and shall be thoroughly wetted and surface damp before application of mortar.
 - (c) Steel surfaces shall be cleaned free of substances that will prevent bond and shall be sand blasted where necessary.
 - (d) Earth surfaces shall be thoroughly compacted, neatly trimmed to line and grade, and shall be wetted and without free surface water before application of mortar.
- 2210.8 PLACING OR MORTAR:
- (a) A uniform water pressure, not less than 15 pounds per square inch above the air pressure, shall be maintained at the nozzle.
 - (b) For lengths of hose up to 100 feet, pneumatic pressure at the gun shall be 45 pounds per square inch or more. Where length exceeds 100 feet pressure shall be increased five pounds per square inch for each additional 50 feet of hose required. Steady pressure shall be maintained.
 - (c) The nozzle shall be held at right angles to the surface and at a distance of two and one-half to three and one-half feet.

- (d) When enclosing reinforcing steel, the nozzle shall be held to direct the material behind the bars. Each side of individual bars shall be shot separately.
- (e) When enclosing reinforcing steel, an air blow-out jet shall precede the nozzle to blow out all rebound or sand which may have lodged behind the bars.
- (f) Mortar shall emerge from the nozzle in a steady uninterrupted flow and when the flow becomes intermittent, the nozzle shall be diverted from the work. Hydration shall be thorough and uniform.
- (g) In shooting walls and columns, application shall begin at the bottom and the first coat shall completely embed the reinforcement to the form.
- (h) In shooting beams, application shall begin at the bottom and a surface at right angles to the nozzle shall be maintained.
- (i) In shooting slabs, the nozzle shall be held at a slight angle to the work so that rebound is blown on to the finished portion where it shall be removed. The limit of material in one layer shall be the appearance of excess moisture on the surface.
- (j) Before placing succeeding layers, all loose material rebound, laitance, rebound pockets, sags or other imperfections harmful to bond or strength shall be removed or carefully cut out and the surface shall be damp. Sufficient time shall be allowed between layers for the material to set.
- (k) Finishing of surfaces may be by any method not harmful to the strength of the material. A finish coat may be applied starting from the top and working down.

CHAPTER 23 STEEL AND IRON

2301 GENERAL

2302 MATERIALS

2303 DESIGN LOADS

2304 MINIMUM THICKNESS OF STRUCTURAL STEEL

2305 CONNECTIONS AND WELDING

2306 TUBULAR COLUMNS

2307 PROTECTION OF METAL

2308 OPEN WEB STEEL JOISTS

2309 LIGHT-GAGE STEEL CONSTRUCTION

2301 GENERAL

2301.1 DESIGN: Steel and iron members and structures shall be designed by methods admitting of rational analysis according to established principles of mechanics, and in accordance with the Standards adopted by this Code and set forth in Appendix A.

2301.2 SCOPE: The design, fabrication and erection of steel and iron for buildings and other structures shall be as set forth in this Chapter and as set forth in Appendix A.

2301.3 STANDARDS: The standards listed in Appendix A are hereby adopted as a part of this Code and supplement, but do not supersede, the specific requirements as set forth herein.

2302 MATERIALS

2302.1 STEEL: Steel shall conform to the physical requirements set forth in the Standards, adopted as a part of this Code.

2302.2 HIGH-STRENGTH STEEL BOLTS: High-strength steel bolts shall conform to the requirements set forth in the Standards adopted as a part of this Code.

2302.3 *RIBBED BOLTS: Ribbed bolts shall be made from a carbon manganese steel with a minimum tensile strength of 70,000 psi.*

2302.4 IDENTIFICATION: Where structural steel is furnished to a specified minimum yield point greater than 36,000 pounds per square inch, the structural steel shall be properly identified.

Where light gauge (gage) steel structural members are furnished to a specified minimum yield point greater than 33,000 pounds per square inch, the grade and the specification designation shall be indicated by painting, decal, tagging or other suitable means on each lift or bundle of fabricated elements. In the case of members having a yield point in excess of 33,000 pounds per square inch obtained through additional treatment, the resulting minimum yield point shall be indicated in addition to the specification designation.

Unidentified stock material, if free from surface imperfections, may be used for short sections of minor importance, or for small unimportant details, where the precise physical properties of the material would not affect the safety of the structure.

2302.5 **USED AND DAMAGED MATERIAL:** All steel shall be straight and true, and any section damaged so as to be out of shape shall not be used. Steel previously used or fabricated for use or fabricated in error shall not be used except with the approval of the BCO. Filled holes or welds shall not be concealed. Straightened or retempered fire-burned steel shall not be used except with the approval of the BCO.

2302.6 **TESTS:** The BCO may require tests and/or mill records to determine the quality of materials.

2303 DESIGN LOADS

2303.1 Design shall be based on the dead, live, wind and other loads set forth in the Chapter on Live and Dead Loads (Chapter 20) and the additional stress considerations set forth in this Chapter.

2303.2 Designs of arches and rigid frames shall include provisions for resistance of lateral thrust at the support by means of tie rods, abutments, foundations, or other adequate measures. When the superstructure is designed separately from the foundation, the magnitude of the vertical and horizontal reactions shall be made available to the foundation designer and shall be shown on the plans.

2304 MINIMUM THICKNESS OF STRUCTURAL STEEL

The minimum thickness of exterior structural steel exposed to frequent rain, or located within 100 yards of the High Water Mark and interior structural steel subject to corrosive exposures shall be as set forth in the Standards contained in Appendix A but shall not be less than:

- (a) 5/16-inch for columns; lintels; girders; beams exterior trusses and exterior bracing members;
- (b) 3/16-inch for purling, girts, trusses and bracing members sheltered from exposure to rain or located more than 100 yards from the High Water Mark.

The controlling thickness of rolled shapes shall be taken as the mean thickness of their flanges, regardless of web thickness.

2305 CONNECTIONS AND WELDING

2305.1 CONNECTIONS: *Connections shall conform to the detailed requirements of the Standards as set forth in Appendix A.*

2305.2 WELDING:

- (a) Welding in the shop or field shall be done only by persons who have been tested and certified for the welds to be performed.
- (b) Surfaces to be welded shall be free from loose scale, slag, rust, paint, grease or other foreign matter.
- (c) Surfaces which are to be welded after erection preferably shall not receive any shop paint. If painted before erection, any shop paint on surfaces adjacent to joints to be field welded shall be wire brushed to reduce the paint film to a minimum.
- (d) Steel construction which is to be welded shall be held in the correct position by bolts, clamps, wedges, guy lines, struts, or other suitable devices or by tack welds until welding has been completed.
- (e) Nothing in this Code shall prohibit arc or gas cutting in steel construction; provided that arc or gas cutting shall not be done on a member while it is under substantial stress.
- (f) Cut edges shall be smooth and regular in contour, and when used in the preparation of base metal parts for welding, special care shall be taken to assure a surface suitable for welding.
- (g) *The cutting of holes shall not be permitted in structural members unless such cutting is clearly shown on the permit drawings.*

2306 TUBULAR COLUMNS

- 2306.1 (a) Tubular columns and other primary compression members, shall have a minimum least dimension of 2-1/2 inches and a minimum wall thickness of 3/16 of an inch.
- (b) Secondary post and struts, not subject to bending, and whose design load does not exceed 2000 pounds may be exempted the minimum dimension set out in (a) above.
- 2306.2 Tubular members when filled with concrete shall have one-quarter inch diameter pressure relief holes drilled through the shell, within 6 inches of the top and bottom of the exposed length of the member, and one hole at mid height.
- 2306.3 Concrete fill in tubular members shall not be assumed to carry any of the load except for compression members having a least dimension of 8 inches or greater and having a one-inch inspection hole in the plate at each end.

2307 PROTECTION OF METAL

- 2307.1 All field rivets, bolts, welds and abrasions to the shop coat shall be spot painted or treated with the material used for the shop coat, or an equivalent comparable to the shop coat, after removal of all objectionable materials.
- 2307.2 Primary structural steel members, except where intended to be encased in concrete, shall have one shop coat of paint and if exposed to the atmosphere in the completed building or structure shall receive a second shop coat of paint or be field painted in addition to the initial shop coat with lead, graphite, asphalt paint or other approved coating compatible with the shop coat, except as herein provided. Surfaces of members in contact with, but not encased in concrete or masonry shall be asphalt coated or otherwise effectively coated where the thickness of the metal is 3/16 inch or less.
- 2307.3 Members having a corrosion-resistive metallic or other equivalent approved coating are not required to have the shop and field painting.
- 2307.4 Where structural steel members are exposed to: —
- (a) corrosive industrial fumes or gases: or
- (b) fresh or salt water spray (this includes all such members located within 100 yards of the High Water Mark): or

- (c) any other corrosive agent,

such members shall be effectively protected with a corrosion-resistive metallic or other equivalent approved coating.

- 2307.5 Where structural members are exposed to industrial fumes, fresh and/or salt water, salt water spray, and other corrosive agents, such members shall be effectively protected with a corrosion-resistive metallic or other equivalent approved coating.
- 2307.6 Corrosion-resistant steels with or without painting or coating may be approved where sufficient test or other factual data establishing the satisfactory performance under the particular exposure conditions or usage is submitted to and approved by the BCO.
- 2307.7 Floor or roof construction which extends into an exterior wall shall be adequately waterproofed and protected from the weather to prevent corrosion.

2308 OPEN WEB STEEL JOISTS

- 2308.1 *STANDARDS: Open web steel joists shall comply with the Standards set forth in Appendix A.*
- 2308.2
 - (a) *DESIGN: Open web steel joist systems shall be designed to accommodate the loads and forces set forth in the Chapter 20.*
 - (b) *Where the net uplift force is equal to or greater than the gravity load of construction, all web and bottom chord members shall comply with slenderness ratio requirements for top chord and for compression members other than top chord as provided for in the standards set forth in Appendix A.*
 - (c) *The top chord for superimposed dead and live loads shall be considered to be stayed laterally if:*
 - (1) *A poured-in-place concrete slab is in direct contact with the top chord.*
 - (2) *A light gage steel deck complying with Section 2309 hereinbelow is fastened to the top chord.*
 - (3) *Any other approved deck system such that attachments of the top chord to the deck are capable of resisting a lateral force specified in the standard set forth in Appendix 'A' and the spacing of the fasteners does not exceed 36" along the chord.*

- (d) *When the bottom chord under net uplift loads is in compression, the bottom chord shall be stayed laterally by a bracing system adequately anchored at each end.*

2308.3 **CONNECTIONS:** *The joints and connections of members of steel joists shall be made by welding, riveting or other approved methods.*

2308.4 **BRIDGING:**

- (a) Lateral bracing shall be provided at intervals suitable for intended use and not greater than given in the following table:

Clear Span	Number of Lines of Bracing
Up to 14 feet	One row near centre
14 to 21 feet	Two rows at approximately 1/3 points of span
21 to 32 feet	Three rows at approximately 1/4 points of span
32 to 40 feet	Four rows at approximately 1/5 points of span
40 to 48 feet	Five rows at approximately 1/6 points of span

- (b) *All bridging and anchors shall be completely installed before application of any construction loads. Bridging shall be connected to the chords of the joists by welding, bolting or other positive mechanical means. Each attachment shall be capable of resisting a horizontal force specified in the Standards set forth in Appendix A. All bridging shall extend and be securely fixed into the end walls.*

- (c) Bridging members shall be of material having a thickness not less than

- (1) 1/2" inch diameter for round members
- (2) 1/8 inch for not-rolled sections
- (3) 0.0598 inches thick for cold-formed sections.

2308.5 **END SUPPORTS AND ANCHORAGE:**

- (a) Joists shall not bear directly on unit masonry.

- (b) *The ends of every joist shall be bolted, welded or embedded at each bearing to provide not less resistance in any direction than 50% of the rated end reaction.*

- (c) *The ends of joists shall have a minimum bearing, on reinforced concrete and steel supports as specified in the Standards set forth in Appendix A.*

2308.6 SHOP STANDARDS: The BCO may require that shop drawings, prepared by a recognized engineer, showing stress diagrams, sizes of members and sizes of welds, be submitted for approval before erection of open-web steel joists and that the designer make inspection of the joists in place and certify that the fabrication and placing conforms to the design.

2308.7 MATERIALS:

- (a) Joists shall be manufactured of hot rolled or cold-formed sections having a minimum thickness of 1 / 8 inch for shapes, flats and formed sections, and 3 / 8 inch for round sections.
- (b) Proof of the characteristics of the material may be required for any steel for which a minimum yield point in excess of 36,000 pounds per square inch is used as the basis of design.

2308.8 SPACING: H and J Series joists shall be spaced a maximum of 24 inches on centres in floor construction.

2309 LIGHT-GAUGE STEEL CONSTRUCTION

2309.1 SCOPE: Light-gauge steel construction shall include individual structural members, structural decks or wall panels, cold formed to shape from sheet or strip steel.

2309.2 STANDARDS: Light gauge steel construction shall conform to the Standards set forth in the Appendices.

2309.3 STRUCTURAL MEMBERS OTHER THAN DECKS: Design and fabrication shall be as set forth in Sub-section 2309.2, except as follows:

- (a) All connections shall be by welding, riveting, bolting or other suitable approved fastening devices or methods providing positive fastening and resistance to loosening under wind and live loads. Welding of members shall be made on two sides or two edges of each hearing in such a manner as to resist effectively the stresses developed.
- (b) Light gauge steel for the treads, risers, stringers and landings of stairways shall have a minimum thickness of .1046 inches.
- (c) (1) Light-gauge steel studs for bearing walls shall have a minimum thickness of .0478 inches and, except where specifically

designed as columns, shall be spaced not more than 24 inches on centres. Provisions shall be made to resist horizontal wind forces by diagonal members, diaphragm panels or other comparable means.

- (2) Light-gauge steel studs for non-bearing partitions shall have a minimum thickness of .0478 inches for exterior or exposed locations and .0149 inches for interior locations.
- (d) Light-gauge steel joists, rafters, purlins, and girts shall have a minimum thickness of .0598 inches, minimum bearing of 4 inches on concrete, minimum bearing of 2-1 / 2 inches on steel and each end shall be positively anchored to resist the loads set forth in the Chapter on Live and Dead Loads.

2309.4 STANDARDS: *Light gauge steel construction shall conform to the Standards set forth in Appendix A.*

- (a) Except as herein provided, no structural value shall be allowed for any fill material used with deck systems. Light weight concrete fill, when permitted to provide stability or diaphragm action, shall be a minimum thickness of 2 inches and have initial volume change and thermal expansion characteristics that prevent objectionable cracking and loss of bond to the deck. Lightweight concrete shall develop a minimum compressive strength at 28 days of 125 p.s.i. based on 6" x 12" cylinder strength, except when acting as a diaphragm it shall conform with the requirements set forth in the Chapter on Reinforced Concrete (Chapter 22).
- (b)
 - (i) *Decks and wall panels, where properly supported by and attached to the building frame, may be considered to act as a diaphragm in resisting lateral forces, where designed as such by an engineer recognised by the Minister.*
 - (ii) *Unfilled decks and panels shall not be designed to act as diaphragms except as redundant systems. Decks and panels having an approved fill material may be designed as diaphragms in accordance with Diaphragm Design Manual of the Steel Deck Institute provided other limitations in this Code are complied with.*
- (c) Where large openings occur, the perimeter of the opening shall be framed with adequate supports for the panels. Openings 12 inches and smaller shall be reinforced as required so that the allowable stresses in the adjoining materials are not exceeded.

- (d) Positive attachment shall be provided as set forth in Paragraph 2309.3 (a). Maximum spacing of fastenings along each supporting member is to be based on gravity, uplift, stress reversal, and diaphragm requirements, but not to exceed 8 inches nominal on centres at ends of sheets and 12 inches nominal on centres at intermediate bearings. At perimeters, parallel to direction of span, edges of sheets are to be so supported as to provide for a maximum spacing of fastenings of 12 inches on centres. An adequate sidelock or other connection shall be made to provide for the distribution of imposed loads. Where continuous interlocking or lightweight concrete fill is not provided, side edges shall be fastened together at intervals not exceeding 12 inches where diaphragm action is required or 18 inches otherwise. Roof and floor panels having a concrete or lightweight concrete fill mechanically connected to the structure may utilize the properly designed fill in diaphragm action, where designed as such by an engineer recognized by the Minister.
- (e) Bolts, rivets or other suitable, and approved fasteners at supports shall be not less than three-sixteenths inch in diameter, under the head.
- (f) Structural sheet sections spanning between supports shall be designed to support the live and/or wind loads without exceeding the deflections set forth in the Chapter on Live and Dead Loads (Chapter 20).
- (g) *The bending stress of metal siding and roof panels shall be designed utilizing a safety factor of not less than 2.5.*
- (h) *Minimum roof decking uplift loads shall comply with UL 580 Class 90.*
- (i) *Metal building siding and roof decking shall be designed without an allowable increase in stresses of 1/3 due to wind load.*

2309.5 ROOFING AND SIDING: Sheet-metal sections not suitable by rational analysis for self-supporting structural sheets, as set forth in Sub-section 2309.4, shall be termed roofing and siding. Roofing and siding shall be used only over solid wood sheathing and shall be as follows:

- (a) The minimum thickness of sheet-metal roofing and siding shall be .0120 inches.
- (b) Attachment shall be as set forth in Paragraph 2309.4 (d) but not less than 12 inches on centres each way; except that attachment

may be by 8d nails, penetrating not less than three-fourths inch into wood sheathing or by No. 6 screws.

2309.6 PROTECTION OF METAL: All members shall be treated with protective paint coatings or equivalent protection except as follows:

- (a) Where exposed to high humidity atmospheres, industrial fumes fresh or salt water spray (including where located within 100 yards of the High Water Mark) or other corrosive agents or where less than .0299 inches thick steel is used, the sheets shall be protected by being galvanized or be of an approved alloy or be otherwise coated to provide equal durability and protection.
- (b) Abrasions to the protective coating shall be spot treated with a material and in a manner compatible to the shop protective coating.

2309.7 WELDING: Welding shall conform to the requirements of Sub-section 2305.2.

CHAPTER 24 WOOD

- 2401 DESIGN**
- 2402 STANDARDS**
- 2403 DEFINITIONS**
- 2404 QUALITY AND SIZES**
- 2405 ALLOWABLE UNIT STRESSES AND LOAD TABLES**
- 2406 CONSTRUCTION DETAILS**
- 2407 HEAVY TIMBER CONSTRUCTION**
- 2408 PROTECTION OF WOOD**
- 2409 FIRE-RETARDANT TREATED WOOD**
- 2410 MINISTRY OF WORKS LOW COST HOUSING PLANS**

2401 DESIGN

Wood members used for structural purposes shall be designed by methods admitting of rational analysis according to established principles of mechanics, and in accordance with the Standards adopted by this Code and set forth in Appendix A.

2402 STANDARDS

The Standards listed in Appendix A are hereby adopted as a part of this Code and supplement, but do not supersede, the specific requirements as set forth herein.

2403 DEFINITIONS

The following words and terms shall for the purpose of this Code, have the meanings set forth in this section:

GLUED-LAMINATED LUMBER, lumber composed of an assembly of wood laminations bonded with adhesives in which the laminations are too thick to be classed as veneers. See definition of Structural Glued-laminated Lumber.

GLUED BUILT-UP MEMBERS, structural members, the sections of which are composed of built-up sawn lumber alone, plywood alone, or plywood in combination with sawn or glued-laminated lumber; all parts bonded together with adhesives.

GRADE (Lumber), the classification of lumber in regard to strength and utility in accordance with the Standards in Appendix A.

GRADE-STRESS (Lumber), a lumber grade defined in such terms that a definite working stress may be assigned to it as set forth in the Standards in Appendix A.

NOMINAL SIZE (Lumber), the commercial size designation of width, and depth, in standard sawn lumber and glued-laminated lumber grades; somewhat larger than the standard net size of dressed lumber, in accordance with the Standards in Appendix A.

PLYWOOD—CONSTRUCTION AND INDUSTRIAL SOFTWOOD is a built-up panel of laminated veneers conforming to the Standards given in Appendix A.

STRUCTURAL GLUED-LAMINATED LUMBER, any member comprising an assembly of laminations of lumber in which the grain of all laminations is approximately parallel longitudinally; in which the laminations are bonded with adhesives; and which is fabricated in accordance with the Standards given in Appendix A.

STRUCTURAL-USE PANEL: Is a panel product composed primarily of wood which, in its commodity end use, is essentially dependent upon certain mechanical and or physical properties for successful end-use performance in accordance with the Standards in Appendix A.

2404 QUALITY AND SIZES

2404.1 QUALITY:

- (a) *All lumber used for joists, rafters, stringers and/or beams shall be of a grade not less than 1200 psi extreme fiber stress in bending and tension parallel to the grain.*
- (b) All lumber permanently incorporated into a building or structure shall be air-dried or kiln-dried and shall contain not more than 19 percent moisture at the time of its use and/or at the time of treatment with a wood preservative.
- (c) The species and grade of all wood used for load-bearing purposes, the design of which is based on stresses in excess of 1200 p.s.i. lumber, shall be shown on the plans submitted with applications for building permits.
- (d) *All lumber used as structural members or sheathing shall be pressure treated against attack by termites and dampness.*

2404.2 SIZES:

- (a) Wood members shall be of sufficient size to carry the dead and required live loads without exceeding the allowable deflections or working stresses specified in this Code.

- (b) Sizes of wood members referred to by this Code are nominal sizes. Nominal sizes may be shown on the plans. The minimum acceptable net sizes conforming to nominal sizes shall be within 2% of the minimum net sizes contained in the Standard specified in Appendix A at 19% moisture content. Computations to determine the required sizes of members shall be based on the net sizes contained in the standard.

2404.3 IDENTIFICATION: All lumber and lumber products used structurally shall be identified as follows: —

- (a) Lumber, including end jointed lumber shall be identified by grade mark and/or a certificate of inspection, by an approved lumber grading or inspection agency in accordance with the Standards in Appendix A.
- (b) All plywood used structurally, including siding, diaphragms, built-up members and all roof, wall and floor sheathing, shall be identified for grade and glue types by an approved testing and grading agency in accordance with the Standards in Appendix A.
- (c) Fire rated wood shingles and/or shakes shall be clearly identified by bundle or certificate in accordance with the Standards in Appendix A.
- (d) All structural-use panels shall be identified for end use grade and exposure durability classification by the trade mark of an approved testing and grading agency in accordance with the Standards in Appendix A.

2404.4 PLYWOOD: Plywood permanently exposed in outdoor locations shall be of exterior type and where used structurally for wall, floor or roof cladding (including that exposed to the outdoors on the underside only) or for diaphragms shall be of a type made with exterior type glue.

2404.5 STRUCTURAL-USE PANELS: Structural-use panels, when permanently exposed in outdoor locations shall be classified Exterior, except that roof sheathing of Exposure I durability classifications may be exposed to the outdoors on the underside.

2405 ALLOWABLE UNIT STRESSES AND LOAD TABLES

2405.1 GENERAL:

- (a) Wood joists and rafters may be of the sizes set forth in the following table without additional professional design or shall be designed based on the allowable unit stresses set forth in the Standards in Appendix A. Where the design is based on allowable working stresses higher than the lowest stress-grade for the species, the design shall be supported by computations submitted by an engineer recognised by the Minister.

TABLE 24-A
ALLOWABLE SPANS - FLOOR JOISTS, ROOF AND
CEILING JOISTS
(Based on 1200 psi fibre stress and L/360 deflection)

Maximum Allowable Span for Uniform Loading

Size (inches)	Spacing (inches)	67 psf	57 psf	47 psf	37 psf	22 psf
2 x 6	12	8'-9"	9'-5"	10'-4"	11'-8"	15'-1"
	16	7'-6"	8'-1"	9'-0"	10'-1"	13'-2"
	24	6'-0"	6'-8"	7'-4"	8'-4"	10'-9"
2 x 8	12	11'-6"	12'-5"	13'-8"	15'-4"	20'-0"
	16	10'-0"	10'-9"	11'-10"	13'-4"	17'-4"
	24	8'-1"	8'-9"	9'-7"	1'-11"	14'-1"
2 x 10	12	14'-7"	15'-10"	17'-5"	19'-7"	25'-6"
	16	12'-8"	13'-9"	15'-1"	17'-0"	22'-0"
	24	10'-3"	11'-2"	12'-4"	13'-11"	18'-0"
2 x 12	12	17'-9"	19'-2"	21'-2"	23'-10"	-----
	16	9'-8"	16'-7"	18'-4"	20'-7"	26'-10"
	24	12'-6"	13'-7"	15'-0"	16'-1"	21'-10"
3 x 6	12	11'-2"	12'-2"	13'-3"	14'-0"	19'-1"
	16	15'-4"	10'-6"	11'-6"	12'-9"	16'-10"
	24	8'-0"	8'-7"	9'-5"	10'-8"	13'-9"
3 x 8	12	14'-9"	16'-0"	17'-6"	18'-5"	25'-10"
	16	12'-9"	13'-10"	15'-2"	16'-9"	22'-3"
	24	10'-6"	11'-3"	12'-5"	14'-0"	18'-2"
3 x 10	12	18'-10"	20'-4"	22'-6"	23'-6"	-----
	16	16'-4"	17'-8"	19'-6"	21'-4"	-----
	24	13'-3"	14'-5"	15'-11"	18'-0"	23'-2"
3 x 12	12	23'-0"	24'-10"	27'-0"	-----	-----
	16	19'-10"	21'-6"	23'-8"	26'-0"	-----
	24	16'-3"	17'-6"	19'-3"	21'-9"	-----
4 x 6	12	13'-2"	14'-2"	15'-8"	15'-8"	22'-2"
	16	11'-6"	12'-5"	13'-9"	14'-3"	20'-0"
	24	9'-5"	10'-1"	1'-2"	12'-5"	16'-4"
4 x 8	12	17'-4"	18'-9"	20'-7"	20'-7"	-----
	16	15'-1"	16'-5"	18'-0"	18'-8"	26'-5"
	24	12'-5"	13'-4"	14'-9"	16'-4"	21'-7"
4 x 10	12	22'-2"	24'-0"	26'-3"	26'-3"	-----
	16	19'-4"	20'-11"	23'-0"	24'-0"	-----
	24	15'-9"	17'-0"	18'-10"	20'-10"	-----
4 x 12	12	27'-0"	-----	-----	-----	-----
	16	23'-6"	25'-5"	-----	-----	-----
	24	19'-2"	20'-9"	23'-0"	25'-5"	-----

Loadings given in the table in pounds per square foot correspond to these combinations of design or working loadings:

Loadings given in the table in pounds per square foot correspond to these combinations of design or working loadings:

67 psf: Floor joists with plaster below—50 psf live load and 17 psf dead load.

57 psf: Floor joists with plaster below—40 psf live load and 17 psf dead load, or roof rafters with a slope greater than 2-1/2 to 12 - 30 psf live load and 27 psf dead load.

47 psf: Floor joists without plaster below—40 psf live load and 7 psf dead load, or roof joists with plaster below—30 psf live load and 17 psf dead load.

37 psf: Ceiling joists over living rooms and usable attic space—25 psf live load and 12 psf dead load, or Roof joists without plaster under—30 psf live load and 7 psf dead load.

22 psf: Ceiling joists without usable attic space—10 psf live load, and 12 psf dead load.

- (a) The deflection of wood members shall not exceed that set forth in the Chapter on Live and Dead Loads.
- (b) The span of roof rafters shall be measured horizontally from bearing to bearing, and the horizontal distance from plate to ridge or other support shall be the span.
- (c) Where there is an accessible space having a clear vertical height of 30 inches or more, ceiling joists shall be designed as having usable attic space.

2405.2 PLYWOOD STRESSES:

- (a) Plywood lumber structural assemblies shall not exceed the working stresses set forth in the Standards in Appendix A.
- (b) Working stresses of plywood other than those in the Standards shall be determined according to the species.
- (c) All plywood permanently exposed in outdoor locations shall be of exterior type, and where used for roof or exterior wall sheathing shall meet the standards for exterior type plywood in Appendix A unless otherwise approved by the BCO.
- (d) Walls or roof sheathed with plywood may be considered as diaphragms to distribute horizontal forces subject to the approval of the BCO, based on structural analysis and/or tests; and where so used plywood shall be bonded with an exterior adhesive meeting standards for exterior type.

- (e) All plywood used structurally shall bear the identification of the manufacturer as to type and grade, species of veneer used and conformance with the appropriate commercial standard.

2405.3 **GLUED-LAMINATED:**

- (a) Glued-laminated members shall comply with the Standards set forth in Appendix A. Where deemed necessary by the Buildings Control Officer, the use of trussed rafters or the equivalent may be requested.
- (b) The BCO may require tests to determine the strength, permanence, effect of moisture and insect resistance of adhesives; and only approved adhesives may be used.
- (c) The BCO may limit or otherwise regulate the use of glued laminated members.

2405.4 **PREFABRICATED ROOF TRUSSES:**

Prefabricated Roof Truss - means an assembly of rafter joists and bracing members forming a single structural unit, made in a plant or factory for erection elsewhere.

(1) **DESIGN:**

- (a) *Prefabricated wood trusses shall be designed and fabricated in accordance with the specifications set forth in Appendix A.*
- (b) *Where Prefabricated wood roof trusses are used the roof framing plans which constitute part of the permit documents shall be provided and shall be signed by the truss manufacturer's Engineers who shall be an Engineer recognised by the Minister. Such roof framing plans shall be reviewed and approved by the Architect or Engineer of Record.*
- (c) *Trusses shall be designed for uniformly distributed live, dead and concentrated loads, and such loads shall be indicated on the truss design drawings. Where a girder or truss is subjected to concentrated loads or any unusual loading condition, or where truss members have been cut or shifted to meet construction needs, drawings and additional calculations signed by the Manufacturers' Engineer, who shall be recognized by the minister, shall be submitted to the BCO for prior approval.*
- (d) *Standard roof trusses shall be designed for a minimum live load of 30psf, a minimum dead load of 15 psf on the top chord, and a minimum dead load of 10 psf on the bottom chord; or*

a minimum total load of 55 psf, with no allowable stress increase for dead or live loads. Where the roof design is such that water is not directed to the interior of the roof and there are no parapets or other roof edge drainage obstructions, roof trusses with slopes of 1-1/2:12 or greater may be designed for a live load of 20 psf and a minimum total load of 45 psf with a 10% allowable stress increase for dead and live loads, and this design method shall be considered and equivalent to designs using a 55 psf total load with a 33 1/2% stress increase for dead and live loads.

- (e) The allowable deflection under live load for trusses shall not exceed span/360 for plastered ceilings span/240 for unplastered.*
- (f) Truss design drawings shall indicate that provisions have been made for support and bearing of the roof structural system, for the permanent cross/lateral bracing, for bracing to transfer member buckling forces to the structure, and for all bracing and anchor required to resist uplift and lateral forces. Truss drawings shall be signed by an Engineer recognised by the Minister.*
- (g) Flat roof trusses shall be designed for not less than the loads set forth in Subparagraph 2405.4(1)(d) above, except that the dead load on the top chord may be taken as 10 psf in lieu of 15 psf, and the total load reduced to 50 psf. No stress increase for wind, live, or dead loading shall be permitted for flat trusses.*
- (h) Gable end trusses shall be designed for a minimum live load of 30 psf and a minimum dead load of 15 psf on the top chord. The minimum load of 10 psf on the bottom chord may be omitted where continuous support is provided.*

In addition, the gable end trusses shall be designed to sustain a horizontal wind spare load of not less than 30 psf perpendicular to the plane of the truss. Such trusses shall be anchored to the sub-structure at intervals of not more than 6'- 0".

- (i) When girders exceed 2 members and when girder reactions exceed the capacity of standard connectors or hangers, these reactions shall be shown on the drawings and the connection must be designed and signed by an Engineer recognised by the Minister.*

(2) MATERIAL SPECIFICATIONS:

- (a) *Trusses shall be fabricated of Southern Yellow Pine, Douglas Fir, Hem-Fir or Fir-Larch, applying the stress ratings listed in the Standards set forth in Appendix A.*

EXEMPTION: The physical characteristics of Select Structural or Dense Select Structural Southern Pine set forth in the Standards shall not be used to determine the maximum span of any truss unless the material is actually used in its manufacture.

- (b) *Top and bottom chords shall have a minimum rating of 1000 psi (fb) before any allowable stress increase shall be permitted. Web members shall be of No.3 Grade Southern Yellow Pine or better.*
- (c) *For trusses spanning 20'-0" or less, the minimum percentage of grade-marked members among top and bottom chords shall be 50%.*
- (d) *For trusses spanning more than 20'-0" the minimum percentage of grade-marked members among top and bottom chords shall be 70%, and there shall be a minimum of 1 marked web on each truss.*
- (e) *All lumber shall be 2" x 4" nominal or larger, and no 2" nominal member shall be less in size than 1 1/2".*
- (f) *The moisture content of all lumber used in wood truss fabrication shall not exceed 19%.*
- (g) *Approved connector plates shall be not less than 20 gauge galvanized steel meeting ASTM A446, and shall be identified by the manufacturers stamp. The size and location of all plates shall be shown on the truss design drawings.*
- (h) *All connector plates shall bear the name, logo or other markings which clearly identify the manufacturer. Semi-annually, Plate manufacturers shall certify compliance with the provisions of Section 202 of the TPI Design Specification for Metal Plate Connected Wood Trusses; with respect to the grade of steel, thickness or gauge of material, and galvanizing to ASTM G-60 as a minimum. This certification requirement may be satisfied by submitting certified mill reports or independent laboratory reports to the Buildings Control Officer.*

- (3) **FABRICATION:**
- (a) *Manufacturers and fabricators of prefabricated wood truss assemblies shall obtain valid approval in accordance with Section 317 of this Code.*
 - (b) *Each truss shall bear the fabricators stamp on a web member and 75% shall be placed so as to be clearly visible after erection.*
 - (c) *Multiple member girder trusses shall be pre-drilled at the truss plant for connection bolts only. Hanger bolt holes shall be drilled on-site.*
- (4) **TRUSS ERECTION:**
- (a) *All trusses shall be erected in accordance with Truss Plate Institute Manual Commentary and Recommendations for Handling & Bracing Metal Plate Connected Wood Trusses, HIB, in addition to any requirements indicated on the approved permit document.*
 - (b) *For trusses having an overall length of the bottom chord in excess of 40'-0" erection shall be supervised by an Engineer recognised by the Minister retained by the contractor.*
 - (c) *Furring of a ceiling in contract with supporting joists shall be not less than 1" x 3" for spans to 24 inches, 2" x 2" for spans to 36 inches, and for longer spans shall be designed as joists.*

2406 CONSTRUCTION DETAILS

2406.1 COLUMNS OR POSTS:

- (a) All wood columns and posts shall be framed to true-end bearings and shall be securely anchored against lateral or vertical forces.
- (b) All wood columns and posts shall have the bottom protected from deterioration.
- (c) Splicing of columns shall be done only in regions where lateral support is adequately provided about both axes.
- (d) No notching or cutting shall reduce the design dimensions of the column.

2406.2 STUDS:

- (a) **SIZE:** Studs shall be not less than 2"X 4" and, where supporting

more than one floor and a roof, shall be not less than 2"x 6" or 3"x 4".

- (b) HEIGHT: Maximum allowable height of 2"x4" and 3"x4" stud framing shall be 14 feet, and of 2"x 6" stud framing shall be 20 feet, unless the wall is otherwise laterally supported. Solid wood bridging shall be placed at intervals of not over eight feet.
- (c) SPACING: Studs shall be spaced not more than 16 inches on centres when supporting floors. Vertical studs not more than 10 feet in length may be spaced 24 inches on centres when supporting roof and ceiling loads only.
- (d) PLACED: Studs in exterior and bearing walls shall be placed with the longest dimension perpendicular to the wall. Studbearing walls shall, so far as is practicable, be carried directly to the foundation or sills or beams at grade.
- (e) PLATES: The top plate of stud-bearing walls shall be doubled and lapped at each intersection with walls and partitions. Joints in the upper and lower members of the top plate shall be lapped not less than 4 feet. Double plates shall be used around entire exterior walls.
- (f) BASE PLATES: Stud walls resting on masonry shall have base plates or sills of wood treated with an approved preservative.

Sills of interior bearing walls, resting on masonry foundation walls where wood floor joists are to be used, and sills of exterior stud walls shall be of not less than 3"X 6" dimension, bolted to the masonry at the corners and at intervals of not more than 4 feet with 5/8-inch bolts embedded 7 inches into the masonry or, in lieu thereof, a 2"X4" base plate, and each such stud anchored past the base plate to the masonry with a 1/8"x 1" steel strap or equivalent.

Base plates of interior stud bearing walls resting on concrete slab floors shall be effectively fastened thereto, and such plates shall not be embedded in the concrete.

- (g) CORNERS AND BRACING: Corners of stud walls or partitions shall be framed solid by not less than three studs. Exterior stud walls shall be effectively wind-braced with diagonal sheathing or plywood.
- (h) SPLICING: Bearing studs shall be spliced only at points where lateral support is provided.

- (i) NOTCHING: No notching or cutting whatsoever shall be permitted in studs which carry loads in excess of 75 percent of their capacity.

Studs which carry 75 percent or less of their capacity or studs of non-bearing partitions may be notched to a depth of 1/3 the depth of the stud without limit of the number of consecutive studs.

- (j) PIPES IN WALLS: Stud partitions containing plumbing or other pipes shall be so framed and the joists underneath so spaced as to give proper clearance for the piping. Where a partition containing such piping runs parallel to the floor joists, the joists shall be doubled and spaced to permit the passage of such pipes and shall be bridged. Where plumbing or other pipes are placed in or partly in a partition, necessitating the cutting of the plates, a metal tie not less than 1/8 inch thick and 1-1/2 inches wide shall be fastened to each side of the plate across the opening with 416d nails at each end of each strap.
- (k) HEADERS: All openings in bearing walls 4 feet or less in width shall be provided with headers equivalent to double headers of not less than 2-inch nominal thickness, placed on edge, securely fastened together, and all openings more than 4 feet wide shall be trussed or provided with headers or lintels. Such headers or trusses shall have not less than 2-inch nominal solid bearing at each end to the floor or bottom plate, unless other approved framing methods or joint devices are used.
- (l) STUDS JOINING MASONRY: Where stud walls or partitions join masonry walls, such studs shall be secured against lateral movement by nailing or bolting to the masonry.
- (m) INTERIOR PARTITIONS: Interior partitions shall be constructed, framed and firestopped as specified for interior bearing walls, except that partitions may have a single top plate. In any occupancy, interior partitions not more than 4 feet from a bearing wall and not exceeding 9 feet in height may be of studs spaced 24 inches on centres and placed flat in the wall.

2406.3 FIRESTOPS: Firestopping shall be provided to cut off all concealed draft spaces both vertical and horizontal. Firestops shall form effective fire barriers between storeys and between a storey and roof space. Firestops shall be provided in specific locations, as follows:

- (a) In exterior or interior stud walls, at ceilings and floor levels.

- (b) In all stud walls and partitions, so placed that the maximum dimensions of any concealed space is not over 8 feet.
- (c) Between stair stringers at intervals not exceeding 7 feet of vertical height and at top and bottom.
- (d) Around sliding door pockets.
- (e) Other locations not specifically mentioned such as holes for pipes, shafting, behind furring strips and similar places which could afford a passage for flames.
- (f) Firestops, when of wood, shall be of 2 inch nominal thickness in direction of protection.
- (g) Horizontal firestops of attic and ceiling plenums shall be provided as specified in the Sub-sections under "Attic Spaces" given in the Chapters under Types of Construction.

2406.4 JOISTS AND RAFTERS:

- (a) SIZE: The minimum size of joists and rafters shall be as specified in Section 2404 of this Chapter and shall be not less than 2"x 6" nominal size, except that the BCO may approve 2"x 4" nominal size rafters for spans and loadings not exceeding those given in Section 2405 of this Chapter.
- (b) SPACING: Maximum spacing of joists and rafters, where a plaster ceiling is directly supported on the bottom of such members, shall be 16 inches on centres.
- (c) BEARING: Joists and rafters shall bear on wood plates and shall not be directly in contact with masonry; except that joists and rafters, when more than 6 feet above grade and bearing on concrete beams cast in masonry walls which extend above the wood joists and rafters, may bear on such concrete beams provided the ends shall be fire-cut and anchored as specified in Paragraph (d) below.

Joists and rafters shall have not less than 4 inches of bearing, except as follows:

- (1) Ceiling joists may butt into the web of a steel beam and be neatly fitted to bear on not less than 3 inch wide bottom flange of such beam.
- (2) Joists and rafters bearing on top of a concrete tie beam where no parapet is to be erected, shall bear on a wood, wall plate

secured to the concrete with anchor bolts or metal straps as set forth below except as noted in (iii).

Where anchorage for the roof members is provided by:

- (i) approved metal fasteners nailed to both the wall plate and each rafter or joist; the wood plate shall not be less than 3"x 6".
- (ii) 1/8"x 1" metal anchors embedded in the concrete tie beam and secured directly to each rafter, or joist; the wood plate should not be less than a 2"x 4".
- (iii) channel—shaped metal saddles fastened directly to the tie beam by a 1" x 1/8" metal anchors embedded in the concrete, the wall plate may be omitted, provided each joist, or rafter, in contact with the masonry is of an approved durable species or pressure treated with an approved preservative.

Any other form of anchor shall be submitted to the Buildings Control Officer, for approval, prior to use.

- (3) Floor joists may butt into a header beam if effectively toenailed and if an approved saddle providing not less than 3 inches of bearing transmits the vertical load to the top of the header.
- (d) ANCHORAGE:
 - (1) Joists fire-cut into a masonry wall shall be anchored to the concrete beam on which they bear. Such anchors shall be spaced not more than 4 feet apart and shall be placed at opposite ends across the building on the same run of joists.
 - (2) All joists shall be nailed to the bearing plates, to each other where they lap, and to the studs where such studs are adjacent; and ceiling joists shall be nailed to roof rafters, if practicable.
 - (3) Every roof rafter and/or roof joist shall be anchored to the beam or studs on which they bear, and roof rafters opposing at a ridge shall be anchored across the ridge.
 - (4) Anchors securing wood to concrete shall be of not less than 1/8" x 1" strap iron embedded in the concrete and nailed to the stud or joist or rafter with not less than 3-16d galvanized

nails or shall be a commercial anchor approved by the BCO, anchoring each member to a plate provided such plate is not less than 3"x 4" and anchored to the concrete by bolts spaced not more than 48 inches apart.

- (5) Anchors securing wood to wood shall be of 1/8"x 1" strap, nailed to each member with 3-16d galvanized nails, or shall be a commercial anchor approved by the BCO, anchoring each member.
 - (6) Any anchoring systems shall be continuous from the foundation to the roof and shall satisfy the uplift requirements of the Chapter on Live and Dead Loads (Chapter 20).
- (e) ANCHOR BOLTS:
- (1) Where a wall plate is required to secure rafters, or joists to a concrete tie beam, the plate shall be attached to the tie beam with 5/8" diameter bolts set not more than 4'- 0" on centres. Each bolt shall be of galvanised steel, at least 10" in length and be provided with a nut and a 1/8" thick washer of no less than 1-1/4" external diameter.

Hooked, 1/2" diameter galvanised anchor bolts 10" long excluding the hook, may be substituted for the above, provided they are set not more than 2'-0" on centres.

The projection of anchor bolts above the top of the tie beam shall be such that the wall plates referred to in sub-section (c) (2) of this section are securely bolted down without reduction in thickness of the plate.
 - (2) METAL STRAPS: Where 1"x 1/8" metal straps are used to secure rafters or joists to a wall plate, or to a metal saddle, care shall be taken with their placement, bent over or misaligned straps shall not be considered acceptable.
 - (3) OTHER ANCHOR SYSTEMS: Any other anchor system shall be submitted to the Building Control Officer for approval prior to use on site.
- (f) SPLICING: No horizontal members shall be spliced between points of support; except that the BCO, in special cases, may approve properly designed and bolted splices.
- (g) FLOOR JOISTS: Floor joists under all walls parallel to any joists shall be doubled. Such doubled joists may be separated not more

than 6 inches by solid blocking spaced at 4-foot intervals.

(h) CEILING JOISTS:

(1) In buildings without parapet walls, the ceiling joists, where practicable, shall be nailed to the rafters to act as a collar tie.

(2) Ceiling joists shall not be used to support rafter loads.

(i) ROOF JOISTS: Roof joists may cantilever over exterior walls as limited by the allowable stress, but the length of such cantilever shall not exceed the length of that portion of such joist inside the building.

(j) ROOF RAFTERS:

(1) Hip rafters, valley rafters and ridges shall be required and shall be not less in size than the largest rafter framing thereto nor less not that required to support the loads.

(2) Collar ties shall be provided at each pair of rafters, unless other means of resisting the thrust of the rafters is required and provided and/or the ridge is designed as a supporting pbeam. Such collar ties shall be placed horizontally at or below the upper-third point of the rafters, and shall be not less than 1"x 6" rough or 2"x 4" nominal size. Effectively nailed ceiling joists may serve as collar ties.

(k) BRIDGING: Bridging of floor and roof joists shall be provided as set forth in the Standards in Appendix A.

(l) MANUFACTURED ROOF TRUSSES: Shall be spaced, anchored and provided with bearing, as set forth in subsections (b), (c), (d) and (e) above.

2406.5 SUSPENDED OR FURRED CEILINGS:

(a) Joists or furring supporting a plaster ceiling shall be spaced not more than 16 inches on centres.

(b) Joists of a suspended ceiling shall be not less than 2"x 4" members, and wood hangers shall provide nailing and be not less than the equivalent of 1"x 4" members.

(c) Furring of a ceiling in contact with supporting joists shall be not less than 1"x 3" for spans to 24 inches, 2"x 2" for spans to 36 inches, and for longer spans shall be designed as joists.

2406.6 SHEATHING:

(1) FLOOR SHEATHING:

- (a) *Floor sheathing, where a part of a required fire-resistive assembly, shall comply with Chapter 32 of this Code.*
- (b) *The finish floor shall be tongue-and-grooved not less than nominal 1" lumber laid perpendicular to the joists with end joints on the joists, or a sub-floor shall be provided as set forth in Paragraphs (c) (d) (e) (g) and (i), tables B through D below.*
- (c) *Square-edged or spaced sub-flooring may be used under only a finish floor having a strength equal to or greater than 1/2" tongue-and groove wood strip flooring; and under finish floors of less strength, a tongue-and-groove or plywood sub-floor shall be required.*
- (d) (i) *Lumber sub-flooring shall be laid diagonally, shall not be less than 5/8" thick when joists are spaced no more than 16" o/c nor less than 3/4" thick when joists shall be staggered and parallel to the joists, and ends at walls and similar places shall be supported by a ribbon or by blocking.*
- (ii) *Plywood sub-floors of C-D grade Underlayment grade bonded to wood joist using adhesives meeting the requirements of AFG-01 shall be applied using nails spaced 12" o/c. The maximum clear spans for plywood/lumber glued floor system shall comply with those published in the APA Design/Construction Guide - Residential and Commercial.*
- (e) *Plywood sub-flooring shall be continuous over 2 or more spans with face grain perpendicular to the supports. The allowable spans shall not exceed those set forth in Table 24-B hereinbelow.*
 - (i) *Plywood panels shall be nailed to supports with 6d common nails when up to 1/2" thick, 8d common nails when 19/32" to 3/4" thick, and 10d common nails or 8d ring shank nails when 1-1/8" thick.*
 - (ii) *Nail spacing shall be 6" o/c at panel edges and 10" o/c at intermediate supports.*

TABLE 24-B
ALLOWABLE SPANS FOR SUB-FLOOR [1]

Panel Identification index [2]	Maximum Plywood span [3]
32/16, 36/16	16" [4]
42/20	20" [4]
48/24	24"

[1] These values shall apply to Structural I and II C-D Sheathing and C/C grades only. Spans shall be limited to values shown, based on possible effect of concentrated loads.

[2] Identification Index appears on all panels in the construction grade listed in Footnote [1].

[3] Plywood edges shall have approved tongued-and-grooved joints or shall be supported with blocking unless 1/4 inch minimum thickness underlay is installed or unless the finished floor is one-inch nominal wood strip.

Allowance uniform load based on deflection of 1/360 of span is 100 lbs. sq. ft.

[4] May be 24 inches if a nominal one inch wood strip finished floor is laid at right angles to joists.

- (f) *Flooring shall be nailed with 8d common nails not less than 2 each board at each support.*
- (g) *Floors for heavy timber buildings shall be sheathed as specified for mill floors, Subsection 2407.2(f) hereinabove.*
- (h) *Flooring shall not extend closer than 1/2" from masonry walls.*
- (i) *If resilient flooring is to be applied directly to a plywood subfloor without separate underlayment, the plywood shall have a top ply of C-plugged grade or better, and the ply immediately under the face shall be as least C grade unless the face ply is 1/6" or more in nominal thickness. Plywood shall be continuous over 2 or more spans with face grain*

perpendicular to supports. Maximum thickness and maximum joist spacing shall comply with table 24-C below:

TABLE 24-C

STRUCTURAL—USE PANEL FLOOR AND ROOF SHEATHING [1]							
Panel Span Rating	Panel Thickness (in)	Roof—Maximum Live Loads (psf) [2]				Floor [3] Maximum Span (in) [5]	
		Edges Supported [4]	Edges Unsupported	Allowable Live Loads (psf) [2]			
				Spacing of supports (in.oc)			
				12	16		24 32 42 48
24/0	1/2	24	24	90	65 30 -- -- --	0	
24/16	1/2	24	24	135	100 40 -- -- --	16	
48/24	3/4, 7/8	48	36	210	155 100 65 50 35	24	

[1] Spans shall be limited to values shown because of possible effect of concentrated loads.

[2] 10 psf dead load assumed.

[3] All panels support 85 psf floor live load plus 10 psf dead load at rated maximum span.

[4] Edges may be supported with lumber blocking or other approved types of edge support.

[5] Edges shall have approved tongued-and-grooved joints or shall be supported by blocking unless 1/4" minimum thickness underlayment or finished floor is 25/32" wood strip.

(j) Underlayment Hardboard shall meet the property requirements for 7/32" and 1/4" service hardboard and shall be 0.215" +/- 0.005" thickness; when supported in sub-flooring. Such sub-flooring shall comply with the requirements of Paragraphs (3) and (4) or (5) above.

(k) Particleboard floor underlayment shall conform to Type 1-B-1 of the Standard listed in Appendix A of this Code. Underlayment shall be not less than 1/4" in thickness and shall be installed in accordance with the installation instructions of the National Particleboard Association.

(2) **ROOF SHEATHING:**

- (1) *Wood roof sheathing shall be boards, plywood or structural-use panels, except as may be otherwise approved by the Buildings Control Officer.*
- (2) *Tongued-and-grooved roof sheathing shall have a thickness of not less than 3/4 inch when the span is not more than 28 in or 5/8 inch when the span is not more than 24 inches. The sheathing shall have staggered joints and shall be nailed with 8d common nails not less than two in each 6-inch board or 3 in each 8-inch board at each support.*
- (3) *Plywood roof sheathing shall be 19/32" inch minimum thickness and shall be continuous over two or more spans with the face grain perpendicular to the supports. The allowable spans shall not exceed the following:*

**TABLE 24 - D
ALLOWABLE SPANS FOR PLYWOOD ROOF SHEATHING [1]**

<i>Panel Identification Index</i>	<i>Maximum Span if Block or Other Edge Supports</i>	<i>Maximum Span without Edge Support</i>
<i>24/0 (9/16 or 5/8 only)</i>	<i>24"</i>	<i>24"</i>
<i>32/16</i>	<i>32"</i>	<i>28"</i>
<i>36/16</i>	<i>36"</i>	<i>30"</i>
<i>48/24</i>	<i>48"</i>	<i>36"</i>

[1] *Values apply to Structural I and II C-D Interior and C-C Exterior grades.*

[2] *Identification Index appears on all panels listed in Footnote [1]*

- (4) *Plywood panels shall be nailed to supports with 6d common nails, for 1/2 inch thickness and with 8d common nails for 5/8 inch, 3/4 inch and 7/8 inch thickness.*
- (5) *Nail spacing in all applications shall be 6 inches on centres at panel edges and at intermediate supports. Nail spacing shall be 4" on centres at gable ends in all cases.*
- (6) *Roof sheathing for heavy timber construction shall comply with Sub-section 2407 of this chapter.*
- (7) *Structural-use panels shall be 1/2 inch minimum thickness and continuous over two or more spans with the long panel dimension perpendicular to the supports unless otherwise*

recommended by the panel manufacturer. Nailing shall be in accordance with sub-sections (c) (i) and (c) (ii) above. Panels may be used for the spacing of supports with live loads not to exceed those given in the table in subsection 2406.6 (a) (10).

(b) **STORM SHEATHING:**

- (1) Exterior stud walls shall be wind-braced with storm sheathing.
- (2) *Such storm sheathing shall be tightly fitted diagonally placed, tongued-and-grooved sheathing, not less than 3/4 inch thickness without tolerance, nailed with three 8d common nails for 6 inch wide boards, and four 8d common nails for 8 inch wide boards to each support; or shall be the maximum practicable size plywood panel, nailed with 6d common nails for 3/8 inch and 1/2 inch thicknesses and 8d common nails for 5/8 inch thickness and all such nails shall be 6 inches on centres at edges of panel and 12 inches on centres to interior panel supports.*
- (3) An effective water barrier shall be provided under all wood exterior cladding between the cladding and the supporting studs, and all openings shall be flashed.
- (4) Plywood wall sheathing shall be applied utilizing maximum stud spacing, minimum panel thickness and acceptable Identification Indexes as shown in the following table:

**TABLE 24 - E
WALL SHEATHING**

Panel Identification Index	Minimum Thickness (inch)	Maximum Stud Spacing (inches) Exterior Covering Nailed to:	
		Stud	Sheathing
16/0, 20/0, 24/0	3/8	24	16
24/0, 32/16	1/2	24	24

When plywood sheathing is used, building paper and diagonal wall bracing can be omitted.

- (d) EXTERIOR WALL CLADDING:
- (1) Plywood may serve for both sheathing and exterior cladding provided:
 - (i) *The panel thickness shall be not less than 3/8 inch except for 303 speciality siding panels and Texture 1-11 panels and the supporting studs shall be spaced not more than 16 inches on centres.*
 - (ii) Plywood not less than 1/2 inch shall be used on stud spacings of 24 inches centres.
 - (2) All joints shall be backed solidly with nailing pieces or studs not less than two inches in width or joints shall be lapped horizontally or otherwise watertight.
 - (3) Where face plies are vertical, bridging pieces spaced not farther apart than three feet eight inches vertically shall be provided for support of plywood for first storey installation and not farther apart than two feet four inches for second storey installations.
 - (4) Where storm sheathing is provided in accordance with subsection 2406.6 (c), exterior cladding may be as permitted in Chapter 31.

2406.7 FURRING: Where the interior of masonry walls are furred, such furring shall be treated and firestopped as herein required and shall be securely fastened to the masonry with not less than one cut nail in alternate courses of block.

2406.8 CONNECTORS:

- (a) *The allowable loads on all types of connectors shall be as set forth in the Standards listed in Appendix A.*
- (b) *G-ring shank nails should be used for all roof sheathing.*
- (c) Nails, bolts and other metal connectors which are used in locations exposed to the weather shall be galvanised or otherwise corrosion resistant.
- (d) In general, nails shall penetrate the second member a distance equal to the thickness of the member being nailed thereto. There shall be not less than two nails in any connection.

TABLE 24-F

(b) NUMBER OF NAILS REQUIRED FOR CONNECTING WOOD MEMBERS:

Connection	Common Nails	Spacing
Joist to Sill or Girder, toe nail	16d	2
Bridging to Joist, toe nail	8d	2 each end
1"x 6" Sub-floor to Joist, Face Nail	8d	2
Over 1"x 6" sub-floor to each joist, Face Nail	8d	3 + 1 for each size increase
2" sub-floor to joist or girder, blind and face nail	16d	2
Sole plate to joist or blocking face nail	16d	16" on centre
Top or sole plate to stud, end nailed	16d 8d or	2 3
Stud to sole plate, toe nail	16d	2
Doubled studs, face nail	16d	24" on centre
Doubled top plates, face nail	16d	16" on centre
Top plates, laps and intersections, face nail	16d	2
Continuous header, two pieces	16d	16" o/c along each edge
Ceiling joists to plate, toe nail	16d	2
Continuous header to stud, toe nail	16d	3
Ceiling joists, laps over partitions, face nail	16d	3
Ceiling joists to parallel rafters, face nail	16d	3
Rafter to plate, toe nail	16d	3
1"x 6" sheathing, to each bearing, face nail	8d	2
Over 1"x 6" sheathing, to each bearing, face nail	8d	3 + 1 for each size increase
Built-up corner studs, face nail	16d	30" on centre
Built-up girders and beams	20d	32" on centre at top and bottom and staggered, 2 at ends and at each splice
2" planks	16d	2 each bearing

- (e) Except for plywood and other laminated members manufactured under technical control and rigid inspection, gluing shall not be considered an acceptable connector in lieu of the connectors herein specified.
- (f) Safe loads and design practice for types of connectors not mentioned or fully covered herein shall be determined by the BCO before approval.

2406.9 WOOD SUPPORTING MASONRY: No wood shall support masonry or concrete except as follows:

- (a) *Wood foundation piles may be used to support concrete or masonry.*
- (b) *Wood joists may be used to support concrete and cement base tile or terrazzo floor surfaces for bathrooms of less than 100 square feet in area, having slabs not more than two and one-half inches in thickness.*
- (c) *There shall be an approved moisture vapor barrier between the concrete or other cementitious materials and the wood.*
- (d) *Wood members supporting concrete shall be preservative treated in compliance with the Standards of AWPB and AWPB set forth in Appendix A and Section 2408 of this chapter.*
- (e) *Plywood decking shall be of C-D grade with exterior glue.*
- (f) *Wood rafters may support concrete roof tile.*

2407 HEAVY TIMBER CONSTRUCTION

2407.1 GENERAL: Heavy timber construction is that type in which fire resistance is attained by placing limitations on the minimum size, thickness, or composition of all load-carrying wood members; by avoiding concealed spaces under floors or roofs; by using approved fastenings, construction details, and adhesives; and by providing the required degree of fire-resistance in exterior and interior walls.

2407.2 HEAVY TIMBER FRAMING:

- (a) COLUMNS: Wood columns may be sawn or glued-laminated and shall be not less than 8-inch nominal in depth when supporting roof loads or floor loads.

Columns shall be continuous or directly superimposed, one above the other with no girders or bolsters between columns, throughout all storeys by means of reinforced concrete or metal caps with brackets, or shall be connected by properly designed steel or iron caps, with pintles and base plates, or by timber splice plates affixed to the column by means of metal connectors housed within the contact faces, or other approved methods.

- (b) FLOOR FRAMING:
- (1) Beams, girders and joists may be sawn or glued-laminated and shall be not less than 6 inch, nominal, in width and 8 inch, nominal, in depth.
 - (2) Framed or glued laminated arches which spring from grade or the floor line and support floor loads shall be not less than 8 inch, nominal, in any dimension.
 - (3) Framed timber trusses supporting floor loads shall have members of not less than 8 inch, nominal, in any dimension.
- (c) ROOF FRAMING: Beams, girders and joists may be sawn or glued-laminated and shall be not less than 6 inch, nominal, in least dimension. Framed members or glued laminated arches which spring from the floor line and do not support floor loads shall have members of not less than 6 inch, nominal, in width and 6 inch, nominal, in depth for the lower half of the height and not less than 6 inch, nominal, in any dimension for the upper half of the height. Framed members or glued laminated arches which spring from the top of walls or wall abutments, framed timber trusses, and other roof framing which does not support floor loads, shall have members not less than 4 inch nominal in width and 6 inch nominal in depth.
- (d) **CONSTRUCTION DETAILS:** *Wall plate boxes of self-releasing type or approved hangers shall be provided where beams and girders enter masonry. An air space of 1/2" inch shall be provided at top, end, and sides of members unless approved durable or treated wood is used. Girders and beams shall be cross-tied to each other, or inter-tied by caps, to transfer horizontal loads across the joint. Wood bolsters may be placed on top of columns which support roof loads only. Intermediate beams used to support floors shall rest on top of girders or be supported on approved metal hangers which transmit the vertical load to the top of the girder. Columns, beams, girders, arches and trusses of material other than wood shall have a fire-resistive rating of not less than one hour. Wood beams and girders supported by masonry walls shall have not less than 4 inches of solid masonry between their ends and the outside*

face of the wall. Roof anchors shall be provided as set forth in this Chapter but not less than required to resist the uplift loads as set forth in the Chapter on Live and Dead Loads (Chapter 20).

- (e) CONCEALED SPACES: Floors and roof decks shall be without concealed spaces, except that building service equipment may be enclosed provided the spaces between the equipment and enclosures are fire-stopped or protected by other acceptable means.
- (f) HEAVY TIMBER FLOORS: Floors may be of sawn or glued-laminated plank, splined or tongued-and-grooved of not less than 3 inch, nominal thickness, or square edged plank not less than 4 inch, nominal thickness, well spiked together. Planks shall be laid so that a continuous line of joints will not occur except at points of support. Planks shall be covered with 1 inch, nominal, tongued and grooved flooring laid crosswise, or diagonally. Planks and floor shall not extend closer than 1/2 inch to wall to provide an expansion joint and such expansion joint shall be covered at top and bottom.
- (g) HEAVY TIMBER ROOF DECKS: Roof decks shall be sawn or glued-laminated, splined or tongued-and-grooved plank, not less than 2 inch, nominal, in thickness or of square edge plank not less than 3 inch, nominal, thickness well spiked together or of a double thickness of 1 inch nominal tongued and grooved boards with staggered joints. Other types of decking may be used if noncombustible when approved by the BCO as being equal.
- (h) CAMBERING: Trusses and long span girders shall be designed with sufficient camber or other provision shall be made to counteract any possible deflection.

2408 PROTECTION OF WOOD

2408.1 PRESERVATIVE TREATED OR DURABLE SPECIES WOOD:

- (a) All wood in areas where deterioration would affect structural safety shall be treated in an approved method with an approved preservative or shall be of durable species as approved by the BCO.
- (b) All wood in contact with, or less than 18 inches from the ground shall be treated in an approved method with an approved preservative or shall be of a durable species as approved by the BCO.
- (c) All wood in contact with concrete or masonry including sills, sleepers, plates, posts, columns, beams, girders and furring shall be treated in an approved method with an approved preservative or

shall be of durable species as approved by the BCO, except that the ends of joists not less than 8 feet above grade when in contact with concrete or masonry, may be treated by dipping the ends in an approved preservative for a period of not less than 5 minutes.

- (d) Approval of the method and materials of treatment with a preservative shall be in accordance with the Standards set forth in the Appendix A.

2408.2 VENTILATION: Attic space between ceiling joists and roof rafters shall be effectively ventilated. Openings shall be located to provide effective cross ventilation, and such openings shall be covered with a corrosion-resistant mesh with openings not greater than one-sixteenth inch.

2408.3 LIGHT AND VENTILATION:

- (a) The space between the bottom of wood-floor joists and the ground of any building, except such space as is occupied by a basement or cellar, shall have ventilating openings through foundation walls, and such openings shall be covered with a corrosion-resistant wire mesh with openings not greater than one-sixteenth inch. Where practicable, ventilating openings shall be arranged on three sides. The minimum total area of ventilating openings shall be 2 square feet for each 15 linear feet of exterior wall. Such openings need not be placed in the front of the building.
- (b) Where wood-floor joists are used, there shall be not less than 18 inches distance between the bottom of such floor joists and the grade beneath.

2409 FIRE-RETARDANT TREATED WOOD

2409.1 Fire-retardant treated wood shall be treated with fire-retardant chemicals in accordance with the Standards set forth in the Appendices and shall have a flame-spread rating of not higher than 25 with no evidence of significant progressive combustion when tested for 30 minutes duration in accordance with ASTM Standard E84-61. (Standard Test Method For Fire Hazard Classification of Building Materials.)

2409.2 Each member or piece of lumber receiving flame-retardant treatment should be marked or identified by an underwriter's label.

2409.3 Fire-retardant treated wood shall have no greater fuel contributed than 30 nor smoke developed greater than 65 as tested in accordance with ASTM Standard E84 (Standard Test Method for Fire Hazard Classification of Building Materials.)

2409.4 Fire retardant treated wood, where permitted and which may be exposed to the weather, shall maintain required fire-retardant classification when tested in accordance with the rain and weathering tests for durability of fire-retardant treated wood of the Standard Test Methods for Fire-Resistance of Roof Covering materials; UL 790.

2410 MINISTRY OF WORKS LOW COST HOUSING PLANS

2410.1 The details of construction given on the Ministry of Works Low-cost Timber House drawings shall be deemed to satisfy the requirements of this Code.

NOTES

CHAPTER 25 ALUMINIUM

2501 GENERAL

2502 ALLOWABLE UNIT STRESSES

2503 DESIGN

2504 CONSTRUCTION DETAILS

2505 FABRICATION AND ERECTION DETAILS

2506 DISSIMILAR MATERIALS

2501 GENERAL

2501.1 DESIGN: Structures in aluminium, and aluminium members shall be of the materials and strength as set forth in this chapter and shall be designed by methods admitting of rational analysis according to established principles of mechanics and in accordance with the Standards adopted by this Code and set forth in Appendix A.

2501.2 STANDARDS: The Standards listed in Appendix A are hereby adopted as a part of this Code and supplement, but do not supersede the specific requirements as set forth herein.

2501.3 *WORKMANSHIP: Aluminium construction shall be in conformance with the tolerances, quality, and methods of construction as set forth in Subsection 2501.2 here-in; and the American Welding Society's Structural Welding Code; Aluminium (D1.2).*

2502 ALLOWABLE UNIT STRESSES

2502.1 *The design, fabrication and assembly of aluminium members for building and other structures shall conform to the Standard set forth in Subsection 2501.2 herein and as otherwise set forth herein.*

- (a) The design, fabrication and assembly of aluminium members for buildings and other structures shall conform to the standards set forth in Subsection 2501.2 of this Chapter, Section 2502 of this Chapter, and as otherwise set forth in this Chapter and Code.
- (b) The BCO may require that any structure using aluminium primary or secondary members be designed by an engineer recognised by the Minister.

- (c) Working stresses are given below for the three most commonly used structural aluminium alloys: 6061-T6, 6063-T6, and 6063-T5 (ASTM designations). Other aluminium alloys may be used with allowable types of stress conforming to the types of stress given below, in proportion to the yield strength, ultimate strength and other properties of the aluminium alloy used.

2502.2 *The use of aluminium alloys, other than those listed in the standard shall provide performance not less than those required by the Standards contained in Appendix 'A'.*

- (a) Working stresses shall not exceed the stresses given below.

Exception: The working stresses for structural aluminium given in this section may be increased by 33-1/3% when produced by wind loads, acting alone or in combination with the design dead and live loads, provided the resulting section computed on this basis is not less than that required for the design dead and live load and impact computed without the 33-1/3% increase.

- (b) **NON-WELDED STRUCTURAL ALUMINIUM MEMBERS AND WELDED MEMBERS AT LOCATIONS FARTHER THAN ONE INCH FROM ANY WELD WORKING STRESSES IN LBS. PER SQUARE INCH.**

(NOTE: These stresses may be increased by 33-1/3 for wind stresses. See 2502.2 (a) above.)

(See Section 2502.4 regarding laterally unsupported sections.)

Type of Stress	Aluminium Alloy by ASTM Designation		
	6061-T6	6063-T6,	6063-T5
TENSION, axial, net action	19,000	15,000	9,500
COMPRESSION, axial, gross section	19,000	13,500	8,500
BENDING, extreme fibers of structural shapes, rectangular tubes, single-web built-up members bent about X-axis			
Portion in tension	19,000	15,000	9,500
Portion in compression	21,000	15,000	9,500
Round or oval tubes	24,000	18,000	11,500
Rectangular bars and plates and tension in outstanding flanges of shapes bent about Y-axis	28,000	20,000	12,500
BEARING			
On rivets and bolts	34,000*	24,000*	16,000*
On milled surfaces and pins	23,000	16,000	10,500
SHEAR, in webs of beams and members subject to torsion	12,000	8,500	5,500

*Ratio of edge distance to rivet or bolt diameter of two or greater. For smaller ratios, multiply this working stress by the ratio:

$$\frac{\text{edge distance}}{\text{twice the rivet or bolt diameter}}$$

- (c) WELDED STRUCTURAL ALUMINIUM MEMBERS ON SECTIONS WITHIN ONE INCH OF A WELD WORKING STRESSES IN LBS. PER SQUARE INCH.

(NOTE: These stresses may be increased by 33 1/3% for wind stresses. See 2502.2 (a) above.)

(See Section 2502.4 regarding laterally unsupported sections)

Type of Stress	Aluminium Alloy by ASTM Designation		
	6061-T6	6063-T6	6063-T5
TENSION, axial, net section	11,000***	6,500	6,500
COMPRESSION, ** axial gross section	12,000***	6,500	6,500
BENDING, **extreme fibers of structural shapes, rectangular tubes, single-web built-up members bent about X-axis	11,000***	6,500	6,500
Round or oval tubes	13,500**	8,000	8,000
Rectangular bars and plates, and tension in outstanding flanges of shapes bent about Y-axis	16,000***	8,500	8,500
BEARING			
On rivets and bolts	18,000****	13,500****	13,500****
On milled surfaces and pins	12,000***	9,000	9,000
SHEAR, in webs of beams and members subject to torsion	7,500***	3,900	3,900

** Compressive working stresses for columns, single-web members, rectangular tubes and box sections supported at both ends and welded at the ends only. For cantilever columns or beams and for columns and beams having welds at locations other than the ends, the working stresses shall be determined in accordance with the provisions of Section 2501.2 of this code.

*** Working stresses apply to all material welded with 5356 or 5556 filler alloy and to material 3/5 inches or less in thickness welded with 4043 filler alloy. For thicker material welded with 4043 filler alloy, reduce these working stresses by multiplying them by 0.8.

$$\frac{\text{edge distance}}{\text{twice the rivet or bolt diameter}}$$

**** Ratio of edge distance to rivet or bolt diameter of 2 or greater. For smaller ratios, multiply this working stress by the ratio.

(d) If less than 15 percent of the area of a given cross section lies within 1 inch of a weld, the effect of the weld may be neglected and the working stresses for non-welded structural members may be used. If the area of a cross section that lies within 1 inch of a weld is between 15 percent and 100 percent of the total area of the cross section, the working stress shall be calculated in accordance with the provisions of Section 2502.2 (a) of this code.

(e) **WORKING STRESSES IN SHEAR FOR ALUMINIUM RIVETS AND BOLTS SHALL NOT EXCEED THE FOLLOWING STRESS IN POUNDS PER SQUARE INCH.**

(NOTE: These stresses may be increased by 33-1/3% for wind stresses. See 2502.2 (a) above.)

Description of Rivet or Bolt	Shear on Effective Shear Area	Tension on Root Area
6053-T61 rivets, cold driven	8,500	-
6061-T43 rivets, driven at temperatures of from 990° to 1050° F	9,000	-
6061-T6 rivets, cold driven	11,000	-
6061-T6 pins	11,000	-
2024-T4 bolts	16,000	26,000

- (f) WORKING STRESSES IN SHEAR FOR FILLET WELDS SHALL NOT EXCEED THE FOLLOWING ALLOWABLE SHEAR STRESS * IN LBS. PER SQUARE INCH.

(NOTE: These stresses may be increased by 33-1/3% for wind stresses. See 2502.2 (a) above.)

Filler Alloy	Transverse Shear in Single Fillet Welds or Longitudinal Shear*		Transverse Shear in Double Fillet Welds	
	Parent Material Alloy			
	6061-T6	6063-T5 or 6063-T6	6061-T6	6063-T5 or 6063-T6
5556	8,500	6,500***	9,000**	6,500***
5356	7,000	6,500***	9,000**	6,500***
4043	5,000	5,000	7,000	6,500***

* Shear stress is considered to be equal to the total load divided by the throat area in square inches, regardless of the direction of loading.

** Single fillet welds in transverse shear may be treated as double fillet welds in joints so designed as to prevent local bending of the parts adjacent to the fillet weld.

*** These values are controlled by the shear strength of the parent material; all other values are controlled by the strength of the fillet metal.

2502.2 Aluminium members shall be limited by the deflections set forth in the relevant Subsections of Chapter 20 of this Code.

2502.3 The working stresses for structural aluminium compression members shall vary with the ratio of effective length to the corresponding radius of gyration (L/r) of the section in accordance with the provisions of Section 2501.2 of this code. For main compression members, the ratio of 120 shall not be exceeded, except as provided by the provisions of Section 2501.2 of this code; for bracing and other secondary members in compression, the ratio of 200 shall not be exceeded.

2502.4 In laterally unsupported structural aluminium bending members, the working stress in compression elements shall be reduced in accordance with the provisions of Section 2501.2 of this code.

- 2502.5 The working stress in compression elements of columns and beams of such proportions that local buckling controls the design shall be reduced in accordance with the provisions of Section 2501.2 of this code.
- 2502.6 The working stress in shear in webs of beams shall vary with the ratio of web height to thickness in accordance with the provisions of Section 2501.2 of this code.

2503 DESIGN

- 2503.1 *The Buildings Control Officer may require that any structure using aluminium primary or secondary members be designed by an Engineer recognised by the Minister.*
- 2503.2 *Increases in allowable unit stresses as set forth for wind loads in Chapter 20 of this Code shall be applicable to aluminium structural members except that allowable unit stresses thus increased shall not exceed 75% of the minimum yield strength.*
- 2503.3 *In addition to flexural and shearing stresses, the critical factors of buckling, fatigue, stress raisers such as notches or holes or shape re-entrant corners, deflection and connections shall be considered and provided for by proper design.*

2504 CONSTRUCTION DETAILS

- 2504.1 *CONNECTIONS: Aluminium members shall be designed as set forth in the standards in Subsection 2501.2 hereinabove.*
- 2504.2 *STRUCTURAL DECKING AND SIDING:*
- (a) *Aluminium sections spanning between supports shall be limited in span to satisfactorily support the positive and negative loads set forth in Chapter 20 of this Code and the deflection of decking shall not exceed that set forth in Chapter 20.*
 - (b) *Aluminium sheets used for roof decking or siding shall be not less than 0.019" in thickness.*
 - (c) *Aluminium sheets shall be secured to the supports to adequately resist positive and negative loads. Attachments shall be at intervals not exceeding 8-1/2" and shall be secured to each other at side laps at intervals not exceeding 12" except that spacing of attachments may be greater if based on rational analysis and/or tests.*

- (d) *Fasteners shall have a head, and/or be provided with washers not less than 1/2" in diameter.*
- (e) *Fasteners located at end laps shall be placed not more than 2" nor less than 1" from the end of overlapping sheets.*
- (f) *Where roof or wall cladding is of aluminium an approved membrane to protect against water intrusion to the interior shall be provided or the aluminium cladding shall be designed and constructed with an approved continuous edge-interlock, overlap or seam to prevent water intrusion.*

2504.3 NON-STRUCTURAL DECKING AND SIDING:

- (a) *Non-structural aluminium sheets shall be backed with cladding as set forth in Chapter 3 of this Code.*
- (b) *Non-structural aluminium sheets shall have a minimum thickness of 0.019".*
- (c) *An approved membrane to protect against water intrusion shall be provided or the aluminium cladding shall be designed and constructed with an approved continuous edge-interlock, overlap or seam to prevent water intrusion.*
- (d) *Non-structural decking and siding shall be attached as set forth in Subsection 2504.2 hereinabove except that aluminium residential siding shall be attached by means of 0.120" diameter aluminium nails of sufficient length to penetrate studs 1". Nailing to studs shall be maximum 24" on centre horizontally and not to exceed 8" on centre vertically.*

2505 FABRICATION AND ERECTION DETAILS

- 2505.1 **OXYGEN CUTTING:** *Oxygen cutting of aluminium alloys shall not be permitted.*
- 2505.2 **BOLTS:** *Bolts and other fasteners used with aluminium shall be aluminium, stainless steel, aluminized, hot-dip galvanized or electro-galvanized steel.*
- 2505.3 **RIVETS:** *Rivets shall be driven hot or cold, as called for on the plans, and shall fill the holes completely. Rivet heads shall be concentric with rivet holes and shall be in proper contact with the surface of the metal. Defective rivets shall be removed by drilling.*

- 2505.4 **WELDING:** *Welding shall be accomplished by means of an arc of resistance welding process. No welding process that requires the use of a welding flux shall be used.*
- 2505.5 **PAINTING:** *Except as prescribed in this section, painting or coating of aluminium alloy parts shall be required only when called for on the plans.*
- 2505.6 **ERECTION:** *During erection, structural aluminium shall be adequately braced and fastened to resist dead, wind and erection loads.*
- 2505.7 **FIELD JOINTS:** *Field joints shall not be finally made up until that part of the structure which will be stiffened thereby has been properly aligned.*
- 2505.8 **WALL PANELS:** *Aluminium sheets used in wall panels shall have a thickness of not less than .032 inch.*
- 2505.9 **EXPANSION, CONTRACTION:** *Aluminium work shall be designed and anchored so that the work will not be distorted nor the fasteners overstressed from the expansion and contraction of the metal.*

2506 DISSIMILAR MATERIALS

- 2506.1 *Where aluminium surfaces come in contact with metals other than stainless steel, zinc, white bronze of small area or other metals compatible with aluminium, aluminium surfaces shall be kept from direct contact with such parts by one of these methods:*
- (a) *Painting the dissimilar metal with a prime coat of zinc-chromate primer or other suitable primer, followed by one or two coats of aluminium metal-and-masonry paint or other suitable protective coating, excluding those containing lead pigmentation;*
 - (b) *Painting the dissimilar metal with a coating of a heavy-bodied bituminous paint;*
 - (c) *A good quality caulking material placed between the aluminium and the dissimilar metal;*
 - (d) *A non-absorptive tape or gasket;*
 - (e) *Steel members hot-dip galvanized or zinc plated after fabrication.*
- 2506.2 *Dissimilar metals shall be painted if used in locations where drainage from them passes over aluminium.*
- 2506.3 *Aluminium surfaces in contact with lime mortar, concrete or other masonry materials shall be protected with alkali-resistant coatings, such as heavy-bodied bituminous paint or water-white methacrylate lacquer.*

- 2506.4** *Aluminium in contact with wood or other absorptive materials which may become repeatedly wet shall be painted with two coats of aluminium metal-and-masonry paint or a coat of heavy-bodied bituminous paint, or the wood or other absorptive material shall be painted with two coats of aluminium house paint and joints shall be sealed with a good quality caulking compound.*
- 2506.5** *Where aluminium is in contact with treated wood, such wood shall be treated with pentachlorophenol, 5 percent minimum concentration or creosote or zinc naphthanate, following the protective measures outlined in Subsection 2506.4.*

NOTES

CHAPTER 26 REINFORCED GYPSUM CONCRETE

2601 DESIGN

2602 STANDARDS

2603 STRESSES

2604 TESTS

2605 CONSTRUCTION DETAILS

2601 DESIGN

2601.1 DESIGN: Reinforced gypsum concrete shall be designed by methods admitting of rational analysis based on established principles of mechanics. The general assumptions and principles specified for reinforced concrete in the Chapter on Reinforced Concrete shall be the basis of the design of reinforced gypsum concrete so far as they are applicable.

2601.2 LIMITATIONS OF USE:

- (a) Reinforced gypsum concrete used for roofs of occupancies producing unusually high humidities shall be constructed with the use of non-absorptive formboard.
- (b) Reinforced gypsum concrete shall not be used:
 - (1) For floors.
 - (2) For direct support of concentrated loads, such as water tanks, fan bases, cooling towers, flag poles and signs. Details must provide for transmitting such loads directly to the walls or the primary framing.
 - (3) For exterior locations other than roofs.
 - (4) For ceilings of structures not completely enclosed, unless constructed with the use of non-absorptive formboard.

2601.3 **WORKMANSHIP:** *Reinforced gypsum concrete shall be in conformance with the tolerances, quality, and methods of construction as set forth in Standards referenced in this Chapter.*

2602 STANDARDS

The Standards listed in Appendix A are hereby adopted to supplement, but not supersede, the specific requirements set forth herein.

2603 STRESSES

Allowable unit working stresses and ultimate compressive stresses for Reinforced Gypsum Concrete shall be as follows:

UNIT WORKING STRESSES

Type of Stress	Class A	Class B
	Pounds per Square Inch	Pounds per Square Inch
Compression—Flexural	125	220
Compression—Bearing	100	165
Bond and Shear	10	20
Modulus of Elasticity	200,000	600,000

NOTE: This table of working stresses is based on gypsum concrete developing a minimum ultimate strength in compression as follows:

CLASS A: 500 psi
CLASS B: 1000 psi

2604 TESTS

The BCO may require a reasonable number of tests of gypsum-concrete units or the materials of gypsum-concrete construction to determine their quality.

2605 CONSTRUCTION DETAILS

2605.1 POURED-IN-PLACE GYPSUM:

- (a) Roof slabs of poured-in-place gypsum shall be solid and, for spans not exceeding 33 inches, shall have a minimum thickness of 2 inches not including the formboard.
- (b) Reinforcing fabric shall conform to ASTM Designation A185; shall be galvanized with a zinc coating conforming to ASTM Designation B6 and contain a minimum weight of coating of 0.30 ounces per square foot of uncoated wire surface determined in accordance with ASTM Designation A90; shall have an effective cross-sectional area of not less than 0.026 square inches per foot of width

or No. 12 gauge wire spaced four inches on centres as principal reinforcing nor less than 0.0075 square inches per foot of width or No. 14 gauge wire spaced eight inches on centres as temperature reinforcing, and shall be lapped not less than 16 inches at the ends. Sides of fabric shall be butted or spaced not more than four inches.

- (c) Sub-purlin shall be designed to provide a mechanical lock or key with the gypsum to resist uplift loads given in the Chapter on Live and Dead Loads (Chapter 20).
- (d) Sub-purlin shall be rigidly secured to the primary roof framing by welding, riveting or bolting to the supporting members including end supports, and where welded, such welding shall be not less than 3/8 inch length on both sides of the sub-purlin. Sub-purlins terminating at or on masonry walls shall be securely anchored to the masonry by a continuous member. Supporting masonry running parallel to the sub-purlin shall not be used in the installation of sub-purlin on or adjacent to the masonry.
- (e) Where sub-purlins are not used, resistance to uplift loads given in the Chapter on Live and Dead Loads (Chapter 20) shall be otherwise provided by suitable design equivalent to the sub-purlin.
- (f) Welding of sub-purlins to supporting members shall be done only under the supervision of a recognized welding inspector and such welding inspector shall submit certification in writing to the BCO that the welding was properly placed; or the BCO may require that the welds not be covered or concealed until inspection and approval by him.
- (g) Sub-purlins shall not be field-spliced between supports.
- (h) Suspended ceilings shall not be hung from the gypsum. Such ceilings may be hung from the sub-purling where the sub-purling are so designed.
- (i) Roof coverings shall be applied as specified in the Chapter on Roof Coverings.

2605.2 PRECAST GYPSUM UNITS:

- (a) Precast gypsum-concrete units for roof construction shall be of uniform thickness, solid or hollow or may be recessed on the underside. The span of precast gypsum concrete shall not exceed six feet eight inches. For the purpose of this section any span over three feet shall be called a long span.

- (b) Except as otherwise provided in Section 2605.2 (c) of this Chapter, precast gypsum-concrete units shall have not less than the following thicknesses:
 - (1) Solid units shall be not less than two inches thick; if a span over three feet shall be not less than three inches thick.
 - (2) Hollow units shall be not less than three inches thick, nor the shell in compression less than three-fourths inch thick; in a long span (over three feet), the units shall be not less than five inches thick nor the shell in compression less than one and three-eighths inches thick.
 - (3) Recessed units shall be not less than five inches thick nor the panel less than one and three-eighths inches thick.
- (c) Precast solid reinforced gypsum-concrete units, not more than 15 inches wide and bound on the long edges with structural or pressed steel of approved design anchored to the units, shall be not less than two inches thick. If the length of units is not less than one and one-half times the span and the steel binding on the edges is designed to interlock with adjoining units in the manner of tongue-and-grooved wooden plank and is of sufficient strength to transmit the load on one unit to adjoining units, the end joints may be staggered at random not less than two feet, and the construction may be designed as continuous.
- (d) Precast gypsum-concrete units for roof construction shall be reinforced, and unless the shape or marking of the unit is such as to insure its being placed right side up, the reinforcing shall be symmetrical so that the unit can support its load either side up.
- (e) Precast gypsum concrete units shall be bolted, or the edge-binding securely welded, to the supporting members. Clips or other methods where lateral movement would reduce the resistance to vertical uplift shall not be permitted.

CHAPTER 27 MASONRY

2701 DESIGN

2702 STANDARDS

2703 DEFINITIONS

2704 QUALITY, TESTS AND APPROVALS

2705 ALLOWABLE UNIT STRESSES IN MASONRY

2706 CONSTRUCTION

2701 DESIGN

2701.1 Masonry in buildings or structures shall be of the materials, proportions, strength and consistency as set forth in this Chapter and shall be designed by methods admitting of rational analysis according to established principles of mechanics and in accordance with the Standards adopted by this Code and set forth in the Appendix A.

2701.2 Buildings not exceeding three storeys or 30 feet in height shall be designed as either wall-bearing or skeleton frame or a combination thereof and all buildings more than three storeys or 30 feet in height shall be designed as a skeleton frame. Refer to Section 2706.2 of this Chapter for exterior wall requirements.

2702 STANDARDS

2702.1 *The Standards listed in Appendix A are hereby adopted as a part of this Code and supplement, but do not supersede the specific requirements as set forth herein.*

2702.2 *Masonry construction shall be in conformance with the tolerances, quality, and methods of construction as set forth in standards referenced in this Chapter; the Portland Cement Association Concrete Masonry Handbook, ANSI A 4.1, A 41.2 and AWS Structural Welding Code: Reinforcing Steel (D1.4). The Buildings Control Officer shall be contacted for any details beyond these standards*

2703 DEFINITIONS

The following words and terms shall for the purpose of this Code, have the meanings set forth in this Section:

DIMENSIONS: Dimensions given are nominal; actual dimensions of unit masonry may not be decreased by more than one half inch (1/2").

GROSS CROSS-SECTIONAL AREA OF HOLLOW UNITS, the total area including cells of a section perpendicular to the direction of loading. Re-entrant spaces are included in the gross area, unless these spaces are to be occupied in masonry by portions of adjacent units.

MASONRY UNIT, any brick, stone, or block conforming to the requirements specified in this Code.

HOLLOW MASONRY UNIT, a masonry unit whose cross-sectional area in any plane parallel to the bearing surface is less than 75 percent of its gross cross-sectional area measured in the same plane.

SOLID MASONRY, masonry consisting of solid masonry units laid contiguously in mortar, or consisting of plain concrete.

SOLID MASONRY UNIT, a masonry unit whose net cross-sectional area in every plane parallel to the bearing surface is 75 percent or more of its gross cross-sectional area measured in the same plane.

2704 QUALITY, TESTS AND APPROVALS

2704.1 GENERAL:

- (a) **QUALITY:** The quality of materials assembled into masonry and the method and manner of their assembly shall conform to the requirements of this Chapter.
- (b) **OTHER MATERIALS:** A material of masonry, other than set forth herein, which is noncombustible and otherwise sufficiently embodies the characteristics and satisfies the requirements of one of the materials herein may be approved by the BCO subject to such tests as he may prescribe.
- (c) **TESTS:** The BCO may require materials to be subjected to tests to determine their quality whenever there is reason to believe the materials used do not meet the requirements of this Code, and may require any tests to be repeated if there is any reason to believe that a material is no longer up to the standards on which the approval was based. The cost of such tests shall be borne by the person or persons proposing to use or continue the use of such material or product. Concrete block strength shall not be less than 400 pounds per square inch.

Tests of materials shall be made in accordance with the Standards given in Appendix A.

(d) **APPROVALS:**

- (1) *Only such masonry units as bear the approval of the BCO and are manufactured or fabricated by plants approved by the BCO shall be considered acceptable for the construction of buildings or other structures. Such approval shall be for a period not exceeding 12 months.*
- (2) The provisions for tests for approval of masonry units shall not be construed as a substitute for any tests otherwise required under this Chapter.
- (3) Failure of a manufacturer of masonry units to obtain approval or to submit tests as required in this Chapter, or such additional tests as the BCO may require, shall be cause for rejection of such masonry units.

2704.2 **BRICK:**

- (a) **GENERAL:** Brick shall include masonry units usually about two and one-fourth inches thick, three and three-fourths inches wide, and eight inches long, and not less than 75 percent solid.
- (b) **TESTS:** Tests shall be made in accordance with the Standards given in Appendix A.
- (c) **QUALITY:**
 - (1) Burned clay or shale brick shall conform to the Standards given in the Appendix A.
 - (2) Sand-lime brick shall conform to the Standards given in the Appendix A.
 - (3) Concrete brick shall conform to the Standards given in Appendix A.

2704.3 **STONE:** Stone for masonry shall be hard and durable.

2704.4 **CAST STONE:** Cast stone shall be made of Portland cement, aggregates and water with or without admixtures. Cast stone for load-bearing masonry or where exposed to the weather shall have an average compressive strength, at 28 days, of at least 3000 pounds per square inch and shall have not more than seven percent water absorption by weight.

2704.5 **CONCRETE BLOCKS:**

- (a) **GENERAL:**
 - (1) Concrete blocks shall be made of Portland cement, water and approved aggregates. The materials shall conform to the

requirements for the materials of concrete specified in the Chapter on Reinforced Concrete (Chapter 22), and the finished units shall meet the requirements of this Section.

- (2) Concrete blocks used for fire-resistive walls rated two hours or more or used for load-bearing or exterior walls shall have a minimum face-shell thickness of one and one-fourth inches, a minimum web thickness of one inch, and shall have a net cross-sectional area not less than 50 percent of the gross section.
- (3) Concrete blocks for other purposes shall have wall and web thicknesses of not less than three-fourths inch.
- (4) Where masonry walls are required by this Code to be eight inches in thickness, hollow concrete block units may be 7-5/8" x 7 5/8" x 15-5/8" modular dimension with corresponding widths for tie columns and tie beams.

- (b) **QUALITY:** Standard Units of hollow concrete block shall conform to the Standards given in Appendix A.

2704.6 **STRUCTURAL CLAY TILE:**

- (a) **LIMITATIONS:** All hollow burned clay wall tile used for fire-resistive walls rated two hours or more, load-bearing or exterior walls shall be load-bearing tile.
- (b) **TESTS:** Tests shall be made in accordance with the Standards given in Appendix A.
- (c) **QUALITY:**
 - (1) Structural clay load-bearing wall tile shall conform to the Standards given in Appendix A.
 - (2) Structural clay floor tile shall conform to the Standards given in Appendix A.
 - (3) Structural clay non-load-bearing tile shall conform to the Standards given in Appendix A.

2704.7 **GYPSUM TILE:**

- (a) **LIMITATIONS:** Precast gypsum shall not be used in load-bearing masonry or in any masonry which will be exposed to the weather.
- (b) **TESTS:** Tests of gypsum tile shall conform to the Standards given in Appendix A.

- (c) **QUALITY:** Gypsum partition tile or block shall conform to the Standards given in Appendix A.

2704.8 **PLAIN CONCRETE:** Plain concrete is concrete cast in place and not reinforced, or reinforced only for shrinkage or change of temperature. Plain concrete shall be mixed, placed and cured as specified for concrete in the Chapter on Reinforced Concrete (Chapter 22)., The minimum strength of regular concrete shall be not less than 2000 psi in 28 days as determined by 6"x 12" cylinders.

The minimum strength of light weight aggregate shall be not less than 500 psi in 28 days as determined by 6"x 12" cylinders.

2704.9 **PLAIN GYPSUM CONCRETE:** Plain gypsum concrete is gypsum concrete cast in place and either unreinforced or reinforced for shrinkage.

2704.10 MORTAR:

(a) **GENERAL:** *Except as otherwise set forth herein, all mortars and the materials therein shall conform to the "Mortar of Masonry Units," ASTM C 270.*

(b) **AGGREGATES:**

(1) *The gradation of aggregate for masonry mortar shall be such that the fineness modulus is between 1.20 and 2.35 when determined in accordance with "Aggregate for Masonry Mortar" ASTM C144 - 62T.*

(2) Aggregates should be quarried or washed in fresh water and should contain not more than one-twentieth of one percent salt by weight.

(c) **MORTAR:**

(1) Mortar used to bond unit masonry shall be of Type M, S, N, or O and shall comply with either the specifications set forth hereinafter or the Specifications of the Standards set forth in Paragraph 2704.10 (a).

MORTAR STRENGTH SPECIFICATIONS

Type	Minimum Average Strength (psi)
M	2500
S	1800
N	750
O	350

- (2) The type of mortar based on consideration of the location of the unit masonry construction shall be as follows:

Use or Location	Type of Mortar
Below grade foundations and walls	M
Swimming pool walls and retaining walls	M
Fire resistive walls rated 2 hours or more	M or S
Exterior walls and load bearing walls	M or S
Piers less than 32 inches wide	M or S
Partitions	M, S, or N
Solid Masonry units	One Classification less than the above
Mortar or grout under concentrated loads	M
Fences	M, S, N or O
Gypsum	Gypsum

- (3) All solid unit masonry shall be laid in full beds with full end joints. All hollow unit masonry shall be laid with full mortar coverage of the face shells in both horizontal and vertical joints.

MORTAR PROPORTIONS
(Parts by Volume)

Mortar Type	Minimum Compressive Strength at 28 Days (p.s.i.)	Portland Cement	Hydrated lime or Lime Putty		Masonry Cements Type II	Damp Loose Aggregate
			Min.	Max.		
S	2000	1	1/4	1/2	-	Not less than 2-1/4 and not more than 3 times the sum of the volumes of the cement and lime used.
N	750	1	1/2	1-1/4	-	
N(Masonry)	750	-	-	-	1	
O	350	1	1-1/4	2-1/2	-	

2705 ALLOWABLE UNIT STRESSES IN MASONRY

2705.1 COMPRESSION:

- (a) Allowable working compressive stresses in masonry walls shall not exceed the limits in pounds per square inch of gross area given in the following table:

Unit	Type N or O Mortar	Type M or S Mortar
Brick	200	300
Stone	450	600
Rubble Stone	200	300
Concrete Block	100	150
Clay Tile	80	100

- (b) The maximum allowable working stress in plain concrete shall be the following percentages of the ultimate strength of the concrete in compression:

Compression	0.20 $f'c$
Shear and diagonal tension	0.02 $f'c$

where $f'c$ represents the ultimate compressive strength.

2705.2 SHEAR: The shear in unit masonry shall not exceed one-tenth the allowable compressive stress.

2705.3 TENSION: Unreinforced unit masonry shall be assumed to have no value in resisting tension.

2705.4 CONCENTRATED LOADS: Walls of hollow masonry units shall not directly support concentrated loads.

2706 CONSTRUCTION DETAILS

2706.1 GENERAL:

- (a) Masonry walls of hollow or solid units or plain concrete shall be constructed as specified in this Section.
- (b) Designed reinforced concrete walls, columns and beams shall be as specified in the Chapter on Reinforced Concrete (Chapter 22), except that such designed columns and beams shall be not less than the equivalent of the minimums herein set forth.
- (c) Reinforced concrete required in this Section shall comply with the Chapter on Reinforced Concrete (Chapter 22).

- (d) Reinforced unit masonry shall comply with Sub-section 2706.1 herein.
- (e) Second-hand masonry units shall not be used unless they conform to the requirements of this Code, are sound, and have been thoroughly cleaned and are approved for use by the BCO.
- (f)
 - (i) *Horizontal joint reinforcement shall be provided at the joint next below the average window opening. Standard 9 gauge ladder type for reinforced masonry and truss type for all others shall be provided. This reinforcement shall extend 4" into tie columns or be tied to structural columns by approved methods where structural columns replace the tie columns.*
 - (ii) *Where individual larger or smaller window openings occur, the horizontal joint reinforcement shall extend into the adjacent masonry units a minimum of 16" each side of the opening. Where a tie or structural column occurs within 16" of such opening the methods of tying the reinforcement shall be as in (i) above.*

2706.2 EXTERIOR WALLS:

(a) GENERAL:

- (1) *Exterior walls of unit masonry shall have a minimum thickness of eight inches except as otherwise specified in Section 2706.2(b)(i) and Section 2704.5(a) and as specified under Chapters covering Types of Construction for heights of masonry walls.*

No roof or other members shall be placed to develop direct horizontal thrust on walls unless such walls are specifically designed for such thrusts.

8 inch thick unreinforced masonry block load-bearing walls shall be limited to 20 feet in height and 12 inch thick unreinforced masonry block load-bearing walls shall be limited to 30 feet in height.

12 inch masonry block load bearing walls may be used up to the 1st storey above the ground floor, and 8 inch masonry block load bearing walls may be used for the next 2 storeys.

The maximum area of wall panels of 8 inch thick unit masonry, as measured between the concrete members which frame the panel such as the beams and tie columns, shall not exceed 240 square feet.

Load bearing walls shall be analyzed and designed for strength where floor loadings are 60 psf or more, or where floors are of unusually long span.

Walls that are load bearing walls shall be so designated on the plans.

(b) **TIE COLUMNS:**

- (1) *Concrete tie columns shall be required in all exterior walls of unit masonry. Concrete tie columns shall be required at all corners, and at intervals not to exceed 20 feet centre-to-centre of columns, adjacent to any corner opening exceeding four feet in width, adjacent to any wall opening exceeding eight feet in width, and at the end of free-standing walls exceeding two feet in length. Where rough openings are between 3'-0" and 8'-0" in width, such openings shall have one #5 vertical reinforcing bar at each side. Vertical bars shall be into footings and tie beams. Structurally designed columns may be substituted for the tie columns herein required.*
- (2) Intermediate tie columns shall be not less than 12 inches in width. Tie columns having an unbraced height not exceeding 15 feet shall be not less in thickness than the wall nor less in thickness than a nominal 8 inches, and, where exceeding 15 feet in unbraced height, shall be not less in thickness than 12 inches.
- (3) Corner tie columns shall be not less than 12 inches in width on both sides of the corner, and not less in thickness than the wall nor less than a nominal 8 inches. The unbraced height shall be taken at the point of positive lateral support in the direction of consideration or the column may be designed to resist applicable lateral loads based on rational analysis.
- (4) Intermediate tie columns shall be reinforced with not less than four No. 5 vertical rods, nor less than 0.0125 of the gross cross-sectional area (whichever is greater), tied with No. 2 (1/4") closed hoops spaced not more than 12 inches apart. Vertical reinforcing shall have starter bars provided in the footing and splices shall be lapped 24 bar diameters. Starter bars are not required if the column steel is embedded in the footing without splices at the bottom of the steel. For No. 5 bars, a standard lap distance of 15" shall be used. If high strength steels are used to provide a structurally designed column, laps shall conform to the standards given in the Chapter on Reinforced Concrete (Chapter 22).

- (5) Corner tie columns shall be reinforced with not less than five No. 5 vertical rods, nor less than 0.0125 of the gross cross-sectional area (whichever is greater), tied with No. 2 (1/4") closed hoops spaced not more than 12" apart, staggered so that each longitudinal rod shall have lateral support provided by the corner of a tie. Vertical reinforcing shall have starter bars provided in the footing and splices shall be lapped 24 bar diameters. Starter bars are not required if the column steel is embedded in the footing without splices at the bottom of the steel. For No. 5 bars, a standard lap distance of 15" shall be used. If high strength steels are used to provide a structurally designed column, laps shall conform to the standards given in the Chapter on Reinforced Concrete (Chapter 22).
- (6) The concrete tie columns set forth herein are a minimum to limit masonry panel areas and provide an integrated framework for masonry. The spacing of concrete columns for skeleton frame construction, designed as specified in the Chapter on Reinforced Concrete, may exceed the spacing herein set forth provided the masonry panels have an area of less than 240 square feet and provided the structural system is designed to transmit horizontal wind loads to the columns.
- (7) Concrete tie columns designed to limit masonry panel areas may be offset at tie beams or other horizontal members to avoid openings, but the maximum spacing shall not be exceeded.
- (8) Concrete columns in load-bearing walls shall be poured only after masonry units are in place. Where masonry walls of skeleton frame construction are laid up after the frame has been erected, lugs not less than one inch deep by three inches wide, or some other similar form of construction as approved by the Buildings Control Officer, shall be provided in the concrete which forms the perimeter of such panels. Where structural steel members are made fire resistive with masonry units, the panel walls shall be bonded into the fire-resistive materials.
- (9) In the case of a low cost housing scheme, designated as such by the Minister responsible for Housing, the tie column requirements set forth above may be relaxed provided that:
 - (i) Acceptable design computations, for each model of building used in the scheme, which admit of a rational

analysis according to accepted engineering principles, shall be furnished by an Engineer recognised by the Minister and such computations shall be approved by the Buildings Control Officer before construction commences.

- (ii) The Engineer responsible for the design analysis shall be responsible for the supervision of all the structural work on site. He shall keep a log of his inspections, copies of which shall be lodged with the Buildings Control Officer during the progress of the scheme.
- (iii) The Engineer shall also test all materials used in the construction of the buildings, on a regular basis, and shall provide the results of all such tests to the Buildings Control Officer.

(c) TIE BEAMS:

- (1) A tie beam of reinforced concrete shall be placed in all walls of unit masonry, at each floor or roof level, and at such intermediate levels as may be required to limit the vertical heights of the masonry units to 16 feet.

Well compacted and confined soil below grade may be considered to provide lateral restraint but such restraint shall begin at a point one foot below grade.

- (2) A tie beam shall be not less in dimension or reinforcing than required for the conditions of loading nor less than the following minimums: A tie beam shall have a width of not less than a nominal 8 inches, shall have a height of not less than 12 inches, and shall be reinforced with not less than four No. 5 reinforcing bars placed two at the top and two at the bottom of the beam, in such manner that 1-1/2" protective cover is maintained at the reinforcement. ***Unless otherwise required by design, tie beams shall have #2 ties 12" on centre.***
- (3) The tie beam shall be continuous. Continuity of the reinforcing in straight runs shall be provided by lapping splices not less than 18 inches. Continuity shall be provided at corners by bending two bars from each direction around the corner 18 inches or by adding two No. 5 bars which extend 18 inches each way from the corner.

Continuity at columns shall be provided by continuing horizontal reinforcing through columns or by bending horizontal reinforcing in the columns a distance of 18 inches.

- (4) Changes in level of tie beams shall be made at columns.
 - (5) A tie beam may follow the rake of a gable or shed end if the slope does not exceed 3 in 12.
 - (6) The concrete in tie beams shall be placed to bond to the masonry units immediately below and shall not be separated therefrom by wood, felt, or any other material which may prevent bond. Felt paper no wider than the width of the cells of the block may be used provided that it is depressed a minimum of 2 inches in one cell of each block.
 - (7) *Tie and coping beams subject to uplift and lateral wind forces shall be sized and designed to resist all such forces. Tie beams over openings shall be sized and designed to resist dead and live loads combined with wind loads, whichever governs.*
 - (8) *Where metal fasteners or anchor bolts are required to secure joists, rafters, or a wall plate, to a tie beam, they shall be as set forth in Section 2406.4(d) or (e).*
- (d) **GABLE AND SHED END (HALF GABLE) WALLS:** *All masonry structures with gable end and shed end (half gable) walls shall have such end walls constructed of masonry, only in accordance with this subsection. A horizontal tie beams shall be provided in line with the low ends of the gables and sheds, except as permitted in Subparagraph 2706.2(c)(5) above, and designed in accordance with Subparagraphs 2706.2(a) and load requirements as set forth in Chapter 20 of this Code. A concrete coping following the rake of the gable, not less than 64 sq.in. in area reinforced with two #5 shall be provided. Tie columns at gable and shed ends shall be provided. Any intermediate tie columns required within the gable shall extend to the coping beam. Tie beams resting on masonry which are not subject to uplift and lateral wind forces shall be provided according to Subparagraph 2706.2(c)(2) hereinabove.*
- (e) **PARAPET WALLS:** Masonry parapet walls shall be not less than eight inches thick, shall be reinforced with minimum tie columns and shall be coped with a concrete beam not less than 64 square inches in cross-section, reinforced with two No. 4 reinforcing bars.

A parapet wall exceeding five feet in height above a tie beam or other point of lateral support shall be specifically designed to resist horizontal wind loads.

(f) **PIERS:**

- (1) *In any section of a masonry wall of an enclosed structure where openings are arranged to leave sections of walls less than 16", such sections shall be of steel or reinforced concrete.*
- (2) *Isolated masonry piers of unclosed structures shall be so constructed that the height of such piers shall not exceed ten times the least dimension, that the cells are filled with cement grout and reinforced with not less than two #5 bars anchoring the beam to the foundation.*

(g) **BRICK AND STONE WALLS:** Walls of brick and stone shall be laterally supported by tie columns and beams, or the equivalent thereof, as provided in this section and shall meet these additional requirements:

Tabby or rubble stone walls shall be four inches thicker than is required for solid brick or concrete walls of the same respective heights, but in no part less than 12 inches.

(h) **WALL ADDITIONS:** Where new walls are connected to existing walls, such connection shall be by means of a starter column of minimum 8" x 8" dimensions, reinforced with 2 No. 5 bars.

(i) **CHASES, RECESSES AND OPENINGS:**

- (1) *No chase or recess in any unit masonry wall shall be deeper than one-half of the wall thickness. No horizontal chase or the horizontal projection of a diagonal chase shall exceed four feet. No required tie column or tie beam shall be reduced in required dimension by chasing or recessing. No recess in a required thickness of a unit-masonry wall shall exceed overall dimensions of two feet by three feet.*
- (2) Openings shall have lintels of reinforced concrete. Where such lintel is precast or formed separately from a tie beam, it shall bear not less than 8 inches on the masonry, at each end. Where such lintel is formed integrally with the tie beam by deepening the tie beam above the opening, and the tie beam itself is capable of safely supporting all loads, the beam may span up to 6 feet in length and may be deepened not to exceed 4 inches without additional reinforcing.

(j) **GLASS BLOCK MASONRY:**

- (1) Thickness: Glass block masonry used in non-bearing portions of exterior or interior walls, shall have a minimum overall

thickness at the mortar joint of at least 3-1/2" inches and all mortar surfaces shall have satisfactory treatment for mortar bonding properties.

- (2) Area permitted:
 - (aa) Glass block panels in exterior walls shall not exceed 144 square feet of unsupported wall surface nor 25 feet in length nor 20 feet in height between mullions or other suitable supports. Glass block panels in interior walls or partitions shall not exceed 250 square feet of unsupported area nor 25 feet in any direction between such supports.
 - (bb) *Glass block panels, when used as window protectives in accordance with the Chapter on Fire Resistive Standards (Chapter 32), shall not exceed 100 square feet in area nor 10 feet in width or height and shall have reinforcement in every horizontal mortar joint, except between the two top rows.*
- (3) Construction:
 - (aa) Glass blocks shall be laid in Type S or M mortar. All mortar joints shall be completely filled and shall have a thickness of at least 1/4-inch and not more than 3/8-inch.
 - (bb) Horizontal mortar joints shall be reinforced with ties which shall run continuously from end to end of mortar joint, but must not "bridge" expansion joints. Where splices occur the individual length shall be lapped not less than 6 inches. The reinforcement shall be spaced not more than 2 feet apart vertically and shall be placed in the joint immediately below and above any openings within a panel.
 - (cc) Reinforcement shall consist of two parallel longitudinal galvanized steel wires, No. 9 gauge or larger, spaced 2 inches apart, and having welded thereto No. 14 gauge or heavier cross wires at intervals not exceeding 8 inches, or the approved equivalent.
 - (dd) Exterior glass block panels shall be held in place in the wall opening to resist both external and internal pressures due to wind. Panels shall be set in recesses at the jambs and, for panels exceeding 10 feet in horizontal dimension between supports, at the head as

well, so as to provide a bearing surface at least one inch wide along the panel edges; except that the BCO may approve anchorage by means of corrosion resistant perforated metal strips for panels not larger than 100 square feet in area with no dimension greater than 10 feet and located at a height not over 4 storeys or 52 feet above grade.

(ee) Exterior glass block panels shall be provided with expansion joints at the sides and top. Such joints shall be entirely free of mortar, and shall be filled with resilient material.

(ff) Where glass blocks are used as veneer in masonry construction, the glass block panels shall be self-supporting, with suitable ties into the masonry wall, and shall be clear from and not adhering to the masonry.

(k) GRILL BLOCK: Decorative grills or screens constructed of unit masonry laid with cells open through the wall shall be as set forth herein or designs shall be based on rational analysis to resist applicable loads and computations shall be submitted to the BCO for approval.

(1) Unit masonry grills or screens as described in this Paragraph shall not be load-bearing.

(2) Unit masonry in exterior walls shall be laid in Type M or S mortar.

2706.3 INTERIOR BEARING WALLS: Interior bearing walls shall be constructed as specified in Section 2706.2 for exterior walls, except that interior-bearing walls in one-storey buildings of occupancy where not required to be more than one-hour fire-resistive construction may be constructed of four inch concrete block not exceeding nine feet in height, capped with a reinforced concrete beam not less than four inches in width nor less than 12 inches in height, reinforced with two one-half inch rods, and such wall shall support only a roof or ceiling not in excess of 700 pounds per lineal foot with no chases or recesses.

2706.4 FIRE WALLS: Fire-walls shall be constructed as set forth in Section 2706.2 for exterior walls and as set forth in the Chapter on Fire-Resistive Standards (Chapter 32).

- 2706.5 PANEL WALLS:
- (a) Panel walls of unit-masonry shall be not less than eight inches thick and shall be limited in panel dimensions as set forth in Section 2706.2.
 - (b) Panel walls of reinforced concrete shall be not less than four inches thick nor less than required by design as specified in the Chapter on Reinforced Concrete. (Chapter 22).
- 2706.6 VENEERED WALLS:
- (a) MASONRY BACKING:
 - (1) Veneering or facing on masonry backing shall not be considered as adding any strength to such walls and shall be limited in height above foundations or between proper and adequate supports to 30 feet. Veneering shall be securely anchored to masonry backing by means of substantial, non-corroding metal wall ties, spaced not farther apart than 16 inches vertically or 24 inches horizontally.
 - (2) Tile veneering, not more than one inch thick with individual units not exceeding 20 inches in any dimension and having not more than 200 square inches of surface area with corrugations or scorings on the back side thereof, need not be anchored in accordance with the above requirements but shall be cemented solid to the backing with Portland cement mortar so as to provide a continuous integral support to the backing. Other types of mortar or adhesives may be used if approved by the BCO.
 - (b) WOOD BACKING:
 - (1) In all cases, before applying masonry veneer, a substantial water proofed paper or asphalt-saturated felt, weighing not less than 14 pounds per 100 square feet shall be applied horizontally, shingle fashion, over diagonal sheathing. Horizontal joints in the paper or felt shall be lapped not less than four inches and vertical end joints not less than six inches.
 - (2) Masonry veneer shall be not less than three and three fourths inches thick and shall be bonded to the backing by means of substantial non-corroding metal wall ties spaced not farther apart than 16 inches vertically and 24 inches horizontally.
- 2706.7 PARTITIONS:
- (a) The requirements specified herein shall apply to non-bearing interior separations, other than fire-walls, or unit masonry construction.

- (b) The lateral distance between vertical supports of non-bearing interior partitions of unit-masonry shall not exceed 72 times the actual thickness of the partition, including plaster.
- (c) The height of unit masonry partitions shall not exceed 36 times the actual thickness, including plaster.
- (d) Bonding between interior partitions and exterior walls shall be provided to the satisfaction of the BCO.
- (e) A concrete foundation shall be provided under non-bearing masonry partitions and shall be 12" wide and 8" thick, with two No. 5 bars or depressed steel mesh for reinforcement.

2706.8 OTHER MASONRY WALLS: Walls of masonry materials or arrangements of masonry units other than those specifically set forth in this Chapter shall be in conformance with the general provisions of this Code, and may be classified by the BCO as one of the types of arrangements provided for herein and subject to all or any of the requirements for this classification, and any such additional requirements as the BCO may prescribe.

2706.9 ALLOWABLE SHEAR ON STEEL BOLTS: The allowable shear on steel bolts for all masonry except gypsum and unburned clay units shall not exceed the following:

Diameter of Steel Bolt (Inches)	Embedment (Inches)	Solid Masonry (without cells) (Shear in Pounds)	Grouted Masonry (Shear in Pounds)
1/2	4	350	550
5/8	4	500	750
3/4	5	750	1100
7/8	6	1000	1500
1	7	1250	1850 [1]
1 1/8	8	1500	2250 [1]

[1] Permitted only with not less than 2500 pounds per square inch units.

NOTES

PART VI
DETAILED REQUIREMENTS

CHAPTER 28

EXIT FACILITIES AND STAIRS

- 2801 GENERAL**
- 2802 REQUIRED MEANS OF EGRESS**
- 2803 STAIRWAYS**
- 2804 RAMPS**
- 2805 SMOKEPROOF TOWERS**
- 2806 HORIZONTAL EXITS**
- 2807 EXIT COURTS AND EXIT PASSAGEWAYS**
- 2808 RAILINGS**
- 2809 ELEVATORS AND ESCALATORS**
- 2810 AISLES AND CORRIDORS**
- 2811 DOORS AND DOORWAYS**
- 2812 EXIT SIGNS AND LIGHTS**
- 2813 MAINTENANCE**

2801 GENERAL

2801.1 **PURPOSE:** The purpose of this Chapter is to provide minimum standards of exit facilities for occupants of buildings.

2801.2 **SCOPE:**

- (a) Every building or portion thereof hereafter erected shall be provided with exits as required by this Chapter and as set forth in the Chapters on Occupancy. (Chapters 4-13 inclusive).
- (b) No building or structure under construction shall be occupied in whole or in part until all exit facilities required for the part occupied are completed and available for use in case of emergency.
- (c) No building or structure, including existing buildings and structures, shall be added to or altered so as to reduce the number or capacity of exit ways to less than required in this Chapter, and as set forth in the Chapters on Occupancy. (Chapters 4-13 inclusive).
- (d) No building shall be occupied during additions or alterations unless all required exits and any required fire protection are continuously maintained, or in lieu thereof other measures are taken which provide equivalent safety.

- (e) *The National Fire Protection Association's Life Safety Code NFPA 101 is recognised as a standard of good practice, however, it shall not supercede the specific requirements set forth herein.*

2801.3 DEFINITIONS: For the purpose of this Chapter, certain terms are defined as follows:

BALCONY, EXTERIOR EXIT, is a landing or porch projecting from the wall of a building, and which serves as a required means of egress. The long side shall be at least 60 per cent open, and the open area above the guardrail shall be so distributed as to prevent the accumulation of smoke or toxic gases.

EXIT: — means that portion of a means of egress that is separated from all other spaces of the building, or structure, by walls, floors, doors or other means which provide a protected way of travel to the exit discharge.

EXIT ACCESS: — means that portion of a means of egress which leads to an entrance of an exit.

EXIT COURT: — means a yard or court providing egress to a public way for one or more required exits.

EXIT DISCHARGE: — means that portion of a means of egress between the termination of an exit and a public way.

EXIT PASSAGEWAY: — means a horizontal means of exit travel protected from fire in a manner similar to an enclosed stairwell in order to provide continuity of the protected means of egress, i.e. from an internal enclosed stairwell to the exit discharge.

MEANS OF EGRESS: — means a continuous and unobstructed path of exit travel from any point in a building or structure to a public way and consists of three separate and distinct parts:

- (a) Exit Access
- (b) Exit
- (c) Exit Discharge

A means of egress may comprise of both horizontal and vertical ways of travel including intervening room spaces, aisles, doorways, corridors, passageways, balconies, ramps, stairs, enclosures, lobbies, escalators, courts and yards.

OCCUPANT LOAD is the total number of persons that may occupy a building or portion thereof at any one time.

PANIC HARDWARE: *A type of latching device used on certain doors in means of egress in which the release mechanism is operated by the application of force in the direction of exit travel.*

PUBLIC WAY is any parcel of land unobstructed from the ground to the sky, more than ten feet (10') in width, appropriated to the free passage of the general public.

TRAVEL DISTANCE: — means the distance to an exit measured on the walking surface along the centre line of the natural path of travel, starting one foot from the most remote point and ending at the centre of the doorway, or other point, at which the exit begins.

- (a) In the case of open areas, the distance to the exits shall be measured from the most remote point subject to occupancy.
- (b) In the case of individual rooms subject to occupancy by no more than six persons, the distance to the exit shall be measured from the doors of such rooms provided the path of travel from any point in the room to the room door does not exceed fifty feet.
- (c) Where the path of travel includes stairs, the measurement shall be taken in the plane of the tread nosings.
- (d) Travel distances in excess of the maximum distances set forth, in Chapters 5—13 inclusive, may be approved by the Buildings Control Officer only if the building is equipped with a complete automatic sprinkler system and provided also that the smoke control system is such as to provide sufficient egress time so as to permit the occupants to reach floor exits in safety. In no case shall the travel distance to the nearest floor exit exceed 400 feet. The permitted increased distances are given in Table 37—1 Chapter 37.

2801.4 GENERAL:

- (a) Means of egress shall be permitted across roofs only where the roof construction is of protected noncombustible material.
- (b) Ramps as herein specified, may be substituted for required stairways.
- (c) Escalators, when constructed and arranged as specified in Section 2809, may be used in the calculation of exit stairways only where open interior stairways are permitted.

- (d) The requirements of this Chapter shall not apply to single-family and duplex occupancies except as specifically stated.
- (e) Minimum head room in all means of egress shall be not less than seven feet and six inches, except as follows:
 - (1) Head room at doors shall be not less than six feet eight inches.
 - (2) Head room at all points of stairs and landings shall be not less than seven feet and six inches, measured vertically above treads and landings, but shall not be less than six feet six inches as measured perpendicularly to a line running through the nosing of the flight.
- (f) All exits shall provide a continuous way of egress to a public space, so that buildings may be emptied with minimum danger to life.
- (g) Means of egress shall continue with no decrease in required widths to a public street or way.
- (h) Nothing that could confuse the direction of exit travel shall be placed in any means of egress.
- (i) Travel distances shall be as set forth in this Chapter and the Chapters on Occupancy. (Chapters 4-13 inclusive and Chapter 37).
- (j) Unless otherwise specifically stated, exits from the ground floor shall be proportioned on the basis of the exits required therefrom plus the required unit of exit width from other floors that exit through the ground floor exits.
- (k) Where stairways serve two or more upper floors the same stairway required to serve one upper floor may serve other upper floors except those serving atriums and permitted unenclosed vertical openings.

2801.5 OCCUPANT CONTENT:

- (a) The occupant content for which exit capacity shall be provided shall be determined as set forth in the classification in the Chapters on Occupancy (Chapters 4-13) and in this Chapter and shall be the maximum number of persons that may be anticipated to occupy a building or portion thereof at any time under any reasonably foreseeable condition. Where a building or fire division thereof is of multiple Occupancy use, rooms and spaces incidental to the principal Occupancy may be considered separately in accordance with the occupant content most reasonably applicable. Where occupant

content is this computed for multiple Occupancy, exit facilities shall be provided as set forth in the Chapters on Occupancy. (Chapters 4-13).

- (b) Buildings shall not be occupied beyond the occupant content for which exits are provided except that the BCO may permit proportional adjustment of exit facilities where the occupant content is clearly established as being more or less than set forth herein.
- (c) The number of occupants of any building or portion thereof shall not exceed the permitted or posted capacity.

2802 REQUIRED MEANS OF EGRESS

2802.1 GENERAL:

- (a) Details of required means of egress including doorway and location requirements are based upon the type of occupancy and are given in the Chapters on Occupancy (Chapters 4-13) and in this chapter.
- (b) Where exits serve more than one floor, only the occupant load of each floor considered individually need be used in computing the capacity of exits at that floor, provided that the exit capacity shall not be decreased in the direction of travel.

EXCEPTION:

- (i) Special exit requirements for certain Occupancies, where up to three communicating floor levels may be permitted without enclosure protection between floors, are given in Section 1507.1(b).
- (ii) Exit facilities for atriums shall be in accordance with Section 515.4.

2802.2 ASSEMBLY OCCUPANCY: Occupant contents for buildings of assembly occupancy shall be computed as given in the Chapters on Occupancy (Chapters 4-13) and in this Chapter.

2802.3 WIDTH OF EXITS:

- (a) *Width of exits shall conform to the requirements given in the Chapters on Occupancy (Chapters 4-13) and in this Chapter.*
- (b) *Where a doorway is divided by mullions, the allowable units of exit width for the entire doorway shall be the sum of the units of exit width calculated separately for each individual door in the opening.*

- (c) *No door opening in the means of egress shall be less than 32" in clear width.*
- (d) *No single door in a doorway shall exceed 44" in width.*

2802.4 ARRANGEMENT OF EXITS: Arrangement of exits shall conform to the requirements given in the Chapters on Occupancy (Chapters 4-13) and in this Chapter.

2802.5 TRAVEL DISTANCE: Travel distance from any point to the exit shall conform to the requirements given in the Chapters on Occupancy (Chapters 4-13) and in this Chapter.

2803 STAIRWAYS

2803.1 GENERAL REQUIREMENTS:

- (a) Stairways shall be designed and constructed and shall be required and limited as set forth in the Chapters on Occupancy (Chapters 4-13), the Chapters on Types of Construction (Chapters 14-19), and in this Chapter.
- (b) Stairways and intermediate landings shall continue with no decrease in width along the direction of exit travel.
- (c) No flight of a stairway shall have less than three risers.
- (d) No flight of a stairway shall have a height of more than ten feet, and no flight of a stairway serving occupancies of more than 300 persons shall have a height of more than eight feet. Intermediate landings shall be provided as set forth in Section 2803.7.
- (e) The width of stairways shall be measured between walls or guard rails. A hand rail projecting not more than three and one-half inches shall not be considered to decrease a stair width.
- (f) Stairways serving an occupant load exceeding 50 persons shall be a minimum of 44" in width.
- (g) Stairways serving an occupant load of 50 persons or less may be a minimum of 36" in width.
- (h) Stairways within single family dwelling units and stairways not intended for public use serving an occupant load of 10 persons or less, may be a minimum of 30" in width.

- (i) The underside of all interior stairways which are of combustible materials, other than single-family residences, shall be protected by one-hour fire-resistive construction.

2803.2 ARRANGEMENT AND ACCESS:

- (a) In every building of four or more stories in height one stairway shall be extended to provide access to the roof, unless—
 - (i) the roof has a slope in excess of 3 in 12, or
 - (ii) access to the roof is purely for the maintenance of the roof and equipment thereon.
- (b) In buildings of three or more stories in height with a roof slope of less than 3 in 12 and where a stairway to the roof is not provided, a trap door or trap doors shall be provided to permit access to all parts of the roof from a common space on the top floor, preferably at a stairway. In such buildings, where permanent stairways are not provided and there is equipment on the roof requiring frequent maintenance permanent ladders at trap doors shall be provided.
- (c) A stairway which serves a roof shall discharge directly to a street or shall connect thereto by means of a passageway or exit court.
- (d) Not less than one half of the required number of stairways shall discharge directly to a street or shall connect thereto by means of a passageway or exit court.
- (e) All stairways which may be used for exit purposes shall be readily visible and shall make clear the direction of egress to the street. Provision shall be made, where stairways continue beyond the main exit to the exterior, to prevent persons exiting from other floors from passing the main exit.
- (f) Stairways shall abut on not more than one side of an elevator enclosure.
- (g) *In no case shall access to an exit be through kitchens, storerooms, restrooms, workrooms, closets, bedrooms or similar spaces or other rooms subject to locking. Except that where the exit access is required to serve only a bedroom or other room subject to locking, or adjoining rooms constituting part of the same dwelling or apartment used for single-family occupancy.*

2803.3 TREADS AND RISERS:

- (a) There shall be no variation exceeding 3/16" in the depth of adjacent treads or in the height of adjacent risers and the tolerance between the largest and smallest tread shall not exceed 3/8" in any flight.
- (b) All treads less than 10" deep shall have a nosing of not less than one inch, or a rake of not more than two inches, over the level immediately below.
- (c) The surface of stair treads and landings shall be such as to not involve danger of slipping. Continuous strip carpeting providing a rounded and padded nosing shall be considered unsafe. Carpeted treads with metal nosings may be accepted.
- (d) So far as practicable, treads and risers shall be different shades or colours, or a nosing strip to distinguish between tread and riser shall be provided.
- (e) Treads shall not vary more than three-sixteenths inch from level.
- (f) Treads and risers shall be so proportioned that the sum of two risers and one tread, exclusive of nosing, shall be not less than 24 inches nor more than 25 inches. For main stairways of other than residential occupancy, no riser shall be more than seven and one-half inches, and no tread less than ten inches, exclusive of nosing; and for other stairways, no riser shall be more than eight inches and no tread less than nine inches, exclusive of nosing.

2803.4 WINDERS: Winders may be used in Group H Occupancies and within single family dwelling units of Group G Occupancies, in stairways used as a means of egress, provided that the minimum depth of tread, when measured at a point not more than 18" from the side of the stairway where the treads are narrowest, is the same depth as all the normal treads in that flight of stairs.

2803.5 CIRCULAR STAIRWAYS: In Buildings with permitted unenclosed vertical openings, a curved monumental stairway may be used to connect the street level floor to the next level above. Such a stairway may be used as a required means of egress if all the requirements for exit stairs are complied with, including minimum depth of treads, the stairway shall also have a minimum radius of 25 feet or more at the inner edges.

2803.6 SPIRAL STAIRS: A spiral stair, constructed of noncombustible materials, may be used in a means of egress in Groups E and F Occupancies and

within single family dwelling units, where it serves an occupant load of five or less persons provided: —

- (a) The clear width of the stairs is not less than 26"
- (b) The riser height shall not exceed 9-1/2"
- (c) The minimum headroom shall not be less than 6'-6"
- (d) At a point 12" from the face of the centre column the tread shall have a minimum depth of 7-1/2"
- (e) All treads shall be identical.

2803.7 LANDINGS:

- (a) The length of intermediate landings shall be not less than the width of the stairways in which they occur but shall not be required to exceed 44 inches in straight-run stairs.
- (b) Doors swinging into landings which serve as a path of egress from floors above shall not reduce the width of such landings to less than 22 inches nor, when open, interfere with the full use of the landing except that in other than residential occupancies, swinging doors during their swing shall not reduce the required width of stairs or landings.
- (c) The outer corners of landing of stairways in other than residential occupancies shall be curved on a radius of at least two feet or shall have a 45-degree splay not less than 20 inches apart.
- (d) No door shall open directly onto a flight of stairs, but landings, as specified in this section, shall be provided between a door and a flight of stairs.
- (e) The requirements for landings shall apply to all occupancies, including residential occupancies, unless otherwise noted.
- (f) The vertical distance between landings shall not exceed 10 feet.

2803.8 STAIRWAY ENCLOSURES:

- (a) All stairways shall be enclosed where required under the Chapters on Types of Construction (Chapters 14-19), or the Chapters on Occupancy (Chapters 4-13), and enclosures shall include the means of egress, so that once inside enclosures, persons may go from any part of the enclosure to the outside exit without leaving the enclosure.

- (b) Stairway enclosures shall not be used for storage or equipment.
- (c) All stairway enclosures serving the upper stories of a building shall discharge at the main street level floor. No such stairway shall continue below that level.
- (d) Doors in connection with stairway enclosures shall be as specified in Section 2811.

2803.9 OUTSIDE OPEN STAIRWAYS:

- (a) Where enclosure of inside stairways is required, outside stairways shall be separated from the interior of the building by walls having the same fire rating as that required for the enclosure of the inside stairways with fire doors protecting any openings therein.

EXCEPTION: The above protection shall not be required where the open stairway is located on the side of the balcony away from the building, if separated from the building by the full required width of the balcony and if the building is less than three stories high and the level of the top floor is no more than 20' above average grade.

- (b) There shall be no opening within 15 feet measured horizontally from any balcony, platform, landing or stairway constituting part of the means of egress. This provision does not apply to any balcony, platform, landing, or walkway, leading from the same floor to an exit. Openings around an outside corner (outside 270 degrees) of the building may be exempted from this restriction where there is more than one exit.
- (c) Outside open stairways shall be constructed of non-combustible materials with solid risers, treads and landings, all access balconies leading thereto shall also be constructed of non-combustible materials.
- (d) Notwithstanding the above no part of any outside open stairway on buildings of four or more storeys shall be closer than thirty feet to any contiguous building line or building on the same lot.

2803.10 FIRE ESCAPES:

- (a) Fire escapes shall not be permitted as required means of egress for new construction.
- (b) Fire escapes may be permitted as a means of increasing the exit facilities of existing buildings less than four floors in height (including the ground floor) when additional exits are required, but

only where conditions do not permit the use of more adequate exit facilities.

- (c) Exterior fire escapes, where permitted, shall conform as far as possible with the requirements of Section 2803 of this Chapter, except that widths shall be based on 18 inches per unit of exit width with a minimum width of 24 inches; maximum height of risers shall be eight inches; minimum width of tread shall be nine inches, exclusive of nosing; landings shall be located to limit flights to not less than three nor more than 13 risers between landings.
- (d) Fire escapes shall be arranged and located as set forth in Section 2801.
- (e) Balcony and stair guard rails shall be designed for a lateral load of 50 pounds per lineal foot with deflection under load limited to 1/240 of the span and within the allowable working stresses of the material used.
- (f) Door openings located along or within ten feet below fire escapes shall be protected by self-closing, fire-resistive doors. Other doors or windows shall not be located within 10 feet of the full overall width of the fire escape.
- (g) The BCO may require permanent ladders to be provided for mechanics' access to machine rooms, tank towers and spaces, and for fire fighting access to flat roofs where no stairways serve the roof; such permanent ladders shall meet these minimum requirements:
 - (1) Distance between rails shall be not less than 16 inches.
 - (2) Distance between rungs shall be 12 inches in every case; top rungs shall be within six inches of the roof or parapet line.
 - (3) Rungs shall have a diameter of not less than seven-eighths inch and shall be riveted or welded in place.
 - (4) Rails shall be supported at intervals of not more than ten feet.
 - (5) Rails shall extend not less than 45 inches above the roof or parapet line, except where such ladders are inside and pass through trap doors.
 - (6) When the travel is between the ladder and the wall, the minimum clearance shall be 27 inches; and when on the outside,

there shall not be less than six and one-half inches clearance between the centre of the rungs and the wall.

- (7) Ladders shall be vertical, or may be positively inclined. No negative incline shall be permitted.

2804 RAMPS

Wherever stairways are required by this code, ramps may be substituted. The construction, width, enclosure, rails, and landings of such ramps shall be set forth in Section 2803 except as follows:

- (a) Changes of direction shall be at a landing or by a curve with radius of not less than 10 feet.
- (b) Ramps shall have non-slip surfaces and shall have a slope not greater than 1 in 10.
- (c) There shall be no variation in slope in the flight of a ramp between landings.
- (d) Ramps with slopes greater than 1 in 12 shall have hand rails as set forth in Sub-section 2808.2.
- (e) EXCEPTION: In places of public assembly, where line-of-sight of a performance is a consideration, the slope of viewing areas and aisles contiguous thereto may exceed the slopes otherwise set forth herein but such slopes shall be not greater than 1 in 5 as set forth in the Chapters on Occupancy (Chapters 4-13). Landings and hand rails may be omitted in viewing area and aisles contiguous thereto.

2805 SMOKEPROOF TOWERS

Smokeproof towers shall be as required under Chapters on Occupancy (Chapters 4-13), and Chapters on Types of Construction (Chapters 14- 19). A smokeproof tower shall consist of a continuous fire-resistive stairway enclosure protecting a stairway from fire or smoke in the building served, together with entrance vestibules or balconies and shall provide a means of egress from the roof and all stories.

- 2805.1 VESTIBULES: Access to the stairway of a smokeproof tower enclosure shall be provided from each storey through vestibules open to the outside of an exterior wall or from balconies overhanging an exterior wall, but such vestibule or balcony to its nearest point as measured at right angles to the vestibule or balcony opening shall be not closer than 20 feet to the building line of a contiguous lot or any building on the same lot. Every such vestibule, balcony, or landing shall have an unobstructed length and

width not less than the required width of the stairway and every such vestibule shall be directly open to a public street or alley or open yard or court not less than 30 feet in width. Balconies or vestibules shall have guard rails of non-combustible material not less than four feet high, as set forth in Section 2808.

Balcony or vestibule floors shall be approximately level with the interior floors, and there shall be no step from a vestibule or balcony into the stairway enclosure.

- 2805.2 DOORS: Access to vestibules or balconies and from the vestibules or balconies to the stairway enclosure shall be through doorways not less than 40 inches wide. Such doorways shall be provided with self-closing, fire-resistive doors swinging in the direction of exit travel. Door hardware shall be as set forth in Section 2811.

An observation panel shall be required in each door from the stairway enclosure. Such panel shall not exceed 100 square inches in area of 12 inches in maximum dimension and shall be glazed with clear wire-glass.

- 2805.3 STAIRWAYS: All other provisions of this chapter relating to stairways shall also apply to smokeproof towers.

- 2805.4 EXIT DISCHARGE: Egress at ground level shall be to a public street or through an exit passageway leading to a public street.

- 2805.5 ENCLOSURES: Smokeproof-tower enclosures shall be of Type 1 (fire-resistive) construction. There shall be no openings in walls separating the enclosure from the interior of the building. Fixed or automatic fire windows are permitted in an exterior wall not subject to severe fire exposure from the same or nearby buildings.

2806 HORIZONTAL EXITS

A horizontal exit is an exit from a building or a fire division of a building to another building or another fire division of the same building. Such horizontal exit shall consist of a passageway or opening from one fire division to another, through or around a fire wall or by means of an enclosed passageway or bridge connecting two separate buildings or portions of the same building.

- 2806.1 AREA OF REFUGE: The area of refuge for which credit is allowed in connection with a horizontal exit shall have not less than one stairway of non-combustible material, arranged to prevent obstruction by the same fire or smoke, as the area from which refuge is taken.

The floor area on either side of a horizontal exit shall be sufficient to hold the occupants of both floor areas.

Horizontal exits shall not exceed 50 percent of the required number of floor exits from any exit area.

- 2806.2 **BALCONIES:** Balconies may be provided to lead around fire walls and shall be constructed as balconies for smokeproof towers.
- 2806.3 **BRIDGES:** Bridges to another building or another fire division of the same building, shall, when serving as part of a required path of egress, be of Type 1 construction, entirely enclosed or with openings protected by fire-resistive windows, and shall approximately meet the level of the floor served.
- 2806.4 **DOORS:** Each opening serving as a horizontal exit shall be protected by a self-closing swinging fire door. There shall be adjacent openings with swinging doors at each side, opening in opposite directions, with signs on each side of the wall indicating as the exit the door which swings with the travel from that side, or other approved arrangements, providing doors always swing with any possible exit travel. Doors shall be as specified in Section 2811.
- 2806.5 **GRADIENTS:** Where there is a difference in level between the connected floor areas, gradients of not more than 1 foot in 10 feet shall be provided. No stairs or steps shall be used in a horizontal exit.

2807 EXIT COURTS AND EXIT PASSAGEWAYS

- 2807.1 **EGRESS:** Egress from an exit court shall be directly to a public street or by a passageway to a public street. Not more than one required exit shall open into an exit court unless such court is open at both ends to a public street.
- 2807.2 **WIDTH:** Every exit court and exit passageway shall be not less in width than the required total width of the tributary means of egress and shall be a minimum of 44 inches wide.
- 2807.3 **CONSTRUCTION:** The walls of buildings within five feet of a required exit court shall have all openings therein to a height of ten feet protected by fire-resistive doors or windows; except that this requirement may be waived by the BCO where, in his opinion, no severe fire hazard exists.
- 2807.4 **PASSAGEWAY WIDTH:** Every exit passageway shall be not less in width than the required total width of the tributary means of egress and shall be a minimum of 44 inches wide.

2807.5 PASSAGEWAY CONSTRUCTION: A passageway shall be without openings other than entrance and exit doors and shall have walls, floors and ceilings of the same period of fire-resistance as that of the building, but not less than two-hour construction. Doors shall be as specified in Section 2811.

2808 RAILINGS

2808.1 GENERAL: The requirements of this section for guard rails and hand rails shall be applicable to all Groups of Occupancy including residential occupancy.

2808.2 GUARD RAILS:

- (a) Open sides of stairways, balconies and landings and any abrupt differences in level exceeding twelve inches shall have well-secured guard rails.
- (b) Where the difference in level is less than 24 inches, such guard rails shall be not less than 30 inches high, and for differences in level of 24 inches or more shall be 42 inches high above the floor of a balcony or landing, or 33 inches high above the nosing of treads of a stairway.
- (c) In all public buildings, buildings of multiple residential, or residential occupancy and all buildings to which the public has access in the normal course of events, guard rails shall be installed so that a sphere of 6 inches diameter shall not pass through any openings in such guard rails.
- (d) Guard rails shall be substantially designed and constructed to withstand a load of 50 pounds per lineal foot applied in any direction, within the allowable working stresses of the material used.
- (e) At windows exceeding 24 inches in width, where the difference in floor level on opposite sides of the window exceeds 6 feet, guard rails shall be provided as herein set forth. A solar screen may serve as a guard rail where such screen complies with the requirements of strength for a guard rail and with the requirements of strength for wind loads.

2808.3 HAND RAILS:

- (a) Flights of three or more steps shall have hand rails. Hand rails shall be on one side of such flights of steps, 44 inches or less in width, and on both sides of such flights of steps which exceed 44 inches in width.

- (b) Any such flight of steps, 88 inches or more in width, shall be provided with one or more intermediate hand rails, the number to be such that the spacing shall not exceed 66 inches.
- (c) Hand rails shall be placed not less than 33 inches nor more than 39 inches above the nosing of the treads, and all ends shall be returned.
- (d) Hand rails shall be so designed and erected that they will withstand a pressure of 50 pounds per lineal foot applied in any direction within the allowable working stresses for the material used.
- (e) Not less than one and one-half inches of clearance shall be provided at all points between any hand rail and a wall.
- (f) When guard rails or stairs meet the requirements for hand rails, additional hand rails shall not be required.
- (g) *Handrails shall be so designed as to be continuously graspable along the entire length.*
- (h) *Handrail ends shall be returned to the wall or floor or shall terminate at newel post.*
- (i) *Handrails that are not continuous between flights shall be extended horizontally a minimum of 12in. at the required height at the top and bottom landings where a guard or wall exists.*

2809 ELEVATORS AND ESCALATORS

2809.1 ELEVATORS: Elevators shall not constitute part of a required means of egress.

2809.2 ESCALATORS:

- (a) Escalators of the horizontal tread type normally operating in the direction of exit travel and complying with this Section may be substituted for stairways.
- (b) Escalators shall be constructed as set forth in the Chapter on Elevators and Escalators. (Chapter 43).
- (c) Only full units of exit width of an escalator may be substituted for a required exit width of a stairway.
- (d) Escalators serving as required exits shall be enclosed as required for stairways. Escalators continuous for more than two floors shall be enclosed or be protected by a water curtain or other method

meeting the requirements of the Standards given in the Appendices.

2810 AISLES AND CORRIDORS

Unless otherwise specified in the Chapters on Occupancy, aisles and corridors shall be as set forth in this Section.

2810.1 AISLES: Aisles shall be provided in every building or part thereof, and such aisles shall be not less than three feet in clear width and shall lead directly to an exit and be arranged to be readily accessible. Every exit shall have an evident and unobstructed aisle thereto.

2810.2 CORRIDORS:

- (a) Corridors which are a required means of egress shall be constructed of not less than one-hour fire resistive construction except as follows: In buildings of mercantile occupancy or office occupancy, or the office portion of industrial occupancy buildings not exceeding 4 floors in height, and on any floor of single tenancy of a building of any height, and on the ground floor of any building with the exception of the required horizontal exits, the corridor walls may be of noncombustible construction, doors may be of 1-3/8" solid wood with or without glass panels, free openings may be used provided the area of such openings does not exceed 10 percent of the gross wall area, and the area of glass shall not exceed 40 percent of the corridor-wall area as measured from the office side; the ceilings not required for protection to the structure may be of noncombustible construction. Ceilings required for protection of the structure shall comply with the Chapter on Fire Resistive Standards. (Chapter 32).

2811 DOORS

2811.1 GENERAL:

- (a) All doors serving required exits shall be substantially constructed, installed and maintained.
- (b) Doors serving required exits shall swing in the direction of exit travel when serving an occupant load of ten or more persons unless otherwise specified in the Chapters on Occupancy (Chapters 4—13) inclusive).
- (c) Doors in the path of exit travel shall be openable from the inside without use of a key or any special knowledge or effort at all times when the building, or portion of the building, or area served is occupied.

- (d) Unless fitted with panic hardware, all doors in the path of exit travel shall be kept unlocked at all times when the building is occupied.

EXCEPTION:

- (1) An exit door in a means of egress serving a secured area may be kept locked provided that: —
- (i) it does not form part of the means of egress for the general public
 - (ii) it serves no more than 6 employees
 - (iii) that a key for the lock shall be installed in a glass fronted box located adjacent to the lock
 - (iv) *Such secured area shall be provided with a fire alarm connected to the main panel*
 - (v) both the box and the lock shall be well illuminated by lights connected to an emergency power system.

EXCEPTION:

- (2) In buildings protected throughout by an approved supervised automatic fire alarm or automatic sprinkler system, unless in high hazard areas, exit doors may be locked if approved by the Buildings Control Officer, provided that such doors shall: —
- (i) unlock upon actuation of an approved supervised automatic fire alarm system or fire extinguishing system
 - (ii) unlock upon loss of power controlling the locking device, and
 - (iii) initiate an irreversible process which will free the latch within 15 seconds whenever a force of not more than 15 lbs. is applied to the release device and will not re-lock the door until it has been opened. Operation of the release device shall activate a signal in the vicinity of the door for assuring those attempting to exit that the system is functional.
 - (iv) the Buildings Control Officer may, in consultation with the Director of Fire Services, approve a delay not to exceed 30 seconds provided that reasonable life safety is assured.

- (v) signs shall be provided on the door adjacent to the release device which shall read:

“KEEP PUSHING, THIS DOOR WILL OPEN IN 15 SECONDS, ALARM WILL SOUND”.

*or as in (iv) above.

- (vi) the door shall be well illuminated by lights connected to an emergency power system.

- (e) Where pairs of exit doors are located in a means of egress each leaf of the pair shall be provided with its own releasing device. Devices which depend upon the releasing of one door before the other shall not be used.

- (f) Revolving, folding, sliding and overhead doors shall not be used in any means of egress unless exit doors of required width are installed adjacent thereto.

- (g) *No required doorways shall be less than 32" inches in width, and no leaf of an exit door shall exceed 44" in width.*

- (h) Exit doors, equipped with self-closing devices, shall be operative at any point in their swing by not more than 15 pounds of horizontal pressure applied at the outer edge thereof, and such closing device shall operate the door's closing at a rate not to exceed 90 degrees of arc in five seconds.

2811.2 WIDTH AND HEIGHT:

- (a) Door jambs shall not project into the required width of opening by more than two inches, and a 20-inch doorway width is equal to a 22-inch unit of required exit width as herein set forth.

- (b) Doorways shall be as specified in the following table:

Doorway Width		Number of Units	Stair Width
Nominal	Clear	Exit Width	Served by Door
30"	28"*	1	
36"	34"	1-1/2	36"
44"	40"	2	44"
66"	60"	3	66"
	2-28"s	2	44"
88"	2-40"s	4	88"

*Twenty-eight inches is the minimum allowed for an individual door.

The minimum height of a door serving as a means of egress shall be six feet eight inches.

2811.3 FIRE-RESISTIVE DOORS: Doors required to be fire resistive and located in required means of egress shall be self-closing and shall be kept free from obstruction.

2811.4 HARDWARE:

(a) PANIC HARDWARE: Panic hardware shall consist of bars or panels not less than two-thirds across the width of the door and not less than 30 inches, nor more than 44 inches above the floor.

Exit doors shall be provided with panic hardware when required in the Chapters on Occupancy, or for smokeproof towers in this Chapter and such hardware shall be operative in the direction of egress with 15 pounds of horizontal pressure. Only approved fire exit hardware shall be used on fire doors.

(b) OTHER HARDWARE: Any required exit door shall be unlocked during periods when the building is occupied or shall be equipped with panic hardware or locking hardware, operative in the direction of egress, without the use of keys or any special knowledge or skill.

2811.5 POWER-OPERATED DOORS:

(a) Power operated doors equipped with photoelectric-actuated mechanisms, or similar devices, that open upon the approach of a person, or doors with power assisted manual operation, shall be so designed that in the event of power failure the door may be opened manually, to permit exit travel, or closed when necessary to protect the means of egress.

(b) * Any such power-operated door forming a part of the required exit requirements shall also swing in the direction of exit travel by manual means.

EXCEPTION: *Power-operated sliding doors activated by an automatic mechanism may be permitted, provided that their movement can be manually overpowered and the door made to swing in the direction of travel thereby providing the required exit widths. The manual operation shall work at all times even when the other features of the door's mechanism (such as the treadle, an electric eye, the sliding rail etc.) have failed.

2812 EXIT SIGNS AND LIGHTS

Exit signs and lights shall be as set forth in the Chapters on Occupancy (Chapters 4-13), in the Electrical Chapter (Chapter 44) and in the Standards given in the Appendices.

At every required exit doorway, and wherever otherwise required to clearly indicate the direction of egress, an exit sign with letters at least 4 inches high shall be provided from all areas serving the occupant load specified in this Chapter. In interior stairways the floor level leading direct to the exterior shall be clearly indicated, with directional signs as required by the BCO.

Exit signs shall be required for buildings with assembly occupancy and for hotels and apartments, with an occupant load of more than 50, in conformance with the requirements of the Chapters on Occupancy. (Chapters 4-13).

Exit signs shall be required for buildings of all other occupancies serving an occupant load of more than 100, in conformance with the requirements of the Chapters on Occupancy. (Chapters 4-13).

Exit signs must be power battery operated and also be fitted with a spotlight. They shall be illuminated at all times when the building is occupied.

EXCEPTION: Main exterior exit doors which obviously and clearly are identifiable as exits need not be sign posted when approved by the BCO.

2813 MAINTENANCE

2813.1 **PHYSICAL CONDITION:** All required exitways shall at all times be maintained in good, safe, usable condition, and shall at all times be kept free and clear of obstructions and readily accessible.

2813.2 **OCCUPANCY PROHIBITED:** No part of a stairway, whether interior or exterior, nor of a hallway, corridor, vestibule, balcony, or bridge, serving as an exit way shall be used for any purpose which will interfere with its value as an exit way.

NOTES

CHAPTER 29

PRECAUTIONS DURING BUILDING CONSTRUCTION

- 2901 GENERAL**
- 2902 DEMOLITION**
- 2903 EXISTING BUILDINGS**
- 2904 EXCAVATION**
- 2905 COVERED SIDEWALKS AND HOARDINGS**
- 2906 STORAGE OF MATERIAL**
- 2907 PLATFORM HOISTS**
- 2908 HOISTING MACHINERY**
- 2909 HOIST TOWERS**
- 2910 DERRICKS AND CRANES**
- 2911 CABLES, ROPES, CHAINS AND BLOCKS**
- 2912 TEMPORARY FLOORING**
- 2913 FLOOR OPENINGS**
- 2914 RUNWAYS AND RAMPS**
- 2915 TEMPORARY STAIRS**
- 2916 LADDERS**
- 2917 SCAFFOLDS**
- 2918 GUARD RAILS AND TOE BOARDS**
- 2919 TEMPORARY LIGHT AND POWER**
- 2920 ACCIDENTS**
- 2921 SANITATION**
- 2922 WELDING AND CUTTING**
- 2923 OPEN FIRES**
- 2924 FIRE PROTECTION**
- 2925 SPECIAL HURRICANE PRECAUTIONS**
- 2926 INSPECTION**

2901 GENERAL

The provisions of this Chapter shall apply to all work in connection with the erection, addition to, alteration, repair, removal or demolition of buildings or structures.

The construction, erection, alteration and removal of scaffolds and the application, installation and setting up of safeguards and equipment devices shall be done by skilled workmen under the supervision of a person qualified by experience or training for such work.

Where the demolition or erection of a building occurs adjacent to a highway boundary, covered sidewalks or hoardings shall be required as set forth in subsection 2905.1. However no such covered sidewalk or hoarding shall be erected without the permission of the Minister. Application to erect a covered sidewalk or hoarding shall be made in writing to the Buildings Control Officer, that officer shall cause an inspection to be made of the premises in conjunction with the Commissioner of Police. Based upon that inspection the Buildings Control Officer shall make recommendation to the Minister. The Minister if satisfied may grant approval subject to such requirements and conditions as he deems fit.

A safeguard, device or piece of equipment which is unsafe shall be reported to the superintendent or foreman, who shall take immediate steps to remedy such condition or remove such safeguard, device or equipment.

Scaffolds, ladders, stairs, fuel gas tanks and other devices or equipment regulated by this Chapter shall be maintained in a good, safe and useable condition as long as in use.

Scaffolds, temporary floors, ramps, stairway landings, stair treads, and all other walkway surfaces shall be kept free from protruding nails and splinters. They shall be kept free from unnecessary obstructions so that the workers may move about safely.

Protruding nails and tie wire ends shall be removed, hammered in or bent in a safe condition.

Electric lines, moving ropes and cable gears, or similar hazards with which a worker might come in contact, shall be encased or guarded.

Prior to making an excavation, drilling or otherwise disturbing the ground, the person doing the work, or causing such work to be done, shall contact all public-utility organizations to determine the possible location of underground facilities, to avoid the hazard to public safety, health and welfare caused by the inadvertent disruption of such facilities.

No person, firm or corporation, either personally or through an employee or agent of another, shall operate or move any machinery, equipment, material, scaffolds or assembly closer than 12 feet to any energized high voltage overhead electrical facilities except with the approval of the Minister.

2902 DEMOLITION

2902.1 PERMISSION:

- (a) A building permit shall be required for the demolition of a building.

EXCEPTION 1: No building permit is required if the building is the subject of a valid demolition order issued by the Minister under Sections 10 or 11 of the Buildings Regulation Act 1971.

EXCEPTION 2: A valid building permit for the erection of a building shall be deemed as approval for the demolition of a building occupying the same portion of the site, unless otherwise noted on the building permit.

- (b) For other buildings, 48 hours notice shall be given to the Minister of Works and permission shall be obtained from the Minister before starting demolition.
- (c) The Minister may require the permit holder to submit a schedule covering the demolition work.

2902.2 PUBLIC UTILITIES: Before commencing the work of demolition of a building or structure, all gas, electric, water and other meters shall be removed and the supply lines disconnected, except such as are provided or required for use in connection with the work of demolition.

2902.3 PRECAUTIONS:

- (a) Glazed sashes and glazed doors shall be removed before the start of demolition operations.
- (b) No wall, chimney or other construction shall be allowed to fall as a unit, except under competent supervision. Scaffolds or stagings shall be erected for workers if walls or other elements of the structure are too thin or too weak to work on. Heavy structural members, such as beams or columns, shall be carefully lowered and not allowed to fall freely.
- (c) Chutes for the removal of materials and debris shall be provided in all parts of demolition operations which are more than 20 feet above the point from which material is to be removed.
- (d) Chutes shall be completely enclosed and shall be equipped, at intervals of 25 feet or less, with substantial stops to prevent descending material from attaining dangerous speeds.
- (e) The bottom of each chute shall be equipped with an adjustable gate or stop for regulating the flow of materials; a danger sign shall be placed at the discharge end of every chute; except for the discharge of materials, the gate or stop shall be kept closed.
- (f) Proper tools shall be provided and kept available to loosen material or debris jammed in the chute.

- (g) Chutes, floors, stairways and other locations shall be wetted down, at frequent intervals, when the dust from such operations would cause a menace or hardship to adjoining buildings or premises.
- (h) Stairs and stair railings shall be kept in place and in usable condition as long as is practicable, and steps and landings shall be kept free from debris.
- (i) Floor openings, unless covered or otherwise protected, shall be provided with guard rails and toe boards, as specified in Section 2918 of this Chapter.
- (j) All areas of danger in demolition operations shall be properly enclosed and danger signs posted. Sufficient watchmen shall be provided to warn workers of impending dangers, and all unauthorised persons shall be excluded from places where demolition is in progress.

2903 EXISTING BUILDINGS

- 2903.1 PROTECTION: All existing and adjoining public and private property shall be protected from damage incidental to construction operations.
- 2903.2 ADJOINING WALLS: The owner of the new or altered structure shall preserve all adjoining independent and party walls from damage as provided herein. He shall underpin where necessary and support the adjoining building or structure by proper foundations to comply with this Chapter and the Chapter on Excavation, Footings and Foundations. (Chapter 21).
- 2903.3 MAINTENANCE: In case an existing party wall is intended to be used by the person who causes an excavation to be made, and such party wall is in good condition and sufficient for the use of both the existing and proposed building, such person shall preserve the party wall from injury and support it by proper foundations at his own expense, so that it shall be and shall remain as safe and useful as it was before the excavation was commenced. During the demolition, the party wall shall be maintained weather-proof and structurally safe by adequate bracing until such time as the permanent structural supports shall have been provided.
- 2903.4 BEAM HOLES: When a structure involving a party wall is being demolished, the owner of the demolished structure shall, at his own expense, bend over all wall anchors at the beam ends of the standing wall and shall brick-up all open beam holes and otherwise maintain the safety and usefulness of the wall.

- 2903.5 PARTY WALL EXIT WAYS: No party wall balcony or horizontal fire exit shall be destroyed unless and until a substitute means of egress has been provided and approved by the BCO.
- 2903.6 ADJOINING ROOFS: When a building or structure is to be carried above the roof of an adjoining building, protection for the skylights and roof of such adjoining building shall be provided, at his own expense, by the person constructing or causing the construction of such building or structure, unless permission to have the roofs and skylights protected is refused by the occupier of the adjoining building.

2904 EXCAVATION

The sides of every excavation in connection with building operations, including trenches for pipes or any other purposes, shall be sheet-piled, braced or shored when necessary to prevent the soil from caving in on persons engaged in work within such excavation.

Where workers are employed adjacent to an excavation on work other than that directly connected with the excavation, substantial railings or fences shall be provided to prevent such workers from falling into the excavation.

Every trench, 5 feet or more in depth, shall have suitable means of exit or escape at least every 25 feet of its length.

2905 COVERED SIDEWALKS AND HOARDINGS

- 2905.1 COVERED SIDEWALKS: Where buildings, which exceed 40 feet in height, are to be erected or demolished closer than 10 feet to a highway boundary, or buildings which exceed 20 feet in height are to be erected or demolished closer than 5 feet to a highway boundary, the owner or the person doing or causing such work to be done shall erect and maintain during such work adjacent to the highway boundary covered sidewalks of sufficient strength and stability to sustain safely the weight of materials that may be placed thereon and to withstand the shocks incident to the handling of such materials or their preparation for use and to the accidental jars from trucks delivering material.

When the roofs of such covered sidewalks are used for the storage of material or for the performance of work of any kind, substantial railings not less than 3 feet high and solid toe boards not less than 6 inches high shall be placed along the open sides and ends of such roofs.

Covered sidewalks shall be designed to the satisfaction of the BCO to withstand the loadings they may receive. Covered sidewalks shall be constructed to afford an unobstructed walkway for pedestrians, not less

than 8 feet high and 3 feet wide. The street side shall be kept open for a height of not less than 7 feet above the curb, and the covered sidewalk shall be properly lighted at night with not less than one 100-watt bulb every 20 feet of its length and at each change of grade or elevation of the sidewalk surface, or by other suitable means of illumination.

Any obstructions in the public street or sidewalk caused by scaffolding, hoarding, equipment, or materials shall be adequately marked and illuminated at night.

- 2905.2 TEMPORARY HOARDING OR BARRICADE: Buildings which are erected or demolished closer than 5 feet to a street line and which are not required to have a covered sidewalk which shall be provided with protection on the street sides in the form of a substantial hoarding not less than 8 feet high unless this requirement is varied or waived by the Minister. Such hoarding shall not restrict the sidewalk to less than 5 feet in width and shall be built solid for its full length except for such openings as may be necessary for a proper execution of the work.

2906 STORAGE OF MATERIAL

Materials to be stored at or near locations where workers are employed or on any public property shall be piled or stacked in an orderly manner to avoid toppling over or being otherwise displaced.

No materials shall be piled or stacked to a greater height than 6 feet, except in yards or sheds intended especially for storage. When piles exceed 4 feet in height, the material shall be so placed that the sides and ends of the piles taper back.

The placing of construction materials in a building or structure during building operations shall be done with due consideration of the effect of such loads on the structural members, and such loads shall in general be placed as near to the points of support of the structural members as possible. Such loading shall not cause stresses in any structural member beyond the design stresses.

Waste material and rubbish shall not be stored nor allowed to accumulate within the building or in the immediate vicinity, but shall be removed from the premises as rapidly as practicable.

2907 PLATFORM HOISTS

No person shall be permitted to ride on any platform hoist unless it has been designed and constructed for passenger service as specified in the Chapter on Elevators and Escalators (Chapter 43). Elevators used for the transportation of workers during construction

shall comply with the requirements of the Chapter on Elevators and Escalators (Chapter 43).

Platform hoists for the handling of materials within buildings under construction shall have the car substantially constructed and provided with covers, either solid or wire mesh. Sections of the cover may be arranged to swing upward for the handling of bulky materials or the covers may be omitted if suitable overhead protection is provided.

Hoists shall be equipped with a broken-rope safety device.

Where wheelbarrows or buggies are used for handling material on platform hoists, cleats shall be nailed to the platform to fix the proper position so that handles shall not project beyond platform edges.

Supports for the overhead sheave shall be designed to carry, within the allowable stresses, as specified in this Code, 2-1/2 times the weight of the maximum load plus the hoist weight.

Platforms shall be fitted with automatically operated gates.

2908 HOISTING MACHINERY

Every hoisting engine shall be provided with adequate brakes, capable of holding the maximum load at any point travel.

Guards shall be provided for exposed gears and other moving parts and around hoisting cables at all points to prevent workers from tripping or getting clothing caught.

Ample room shall be provided around hoisting engines, motors or other machinery or apparatus for the free and safe movement of those who operate or otherwise attend such engines, motors or other machinery apparatus.

Hoisting machinery shall be enclosed to exclude unauthorized persons, and if placed outside the building, further protection against falling objects shall be provided.

When hoisting machinery is set on an elevated platform, such platform shall be of substantial construction, and guard rails, and toe boards shall be provided along all open sides of such platform.

Where electric power is used, the panel boards, motor's source of power, brakes and other devices shall be installed as specified in Chapter 44 of this Code.

Steam boilers used in connection with building construction shall be installed, equipped and maintained as specified in this Code, and operators in charge of such boilers shall be competent persons.

The exhaust of an internal combustion engine shall be vented outside of any enclosing structure.

2909 HOIST TOWERS

Hoist towers erected in connection with building construction shall be substantially constructed, and all members shall be so proportioned that the stresses shall not exceed those specified for that material, when carrying the dead load of the tower plus 2-1/2 times the weight of the platform or bucket or its maximum load.

Every hoist tower shall rest on a sufficiently solid foundation to avoid injurious settlement or distortion.

Every hoist tower shall be secured in not less than 4 directions against swaying or tipping, at intervals of not more than 32 feet in its height, by steel cable guys adequately anchored, or by other satisfactory means. Such towers which are constructed adjacent to buildings shall be secured to the building frame at each floor as the building progresses.

Landing platforms in hoist towers or platforms connecting a hoist tower to a building or other structure shall be provided with guard rails and toe boards.

The bottom of every hoist tower shall be screened or otherwise protected on all sides to a height of not less than 6 feet.

Hoist towers erected within the building, but not occupying the entire opening through which they pass, shall be completely enclosed on all sides and shall be provided with doors at the unloading points unless the platform hoist is solidly enclosed on all sides to the height to which material is to be loaded or unloaded.

Towers shall be screened.

2910 DERRICKS AND CRANES

No one shall erect a derrick or crane on any site adjacent to any public highway or public space without obtaining the written permission of the Minister. Application for such permission shall be in writing and shall contain drawings clearly showing the height and swing of any boom in relation to the site boundaries. Should the Minister grant permission with, or without conditions, he may also if he deems necessary, require that before the derrick or crane is erected the contractor shall indemnify the Bahamas Government against any or all claims that may arise from any accident involving such equipment.

Derricks shall be designed and assembled so that no part shall be stressed beyond the safe working stress for the material, as specified in this Code, under its maximum-rated load in any possible position. Such maximum rated load shall be conspicuously posted on each derrick.

The foot-block of every derrick shall be firmly secured against motion in any direction.

Guy derricks shall have the top of the mast held by not less than 6 steel guy cables secured by firm anchorages and so placed that the angle of the guy with the mast shall be as large as possible.

The moving parts of derricks and cranes shall be kept well lubricated, and all parts shall be inspected at least every other day.

2911 CABLES, ROPES, CHAINS AND BLOCKS

Cables, ropes, chains and blocks shall be of such size that the maximum load supported by them will not exceed one sixth of their breaking strength.

Blocks designed for use with manila ropes shall not be used for steel cables. Blocks used at or near floors or in other exposed places to change the direction of cables shall be enclosed or otherwise effectively guarded.

All ropes and cables used in connection with scaffolds, derricks, and hoisting apparatus shall be tested before being put to use and at least once every 30 days while in use, or more frequently if required by the BCO, to insure their safety and suitability for the purpose to which they are to be put. Any rope or cable found to be unsafe or unfit shall not be used. A record of this test shall be maintained by the contractor with the times, dates and results of such testing indicated in the records.

Chains shall not be used for slings, bridles or other similar purposes, but shall be restricted to only such purposes as require a straight pull.

Open hooks shall not be used for hoisting buckets, cages or skips.

2912 TEMPORARY FLOORING

In buildings of skeleton construction, the permanent structural floor, except for necessary hoistway openings, shall, when possible, be constructed as the building progresses.

Where deemed necessary, the BCO shall require that in buildings of skeleton construction there shall be not more than 3 unfilled floors above the highest permanent floor, nor more than one unfilled floor below permanent floors.

In buildings or structures on which construction of the frame is proceeding, the entire tier of beams, known as the working floor, shall be planked over, except spaces required for construction work, for rising or lowering materials and for stairways or ladders. Planks shall be placed so that they cannot tip under the weight of a worker at any point and secured so that they cannot slip out of place.

In buildings of wood joist construction, the underfloor shall be laid for each floor as the building progresses.

2913 FLOOR OPENINGS

All floor openings, used as hoistways or elevator shaftways, shall be guarded on all sides, except the side being used for loading or unloading. Guards shall be barricades not less than 4 feet high along or near the edges of such openings, or guard rails not less than 3 feet high, placed not less than 2 feet distant at all points from the edges of such openings. If guard rails are used, toe boards shall be provided along the edges of the openings. Sides left open for loading or unloading shall be guarded by similar solid doors or gates.

All floor openings used as stairways, or for the accommodations of ladders or runways, shall be guarded by railings and toe boards.

All other floor openings shall be guarded on all sides by solid barriers not less than 3 feet high, or by railings and toe boards or shall be planked over or otherwise covered over by temporary construction capable of sustaining safely such loads as are likely to come thereon.

Barriers for the guarding of openings used as hoistways or for elevators shall be constructed so that workers cannot thrust head or limbs through them, and loose material cannot fall or be pushed into the shaftway.

Barriers and guard rails around floor openings shall remain in place until permanent enclosures or protection are otherwise provided.

2914 RUNWAYS AND RAMPS

Runways and ramps in connection with scaffolds or extending from storey to storey or otherwise located and maintained for an extended period of time, or used for the transfer of bulky material, shall be constructed of at least three 10-inch planks laid closely side by side and substantially supported and braced to prevent unequal deflection and springing action.

Runways and ramps shall have a slope not steeper than one in 3, and the total rise of a runway or ramp between landings shall not exceed 12 feet.

When the rise is steeper than one in 6, or when the rise is more than 6 feet and steeper than one in 8, runways or ramps shall be provided with cleats spaced not more than 8 inches apart.

Runways and ramps, having a total rise of more than 6 feet, or passing over or near floor openings, high tension wires or other dangerous places, shall be provided with guard rails and toe boards.

2915 TEMPORARY STAIRWAYS OR LADDERS

When the construction of a building has progressed to a height exceeding 50 feet above grade or when a building exceeding 50 feet in height is undergoing alterations, unless one or more permanent stairways have been installed, at least one temporary stairway shall be provided, continued in height as rapidly as the work progresses to the highest floor that has been installed, and maintained in serviceable condition until a permanent stairway has been completed.

Stairs and stairways shall be of sufficient strength to support a load of at least 100 pounds per square foot, and all stairways shall be guarded on all open sides with hand rails and toe boards.

Temporary stairs shall be constructed so that treads and risers are uniform in width and height in any one flight. The sum of the height of the two risers and the width of one tread shall be not less than 24 inches nor more than 26 inches. Temporary stairways shall be not less than 36 inches wide. Landings shall be no less than 30 inches long.

No flight of stairs of a temporary stairway shall have a vertical rise in excess of 12 feet, and, when necessary, intermediate landings shall be provided.

Temporary and permanent stairways shall be adequately lighted as set forth in Section 2919 of this Chapter.

No door shall open directly onto a flight of stairs, but a landing equal to at least the width of the door shall be provided between the door and the stairs.

Permanent stairs that are to be used during construction and on which treads are to be filled in later shall have wooden treads firmly fitted in place for the full area of the tread. The top surfaces of the temporary treads shall be maintained above the tops of the risers or nosings.

The storage of materials on stairs or in stairways or adjacent to stair openings shall not be permitted.

2916 LADDERS

Except where either permanent or temporary stairways or runways are required, ladders shall be provided to give access to all floors, stagings or platforms where work is being done more than five storeys above ground or above a permanent or temporary floor.

Ladders required by this Code shall be left in place until the permanent stairways are ready for use or until temporary stairways are installed, and stairways shall be erected as soon as the building exceeds 50 feet in height.

All ladders shall be substantial in construction.

All ladders, when in use, shall be set up in a manner to be secure and to prevent slipping. Ladders, except stepladders or other self-supporting ladders, shall be securely fastened to a permanent support at the top, and if necessary, at the bottom, and be braced to prevent swaying, bending or shaking.

Ladders, leading to floors, stagings or platforms, shall extend at least 3 feet above the level of such floors, stagings or platforms.

No single ladder shall exceed 20 feet between supports. When greater heights are to be reached, intermediate platforms shall be erected. Ladder landings shall be at least 4 feet square and equipped with handrails and toe boards.

Ladder rungs shall be spaced uniformly and as near to 12 inches on centres as is practicable. Ladder rungs shall be properly notched into the main members.

When used temporarily, in place of stairways or runways, ladders serving traffic in both directions simultaneously shall be at least 36 inches wide. If separate ladders are provided for going up and coming down, they shall be marked "UP" and "DOWN" respectively at each floor and platform level.

Ladders, other than sectional or extension ladders, shall not be extended by joining two or more together.

Ladders shall not be placed or used in shafts of operative elevators or hoists except by workers engaged in the erection, construction, alteration or repair of any such shafts, hoistways or equipment.

Ladders shall not be painted, but may be oiled with linseed oil or otherwise treated with preservative so as to permit the detection of faults. Every ladder shall be inspected by the superintendent or foreman in charge before being put to use on a building operation and thereafter at least once every 30 days while continued in use. Broken or weak ladders, or ladders with weak or missing rungs, shall not be used or permitted to remain on the site of building operations, but shall be repaired and made safe or destroyed.

2917 SCAFFOLDS

Properly constructed scaffolds shall be provided for all work which cannot be done safely by workmen standing on permanent or solid construction except when such work can be done safely from ladders. Each scaffold shall be substantially constructed, designed to support at least four times as much load as it is expected to carry, but in no case less than 125 pounds per square foot. Scaffolds shall be secured to prevent swaying. Superintendents shall be responsible for the inspection of these scaffolds.

Planks used in the construction of stationary scaffolds shall be not less than 2 inches nominal thickness of sound, seasoned lumber. Where such planks overlap at the ends, the overlap shall be not less than 6 inches. Planks shall be so placed that they cannot tip under the weight of the worker at any point.

Adequate footings and cross bracing shall be provided for uprights used for scaffolding supports.

Uprights, bracing and platform supports shall be constructed of good quality, seasoned and straight grained lumber, or metal structural members which are clean and rust free.

Ropes, cables and blocks used in the support of cradled scaffolds shall be of sufficient size and strength to sustain at least 6 times the maximum loads to which they will be subjected. Where acids are likely to come into contact with them, ropes shall not be used in the support of scaffolds, but steel cables properly protected by grease or oil or other effective method shall be used instead.

Every scaffold, the platform level of which is more than 6 feet above the ground or above a permanent or temporary floor, other than iron workers' scaffolds and carpenters' bracket scaffolds, shall be provided with guard rails and toe boards extending the full length of the scaffold and along the ends except where ramps or runways connect with them, unless otherwise enclosed or guarded. On suspended, swinging and pole scaffolds, the space between guard rails and toe boards shall be fitted with wire mesh screens securely attached.

When objects are likely to fall on a scaffold from above, substantial overhead protection shall be provided not more than 10 feet above the scaffold platform.

Roof brackets and similar forms of support shall be substantial in construction and securely fastened in place when in use.

Barrels, boxes or other similar unstable objects shall not be used as supports for planking where used as scaffolds or places of work.

When used over public sidewalks or other places of public use, scaffolds used for minor building repairs, alterations, or painting, shall be equipped with some effective means to prevent the falling of debris or paint.

Scaffolds used for sandblasting and guniting operations shall be entirely and effectively enclosed, and the determination of effective enclosure shall be the complete absence of particles of material of operation in the air at a horizontal distance of 50 feet from the point of operation.

2918 GUARD RAILS AND TOE BOARDS

- 2918.1 GUARD RAILS: Guard rails, when required in this chapter, shall have the top rail not less than 42 inches high above the platform level, and an intermediate rail shall be provided between the top rail and the platform. All guard rails shall have adequate support not more than 8 feet apart and shall resist a load of 50 pounds per linear foot at the top rail.
- 2918.2 TOE BOARDS: Toe boards, when required, shall be solid to full height, shall extend not less than 6 inches above the platform level and shall be placed to fit close to the edges of the platform. They shall be adequately supported, secured and braced along the entire length to resist the impact of workers' feet and the shifting of materials. Toe boards of wood shall be not less than one inch nominal thickness with supports not more than 4 feet apart, and toe boards of metal shall be not less than one eighth inch thick, with supports not more than 4 feet apart.

2919 TEMPORARY LIGHT AND POWER

All parts of buildings under construction, or other operations covered by the general provision of this chapter, and all sheds, scaffolds, covered walks, other work or storage areas, and equipment in connection with such operations, should have sufficient light to insure safety and protection of life and property. In passageways, stairways and corridors, the average light intensity measured at the floor level should be not less than 2 foot candles.

At locations where tools and/or machinery are used, the average light intensity measured at the floor level shall be not less than 5-foot candles. Natural or artificial illumination shall be provided in such a manner that glare and shadows will not adversely affect the safety and protection of workers' property.

Temporary wiring for light or power shall be adequately protected against mechanical or overcurrent failures. All conductive materials enclosing fixed or portable electric equipment, or forming a part of such equipment, shall be grounded by one or more of the methods permitted by this Code.

Temporary electric service poles shall be self-supporting or adequately braced or guyed at all times.

2920 ACCIDENTS

- 2920.1 FIRST AID: On every building operation, an approved first aid cabinet should be provided and maintained, to the satisfaction of the Minister of Health.

2920.2 MEDICAL ATTENTION: Arrangements should be made for prompt medical attention in case of need, to the satisfaction of the Minister of Health.

2920.3 REPORTS: Accidents shall be reported to the BCO and to the Chief Labour Officer at the Ministry of Labour and recorded in the records main-

2921 SANITATION

Unless permanent provision is made, every building or structure in the course of erection, alteration, repair or demolition shall be provided with suitable and adequate toilet and drinking water facilities, to the satisfaction of the Minister of Health.

2922 WELDING AND CUTTING

Gas welding and cutting and arc welding in building construction and demolition operations should be restricted to experienced workers acceptable to the BCO.

Suitable goggles or helmets and gloves should be provided for and worn by workers engaged in gas welding or cutting or arc welding. Noncombustible shields should be provided to protect the worker when exposed to falling hot metal or oxide.

Welding equipment including but not limited to such items as regulators, torches and hoses, when not attached to cylinders ready for use, shall be stored in clean locations away from grease, oil and excessive heat.

Unless unavoidable, gas welding or cutting, or arc welding shall not be done above other workers. When unavoidable, a noncombustible shield shall be provided between the work and the workers below, or a watchman shall be stationed to give warning at places where workers are likely to pass under a gas welding or cutting or an arc welding operation.

Unless avoidable, gas welding or cutting should not be carried on in any place where ample ventilation is not provided, or from which quick escape is difficult. When unavoidable, workers engaged in such work in confined spaces should be allowed frequent access to fresh air and a relief worker shall be stationed close at hand to assist the worker in case of accident and to shut off the gases.

Tanks of fuel gas shall not be moved or allowed to stand for any extended period when not in use unless the caps of such tanks are in place. Suitable cradles shall be used for lifting or lowering oxygen or fuel tanks, to reduce to a minimum the possibility of dropping tanks. Ordinary rope slings shall not be used.

Tanks supplying gases for welding or cutting shall be located at no greater distance from the work than is necessary for safety. Such tanks shall be securely fastened in place and in an upright position. They shall be stored, or set in place for use, so that they are not exposed to the direct rays of the sun or to high temperatures.

Before steel beams or other structural shapes or elements of construction are cut by means of a gas flame or other means, they shall be secured by cables or chains to prevent dropping or swinging.

2923 OPEN FIRES

Open fires, for the purpose of disposing of waste materials, the heating of roofing or other materials, or for any other purpose whatsoever, should not be allowed except with the permission of the Chief Fire Officer.

Wherever any enclosed flame heaters or open fires are used, there shall be a workman in constant attendance, whose duty shall be to have such heater or fire under proper control at all times.

2924 FIRE PROTECTION

Storage of combustible material shall not be permitted under or near welding operations. No part of the building shall be used for the storage of combustible materials until such fireproofing in that part has been installed.

In every building of reinforced concrete construction, forms of combustible materials shall be stripped from the concrete and removed from the building as soon as practicable. No part of the building shall be used for the storage of combustible materials until such forms have been removed in that part of the building.

In all buildings in which stand pipes are required and where water is available, such standpipes shall be installed as the construction progresses, and installations shall be in such a manner that they are always ready for firemen to use, to the topmost constructed floor. Such stand pipes shall be provided with a connection acceptable to the Chief Fire Officer on the outside of the building at the street level and with one outlet at each floor.

If available water pressure is insufficient to provide necessary water supply for fire fighting, the installation of a fire pump may be required in the early stages of construction, but not later than the construction of the 6th floor level.

Temporary standpipes may be provided in lieu of permanent systems if they are designed and installed to accommodate not less than 50 gpm of water at 65 psi pressure, with sufficient pumping equipment capable of providing this volume and pressure at any given time.

In every building operation wherever a tool house, storeroom or other shanty is placed, or a room or space is used for storage, dressing room or workshop, at least one approved hand pump, tank or portable fire extinguisher shall be provided and maintained in an accessible location in accordance with the requirements of the Chief Fire Officer.

During building operations, free access from the street to fire hydrants and to outside connections for stand pipes, sprinklers or other fire-extinguishing equipment, whether permanent or temporary, should be provided and maintained at all times.

No material or construction equipment shall be placed within 10 feet of such hydrant or connection, nor between it and the central line of the street.

The requirements of the Chief Fire Officer shall be satisfied during all construction and demolition operations.

2925 SPECIAL HURRICANE PRECAUTIONS

During such periods of time as are officially designated as being a hurricane warning or hurricane alert, all construction materials or equipment shall be secured against displacement by wind forces. Where a full complement of personnel is employed or otherwise in attendance, or engaged for such protection purposes, normal construction procedures or uses of materials or equipment may continue allowing such reasonable time as may be necessary to secure such materials or equipment before winds of hurricane force are anticipated. Construction materials and equipment shall be secured by guying and shoring, and by tying down loose materials, equipment and construction sheds.

2926 INSPECTION

When inspection of any construction operation reveals that any unsafe or illegal conditions exist, the BCO shall notify the owner and direct him to take the necessary remedial measures to remove the hazard or violation.

When the strength and adequacy of any scaffold or other device or construction equipment is in doubt, or when any complaint is made, the BCO shall inspect such equipment and shall prohibit its use until tested satisfactorily or until all danger is removed. The BCO may accept a strength test to two and one-half (2-1/2) times the superimposed live load to which the material or structural member is to be subjected; the member shall sustain the test load without failure.

NOTES

CHAPTER 30 ROOF COVERING AND APPLICATION

- 3001 GENERAL
- 3002 GUIDELINES FOR ROOFING APPLICATIONS
- 3003 CEMENT AND CLAY ROOF TILE
- 3004 METAL SHINGLES
- 3005 WOOD SHINGLES AND SHAKES
- 3006 ROOF INSULATION
- 3007 ROOFING ACCESSORIES
- 3008 ROOF MOUNTED EQUIPMENT

3001 GENERAL

3001.1 NEW ROOF CONSTRUCTION: *In the City of Nassau, new roofs shall require fire retardant Class B roofing, as described in Section 3001.3 of this Chapter. In the City of Nassau fire retardant Class B roofing shall also be required for the repair of more than 25% of the existing roof covering on any building or structure, such work shall require a building permit.*

3001.2 DEFINITIONS AND STANDARDS:

- (a) **DEFINITIONS:** *For the purpose of this Chapter roofing terms shall be defined in compliance with ASTM D1079 unless otherwise defined below. Definitions enumerated below shall take precedence. Other terms used herein be defined as set forth in Appendix A of this Code.*
 - (1) **ANCHOR SHEET:** *a roofing felt mechanically attached to a nailable deck with approved fasteners to which insulation is then installed in a solid mopping of asphalt. The roofing membrane is then installed to the insulation in the usual manner.*
 - (2) **APPROVED ROOFING PRODUCT:** *means a component covering or system which has been tested and approved by a testing agency recognised by the Minister for such purposes. The usage of an Approved Roofing Product shall be predicated upon its use or installation in strict compliance with the test under which it was approved. Such testing shall be*

made based upon the fire requirements or live, wind and dead loads that form part of this Code and are applicable to the use of the component or system in question.

- (3) **BASE SHEET:** *The bottom or first ply of a Roof System Assembly over which subsequent roofing plies are applied. A base sheet may be designed for mechanical attachment, full or partial adhesion to the substrate.*
- (4) **CLASSIFICATIONS:** *Roof coverings are intended for the protection of roof decks from external fire exposure and evaluated for performance by the Underwriters' Laboratories under the categories of Class A, Class B and Class C coverings.*

Class A covering includes roof coverings which are effective against severe fire exposures. Under such exposures roof coverings of this class are not readily flammable and do not carry or communicate fire; afford a fairly high degree of fire protection to the roof deck; do not slip from position; possess no flying brand hazard; and do not require frequent repairs in order to maintain their fire-resisting properties.

Class B covering includes roof coverings which are effective against moderate fire exposures. Under such exposures roof coverings of this class are not readily flammable and do not readily carry or communicate fire; afford a moderate degree of fire protection to the roof deck do not slip from position; possess no flying brand hazard; but may require infrequent repairs in order to maintain their fire-resisting properties.

Class C covering includes roof coverings which are effective against light fire exposure. Under such exposures roof coverings of this class are not readily flammable and do not readily carry or communicate fire; afford some degree of fire protection to the roof deck; do not slip from position; possess no flying brand hazard; and may require occasional repairs or renewals in order to maintain their fire-resisting properties.

- (5) **CONTINUOUS ROOF SYSTEM:** *an impervious Roof Covering composed from a single or multiple layers, forming a homogenous membrane over the entire roof surface applied to either a flat or pitched roof surfaces.*
- (6) **CORROSION RESISTANT:** *any component that passes Appendix of Factory Mutual Research Corporation's Test Standard 4470.*

- (7) **COUNTER BATTENS:** *any wood batten strip installed in a horizontal direction in conjunction with vertical battens. Counter battens are required in clay and concrete tile systems, metal tile panels, and other prepared roof coverings, as required by the Approved Roofing Product test relating thereto.*
- (8) **DISCONTINUOUS ROOF SYSTEM:** *a roof system with unsealed overlapping components, where the combined roof system has openings at the point of overlap, applied to a sloped surface with a pitch of 2:12, or greater. A discontinuous roof systems include asphalt shingle; concrete, clay or metal tile; wood shingles or shakes, and cement fiber roof systems.*
- (9) **FASTENER WITHDRAWAL RESISTANCE TEST:** *a static pullout test of mechanical fasteners, which are used to anchor any Roofing Component, to determine the force required to withdraw a fastener from the substrate.*
- (10) **FIRE RESISTANT ROOF COVERING:** *any Class A, Class B or Class C Roof System Assembly applied to the appropriate deck type within the specified slope of the listed classification.*
- (11) **MINIMUM CHARACTERISTIC RESISTANCE FORCE:** *a force or pressure which is representative of data from withdrawal resistance testing; static uplift testing and/or wind uplift testing after the data has been statistically analyzed to a 95% level of precision.*
- (12) **MINIMUM ROOF COVERING:** *a Roof System Assembly Approved for use on flat or pitched residential roof applications, up to and including 3, 12 in compliance with Subsection 3401.7 herein.*
- (13) **ORDINARY ROOF SYSTEM ASSEMBLY:** *any Roof System that has no classified fire rating.*
- (14) **PREPARED ROOF COVERING:** *any manufactured or processed roof covering designed for use as the top layer of a Discontinuous Roof System applied to a sloped roof.*
- (15) **RECOVERING:** *the process of covering an existing Roof System Assembly with Approved Roofing.*

- (16) *REPAIR: the application of a roofing product to extend the life of an existing roof and/or enhance the waterproofing capabilities thereof.*
- (17) *RE-ROOFING: the processing of removing an existing roof system and replacing it with an Approved Roofing Product.*
- (18) *ROOF COATINGS, ADHESIVES AND MASTICS: any and all liquid materials applied to the roof membrane layer to enhance ultraviolet light resistance; increase resistance to fire; increase reflectivity of the Roof System Assembly; or, in some way, enhance the performance of the Roof System Assembly. Roof coatings, adhesives or mastics shall not contain asbestos materials.*
- (19) *ROOF COVERING: an assembly of multiple field applied components or a single component designed to weatherproof of a building's top surface. A roof covering may be a Roof System Assembly or form a portion thereof.*
- (20) *ROOF SYSTEM ASSEMBLY: a combination of Roofing Components, comprising a weatherproofing membrane, with or without an insulation layer, that comply with wind uplift; fire; and physical property testing as defined in Sections 3401 and 3402 herein. A Roof System Assembly shall be defined in the Approved Roofing Product Approval, including any limitations of its use.*
- (21) *ROOFING COMPONENT: a roofing product that is incorporated into various Roof System Assemblies.*
- (22) *UNDERLAYMENT: one or more water shedding layers applied to a sloped roof prior to the application of a prepared Roof Covering. The primary purpose of an underlayment is defined as a water shedding layer to function in combination with a Prepared Roof Covering.*
- (23) *WOOD SHINGLES: tapered pieces of red cedar, or other wood types, sawn on both faces of widths ranging from 3" to 14" and lengths of 16", 18" and 24" applied to a sloped roof forming a discontinuous Prepared Roof System.*
- (24) *WOOD SHAKES: tapered or straight pieces of red cedar, or other wood types, of widths ranging from 3" to 14" ranging in lengths from 18" to 32" applied to a sloped roof in conjunction with an approved underlayment, forming a discontinuous Prepared Roof System.*

3001.3 STANDARDS: *The standards referenced in this Chapter shall be those set forth in Appendix A and those defined within this Chapter.*

(a) FIRE-RETARDANT ROOF COVERINGS REQUIRED:

(i) *Roof coverings for all buildings in areas designated by the BCO for all buildings of Type I or Type II construction and for all buildings of other than single family and duplex occupancy shall be fire-retardant. A fire-retardant roof covering shall be any roof or any roof covering which meets the requirements of or shall be any roof assembly bearing the label of the Underwriters' Laboratories, Inc., for class A or B roofing.*

(b) MATERIAL STANDARDS: *Every Roofing Component shall comply with the applicable ASTM material standards adopted by this Code.*

(1) *All such products shall bear the testing logo imprinted on the material and/or container or shall be marked in a distinctive manner to define compliance with the standards.*

(2) *All such products shall be evaluated for compliance by the Buildings Control Officer who may carry out or cause to be carried out random testing of labelled products to confirm compliance with ASTM material standards.*

(c) WORKMANSHIP STANDARDS: *All roofing work shall be performed in compliance with the tolerances, quality and methods of construction established herein or set forth in the standards adopted by this Chapter. Roof System Assemblies and prepared Roof Coverings detailed in Approved Roofing Product Approval documents shall be installed in strict compliance with the method of application set forth in the product of approval or, if not part of the product approval, in compliance with manufacturer's published application instructions. In the event of a conflict between the application instructions set forth in the product approval and those contained in the manufacturer published application instructions, the product approval application shall govern.*

3001.4 (a) VENTING:

(1) *Vapour retarders shall be installed, where applicable, to reduce moisture vapour flow into insulation from the warm, humid building interior, leading to internal condensation. Vents shall be installed to assist in the expulsion of moisture vapour.*

- (2) *Venting units shall not allow vapour to enter the roof space when the high vapour pressure side is above the roofing membrane.*
- (3) *All sloped roofs covered with an underlayment comprised of a 30lb or 43lb anchor sheet and a self adhering membrane shall be vented from both the soffit and with 18" of the ridge. The area of ventilation shall be in compliance with Section 2408 of this Code.*
- (4) *All sloped roofs shall require soffit and ridge ventilation.*

(b) **SOFFIT VENTILATION**

- (1) *Soffit ventilation shall consist of a continuous strip vent, 1" wide running the length of the soffit, or an intermittent vent with breaks not greater than 4 feet.*
- (2) *Soffit ventilation strips shall be fabricated from corrosion resistant wire mesh or perforated material not less than 1/4" nor more than 1/2" in any direction.*

(c) **RIDGE VENTILATION**

- (1) *Ridge ventilation systems shall be of a type approved by the Buildings Control Officer for use with the prepared roof system. Ridge vents shall be continuous over a 3/8" gap in the sheathing along the entire length of the ridge area of the roof. Alternatively, Approved roof louvers, turbines or gable vents may be placed within 18" of the ridge, spaced not greater than 8 feet apart. These vents may be alternated on either side of the ridge.*
- (2) *Ridge vents shall be tested for wind driven rain infiltration resistance to a standard approved by the Buildings Control Officer.*

3001.5 FIRE RESISTANT ROOF COVERINGS: *Shall be provided as required in Section 3001.1 herein and as required by Chapters 14-19 of this Code.*

3001.6 MINIMUM ROOF COVERING: *Minimum Roof Coverings shall be applied over wood or concrete decks only and shall not be applied over insulation. Approved Roofing Product is required over all other substrates.*

- (a) **MATERIALS - A Minimum Roof Covering shall consist of the following:**
- (1) *All based flashing and roof top penetrations flashing shall have cant strips applied in hot asphalt. Approved cold adhesive, or mechanically attached when the angle at the roof deck and vertical surface exceeds 45 degrees.*
 - (2) *An ASTM D 226 type II organic base sheet; an ASTM D 2626 organic coated base sheet; an ASTM D 4601 type III, fiberglass reinforced base sheet; or an ASTM D 4897 vented base sheet attached in compliance with Subsection 3403.4(b)(1). A red rosin paper may be applied prior to base sheet application. A base sheet over a structural concrete deck shall be ASTM D226 type I or type II felt; ASTM D 2178, type IV or type VI ply sheet; or ASTM D 2626 organic coated base sheet. Base sheet shall be mechanically fastened or mopped to a fully primed and dry substrate with ASTM D 312, type III or IV asphalt or Approved cold adhesive.*
 - (3) *Subsequent interply and cap sheets shall be of similar material (e.g. organic or inorganic) to the base sheet unless dissimilar materials are included in the Approved Roofing Product approval.*
 - (4) *Interply membrane shall be one or more of the following:

ASTM D 226 type I or type II;
ASTM D 2178 type IV or type VI; or
ASTM D 4601 type I or type II

shall be applied in a full mopping of ASTM D 312, type III or IV hot asphalt Approved cold adhesive.*
 - (5) *Top ply shall be one interply as defined above or a cap sheet in compliance with ASTM D 3909 for fiberglass systems or a single layer of SBS or other hot asphalt applied granular surfaced modified bitumen membrane.*
 - (6) *If an interply membrane is applied as a top sheet, the Minimum Roof Covering shall be coated with an Approved roof coating for ultraviolet resistance and for compliance with the fire rating requirements for the deck type and slope, or covered with a flood coat of not less than 50 lb. per roofing square of type III or IV hot asphalt and aggregate applied at not less than 400 lb. per roofing square.*

- (7) *A Minimum Roof Covering shall consist of not less than one base sheet and two plies or a base sheet; interply and mineral surfaced cap sheet.*
 - (8) *A wide selvage edge organic cap sheet (ASTM D 371) applied over an organic base shall be an acceptable Minimum Roof Covering at slopes greater than 1:12 providing the Minimum Roof Covering complies with the required fire classification.*
 - (9) *All other Roof System Assemblies shall be Approved Roofing Products.*
- (b) *APPLICATION: A Minimum Roofing Covering may be installed only in Group H Occupancies; constructed on structures less than or equal to 30 ft. in height from ground level; not greater than 50 roofing squares in area and not greater than 3:12 in slope.*
- (1) *Mechanical fasteners and tin caps as defined in Subsection 3002.4 (b) shall be spaced in a minimum pattern of 12" o.c. on a 4" overlap and 18" o.c. in two staggered rows in the field area of the roof. Perimeter areas shall be fastened 9" in the lap and 12" in the field.*
 - (2) *Perimeter area shall be defined as a perimeter band 40% of the roof height surrounding the entire roof area. Multiple roof areas on a single structure shall have the above noted band around all sides of each area.*
 - (3) *Edge metal and other metal roof system components shall be in compliance with Section 3007.*
 - (4) *All sloped roof applications, other than Minimum Roof Coverings applied to a maximum slope of 3:12 shall be either Prepared Roof Coverings installed in compliance with the Approved Roofing Product Approval.*
 - (5) *All Minimum Roof Coverings shall be installed in compliance with Guidelines for Roofing Application enumerated in Section 3002 of this Code.*
 - (6) *Minimum Roof Covers applied in new construction shall drain in such manner to leave the roof surface void of water within 48 hours after rainfall.*

- (7) *All applications applied over a slope of 1": 12" or greater shall be blind nailed into the substrate at the side laps 12" o.c. and at the head laps 6" o.c. with approved roofing nails and tin caps.*

3001.7 APPROVED ROOF SYSTEM ASSEMBLIES: *All Roof System Assemblies other than 'Minimum Roof Covers' as defined in section 3001.6 shall be required to obtain a product approval from the Buildings Control Officer.*

(a) **MINIMUM REQUIREMENTS:** *All Roof System Assemblies shall meet the following minimum requirements:*

- (1) *All continuous Roof System Assemblies shall be tested by a testing agency approved by the Minister for compliance with Factory Mutual research Corporation test Standard 4470. Only those components listed within the Roof System Assembly Approval shall be used with the roof covering. Roof Systems Assemblies shall be acceptable for use providing they comply with the test requirements under Standard 4470, and providing they are in compliance with the fire classification required for the structure to which the Roof system Assembly is to be installed.*
- (2) *All fastening devices and fastening assemblies used for insulation, anchor sheet or roof coverings shall be in compliance with the corrosion test requirements detailed in Appendix E of Dade County Protocol PA 114.*

3001.8 SELF SUPPORTING ROOF COVERINGS: *Roof Coverings intended to be self supporting between structural members shall be designed and constructed as follows:*

- (a) **STEEL:** *Steel roofing as sheets or composite panels shall comply with Section 2309 of this Code. All steel sheet or composite Roof System Assemblies shall have an Approved Roofing Product Approval.*
- (b) **ALUMINUM:** *Aluminum roofing as sheets or composite panels shall comply with Chapter 25 of this Code. All aluminum sheet or composite Roof System Assemblies shall have an Approved Roofing Product Approval.*
- (c) **PLASTIC:** *Plastics as sheets or composite panels shall comply with Section 3105 of this Code. All plastic Roof System Assemblies shall have an Approved Roofing Product Approval.*

3002 GUIDELINES FOR ROOFING APPLICATIONS

3002.1 DECKS: *All Roof System Assemblies and prepared Roof Coverings shall be installed over solid decks unless specifically approved for application over spaced sheathing in the Roof System Assembly Approved Roofing product Approval. All roof decks shall be in compliance with the minimum requirements of Chapter 22 for structural concrete decks; Chapter 26 for gypsum and insulating concrete decks; Chapter 23 for metal decks; and Chapter 24 for wood decks.*

3002.2 MINIMUM SLOPE:

- (a) *No Roofing Component, Roof System Assembly or Prepared Roof Covering shall be installed at a slope of less than the minimum slope set forth in the Roofing Component or Roof System Assembly Approved Roofing Product Approval.*
- (b) *All Roof System Assemblies applied in new construction or re-roof applications shall have sufficient slope to completely drain all water from the entire roof area within 48 hours after a rainfall.*
- (c) *All Roof System Assemblies applied in a re-roof or recover application shall be constructed in such a manner as to minimize ponding.*
- (d) *All Roof System Assemblies and Prepared Roof Coverings shall be installed at a slope no greater than the maximum allowed for the required fire classification.*

3002.3 GENERAL: *All Roof System Assemblies and Prepared Roof coverings shall have an Approved Roofing Product Approval and shall comply with the minimum requirements of this Section.*

(a) DECK PREPARATION:

- (1) *All roof decks, substrates, existing Roof System Assemblies or Prepared Roof Coverings to which a new Roof System Assembly is to be installed shall be broom cleaned, free from dirt and silt and dry prior to commencement of the roofing application.*
- (2) *Where practical, eaves, parapet walls, vertical walls, penthouses and other roof level structures be completed prior to the commencement of the roofing application.*
- (3) *If such construction methods noted in Subsection 3403.3(2)*

are not followed, precautions shall be taken to protect the Roof System Assembly from wind loads and use as a construction platform. The Buildings Control Officer may direct the contractor to provide additional perimeter securement as a temporary measure.

- (4) Cant strips, where required by the Roof System Assembly manufacturer and in all Minimum Roofing Systems shall be extended not less than 3" up vertical flashing surfaces measured from the top of the new roof covering.*
- (5) All eaves shall provide a firm nailable substrate for secure attachment of perimeter edge metal.*
- (6) Perimeter edge metal shall be fastened with nails or fasteners fabricated from similar or compatible material. The nails or fasteners shall be as set forth in the relevant Approved Roofing Product Approval.*
- (7) All pre-cast and pre-stressed concrete deck components shall be levelled with levelling fill, where such components edges are greater than 1/2" from being flush. Rigid or semi-rigid insulation panels shall be in 85% contact with the deck if bonded in hot asphalt or cold adhesive. Mechanical attachment of insulation panels at uneven areas shall be acceptable. Cutting or scoring of insulation panels to provide contact is not acceptable.*

3002.4 BUILT-UP ROOFING COMPONENTS AND ROOF SYSTEM ASSEMBLIES:

- (a) ADHESION: All adhered Roofing Components shall be bonded to the various types of substrates in compliance with the requirements set forth in the Roof System Assembly Approved Roofing Product Approval and the following minimum requirements:*
 - (1) A Minimum Roof Covering base sheet, as defined in Subsection 3401.7(a)(2), if hot mopped to a concrete substrate, shall be mopped to a minimum of 20-25 lbs. per square yard of approved asphalt. The hot mopped asphalt membrane is to be applied to a dry primed surface. Additional plies over a base ply shall be applied in a quantity not less than 20 lbs. per square yard. Asphalt mopping shall provide a thin, even layer, with no voids or dry spots. Pour coats over a top ply shall be in a quantity not less than 50 lbs. per square. Application temperatures shall be within +/- 25° F of the*

equiviscous temperature (EVT) printed on the asphalt or coal tar carton or printed on the bulk delivery ticket.

- (2) *All packaged asphalt shall have the following data printed on the carton wrapper:*
 - (i) *ASTM designation and type;*
 - (ii) *Flash point as determined by ASTM D 92, Flash and Fire Point by Cleveland Open Cupl, and*
 - (iii) *Equiviscous temperature (EVT) at which the asphalt attains a viscosity of 125 centipoise (25 centipoise for coal tar) as determined by ASTM D 4402, Viscosity Determinations of Unfilled Asphalt Using The Brookfield Thermoset Apparatus.*
 - (3) *Asphalt types as defined by ASTM D 312 shall be employed in all Roof Systems Assemblies.*
 - (4) *Cold adhesives, cements or other adhesive compounds shall be subject to Approval by the Building Control Officer, shall be listed as a Roofing Component and within any Roof System Assembly's Approved Roofing Product Approval; and shall be asbestos free.*
- (b) **MECHANICAL ATTACHMENT:** *All mechanically attached Roofing Components shall be attached to the various types of substrates in compliance with the requirements set forth in the Roof System Assembly Approved Roofing Product Approval and the following minimum requirements.*
- (1) **BASE SHEET ATTACHMENT ON WOOD DECKS:**
 - (i) *Nails shall be minimum 12 gage annular ring shank nails having not less than 20 rings per inch; heads not less than 3/8" in diameter; and lengths sufficient to penetrate through the plywood panel or wood plank decking not less than 3/16" or to penetrate into a 1" or greater thickness of lumber not less than 1". Nails shall be hot dipped; electro or mechanically galvanized to a thickness sufficient to resist corrosion. Evidence of such compliance shall be provided to the Building Control Officer. Subsequent to the introduction of this revision of the Code. All nail cartons or carbon labels*

shall be labelled to note compliance with the corrosion resistance requirements.

- (ii) Such fasteners shall be applied through 'tin caps' not less than 1 5/8" and not more than 2" in diameter and of not less than 32 gage (.010") sheet metal. 'Cap nail' with integral heads shall not be an acceptable substitute.*
 - (iii) Spacing of such fasteners shall be in compliance with patterns set forth in Roof System Assembly Approved Roofing product Approval or in the Minimum Roof Covering requirements set forth in Section 3001.6(b)(1) of this Code.*
 - (iv) Where the architectural appearance of the underside is to be preserved, a base sheet may be secured in an alternate method providing the attachment components and spacing have been approved by the Roof System Manufacturer and the spacing has been certified by an engineer recognized by the Minister to meet the design pressures calculated for the structure under Chapter 20 of this Code.*
- (2) OTHER NAILABLE DECKS:** *The mechanical attachment of Roofing Components which make up a continuous Roof System Assembly to other nailable decks shall be governed by the Roof System Assembly Approved Roofing Product Approval.*
- (c) NON-NAILABLE DECKS:** *Poured and pre-cast structural concrete and steel deck units are considered non-nailable.*
- (1) POURED AND PRECAST STRUCTURAL CONCRETE DECKS:**
- (i) Concrete decks shall be clean, dry and fully primed with ASTM D 41 primer applied at a rate of not less than one gallon per square. Hot asphalt or cold adhesive shall not be applied until the primer has fully dried.*
 - (ii) Anchor sheets or insulation panels may be mechanically fastened to a non-primed concrete deck with concrete fastener types which have Product Control Approval with the anchor sheet or insulation panel.*

- (iii) Where the slope of the roof deck exceeds 3:12 the base shell of a Minimum Roof Covering shall be blind nailed at the head laps at 6" o.c. The base sheet shall be applied parallel to the slope of the deck.*
- (iv) Application of continuous Roof Systems Assemblies over poured and pre-cast concrete decks shall be governed by the Roof System Assembly Approved Roofing Product Approval.*
- (v) In new construction applications, hot mopped applications over precast panels shall have grouted joints. In re-roof applications, where joints have been grouted in original construction, minimum 6" wide strips of roofing felt or modified bitumen shall be bonded to the joints with asphalt, approved mastic or approved cold applied adhesive or shall be torched to a primed surface.*

(2) STEEL DECKS:

- (i) Steel decks shall be covered with a Roofing Product Approved roof insulation panel listed in the Roof System Assembly Approved Roofing Product Approval. Insulation panels shall be mechanically fastened with an Approved Fastening assembly in compliance with the mechanical attachment patterns listed in the Roof System Assembly Approved Roofing Product Approval.*
- (ii) Steel decks for new construction applications shall be a minimum of 22 gauge unless the Roof System Assembly has a specific Approved Roofing Product Approval for application to a lighter deck type or a composite roof deck system which has received such approval.*
- (iii) Steel decks shall be welded or mechanically attached to the structure in compliance with the design pressure requirements set forth in Chapter 20 of this Code.*
- (iv) Application of impervious Roof Systems Assemblies over steel decks shall be governed by the Roof System Assembly Approved Roofing Product Approval.*
- (v) Composite wood and insulation panels shall be me-*

chanically attached to steel decks in compliance with the attachment requirements enumerated in the insulation Roofing Component Approved Roofing Product Approval. The composite wood insulation panel shall be in compliance with the minimum sheathing requirements of this Code.

- (3) **OTHER NON-NAILABLE DECKS:** *Attachment to other non-nailable decks shall be in compliance with the Roof System Assembly Approved Roofing Product Approval or, in the case of Minimum Roof Coverings by methods approved by the Building Control Officer.*

(d) **FLASHING:**

- (1) *Flashing shall be constructed as detailed in the Roof System Assembly Product Control Approval and in compliance with the following minimum standards:*

- (i) *A minimum flashing shall consist of a base layer of ASTM D 226 type II; ASTM D 4601 type II; ASTM D 2626 base ply; or ASTM D 4897 venting base ply bonded to a primed vertical surface with type IV asphalt or a Product Control Approved cold adhesive or cement. The base ply shall be covered with one interply of a like material to the base ply bonded in type IV asphalt or ASTM D 4586 flashing cement. The top flashing ply shall have either a granular surface or be coated with an Approved Roofing Product Approval aluminized or emulsion coating to meet the fire classification and to resist ultraviolet exposure.*
- (ii) *Metal flashing shall be applied over the top roofing ply and mechanically attached in place in compliance with the requirements of the Building Control Officer. All metal surfaces to which an asphalt product is to be applied shall be fully primed with an ASTM D 41 primer. Metal flashing shall be 'stripped' or flashed with a single ply of modified bitumen; a two ply system of organic felts; or a two ply system of inorganic plies.*
- (iii) *Flashing shall be mechanically attached to the vertical wall not more than 1 1/2" down from the upper edge 6" o.c.. Felt flashing shall terminate under a metal counter flashing or be finished with a metal surface*

mounted reglet attached to the wall not less than 8" on center. The reglet shall be weatherproofed with a caulk bead of a suitable type to bond to both the metal reglet and the wall surface.

(iv) Flashing of Approved Roofing Product Roof System Assemblies shall be applied in strict compliance with the application methods detailed in the Approved Roofing Product Approval.

(v) Flashing in all new construction projects shall be a minimum of 8" above the roof membrane unless otherwise indicated in the Roof System Assembly Approved Roofing Product Approval.

(vi) In all reroof applications, flashing shall be a minimum of 8" above the roof membrane where job conditions allow. In no case shall flashing be less than 4" above the roof membrane.

(2) Metal flashing shall be fabricated from materials and installed in compliance with methods set forth in Appendix A.

(e) VALLEYS:

(1) Valleys shall in general, be fabricated from metal materials and installed in compliance with methods set forth in Subsection 3007.4 of this Code and Appendix A.

(2) Minimum Roof Coverings, applied at slopes greater than 2": 12" may have valleys fabricated from composition materials incorporating an additional interply of compatible material.

(3) Valleys of Approved Roofing Product Roof System Assemblies shall be applied in strict compliance with the application methods detailed in the Product Approval.

(f) PARAPET WALLS:

(1) Parapets for Approved Roofing Product Roof System Assemblies shall be applied in strict compliance with the application methods detailed in the Approved Roofing Product Approval.

(2) Where the application is a Minimum Roof Covering the following application method shall be employed:

- (i) *The base flashing felts shall be ASTM D 4601, type II; ASTM D 2626; or ASTM D 226 type II.*
- (ii) *Base flashing shall extend a minimum of 4" above the cant strip and terminated under a metal reglet or surface mounted reglet as shown in Figure 2, below. If the flashing is continued up the parapet wall to the top of the parapet, the base flashing shall completely cover the top of the parapet and shall be fastened 12" o.c., within 1 1/2" from the edge of the base flashing. The top ply flashing shall be set in type IV asphalt or Approved Roofing Product cold adhesive or cement.*
- (iii) *Top ply flashing shall be a granular surface membrane of similar reinforcement to the base flashing. Where a coping cap is to be installed, the granular surface membrane shall extend 2" beyond the base ply over the top face of the parapet and fastened to the outside face or, on a curved parapet, the granular surfaced membrane shall extend past the apex to eliminate water build up at the flashing edge. The granular surface edge shall be fastened 6" o.c., 1" from the flashing edge. The flashing shall be covered with a counter flashing coping cap or a surface mounted reglet attached to the vertical wall not less than 8" on center and weatherproofed with a sealant bead of a material that will bond to the metal reglet and to the vertical wall material.*
- (iv) *If the parapet wall is higher than 18", measured from the roof deck the top ply shall be blind nailed at the selvage edge 6" o.c., and shall be applied vertically.*
- (g) *INSULATION: Roof insulation shall be applied in compliance with the Roof System Assembly Approved Roofing Product Approval. No insulation shall be applied in Minimum Roof Covering applications.*
- (h) *SURFACING: Roof System Assemblies shall be surfaced in compliance with the Approved Roofing Product Approval. Surfacing shall be in sufficient quantity to comply with the required fire classification.*
 - (1) *Aggregate surfacing shall not be used on slopes greater than 3:12. Aggregate shall be embedded in a flood coat of bitumen applied over a prepared top ply.*

- (2) *On slopes of 3:12 or less, not less than 400 lbs. of roofing gravel or 300 lbs. of slag per square shall be applied. A minimum of 50 percent of the aggregate shall be embedded in the flood coat of hot asphalt. Aggregate shall be dry and free from dirt and shall be in compliance with the sizing requirements set forth in ASTM D 1863. The Building Control Officer may request a test to confirm compliance with these requirements.*
 - (3) *On inclines greater than 3:12, a smooth surface coating shall be applied.*
 - (4) *Aggregate types and quantities set forth in the Approved Roofing product Roof System Assemblies shall take precedence over the requirements set forth in this Section.*
 - (5) *Mineral surfaced cap sheet applications shall not require any additional surfacing unless required with the particular assembly for a fire classification. Mineral surface cap sheets shall be back nailed in Minimum Roof Covering applications at inclines greater than 1": 12" at 12" o.c. at head laps of 6" o.c., at end laps when the cap sheet is applied parallel to the slope.*
 - (6) *All smooth surface applications shall be coated with an Approved Roofing Product aluminized or emulsion coating in compliance with the application instructions in the Roofing Component Approved Roofing Product Approval, but not less than 1 1/2 gallons per square coating quantity shall be in compliance with the required fire rating classification for the structure.*
- (i) **ATTACHMENT OF METAL TERMINATION:**
- (1) *Edge metal shall be in compliance with the requirements set forth in Section 3007.2.*
 - (2) *Edge metal systems shall be attached to resist wind loads as calculated under Chapter 20 of this Code.*
- (j) **EXPANSION JOINTS:**
- (1) *Expansion joints shall be in compliance with the Roof System Assembly Approved Roofing Product Approval.*
 - (2) *Expansion joint covers shall be constructed of metal or metal and elastomeric components. Pre-assembled components*

shall have Roof Component Approved Roofing Product Approval.

3002.5 PREPARED ROOF COVERINGS:

(a) MATERIALS:

- (1) Prepared Roof Coverings shall be as defined in Section 3401.3(a)(12) of this Code and are, in general, limited to application over sloped roof decks capable of receiving mechanical fasteners. Prepared roof coverings may be mechanically fastened or in specific limited cases noted in the Approved Product Roofing Approval, set in an adhesive bond.**
- (2) The application of materials defined in this Section shall be in compliance with the application instructions provided on the product packaging; in the Roofing Component Approved Roofing Product Approval and supplemented by the provisions of this Chapter. Application instructions published in the Approved Roofing Product Approval shall take precedence.**

(b) UNDERLAYMENT: Underlayment shall be a water shedding layer as defined in Section 3001.3(a)(2) of this Code.

- (1) Underlayment shall be attached in compliance with the Roofing Component Product Control Approval and shall be in compliance with the following minimum requirements:**
 - (i) Underlayment shall be attached to a nailable deck in a grid pattern of 12" with 6" spacing at the overlaps. The grid pattern shall be decreased to 10" with 6" spacing at the overlaps on all installations above 100 feet**
 - (ii) Underlayment nails shall be as defined in Subsection 3003.4(b)(1)(i) of the Code. Underlayment nails do not require ring shanks; however, all underlayment nails shall be in compliance with the corrosion resistance requirements set forth in the above mentioned Subsection.**
 - (iii) Underlayment nails shall be applied through 'tin caps' defined in Subsection 3002.4(b)(1)(i) of this Code.**
 - (iv) Where the architectural appearance of the underside is to be preserved, underlayment may be secured with battens secured to the structural members providing**

that the prepared roof covering is approved for applications over battens.

- (2) *If the underlayment is a self-adhering membrane, the sloped roof shall be vented in compliance with Subsection 3001.4(e)(3).*
 - (3) *If the underlayment is a self-adhering membrane, the membrane shall be applied over a mechanically attached anchor sheet., attached in compliance with subsection 3002.5(b)(1)(i) of this Code.*
 - (4) *All self-adhered or products termed single or double layer nailed in place underlayment materials shall be tested as required by the Building Control Officer.*
 - (5) *Single layer underlayment materials shall be tested as a part of a Prepared Roof Covering, or under a generic test protocol for use with a number of prepared roof coverings.*
 - (6) *All underlayments applied at a roof pitch less than 4:12 shall be applied in a double layer by applying a 50% overlap or by the application of an ASTM D 226, type II organic felt or an ASTM D 2626 coated base sheet as a base ply. Head laps shall be 6". If a self-adhered underlayment is applied, a base sheet shall be nailed prior to the application of the self-adhered membrane.*
- (c) *APPLICATION: Unless otherwise specified herein, Prepared Roofing Components and Roof System Assemblies shall be applied at such slopes and over such underlayment materials set forth in the Roof System Assembly Approved Roofing Product Approvals.*
- (d) **FIBRE-CEMENT SHINGLES:**
- (1) *Fibre-cement shingles shall be applied in compliance with the shingle manufacturer's Roof System Assembly Approved Roofing Product Approval.*
 - (2) *Underlayments shall be only those approved in the Roof System Assembly Approved Roofing Product Approval and shall be applied in compliance with the application methods detailed in the Product Approval and the minimum requirements set forth in Subsection 3002.5(b) if mechanically attached.*

- (3) *The Roof Assembly Approved Roofing Product Approval shall meet the following minimum requirements:*
- (i) *All Non-Asbestos Fibre-cement shingles shall conform to ASTM C 1225.*
 - (ii) *Fibre-cement shingles shall not be installed at a slope less than 4:12.*
 - (iii) *Fibre-cement shingles shall be installed in compliance with the nailing requirements set forth in the product Approval; however, attachment of each component shall be with not less than two corrosion resistant fasteners. If adhesive is used at the head or side laps, the system shall be defined as a 'sealed system' with load calculations in compliance with Chapter 20 of this Code.*
 - (iv) *All intersections shall be flashed in metal as provided in Section 3007 herein.*
- (f) **ASPHALT SHINGLES:**
- (1) *Asphalt shingles shall be applied in compliance with the Roof System Assembly Approved Roofing Product Approval.*
 - (2) *Underlayment shall be only those defined in the Roof System Assembly Approved Roofing Product Approval, but shall not be less than a single layer of ASTM D 226 type I felt overlapped 19" or one layer of ASTM D 226 type II felt with a 4" overlap on application on slopes of not less than 4:12. All underlayments and shingles shall be nailed with a minimum 12 gauge corrosion resistant roofing nail.*
 - (3) *Underlayments exceeding minimum underlayments shall be applied in compliance with the application methods detailed in the Roof System Assembly Product control Approval and the minimum requirements set forth in Subsection 3002.5(b) if mechanically attached. Self-adhered membranes shall not require additional nailing except as may be noted in the Approved Roofing Product Approval.*
 - (4) *The Asphalt Shingle Prepared Roof Covering Approved Roofing Product Approval shall meet the following minimum requirements:*

- (i) *Asphalt shingles applied over rigid insulation, wood fibre gypsum or concrete decks shall be secured through a sheathing panel of minimum 15/32" exterior grade plywood or 1" x 6" tongue and groove wood sheathing which has been anchored to the deck in compliance with Chapter 20 of this Code, but not less than one fastener every two square feet. Overlaid decking shall have a ventilation channel between the existing deck and the new sheathing.*
 - (ii) *Asphalt shingles shall be installed in compliance with the Approved Roofing Product Approval, but in no case with less than six approved roofing nails or approved fastening devices which penetrate the sheathing or wood plank a minimum of 3/16" or penetrate a 1" or greater thickness of lumber a minimum of 1".*
 - (iii) *Intersections, eaves, rakes, valleys, gable ends, and the starter course of Composition Shingles shall be set in an 8" wide bed of approved cold adhesive or roofing cement. Application of adhesive or cement shall be in compliance with the application instructions of the Roofing Component Approved Roofing Product Approval.*
 - (iv) *All perimeter termination and valleys shall be fabricated from metal. Minimum metal requirements are set forth in Subsection 3007.4 of this Code.*
- (5) *Composition shingles shall be tested in compliance with the provisions set forth in Section 3402 of this Code.*

3003 CEMENT AND CLAY ROOF TILE

3003.1 MATERIALS:

- (a) *Tile shall be clay, concrete or composition material of various configurations complying with the physical property requirements of this Code.*
- (b) *Tile shall have an Approved Roofing Product Approval for a complete Tile System, which shall include the tile, underlayment and all related accessories required to provide a waterproof system. If a tile profile may be attached using more than one method (i.e. mortar or adhesive set or mechanically attached), Approved Roofing Product Control Approval shall be obtained for each method of application.*

- (c) *Mortar shall be a pre-mixed unit consisting of ASTM C 91, type M mortar in combination with ASTM C 150, type I Portland cement; and/or lightweight aggregate in compliance with ASTM C 332; and/or sand in compliance with ASTM C 144.*

3003.2 APPLICATION:

- (a) *The entire application method of all Tile Systems shall be in compliance with the system manufacturer's Approved Roofing Product Approval.*
- (b) *The Approved Roofing Product Approval shall include a minimum slope of each tile and underlayment system shall meet the following slope requirements.*
 - (1) *Tile or other discontinuous Prepared Roof Coverings installed at slopes 4:12 or less shall be applied in a mortar or adhesive set application or in a batten system applied over vertical and horizontal batten strips (herein after referred to as 'Counter Battens').*
 - (2) *Mortar or adhesive set nail -on and batten installed systems may be applied to roof pitches of 4:12 to 7:12. Only batten installed systems shall be applied at slopes greater than 7:12.*
- (c) *Tile Systems shall be applied to a solid sheathing in compliance with Section 3002 of this Code, or other nailable decks in which the minimum characteristic resistance force is not less than 75 lbs of withdrawal resistance per fastener. The Building Control Officer may by a recognised require testing by a recognised testing agency to confirm fastener performance. Fasteners shall be in compliance with ASTM A 641, class 1 for carbon steel galvanized nails, or fabricated from aluminum, cooper or stainless steel. All nails and threaded fasteners used to attach tile shall be non-ferrous. Fasteners shall be in compliance with the corrosion resistance requirements of this Code.*
- (d) *Tile Systems shall be applied using methods detailed in the Approved Roofing Product Approval as a minimum criteria.*
- (e) *The proposed method of attachment for systems shall be tested for wind characteristics, in compliance with Chapter 20 of this Code.*
- (f) *The proposed method of attachment for systems which are not tested for wind characteristics shall provide a minimum charac-*

teristic force (F') to meet or exceed the design pressure requirements for the building, determined in compliance with Chapter 20 of this Code.

- (g) The mortar or adhesive set tile systems, a field static uplift test be required not less than 30 days after application to confirm the tile adhesion. For mechanically attached tile systems, this field static uplift test may be required at their discretion of the Building Control Officer.*
- (h) Tile Systems shall extend beyond the roof sheathing not less than 3/4" but not more than 2".*
- (i) Spanish 'S' tile, Barrel tile or other tile systems that create a void between the deck and the underside of the tile shall closed at the eaves with a prefabricated closure or mortar filler to close the eaves and elevate the butt ends of the first course.*
- (j) Weepholes shall be provided in mortar or adhesive set systems to drain any water reaching the underlayment.*
- (k) Mortar or Adhesive Set tiles applied at an incline from 4:12 to 7:12 shall have the first three courses of tile nailed with not less than one nail per tile. As an alternate, the first three courses of tile shall be applied in mortar over a single layer of minimum 12 gauge wire mesh with square openings of not less than 3/8" which is mechanically attached to the deck with not less than one roofing nail per sq.ft. For roof pitches from 6:12 to 7:12 every third tile of every fifth course, beginning at the eight course shall be nailed with not less than one nail per tile.*
- (l) All tile set at an incline greater than 7:12 shall be nailed to the deck over battens, regardless of the type of system.*
- (m) All tile systems shall be installed with a minimum 3" headlap or with an approved headlap configuration which has been tested for water infiltration.*
- (n) Vertical battens strips shall be minimum 1"x4" nominal pressure treated or decay resistant lumber installed over the sheathing nailed or screwed to the top chord of the roof trusses spaced not greater than 24" o.c. Underlayment shall be applied over the vertical battens and shall be secured with the horizontal battens.*

 - (1) As an alternative the underlayment may be applied under the vertical battens or;*

- (2) *Vertical battens may be applied over the top of a self-adhered or nail-on single ply membrane providing a continuous bead of compatible mastic is applied to the underside of each batten.*
- (o) **ALL TILE SYSTEMS:**
 - (1) *All tile application designs shall comply with the following limitations in order to withstand the wind loads prescribed in this section as well as all wind load requirements prescribed in section 3402 of this Code.*
 - (aa) *Roof tiles shall be either mechanically attached or bonded with mortar/adhesive. System combining both applications shall be acceptable.*
 - (bb) *The tile shall be single lapped interlocking with a minimum head of not less than 3", or a designed interlocking headlap of not less than 2".*
 - (cc) *The length of each tile shall be not less than 12" and not greater 21" and the exposed width of the tile shall be between 8.5" and 15".*
 - (dd) *Maximum thickness of the nose (leading edge) of the tile shall not exceed 1.3".*
 - (ee) *All tile systems shall be installed over solid sheathed decks.*

3004 METAL SHINGLES

3004.1 MATERIALS:

- (a) (1) *Corrosion resistant steel shingles shall be not less than 30 gauge in thickness. Aluminum Shingles shall not be less than .019" thick. All other metal shingle products shall be an equivalent weight. All metal shingle assemblies shall be capable of withstanding reasonable foot traffic without damage to the metal shingles.*
- (2) *Metal Shingles shall have an Approved Roofing Product Approval for a complete Metal Shingle System which shall included the tile underlayment and all related accessories to provide a complete waterproofing system.*

3004.2 APPLICATION:

- (a) The entire application method of all Metal Shingle Systems shall be detailed in the Approved Roofing Product Approval.*
- (b) The Approved Roofing Approval shall include a minimum slope for each Metal Shingle System which shall not be less than 4:12.*
- (c) Metal Shingles may be applied as a recover over a single layer of asphalt shingles providing the deck is solid sheathed the existing Prepared Roof Covering is in compliance with provisions of this Code and the entire Metal Shingle system is applied as set forth in the Approved Roofing Product Approval.*
- (d) Metal Shingle systems shall extend beyond the roof sheathing not more than 1".*
- (e) Metal Shingles shall be installed in compliance with the attachment criteria established in the Approved Roofing Product Approval but with not less than three nails per shingle. Nails shall be the type and length detailed in the attachment criteria of the Product Approval.*
- (f) All intersections shall be flashed in metal as provided in Section 3408 herein.*

3005 WOOD SHINGLES AND SHAKES

3005.1 MATERIALS:

- (a) (1) *Wood shingles and shakes shall be of the type and sizes set forth in Table 30-C herein.*
- (2) *Underlayment and/or interlayment strips shall be not less than ASTM D 226, type II felt not less than 18" wide.*
- (3) *Wood shingles and shakes shall have an Approved Roof Product Approval for a complete Wood Shingle or Shake System which shall include the shingle/shake, underlayment/interlayment and all related accessories.*

3005.2 APPLICATION:

- (a) *The entire application method of all Wood Shingle and Shake Systems shall be detailed in the Approved Roofing Product Approval.*
- (b) *Wood shingles and shakes may be applied to spaced or solid sheathed substrates.*
 - (1) *Spaced sheathing shall not be an acceptable substrate if the slope is 4:12 or less*
 - (2) *Spaced sheathing shall be not less than a nominal 1" x 3" batten board for shingles spaced not greater than the actual board width, and a nominal 1" x 4" batten board for shakes spaced not greater than the actual board width.*
- (c) *The minimum slope for wood shingles shall be 3:12 and the minimum slope for shakes shall be 4:12.*
- (d) *Maximum weather exposure of wood shingles and shakes shall be as set forth in Table 30-C herein.*
- (e) *No underlayment/interlayment felt shall be exposed to the weather.*
- (f) *All intersections shall be flashed in metal as provided in Section 3007 herein.*

3005.3 FASTENING:

- (a) *Fasteners shall be of the type and length detailed in the Approved*

Roofing Product Approval but shall not be less than two nails per shake or shingle.

- (b) *All nails shall comply with the corrosion resistance requirements set forth in this Code and shall be manufactured from copper, zinc, zinc coated aluminum or commercially pure iron not less 14 B&S gauge. All nails shall be not less than 1-1/2" long and shall have a minimum head diameter of 7/32" and shall penetrate into the sheathing 1" or through the thickness of sheathing a minimum of 3/16" whichever is less.*

3005.4 TESTING:

- (a) *All Wood Shingle or Shake Systems shall be tested for wind driven rain infiltration resistance to the satisfaction of the Building Control Officer.*
- (b) *Wood shingles and shakes shall be tested as a system including the underlayment and/or interlayment strips and related accessories. Testing shall be carried out by the producing mill or by the trade association representing a group of mills providing similar products to the South Florida market.*

**TABLE 30-C
MAXIMUM EXPOSURE TO WEATHER**

Grade	Roof Incline	Shingle Length		
		16 inch	18 inch	24 inch
Wood Shingles				
#1	3" to less than 4" per foot	3¾"	4¼"	5¾"
#2	3" to less than 4" per foot	3½"	4"	5½"
	4" or more per foot	4"	4½"	6½"
#3	3" to less than 4" per foot	3"	3½"	5"
	4" or more per foot	3½"	4"	5½"
Shakes				
#1	4" or more per foot	8"		10"

Exposure of 24"x3/4" resawn handsplit shakes shall not exceed 5" regardless of slope.

3006 ROOF INSULATION

3006.1 MATERIALS:

- (a) *All roof insulation shall be approved by the Building Control officer as an approved Roofing Component for use in Roof System Assemblies. Roof insulation shall be installed as a Roofing Component only in Approved Roofing Product Roof System*

Assemblies listing the insulation type as Approved Roofing Component.

- (b) Foam insulation panels shall be overlaid with a perlite, fiberglass, wood fiber, or rockwool overlay unless specifically stated to the contrary in the Product Control Approval.*
- (c) Minimum Roof Coverings shall not include insulation.*
- (d) Mechanical fasteners shall be an approved attachment assembly listed in the Approved Roofing.*

3006.2 APPLICATION:

- (a) Roof insulation shall be applied in strict compliance with the application methods detailed in the Approved Roofing Product Approval.*
- (b) Stored roof insulation either on the ground or on the roof top shall be kept dry while on a job site awaiting installation. Should the Building Control Officer find elevated moisture levels in store insulation, he may instruct the removal of the insulation from the job site.*
- (c) When applied in hot asphalt or cold adhesive no insulation panels dimension shall be greater than 4 feet.*
- (d) Strip or spot mopping of insulation panels shall only be utilized as an application method when approved in the Roof System Assembly approved Roofing Product Approval.*
- (e) Where more than one layer of insulation is applied joints between layers shall be staggered.*
- (f) Application over steel decks and structural concrete, lightweight concrete, wood and cementitious wood fiber decks shall be to a standard acceptable to the Building Control Officer.*
- (g) Application in Approved cold adhesive shall be as detailed in the Approved Roofing Product Approval and shall be in compliance with the required fire classification.*
- (h) Nail boards or composite panels with a nailable surface may be applied to sloped decks for the application of Prepared Roof Covering or metal roof systems, providing the nailing surface is in*

compliance with minimum sheathing requirements of this Code and the panel has been attached to the deck with approved fastening assemblies at a density of not less than 1/2 sq.ft. Nail boards or composite panels must allow for ventilation immediately adjacent to the underside of the nailable surface to which the prepared roofing is applied.

- (1) *Composite panels shall be gapped a minimum of 1/8" to allow for expansion of the sheathing panel.*

3007 ROOFING ACCESSORIES

3007.1 GENERAL:

- (a) *Metal accessories for roofs shall be not less than 26 gauge galvanized or stainless steel, 16 ounce copper 0.025" thick aluminum or equivalent non-corrosive metal alloys or composite materials manufactured for use as roof termination. All composite and non-metallic flashing materials shall have Approved Roofing Product Approval.*
- (b) *Metal accessories may be of a manufactured shop fabricated or field fabricated type, providing the materials and fasteners are in compliance with the minimum requirements of this Code.*

3007.2 GRAVEL STOP OR DRIP EDGE: Gravel stop or drip edge profiles shall be as follows:

- (a) *All gravel stops shall be raised above the roof surface a minimum of 2" Water shedding perimeters, such as gutters and scupper areas are exempt from the requirement. The gravel stop shall be nailed on the flange and nailed or clipped at the face. The deck flange shall be not less than 3" in width.*
- (b) *The vertical face shall be a minimum of 2" and shall extend down not less than 3/4" below the sheathing or other member immediately contiguous thereto. Should the face of the gravel stop or drip edge exceed 4", a continuous clip, (Hook strip) fabricated from material not less than 10% thicker than the gravel stop/drip edge, shall be installed. Non-clipped vertical faces greater than 3" shall be fabricated from minimum 26 gauge steel or stainless steel; .040" aluminum; 20 oz copper; or a similar thickness of other termination materials.*
- (c) *Gravel stop shall be designed so that the bottom of the drip edge shall have a minimum of 1/2" clearance from the structure.*

- (d) *Gravel stop shall be attached to the sheathing or nailing strip with minimum 12 gauge ring shank nails or other approved non-corrosive fasteners 1" long. Smooth shank nails shall not be acceptable for the attachment of perimeter metal. Nails shall be fabricated from similar and compatible material to the metal profile. If the substrate is less than 1 1/2" of dimensional lumber, in combination of thickness, the gravel stop/drip edge shall be fastened with minimum #10 diameter screws penetrating the substrate 1" or if the sheathing is less than 1" through the substrate not less than 3'16". If the substrate is less than 1" the gravel stop/drip edge may be fastened with #8 x 1/2" modified truss gimlet point fasteners spaced 4" o.c..*

- (e) *Gravel stops shall be installed after all roof felts have been applied or in compliance with the application method set forth in the Roof System Assembly Approved Roofing Product Approval. All asphalt or approved cold adhesive bonding areas shall be coated with ASTM D 41 asphalt cut-back primer and allowed to dry prior to application.*

- (f) *Gravel stops shall be joined by one of the following methods:*
 - (1) *Lapped a minimum of 4" and the entire interior of the joints shall be coated with approved flashing cement.*

 - (2) *At gables, only lap joints shall be used with a minimum lap of 2".*
 - (aa) *Cover and splice plates shall be of the same material as the gravel stop.*

3007.3 EAVE AND GABLE DRIP:

- (a) *Eaves and gable drip for tile, fiber-cement shingles, asphalt shingles, metal shingles, and mineral surfaced roofs shall have a roof flange not less than 2" wide. The metal profile shall be nailed with a minimum 12 gauge annular ring shank nail at 4" o.c. The nail shall be manufactured from similar and compatible material to the termination profile. All composite materials shall be fastened with non-ferrous nails.*

- (b) *The drip or face flange shall be a minimum of 2" in width and extend not less than 3/4" below the sheathing.*

- (c) *Eave and gable drip shall be designed so that the bottom of the drip edge shall have a minimum of 1/2" clearance from the structure.*

- (d) *The roof flange shall be installed in compliance with the Roof System Assembly Approved Roofing Product Approval.*
- (e) *Eaves and gable drip shall be lapped a minimum of 4" at perimeter laps and shall be wrapped around and lapped a minimum of 5" at corners.*

3007.4 VALLEY METAL:

- (a) *Valley metal shall be of the materials set forth in Subsection 3007.1 herein*
- (b) *Valleys shall be installed in compliance with the Roof System Assembly Product Approval.*

3007.5 BASE FLASHING:

- (a) *Base flashing shall be installed after the roofing felts have been laid and turned up the vertical surfaces in compliance with the Roof System Assembly Product Control Approval.*
 - (1) *Such felts shall be embedded in hot bitumen or an approval adhesive.*
 - (2) *Metal surfaces shall be primed and allowed to dry prior to receiving hot bitumen or cold adhesive.*
- (b) *Metal base flashing where installed shall extend not less than 8" up vertical surfaces in new construction applications and, where possible in reroof and recover applications and shall extend not less than 4" on the deck and shall be:*
 - (1) *Fastened to the deck with fasteners as provided herein for gravel stop and stripped as set forth in Subsection 3002.4(d)(1)(ii) of this Code; and*
 - (2) *Locked and/or soldered at end laps.*
- (c) *Base flashings constructed from multiple layers of reinforced asphalt materials shall be applied in compliance with the manufacturers' published application instructions and in compliance with the application instruction detailed in the Approved Roofing Product Approval.*

3007.6 METAL COUNTER FLASHING:

- (a) *Metal counter flashings shall be built into walls, set in reglets or applied as stucco type and shall be turned down over base flashings not less than 3".*
- (b) *Metal counter flashings shall be side lapped a minimum of 3".*
- (c) *Metal counter flashings where set in reglets or surface-mounted shall be thoroughly weatherproofed with a sealant bead. Primer shall be applied to the substrate surfaces where recommended by the sealant manufacturer.*
- (d) *Where metal counter flashing is used as the means of sealing (such as a vented system) it shall be set in an approved sealant, sealed with an approved adhesive on the top flange and all joints shall be sealed with an approved sealant and lapped a minimum of 3".*

3007.7 ROOF PENETRATION FLASHING:

- (a) *All pipes shall be flashed with approved lead sleeve-type pitch pans or other approved methods detailed in the Roof System Assembly Approved Roofing Product Approval. Lead flashing shall not be less than 2.5 lb. per square foot. Flanges shall be a minimum of 4".*
- (b) *Other roof penetrations shall be suitably flashed with curbs, collars, pitch pans or other Approved weather-tight methods, in compliance with the Roof System Assembly Approved Roofing Product Approval.*
- (c) *All rooftop equipment shall be secured to a curb unit constructed from salt pressure treated or decay resistant wood or galvanised metal that has been mechanically attached to the building structure. Attachment to wood 'sloopers' which are attached to the deck shall not be an acceptable alternate.*

3007.8 OVERFLOW SCUPPERS AND OUTLETS: *Overflow scuppers and roof outlets shall be lined with approved metal or other approved materials set forth in the Roof System Assembly Approved Roofing Product Approval and shall comply with the requirements of Subsection 1506.4 and Section 3611 of this Code.*

3007.9 GUTTERS AND DOWNSPOUTS: *Gutters and downspouts shall be constructed of metal with lapped, soldered or caulked joints and shall be securely fastened to the building with a corrosion resistant fastening device of similar or compatible material to the gutters and downspouts.*

3008 ROOF MOUNTED EQUIPMENT

3008.1 Machinery, piping, conduit, ductwork, signs and similar equipment may be mounted on roofs subject to the following:

- (a) (1) Permanently mounted roof-top equipment shall be installed with clearances sufficient to permit roof and roof covering maintenance but no instances shall the clearance be less than shown in Table 30-D.

TABLE 30-D
ROOFTOP EQUIPMENT HEIGHT REQUIREMENTS

<i>WIDTH OF EQUIPMENT</i>	<i>HEIGHT OF LEGS</i>
<i>Up to 24"</i>	<i>14"</i>
<i>25" to 36"</i>	<i>18"</i>
<i>37" to 48"</i>	<i>24"</i>
<i>49" to 60"</i>	<i>30"</i>
<i>61" and wider</i>	<i>48"</i>

- (2) Electrical conduit, mechanical piping or any other service lines running on the roof shall be raised not less than 8" above the roof surface.
- (3) Condensate lines shall not be required to have a minimum roof-top clearance.
- (b) Equipment supports signs and all anchorage shall be designed and constructed to comply with the provisions of Chapter 20.
- (c) Penetrations through and attachments to roofs required for the support of such equipment, shall comply with Subsection 3007.7 herein.

CHAPTER 31 CLADDING AND GLAZING

- 3101 GENERAL
- 3102 LATHING
- 3103 PLASTER
- 3104 RENDERING AND STUCCO
- 3105 PLASTICS
- 3106 ASBESTOS CEMENT
- 3107 TILE
- 3108 GLASS AND GLAZING
- 3109 GLASS VENEER
- 3110 GYPSUM BOARD PRODUCTS AND ACCESSORIES
- 3111 *SUSPENDED AND FURRED CEILINGS*
- 3112 OTHER MATERIALS
- 3113 STORM SHUTTERS
- 3114 *CURTAIN WALL AND STRUCTURAL GLASS*

3101 GENERAL

- 3101.1 SCOPE: Wall coverings and glazing shall be as set forth in this chapter and be fire-resistive where required by this Code, except that the requirements of this chapter shall be applicable to lath and plaster as follows:
- (a) Where fire-resistive protection is required by this Code, lath, plaster and stucco shall be as set forth herein and shall also comply with the requirements of the Chapter on Fire Resistive Standards (Chapter 32).
 - (b) Where fire-resistive protection is not required by this Code, lathing shall be as set forth herein and plaster and stucco may be omitted or otherwise varied.
- 3101.2 INTERIOR FINISHES: Interior finishes shall be as set forth in the Chapter on Fire Resistive Standards (Chapter 32).
- 3101.3 EXISTING BUILDING: The BCO shall inspect existing buildings having wood-stud exterior walls for which application for a permit for exterior wall coverings is made, he shall have the authority to order

the uncovering of structural elements for inspection and may require necessary repairs as a part of such approval for a permit.

3101.4 *DEFINITIONS AND STANDARDS: The terms used in this Chapter shall be as defined in Chapter 2 of this Code, and the Standards referenced herein shall be those set forth in Appendix A.*

3102 LATHING

3102.1 GENERAL: Lath shall be gypsum, metal or wire lath, as set forth herein, and shall conform to the Standards given in the Appendix A.

3102.2 GYPSUM LATH:

- (a) Gypsum lath shall conform to the standards given in Appendix A and shall be used for interior lath only.
- (b) Gypsum lath shall be nailed to wood supports, at intervals not to exceed five inches, with 13-gauge galvanised or blued nails having 19/64-inch diameter flat heads. Nails shall be not less than one and one-eighth inches long for three-eighths-inch lath nor less than one and one-fourth inches long for one-half-inch lath. Each 16-inch width of lath shall be secured to each support with not less than five nails, except that where fire-resistive rated construction is not required, there shall be not less than four nails. Lath shall be secured to horizontal or vertical metal supports by means of approved special clips.
- (c)
 - (1) The centre-to-centre distance between supports for three eighths-inch thick gypsum lath shall exceed 16 inches, and the centre-to-centre distance between supports for one-half inch gypsum lath shall not exceed 24 inches.
 - (2) The centre-to-centre spacing for gypsum lath applied to metal studs shall not exceed that set forth herein above for wood supports except that 3/8 inch gypsum lath may be applied to metal studs spaced 24 inches on centres where a minimum of 3/4 inch, 3-coat plaster is applied over the lath.
- (d) Lath shall be applied with face side out and with the long dimension at right angles to the framing members. Joints shall be broken in each course, except that end joints may fall on one support when such joints are covered with three-inch-wide strips of metal lath. Lath shall be butted together.

- (e) Corner bead shall not be required. Where reinforcement is used it shall not be secured to the framing members.
- (f) No interior lath shall be applied until the roof is on and the building is dried in.

3102.3 METAL AND WIRE LATH:

- (a) Metal and wire lath and metal accessories embedded in the plaster shall be galvanised or otherwise rust-resistant by approved means. Weight tags shall be left on all metal or wire lath until approved by the BCO.
- (b) The weight of metal and wire lath and the spacing of supports shall conform to the requirements set forth in this Table:

**TABLE 31-A
WEIGHTS OF METAL AND WIRE LATH**

Type of Lath	Minimum Wgt. (Lbs. Per Sq. Yd.)	Maximum Spacing of Supports	
		For Walls	For Ceilings
Flat Expanded Metal Lath	2.5	16"	0
Flat Expanded Metal Lath	3.4	16"	16"
Flat Rib Metal Lath	2.75	16"	12"
Flat Rib Metal Lath	3.4	19"	19"
3/8" Rib Metal Lath*	3.4	24"	24"
Sheet-Metal Lath	4.5	24"	24"
Wire Lath	2.48	16"	12"
Wire Fabric	**	16"	16"

*V-stiffened flat expanded metal lath of equal rigidity and weight is permissible on the same spacing as 3/8" rib metal lath.

**Paper-backed wire fabric, No. 16-gauge wire 2" x 2" mesh, wire stiffener.

- (c) Diamond mesh metal lath shall be lapped at sides not less than 1/2 inch. Rib metal lath with edge ribs no greater than 1/8" in depth shall be lapped 1/2 inch at sides or outside ribs shall be nested. Sheet lath shall be lapped at sides by nesting outside selvage. All metal lath shall be lapped 1 inch at ends or nested.

- (d) All attachments for securing metal lath, wire lath and wire fabric to supports shall be spaced not more than six inches apart, and side laps shall be secured to supports and be tied between supports as not to extend nine inch intervals.
- (e) Metal and wire lath shall be attached to vertical wood supports with the equivalent of 4d-galvanized or blue common nails driven to a penetration of at least three-quarters inch and bent over to engage not less than three stands of lath. Metal and wire lath shall be attached to ceiling joists or other horizontal wood supports with equivalent of No. 11-gauge, barbed, galvanised or blued nails one and one-half inches long having a head not less than seven-sixteenths inches in diameter.
- (f) Metal and wire lath shall be attached to horizontal and vertical metal supports with the equivalent of No. 18 W. and M. gauge, galvanised annealed wire.

3102.4 NON-BEARING LATH AND PLASTER PARTITIONS:

- (a) Where reinforced plaster or pneumatically-placed plaster partitions are used, they shall have vertical steel or iron channels with a depth of not less than one-third the thickness of the partition and spaced not more than 24 inches on centres. The thickness of metal in the channels shall not be less than 16 gauge.
- (b) Hollow non-bearing partitions of reinforced plaster or pneumatically-placed plaster shall have a shell thickness of not less than three-fourths inch.
- (c) *Metal reinforcing shall be as set forth in the Table in 31-A. The minimum thickness of metal lath and plaster partitions shall be not less than 2 inches, nor 1/84 of the distance between supports.*

3102.5 SUSPENDED AND FURRED CEILING:

- (a) GENERAL: Suspended or furred ceilings shall be designed to meet the requirements of this section.
- (b) **MAIN RUNNERS:** *Main runners or carriers shall be rolled steel channels not less than the sizes and weights set forth in Table: 31-B:*

TABLE 31-B
SPANS AND SPACINGS OF MAIN RUNNERS

Minimum Size and Type	Maximum Span Between Hangers or Supports	Maximum Centre-to-Centre Spacing of Runners
3/4in. --- 0.3 lb. per ft.	2 ft. 0 in.	3 ft. 0 in.
1-1/2 in. --- 0.475 lb. per ft.	3 ft. 0 in.	4 ft. 0 in.
1-1/2 in. --- 0.475 lb. per ft.	3 ft. 6 in.	3 ft. 6 in.
1-1/2in. --- 0.475 lb. per ft.	4 ft. 0 in.	3 ft. 0 in.
1-1/2in. --- 1.12 lb. per ft.	4 ft. 0 in.	5 ft. 0 in.
2 in. --- 1.26 lb. per ft.	5 ft. 0 in.	5 ft. 0 in.
1-1/2" x 1-1/2" x 3/16" angle	5 ft. 0 in.	5 ft. 0 in.

A main runner shall be located not more than six inches from parallel walls to support the ends of cross furring. The ends of main runners at walls shall be supported by hangers located not more than 12 inches from such ends. Splices in main runners shall be lapped 12 inches and tied, each end, with double loops of No. 16-gauge wire.

- (c) **CROSS FURRING:** Cross furring, or spaces, for various spacings of main runners or other supports shall be not less than as set forth in Table 31-C:

TABLE 31-C
SIZES OF CROSS FURRING IN SUSPENDED AND FURRED CEILINGS

Size and Type	Maximum Span Between Supports	Maximum Spacing
1/4" pencil rods	Up to 2 feet	12"
3/4" channels	Up to 3 feet	24"
3/4" channels	Up to 4 feet	16 "

Cross furring shall be securely saddle-tied to the main runners by not less than two stands of No. 16 W. and M. gauge galvanised wire or equivalent approved attachments. Cross furring shall be attached to joists or beams with double No. 14 W. and M. gauge galvanised wire or equivalent approved attachments. Splices in cross furring shall be lapped eight inches and tied, each end, with double loops of No. 16-gauge wire.

- (d) HANGERS: Hangers supporting suspended ceilings shall be not less than the following minimums:

TABLE 31-D

Ceiling Area Supported Square Feet	Minimum Size of Hanger
12.5	8-gauge wire
16	6-gauge wire
18	3/16" rod
22.5	1/4" rod
25	1" x 3/16 " flat bar

Hangers shall be saddle-tied or wrapped around main runners to develop the full strength of the hangers. Hangers shall be fastened to, or embedded in, the structural framing, masonry or concrete. Lower ends of flat-strap hangers shall be bolted with three-eighth-inch bolts to runner channels or bent tightly around corners and bolted to the main part of the hanger. Where the area of a plastered ceiling exceeds 100 square feet, suitable methods to resist uplift forces shall be provided for each 64 square feet of ceiling.

3103 PLASTER

3103.1 GENERAL:

- (a) The Standards given in Appendix A are adopted and supplement but do not supersede the requirement for gypsum plastering set forth herein.
- (b) Plastering with gypsum, hardwall, lime or cement plaster shall be three-coat work when applied over metal and wire lath and shall be not less than two-coat work when applied over gypsum lath, gypsum block, or concrete block.

- (c) Portland cement plaster shall not be applied directly to gypsum lath.
- (d) In no case shall a brush coat be accepted as a required coat where three-coat work is required by this section.
- (e) *Grounds shall be installed to provide for the thicknesses of plaster as set forth in Table 31-E measured from the face of the lath.*

TABLE 31-E
REQUIRED THICKNESS OF INTERIOR PLASTER

Type of Lath	Thickness of Plaster
Metal or wire lath	5/8" minimum
Gypsum lath	1/2" minimum

- (f) If monolithic-concrete ceiling surfaces require more than three eighths inch of plaster to produce desired lines or surfaces, metal lath or wire lath shall be attached thereto; except that special bonding agents approved by the BCO may be used.
- (g) The BCO may require test holes to be made for the purpose of determining the thickness of plaster.

3103.2 MATERIALS:

- (a) AGGREGATES:
 - (1) Inorganic aggregates used for plaster and stucco shall conform to Standards given in Appendix A.
 - (2) Aggregates should be quarried or washed in fresh water and should contain not more than one-twentieth of one percent salt, by weight.
- (b) GYPSUM: Gypsum plaster shall conform to the Standards given in Appendix A.
- (c) LIME: Lime shall conform to the Standards given in Appendix A. Lime putty shall be made from quicklime or hydrated lime and shall be prepared in an approved manner, stored and protected for an approved period of time. At the discretion of the BCO, local lime may be used.

- (d) KEENE'S CEMENT: Keene's cement shall conform to the Standard given in Appendix A.
- (e) PORTLAND CEMENT: Portland cement shall conform to the Standards given in Appendix A. Approved types of plasticity agents maybe added to Portland cement in the manufacturing process or when mixing the plaster, but in no case shall the amount of the plasticity agent exceed ten percent of the volume of cement in the plaster mixture.
- (f) MASONRY CEMENT: Masonry cement shall conform to the Standards given in Appendix A.

3103.3 PROPORTIONING AND MIXING: (a) BASE COATS: The proportions of sand, vermiculite or perlite to 100 pounds of gypsum neat plaster shall not exceed the following:

(1) GYPSUM OR HARDWALL PLASTER:

TABLE

	Pounds, Damp Loose Sand	Cu. Ft. Vermiculite or Perlite
TWO-COAT WORK (DOUBLE-UP METHOD)		
(1) Over gypsum lath	250	2 1/2
(2) Over Masonry*	300	3
THREE-COAT WORK		
(1) First (scratch) coat over lath	200+	2+
(2) First (scratch) coat over lath	300	3
(3) All second (brown) coats	300+	3+

* Except over monolithic concrete.

+ In lieu of the proportioning specified, the proportions may be 100 pounds of gypsum neat plaster to not more than 250 pounds of damp, loose sand or 2-1/2 cubic feet of vermiculite or perlite, provided this proportioning is used for both scratch and brown coats.

- (2) WOOD-FIBRE GYPSUM PLASTER: Wood-fibre gypsum plaster for use on all types of lath, shall be mixed with water only and shall be mixed in the proportion of one part of plaster to one part of sand, by weight, for use on masonry.
- (3) READY-MIXED PLASTER: Gypsum ready-mixed plaster shall be in the proportion of 100 pounds of gypsum neat plaster to not more than 250 pounds of sand; or when vermiculite or perlite used as an aggregate, the proportions shall be 100 pounds of gypsum neat plaster to not more than two and one-half cubic feet of vermiculite or perlite.

- (4) PORTLAND-CEMENT PLASTER: For three-coat work, the first two coats shall be as required for the first two coats of exterior stucco, Section 3104.
 - (5) MASONRY CEMENT PLASTER: For 2 or 3 coat work all work shall be set forth in Section 3104 herein.
- (b) FINISH COATS FOR GYPSUM OR LIME PLASTER: The finish coats shall be mixed and proportioned in accordance with the following procedures:
- (1) Smooth white finish, mixed in the proportion of not less than one part gypsum gauging plaster to three parts lime putty, by volume, or an approved prepared gypsum trowel finish.
 - (2) Sand-float finish, mixed in the proportion of one-half part of Keene's cement to two parts of lime putty and not more than four and one-half parts of sand, by volume, or an approved gypsum sand-float finish.
 - (3) Keene's-cement finish mixed in the proportion of three parts Keene's cement to one part lime putty, by Volume.
 - (4) Lime sand-float finish, mixed in the proportion of three parts lime putty to three parts sand, by volume.
 - (5) Finish coat for perlite or vermiculite aggregate plasters, mixed in the proportion of one cube foot of aggregate to 100 pounds of unfibered gypsum plaster, or mixed according to manufacturer's specifications.
- (c) FINISH COAT FOR PORTLAND-CEMENT PLASTER: Finish coats for interior Portland-cement plaster shall be one of the following:
- (1) As required for the third coat of exterior stucco, Section 3104.
 - (2) A gauged cement plaster, mixed in proportion of one part Portland cement to not more than 15 percent lime putty and not more than four parts of sand, by volume.
- (d) FINISH COAT FOR MASONRY CEMENT PLASTER: Finish coat for masonry cement plaster shall be as set forth in Sub-paragraph 3103.4 (b) (3) herein.

3103.4 APPLICATION:

(a) BASE COATS:

- (1) GYPSUM PLASTER: The scratch coat shall be applied with sufficient material and pressure to form a full key or bond.

For two-coat work it shall be doubled back to bring the plaster out to grounds and straightened to a true surface and left rough to receive the finish coat.

For three-coat-work, the scratch (first) coat shall be scratched to a rough surface. The brown (second) coat shall be applied after the scratch coat has set firm and hard, brought out to grounds, straightened to a true surface with rod and darby and left rough, ready to receive the finish (third) coat.

The finish coat shall be applied to a practically dry base coat or to a thoroughly dry base coat which has been evenly wetted by brushing or spraying.

The use of excessive water shall be avoided in the application of all types of finish coat plastering.

- (2) PORTLAND-CEMENT PLASTER: The first two coats shall be as required for the first two coats of exterior stucco, except that the interval between the first and second coats shall be not less than 24 hours.

- (3) MASONRY CEMENT PLASTER: Where masonry cement is the only cementitious material, the second coat may be applied to the base coat as soon as the base coat has attained sufficient strength and rigidity to support the second (finish) coat.

(b) FINISH COATS:

- (1) Smooth white finish shall be applied over the base coat which has set for a period of not less than 24 hours and is surface dry. Thickness shall be from one-sixteenth inch to one-eighth inch.

- (2) Sand-float finish shall be applied over the set base coat which is not quite dry.

- (3) Keene's cement finish shall be applied over the set base coat which is not quite dry. Thickness shall be from one-sixteenth inch to one-eighth inch, unless finish coat is marked off or is jointed; in which case, the thickness may be increased as required by depth of marking or jointing.

- (4) The finish coat for interior Portland-cement plastering shall be applied in the same manner as required for the third coat of exterior stucco, except that other types of finish coat may be applied as specified in Section 3104.
 - (5) The finish coat for lightweight aggregate plastering shall be applied over a base coat which is not quite dry. The thickness shall be from one-sixteenth inch to one-eighth inch.
- (c) PLASTER ON CONCRETE:
- (1) Monolithic-concrete surfaces shall be clean, free from efflorescence, damp, and sufficiently rough to insure adequate bond.
 - (2) Gypsum plaster applied to monolithic-concrete ceilings shall be specially-prepared bond plaster for use on concrete, to which only water shall be added. Gypsum plaster on monolithic walls and columns shall be applied over a scratch coat of bond plaster, or other bonding material before it has set. The brown coat shall be brought out to grounds, straightened to a true surface and left rough, ready to receive the finish coat.
 - (3) Portland cement plaster applied to interior concrete walls or ceiling shall conform to requirements for application to exterior concrete walls as specified in Section 3104.

3104 RENDERING AND STUCCO

3104.1 RENDERING CONCRETE OR MASONRY:

- (a) GENERAL:
- (1) Rendering base coat shall be mixed in the proportion of one part Portland cement and 3-1/2 parts of sand by volume, or one part Portland cement to one part Type S lime and 4-1/2 parts sand by volume or shall be any approved prepared product containing not less than one-third, by weight, Portland cement.
 - (2) Finish-coat rendering shall be mixed in the proportion of one part Portland cement to 2 parts sand, by volume, with not more than 15 percent lime, by volume, or shall be one part Type II masonry cement to 2 parts sand, by volume.
 - (3) Where stucco is required to meet fire resistive standards, it shall be mixed in the portions of at least one part by volume of Portland Cement to no more than two and one half parts sand.

- (b) MATERIALS: The materials for rendering shall conform to the standards set forth in Section 3103.
- (c) ADMIXTURES: Plasticity agents shall be of approved types and amounts; and if added to Portland cement in the manufacturing process, no later additions shall be made. Colour may be added to the finish coat in approved amounts.
- (d) APPLICATION:
 - (1) Rendering concrete or masonry shall consist of not less than two coats, and the total thickness shall be not less than five eighths inch, nor shall any one coat be less than one-fourth inch thick
 - (2) The masonry surface which is rendered shall be clean, free from efflorescence, damp, and sufficiently rough to insure proper bond.
 - (3) The first coat shall be well forced into the pores of the masonry, shall be brought out to grounds, straightened to a true surface and left rough to receive the finish coat. The first coat of two coat work shall be rodded and water-flooded with no variations greater than one-quarter inch under a five-foot straight edge in any direction.
 - (4) The base coat shall be damp cured for a period of not less than 24 hours.
 - (5) The finish coat shall be applied over a uniformly damp but surface dry base.
 - (6) Rendering shall be kept damp for a period of not less than 48 hours after any type finish coat application.
 - (7) Where masonry cement with a minimum of 25 percent by weight of Portland cement is used, there shall be a period of not less than 24 hours of damp curing between subsequent coats.

3104.2 STUCCO ON WALLS OTHER THAN CONCRETE OR MASONRY:

- (a) GENERAL: Stucco shall be as provided in Subsection 3104.1.
- (b) BACKING: Studs shall be wood sheathed. Wood sheathing shall be covered with 15 pound roofing felt, or other approved moisture resisting material and metal reinforcement.

- (a) METAL REINFORCEMENT:
- (1) Stucco shall be reinforced with expanded metal weighing not less than 1.8 pounds per square yard or welded or woven wire fabric, weighing not less than one pound per square yard.
 - (2) *Metal reinforcement shall be furred out from the backing at least one-quarter inch by an approved furring method, which shall be spaced not more than six inches vertical and 16 inches horizontally. Nailing shall be by galvanized nails with heads not less than 3/8" in diameter driven to full penetration using a minimum of 2 nails per sq. ft.*
 - (3) Diamond mesh metal lath shall be lapped at sides not less than 1/2 inch. Rib metal lath with edge ribs greater than 1/8 inch in depth shall be lapped at sides by nesting outside ribs. Rib metal lath with edge ribs no greater than 1/8 inch in depth shall be lapped 1/2 inch at sides or outside ribs shall be nested. All metal lath shall be lapped not less than 1 inch at ends. Stucco mesh shall be lapped one diamond at sides and ends.
- (b) APPLICATION:
- (1) Stucco applied on metal lath shall be three coat work.
 - (2) The first coat shall be forced through all openings in the reinforcement to fill all spaces and scored horizontally.
 - (3) The second coat shall be rodded and water-floated, with no variation greater than one -quarter inch in any direction under a five -foot straight edge.
 - (4) The third coat shall be troweled to a thickness of not less than one eighth inch.

3104.3 PNEUMATICALLY-PLACED STUCCO: Pneumatically placed stucco shall consist of a mixture of one part Portland cement to not more than five parts sand, conveyed through a pipe or flexible tube and deposited by pressure in its final position. Rebound material may be screened and re-used as sand in an amount not greater than 25 percent of the total sand in any batch. Plasticity agents may be used as specified in Paragraph 3104.1 (c).

3105 PLASTICS

3105.1 GENERAL:

- (a) *Plastic materials used as structural elements shall be designed by methods admitting of rational analysis according to established principles of mechanics.*
- (b) *Plastic materials may be permitted as set forth herein. The physical properties, such as, not but limited to, weather resistance, fire resistance, and flame spread characteristics, shall comply with the requirements of this Code.*
- (c) *Application and plans submitted for proposed construction shall identify the plastic material intended for use and such material shall be stamped or otherwise marked so as to be readily identifiable in the field.*
- (d) *Plastic structural elements, other than sheets, shall be designed by an Engineer recognised by the Minister.*

3105.2 INSTALLATION: Plastic shall be secured to supports at intervals not exceeding six inches, and edges and sidelaps of sheets shall be secured at intervals not exceeding 12 inches. Fastening shall be through one-half-inch diameter cushion washers and shall develop not less than 40 pounds pullout.

3105.3 EXTERIOR VENEER: Exterior veneer may be of approved plastic materials and shall conform to the provisions of this Code.

Plastic veneer shall not be attached to any exterior wall above the second storey.

3105.4 AREALIMITATIONS: Where buildings or parts of buildings are enclosed with solid walls, other than screen, plastic panels in roofs shall be limited to one-fourth of the roof area and plastic panels in walls shall be limited to the following table:

TABLE OF OPENINGS FOR PLASTIC* 31-F

Distance of Exterior Wall From Property Line or Width of Adjoining Public Way in Feet	Maximum Percent of Exterior Wall Area Permitted to be of Plastic Panels	Maximum Area of Individual Plastic Panel in Square Feet	Maximum Separation Between Plastic Panels in Feet	
			Vertical	Horizontal
10-20	10	50	8	4
20-30	20	80	6	3
30-more	30	100	4	2

*NOTE: Not permitted in Types I and II buildings.

3106 ASBESTOS CEMENT

3106.1 GENERAL: The use of asbestos cement products shall not be permitted except with the prior written approval of the Minister.

3107 TILE

3107.1 Ceramic and Portland cement floor tile should be set on a concrete slab or on wood sheathing on wood joists as set forth in the Section on Floors in the Chapter on Type III Buildings (Chapter 17) and protected by a waterproof membrane, or set directly on fill.

3107.2 Floor tile shall be set in a mortar bed of one part Portland cement to 3 parts sand or otherwise bedded in an approved adhesive material.

Ceramic and Portland cement wall tile used in areas subject to frequent wetting shall be backed with masonry, stucco on wire lath or approved tile backer board. Wall tile used in areas not subject to frequent wetting shall be backed by a cladding having the rigidity of stucco on wire lath and shall be bedded in cement mortar or other approved adhesive material.

3107.3 Portland cement or other porous tile shall be soaked in water not less than one hour before placing when set on a mortar bed.

3107.4 *Built-in tubs with overhead showers shall have waterproof joints between the tub and the wall and floor.*

3108 GLASS AND GLAZING

3108.1 GENERAL:

- (a) Windows, doors, glass and glazing shall be as set forth herein and, where required to be fire-resistive for the protection of openings, shall also comply with the requirements of the Chapter on Fire Resistive Standards (Chapter 32).

Windows, doors and glazing that are not protected with approved storm shutters shall be as set forth in this section and where required to be fire resistive by Section 1504 of this Code they shall comply with Section 3206.

- (b) Glass shall comply with the Standards given in Appendix A.
- (c) Installed glass shall not be less than Single Strength, B quality unless otherwise approved by the BCO and where edges are exposed they shall be seamed or fire polished.
- (d) Where a light of glass is of such height above grade that the top 50 percent or more is in a zone of greater wind load, the area of the entire light shall be limited as for the greater height above grade.
- (e)
 - (1) Appropriate measures shall be provided to deter persons from walking into fixed glass panels where the floor contiguous thereto on both sides is approximately the same level. Glass panels more than 24 inches in width and 6 feet or more in height adjacent to wall openings shall be safety glass unless a bulkhead of opaque material not less than 18 inches high is provided. Glass panels not adjacent to wall openings shall be made obvious by horizontal bars at guardrail height, an 18 inch opaque bulkhead, distinctive glass such as etched or translucent for guardrail height or other appropriate construction arrangement.
 - (2) Where differences in level on opposite sides of a glass panel are 24 inches or more, positive protection shall be provided by a guard rail or other horizontal bar complying in strength and height with the Chapter on Exit Facilities and Stairs (Chapter 28).
- (f) The requirements set forth herein shall also apply to the replacement and reglazing of existing windows, doors and fixed panels.

3108.2 FIXED GLASS IN EXTERIOR WALLS:

(a) LIMITS OF SIZE OF GLASS:

- (1) Regular plate and sheet glass used in exterior walls shall not exceed the areas set forth in this Table.

The Table is based on short duration wind loadings and shall not be used for other types of loadings. The areas apply to rectangular lights firmly supported on all four sides in a vertical position. Glass mounted at a slope not to exceed one horizontal to five vertical may be considered vertical. The table applies for short side to long side ratios from 3:10 up to 10:10. For other ratios use Sub-section 3108.2 (a) (3).

TABLE 31-G

MAXIMUM AREA OF GLASS IN SQUARE FEET
Wind velocity taken as 120 MPH at 30 feet above grade*

Height Above Grade	Glass Thickness (Inches)									
	S.S.	D.S	3/16 & 13/64	7/32	1/4	5/16	3/8	1/2	5/8	3/4
0'-15'	8.2	12.5	24	30	37	52	67	98	133	169
15'-25'	6.8	10.3	21	24	31	43	56	81	110	138
25'-35'	5.9	9.2	18	22	27	38	49	72	97	122
35'-55'	5.3	8.3	16	19	24	34	44	64	87	111
55'-75'	4.8	7.4	14.5	17.5	22	31	39	57	78	99
75'-100'	4.4	6.7	13.2	16	20	28	36	53	72	91
100'-150'	4.1	6.2	12	14.7	18	26	33	48	66	83
150'-250'	3.6	5.4	10.5	12.8	16	22	29	42	57	72
250'-350'	3.1	4.8	9.3	11.3	14.1	19	26	37	51	64
350'-550'	2.8	4.2	8.3	10.1	12.5	17.5	23	33	45	57
550'-750'	2.5	3.8	7.4	9.0	11.3	15.8	21	30	41	53
750'-1000'	2.3	3.5	6.8	8.3	10.3	14.5	19	27	37	47
Over 1000'	2.2	3.4	6.6	8.0	10.0	14.0	18	26	36	46

*Velocity increases with height in conformance with the Chapter on Live and Dead Loads (Chapter 20).

- (2) The allowable area of glass, other than regular plate and sheet, used in exterior walls shall not exceed the areas obtained by multiplying the areas in the Table by the following factors:

FULLY TEMPERED SAFETY GLASS	4.0
INSULATING (double glazed)	1.5
LAMINATED	0.6
WIRE GLASS	0.5
SANDBLASTED OR ETCHED	0.4**
ROUGH ROLLED PLATE	1.0

**Adjustment factor may vary with amount of depreciation and types of glass.

Each light with special performance characteristics such as laminated or fully tempered shall bear the manufacturer's identification showing the special characteristic and thickness by etching or other permanent identification that shall be visible after the glass is glazed.

- (3) Corrugated glass or other special glass shall be limited to spans determined by analysis or test to resist the loads set forth in the Chapter on Live and Dead Loads (Chapter 20) based on fibre stresses not exceeding 4000 psi.
- (4) Glass for special uses such as swimming pool windows, tanks, skylights, and floors shall be designed by qualified engineers recognized by the Minister.
- (b) CONSTRUCTION DETAILS: (1) Each light of fixed glass more than 3 feet in width shall have 2 setting blocks or suspension clamps made of lead or other approved materials.
- (2) Fixed lights shall be set in frames of non-corrosive metal, or other non-corrosive material where substantiated by load tests and permitted by fire requirements.
- (3) Wind load requirements shall be as set out in Chapter 20.
- (4) Fixed lights may be set in wooden frames where wood construction is permitted.
- (5) Wood shall have been treated with an approved preservative as set forth in the Chapter on Wood (Chapter 24).

- (6) Attachment shall be as set forth in the Chapter on Live and Dead Loads and shall be corrosion-resistant (Chapter 20).
- (7) Glass in fixed lights shall be securely and continuously supported at the perimeter of each sheet unless the design is based on one or more unsupported edges. Supporting members such as division bars and mullions shall be designed by rational analysis to support the wind pressures set forth in the Chapter on Live and Dead Loads (Chapter 20). Supporting bars shall be attached at the ends to resist the loads set forth in the Chapter on Live and Dead Loads (Chapter 20).
- (8) The deflection of structural supporting mullions, when subjected to live, wind or other superimposed loads as set forth in the Chapter on Live and Dead Loads, shall not exceed $1/180$ of the span.
- (9) The depth of the glazing rebate and depth of engagement in the rebate, for fixed glass, shall be based on consideration of the dimensional reduction due to deflection and the dimensional changes due to temperature.
- (10) Where one or more sides of any light of glass is not supported, or where glass is subjected to unusual loading conditions, detailed shop drawings, specifications and analysis or test data assuring safe performance for the specific installation shall be prepared by engineers experienced in this work.

3108.3 DOORS AND OPERATIVE WINDOWS IN EXTERIOR WALLS:

- (a) The design and approval of doors and operative windows, including their supporting members in exterior walls shall be based on the proposed-use height above grade in accordance with the Chapter on Live and Dead Loads (Chapter 20). Maximum glass sizes shall comply with the Table in Section 3108.2
- (b) The frames of doors and operative windows shall be of noncorrosive metal or other non-corrosive material, unless otherwise restricted by load tests or fire requirements.

EXCEPTION: The frames of doors and operative windows may be of wood, where wood construction is permitted.

- (c) The design and approval of operative windows, sliding doors and swinging doors having more than one-half of the door area in glass shall be supported by tests as nearly as practicable simulating the conditions of use at the proposed height above grade.

- (d) Window and door assemblies shall be tested in accordance with, and shall comply with the Standards for Windows and Doors given in Appendix A, which are hereby adopted to supplement, but not supersede, the requirement set forth herein.
 - (1) Windows and doors with permanent muntin bars shall be tested with muntin bars in place.
 - (2) When a static pressure of 10 percent of the design wind load in psf but not less than 2.86 psf, has been stabilized, 5 gallons of water per hour per square foot of overall frame dimension shall be applied to the exterior face of the unit for a period of 15 minutes.

No water shall pass the interior face of the window or door frame.

EXCEPTIONS: Entrance doors without a continuous frame with tempered glass not less than 1/2 inch in thickness and swinging entrance doors with continuous frame are not required to meet the water resistance requirements set forth herein where protected by storm shutters.

- (e) Doors shall be equipped to be readily operative without contact with glass.
- (f) Swinging doors of glass in exterior walls without a continuous frame shall be only fully tempered glass not less than 1/2 inch in thickness.
- (g) The glazing in sliding doors in exterior walls shall be safety glass.
- (h) The glazing in swinging doors and similar fixed doors in exterior walls where such doors have a stile and rails less than 5 inches in width shall be safety glass.
- (i) Windows and door assemblies shall be installed in accordance with the conditions of test, analysis, and approval.

3108.4 INTERIOR LOCATIONS:

- (a) Swinging or sliding doors of glass in all buildings other than single family residences shall be of only fully tempered glass not less than 3/8 inch in thickness. All single family residence swinging or sliding doors of glass are recommended to comply with this specification.

- (b) Wherever existing glass is replaced, safety or tempered glass shall be provided in the replacement, if required by this chapter in the cases of new construction.
- (c) A decal, permanent marking or fixed bar must be provided across all frameless glass doors, glass in doors, fixed glass panels and similar glazed openings which may be subject to accidental human impact.
- (d) The glazing in swinging doors in interior locations having stiles and rails less than 5 inches in width shall be of safety glass.
- (e) The glazing in fixed panels adjacent to paths of egress shall comply with Paragraph 3108.1 (f) herein.
- (f) Glass shall not be solid painted or otherwise concealed where such painted glass may be mistaken for other construction materials.
- (g) Mirrors more than 9 square feet in area shall be directly secured to supports and shall not be hung.

3108.5 SAFETY GLASS: Safety glass where required shall meet the following specifications:

- (a) FULLY TEMPERED GLASS: Particle test. The fully tempered safety glass panel shall be fractured by impact with a spring loaded centre punch with a hammer. The point of impact shall be 1/2 to 1 inch from any glass edge. When fractured, there shall be no individual fragment larger than 0.15 ounces.
- (a) LAMINATED GLASS:
 - (1) Boil test shall comply with Test No. 4 of the Standard set forth in Appendix A.
 - (2) Impact test shall comply with Tests No. 9 and 12 of the Standard set forth in Appendix A.
- (c) WIRED GLASS: Impact test shall comply with Test No. 11 of the Standard set forth in Appendix A.
- (d) PLASTICS: Plastics with or without reinforcing or acrylic modifiers shall comply with Section 3105 herein and consideration of dimension reduction caused by deflection and/or dimensional instability of the material shall be given in the determination of the depth of the glazing rabbet and engagement of the plastic in the

rabbet. Plastics shall be limited to spans determined by analysis and test to resist the loads set forth in the Chapter on Live and Dead Loads (Chapter 20).

3109 GLASS VENEER

Glass veneer shall be as set forth in this section.

- 3109.1 DIMENSION: Glass-veneer units shall be not less than 11 / 32 inch in thickness. No unit shall be larger in area than ten square feet where 15 feet or less above the grade directly below, nor larger than six square feet more than 15 feet above the grade directly below.
- 3109.2 ATTACHMENT: Every glass-veneer unit shall be attached to the backing with approved mastic cement and corrosion-resistant ties and shall be supported upon shelf angles.
- (a) Where more than six feet above grade, veneer shall be supported by shelf angles; and ties shall be used in both horizontal and vertical joints.
 - (b) Below a point six feet above grade, veneer shall rest on shelf angles. Veneering shall not be supported on construction which is not an integral part of the wall, and over sidewalks shall be supported on a shelf angle not less than one-fourth inch above grade.
 - (c) All edges of glass veneer shall be ground.
- 3109.3 MASTIC:
- (a) The mastic shall cover not less than one half of the area of the unit after the unit has been set in place and shall be neither less than one-fourth inch nor more than one-half inch in thickness.
 - (b) The mastic shall be insoluble in water and shall not lose its adhesive qualities when dry.
 - (c) Absorbent surfaces shall be sealed by a bonding coat before mastic is applied. The bonding coat shall be cohesive with the mastic.
 - (d) Glass-veneer surfaces to which mastic is applied shall be clean and uncoated.
 - (e) Space between edges of glass veneer shall be filled uniformly with an approved type pointing compound.

- 3109.4 **SHELF ANGLES AND TIES:**
- (a) Shelf angles shall be of corrosion-resistant material capable of supporting four times the weight of the supported veneer. The shelf angles shall be spaced vertically in alternate horizontal joints, but not more than three feet apart. Shelf angles shall be secured to the wall at intervals not exceeding two feet with corrosion-resistive bolts not less than one-fourth-inch diameter. Bolts shall be set in masonry and secured by lead shields.
 - (b) Ties shall be of corrosion-resistant metal as manufactured especially for holding glass-veneer sheets to masonry surfaces. There shall be not less than one such approved tie for each two square feet of veneer surface.
- 3109.5 **BACKING:** Exterior glass veneer shall be applied only upon masonry, concrete or stucco.
- 3109.6 **EXPANSION JOINTS:** Glass-veneer units shall be separated from each other and from adjoining materials by an expansion joint at least one-sixteenth inch in thickness. There shall be at least one sixty-fourth inch clearance between bolts and the adjacent glass.

3110 GYPSUM BOARD PRODUCTS AND ACCESSORIES

- 3110.1 **GENERAL:** The use of gypsum wallboards and related items and accessories for partitions, walls and ceilings shall be as set forth in this section.
- 3110.2 **GYPSUM WALLBOARD:**
- (a) Gypsum wallboard shall comply with the standards set forth in Appendix A and shall not be less than one-half inch in thickness.
 - (b) Supports for 1/2" or 5/8" thick gypsum wallboard shall not be spaced more than 24" on centres.
 - (c) Where used in fire-rated assemblies the gypsum wallboard shall be of a tested and rated category and marked accordingly by the manufacturer.
- 3110.3 **WOOD STUDS AND WOOD CEILING SUPPORTS:** Wood studs and wood ceiling supports shall comply with Chapter 24.
- 3110.4 STEEL STUDS, CEILING SUPPORTS, TRACK RUNNERS:**
- (a) *Steel studs and runners used to construct fire-resistive walls or partitions shall be hot-dipped galvanized in accordance with*

ASTM A525, of channel or "C" type shape and not less than 0.019" in thickness if unpainted and 0.020" in thickness if painted after galvanizing. Structural properties of such studs and runners shall comply with ASTM C645.

- (1) Steel studs supporting wall hung plumbing fixtures shall be doubled or not less than 20 gage with a minimum effective moment of inertia equal of 0864 in.4*
 - (2) Such studs shall be rigidly connected top and bottom to prevent significant end rotation or displacement.*
 - (3) A horizontal member securely fastened to not less than two studs shall be installed for the attachment of each wall hung plumbing fixture.*
- (b) The unsupported height of partitions shall comply with the loads and deflections set forth in Chapter 20 of this Code and where wallboard is suitably attached, the composite action may be accounted for in the design.*
- (c) Steel ceiling supports shall comply with Subsection 3102.5 of this Code.*
- (d) Steel studs track runners and ceiling supports in walls, including curtain walls, shall comply with ASTM A525.*

3110.5 ATTACHMENTS:

- (a) Attachment shall be as set forth herein and for fire-rated assemblies shall also conform to the material and conditions of the assembly tested.*
- (b) (1) Attachment to wood supporting members shall conform to the Standard set forth in Subsection 3110.2 hereinabove.*
- (2) Nails and screws attaching gypsum wallboard shall, without substantially fracturing the surface paper, be driven below the surface and spotted with finishing joint compound.*
- (c) Attachment to metal members shall be as follows:*
- (1) Gypsum wallboard shall be attached to metal members by self-drilling, self-tapping sheet metal screws.*
 - (2) The spacing of screws attaching gypsum wallboard to metal studs and runners, shall be not more than 12"o/c.*

- (3) *Screws for attaching gypsum wallboard to metal studs shall be not less than 7/8" long for 1/2" wallboard nor 1" long for 5/8" wallboard.*
- (4) *Screws attaching gypsum wallboard shall be driven below the surface and spotted with finishing compound.*
- (5) *Runners shall be fastened to the ceiling, contiguous walls and partitions and to the floor at intervals not exceeding 24" o/c. Such attachment may be by nails penetrating the base material not less than 5/8" or by self-drilling, self-tapping sheet metal screws attaching metal to metal.*

3111 SUSPENDED AND FURRED CEILINGS

- 3111.1 *Lath and plaster ceilings shall be as set forth in this Chapter.*
- 3111.2 *Suspended and furred ceilings, other than lath and plaster where providing fire protection shall comply with Subsection 3205.5 of this Code.*
- 3111.3 *Suspended and furred ceilings, other than lath and plaster shall be suspended and supported in conformance with the conditions of fire-tests or, if not tested, as recommended by the manufacturer or as required for structural stability.*

3112 OTHER MATERIALS

- 3112.1 **WOOD:**
- (a) Wood and wood products used for wall claddings shall comply with the Chapter on Wood (Chapter 24).
 - (b) Wood and wood-products used for wall cladding as non-structural exterior trim, fascia and soffits on buildings of Type I, Type II and Type III Construction may be used provided such materials comply with Subsection 1512.6 of this Code.
- 3112.2 **ASPHALT SHINGLES:** Asphalt shingles shall be applied only to solid wood sheathing and shall be tin-capped and spot-stuck, as set forth in the Chapter on Roof Coverings (Chapter 30).
- 3112.3 **ROLL SLATE OR FELT:** Roll slate or felt shall be applied only to solid wood sheathing and shall be secured by nailing, as set forth in the Chapter on Roof Coverings (Chapter 30).

- 3112.4 METAL SHINGLES: Metal shingles shall be applied only to solid wood sheathing and shall be secured with 6d nails spaced not more than 12 inches apart, each way, not less than one nail in each piece of metal.
- 3112.5 STEEL SIDING: Steel siding shall be designed and applied as set forth in the Chapter on Steel (Chapter 23).
- 3112.6 ALUMINIUM SIDING: Aluminium siding shall be designed and applied as set forth in the Chapter on Aluminium (Chapter 25).
- 3112.7 VENEERS: Masonry veneers shall be applied as set forth in the Chapter on Masonry (Chapter 27).
- 3112.8 GYPSUM WALLBOARD: Gypsum wallboard shall comply with the Standards given in Appendix A.
- 3112.9 COMBUSTIBLE MATERIALS: Combustible materials and fire-resistive characteristics of all materials shall be regulated as otherwise required by this Code for the "Group of Occupancy" or "Type of Construction," or as "Interior Finishes" in the Chapter on Fire Resistive Standards (Chapter 32).
- 3112.10 OTHER MATERIALS: Other materials and assemblies shall be classified by the BCO as described in this Code and shall comply with the requirements of loading or fire resistance herein required.

3113 STORM SHUTTERS

- 3113.1** *Unless exterior wall components including but not limited to structural glazing, doors and windows of enclosed buildings, are specifically designed and constructed to preserve the enclosed building envelope against wind pressures as set forth in Section 2010 of this Code, and impact loads as set forth in Chapter 20 of this Code, all such components shall be protected by engineered storm shutters.*
- 3113.2** *The storm shutters shall be designed and constructed to insure a minimum of a 1" separation at maximum deflection with components and frames of components they are to protect unless the components and frame are specifically designed to receive the load of storm shutters, and shall be designed to resist the wind pressures as set forth in Section 2110 of this Code by methods admitting of rational analysis based on established principles of design. Storm shutters shall also be designed to comply with the impact load requirements included within Chapter 20 of this Code.*

- 3113.3 *The storm shutter design calculations and detailed drawings, including attachment to the main structure, shall be prepared by an Engineer recognised by the Minister. The Architect or Engineer of record shall, in all instances, review and approve documents prepared by the delegated Engineer.*
- 3113.4 *Storm shutters shall be approved by the Buildings Control Officer and shall bear the name of the company engraved in every section of the system.*
- 3113.5 *Deflection shall not exceed the limits set forth in Section 2003 of this Code.*
- 3113.6 *Unless storm shutters are permanently attached to the main structure, all such storm shutters shall, where practicable, be neatly stored at all times in a designated and accessible area within the building.*

3114 CURTAIN WALLS & STRUCTURAL GLAZING

- 3114.1 *DEFINITIONS: The terms used in this section shall be defined as set forth in Chapter 2 of this Code.*
- 3114.2 *PRELIMINARY: Where it is proposed to use curtain walls and or structural glazing in a building, the Architect shall, at the preliminary design stage, discuss the method of cladding with the Buildings Control Officer.*
- 3114.3 *DESIGN AND TEST DATA: The Buildings Control Officer may require: -*
- (a) *Calculations showing that the curtain walls and or the structural glazing will be capable of withstanding the design loads as set forth in Chapter 20 of this Code.*
 - (b) *Test results to indicate that the curtain wall and or structural glazing elements have been tested to the maximum design loads by an approved testing agency.*
 - (c) *Test results to indicate that the method of attaching the curtain wall and or structural glazing can withstand the design loads as set forth in Chapter 20 of this Code.*
 - (d) *Test data to indicate that the required fire resistance deemed necessary for the outer cladding of the building can be achieved by the curtain wall and or the structural glazing.*

NOTES

PART VII
FIRE RESISTIVE STANDARDS

CHAPTER 32 FIRE RESISTIVE STANDARDS

3201 GENERAL

3202 FIRE-RESISTIVE MATERIALS AND ASSUMPTIONS

3203 PROTECTION OF STRUCTURAL MEMBERS

3204 WALLS AND PARTITIONS

3205 FLOOR-CEILINGS OR ROOF-CEILINGS

3206 FIRE-RESISTIVE ASSEMBLIES FOR PROTECTION OF OPENINGS

3207 FIRE RETARDANT ROOF COVERINGS

3208 INTERIOR FINISHES

3209 INSULATING MATERIALS

3210 *CALCULATIONS OF FIRE RESISTANCE*

3201 GENERAL

3201.1 GENERAL:

- (a) Materials of construction and assemblies or combinations thereof shall be classified for fire-resistive, fire-retardant or flame-spread purposes in terms of performance in authoritative tests made by a recognised laboratory in accordance with the standards set forth herein.
- (b) For the purpose of determining the degree of fire-resistance afforded, some materials and assemblies are listed in this Chapter and shall be assumed to have the fire resistance set forth herein.
- (c) Other materials and assemblies not listed herein and for which results of standard tests are available, such as those conducted by Underwriters Laboratories Inc. or the Canadian Standards Association, shall be acceptable if substantiated by suitable documentary evidence and used exactly as tested.
- (d) Other materials and assemblies not listed herein and for which results of standard tests are not available shall be given ratings by the Buildings Control Officer based upon reasonable interpolation of ratings herein set forth and/or performance in standard tests.

3201.2 *APPLICATIONS: Every material component, assembly or system used to comply with the fire resistance requirements of this Code shall comply with this Chapter.*

3201.3 *DEFINITIONS: For the purpose of compliance with Table 37-A, the*

following terms are defined for this Chapter. Other terms used in this chapter shall be defined as set forth in Chapter 2 of this Code; and ASTM E176, Terminology Relating to Fire Standards.

- (a) **GRADE A CONCRETE:** *Concrete in which the coarse aggregate consists of limestone, calcareous gravel, trap rock, burnt clay or shale, cinders containing not more than 25% combustible material and not more than 5% volatile material, and other materials complying with the provisions of this Code and containing not more than 30% quartz chert, flint, and similar material.*
- (b) **GRADE B CONCRETE:** *Concrete in which the coarse aggregate consists of granite quartzite, siliceous gravel, sandstone, gneiss, cinders containing not more than 40% combustible material, and other materials complying with the provisions of the Code and containing not more than 30% quartz, chert, flint, and similar materials.*
- (c) **LIGHTWEIGHT AGGREGATE V CONCRETE:** *Concrete made with aggregates of expanded clay, shale, slag, or slate or sintered fly ash and natural sand. Its unit weight is generally between 85 to 115 pcf.*
- (d) **SAND-LIGHTWEIGHT CONCRETE:** *Concrete made with a combination of expanded clay, shale, slag, or slate or sintered fly ash and natural sand. Its unit weight is generally between 105 and 120 pcf.*
- (e) **SILICEOUS AGGREGATE CONCRETE:** *Concrete made with normal weight aggregates consisting mainly of silica or compounds other than calcium or magnesium carbonate.*
- (f) **PNEUMATICALLY - PLACED CONCRETE:** *Pneumatically placed concrete without coarse aggregate shall be classified as GRADE A OR GRADE B in accordance with the Aggregates used.*

3201.4 STANDARDS: *The Standards set forth in this Subsection are hereby adopted and may be used to achieve compliance with this Chapter. Other standards are contained in Appendix A of this Code.*

3201.5 (a) *The following designations of the American Society for Testing Materials (ASTM):*

- (1) *ASTM D2899, Accelerated Weathering on Fire-Retardant Treated Wood for Fire Testing.*

- (2) *ASTM E84, Surface Burning Characteristics of Building Materials.*
 - (3) *ASTM E119, Fire Tests of Building Construction Materials.*
 - (4) *ASTM E108, Fire Tests of Roof Coverings.*
 - (5) *ASTM E136, Behaviour of Materials in a Vertical Tube Furnace at 750 degrees C.*
 - (6) *ASTM E163, Standard Specification for Fire Tests of Window Assemblies.*
 - (7) *ASTM E152, Standard Method of Fire Tests for Door Assemblies.*
 - (8) *ASTM E176, Terminology Relating to Fire Standards.*
 - (9) *ASTM E814, Tests of Through-Penetration Fire Stops.*
- (b) *The following National Fire Protection Association (NFPA) Standards:*
- (1) *NFPA 80, Fire Doors and Windows.*
 - (2) *NFPA 90A, Installation of Air Conditioning and Ventilation Conditioning Systems.*
 - (3) *NFPA 90B, Installation of Warm Air Type Heating and Air Conditioning Systems.*
 - (4) *NFPA 105, Smoke-and-Draft-Control Door Assemblies.*
 - (5) *NFPA 251, Fire Tests of Building Construction and Materials.*
 - (6) *NFPA 252, Fire Tests of Door Assemblies.*
 - (7) *NFPA 257, Fire Tests of Window Assemblies.*
 - (8) *NFPA 703, Fire Retardant Impregnated Wood and Fire Retardant Coatings for Building Material.*
- (c) *The following standards and publications of Underwriters Laboratories, Inc. (UL):*

- (1) *UL 9, Fire Tests of Window Assemblies*
 - (2) *UL 10, Fire Tests of Door Assemblies.*
 - (3) *UL 168, Standard for Smoke Detectors for Fire Protective Signalling Systems.*
 - (4) *UL 555, Fire Dampers and Ceiling Dampers.*
 - (5) *UL 1256, Fire Tests of Roof Deck Construction.*
 - (6) *UL 1479, Through-Penetration Fire Stops.*
 - (7) *Fire Resistance Directory.*
 - (8) *Building Materials List.*
- (d) *The fire Resistance Design manual of the Gypsum Association (GA).*
- (e) *The Product and Approval Guides of the Factory Mutual Research Corporation (FM).*

3201.5 *WORKMANSHIP: Fire Resistive Materials and assemblies shall be installed in conformance with the tolerances, quality, and methods of construction as set forth in the Standards referenced in this Chapter; The United States Gypsum Company Gypsum Construction Handbook, the Gypsum Association Fire Resistance Design manual GA-600; The Underwriters Laboratory Building Materials Directory; Through-Penetration Firestops Systems (XHEZ), the Fill, Void or Cavity materials (XHHW); NFPA 70 National Electric Code; and NFPA 101 Life Safety Code.*

3202 FIRE-RESISTIVE MATERIALS

3202.1 *GENERAL: Materials and systems used for fire-resistive purposes shall be limited to those specified in this Chapter unless accepted under the procedure given in Section 3202.2 of this Chapter and shall conform to the material and test standards given in Appendix A. For standards for the specific materials of construction referred to in this Chapter, see the appropriate Chapter in this code specifically regulating such materials.*

3202.2 DETERMINATION OF FIRE RESISTANCE RATING:

- (a) *The fire resistance rating of structural members and of wall, floor, ceiling or roof assemblies and systems may be determined based on the values given in Tables 32A, B and C herein. The values of*

minimum thickness given in the tables shall be assumed to afford the fire resistance ratings indicated for listed member, assembly or system.

- (b) The fire resistance rating of materials, assemblies and systems may also be determined based on the results of testing performed by an accredited testing laboratory in accordance with applicable standards adopted in Section 3701 herein, and such materials, assemblies and systems shall be assumed to afford the fire resistance determined by such results.*
- (c) remains the same*
- (d) The fire resistance rating of an assembly or system substantially similar to one which has been tested or one for which values are given in the tables, may be determined by interpolation of test results or tabular values, provided such interpolation is acceptable to the Buildings Control Officer and can be supported by rational analysis.*
- (e) The fire resistance rating of an assembly or system may also be determined by calculation in accordance with Subsection 3210 herein.*

3202.3 PENETRATION OF FIRE RESISTIVE ASSEMBLIES:

- (a) Penetrations through fire-resistive assemblies or fire barriers, including passages of pipes, conduits, bus ducts, cables, wires, air ducts, pneumatic ducts, and similar building service equipment shall be protected in accordance with this Subsection.*

EXCEPTION: Penetrations protected by fire rated assemblies complying with Section 1507 of this Code or Section 3206 herein, as applicable.

- (b) (1) The space between the penetrating item and the fire assembly or fire barrier shall be firestopped against the passage of hot flame and gases with a material capable of maintaining the fire resistance of the fire barrier, or protected by an approved system or device designed to provide such protection which has been tested in accordance with ASTM E814 or UL 1479.*
- (2) Firestops and firestop materials shall be designed to remain securely in place for the period of the fire resistance rating of the penetrated assembly. Where penetrating items are of*

approved combustible materials, firestopping shall be capable of maintaining the fire integrity of the penetrated assembly or barrier by closing the opening created when the penetrating item burns through or melts away.

- (3) Firestops and firestop materials shall be installed by qualified persons in accordance with both the limitations of their listing and requirements of the manufacturer.*
 - (4) Where a sleeve is used at the penetration it shall be solidly set in the fire assembly or barrier and the spaces between the items, the sleeve, and the fire assembly or barrier shall be protected as required herein.*
 - (5) No insulation or coverings for pipes or ducts shall pass through the fire assembly or barrier unless the firestop listing permits the insulation material to pass through the assembly or barrier.*
 - (6) No device designed for vibration isolation shall penetrate a fire assembly or barrier unless it is constructed entirely of materials capable of maintaining the fire resistance of the assembly or barrier.*
- (c) Openings occurring at points where floors or fire barriers meet the outside walls of a building shall be protected as required for penetrations in Paragraph (b), above.*

3202.4 PENETRATIONS OF SMOKE BARRIERS:

- (a) Penetrations through floors or smoke barriers, including passages of pipes, conduits, bus ducts, cables, wires, air ducts, pneumatic ducts, and similar building service equipment shall be protected in accordance with this Subsection and shall be inspected as set forth in Section 312 of this Code.*
- (b) The space between the penetrating item and the smoke assembly or barrier shall be protected against the passage of smoke and hot gases with material capable of maintaining the smoke resistance of the smoke barrier, or protected by an approved material or device designed to provide such protection which meets the acceptance criteria of ASTM E814 and is installed in accordance with the manufacturers specifications. Where a smoke barrier is required to be fire resistive, smokestop materials shall be designed to remain securely in place for the period of the fire resistance rating of the penetrated assembly.*

Note: Where penetrating items are of approved combustible material, smokestopping shall be capable of maintaining the smoke resistance of the assembly or barrier in the event the penetrating item burns through or melts away.

- (1) Where a sleeve is used at the penetration, it shall be solidly set in the smoke assembly or barrier and the spaces between the item, the sleeve, and the smoke assembly or barrier shall be protected as required herein.*
 - (2) No insulation or coverings for pipes or ducts shall pass through the smoke assembly or barrier unless the insulation material is capable of maintaining the smoke resistance of the assembly or barrier.*
 - (3) No device designed for vibration isolation shall penetrate a smoke assembly or barrier unless it is constructed entirely of materials capable of maintaining the smoke resistance of the assembly or barrier.*
- (c) Openings occurring at a point where floors or smoke barriers meet the outside walls, other smoke barriers, or fire barriers of a building shall be protected as required for penetrations in Subsection (b), above.*
- (d) Plans and specifications detailing how penetrations will be smokestopped shall be provided as set forth in Section 302 of this Code.*

3202.5 FIRE-RESISTIVE ASSEMBLIES:

- (a) GENERAL: The fire resistivity of materials of construction or assemblies shall be as set forth in this Chapter or acceptable under the provisions of Standards set forth in Section 3201 herein.*
- (b) CONCRETE: Concrete shall be as set forth in Chapter 22 of this Code and have a 28-day strength of not less than 2500 psi.*
- (c) MASONRY: Masonry shall be as set forth in Chapter 27 of this Code and shall be laid in cement lime or masonry cement mortar; except gypsum tile shell, and clay tile may be laid in gypsum mortar when not exposed to the weather. Masonry shall be bonded by breaking joints in successive courses.*
- (d) LATH:*
 - (1) Gypsum lath shall be as set forth herein and in Chapter 31 of this Code.*

- (2) *Metal lath shall be as set forth herein and in Chapter 31 of this Code.*
- (e) **PLASTER:**
 - (1) *Plaster shall be as set forth herein and in Chapter 31 of this Code. Thickness of plaster is measured from the face of the plaster base; except that with metal lath, it is measured from the back of the lath unless otherwise stated. The usual 1/16" white or finish coat may be included in the required plaster thickness.*
 - (2) *Pneumatically-placed stucco shall be rated as Portland-Cement plaster.*
- (f) **OTHER FIRE RESISTIVE MATERIALS:** *Approved foams, caulks, mastics, grouts and intumescent shall be installed or applied in accordance with manufacturers specifications.*

3203 PROTECTION OF STRUCTURAL MEMBERS

3203.1 GENERAL: Structural members having the fire-resistive protection set forth in Table 32 shall be assumed to have the fire-resistance ratings set forth therein.

3203.2 PROTECTIVE COVERINGS:

- (a) Thickness of protection: The thickness of fire-resistive materials required for protection of structural members shall be not less than set forth in Table 32 except as modified in this Section. The figures shown shall be the net thickness of the protecting materials and shall not include any hollow space back of the protection within the thickness.
- (b) Unit Masonry Protection: Where required, metal ties shall be embedded in transverse joints of unit masonry for protection of steel columns. Such ties shall be as set forth in Table 32 or be equivalent thereto.
- (c) Reinforcement for cast-in-place concrete column protection: Cast-in-place concrete protection for steel columns shall be reinforced at the edges of such members with wire ties of not less than .18 inch in diameter wound spirally around the columns on a pitch of not more than eight inches (8").
- (d) Embedment of Pipes: Conduits and pipes shall not be embedded in required fire protection of structural members.

(e) Column Jacketing: Where the fire-resistive covering on columns is exposed to damage from moving vehicles, the handling of merchandise or other means, it shall be protected in a manner approved by the BCO.

(f) Ceiling Protection:

(1) Where a ceiling is used to fire-protect floors or roofs of non-combustible construction, the constructions and the supporting structural beams, girders and columns need not be individually fire-protected;

EXCEPTION: Where such beams, girders and columns support loads from more than one floor, roof, or contributory area exceeding 2,000 square feet, such members shall be individually protected.

(2) Such ceilings shall be continuous but may have openings for noncombustible pipes, ducts and electrical outlets provided the area of such pipes, ducts and electrical outlets aggregate not more than 100 square inches in 100 square feet of ceiling area and provided the spaces above such ceilings are divided into areas not exceeding 10,000 square feet.

(3) All openings for light fixtures and ceiling diffusers or other devices in ceilings where the aggregate area of all openings exceed that set forth in Paragraph (2) above shall be protected in a manner that will provide the same rating as the ceiling and the manner of protection shall be based on the results of fire tests.

(4) The material of construction of draft stops shall be as set forth in Type of Construction.

3203.3 PROTECTED MEMBERS:

(a) Attached metal members: The edges of lugs, brackets, rivets, and bolt heads attached to structural members may extend to within one inch (1") of the surface of the fire protection.

(b) Reinforcing: Thickness of protection for concrete or masonry reinforcement shall be measured to the outside of the reinforcement except that stirrups and spiral reinforcement ties may project not more than one-half inch (1/2") into the protection.

(c) Bonded Prestressed Concrete Tendons: For members having a single tendon or more than one tendon installed with equal concrete cover measured from the nearest surface, the cover shall be not

less than set forth in Table 32A.

For members having multiple tendons installed with variable concrete cover, the average tendon cover shall be not less than that set forth in Table 32A provided:

- (1) The clearance from each tendon to the nearest exposed surface is used to determine the average cover.
 - (2) In no case can the clear cover for individual tendons be less than one-half of that set forth in Table 32A. A minimum cover of three-fourths inch (3/4") for slabs and one inch (1") for beams is required for any aggregate concrete.
 - (3) For the purpose of establishing a fire-resistive rating, tendons having a clear cover less than that set forth in Table 32A shall not contribute more than 50 per cent of the required ultimate moment capacity of the member. For structural design purposes, however, tendons having a reduced cover are assumed to be fully effective.
- (d) Pipe columns: In buildings not exceeding one storey in height and 10,000 square feet in area where fire-resistive protection not exceeding one hour is required, concrete-filled pipe columns will be accepted in lieu of the required one-hour rating provided such pipes are filled with 2500 psi concrete, have wall thicknesses not less than 0.237 inch, are a minimum 4 inch inside diameter and are provided with pressure relief holes as set forth in Section 2306.
- (e) Where structural steel columns, required by this Code to be fire-protected, are enclosed within walls or partitions, the required fire-resistive protection for such steel columns shall be provided for the full vertical length of such columns.
- (f) Where structural steel, concrete filled pipe columns are enclosed within a wall or partition of one-hour fire-resistive rating which is of noncombustible materials, the assembly will be accepted as one-hour fire protection for the structural pipe column.
- 3203.4 FIRE PROTECTION OMITTED: Fire protection may be omitted from the bottom flange of lintels, spanning not over six feet (6), shelf angles, or plates that are not a part of the structural frame.
- 3203.5 ***EXPOSED EXTERIOR STRUCTURAL STEEL FRAMES: The Buildings Control Officer may accept a reduction in the fire protection of an exposed exterior structural steel frame. Such reduction shall be based upon***

calculations, prepared by an Engineer recognised by the Minister, which shall show: -

- (a) *The effects of fire exposure*
- (b) *The heat gain*
- (c) *The effects of ventilation*
- (d) *The temperature profile*

Furthermore such calculations shall clearly show the effect that ultra violet rays and saline atmospheric conditions will have on any protective coatings on the steel.

3204 WALLS AND PARTITIONS

- 3204.1 GENERAL: Fire-resistive walls and partitions shall be assumed to have the fire-resistance ratings set forth in Table 32B.
- 3204.2 COMBUSTIBLE MEMBERS:
- (a) Combustible members framed into a wall shall be protected at their ends by not less than one-half the required fire-resistive thickness of such wall.
 - (b) Materials, excluding pipe and conduit, may be attached to or placed between the studs under the required wall claddings and, where such wall or partition is required to be of non-combustible material or have a fire-resistive rating of more than one-hour, such material shall be noncombustible.
- 3204.3 EXTERIOR WALLS: In fire-resistive exterior wall construction the fire - resistive rating shall be maintained for such walls passing through attic areas.

3205 FLOOR-CEILINGS OR ROOF-CEILINGS

- 3205.1 GENERAL: Fire-resistive floor-ceiling, or roof-ceiling construction systems shall be assumed to have the fire-resistance ratings set forth in Table 32C.

LIMITATION: Steel Joist Construction shall not be used in buildings over 4 floors in height, regardless of the fire-resistance ratings set forth in Table 32C for various types of protection for Steel Joist Construction.

3205.2 FLOORS: Fire-resistive floors shall be continuous and all openings for mechanical and electrical equipment shall be enclosed as specified in this Code.

EXCEPTIONS:

- (a) Occasional pipes, conduits, sleeves and electrical outlets of copper, sheet steel or ferrous construction may be installed within or through fire-resistive floor systems provided such installations do not unduly impair the required fire-resistance of the assembly.
- (b) The provisions of this Section shall not apply when such openings are in accordance with the results of tests conducted pursuant to the provisions of Section 3202.2 of this Chapter.
- (c) No lumber shall be used as ceiling supports in fire rated floor or ceiling assemblies except as may be permitted by Section 3111.2.

3205.3 ROOFS: Fire-resistive roofs may have the same openings as permitted for floors and may contain other openings as permitted by this Code.

3205.4 UNUSABLE SPACE ABOVE OR BELOW: In one-hour fire-resistive construction the ceiling may be omitted over unusable space and flooring may be omitted where unusable space occurs above.

3205.5 SUSPENDED CEILING SYSTEMS:

- (a) Where a ceiling is constructed of suspended tile or board it shall comply with Section 3208 or it shall be non-combustible or fire resistive as set forth herein.
- (b) If the suspended board is to provide the required fire protection then:
 - (1) All tiles or boards shall be attached to the supporting suspension system in such a manner as to resist uplift.
 - (2) Suspended ceilings exceeding 100 square feet in area shall be provided with adequate means for every 64 square feet of ceiling to resist uplift forces on the entire suspended system.

3206 FIRE RESISTIVE ASSEMBLIES FOR PROTECTION OF OPENINGS

3206.1 GENERAL: Where required by this Code for fire protection of openings, fire-resistive assemblies shall comply with the standards set forth in this Section and in Appendix A and Table 32-I.

3206.2 IDENTIFICATION OF FIRE ASSEMBLIES:

(a) All fire assemblies required to have fire-protection ratings of three hours, one and one-half hours, one hour, and three-fourths hours shall bear a label or other identification showing the rating thereof except that such label shall not be required for doors complying with Sub-paragraph 3206.2 (c) (2) herein and windows complying with the paragraphs of Sub-section 3206.6 herein.

(b) Such label shall be issued by an approved testing agency having a service for inspection of materials and workmanship at the factory during fabrication and assembly.

(c) EXCEPTIONS:

(1) A three-fourths-hour labeled fire assembly door may be used where a one-hour rating is required provided the door is tested, together with the frame and type of hardware as set forth in this Code, for a period of three-fourths hour.

(2) Where a fire assembly having a fire-protection rating not exceeding three-fourths hour is required, any of the following doors may be installed provided such doors meet with other requirements of this section for frames, hardware, and glazing.

(i) Sheet-metal doors constructed of two sheets of metal not less than .0179" thick, fastened to a structural steel frame in such manner as to leave a one-inch space between the panels, which space shall be approved with non-combustible material.

(ii) Metal-clad doors which shall be wood-panel doors with frame not less than one and three-fourths inch in thickness and with wood panels not less than three-fourths inch in thickness, the whole door covered with not less than .0179" thick metal. The panels of such doors shall fit into the frame not less than three-fourths inch and all joints of metal shall be lapped with sufficient lap width and nailed tightly to the wood frames.

(iii) Doors of solid wood not less than one and three-fourths inches thick.

3206.3 FIRE-RESISTIVE TESTS:

- (a) The fire-protection rating of all types of required fire assemblies, except doors complying with Subparagraph 3206.2 (c) (2) and windows complying with the paragraphs of Sub-section 3206.6, shall be determined in accordance with the requirements set forth in Appendix A.
- (b) A minimum transmitted temperature and end point shall not be required except for fire-exit doors in stairway enclosures where the temperature shall not exceed 450°F. at the end of 30 minutes of the fire exposure set forth in the standards.

3206.4 HARDWARE:

- (a) Every fire assembly required to have a three-hour fire-protection rating shall be an automatic closing type.
- (b) *Every fire assembly required to have a one and one-half hour, one-hour, or three-fourths-hour fire-protection rating shall be an automatic or self-closing type, or as indicated in Table 32-I.*

TABLE 32-I

FIRE RATED DOOR REQUIREMENTS				
(1, 2) (footnotes)				
DOORS TO ONE-HOUR FIRE-RATED MEANS OF EGRESS				
(Corridors)				
Occupancy	Rating (hours)	Label (3)	Maximum Glazing Per leaf. sq.in.	Closing Device (see footnote)
A	3/4	C	1200	A or B
B-1, B-2	3/4	C	1200	C
C	3/4	C	1200	C
D-1, D-2	1	B	100	A OR D
E-1, E-2	3/4	C	1200	C
F-1, F-2	3/4	C	1200	C
G	3/4	C	1200	E
H	no requirements			
I	3/4	C	1200	C

TABLE 32-I (Continued)

EXIT ENCLOSURE DOORS					
Occupancy	Rating (hours)		Label (3)	Maximum Glazing per leaf sq.in.	Closing Device (footnotes)
	Less than 4 stories	4 stories and over			
H	no requirement				
All others	1	1-1/2	B	100	A or B
DOORS FOR OPENINGS IN OCCUPANCY SEPARATION AND FIRE DIVISION WALLS					
Wall Rating (hours)	Door Rating (hours)		Label (3) (footnote)		
4	3		A		
3	3		A		
2	1-1/2		B		
1	3/4		C(4)		

A- Self closing.

B- Automatic closing. Shall close when released by activation of a detector set to operate when smoke reduces the intensity of a one-foot long beam of white light by four percent, or any other detection device which will operate within that limitation.

C- None required except doors from enclosed corridors to rooms of hazardous uses such as linen rooms, trash rooms, mechanical repair rooms, etc.

D- Automatic closure at 165° degrees F, fusible link or equal.

E- Self closing, rising butt hinge or closer.

1- For hardware requirements see Sub-section 3206.4

2- For glazing see Sub-sections 3206.5 and 3206.7

3- Ratings of 3, 1-1/2, 1, 3/4, 1/2, or 1/3 hours indicate the duration of the test exposure. Such numbers are followed by letters A, B, C, D, or E to indicate the classification of wall opening.

4- For doors connecting residences to attached garages, see Sub-paragraph 1307.2(a)(3)

- (c) (1) Doors shall have closing devices as provided in TABLE 32-I and as set forth in Section 2811 of this Code.
- (2) Closing devices may be omitted where three-fourths-hour fire-resistive assemblies are required in exterior walls and in interior walls and partitions unless otherwise required in Section 2811.

- (d) Heat-activated devices used in automatic fire assemblies shall be installed, one on each side of the wall at the top of the opening and one on each side of the wall at ceiling height where the ceiling is more than three feet above the opening.
- (e) Devices detecting products of combustion shall meet the approval of the Buildings Control Officer as to installation and location, and shall be subject to such periodic tests as may be required by Section 3708 herein.

3206.5 GLAZED OPENINGS IN FIRE DOORS AND WINDOWS:

- (a) There shall be no glazed openings in a fire door required to have a three-hour fire-resistive rating.
- (b) The area of glazed openings in a fire door required to have one-and-one-half-hour or one-hour fire-resistive ratings shall be limited to 100 square inches with a minimum dimension of four inches.
- (c) Where both leaves of a pair of doors have observation panels, the total area of the glazed openings shall not exceed 100 square inches for each leaf.
- (d) Glazed openings shall be limited to 1200 square inches in wood and plastic faced composite or hollow metal doors, per light, when fire resistive assemblies are required to have a three-fourths-hour fire-resistive rating.
- (e) Windows required to have a three-fourths-hour fire-resistive rating may have an area not greater than 84 square feet with neither width nor height exceeding 12 feet.

3206.6 FIRE WINDOWS: Where windows are provided in openings required by this Code to be protected by a fire-resistive assembly having a three-fourths-hour fire-protection rating, such windows shall be labelled as set forth in Sub-section 3206.2 or shall be as follows:

- (a) Windows shall have frames and sash of solid steel sections or of hollow steel or iron shapes and be fabricated by pressing, riveting, interlocking, welding, or crimping together, but not by the use of solder or other fusible alloy.
- (b) Wire glass and glazing shall comply with Sub-section 3206.7.
- (c) Maximum height of hollow-metal-frame windows shall be 10 feet.

- (d) Maximum width of hollow-metal-frame windows shall be six feet for double-hung, counter-weighted, counter-balanced, and fixed-sash type windows and shall be five feet for all other types.
- (e) Solid-section-frame windows shall have a maximum area of 84 square feet with neither width nor height exceeding 12 feet, except that, when used with unprotected steel mullions, the width shall not exceed seven feet.
- (f) Solid-section mullions, where used in lengths exceeding 12 feet shall be fire-protected.

3206.7 GLAZING:

- (a) Glazing shall be glass not less than one-fourth inch thick and shall be reinforced with wire mesh No. 24 gauge or heavier embedded in the glass with openings not larger than one inch square.
- (b) Glass not conforming to these requirements may be used when qualified by tests in accordance with the standards set forth in this Chapter.
- (c) Glass shall be held in place by steel glazing-angles except that in casement windows wire clips may be used.

3206.8 TIN-CLAD DOORS: If constructed as set forth in the standards, tin-clad fire doors installed on each side of openings requiring protection shall be considered as providing a fire assembly having a three-hour fire-protection rating provided each door bears the label of an approved testing agency showing the classification thereof.

3206.9 INSTALLATION: A fire assembly shall be installed as set forth in the standards.

3206.10 SIGNS: A sign may be deemed necessary by the Buildings Control Officer at or near each required fire door in letters not less than 4" high to read as follows:

**FIRE DOOR
DO NOT OBSTRUCT**

Where corridors change direction, doors which are not exit doors shall be marked PRIVATE.

3207 FIRE RETARDANT ROOF COVERINGS

Roof coverings shall be required to be fire retardant where and as set forth in the Chapter on Roof Coverings (Chapter 30).

3208 INTERIOR FINISHES

3208.1 GENERAL:

- (a) Interior finish means the exposed interior surfaces of buildings including, but not limited to, fixed or moveable walls and partitions, columns and ceilings and any surfacing material such as paint or wallpaper applied thereto.
- (b) Interior floor finish means the exposed floor surfaces of buildings including coverings which may be applied over a normal finished floor.
- (c) Cellular or foamed plastic materials shall not be used as interior finish.

3208.2 CLASSIFICATION:

- (a) Interior finish materials shall be classified by their average flame spread and smoke development ratings as determined by the results of a test conducted in accordance with NFPA 255 'Method of Test of Surface Burning Characteristics of Building Materials'.

Class A Interior Finish: Flame spread rating 0-25, smoke developed 0-450, includes any material classified at 25 or less on the flame spread test scale and 450 or less on the smoke test scale. Any element thereof when so tested shall not continue to propagate fire.

Class B Interior Finish: Flame spread rating 26-75, smoke developed 0-450, includes any material classified at more than 25 but not more than 75 on the flame spread test scale and 450 or less on the smoke test scale.

Class C Interior Finish: Flame spread rating 76-200 smoke developed 0-450, includes any material classified at more than 75 but not more than 200 on the flame spread test scale and 450 or less on the smoke test scale. The classification of the interior finish materials shall be that of the basic material used by itself or in combination with other materials.

- (b) Interior floor finishes shall be classified by their critical radiant flux ratings as determined by the results of a test conducted in accord-

ance with NFPA 253 'Standard Method of Test for Critical Radiant Flux of Floor Covering Systems, Using a Radiant Heat Energy Source.'

Class I Interior Floor Finish: Critical radiant flux, minimum of 0.45 Watts per square centimetre.

Class II Interior Floor Finish: Critical radiant flux, minimum of 0.22 Watts per square centimetre.

- (c) The flame spread ratings and the critical radiant flux ratings for various groups of occupancy shall be as set forth in Table 32-II below: -

**TABLE 32-II
INTERIOR FINISH REQUIREMENTS BASED UPON OCCUPANCY**

OCCUPANCY	EXITS	CLASS OF FLAME SPREAD RATING	
		ACCESS TO EXITS	OTHER SPACES
GROUP A	A	A or B	A, B or C
GROUP B	A	A or B	A, B or C
GROUP C	A	A or B	A, B or C
OPEN PLAN	A	A	A or B*
GROUP D	A	A or B	A or B
GROUP E DIV 1	A, B or C	A, B or C	A, B or C
DIV 2	A or B	A, B or C	A, B or C
GROUP F DIV 1	A or B	A or B	A or B
DIV 2	A or B	A or B	A, B or C
GROUP G	A or II**	A or B or II	A, B or C
GROUP H		A, B or C	
GROUP I		No Requirements	

* C on moveable partitions not more than 5' high.

** Interior Floor Finish Classifications.

- (1) Exposed portions of structural members complying with the requirements for heavy exposed timber construction may be permitted.
- (2) Automatic sprinklers—where an approved automatic sprinkler system is installed the following may pertain: —

NORMAL FINISH REQUIRED			FINISH REQUIRED IF APPROVED SPRINKLER SYSTEM INSTALLED		
Class	B	flame spread rating.	Class	C	flame spread rating.
"	A	" " "	"	B	" " "
"	I	Interior floor finish.	"	II	Interior floor finish.
"	II	" " "	None.		

3208.3 FIRESTOPPING IN BACK OF WAINSCOTING AND PANELING: Except in single family and duplex residential occupancies, all spaces between combustible wainscoting or panelling and the wall or partition to which it is attached shall be firestopped to form areas not exceeding seven feet in any dimension.

If panelling is applied directly to the wall with no air space, or if the space between battens and back of the wall is filled and surface treatment conforms to these requirements, firestopping is not required.

3209 INSULATING MATERIALS

3209.1 GENERAL: Insulating materials having a flame spread rating of 25 or less and a smoke development rating of 100 or less, shall be used as set forth herein.

- (a) Insulating materials may be used within non-fire-rated assemblies.
- (b) Insulating materials may be used within fire-rated assemblies if such assemblies are tested in accordance with ASTM E119.
- (c) Insulating materials may be applied to the room side surface of combustible or non-combustible assemblies if the insulation is protected by a thermal barrier having a finish rating of not less than 15 minutes.

NOTE: Finishing rating: means the time as determined in accordance with ASTM E 119, at which a thermal barrier reaches a tem-

perature of 250 degrees Fahrenheit above ambient or an individual temperature rise of 325 degrees Fahrenheit above ambient as measured on the plane of the thermal barrier nearest to the insulating material.

3209.2 EXCEPTIONS:

- (a) The requirements of Section 3209.1 (b) may be waived if such assemblies are protected by an approved fire extinguishing system.
- (b) The requirements of Section 3209.1 (c) shall not apply to single family residences of Group 'H' Occupancy.

3210 CALCULATIONS OF FIRE RESISTANCE

3210.1 GENERAL:

- (a) *SCOPE: The fire resistance rating of any construction component or assembly required to be fire resistive may be calculated in accordance with the provision of this Section. The procedures for the calculation of fire resistance shall comply with the provisions of this Sections.*
- (b) *APPLICATION: The procedures and requirement established herein shall be applicable and shall be valid only for this Section.*

3210.2 STANDARDS: Calculations of fire resistance shall be based upon the methods established in this Section, and/or one or more of the following Standards:

- (a) *NCMA TEK 80A, Increasing the Fire Resistance of Concrete Masonry.*
- (b) *AISI, Designing Fire Protection for Street Trusses*
- (c) *AISI, Designing Fire Protection for Steel, Columns*
- (d) *CRSI, Reinforced Concrete Fire Resistance*
- (e) *PSI, Design for Fire Resistance of Precast Prestressed Concrete*

3210.3 CONCRETE WALL WITH GYPSUM WALLBOARD OR PLASTER FINISHES

The fire resistance rating of cast-in-place or precast concrete walls with finishes of gypsum wallboard or plaster applied to 1 or both sides may be calculated in accordance with the provisions of this Section:

- (a) *Where the finish of gypsum wallboard or plaster is applied to the non-fire-exposed side of the wall, the contribution of the finish to the total fire-resistance rating shall be determined as follows: The thickness of finish shall first be corrected by multiplying the actual thickness of the finish by the applicable factor determined from Table 32-A based on the construction and type of aggregate. The corrected thickness of finish shall then be added to the actual thickness or equivalent thickness of concrete and the fire-resistant rating of the concrete and finish determined from Table 32B.*
- (b) *Where gypsum wallboard or plaster is applied to the fire-exposed side of the wall, the contribution of the finish to the total fire-resistance rating shall be determined as follows: The time assigned to the finish as established by Table 32-B shall be added to the fire-resistance rating determined from Table 32-B for the concrete alone, or to the rating determined in Paragraph 3210.3(a) herein for the concrete and finish on the non-fire exposed side.*
- (c) *For a wall having no finish on 1 side or having different types or thicknesses of finish on each side, the calculation procedures of Paragraphs 3210.3(a) and 3210.3(b) herein shall be performed twice, i.e. assume that either side of the wall may be the fire-exposed side. The fire resistance rating of the wall shall not exceed the lower of the two values calculated.*

EXCEPTION: For exterior wall with more than 5'-0" of horizontal distance separation, the fire may be assumed to occur on the interior side only.

- (d) *When the finish applied to a concrete wall contributes to the fire-resistance rating, the concrete alone shall provide not less than 1/2 the total required fire-resistance rating.*
- (e) *Finishes on concrete walls which are assumed to contribute to the total fire resistance rating of the wall shall comply with the installation requirements of Paragraph 3210.4(f) hereinbelow.*

3210.4 CONCRETE MASONRY WALLS

- (a) *The fire resistance rating of walls and partitions constructed of concrete masonry units shall be determined from Table 32-B. The rating shall be based on the equivalent thickness of the masonry and type of aggregate used.*
- (b) *Where plaster or gypsum wallboard is applied to the non-fire-exposed side of the wall, the contribution of the finish to the total fire resistance rating shall be determined as follows: The thickness of gypsum wallboard or plaster shall be corrected by multiplying the actual thickness of the finish by the applicable factor determined from Table 32-A. This corrected thickness of finish shall be added to the equivalent thickness of masonry and the fire resistance rating of masonry and finish determined; from Table 32-B.*
- (c) *Where plaster or gypsum wallboard is applied to the fire-exposed side of the wall, the contribution of the finish to the total fire resistance rating shall be determined as follows: The time assigned to the finish as established by Table 32-B shall be added to the fire resistance rating determined in Paragraph 3210.4(a) hereinabove for the masonry alone, or in Paragraph 3210.4(b), hereinabove for the masonry and finish on the non-fire-exposed side.*
- (d) *For a wall having no finish on one side or having different types or thicknesses of finish on each side, the calculation procedures of this section shall be performed twice, i.e., assume that either side may be the fire-exposed side of the wall. The fire resistance rating of the wall shall not exceed the lower of the two values calculated.*

EXCEPTION: For exterior wall with more than 5'-0" of horizontal distance separation, the fire shall be assumed to occur on the interior side only.
- (e) *When the finish applied to a concrete masonry wall contributes to the fire resistance rating, the masonry alone shall provide not less than 1/2 the total required fire resistance rating.*
- (f) *Installation of finishes shall be as follows:*
 - (1) *Gypsum wallboard and gypsum lath applied to concrete masonry or concrete walls shall be secured to wood or steel furring members spaced not more than 16" o/c.*

- (2) *Gypsum wall board shall be installed with the long dimension parallel to the furring members and shall have all joints finished.*
- (3) *Other aspects of the installation of finishes shall comply with the applicable provisions of Chapter 31 of this Code.*

TABLE 32A
MINIMUM PROTECTION OF STRUCTURAL PARTS BASED ON TIME PERIODS FOR
VARIOUS NON-COMBUSTIBLE INSULATING MATERIALS

Structural Parts to be Protected	Item Number	Insulating Material Used	Minimum Thickness of Insulating Material for Following Fire-Resistive Periods (In Inches)				
			4Hr.	3Hr.	2 Hr.	1 Hr.	
Steel Columns and all Members of Primary Trusses 10	1	Grade A concrete, members 6" x 6" or greater (not including sandstone, granite and siliceous gravel) ¹	2½	2	1½	1	
	2	Grade A concrete, members 8" x 8" or greater (not including sandstone, granite and siliceous gravel) ¹	2	1½	1	1	
	3	Grade A concrete, members 12" x 12" or greater (not including sandstone, granite and siliceous gravel) ¹	1½	1	1	1	
	4	Grade B concrete and Grade A concrete excluded above, members 6" x 6" or greater ¹	3	2	1½	1	
	5	Grade B concrete and Grade A concrete excluded above, members 8" x 8" or greater ¹	2½	2	1	1	
	6	Grade B concrete and Grade A concrete excluded above, members 12" x 12" or greater ¹	2	1	1	1	

TABLE NO. 32A (Continued)

7	Solid gypsum blocks with woven wire mesh ² in horizontal joints, laid with 1" mortar on flanges ¹ and plastered with ½" gypsum plaster	2½	2½	—	—
8	Portland cement plaster over metal lath wire ties to ¾" cold-rolled vertical channels with No. 18 gauge wire ties spaced 3" to 6" on centre. Plaster mixed 1:2½ by volume, cement to sand	—	—	2½ ³	¾
9	Vermiculite concrete, 1:4 mix by volume over paperbacked wire fabric lath wrapped directly around column with additional 2" x 2" No. 16/16 gauge wire fabric placed ¾" from outer concrete surface. Wire fabric tied with No. 18 gauge wire spaced 6" on centre for inner layer and 2" on centre for outer layer	2	—	—	—
10	Perlite or vermiculite gypsum plaster over metal lath wrapped around column and furred 1¼" from column flanges. Sheets lapped at ends and tied at 6" intervals with No. 18 gauge tie wire. Plaster pushed through to flanges	1½	1	—	—
11	Perlite or vermiculite gypsum plaster over self-furring metal lath wrapped directly around column, lapped 1" and tied at 6" intervals with No. 18 gauge wire	1¾	1¾	1	—
12	Perlite or vermiculite gypsum plaster on metal lath applied to ¾" cold-rolled channels spaced 24" inches apart vertically and wrapped flatwise around column	1½	—	— ²	—

TABLE NO. 32A (Continued)

Steel Columns and all Members of Primary ¹⁰ Trusses (Cont'd)	13	Perlite or vermiculite gypsum plaster over 2 layers of ½" plain full-length gypsum lath applied tight to column flanges. Lath wrapped with 1 hexagonal mesh of No. 20 gauge wire and tied with doubled No. 18 gauge wire ties spaced 23" on centre. For three-coat work the plaster mix for the second coat shall not exceed 100 pounds of gypsum to 2½ cubic feet of aggregate for the three hour system	2½	2	—	—
	14	Perlite or vermiculite gypsum plaster over one layer of ½" plain full-length gypsum lath applied tight to column flanges. Lath tied with doubled No. 18 gauge wire ties spaced 23" on centre and scratch coat wrapped with 1" hexagonal mesh. No. 20 gauge wire fabric. For three-coat work the plaster mix for the second coat shall not exceed 100 pounds of gypsum to 2½ cubic feet of aggregate	—	2	—	—
	15	Perlite or vermiculite gypsum plaster over ¾" perforated gypsum lath applied tight to column flanges and tied with doubled No. 18 gauge wire ties spaced 15" on centre. For three-coat work the plaster mix for the second coat shall not exceed 100 pounds of gypsum to 2½ cubic feet of aggregate for the two-hour system	—	1¾	1%	—
	16	Gypsum plaster over ¾" perforated gypsum lath applied tight to column flanges and tied with doubled No. 18 gauge wire ties spaced 15" on centre	—	2%	1¾	¾
	17	Multiple layers of ½ gypsum wallboard adhesively ⁴ secured to column flanges and successive layers. Wallboard applied without horizontal joints. Corner edges of each layer staggered. Wallboard layer below outer layer secured to column with doubled No. 18 gauge wire ties spaced 15" on centre. Exposed corners taped and treated	—	—	2	1

TABLE NO. 32A (Continued)

18	Three layers of $\frac{3}{8}$ " Type "X" gypsum wallboard. First and second layer held in place by $\frac{1}{8}$ " diameter by $\frac{1}{8}$ " long ring shank nails with 5/16 diameter heads spaced 24" on centre at corners. Middle layer also secured with metal straps at mid-height and 18" from each end, and by metal corner bead at each corner held by the metal straps. Third layer attached to corner bead with 1" long gypsum wallboard screws spaced 12" on centre	—	—	—	1 $\frac{1}{2}$	—
19	Three layers of $\frac{3}{8}$ " Type "X" gypsum wallboard, each layer screw attached to 1 $\frac{1}{2}$ " steel studs, (No. 25 gauge) at each corner of column. Middle layer also secured with No. 18 gauge double strand tie wire, 24 on centre. Screws are No. 6 by 1" spaced 24" on centre for inner layer, No. 6 by 1 $\frac{1}{2}$ " spaced 12" on centre for middle layer and No. 8 by 2 $\frac{1}{4}$ " spaced 12" on centre for outer layer	—	1 $\frac{1}{2}$	—	—	—
20	Grade A concrete (not including sandstone, granite and siliceous gravel) with 3" or finer metal mesh placed 1" from the finished surface anchored to the top flange and providing not less than .025 square inch of steel area per foot in each direction	2	1 $\frac{1}{2}$	1	1	1
21	Grade B concrete and Grade A concrete excluded above with 3" or finer metal mesh placed 1" from the finished surface anchored to the top flange and providing not less than .025 square inch of steel area per foot in each direction	2 $\frac{1}{2}$	2	1 $\frac{1}{2}$	1	1
22	Portland cement plaster on metal lath attached to $\frac{3}{8}$ " cold-rolled channels with No. 18 gauge wire ties spaced 3" to 6" on centre. Plaster mixed 1:2 $\frac{1}{2}$ by volume, cement to sand	—	—	2 $\frac{1}{2}$ s	—	$\frac{3}{8}$

TABLE NO. 32-A (CONCLUDED)

Bonded Tendons in Prestressed Concrete ⁵	23	Grade A ⁶ concrete	Beams or girders		4 ⁷	3 ⁷	2½ ⁷	1½
			Solid slabs ⁸					
Reinforcing Steel in	24	Grade A concrete, members 12" or larger, square or round (Size limit does not apply to beams and girders monolithic with floors)	1½	1½	1½	1½	1½	1½
Reinforced Concrete Columns, Beams, Girders and Trusses	25	Grade B concrete, members 12" or larger, square or round (Size limit does not apply to beams and girders monolithic with floors)	2	1½	1½	1½	1½	1½
Reinforcing Steel in	26	Grade A Concrete	1½	1½	1	1	¾	¾
Reinforced Concrete Joists ⁹	27	Grade B Concrete	1½	1½	1	1	¾	¾
Reinforcing and Tie Rods in	28	Grade A Concrete	1	1	1	¾	¾	¾
Floor and Roof Slabs ⁹	29	Grade B Concrete	1½	1	1	1	¾	¾

1 Reentrant parts of protected members to be filled solidly.

2 Woven wire mesh consists of three-eighths-inch (¾") mesh of No. 17 gauge wire.

3 Two layers of equal thickness with a three-fourths-inch (¾") air space between.

4 An approved adhesive qualified under the Standards in Appendix A.

5 Cover for end anchorages shall be twice that shown for the respective ratings. Where lightweight Grade A concrete aggregates producing structural concrete having an oven-dried weight of 110 pounds per cubic foot or less are used, the tabulated minimum cover may be reduced 25 per cent.

6 For Grade B concrete increase tendon cover 20 per cent.

7 Adequate provisions against spalling shall be provided by U-shaped or hooped stirrups spaced not to exceed the depth of the member with a clear cover of one inch (1").

8 Prestressed slabs shall have a thickness not less than that required in Table 32C for the respective fire-resistive time period.

9 For use with monolithic reinforced concrete slabs having a comparable fire endurance. Thicknesses do not apply to precast construction.

**TABLE 32B
RATED FIRE-RESISTIVE PERIODS FOR VARIOUS WALLS AND PARTITIONS**

Material	Item Number	Construction ¹	Minimum Finished Thickness Face-to-Face (In Inches)				
			4 Hr.	3 Hr.	2 Hr.	1 Hr.	
Concrete Masonry Units ⁷	1	Aggregate Expanded Slag, Burned Clay or Shales, Cinders	1 1/4" Face Shells	—	—	8	4 1/2
			Unplastered	—	—	—	—
	1	Aggregate Expanded Slag, Burned Clay or Shales, Cinders	1 1/4" Face Shells	—	8 1/2	4 1/2	—
			Unplastered	12	8	—	—
	2	Aggregate Expanded Slag, Burned Clay or Shale, Cinders	1 1/4" Face Shells	9	—	—	—
			Unplastered	—	—	—	—
	3	Other Aggregates	1 1/4" Face Shells	8	—	—	—
			Unplastered	—	—	—	—
	3	Other Aggregates	1 1/4" Face Shells	—	—	8	4 1/2
			Unplastered	—	—	—	—
3	Other Aggregates	1 1/4" Face Shells	—	9	5 1/2	—	
		Unplastered	12	8	—	—	
3	Other Aggregates	1 1/4" Face Shells	9	—	—	—	
		Unplastered	—	—	—	—	

TABLE 32B (Continued)

	4	Other Aggregates	2 1/4" Face Shells	Unplastered	8			
Solid Concrete	5	Horizontal reinforcement not less than 0.25 per cent and vertical reinforcement not less than 0.15 per cent. (Three-fourths as much for welded wire fabric)		Grade A Concrete	6 1/2	6	5	3 1/2
	6	3/4" by No. 16 gauge vertical cold-rolled channels, 16" on centre with 2.5 pounds flat metal lath applied to one face and tied with No. 18 gauge wire at 6" spacing. Gypsum plaster each side mixed 1:2 by weight, gypsum to sand aggregate		Grade B Concrete	7 1/2	6 1/2	5 1/2	4 1/4
Solid Gypsum Plaster	7	Studless with 1/2" full-length plain gypsum lath and gypsum plaster each side. Plaster mixed 1:1 for scratch coat and 1:2 for brown coat, by weight, gypsum to sand aggregate			—	—	—	2 1/4
	8	3/4" by No. 16 gauge cold-rolled channels 16" on centre with metal lath applied to one face and tied with No. 18 gauge wire at 6" spacing. Perlite or vermiculite gypsum plaster each side. For three-coat work the plaster mix for the second coat shall not exceed 100 pounds of gypsum to 2 1/2 cubic feet of aggregate for the one hour system			—	—	2 1/2 1/4	2 1/4
	9	Studless with 1/2" full-length plain gypsum lath and perlite or vermiculite gypsum plaster each side			—	—	2 1/2 1/4	2 1/4
	10	Studless partition with 3/8" rib metal lath installed vertically, adjacent edges tied 6" on centre with No. 18 gauge wire ties, gypsum plaster each side mixed 1:2 by weight, gypsum to sand aggregate			—	—	—	2 1/4

TABLE 32B (Continued)

<p>Solid Perlite and Portland Cement</p>	<p>11</p>	<p>Perlite mixed in the ratio of 3 cubic feet to 100 pounds of Portland cement and machine applied to stud side of 1½" mesh by No. 17 gauge paperbacked woven wire lath nailed to 4 deep steel trussed wire studs 16" on centre with 1" long by No. 11 gauge by 7/16" head annular ring shank nails</p>	<p>—</p>	<p>—</p>	<p>3¼"</p>	<p>—</p>
<p>Solid Gypsum Wallboard Partition</p>	<p>12</p>	<p>One full-length layer ½" Type "X" gypsum wallboard laminated to each side of 1" full length V-edge gypsum coreboard with approved laminating compound. Vertical joints of face layer and coreboard staggered at least 3"</p>	<p>—</p>	<p>—</p>	<p>2"</p>	<p>—</p>
<p>Solid Gypsum Wallboard Partition</p>	<p>13</p>	<p>One full-length layer of ½" gypsum wallboard laminated to each side of 1" full length interlocking factory laminated gypsum core board with approved laminating compound. Vertical joints of face layer and coreboard staggered</p>	<p>—</p>	<p>—</p>	<p>2"</p>	<p>—</p>
<p>Hollow (Studless) Gypsum Wallboard Partition</p>	<p>14</p>	<p>One full-length layer of ½" Type "X" gypsum wallboard attached to both sides of wood or metal top and bottom runners laminated to each side of 1" x 6" full-length gypsum coreboard ribs spaced 24" on centre with approved laminating compound. Ribs centered at vertical joints of face plies and joints staggered 24" in opposing faces. Ribs may be recessed 6" from the top and bottom</p>	<p>—</p>	<p>—</p>	<p>—</p>	<p>2¼"</p>

TABLE 32B (Continued)

<p>Hollow (Studless) Gypsum Wallboard Partition (Cont'd.)</p>	<p>15</p>	<p>1" regular gypsum "V" edge full-length backing board attached to both sides of wood or metal top and bottom runners with nails or 1 1/2" drywall screws at 24" on centre. Minimum width of runners 1 1/2". Face layer of 1/2" regular full-length gypsum wallboard laminated to outer faces of backing board with approved laminating compound</p>	<p>—</p>	<p>—</p>	<p>—</p>	<p>4 1/4"</p>
<p>Non-combustible Studs — Interior Partition with Plaster Each Side</p>	<p>16</p>	<p>3 1/4" by No. 18 gauge steel studs spaced 24" on centre. 3/4" gypsum plaster on metal lath each side mixed 1:2 by weight, gypsum to sand aggregate</p>	<p>—</p>	<p>—</p>	<p>—</p>	<p>4 1/4"</p>
	<p>17</p>	<p>3 1/2" No. 16 gauge approved nailable studs spaced 24" on centre. 3/4" neat gypsum wood fibered plaster each side over 3/4" rib metal lath nailed to studs with 6d common nails, 8" on centre. Nails driven 1 1/4" and bent over</p>	<p>—</p>	<p>—</p>	<p>5%</p>	<p>—</p>
	<p>18</p>	<p>2 1/2" steel studs 16" on centre formed with No. 16 gauge angle flanges and No. 7 gauge wire diagonals. 3/4" perforated gypsum lath attached to the studs each side with No. 12 gauge wire clips at horizontal and vertical joints. 1/2" gypsum plaster applied each side mixed 1:2 by weight, gypsum to sand aggregate</p>	<p>—</p>	<p>—</p>	<p>—</p>	<p>4 1/4"</p>
	<p>19</p>	<p>2 1/2" steel studs 16" on centre formed with No. 16 gauge angle flanges and No. 7 gauge wire diagonals. 3/4" perforated gypsum lath attached to the studs each side with No. 12 gauge approved steel wire clips. End joints of lath held by approved end joint clips. 3/4" perlite or vermiculite gypsum plaster applied each side</p>	<p>—</p>	<p>—</p>	<p>—</p>	<p>4 1/4"</p>

TABLE 32B (Continued)

<p>Non-combustible Studs — Interior Partition with Plaster Each Side (Cont'd)</p>	<p>20</p>	<p>4" No. 18 gauge channel-shaped steel studs at 16" on centre. On each side approved resilient clips pressed onto stud flange at 16" vertical spacing, ¼" pencil rods snapped into or wire-tied on to outer loop or clips, metal lath wire-tied to pencil rods at 6" intervals, 1" perlite gypsum plaster, each side</p>	<p>—</p>	<p>7%⁴</p>	<p>—</p>	<p>—</p>
<p>Wood Studs Interior Partition with Plaster Each Side</p>	<p>21</p>	<p>2" x 4" wood studs 16" on centre with ¾" gypsum plaster on metal lath. Lath attached by 4d common nails bent over or No. 14 gauge by 1½" x ¾" crown width staples spaced 6" on centre. Plaster mixed 1:1½ for scratch coat and 1:3 for brown coat, by weight, gypsum to sand aggregate</p>	<p>—</p>	<p>—</p>	<p>—</p>	<p>5%</p>
<p>Wood Studs Interior Partition with Plaster Each Side</p>	<p>22</p>	<p>2" x 4" wood studs 16" on centre with metal lath and ¾" neat wood fibered gypsum plaster each side. Lath attached by 6d common nails, 7" on centre. Nails driven 1¼" and bent over</p>	<p>—</p>	<p>—</p>	<p>5%⁴</p>	<p>—</p>
<p>Wood Studs Interior Partition with Plaster Each Side</p>	<p>23</p>	<p>2" x 4" wood studs 16" on centre with ¾" perforated or plain gypsum lath and ½" gypsum plaster each side. Lath nailed with 1½" by No. 13 gauge by 19/64" head plasterboard blued nails, 4" on centre. Plaster mixed 1:2 by weight, gypsum to sand aggregate</p>	<p>—</p>	<p>—</p>	<p>—</p>	<p>5%</p>
<p>Wood Studs Interior Partition with Plaster Each Side</p>	<p>24</p>	<p>2" x 4" wood studs 16" on centre with ¾" Type "X" gypsum lath and ½" gypsum plaster each side. Lath nailed with 1½" by No. 13 gauge by 19/64" head plasterboard blued nails, 5" on centre. Plaster mixed 1:2 by weight, gypsum to sand aggregate</p>	<p>—</p>	<p>—</p>	<p>—</p>	<p>5%</p>
<p>Wood Studs Interior Partition with Plaster Each Side</p>	<p>25</p>	<p>2" x 4" wood studs 16" on centre with ¾" plain gypsum lath and ½" neat wood-fibered gypsum plaster each side. Lath nailed with 4d common wire nails, 5" on centre</p>	<p>—</p>	<p>—</p>	<p>—</p>	<p>5%</p>

TABLE 32B (Continued)

<p>Wood Studs Interior Partition with Plaster Each Side (Cont'd)</p>	<p>26</p>	<p>2" x 4" wood studs 16" on centre with 3/4" perforated gypsum lath and 1/2" perlite or vermiculite gypsum plaster each side. Lath nailed with 1 1/2" by No. 13 gauge by 19/64" head plasterboard blued nails, 5" on centre. For three-coat work the plaster mix for the second coat shall not exceed 100 pounds of gypsum to 2 1/2 cubic feet of aggregate</p>	<p>—</p>	<p>—</p>	<p>—</p>	<p>5%</p>
	<p>27</p>	<p>2" x 4" wood studs 16" on centre with 3/4" perforated gypsum lath with 1" hexagonal mesh of No. 20 gauge wire furred out 5/16" and 1" perlite or vermiculite gypsum plaster each side. Lath nailed with 1 1/2" by No. 13 gauge by 19/64" head plasterboard blued nails spaced 5" on centre. Mesh attached by 1 1/4" by No. 12 gauge by 3/8" head nails with 3/4" furrings, spaced 8" on centre. For three-coat work the plaster mix for the second coat shall not exceed 100 pounds of gypsum to 2 1/2 cubic feet of aggregate</p>	<p>—</p>	<p>—</p>	<p>6%</p>	<p>—</p>
<p>Non-combustible Studs — Interior Partition with Gypsum Wallboard Each Side</p>	<p>28</p>	<p>No. 25 gauge channel-shaped studs 16" on centre with one full-length layer of 3/8" Type "X" gypsum wallboard applied vertically attached with 1" long No. 6 drywall screws to each side. Screws are 8" on centre around the perimeter and 12" on centre on the intermediate stud</p>	<p>—</p>	<p>—</p>	<p>—</p>	<p>4%</p>
	<p>29</p>	<p>No. 25 gauge channel-shaped studs 24" on centre with two full-length layers of 3/8" Type "X" gypsum wallboard applied vertically each side. First layer attached with 1" long, No. 6 drywall screws, 8" on centre around the perimeter and 12" on centre on the intermediate stud. Second layer applied with vertical joints offset one stud space from first layer using an approved adhesive</p>	<p>—</p>	<p>—</p>	<p>6 1/4%</p>	<p>—</p>

TABLE 32B (Continued)

<p>Non-combustible Studs — Interior Partition with Gypsum Wallboard Each Side (Cont'd)</p>	<p>30</p>	<p>No. 25 gauge channel-shaped studs 24" on centre with two full-length layers of ½" Type "X" gypsum wallboard applied vertically each side. First layer attached with 1" long, No. 6 drywall screws, 8" on centre around the perimeter and 12" on centre on the intermediate stud. Second layer applied with vertical joints offset one stud space from first layer using 1½" long, No. 6 drywall screws spaced 9" on centre along vertical joints, 12" on centre at intermediate studs and 24" on centre along top and bottom runners</p>	<p>—</p>	<p>—</p>	<p>—</p>	<p>3%⁴</p>	<p>—</p>
	<p>31</p>	<p>No. 16 gauge approved nailable metal studs^{9,12} 16" on centre with full-length ¾" Type "X" gypsum wallboard applied vertically and nailed 7" on centre with 6d cooler nails. Approved metal fastener grips used with nails at vertical butt joints along studs</p>	<p>—</p>	<p>—</p>	<p>—</p>	<p>4%</p>	
<p>Wood Studs-Interior Partition with Gypsum Wallboard Each Side</p>	<p>32</p>	<p>2" x 4" wood studs 16" on centre with two layers ¾" regular gypsum wallboard each side, 4d cooler nails 8" on centre first layer, 5d cooler nails 8" on centre second layer with laminating compound between layers. Joints staggered. First layer applied full length vertically, second layer applied horizontally or vertically</p>	<p>—</p>	<p>—</p>	<p>—</p>	<p>5%</p>	
	<p>33</p>	<p>2" x 4" wood studs 16" on centre with space between filled with mineral wool batts¹⁰ nailed to studs and full-length ½" regular gypsum wallboard applied vertically nailed with 5d cooler nails spaced 7" on centre</p>	<p>—</p>	<p>—</p>	<p>—</p>	<p>4%</p>	
	<p>34</p>	<p>2" x 4" wood studs 16" on centre with two layers ½" regular gypsum wallboard applied vertically or horizontally each side, joints staggered. Nail base layer with 5d cooler nails at 8" on centre, face layer with 8d cooler nails at 8" on centre</p>	<p>—</p>	<p>—</p>	<p>—</p>	<p>5%</p>	
	<p>35</p>	<p>2" x 4" wood studs 16" on centre with ¾" Type "X" gypsum wallboard applied vertically or horizontally nailed with 6d cooler nails 7" on centre with end joints on nailing members</p>	<p>—</p>	<p>—</p>	<p>—</p>	<p>4%</p>	

TABLE 32B (Continued)

<p>Wood Studs- Interior Partition with Gypsum Wallboard Each Side (Cont'd)</p>	<p>36</p>	<p>2" x 4" fire-retardant treated wood studs spaced 16"¹² on centre with one layer of 5/8" thick Type "X" gypsum wallboard applied with face paper grain (long dimension) paralleled to studs. Wallboard attached with 6d cooler nails spaced 7" on centre</p>	<p>—</p>	<p>—</p>	<p>—</p>	<p>4 7/8⁴</p>
<p>37</p>	<p>2" x 4" wood studs 16" on centre with two layers 5/8" Type "X" gypsum wallboard each side. Base layers applied vertically and nailed with 6d cooler nails 9" on centre. Face layer applied vertically or horizontally and nailed with 6d cooler nails 7" on centre. For nail-adhesive application, base layers are nailed 6" on centre. Face layers applied with coating of approved wallboard adhesive and nailed 12" on centre</p>	<p>—</p>	<p>—</p>	<p>6 1/8</p>	<p>—</p>	
<p>Exterior or Interior Walls</p>	<p>38</p>	<p>3/4" drop siding or 3/8" exterior type plywood over 1/2" gypsum sheathing on 2" x 4" wood studs at 16" on centre on exterior surface with interior surface treatment as required for one-hour rated extension or interior 2" x 4" wood stud partitions. Gypsum sheathing nailed with 1 3/4" by No. 11 gauge by 7/16" head galvanized nails at 8" on centre. Siding nailed with 7d galvanized smooth box nails. Plywood nailed with 6d galvanized siding or casing nails, 6" on centre around the perimeter and 12" on centre elsewhere</p>	<p>—</p>	<p>—</p>	<p>—</p>	<p>Varies</p>
<p>39</p>	<p>2" x 4" wood studs 16" on centre with metal lath and 3/4" exterior cement plaster on each side. Lath attached with 6d common nails 7" on centre driven to 1" minimum penetration and bent over. Plaster mix 1:2 scratch coat and 1:3 brown coat, by weight, cement to sand</p>	<p>—</p>	<p>—</p>	<p>—</p>	<p>5 1/2</p>	

TABLE NO. 32-B (CONCLUDED)

	40	2" x 4" wood studs 16" on centre with 7/8" exterior cement plaster (measured from the face of studs) on the exterior surface with interior surface treatment as required for interior wood stud partitions in this Table. Plaster mix 1:2 scratch coat and 1:3 brown coat, by weight, cement to sand	—	—	—	Varies
Exterior or Interior Walls (Cont'd)	41	3 5/8" No. 16 gauge Non-combustible studs 16" on centre with 7/8" exterior cement plaster (measured from the face of the studs) on the exterior surface with interior surface treatment as required for interior, nonbearing, non-combustible stud partitions in this Table. Plaster mix 1:2 for scratch coat and 1:3 for brown coat, by weight, cement to sand	—	—	—	Varies 4

- 1 Staples with equivalent holding power and penetration may be used as alternate fasteners to nails for attachment to wood framing.
- 2 Thicknesses shown for concrete masonry units are (equivalent thicknesses) as defined in the Standards. Thickness includes plaster, lath and gypsum wallboard where mentioned. Plaster thickness is measured from face of lath or other plaster base unless otherwise stated.
- 4 Shall be used for nonbearing purposes only.
- 7 See also Footnote No. 2. The equivalent thickness may include the thickness of gypsum or Portland cement plaster applied in accordance with the requirements of this Code.
- 8 Studs are doubled trussed wire studs each with No. 3 gauge flange wires and No. 11 gauge truss wires, welded together.
- 9 Nailable metal studs consist of two channel studs spot welded back-to-back with a crimped web forming a nailing groove.
- 10 Mineral or slag wool batts shall weigh not less than 1 pound and glass wool batts not less than .6 pounds per square foot of wall surface.
- 12 Stud spacing has been limited to sixteen inches (16") on centre. The fire test specimen qualified at a twenty-four inch (24") stud spacing. In the case of Item No. 36 the gypsum wallboard was applied horizontally when studs were twenty-four inches (24") on centre.
- 13 3/4" face shells.

TABLE 32C
MINIMUM PROTECTION FOR FLOOR AND ROOF SYSTEMS¹

Floor or Roof Construction	Item No.	Ceiling Construction	Thickness of Floor or Roof Slab (In Inches)				Minimum Thickness of Ceiling (In Inches)						
			4 Hr.	3 Hr.	2 Hr.	1 Hr.	4 Hr.	3 Hr.	2 Hr.	1 Hr.			
Concrete Excluding Expanded Clay Shale or Slate (by Rotary Kiln Process) or Expanded Slag	1	Slab (no ceiling required)	6½	5½	4½	3½ ²	—	—	—	—	—	—	—
Concrete-Expanded Clay Shale or Slate (by Rotary Kiln Process) or Expanded Slag	2	Slab (no ceiling required)	5	4½	4	3	—	—	—	—	—	—	—
Reinforced Concrete Joists	3	Slab with suspended ceiling of vermiculite gypsum plaster over metal lath attached to ¾" cold-rolled channels spaced 12" on centre. Ceiling located 6" minimum below joists	3	2	—	—	1	¾	—	—	—	—	—
Steel Joist Construction with a Reinforced Concrete Slab on Top Poured on a Metal Lath Form ³	4	Gypsum plaster on metal lath attached to the bottom chord with single No. 16 gauge or doubled No. 18 gauge wire ties spaced 6" on centre. Plaster mixed 1:2 for scratch coat, 1:3 for brown coat, by weight, gypsum to sand aggregate for two-hour system. For three-hour system plaster is neat.	—	2½	2¼	—	2	¾	¾	—	—	—	—

TABLE 32C (Continued)

Steel Joist Construction with a Reinforced Concrete Slab on Top Poured on a Metal lath Form (Cont'd)	5 Vermiculite gypsum plaster on metal lath attached to the bottom chord with single No. 16 gauge or doubled No. 18 gauge wire ties 6" on centre	—	2	—	—	—	5/8	—	—
	6 Perlite or vermiculite gypsum plaster on 3/4" perforated gypsum lath attached to 3/4" cold-rolled channels with approved clips giving continuous support to lath. Channels attached to or suspended below joists and held to bottom chord of joists	2	2	2	2	1 3/8 ^{6,8}	5/8 ⁶ 7/8 ⁷	1	1
	7 Gypsum plaster on 3/4" perforated gypsum lath attached to 3/4" cold-rolled channels, with approved clips giving continuous support to lath. Channels attached to or suspended below joists and wire tied to bottom chord of joists	—	—	2	—	—	—	1 ²	—
Steel Joist Construction with a Reinforced Concrete slab on top poured on metal lath form ³ (Cont'd)	8 5/8" Type "X" gypsum wall-board attached to approved nailing channels 16" on centre with 1 1/4" by No. 11 gauge by 5/16" head nails with annular ring shanks spaced 7" on centre. Double channels at end joists. Channels attached to bottom chord of joists with doubled No. 18 gauge wire ties or suspended below joists on wire hangers	—	—	—	2	—	—	—	5/8

TABLE 32-C (Continued)

<p>Fibers with Cement Binders of Thickness Shown Bonded to Deck with Unfinished Asphalt Adhesive. Covered with a Fire-retardant Roof Covering.</p>	<p>spaced 36" on centre suspended 2" below steel framing and saddle-tied with No. 8 gauge wire. Plaster mixed 1:2 by weight. gypsum to sand aggregate</p>	<p>—</p>	<p>—</p>	<p>—</p>	<p>—</p>
<p>Double Wood Floor Over Wood Joists¹⁴</p>	<p>Gypsum plaster over 3/8" perforated gypsum lath attached to joists with 1 1/8" by No. 13 gauge by 19/64" head plasterboard blued nails at a spacing of 4" on centre. All joints reinforced with 3" wide strips of metal lath nailed through gypsum lath to joists with 1 3/4" by No. 11 gauge by 1/2" head nails spaced 5" on centre along joists and with two nails per joist in the opposite direction. Plaster mixed 1:2 by weight, gypsum to sand aggregate</p>	<p>13</p>	<p>—</p>	<p>—</p>	<p>7/8</p>
<p>Double Wood Floor Over Wood Joists¹⁴</p>	<p>Gypsum plaster over 3/8" type "X" gypsum lath. Lath initially applied with not less than four 1 1/8" by No. 13 gauge by 19/64" head plasterboard blued nails per bearing. Continuous stripping over lath along all joist lines. Stripping consists of 3" wide strips of metal lath attached by 1 1/2" by No. 11 gauge by 1/2" head roofing nails spaced 6" on centre. Alternate stripping consists of 3" wide .049</p>	<p>14</p>	<p>—</p>	<p>—</p>	<p>7/8</p>

TABLE 32-C (Continued)

Wood Trusses spaced a maximum of 24 inches on centres, sheathed with a minimum of one-half inch plywood and covered with approved roofing materials.	18	1" x 3" furring 16" o.c., flat expanded metal lath (3.4 lbs. per sq. yd.) and 3/4" sanded Vermiculite or Perlite gypsum plaster.	—	—	—	—	—	—	—	—	—	—	3/4
	19	No furring but top of bottom chord laterally braced with 1" x 4" at each panel point, rib metal lath (3.4 lbs. per sq. yd.) attached directly to the bottom chord and 3/4" sanded Vermiculite or Perlite gypsum plaster.	—	—	—	—	—	—	—	—	—	—	3/4
	20	1" x 3" furring 16" o.c., two layers of 3/8" type X gypsum lath, 6d cement-coated or ring-shanked nails 4" o.c., with butt and side joints staggered, and 1/2" sanded Vermiculite or Perlite gypsum plaster.	—	—	—	—	—	—	—	—	—	—	7/8
	21	No furring, but top of bottom chord laterally braced with 1" x 4" at each panel point, two layers of 1/2" type X gypsum lath, 3d cement-coated or ring-shanked nails 4" o.c. with butt and side joints staggered and 1/2" sanded Vermiculite or Perlite gypsum plaster.	—	—	—	—	—	—	—	—	—	—	1 1/2

TABLE No. 32-C (Continued)

Floor or Roof Construction	Item No.	Ceiling Construction	Thickness of Floor or Roof Slab (In Inches)				Minimum Thickness of Ceiling (In Inches)
			4 Hr. 3 Hr.	2 Hr. 1 Hr.	4 Hr. 3 Hr.	2 Hr. 1 Hr.	
Wood Trusses spaced a maximum of 24 inches on centres, sheathed with a minimum of one-half inch plywood and covered with approved roofing materials (Cont'd.)	22	1" x 3" furring 16" o.c., one layer 3/8" plain gypsum lath, 20 gauge galvanized wire fabric (1" hexagon mesh reinforcement for plaster) over all lath and attached to furring with 8d box nails 5" to 7" o.c. and 1" Vermiculite or Perlite plaster (2 1/2 cu. ft. to 100 lbs. bag gypsum, no sand) for scratch and brown coats.	—	—	—	—	1 3/4
Wood Trusses spaced a maximum of 24" inches on centres, sheathed with a minimum of one-half inch plywood and covered with approved roofing materials. (cont'd)	23	1" x 3" furring 16" o.c., one layer 3/8" plain gypsum lath, 3" wide strips of metal lath, welded or woven wire fabric continuous at each furring strip, 1/2" sanded gypsum plaster and a minimum of 3" of Vermiculite or Perlite attic fill or 4" bats of fiberglass or mineral wool, or 6" of blown-in fiberglass or mineral wool.	—	—	—	—	7/8
	24	1" x 3" furring 16" o.c., two layers 3/8" type X gypsum lath, 6d cement-coated or ringshanked nails 6" o.c. with butt and side joints staggered, paper tape embedded over joints and exposed nail heads covered with compound.	—	—	—	—	1 1/4
	25	1" x 3" furring 16" o.c., one layer 3/8" type "X" gypsum lath, 5d cement-coated or ring shanked nails 6" o.c., paper tape embedded in cementitious compound over joints, exposed nail heads covered with compound and a minimum of 3" of Vermiculite or Perlite attic fill, or 4" bats or fiberglass or mineral wool, or 6" of blown-in fiberglass or mineral wool.	—	—	—	—	3/4

TABLE No. 32-C (Continued)

Wood Trusses spaced a maximum of 24" on centres, sheathed with a minimum of one-half inch plywood and covered with approved roofing materials (Cont'd.)	26	Group H Occupancy only: 1" x 3" furring 16" o.c., metal lath and 1/2" sanded Vermiculite or Perlite gypsum plaster.	1/2
	27	Group H Occupancy only: 1" x 3" furring 16" o.c., one layer of 3/8" type "X" gypsum lath with joints staggered and 1/2" sanded Vermiculite or Perlite gypsum plaster.	7/8

LIMITATION: For all floor and roof systems listed above, except those utilizing wood floors and joists, no timber of any kind shall be permitted between the protected ceiling and the floor or roof assembly.

MEMBRANE CEILING PROTECTION: ACOUSTICAL MATERIAL (TILE AND PANELS); Acoustical tile systems may be used for floor or roof protection if the entire system conforms to the approved designs for membrane ceiling protection as set forth in the Underwriters Laboratories Building Material List. Hourly ratings shall conform to the designs used. Designs tested by equivalent approved laboratories may be used if approved by the BCO.

FOOTNOTES TO TABLE 32-C

- 1 Staples with equivalent holding power and penetration may be used as alternate fasteners to nails for attachment to wood framing.
- 2 The thickness may be reduced to three inches (3) where limestone aggregate is used.
- 3 Slab thickness over steel joists measured at the joists.
- 6 One inch (1") by No. 20 gauge hexagonal wire mesh installed below lath and tied to each furring channel at joints between lath.
- 7 No. 14 gauge wires spaced eleven and three-tenths inches (11.3") on centre or ten inches (10") on centre (for channel spacing of sixteen inches (16") and twelve inches (12") respectively installed below lath sheets in a diagonal pattern. Wires tied to furring channels or clips at lath edges.
- 8 Furring channels spaced twelve inches (12") on centre.
- 9 Allowable working stress for bulb tees to be based upon a factor of safety of four applied to the yield point for negative bending and six and five-tenths applied to the yield point for positive bending.
- 12 Thickness measured to bottom of steel form units.
- 14 Double wood floor may be either of the following:
 - (a) Subfloor of one-inch (1") nominal boarding, a layer of fire-resistive material paper weighing not less than 14 pounds per one hundred square feet (100 sq. ft.) and a layer of one-inch (1") nominal tongue and groove finish flooring;
 - (b) Subfloor of one-inch (1") nominal tongue and groove boarding or one-half-inch (1/2") interior type plywood with exterior glue, a layer of .010-inch thick rosin sized building paper and a layer of one-inch (1") nominal tongue and groove finish flooring or five-eighths-inch (5/8") interior type tongue and groove plywood finish flooring.

CHAPTER 33

INTERIOR DECORATIVE FINISHES

3301 GENERAL

This Chapter is intended to set out standards for the fixed interior decorative features, fixed seats, wall papers, wall fabrics, paneling, drapes, carpets and other similar items.

- 3301.1 All drawings and specifications for interior decorative finishes and features to be installed in conjunction with building operations for Groups A, B, F, and G Occupancies shall be submitted to the Buildings Control Officer, for approval, prior to the issue of a Certificate of Occupancy. These drawings and specifications shall clearly show the materials to be used, and their location within the building.
- 3301.2 Interior finishes shall include the exposed interior surfaces of the building including, but not limited to fixed or moveable walls and partitions, columns and ceilings. All interior finishes shall comply with the flame spread ratings and critical radiant flux ratings set forth in Section 3208.
- 3301.3 Fixed interior decorative features shall not substantially increase the fire load of the building and for the purposes of this Code shall include but not be limited to the artificial furring down of ceilings and raising of floor levels in certain areas, the installation of columns, posts and beams which are not of a structural nature, and the installation of railings, panels, trim and other similar decorative features.
- 3301.4 Cellular or foamed plastic materials shall not be used:
- (a) as an interior finish or
 - (b) as trim.

EXCEPTION: Cellular or foamed plastic may be used for trim, not in excess of 10 percent of the wall or ceiling area, provided, it is not less than 20 lbs./cu. ft. in density, is limited to 1/2 inch in thickness, 4 inches in width and complies with the limits for Class A or B interior finish.

- 3301.5 The fire rating, flame spread and smoke development properties of the material to be used should either be stamped upon the material, or the material should come in packages *labelled* as to its properties by an approved testing agency. In all other cases the material shall be accompanied by a covering letter from the supplier indicating that these materials have been tested by an approved agency.

- 3301.6 No interior finish nor decorative feature shall be allowed to impede access to any fire exit or fire fighting equipment, nor shall any decoration be permitted to cover up or obscure any fire exit or exit signs or fire fighting equipment.
- 3301.7 No interior finish or decorative feature shall be used that gives off toxic fumes when subject to heat or flame.
- 3301.8 Drapes, curtains and similar furnishings and decorations used in connection with Groups A, B, F and G Occupancies shall be flame resistant.

PART VIII
MISCELLANEOUS

CHAPTER 34

FABRIC AWNINGS, CANOPIES, TENTS AND BLEACHERS

- 3401 GENERAL
- 3402 DEFINITIONS
- 3403 PERMITS AND INSPECTIONS
- 3404 LOCATION AND USE
- 3405 CONSTRUCTION
- 3406 TENTS
- 3407 BLEACHERS

3401 GENERAL

3401.1 GENERAL: *Fabric awnings, canopies and tents shall be of materials, proportions and strength as set forth in this Chapter. The limitations of zoning or of the Department of Physical Planning shall apply where more restrictive with respect to location, use, size and height.*

3401.2 PURPOSE:

- (a) It is the intent and purpose of this Chapter to regulate the erection and location of:
 - (i) awnings and canopies on private property and to set forth the conditions under which awnings may be constructed over public property.
 - (ii) any tent to which the public is to be admitted.
 - (iii) any bleachers which are to be used by the public.

3402 DEFINITIONS

AWNING, any movable rooflike structure, cantilevered, or otherwise entirely supported from a building, so constructed and erected as to permit its being readily and easily moved within a few minutes time to close an opening, or rolled or folded back to a position flat against the building or a cantilevered projection thereof, or is detachable.

BLEACHERS: Bleachers are tiered or stepped seating facilities without backrests in which an area of three square feet or less is assigned per person for computing the occupant load.

CABANA, a sun and wind protection erected nearby and in connection with swimming areas having removable *fabric* roof and walls, on a fixed metal frame.

CANOPY, any fixed rooflike structure, not movable like an awning, and which is cantilevered or in whole or in part self-supporting, but having no side walls or curtains other than valances not more than 18 inches deep. Lean-to-canopies, fixed umbrellas and similar structures are included in this classification. Structures having side walls or valances more than 18 inches deep shall be classified as a tent or cabana as set forth herein.

FABRIC, cloth or any material similarly flexible or woven.

ROLLER CURTAIN, shall be included in the classification of a movable awning and shall be defined as having a roller attached to the lower edge of a *fabric* and supported in whole or in part by the awning material.

SELF-SUPPORTING, supported to the ground or construction below by columns or walls, but not cantilevered.

TENT, a shelter or structure, the covering of which is made of a pliable material which achieves its sole support by mechanical means such as beams, columns, poles, arches and/or cables.

3403 BUILDING PERMITS AND INSPECTIONS

3403.1 PERMITS:

(a) A building permit shall be required for: —

- (i) the construction, fabrication, installation, repair or replacement of any awning, canopy, or any other *fabric* structure erected over public property or over private property used for business or industrial purposes or over private property when such structure is in whole or in part self supported.
- (ii) the erection of any tent to which the public is to be admitted.
- (iii) the erection of any bleachers which are to be used by the public.

EXCEPTION: Permits will not be required for the repair or replacing of *fabric* when the existing structural framework is not altered or removed and when such framework is in compliance with the requirements of this Code.

- (b) Application for permit shall be accompanied by plans. When required by the BCO such plans shall be prepared by an engineer recognized by the Minister.

- (c) *Where the proposed structure is to be erected over public property, applications will be accepted from only the adjacent owner or his agent.*
- (d) Permission to erect a tent shall be temporary and for a period not exceeding 30 days. Such permission may be revoked on 24 hours written Notice from the Buildings Control Officer.

3403.2 INSPECTION:

- (a) The permit holder shall request the BCO to make a final inspection when the work is completed.
- (b) The name of the manufacturer shall be affixed and shall be visible and legible.

3404 LOCATION AND USE

3404.1 LOCATION:

- (a) *Fabric* awnings and canopies located over public property or in areas accessible to the general public shall be constructed so that no rigid part of such *fabric* awning or canopy shall be less than seven feet and six inches from the grade directly below, and no part of the cloth drop shall be less than six feet and six inches. The minimum clearance under awnings or canopies located over highway rights-of-way shall be as required by the Minister.
- (b) No cantilevered portion of an awning or canopy exceeding nine feet in projection shall extend over public property, nor shall any portion be closer than 18 inches to the curb lines.
- (c) Canopies in whole or in part support directly by the ground shall comply with building set back requirements unless otherwise regulated by the Department of Physical Planning.

3404.2 USE:

- (a) *Fabric* awnings or canopies may be used for the shading and weather protection of windows, door entrances, restaurant tables not enclosed with insect screening, seats and playgrounds. *Fabric* awnings and canopies used for the shading or weather protection of cars or boats in connection with single family or duplex residential occupancies shall be limited to a size to cover not more than 2 such vehicles or craft.

- (b) *Fabric* awnings and canopies may not be used for general storage or combustible materials or goods packaged in combustible materials.
- (c) *Fabric* awnings and canopies may not be enclosed with any material other than a valance not more than 18 inches in vertical depth or *fabric* roller curtains for temporary shade and weather protection.

3405 CONSTRUCTION

3405.1 AREA:

- (a) No *fabric* awning or canopy shall exceed the area of the building to which it is attached.
- (b) No *fabric* awning or canopy shall exceed ten percent of the area of the lot on which such awning or canopy is located.

3405.2 MATERIAL:

- (a) *Fabric* used for any purpose herein defined shall be a minimum of 10.10 army duck. *Fabric* for tents shall be flame-resistant in accordance with the Standard for Flame-Resistant Textiles and Films, NFPA No. 701.
- (b) Supports for *fabric* awnings, and canopies shall be of metal or similar durable material.

3405.3 DESIGN:

- (a) *The minimum size of structural members for cantilevering awnings or canopies, or cabanas shall be not less than as set forth hereinafter, nor less than required to resist 75 mph wind with applicable shape factors as set forth in the Chapter on Live and Dead Loads (Chapter 20). Design of the structural frame shall not be based on the removal or repositioning of parts, or the whole, during periods of high wind velocity. All fabric shall be designed for quick removal.*

The materials and design of the structural members and frame shall conform to the requirements of the specific chapters in this Code for such materials.

MINIMUM SIZE OF FRONT BARS

3' width between supports	1/2" pipe
9' width between supports	3/4" pipe
14' width between supports	1" pipe

EXTENSIONS ON AWNINGS AND TRUSS EXTENSIONS ON CANOPIES

Rafters up to 5 in extension from supporting wall.	1/2" pipe
Rafters up to 9' in extension from supporting wall.	3/4" pipe
Rafters up to 12' in extension from supporting wall.	1" pipe
Rafters on canopies shall be not more than five feet apart.	

NUMBER OF SUPPORTS REQUIRED OF ROLLER GEARS AWNINGS

Up to 20' in width parallel to supporting wall.	no centre support
20' to 30' in width parallel to supporting wall.	1 centre support
30' to 50' in width parallel to supporting wall.	2 centre supports
50' to 60' in width parallel to supporting wall.	3 centre supports
60' to 70' in width parallel to supporting wall.	4 centre supports

NUMBER OF ARMS REQUIRED FOR ROLLER-GEAR AWNINGS

Length of Awning	Quantity
Up to and including 20'	2 arms
Up to and including 30'	3 arms
Up to and including 40'	4 arms

- (b) The cloth parts of canopies and awnings shall be securely laced, tied or otherwise fastened to the frame; no rafter or front bar will be permitted in pockets; and in no case shall a rolling curtain be caused to operate over a canopy frame.
- (c) The front bar of an awning, when pulled up, shall not be higher than the head of the awning.
- (d) The awning head bar may be of wood, provided such wood is treated to resist rot and weather deterioration.
- (e) When attaching awnings or canopies to masonry walls or columns, lags and expansion bolts in metal shields shall be required. Wood plugs are prohibited. Fastening shall be not less than three-eighths inch bolts, nor more than three feet apart.
- (f) The horizontal projection of cantilevered portions shall not be greater than two times the height, except where the building construction does not permit a proper installation; in which case, variance may be permitted by the BCO, based on special design and construction. All *fabric* awnings, except roller-gear awnings with folding arms, must be equipped with fire chains, one end of which fastens to the front bar or side arm, not more than six inches back of the front bar and the other end of which fastens to a point just under the head bar, but not to the head bar or head-bar fastenings. Such chains and fastenings shall be of sufficient strength to withstand the stress of the awning being dropped and to keep the frame from going below the required minimum.

3406 TENTS

- 3406.1 Tents may not be used for general storage of any character whatsoever and may not be used for sleeping purposes without permission.
- 3406.2 All *fabric*, curtains, cloth, rope, netting and decorative material used for, or in, or on, a tent shall be rendered flameproof, provided that flameproofing will not be required for tents open on one side and with standing capacity only for 20 or less persons. Tents required to be of flameproofed materials shall be inspected by the BCO, who may require written verification from the owner as to the flame-proofing of the materials before issuing an Occupancy Certificate.
- 3406.3 Tents shall be adequately guyed, supported and braced to withstand a wind pressure or suction of 10 pounds per square foot. The poles and their supporting guys, stays, stakes, fastenings, etc., shall be of sufficient strength and attached so as to resist wind pressure of 20 pounds per square foot of projected area of the tent. No tier of seats shall rise to a height exceeding 12 feet. All lighting shall be by electricity. A minimum of two

exits shall be provided where a tent is used as a place of assembly for 100, or more, persons. Where tents are used as a place of assembly, with a capacity of 500 or more persons, each exit shall be not less than nine-feet wide, and the number of exits shall be one additional exit for each additional 500 persons or major fraction thereof. Exits shall be spaced not more than 75 feet apart. Aisles shall be not less than 44 inches in width, provided such aisles shall not be less in width than the combined width of aisle that they connect. There shall be not more than ten seats between any seat and aisle, and if the seating capacity or such tent exceeds 500 persons, collapsible chairs shall be fastened together in banks of ten.

- 3406.4 Tents shall not be less than 30 feet from side or rear property lines or from other buildings on the same property. No tent shall be erected in zones designated by the Chief Fire Officer as being of high fire hazard.
- 3406.5 No smoking, fireworks, or unapproved open flame of any kind shall be permitted in any tent while occupied by the public. "No smoking" signs shall be conspicuously posted in any tent open to the public.
- 3406.6 Tents shall not be used for the display of motion pictures unless safety film is used.

3407 BLEACHERS

- 3407.1 (a) All bleachers and grandstands shall conform to the provisions of this Code and this section. All bleachers and grandstands shall be designed by an engineer recognized by the Minister.
 - (b) Where the height of any row of seats in any bleachers or grandstand is more than 6 feet above the adjacent grade, the erection of the bleachers or grandstand shall be supervised by an engineer recognized by the Minister.
- 3407.2 Bleachers employing combustible framing shall be limited to 11 rows or 9 feet in height.
- 3407.3 The minimum unit live load for bleachers, grandstands and reviewing stands shall be 100 pounds per square foot of horizontal projection for the structure as a whole. Seat and floorboards shall be designed for 120 pounds per lineal foot. The sway force, applied to scab, shall be 24 pounds per lineal foot parallel to the seats, and 10 pounds per lineal foot perpendicular to the seats.
- 3407.4 SPACING OF SEATS:
 - (a) Row spacing: The minimum spacing of rows of seats measured from back to back shall be: Twenty-two inches (22") for seats with-

out backrests in open air stands; thirty inches (30") for seats with backrests, and thirty-three inches (33") for chair seating.

There shall be a space of not less than twelve inches (12") between the back of each seat and the front of the seat immediately behind it.

- (b) Rise between rows: The maximum rise from one row of seats to the next shall not exceed sixteen inches (16").
- (c) Seating capacity: For determining the seating capacity of a stand, the width of any seat shall be not less than eighteen inches (18") nor more than nineteen inches (19").
- (d) Number of seats between aisles: the number of seats between any seat and an aisle shall not be greater than 15 for open air stands with seats without backrests; nine for open air stands with seats having backrests; nine for seats without backrests within buildings, and six for seats with backrests in buildings.

3407.5 AISLES:

- (a) Aisles required: Aisles shall be provided in all stands.

EXCEPTION: Aisles may be omitted when all of the following conditions exist:

1. Seats are without backrests.
 2. The rise from row to row does not exceed twelve inches (12) per row.
 3. The number of rows does not exceed 11 in height.
 4. The top seating board is not over ten feet (10') above grade.
 5. The first seating board is not more than twenty inches (20") above grade.
- (b) Obstructions: No obstruction shall be placed in the required width of any aisle or exitway.
 - (c) Stairs required: When an aisle is elevated more than eight inches (8") above grade, the aisle shall be provided with a stairway or ramp whose width is not less than the width of the aisle.
 - (d) Dead end: No vertical aisle shall have a dead end more than 16 rows in depth regardless of the number of exits required.

- (e) Width: Aisles shall have a minimum width of forty-two inches (42").
- (f) Stairs and Ramps:
 - (1) Scope: The requirements of this Section shall apply to all stairs and ramps except for portions that pass through the seating area.
 - (2) Stair rise and run: The maximum rise of treads shall not exceed eight inches (8") and the minimum width of the run shall be eleven inches (11"). The maximum variations in the width of treads in any one flight shall be not more than three-sixteenths inch (3/16") and the maximum variation in the height of two adjacent risers shall not exceed three-sixteenths inch (3/16").
 - (3) Ramp slope: The slope of a ramp shall not exceed one foot (1') in eight feet (8'). Ramps shall be roughened or shall be of approved non-slip material.
 - (4) Handrails: A ramp with a slope exceeding one foot (1') in ten feet (10') shall have handrails. Stairs from stands shall have handrails.
 - (5) Guardrails: Guardrails shall be required in all locations where the top of a seat plank is more than four feet (4') above the grade and at the front of stands elevated more than two feet (2') above grade. Where only sections of stands are used, guardrails shall be provided as required in this Section.

Railings shall be forty-two (42") above the rear of a seat plank or forty two inches (42") above the rear of the steps in an aisle when the guardrail is parallel and adjacent to the aisle.

EXCEPTION: The height may be reduced to thirty-six inches (36") for guardrails located in front of the grandstand.

A midrail shall be placed adjacent to any seat to limit the open distance above the top of any part of a seat to ten inches (10") where the seat is at the extreme end or at the extreme rear of the bleachers or grandstand. The intervening space shall have one additional rail midway in the opening.

EXCEPTION: Railings may be omitted when stands are placed directly against a wall or fence giving equivalent protection.

Stairs and ramps shall be provided with guardrails.

Handrails at the front of stands and adjacent to an aisle shall be designed to resist a load of 50 pounds per lineal foot applied at the top rail. Other handrails shall be designed to resist a load of 20 pounds.

- (g) Floorboards: Floorboards shall be provided for all rows of seats above the third row, or beginning at such point where the seating plank is more than two feet (2') above grade.

EXCEPTION: Where the same level is used for both seats and footrests, and these levels are not less than twenty-two inches (22") in width, footrests will not be required.

3407.6 EXITS:

- (a) Distance to exit: The line of travel to an exit shall be not more than one hundred and fifty feet (150'). For stands with seats without backrests this distance may be measured by direct line from a seat to the exit from the stand.
- (b) Aisle used as exit: An aisle may be considered as only one exit unless it is continuous at both ends to a legal building exit or to a safe dispersal area.
- (c) Two exits required: A stand with the first seating board not more than twenty inches (20") above grade or floor may be considered to have two exits when the bottom of the stand is open at both ends.

Every stand or section of a stand within a building shall have at least two means of egress when the stand accommodates more than 50 persons.

Every open air stand having seats without backrests shall have at least two means of egress when the stand accommodates more than 300 persons.

- (d) Three exits required: Three exits shall be required for stands within a building when there are more than 300 occupants within a stand, and for open air stands with seats without backrests where a stand or section of a stand accommodates more than 1000 occupants.
- (e) Four exits required: Four exits shall be required when a stand or section of a stand accommodates more than 1000 occupants.

EXCEPTION: For an open air stand with seats without backrests four exits need not be provided unless there are accommodations for more than 3000 occupants.

- (f) Determination of exit width: The total width of exits in feet shall be not less than the total occupant load served divided by 50.

EXCEPTION: For open air stands with seats without backrests the total width of exits in feet shall be not less than the total occupant load served divided by 150 when exiting by stairs, and divided by 200 when exiting by ramps or horizontally. When both horizontal and stair exits are used, the total width of exits shall be determined by using both figures as applicable.

- (g) Minimum exit width: No exit shall be less than forty-two inches (42") in width.
- (h) Exit arrangement: Exits shall be arranged a reasonable distance apart. When both two exits are provided, they shall be spaced not more than one-fifth of the perimeter apart.

NOTES

CHAPTER 35

RIGID AWNINGS, CANOPIES, SCREEN ENCLOSURES AND UTILITY SHEDS

3501 GENERAL

3502 PERMITS AND INSPECTION

3503 DESIGN

3504 LOCATION

3505 OUTDOOR THEATRE SCREENS AND BANDSHELLS

3501 GENERAL

3501.1 GENERAL: Rigid awnings and canopies and screen enclosures shall be of the materials, proportions and strength as set forth in this chapter.

3501.2 DEFINITIONS:

AWNING, any fixed rooflike structure, cantilevered, or otherwise entirely supported from a building, so constructed and erected as to permit its being readily and easily moved within a few minutes time to close an opening, or rolled or folded back to a position flat against the building or a cantilevered projection thereof, or is detachable.

CANOPY, any fixed rooflike structure not movable like an awning and which is cantilevered or in whole or in part self-supporting, but having no side walls or curtains other than valances not more than 18-inches deep. Lean-to-canopies, fixed umbrellas and similar structures are included in this classification. Structures having side walls or valances more than 18 inches deep shall be classified as a building of a Type of Construction as set forth in this Code.

CANOPY SHUTTER, any fixed rooflike structure which is movable like an awning and which is cantilevered or in part supported to the ground or construction below by removable columns or posts, but having no side walls or curtains other than valances not more than 18 inches deep. A canopy shutter is so constructed and erected as to permit its being readily and easily moved within a few minutes time to close an opening by folding back to a position flat against the building when the building is unattended or act as a storm shutter during periods of high wind velocity.

RIGID, not flexible as distinguished from fabric.

SCREEN ENCLOSURE, a building or part thereof, in whole or in part

self-supporting, and having walls of insect screening and a roof of insect screening, plastic, aluminum, or similar light-weight material.

SELF-SUPPORTING, supported to the ground or construction below by columns or walls, but not cantilevered.

UTILITY SHED: any building designed for the storage of small equipment, tools and/or miscellaneous items of use and which shall have maximum dimensions of 10'-0" length, 10'-0" width and 7'-0" height.

3502 BUILDING PERMITS AND INSPECTION

3502.1 PERMITS:

- (a) A building permit will be required for the construction, fabrication, installation, alteration or repair of any rigid awning, canopy or canopy shutter, or screen enclosure.
- (b) Application for permit shall be accompanied by plans, and, when required by the Buildings Control Officer, such plans shall be prepared by an engineer recognized by the Minister.

3502.2 INSPECTION: The permit holder shall request the BCO to make a final inspection when the work is completed.

3502.3 POSTING: Structures designed to be readily removed or repositioned during periods of high wind velocity shall be posted with a legible and readily visible decal or painted instructions to the owner or tenant to remove or reposition the structure or part thereof during such periods of time as are officially designated as being a hurricane warning or alert.

3503 DESIGN

3503.1 LOADS: Rigid awnings, canopies, canopy shutters and screened enclosures shall be designed to resist the loads set forth in the Chapter on Live and Dead Loads (Chapter 20) herein except that structures or parts thereof which are intended to be removed or repositioned during periods of high wind velocity shall be designed in their open or extended position to resist velocity pressures not less than that based on 75 MPH wind with applicable shape factors and to resist not less than 15 pounds per square foot roof live load. Where such structure is intended to be folded or otherwise repositioned to close an opening when the building is unattended or act as a storm shutter the design in the closed position shall also comply with the full wind loads given in the Chapter on Live and Dead Loads (Chapter 20).

- 3503.2 ALLOWABLE STRESSES: The allowable stresses shall not exceed those set forth in this Code for the materials of construction used.
- 3503.3 MATERIALS: Rigid awnings canopies or canopy shutters located over public property shall be of non-combustible materials unless specifically exempted by zoning regulations.
- 3503.4 SCREEN ENCLOSURES:
- (a) The maximum allowable deflection of roof supporting members shall not exceed a ratio of $L/180$ based on design load done. The top flange of these members shall be laterally supported by positive means at spacings not to exceed 40 times the flange width of the composite member and the entire structure shall be braced in the plane of the roof.
 - (b) Vertical members shall be designed to resist applicable axial and bending loads. Positive rational means shall be provided to transmit beam reactions to the columns and column loads to the footings.
 - (c) The supporting members of screens having openings of less than 40 percent of the gross area shall be designed to resist 30 psf wind load on the screen. The supporting members of screens having openings of 40 percent or more but not more than 60 percent shall be designed to resist 20 psf wind load on the screen. The supporting members of screens having openings of more than 60 percent shall be designed to resist 10 psf wind load on the screen. The shape factors set forth in the Chapter on Live and Dead Loads (Chapter 20) shall be applied.
 - (d) Application for permit shall be accompanied by scaled drawings and, where required by the BCO shall be prepared by an engineer recognized by the Minister. Drawings shall show a foundation plan, roof framing plan, all elevations, plot plan, properties and dimensions of members and, where required by the BCO computations of design.
 - (e) Screen enclosure walls shall be supported by a continuous concrete foundation not less than 8 inches deep, 8 inches wide and reinforced with one #5 continuous bar, or 16"x 16" pads with two #4 bars each way. The vertical members supporting beams, at all corners, and at least every 18 feet along all sides shall be attached to the foundation with at least a 3/8 inch diameter bolt at each such column.
 - (f) *Screen enclosure roof framing members may be attached to a fascia at the end of rafter overhang only where such fascia is not less*

than a nominal two inches in thickness and the fascia is attached to each rafter with an anchor capable of resisting 1000 pounds vertical load.

An analysis of the ability of the existing structure to carry the enclosure loads shall be made.

- (g) Aluminium structural members shall be not less than .055 inches in thickness with .006 inch tolerance. Tests to determine the physical properties of any alloy may be required by the BCO. All structural aluminum members shall be viably marked to indicate the alloy and heat treatment.
- (h) Aluminium columns supporting aluminum roof beams shall be designed in accordance with the Chapter on Aluminum (Chapter 25) for both axial and bending wind, dead and live loads.
- (i) The minimum bolt size shall be 1/4 inch diameter for any structural attachment. Sheet metal screws may be used only where specifically approved by the BCO based on the result of satisfactory tests.

3503.5 UTILITY SHEDS:

- (a) *The foundations for utility sheds shall comply with the applicable provisions of subsection 2103.5*
- (b) *The provisions of subsection 3503.4 (a), (b), (d), (g), and (h) herein above shall be met by all utility sheds.*

3504 LOCATION

- 3504.1 Rigid awnings canopies or canopy shutters located over public property or such awnings or canopies located over private property shall be not less than seven feet above the grade directly below.
- 3504.2 No cantilevered portion of an awning, canopy or canopy shutter exceeding nine feet in projection shall extend over public property, nor shall any portion be closer than 18 inches to the curb line.
- 3504.3 Rigid canopies and canopy shutters, in whole or in part self-supporting and screen enclosures shall comply with the zoning setbacks for buildings.

3505 OUTDOOR THEATRE SCREENS AND BANDSHELLS

- 3505.1 Outdoor theatre screens and bandshells shall be designed by a qualified engineer recognized by the Minister, with stresses conforming to the requirement of this Code for the materials used.
- 3505.2 (a) Secondary portions of theatre screens and secondary portions of bandshells between the structural framing members may be designed for a wind loading not over that caused by a 75 miles per hour wind, if the screens will be removed during a period of hurricane alert, as officially designated.
- (b) This method of design and construction shall be permitted at the discretion of the BCO and, if permitted, permanent markings must be placed indicating the portions of the screen to be removed during a period of, hurricane alert. Procedures and names of personnel designated to remove these screens must be on file with the BCO.
- (c) Permanent portions of the frame shall be designed for the full wind loadings given in the Chapter on Live and Dead Loads (Chapter 20).

NOTES

PART IX
MECHANICAL

CHAPTER 36 PLUMBING

SUB INDEX

- 3601 ADMINISTRATIVE
- 3602 DEFINITIONS
- 3603 GENERAL
- 3604 MATERIALS
- 3605 DRAINAGE SYSTEM AND DISPOSAL
- 3606 INDIRECT WASTE PIPING AND SPECIAL WASTES
- 3607 JOINTS AND CONNECTIONS
- 3608 TRAPS AND CLEANOUTS
- 3609 HANGERS AND SUPPORTS
- 3610 VENTS AND VENTING SYSTEMS
- 3611 STORM DRAINAGE SYSTEMS
- 3612 INTERCEPTORS AND SEPARATORS
- 3613 PLUMBING FIXTURES AND REQUIREMENTS
- 3614 WATER SUPPLY AND DISTRIBUTION
- 3615 SEWAGE AND LIQUID WASTE DISPOSAL SYSTEMS
- 3616 SUPPLY AND DISPOSAL WELLS
- 3617 PLUMBING CODE FOR SMALL BUILDINGS

3601 ADMINISTRATIVE

Paragraph No.	Paragraph Title	Page No.
3601.1	Title and Scope	36-2
	(a) Title	36-2
	(b) Purpose	36-3
	(c) Scope	36-5
	(d) Application to Existing Plumbing Installations	36-5
	(e) Maintenance	36-5
3601.2	Power and Duties of Inspectors	36-6
3601.3	Insanitary Buildings and Premises	36-6
3601.4	Alternate Materials and Types of Construction	36-6

3601.5	(a) Standards	36-6
	(b) Application	36-6
	(c) Appeal	36-6
	(d) Repeated Tests	36-6
	Building Permits & Plumbing Permits	36-7
	(a) Permits Required	36-7
	(b) Other Approvals	36-7
3601.6	(c) Plans and Specifications	36-7
	(d) Precontract Examination of Plans	36-8
	(e) Examination of Plans	36-8
	(f) Building Permit Fee	36-8
	(g) Permits Available at Work Site	36-9
	Inspection and Tests	36-9
	(a) Inspections	36-9
	(b) Final Inspection	36-9
	(c) Tests	36-9
	(d) System Test	36-9
	(e) Methods of Testing	36-9
	(f) Combined Bathtub or Sewer and Water Pipe Inspection	36-10
	(g) Tests Where All Parts of System Are Outside of Building	36-11
	(h) Covering of Work	36-11
	(i) Defective Work	36-11
	(j) Correction Notices	36-11
	(k) Tests of Alterations, Repairs or Extensions	36-11
(l) Test of Rainwater Pipes	36-11	
(m) Test of Water Distribution System	36-11	
(n) Workmanship	36-11	
(o) Certificates of Approval	36-12	
(p) Test of Existing Installations	36-12	
(q) Inspection and Tests – Exceptions	36-12	
(r) Damages Resulting from Required Tests	36-12	

PLUMBING

3601 ADMINISTRATIVE

3601.1 TITLE AND SCOPE:

- (a) TITLE: This Chapter shall be known as "THE BAHAMAS PLUMBING CODE," may be cited as such or as the "PLUMBING CODE."

(b) PURPOSE: The basic principles of the Plumbing Code are designated to protect the public health, welfare and safety by properly designing installing and maintaining plumbing systems. While details of plumbing installations must of necessity vary, the basic principles of sanitation and safety remain the same. The following basic principles are necessary to obtain these results and while unforeseen situations will no doubt arise which are not included in this Code, the following principles may serve to define the intent.

- (1) All premises intended for human habitation, occupancy or use shall be provided with sanitary facilities as deemed necessary by the Minister of Health. When plumbing fixtures are installed, they shall not be connected to unsafe water supplies nor be subject to the dangers of backflow or backsiphonage, and shall be connected to an approved method of public or private sewage disposal.

NOTE: Notwithstanding the requirements of the above paragraph: —

- (i) a brackish or re-usable water supply may be used for flushing toilets, or
- (ii) a brackish water supply may be used for an automatic sprinkler system.

provided always that there is no connection whatsoever between any brackish, or re-usable supply and the potable supply.

- (2) Plumbing fixtures, appliances and appurtenances shall be supplied with a sufficient supply of water at adequate pressure to enable them to function properly without undue noise under normal operating conditions.
- (3) Appurtenances for heating and storing water shall be designed and installed that dangers from overheating and explosion are eliminated.
- (4) Where any plumbing installation is installed in a new residence the minimum facilities shall be a water closet, a shower or tub, a lavatory, and a kitchen sink.
- (5) Every building having plumbing fixtures installed and intended for human habitation, occupancy, or use on premises abutting on a street, alley or easement in which there is a

public sewer existing at a suitable elevation and within a reasonable distance, shall have a connection with the sewer.

- (6) The drainage system shall be designed to prevent fouling and depositing of solids. Cleanouts shall be provided so that pipes may be readily cleaned.
- (7) Every fixture connected to the drainage system shall be equipped with a water-seal trap.
- (8) All conventional drainage systems shall be designed so as to provide a free circulation of air with no danger of siphonage or forcing of trap seals. Vacuum systems shall be as specified hereinafter.
- (9) No substance which will produce explosive mixtures, obstruct free flow in piping, destroy the pipes or joints, or interfere with the sewage disposal system shall be allowed to enter the drainage system.
- (10) Proper protection shall be provided to prevent contamination of food, water and similar materials by backflow of sewage.
- (11) All plumbing fixtures shall be installed in regard to spacing so that they will be readily accessible for their intended use.
- (12) Plumbing shall be installed in such a manner as to preserve the strength of structural members.
- (13) Sewage and other waste from a plumbing system which may be deleterious to surface or subsurface waters shall not be discharged into the ground or into any lakes, ponds, streams, ditches or tidal waters unless it has first been rendered innocuous by some form of treatment and approved by the Minister of Health.
- (14) The pipes conveying water to water-closets shall be of sufficient size to supply the water at a rate required for adequate flushing without unduly reducing the pressure at other fixtures.
- (15) Plumbing fixtures shall be made of smooth non-absorbent materials, and shall be free from concealed fouling surfaces.
- (16) Each vent terminal shall extend full size upward through the

roof and have a free opening with the roof terminal being so located that there will be no danger of gas passing from it to any window, louver or air intake mechanism and no danger of clogging the pipe by articles being thrown into it, or of roof water drainage into it.

(17) Liquid wastes from air conditioning equipment, swimming pools, etc., shall be disposed of by an accepted and approved method, as hereinafter described.

(c) SCOPE:

(1) New plumbing or drainage systems or parts thereof or additions, alterations, repairs or changes to existing plumbing or drainage installations or fixtures or appliances shall conform to the requirements of this plumbing code.

(2) A previously issued lawful plumbing permit shall be valid under the terms of the Plumbing Code under which it was issued, provided the permit is not over two years old.

(d) APPLICATION TO EXISTING PLUMBING INSTALLATIONS:

Nothing contained in this code shall be deemed to require any plumbing or drainage system or part thereof, or any other work regulated by this code and existing prior to the effective date of this code, to be altered changed, reconstructed, removed or demolished if such work was installed in accordance with all applicable laws in effect prior to the date this code became effective, except when any such plumbing or drainage system or other work regulated by this code is dangerous, unsafe, insanitary or a menace to life, health or property, in the opinion of the Minister of Health.

(e) MAINTENANCE:

(1) All installations regulated by this code shall be maintained and executed in such a manner as not to constitute a nuisance or to threaten or impair the health of any individual or the public in general.

(2) It shall be unlawful for any person, firm or corporation whether owner or agent of owner, to create, keep, cause, maintain, propagate or permit the existence of a nuisance as defined in this code.

(3) The Minister of Health shall have the power to abate any nuisance by the issuance of a notice in writing, to correct and/or eliminate the nuisance within a reasonable length of time.

- 3601.2 POWER AND DUTIES OF INSPECTORS: The power and duties of inspectors (Plumbing) shall be as defined in the Buildings Regulation Act 1971 and in the rules made thereunder.
- 3601.3 INSANITARY BUILDINGS AND PREMISES: Whenever any building or premises is found by the Minister of Works, Minister of Health, or a duly authorized Inspector, to be in an insanitary or unsafe condition, proceedings for correction shall be initiated in accordance with the Act and the Rules.
- 3601.4 ALTERNATE MATERIALS AND TYPES OF CONSTRUCTION: The Provisions of this Plumbing Code are not intended to prevent the use of types of construction or materials or methods of design as an alternate to the standards herein set forth, but such alternates may be offered for approval, and their consideration shall be as set forth in this Subsection.
- (a) STANDARDS: The types of construction or materials or methods of design referred to in this Plumbing Code shall be considered as standard of quality. New types of construction or materials or methods of, design shall be at least equal to these standards for the corresponding use intended. Most referenced standards in this Code are available for public inspection at the Ministry for Works. Addresses for procurement of copies of all referenced standards are available at the Ministry for Works.
 - (b) APPLICATION: Any person desiring to use types of construction or materials or methods of design not specifically mentioned in this Plumbing Code shall file with the BCO authentic proof in support of claims that may be made regarding the sufficiency, and request approval and permission for use. The Buildings Control Officer or the Minister of Health shall approve such alternates if it is clear that the standards of the Plumbing Code are at least equalled. If, in the opinion of the BCO the standards of the Plumbing Code will not be satisfied by the requested alternate, he shall refuse approval.
 - (c) APPEAL: Any person whose request for alternate types of construction or materials or methods of design has been refused may appeal the decisions by written request, and such written request will be transmitted to the appropriate Minister for review and final decision.
 - (d) REPEATED TESTS: The Buildings Control Officer may require tests of a fixture, method, device or appurtenances to be requested if, at any time, there is reason to believe that an approved fixture, method, device or appurtenance no longer conforms to the characteristics on which its approval was based.

3601.5 BUILDING PERMITS & PLUMBING PERMITS:

- (a) PERMITS REQUIRED: It shall be unlawful to commence work on any building or premises on which plumbing is required or is to be installed; perform any work covered by the Plumbing Code including, but not limited to, the excavation or obstruction of any public or private street, alley or other thoroughfare for the purpose of installing plumbing, sewer or drainage work or connect to any public or private water supply system and/or sewer or appurtenance thereof, commence the construction, reconstruction, alteration, repair and/or remodeling of any plumbing, sewer, septic tank, sewage or liquid waste treatment system, surface drainage, public swimming pools, supply or drainage wells, fire lines, water supply and waste connections from air handling and heating units and/or other drainage work without first having filed application and obtained a permit from the BCO, except that no permit will be necessary for the repair of leaks, unstopping of sewers or waste pipes, repairing faucets or valves or cleaning of a septic tank where such work is located within the property lines. The cost of permits shall be as set forth in the Act and Rules, in accordance with current published rates. Effective January 1st, 2003 a plumbing permit shall also be obtained from the Buildings Control Officer before work commences on any building or premises on which plumbing works is required.
- (b) OTHER APPROVALS: In addition to the building permit, permits shall be required by other regulatory authority having jurisdiction. Such other approvals shall be as set forth in the Act and Rules.
- (c) PLANS AND SPECIFICATIONS:
 - (1) Each application for a permit shall be accompanied by three sets of plans and specifications when required by the BCO. The BCO may authorize the issuance of a building permit without plans or specifications for relatively small such as a single-family unit, if one of the Typical Drainage Drawings shown in Appendix B is to be used for the installation work.
 - (2) Contract documents are required for multi-family, multi-story, commercial or industrial buildings as follows: Plans, and a brief, but complete design analysis, with calculations as required to demonstrate that the basic design is satisfactory for the intended purpose, and conforms to the intent of this Code, shall be prepared by qualified engineers approved by the Minister.
 - (3) Plans shall be mechanically reproduced prints on substantial paper or cloth with the main details, other than isometric

drawings, drawn to scale and shall be suitably descriptive and shall fully and clearly illustrate together with the specifications, sufficient detail and data to show the nature, character and location of the proposed work. Where, in the opinion of the Buildings Control Officer, isometric plans are necessary to describe the proposed work, and particularly, but not limited to, proposed residential buildings having eight or more units or store buildings having five or more stores, riser diagrams of both water and sanitary piping services shall be submitted. Specifications where general expressions are used to the effect that "Work shall be done in accordance with the Plumbing Code" or "to the satisfaction of the BCO, and the Minister of Health" shall be deemed imperfect and incomplete and every reference to the Plumbing Code shall be by the section or subsection applicable. Plans shall be adequately identified.

- (d) PRECONTRACT EXAMINATION OF PLANS: Preliminary plans should be submitted to the BCO before a contract for the proposed work is entered into by the owner. It is the duty of the BCO to cooperate with owners, designers and contractors to provide precontract examination of plans and specifications, to insure the sufficiency and Plumbing Code compliance of such plans before final contracts for construction are made. Application for permit may not be required for such examination.
- (e) EXAMINATION OF PLANS: The BCO and the Minister of Health will examine all plans and applications for permits. Plans and applications shall be examined in the order received, except that plans previously given precontract examination shall be examined first. When approvals by other agencies having authority may logically be required to be affixed to the plan before approval by the BCO, such approval shall be affixed on the plans before examination by the BCO. If the application or plans do not conform to the requirement of all pertinent laws or regulations, the BCO shall reject such application in writing, stating the reasons therefore. Plans which are rejected, as stated hereinabove shall be returned for correction. Penciled notations on mechanically reproduced plans may be accepted for only minor corrections. If the application, plans, and specifications, upon examination are found to comply with the requirements of the Plumbing Code, the plans shall be signed and marked "Approved."
- (f) BUILDING PERMIT FEE: Any person desiring a permit to be issued shall, in addition to filing an application therefore, and before such permit is issued, pay a permit fee in accordance with Section 310.

- (g) PERMITS AVAILABLE AT WORK SITE: All permits shall be kept at the work site and shall be exhibited on request to do so by an authorized person.

3601.6 INSPECTION AND TESTS:

(a) INSPECTIONS:

(1) All materials and installations covered by the Plumbing Code shall be inspected by the BCO to insure compliance with the requirements of the Plumbing Code.

(2) The permit holder shall notify the Buildings Control Officer when the work is ready for test and inspection.

(b) FINAL INSPECTION: When the work for which a permit is issued is completed, the permit holder shall request final inspection and such request shall be made before the building or construction in which such work done is occupied or used and not more than 30 days after completion of the work.

(c) TESTS: Before approving any plumbing system or addition thereto or part thereof for use the Buildings Control Officer may require that such system, in whole or in part, be tested to prove its sufficiency. All equipment, material, power and labour necessary for inspections and tests shall be supplied by the permit holder.

(d) SYSTEM TEST: All the piping of the plumbing system shall be tested with water or air. The Buildings Control Officer may require the removal of any cleanouts, plugs or caps to ascertain if the pressure has reached all parts of the system.

(e) METHODS OF TESTING:

(1) WATER TESTS, GENERAL: For building sewer tests a fitting shall be placed at the property line for the purpose of inserting a test plug and such building sewer shall be connected with proper fittings to the public sewer lateral at time of test. The water test may be applied to the drainage system in its entirety or by sections. If applied to the entire system, all openings in the piping shall be tightly closed, except the highest opening above the roof. When tested in sections, at least the lower five feet of the next section above shall be retested, so that every joint and pipe in the plumbing drainage system shall have been submitted to a test of not less than a five-foot head of water.

(2) AIR TEST: The air test shall be made by attaching the air compressor or test apparatus to any suitable opening, and

closing all other inlets and outlets to the system, then forcing air into the system until there is a uniform pressure, sufficient to balance a column of mercury ten inches in height or five pounds-per-square inch on the entire system. Safety devices shall be used to prevent dangerous air pressure build-up.

- (3) **WATER TESTS IN UNFRAMED ONE-STOREY BUILDINGS:** For one-storey, unframed buildings with bathtubs on the ground floor and where plumbing is installed prior to completion of building walls, partitions and roofing, the test shall be made by plugging all openings except the terminus of the vent stacks and filling the mains and waste branches which are to be concealed with water to a point in vent stacks five feet above the highest fixture branch. On ground inspections for one-storey buildings entering a common sewer and having more than one stack, a five-foot head of water will not be required where steel, copper or P.V.C. stacks are to be installed; provided one stack is filled to a point five feet above the highest fixture branch. Other stacks may be plugged above the fixture opening provided all lead and P.V.C. joints are made and tested. Free standing stacks shall not exceed 14 feet above the horizontal soil line.
 - (4) **WATER TESTS IN FRAMED BUILDINGS:** Where building walls and partitions are in place and support the stacks, the water test shall be applied to test the entire system to the overflow point of the highest vent terminus above the roof.
 - (5) **BATHTUB CONNECTION WATER TEST:** After the test required in (2) and (3) has been applied and approved, the bathtub on the first floor shall be set and properly connected and the drainage system and first floor tub filled with water to the flood rim level of the first floor tub. The water test above the required five-foot head shall be waved and a visual inspection substituted provided all P.V.C., bad caulked, screwed or sweated type joints are properly made and accepted by the Buildings Control Officer. Above the ground floor, tub connections shall be tested by the plumber with the tub filled with water to the overflow point flowing through the overflow connection and with the tub draining. See Section 36-03 "GENERAL" for access to tub, waste and overflow fittings.
- (f) **COMBINED BATHTUB OR SEWER AND WATER PIPE INSPECTION:** The required bathtub and water pipe or sewer and water pipe inspection shall be called for and made at the same time.

- (g) TESTS WHERE ALL PARTS OF SYSTEM ARE OUTSIDE OF BUILDING: Where all parts of soil, waste and vent lines are outside a building and visible the fixtures may be set and the system filled with water to the point of overflow of the lowest fixture on the highest floor.
- (h) COVERING OF WORK: No drainage or plumbing system or part thereof shall be covered until it has been inspected, tested and approved. It shall be the duty and responsibility of the permit holder to determine if work has been inspected before it is covered or concealed. Any drainage or plumbing system or part thereof that is covered or concealed before being inspected, tested and approved shall be uncovered upon order of the BCO.
- (i) DEFECTIVE WORK: If on inspection and tests any plumbing work shows defects, the defective work or materials shall be replaced and inspection and test repeated.
- (j) CORRECTION NOTICES: The Buildings Control Officer shall make written notice of violation of the Plumbing Code and/or corrections ordered and such notice shall be served on or mailed or delivered to the permit holder or his job representative or may be posted at the site of the work. Refusal, failure, or neglect to comply with such notice or order shall be considered a violation of this code and shall be subject to the penalties as set forth in the Act and the Rules.
- (k) TESTS OF ALTERATIONS, REPAIRS OR EXTENSIONS: All alterations, repairs, or extensions which include more than ten feet in length of piping and fittings shall be inspected and tested before final approval.
- (l) TEST OF RAINWATER PIPES: Rainwater pipes and their roof connections within buildings and extending to a point five feet outside the building shall be tested by the water test.
- (m) TEST OF WATER DISTRIBUTION SYSTEM: Upon the completion of the entire water distribution system it shall be tested inspected and proved tight under a water pressure of not less than the maximum working pressure under which it is to be used. Water shock or hammer in water supply system will be cause of condemnation on final inspection.
- (n) WORKMANSHIP: All plumbing work shall be done in a workmanlike manner, and in compliance with the provisions of this Plumbing Code.

- (o) **CERTIFICATES OF APPROVAL:** After the satisfactory completion and final inspection of the plumbing system, or any part thereof, and upon request, a Certificate of Approval shall be issued by the Buildings Control Officer to the permit holder.
- (p) **TEST OF EXISTING INSTALLATIONS:** The Buildings Control Officer may require that a suitable test be applied to any existing plumbing system which he has reason to believe has become insanitary or defective. The Buildings Control Officer shall notify the owner or agent of the property to apply such test within a reasonable length of time but not to exceed ten days. If defects or insanitary conditions are, by such tests, found to exist correction of the defects or insanitary conditions shall be made within ten days.
- (q) **INSPECTION AND TESTS—EXCEPTIONS:** A test shall not be required for a plumbing system or part thereof set up for exhibition or demonstration purposes and not to be used for the disposal of body wastes. A test shall not be required after the repairing or replacing of an old faucet or valve, nor after forcing out stoppages and repairing leaks. A test shall not be required for a building storm sewer.
- (r) **DAMAGES RESULTING FROM REQUIRED TESTS:** Damage caused by breakage or faulty installation during required tests shall be the responsibility of the permit holder.

SUB-INDEX

3602 DEFINITIONS

	Page No.
Accessible	36-14
Battery of Fixtures	36-15
Building Storm Sewer	36-16
Drainage Well	36-17
Grade	36-18
Loop Vent	36-19
Plumber-Master	36-20
Plumbing Fixtures	36-20
Relief Vent	36-21
Soil Pipe	36-22
Vacuum Drainage System	36-23
Wet Vent	36-24

PLUMBING (Continued)

3602 DEFINITIONS

Unless otherwise expressly stated, all words other than herein defined shall have the meaning implied by their context in the Code or their ordinarily-accepted meanings in the construction industry; words used in the present tense shall include the future; words in the masculine gender shall include the feminine and neuter, the singular number shall include the plural; and the plural number shall include the singular.

Wherein a definition set forth in this Chapter varies from a definition set forth in other sections of the Building Code, the definition set forth as follows shall be applicable only to The Bahamas Plumbing Code.

ACCESSIBLE: Visible, unobstructed and within physical reach.

ACT: The Buildings Regulation Act 1971.

AIR GAP: An air gap in a water-supply system is the unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture, or other device and the flood level rim of the receptacle.

APPROVED: Approved means accepted under an applicable specification stated or cited in this Code, or accepted as suitable for the proposed use under procedures and powers of the Minister of Works and Minister of Health.

AREA DRAIN: An area drain is a receptacle designed to collect surface or rain water from an open area.

BACKFLOW: Backflow is the flow of water or other liquids, mixtures or substances into the distributing pipes of a potable supply of water, and any other fixture or appliance, from any source or sources other than its intended course. (See Back-siphonage.)

BACKFLOW CONNECTION: Backflow connection or condition is any arrangement whereby backflow can occur.

BACKFLOW PREVENTER: A backflow preventer is a device or means to prevent backflow into the potable water system.

BACK-SIPHONAGE: Back-siphonage is the flow of water or other liquids, mixtures or substances into the distributing pipes of a potable supply of water, or any other fixture, device, or appliance, from any sources other than its intended course, due to a negative or lower differential pressure in such pipe.

BASEMENT: A level of a building, the floor of which is two feet or more below

grade and the ceiling of which is not more than four feet and six inches above grade.

BATTERY OF FIXTURES: A “battery of fixtures” is any group of two or more similar adjacent fixtures which discharge into a common horizontal waste or soil branch.

BOILER BLOW-OFF: A boiler blow-off is an outlet on a boiler to permit emptying or discharge of the water or sediment in the boiler.

BRANCH: A branch is any part of a piping system other than a main.

BRANCH, FIXTURE: See Fixture Branch.

BRANCH, HORIZONTAL: See Horizontal Branch.

BRANCH INTERVAL: A branch interval is a length of soil or waste stack corresponding in general to a storey height, but in no case less than eight feet within which the horizontal branches from one floor or storey of a building are connected to the stack.

BRANCH VENT: A branch vent is a vent connecting one or more individual vents with a vent stack or stack vent.

BUILDING: A building is a structure built, erected, and framed of component structural parts designed for the housing, shelter, enclosure, or support of persons, animals, or property of any kind. For further definition see the Act.

BUILDING CLASSIFICATION: Building Classification is the arrangement adopted by the Building Code for the designation of buildings in classes based upon their use and occupancy.

BUILDING DRAIN: The building (house) drain is that part of the lowest horizontal soil piping of a building drainage system, including groundfloor soil branches, exclusive of storm sewer, which receives the discharge from soil, waste, and other drainage pipes inside the walls of the building and conveys it to the building (house) sewer beginning five feet outside the building wall.

BUILDING SEWER: The building (house) sewer is that part of the horizontal piping of a drainage system which extends from the end of the building drain and which receives the discharge of the building drain and conveys it to a public sewer, private sewer, or individual sewage disposal system.

BUILDING STORM DRAIN: A building (house) storm drain is a drain used for conveying rain water, surface water, ground water, subsurface water, condensate, cooling water, or other similar discharge to a building storm sewer or a combined building sewer, extending to a point not less than five feet outside the building wall.

BUILDING STORM SEWER: A building (house) storm sewer is the extension from the building storm drain to the public storm sewer, combined sewer, or other point of disposal.

BUILDING SUBDRAIN: A building (house) subdrain is that portion of a drainage system which cannot drain by gravity into the building sewer.

CODE: The word "Plumbing Code" or "Code" when used alone shall mean these regulations, subsequent amendments thereto, or any emergency rule or regulation which may be lawfully adopted.

COMBINED BUILDING SEWER: A combined building sewer receives storm water, sewage and liquid waste. (Combined sewers are normally not permitted.)

COMMON VENT: A common vent is a vent above the junction of two fixture drains installed at the same level in a vertical stack and serving as a vent for both fixture drains.

CONDUCTOR: A "Leader." (Usually for rain water.)

CONTINUOUS WASTE: A continuous waste is a drain connecting the compartments of a combination fixture to its trap or connecting other permitted fixtures to a common trap.

CROSS-CONNECTION: A cross-connection is any physical connection or arrangement between two otherwise separate piping systems, one of which contains potable water and the other water of unknown or questionable safety, or any other kind of matter, whether element, compound or mixture, whereby water may flow from one system to the other, the direction of flow depending on the pressure differential between the two systems. (See Backflow and Backsiphonage.)

DEAD END: A dead end is a branch leading from a soil waste or vent pipe, building drain or building sewer which is terminated at a developed distance of two feet or more by means of a plug or other closed fitting.

DEVELOPED LENGTH: The developed length of a pipe is its length measured along the centre line of the pipe and fittings.

DIAMETER: Unless specifically stated, the term "diameter" is the nominal diameter as designated commercially.

DOWNSPOUT: A "Leader." (Usually for rain water.)

DRAIN: A drain is any pipe which carries liquid, waste water or water borne wastes to an approved point of disposal.

DRAINAGE SYSTEM: A drainage system (drainage piping) includes all the piping

within public or private premises, which conveys sewage, rain water, or other liquid wastes to a legal point of disposal.

DRAINAGE WELL: A drainage (disposal) well in this Code is any cavity, drilled, driven or natural, which taps the underground water and into which surface waters; waste waters or industrial wastes are placed. All drainage wells shall be cased. See Appendix B.

DURHAM SYSTEM: Durham system is a term used to describe soil or waste systems where all piping is of threaded pipe, tubing, or other such rigid construction, using recessed drainage fittings to correspond to the types of piping.

EFFECTIVE OPENING: The effective opening is the minimum cross-sectional area at the point of water-supply discharge, measured or expressed in terms of: the diameter of a circle of equivalent cross-sectional area.

ENGINEER: For purposes of this Chapter of the Code, an engineer is a person approved by the Minister to prepare contract documents and/or supervise construction of plumbing work in all its branches and aspects.

FIXTURE BRANCH: A fixture branch in a drainage system is the drain from the trap of a fixture to the junction of that drain with a vent.

FIXTURE DRAIN: A fixture drain is the drain from the fixture branch to the junction of that drain with any other drain pipe.

FIXTURE UNIT: A fixture unit is a design factor so chosen that the load-producing values of the different plumbing fixtures can be expressed approximately as multiples of that factor. For the purposes of this Code, one fixture unit flow rate shall be deemed to be one cubic foot (or 7.5 United States gallons) of water per minute.

FIRE LINES: The fire control system, including water service, standpipe, siamese connections and pumps.

FLOOD-LEVEL RIM: The flood-level rim is the top edge of the receptacle from which water or other liquids overflow.

FLOOR DRAIN: A floor drain is an opening or receptacle located at approximately floor level connected to a trap to receive the discharge from indirect waste and floor drainage.

FLUSHOMETER OR FLUSH VALVE: A flushometer or flush valve is a device which discharges a predetermined amount of water to fixtures for flushing purposes and is actuated by direct water pressure.

GALLON: Gallon as used in this Code is a United States Gallon. One cubic foot is equal to 7.5 U.S. Gallons, for purposes of this Chapter of the Code.

GRADE: Grade is the slope or fall of a line of pipe in reference to a horizontal plane. In drainage it is usually expressed as the fall in a fraction of an inch per foot length of pipe.

GREASE INTERCEPTOR: A device to collect grease from a greasy water flow.

GREASE TRAP: An "Interceptor."

GUTTER: An open channel for carrying away rain water.

HANGERS: "Supports."

HORIZONTAL PIPE: Horizontal pipe means any pipe or fitting which makes an angle of more than 45 degrees with the vertical.

HORIZONTAL BRANCH: A horizontal branch is a drain pipe extending laterally from a soil or waste stack or building drain, with or without vertical sections or branches, which receives the discharge from one or more fixture drains and conducts it to the soil or waste stack or to the building (house) drain.

INDIRECT WASTE: An indirect waste pipe is a pipe that conveys liquid wastes (other than body wastes) by discharging them into an open plumbing fixture or receptacle, the overflow point of which is at a lower elevation than the item drained and which is properly connected to the drainage system, soakage pit or discharge well.

INDUSTRIAL WASTES: Industrial wastes are liquid wastes resulting from the processes employed in industrial establishments and are free of body wastes.

INSANITARY: Contrary to sanitary principles — injurious to health.

INTERCEPTOR: An interceptor is a device designed and installed so as to separate and retain deleterious, hazardous, or undesirable matter from normal wastes and permit normal sewage or liquid wastes to discharge into the disposal terminal by gravity.

LEADER: A leader (downspout) is the vertical water conductor from the roof to the building storm drain, combined building sewer, or other means of disposal.

LIQUID WASTE: Liquid waste is the discharge from any fixture, appliance, or appurtenance, in connection with a plumbing system which does not receive body waste.

LOAD FACTOR: Load factor is the percentage of the total connected fixture unit flow rate which is likely to occur at any point in the drainage system. It varies with the type of occupancy, the total flow unit above this point being considered, and with the probability factor of simultaneous use.

LOOP VENT: A series of fixtures installed on a horizontal branch. A vent shall be installed vertically within five feet down stream from the first fixture branch, and another vent installed vertically between the last two fixture branches; all fixture branches shall enter the circuit or loop vented branch at intervals not to exceed five feet.

MAIN: The main of any system of continuous piping is the principal artery of the system, to which branches may be connected.

MAIN VENT: The main vent is the principal artery of the venting system, to which vent branches may be connected.

MAY: The word "may" is a permissive term.

MEZZANINE: Is an intermediate floor placed in any storey or room. When the total area of any such mezzanine floor exceeds 3-1/3 percent of the total floor area in that room or storey in which the mezzanine floor occurs, it shall be considered as constituting an additional storey. The clear height above or below a mezzanine-floor construction shall be not less than seven feet.

PENTHOUSE: An enclosed structure extending not more than 12 feet above the roof of a building other than a roof structure which occupies not more than 25 per cent of the roof area and considered a storey.

PERSON: Person is a natural person, his heirs, executors, administrators or assigns; and includes a firm, partnership or corporation, its or their successors or assigns. Singular include plural; male includes female.

PITCH: "Grade."

PLUMBING: Plumbing means, includes and refers to:

- (1) The materials including pipe, fittings, valves, fixtures and appliances attached to and a part of a plumbing system for the purpose of creating and maintaining sanitary conditions.
- (2) That part of a water supply and sewage and drainage system extending from either the public water supply mains or private storm sewers or to a private sewage disposal plant, septic tank, disposal field, pit, box filter bed or any other receptacle or into any natural or artificial body of water, water course upon public or private property.
- (3) The design, installation or contracting for installation, removal and replacement, repair or remodelling, of all or any part of the materials, appurtenances or devices attached to and forming a part of a plumbing system, including the installation of any fixture, appurtenance or devices used for cooking, washing, drinking, cleaning, fire fighting, and miscellaneous steam and process, mechanical or manufacturing purposes.

- (4) For further definition and interpretation see the Act and Rules.

PLUMBER-MASTER: A Master Plumber is a person at least 25 years of age holding a Certificate of Competency issued by the Minister to engage in plumbing work in all its branches and aspects. For further definition and interpretation see the Act and Rules.

PLUMBER-LICENCED: A Licensed Plumber is a person who, on or before the 31st day of December, 1969, had passed the Bahamas Licensed Plumbers Examination of the Ministry of Works. A Licensed Plumber holding a Certificate of Competency issued by the Minister is entitled to engage in plumbing work in all its branches and aspects. For further definition and interpretation see the Act and Rules.

PLUMBER-JOURNEYMAN: A Journeyman Plumber is a person at least 21 years of age holding a Certificate of Competency issued by the Minister to engage in the business of a plumbing contractor in respect only of such building operations as may be specified in the "Small Buildings" part of the Code. A Journeyman Plumber may engage in the physical or mechanical execution of plumbing work in all its branches and aspects only under the supervision and responsibility of Master Plumbers and/or Licensed Plumbers holding current Certificates of Competency issued by the Minister. For further definition and interpretation see the Act and Rules.

PLUMBER-APPRENTICE: An Apprentice Plumber is a person holding a Certificate issued by the Minister, allowing him to perform the physical or mechanical work of plumbing under the direction of, and in the presence of, Master, Licensed, or Journeyman Plumbers holding current Certificates of Competency issued by the Minister. For further definition and interpretation see the Act and Rules.

PLUMBING FIXTURES: Plumbing fixtures are receptacles, devices, or appliances which are supplied with water or which receive or discharge liquids or liquid borne wastes, with or without discharge into the drainage system with which they may be directly or indirectly connected.

PLUMBING SYSTEM: The plumbing system under the jurisdiction of the Bahamas Plumbing Code, includes the drainage system water supply and water-supply distribution pipes; plumbing fixtures and traps; soil, waste, and vent pipes; building drains and building sewers; building storm drains and building storm sewers; liquid waste piping, and appliances and appurtenances; including their respective connections and devices, with the private property limits of the premises, and water and sewer-treating or water and sewer-using equipment and fire standpipe systems. Included under the jurisdiction of the Bahamas Plumbing Code, shall be miscellaneous categories of piping and equipment as specified in the Act and Rules.

POTABLE WATER: Potable water is water which is satisfactory for drinking, culinary and domestic purposes, and meets the requirements of the Minister of Health.

PLUMBER-JOURNEYMAN (RESTRICTED): A Journeyman Plumber (Restricted) is a person who on, or before, the 31st day of March, 1974 had passed a qualifying examination set by the Ministry of Works. A Journeyman Plumber (Restricted) holding a Certificate of Competency issued by the Minister may engage in plumbing work as a journeyman plumber (as set out above) in the island, or district, for which his Certificate is restricted.

PRIVATE PROPERTY: Private property for the purpose of this Code shall mean all property except streets or roads dedicated to the public and easements (excluding easements between private parties.) See the Act and Rules for further definition and interpretation.

PRIVATE OR PRIVATE USE: In the classification of plumbing fixtures, private applies to fixtures in residences and apartments and to fixtures in private bathrooms of hotel and similar installations where the fixtures are intended for the use of a family or an individual.

PRIVATE SEWER: A private sewer is a sewer privately owned and not directly controlled by Government.

PUBLIC OR PUBLIC USE: In the classification of plumbing fixtures “public” applies to fixtures in commercial and industrial establishment, in restaurants, bars, public buildings, comfort stations, schools, gymnasiums, or places to which the public is invited or which are frequented by the public without special permission or special invitation, and other installations (whether pay or free) where a number of fixtures are installed so that their use is similarly unrestricted.

PUBLIC SEWER: A public sewer is a common sewer directly controlled by Government.

PUBLIC SWIMMING POOL: A public swimming pool is a pool together with its buildings and appurtenances where the public is allowed to bathe or is open to the public for bathing purposes by consent of the owner.

RELIEF VENT: A relief vent is a vent, the primary function of which is to provide circulation of air between drainage and vent systems.

REVENT: A revent pipe is a vent which connects directly with an individual waste, or group of wastes underneath, or back of the fixture, and extends either to the main, loop, or circuit vent, or branch vent pipe.

RIM: For the purpose of this Code a rim is an unobstructed open edge at the overflow point of a fixture.

ROCK DRAINFIELD: Three-quarter inch drainfield rock 100 percent passing a one inch screen and a maximum of ten percent passing a one-half inch screen.

ROOF-DRAIN: A roof drain is an outlet installed to receive water collecting on the surface of a roof and to discharge it into the leader (downspout).

ROUGHING-IN: Roughing-in is the installation of all parts of the plumbing system which can be completed prior to the installation of fixtures, or finishing work.

RULES: Rules in this Chapter of the Code, mean subsidiary legislation to the Act known as The Buildings Regulation (Plumbing) Rules.

SANITARY SEWER: A sanitary sewer is a pipe which carries sewage and excludes storm, surface and ground water.

SECOND HAND: Second hand as applied to material or plumbing equipment is that which has been installed, and has been used or removed.

SEPARATOR: See Interceptor.

SEPTIC TANK: A septic tank is a watertight receptacle which receives the discharge of a drainage system or part thereof, and is designed and constructed so as to separate solids from the liquid, digest organic matter through a period of detention, and allow the liquids to discharge into the soil outside of the tank through a sub-surface system of open-joint or perforated piping, or other approved methods.

SEWAGE: Sewage is any liquid waste containing animal, mineral or vegetable matter in suspension or solution, and may include liquids containing chemicals in solution.

SHALL: The word "shall" is a mandatory term.

SHOULD: The word "should," for purposes of this Chapter of the Code is permissive, but implies a strong recommendation for compliance.

SLOPE: See Grade.

SOIL WATER: Soil water is waste water which contains human or animal excretions.

SOIL PIPE: A soil pipe is any pipe which conveys the discharge of water closets or fixtures having similar functions, with or without the discharge from other fixtures, to the building drain or building sewer.

SPECIAL WASTE PIPE: See Indirect Waste Pipe.

STACK: A stack is the vertical pipe of a system of soil, waste, or vent piping.

STACK VENT: A stack vent (sometimes called a waste vent or soil vent) is the extension of a soil or waste stack above the highest horizontal drain connected to the stack.

STORM DRAIN: See Building Storm Drains.

STANDPIPE SYSTEMS: A system of piping installed for fire protection purposes having a primary water supply constantly or automatically available at each hose outlet.

STORM SEWER: A storm sewer is a sewer used for conveying rain water and/or surface water.

STOREY: That part of a building comprised between a floor and a floor or roof next above, including a basement with a ceiling which is six feet, or more above the line and grade of the sidewalk but neither a cellar, an attic nor a penthouse.

SUBSURFACE DRAIN: A subsoil drain is a drain which receives only subsurface or seepage water and conveys it to a place of disposal.

SUMP: A sump is a tank or pit which receives sewage or liquid waste, located below the normal grade of the gravity system and which must be emptied by mechanical means.

SUPPORTS: Supports, hangers, and anchors are devices for supporting and securing pipe and fixtures to walls, ceilings, floors, or structural members.

SUPPLY WELL: Any artificial opening in the ground designed to conduct water from a source bed through the surface when water from such well is used for public, semi-public or private use.

TRAP: A trap is a fitting or device so designed and constructed as to provide a liquid seal which will prevent the back passage of air without materially affecting the flow of sewage or waste water through it.

TRAP SEAL: The trap seal is the maximum vertical depth of liquid that a trap will retain, measured between the crown weir and the top of the dip of the trap.

V.W.C.: V.W.C. is an abbreviation for "vacuum water closet" for use with a vacuum drainage system.

VACUUM DRAINAGE SYSTEM: A vacuum drainage system is a piping system for conveying water under the motive force of a negative pressure in the system.

VACUUM BREAKER: See Backflow Preventer.

VENT STACK: A vent stack is a vertical vent pipe installed primarily for the purpose of providing circulation of air to and from any part of the drainage system.

VENT SYSTEM: A vent system is a pipe or pipes installed to provide a flow of air to or from a drainage system or to provide a circulation of air within such system to

maintain integrity of trap seals.

VENTILATION—TOILET ROOMS: The process or means of supplying or removing air which may or may not be conditioned for temperature and humidity by natural or mechanical means to and from the outside atmosphere.

VERTICAL PIPE: A vertical pipe is any pipe or fitting which is installed in a vertical position or which makes an angle of not more than 45 degrees with the vertical.

WASTE: See Liquid Waste and industrial Wastes.

WASTE WATER: Waste water is water which does not contain human or animal excretions.

WASTE PIPE: A waste pipe is any pipe which receives the discharge of any fixture, except water closets or fixtures having similar functions and conveys it to the building drain or to the soil or waste stack.

WATER-DISTRIBUTING PIPE: A water-distributing pipe in a building or premises is a pipe which conveys water from the water-service pipe to the plumbing fixtures, appliances and other water outlets.

WATER MAIN: The water (street) main is a water supply pipe for public or community use.

WATER OUTLET: A water outlet, as used in connection with the water-distributing system, is the discharge opening for the water,

- (1) to a fixture;
- (2) to atmospheric pressure (except into an open tank which is part of the water-supply system);
- (3) to a boiler or heating system;
- (4) to any water-operated device or equipment requiring water to operate.

WATER SERVICE PIPE: The water-service pipe is the pipe from the water main or other source of water supply to the building served.

WATER-SUPPLY SYSTEM: The water-supply system of a building or premises consists of the water-service pipe, the water-distributing pipes, standpipe system and the necessary connecting pipes, fittings, control valves, and all appurtenances in or on private property.

WET VENT: A wet vent is a waste pipe which serves to simultaneously vent and convey waste from fixtures other than water closets.

YOKE VENT: A yoke vent is a pipe connecting upward from a soil or waste stack to a vent stack for the purpose of preventing pressure changes in the stacks.

SUB-INDEX

3603 GENERAL

Paragraph No.	Paragraph Title	Page No.
3603.1	Conformance With Code	36-26
3603.2	Change in Direction	36-26
3603.3	Prohibited Fittings and Connections	36-26
3603.4	Repair and Alterations to Existing Plumbing	36-26
3603.5	Trenching, Excavation, and Backfilling	36-26
	(a) Support of Piping	36-26
	(b) Open Trenches	36-26
	(c) Backfilling	36-26
3603.6	Structural Safety	36-27
3603.7	Higher Requirements	36-27
3603.8	Protection of Pipes	36-27
	(a) Breakage and Corrosion	36-27
	(b) Cutting or Notching	36-27
	(c) Pipes Through Footings or Foundation Walls	36-27
3603.9	Damage to Drainage System or Public Sewer	36-27
3603.10	Industrial Wastes	36-28
3603.11	Sleeves	36-28
3603.12	Vermin Proofing	36-28
3603.13	Used or Second-Hand Equipment	36-28
3603.14	Condemned Equipment	36-28
3603.15	Piping in Relation to Footings	36-28
3603.16	Connections to Plumbing System Required	36-28
3603.17	Sewer Required	36-28
3603.18	Location of Fixtures	36-29
	(a) Light and Ventilation	36-29
	(b) Improper Location	36-29
3603.19	Floor Connections for Integral Trap Fixtures	36-29
	(a) Lead or Cast Iron	36-29
	(b) Reducing	36-29
	(c) Copper or P.V.C.	36-29
	(d) Wood Floor Construction	36-29
3603.20	Dead Ends	36-29
3603.21	Temporary Toilets	36-29
	(a) General	36-29
	(b) Construction Sites	36-30
	(c) Public Assembly	36-30
	(d) Temporary Toilet Enclosure	36-30
	(e) Water-Borne Flush Type	36-31
	(f) Portable Chemical Type	36-32
3603.22	Colour Code for Piping	36-32
3603.23	Special Piping Systems	36-33
3603.24	Accessibility for Service	36-33
3603.25	General Safety	36-34

PLUMBING (Continued)

3603 GENERAL

- 3603.1 CONFORMANCE WITH CODE: All plumbing systems hereafter installed shall conform to the minimum requirements and provisions as set forth in this Code.
- 3603.2 CHANGE IN DIRECTION: Changes in direction in drainage shall be made by appropriate use of 45-degree wyes, long-or-short-sweep quarter bends, sixth, eighth, or sixteenth bends, or by a combination of these or other approved fittings. Single and double sanitary tees, quarter bends and one-fifth bends may be used in vertical sections of drainage lines only where the direction of flow is from the horizontal to the vertical.
- 3603.3 PROHIBITED FITTINGS AND CONNECTIONS:
- (a) No fitting having a hub in the direction opposite to flow, or tee branch shall be used as a drainage fitting.
 - (b) No running threads, bands, or saddles shall be used in new drainage systems.
 - (c) No drainage or vent piping shall be drilled or tapped.
- 3603.4 REPAIR AND ALTERATIONS TO EXISTING PLUMBING: Alteration, repair or renovation of existing plumbing or drainage installations may be made at variance from the provisions of this Code, provided such deviations conform to the intent of the Code and are approved in writing by the Minister. Any previously installed fixture or material found to be defective, deteriorated or dangerous to personal health or safety by the Minister of Health shall be replaced in accordance with the provisions of the Act and Rules, and this Chapter of the Code.
- 3603.5 TRENCHING, EXCAVATION, AND BACKFILLING:
- (a) SUPPORT OF PIPING: Buried piping shall be securely supported in an approved manner to prevent sagging, misalignment and breaking.
 - (b) OPEN TRENCHES: All excavations required to be made for the installation of a plumbing piping system shall be open trench work and shall be kept open until the piping has been inspected, tested and accepted.
 - (c) BACKFILLING: Adequate precaution shall be taken to insure proper compactness of backfill around piping without damage to such piping. Backfilling to a point not less than 12 inches above the

top of the pipe shall be placed in thin layers with clean fill which does not contain stones, boulders, cinder-fill, or other material which would damage or break the piping or cause corrosive action.

- 3603.6 STRUCTURAL SAFETY: The work of installing or repairing any part of a plumbing and/or drainage system shall not impair the structural safety of the building or premises. The building or premises shall be left in a safe structural condition in accordance with the requirements of this Code, and the Act and Rules.
- 3603.7 HIGHER REQUIREMENTS: Nothing herein contained shall be construed to prevent the owner from using higher requirements than those set forth in this Code.
- 3603.8 PROTECTION OF PIPES:
- (a) BREAKAGE AND CORROSION: Pipes passing under or through walls shall be protected from external loadings or against differential settlement. Pipes in contact with cinders, concrete or other corrosive materials shall be protected from external corrosion by sleeves, coating, wrapping or other approved methods which will prevent such corrosion.
 - (b) CUTTING OR NOTCHING: NO STRUCTURAL MEMBER, TIE BEAM, OR THE COLUMN, SHALL BE REDUCED IN AREA BY CUTTING, NOTCHING, OR OTHERWISE, EXCEPT TO THE EXTENT PERMITTED BY THE BCO. NO EXTERIOR BLOCK WALL SHALL BE NOTCHED, CUT OR CHASED TO ALLOW INSTALLATION OF PLUMBING, EXCEPT TO THE EXTENT PERMITTED BY THE BCO.
 - (c) PIPES THROUGH FOOTINGS OR FOUNDATION WALLS: All piping passing under a footing shall have a clearance of at least two inches between the top of the pipe and bottom of the footing. All piping passing through cast-in-place concrete construction shall be sleeved to provide one-half inch annular space around the entire circumference of pipe to be sleeved.
- 3603.9 DAMAGE TO DRAINAGE SYSTEM OR PUBLIC SEWER: It shall be unlawful for any person to deposit by any means into the building drainage system or into a public or private sewer any ashes; cinders; rags; flammable, poisonous, or explosive liquids; gases; oils; grease; or any other deleterious material which would or could obstruct, damage, or overload such system or sewer.

- 3603.10 INDUSTRIAL WASTES: Wastes detrimental to the public or private sewer system or detrimental to the functioning of the sewage-treatment plant shall be treated and disposed of as directed by the Minister and/or the Minister of Health. Air conditioning equipment shall not discharge directly or indirectly into rainwater leaders which discharge into any surface gutter.
- 3603.11 SLEEVES: Annular space between sleeves and pipes shall be filled or tightly caulked with coal tar or asphaltum compound, lead or other material found equally effective and approved as such by the BCO.
- 3603.12 VERMIN PROOFING: All inaccessible or concealed lead work within the enclosing walls of a building not enclosed in concrete or fill, shall be made ratproof by covering with copper or galvanised wire cloth well secured. Interior openings through walls, floors, and ceilings shall be sealed vermin proof.
- 3603.13 USED OR SECOND-HAND EQUIPMENT: It shall be unlawful to purchase, sell, or install used equipment or material for plumbing installations unless it complies with the minimum standards set forth in this Code.
- 3603.14 CONDEMNED EQUIPMENT: Any plumbing equipment condemned by the BCO or the Minister of Health, shall not be re-used for plumbing purposes.
- 3603.15 PIPING IN RELATION TO FOOTINGS: Unless otherwise approved by the BCO, by reason of a special design, no excavation for piping or drainage work shall be placed within the angle of pressure as transferred from the base of an existing structure to the sides of an excavation on a 45-degree angle, other than an excavation making an angle of more than 45 degrees to the wall.
- 3603.16 CONNECTIONS TO PLUMBING SYSTEM REQUIRED: All plumbing fixtures, drains, appurtenances, devices and appliances used to receive or discharge liquid wastes or sewage shall be connected to a drainage system, in accordance with the provisions of this Code.
- 3603.17 SEWER REQUIRED:
- (a) Every building in which plumbing fixtures are installed shall have a connection to a public sewer if available within 300 feet.
 - (b) When a public sewer is not available for use, sewage and drainage piping shall be connected to an approved individual sewage, or waste disposal system.

- 3603.18 LOCATION OF FIXTURES:
- (a) LIGHT AND VENTILATION: Plumbing fixtures shall be located in compartments or rooms provided with ventilation and illumination as set forth in the appropriate Chapters of the Building Code.
 - (b) IMPROPER LOCATION: Piping, fixtures, or equipment shall not be located in a manner to interfere with the normal operation of windows, doors, or other exit openings.
- 3603.19 FLOOR CONNECTIONS FOR INTEGRAL TRAP FIXTURES:
- (a) LEAD OR CAST IRON: Four-inch lead or cast iron bends and stubs shall be used on floor standing water closets or similar integral trap fixtures. The outlet may be dressed or swedged to receive a three-inch ferrule. No three-inch lead stubs will be permitted for fixtures with integral trap.
 - (b) REDUCING: Four-by-three-inch reducing one-quarter bends or 4 x 4-inch or 3 x 3-inch one-quarter bends are acceptable.
 - (c) COPPER OR P.V.C.: Annealed copper stubs with brass closet flanges on a copper drainage system, may be installed by the use of a 4" x 3"-90 ell on 4 stub and standard brass closet flange, soldered to copper stub, or 3 stub with 4 x 3 brass closet flange. P.V.C. connections may be installed in a manner similar to copper.
 - (d) WOOD FLOOR CONSTRUCTION: Connections to conventional water closets, or similar fixture installed on wood floor in single or multi- storey buildings shall be with lead stubs or bends, except where, in the opinion of the BCO, the piping design incorporates sufficient flexibility to preclude damage to the fixture if settlement of the floor occurs.
- 3603.20 DEAD ENDS: In the installation or removal of any part of a drainage system, dead ends shall be avoided except where necessary to extend a cleanout so as to be accessible, or where lines are extended to serve future fixtures in specific, planned locations.
- 3603.21 TEMPORARY TOILETS:
- (a) GENERAL:
 - (1) Sanitary facilities shall be required at construction sites, fairs, carnivals, revivals, encampments and other locations where numbers of people congregate for short periods of time and such sanitary facilities shall be permanent facilities as set forth herein or, where permanent facilities are not practicable, may be temporary toilets either of a water-borne flush type with sewer connection or of a portable chemical type, either of which shall comply with the requirements set forth herein.

- (2) Pit, bucket or ground surface privies shall be used only after approval of the Minister of Health.
 - (3) Any persons desiring to provide or erect temporary toilet facilities shall first submit plans and secure approval (as set forth in this Chapter) from the Minister of Health.
 - (4) The permit for a temporary toilet shall be for such period of time as the facilities may actually be needed but not to exceed 3 months, except that for construction sites such period may be for 6 months, or longer as approved by the Minister of Health.
 - (5) Temporary facilities are acceptable only where permanent facilities are not available.
 - (6) Temporary toilets shall be not less than 50 feet from any supply well or underground potable water tank.
- (b) CONSTRUCTION SITES:
- (1) PERMANENT TOILETS: Permanent toilet facilities located in a structure where alterations or additions are being made, or toilet facilities within 200 feet of the construction work, may be used provided the owner or party in possession thereof shall have given written consent for the use of such facilities during the entire period of construction and that a letter of written consent is attached to the approved plans.
 - (2) MINIMUM FIXTURES: A water closet shall be provided for each 25 workmen or fraction thereof, and where the building under construction is multi-storeyed, such facilities shall also be provided on the fifth and tenth floors.
- (c) PUBLIC ASSEMBLY: In places of public assembly such as fairs, carnivals, encampments and similar temporary assembly, where permanent facilities are not available, toilet facilities shall be provided as approved by the Minister of Health, and may be of the temporary type as set forth herein.
- (d) TEMPORARY TOILET ENCLOSURE:
- (1) Regardless of the type of fixtures, all temporary toilets shall be enclosed in fly-tight, weather protected, well ventilated buildings with self-closing doors or the containers shall be enclosed to be fly-tight and ventilated with screened vents having an area not less than 1/7 of the floor area.

- (2) Doors to stalls shall be provided with internal lock.
 - (3) Urinals shall be non-absorbent, and non-corrosive and designed to drain completely.
 - (4) Toilet tissue shall be furnished.
 - (5) Enclosures shall be constructed of non-corrosive materials not readily absorptive of odour or moisture.
 - (6) Enclosures shall be maintained in sanitary condition and shall be thoroughly cleaned and disinfected at least twice weekly.
 - (7) Enclosure shall be not less than 11 square feet total inside area.
- (e) WATER-BORNE FLUSH TYPE:
- (1) Flush tanks or flush valves shall be connected to an approved public or private water supply except that where such water supply is not available water pressure shall be provided by means of a well and pump, as approved by the BCO.
 - (2) Where a public sewer is available, a permit to connect thereto shall be obtained and a proper branch fitting inserted between the reducing fitting at the property line and the test fitting. Upon completion of the construction work or termination of use of the temporary toilet, temporary sewer and water branches shall be removed and the branch sewer opening closed with a cast iron plug or cleanout caulked in place with an oakum and lead caulked joint. Water lines shall be permanently capped or plugged.
 - (3) A permanent building sewer or drain may be installed to serve temporary toilets provided such sewer or drain complies with all requirements of this Chapter.
 - (4) Where a public sewer is not available, disposal may be to a septic tank and drain field. Fixtures may be connected by a proper fitting in the building sewer between the septic tank and the test fitting; except that at construction sites fixtures may be placed over the septic tank on a temporary wood platform, by either removing the permanent concrete top cover or by providing a temporary wood platform over a manhole. A hole shall not be cut into a septic tank cover for the insertion of a water closet outlet unless the entire cover section is replaced on the tank.

- (5) Fixture vents shall not be required for temporary water closets, unless three, or more, water closets are to be installed on a common drain line.
 - (6) Full caulked oakum joints with lead shall be used for temporary water closet branches. P.V.C. or copper joints shall be soldered or solvent jointed.
- (f) PORTABLE CHEMICAL TYPE:
- (1) Containers shall have a capacity of not less than 24 gallons.
 - (2) The top of the seat shall be not less than 8 inches above the liquid level in the container.
 - (3) Containers shall be of non-absorptive, non-corrosive material.
 - (4) Drain line from urinal to container shall be minimum 1/2 inch ID plastic or non-corrosive material.
 - (5) Containers shall be completely emptied, thoroughly cleaned and disinfected in accordance with requirements of the Minister of Health.
 - (6) An approved type disinfectant shall be used in sufficient quantity to provide odourless operation with normal usage.
 - (7) Waste shall be collected, transported and disposed of in a manner as approved by the Minister of Health.
 - (8) Units shall be marked with the name, address and telephone number of the servicing company.

3603.22 COLOUR CODE FOR PIPING: In order to prevent misuse or a wrong connection at a later date, it is mandatory that the following colour code system be provided for piping in large buildings (five water closets, or more): —Color may be inherent in the material or permanent painted 2 inch wide bands on three foot centres.

(1) City water (main) supply	—	Green
(2) Water from lavatory hand basin	—	Grey
(3) Treated flushing water or where flushing water is from well supply*	—	Brown
(4) Water closet waste (and bath and lavatory wastes) where a recirculation system is not used	—	Black
(5) Fire line	—	Red
(6) Domestic Hot (water)	—	Orange
(7) Domestic Cold (water)	—	Yellow
(8) L. P. Gas Lines	—	Blue

An approved colouring dye shall be injected into the system where non-potable treated effluent is used for flushing or any other purpose. Provisions for dye injection shall be fully automatic for constant and continuous colouring of the non-potable water. Injectors requiring electric motors shall be connected to emergency power sources, when available, or the injection point shall be near the influent point of non-potable water storage reservoir for residual effect during power cuts.

3603.23 SPECIAL PIPING SYSTEMS: Special piping systems, including but not limited to, those noted in the definition of "PLUMBING" in Section 3602, "DEFINITIONS" shall be subject to specific approval by the BCO. Where these special systems are not covered in detail in The Bahamas Plumbing Code, or in other Chapters of the Building Code covering such systems they shall be considered special cases and all information, design data, drawings, specifications, or physical samples as required by the BCO shall be submitted for review. Contractors, and their employees shall be subject to approval by the BCO prior to beginning installation of any special piping system.

3603.24 ACCESSIBILITY FOR SERVICE: All items of equipment requiring routine service, such as valves, machinery equipment with moving parts, etc., shall be installed in a manger to allow service or repair without damage to the building. No valve which not have a replaceable seat (or designed for simple re-grinding shall be imbedded in a tile or concrete wall. Unless otherwise approved by the BCO in special cases, all bathtub waste and overflow fittings shall be accessible by means of an access panel.

3603.25 GENERAL SAFETY: In addition to considerations of Structural Safety, specified herein before, general safety precautions shall be exercised during the installation, and testing of work included in this Chapter. All excavations for piping, tanks or equipment shall be barricaded where a potential hazard to life and property exists. For further requirements see the Act and Rules.

SUB-INDEX

3604 MATERIALS

Paragraph No.	Paragraph Title	Page No.
3604.1	Materials	36-36
	(a) Minimum Standards	36-36
3604.2	Materials for Piping Systems	36-36
	(a) General	36-36
	(b) Above Ground Drains Within Buildings	36-36
	(c) Underground Drains Within Buildings	36-36
	(d) Underground Drains in Highly Corrosive Areas	36-36
	(e) Acid Waste Piping	36-37
	(f) Pressure Piping	36-37
3604.3	Buildings Sewer	36-37
	(a) General	36-37
	(b) Vitrified Clay or P.V.C. Installation	36-37
	(c) Test Required	36-39
	(d) Old Building Drains and Sewers	36-39
	(e) Building Storm Sewer	36-39
	(f) Inside Leaders and Drains	36-39
	(g) Collection Boxes	36-39
	(h) Outside Leaders	36-39
3604.4	Material for Cleanouts	36-40
3604.5	Materials for Venting	36-40
	(a) Vents	36-40
	(b) Piping Above Ground	36-40
	(c) Underground	36-40
	(d) Fittings	36-40
	(e) Acid Systems	36-40
3604.6	Materials—Special Requirements	36-40
	(a) Caulking Ferrules	36-40
	(b) Soldering Nipples and Bushings	36-43
3604.7	Identification of Materials	36-43
3604.8	Sinks and Special Fixtures	36-43
3604.9	Periodic Review	36-43
3604.10	Special Materials	36-43
3604.11	Effective Standards	36-43

PLUMBING (Continued)

3604 MATERIALS

3604.1 MATERIALS:

- (a) **MINIMUM STANDARDS:** Standard specifications for materials for plumbing installations are listed in Tables A, B and C. Products conforming to the specifications listed for such products shall be considered acceptable in the construction, installation, alteration, or repair of any part of a plumbing and drainage system, except that the BCO may allow the extension, addition, or relocation of existing soil, waste, or vent pipes with materials of like grade or quality.

3604.2 MATERIALS FOR PIPING SYSTEMS:

- (a) **GENERAL:** Pipe, tubing and fittings for plumbing systems shall comply with the requirements of this section, and Section 3607, "JOINTS AND CONNECTIONS."
- (b) **ABOVE GROUND DRAINS WITHIN BUILDINGS:** Piping for a drainage system within a building or structure conveying non-corrosive, non-salt or non-brackish wastes, shall be of centrifugally spun cast iron soil pipe, galvanised wrought iron, galvanised steel, brass or copper pipe, Schedule 40 polyvinyl-chloride pipe and fittings, or copper tube Type K, L, M or DWV. Piping for a drainage system within a building or structure conveying corrosive, salt, or brackish wastes shall be Schedule 40 P.V.C. or cast iron. Cast iron in buildings exceeding three stories shall be extra heavy weight.
- (c) **UNDERGROUND DRAINS WITHIN BUILDINGS:** All drains conveying non-corrosive, non-salt or non-brackish wastes, within buildings, when underground, shall be cast iron soil pipe, Schedule 80 P.V.C. pipe, or brass pipe; except that copper tube and fittings Type K or L may be used for underground drainage installations for private residential or duplex work, including indirect waste lines. All underground piping conveying corrosive, salt or brackish wastes, within buildings shall be cast iron pipe or Schedule 80 P.V.C. All underground cast iron piping in buildings exceeding three stories shall be extra heavy weight.
- (d) **UNDERGROUND DRAINS IN HIGHLY CORROSIVE AREAS:** On all filled ground where the presence of hydrogen sulphide gas or other injurious elements are known, and in areas being or having been filled below high tide, all underground soil, vent and waste piping and fittings shall be extra heavy cast iron or Schedule 80 P.V.C.

- (e) ACID WASTE PIPING: All pipes and fittings in a system conveying liquids with high acid content to a point of approved neutralisation, or dilution, including the connecting fitting in a main drain or sewer, shall be 14% silicon cast iron, Schedule 80 P.V.C., vitrified clay pipe, glass, or other approved material.
- (f) PRESSURE PIPING: Pressure piping within buildings, including potable cold water distribution piping, shall be type K or I, copper tube, non-toxic schedule 40 or 80 P.V.C., brass, galvanised wrought iron or steel schedule 40 pipe, or cast iron pressure pipe. All piping shall be as recommended by the manufacturer for the temperatures and working pressures involved. CPVC may be used in certain cases for hot water piping, provided the prior approval of the Buildings Control Officer has been obtained.

Underground piping shall be copper, cast iron, or P.V.C. P.V.C. piping shall not be used for fire lines. All pressure piping within a building under a concrete floor slab shall be Schedule 80 P.V.C., Type K copper, or cast iron pressure pipe. Pressure piping systems, conveying salt or brackish water for flushing water service shall be P.V.C., or cast iron. Galvanised steel for any water service other than for fire lines is not recommended. See Section 3614, "WATER SUPPLY AND DISTRIBUTION" for further recommendations.

3604.3 BUILDINGS SEWER:

- (a) GENERAL: The building sewer shall be of not less than four inch diameter and shall be cast iron soil pipe, Schedule 40 P.V.C. pipe, or vitrified clay pipe conforming to A.S.T.M. specification C-200, extra strength including 4-inch size, with an approved interlocking P.V.C. compression-joint formed on vitrified clay pipe at the factory. Joints shall be water-tight and rustproof.
- (b) VITRIFIED CLAY OR P.V.C. INSTALLATION:
 - (1) USE: Vitrified Clay Pipe conforming to ASTM specifications C-200, extra strength including 4" size, with an approved interlocking compression joint formed on vitrified clay pipe at the factory and made of elasticised— polyvinyl chloride to specifications established by the National Clay Pipe Manufacturers, Inc. ASTM-C425. Installation methods for bedding, backfill and depth of cover of vitrified clay pipe and P.V.C. shall be the same.
 - (2) PLASTIC PIPES:
 - (a) USE: The use of plastic pipe for building sewers shall be limited to Schedule 40 or 80 P.V.C. properly installed to allow for expansion-contraction and adequately supported.

- (3) MATERIAL: Plastic pipe and fittings shall be manufactured of polyvinyl chloride (PVC) conforming to Commercial Standard C272 as developed by the U.S. Department of Commerce, Office of Commodity Standards.
- (4) JOINTS: All joints shall be made so that pipe and fittings shall be fully seated with no open space in the invert. Joints shall be solvent welded with sleeves, or butt welded by heat fusion using the heat plate as recommended by the manufacturer. Jointing between cast iron and plastic pipe shall be made by use of hot poured joints. Installation procedures and solvents shall conform to CS 272, or as approved by the BCO.
- (5) PIPE BEDDING:
 - (1) Where the top of the barrel is shallower than 3 ft. 0 in. under roads which could be used by motor vehicles, or 1 ft. 6 in. elsewhere, such pipes shall be protected either by reinforced concrete slabs or by strengthening the pipe with concrete.
- (6) Trenches at the level of the top of the pipe shall not be more than 12 inches wider than the outside diameter of the pipe collars hubs, or joints. Trenches shall be excavated at least 4 inches below the underside of the pipe and this space refilled with well-compacted fill, free from large rocks or boulders. After pipelaying the trench shall be refilled up to the level of the middle of the pipes with fill free from large rocks or boulders, carefully compacted. From this level to a height of 12 in. above the top of the pipes the trench shall be refilled with fill carefully compacted by hand in layers of not more than 6 inches.
- (7) Where slabs are used to protect a shallow pipeline they shall be made of reinforced concrete, the thickness reinforcement being decided by the Buildings Control Officer; supported on unexcavated ground on each side of the trench: and set with the underside of the slabs not less than 2 in. above the tops of the pipe collars.
- (8) Where a shallow pipeline is protected by strengthening with concrete the trench shall be excavated, pipes tested, and the trench partly refilled, then the upper half of the pipe shall be covered with concrete to a depth of at least 4 inches with the concrete extending on either side of the pipeline at least as far as the outside of the collars. Provide a vertical gap 1/2 inch wide at each joint to permit flexibility. The trench shall

not be refilled above the concrete until it has cured for at least 48 hours.

- (9) **FITTINGS:** Manufactured fittings or reducers shall be used at all changes in line, grade or size of sewer and adapters for connection to vitrified clay or cast iron pipe shall be furnished with joints as specified for vitrified clay or cast iron pipe. All P.V.C. fittings buried under floor slabs which constitute a change in direction of more than 45 degrees shall be encased with 6 inches of concrete.

- (c) **TEST REQUIRED:** Before approval, each installation shall be tested as follows: The end of the building sewer shall be plugged at the point of connection with the public sewer. The building sewer shall then be filled with water and tested with not less than a ten-foot (10') head of water and proven tight.

- (d) **OLD BUILDING DRAINS AND SEWERS:** Old building drains and building sewers may be used in connection with new buildings or new plumbing and drainage work only when they are found on examination or test, to conform in all respects to the requirements governing new building drains and building sewers.

- (e) **BUILDING STORM SEWER:** The building storm sewers shall be clay pipe, cast iron, P.V.C., cement-asbestos, concrete pipe, or other material approved by the Buildings Control Officer.

- (f) **INSIDE LEADERS AND DRAINS:** When placed within the building or run in an inner or interior court or shaft, all roof leaders shall be constructed of Schedule 40 P.V.C., or cast iron with oakum and lead caulked joints; copper tube, brass, galvanised wrought iron or galvanised steel pipe with recessed drainage fittings. Where only one roof drain is to be installed, the roof must have emergency overflow scuppers, in sizes approved by the Buildings Control Officer to prevent flooding.

- (g) **COLLECTION BOXES:** Connection to sheet metal collection boxes shall be made only with lead pipe wiped on a ferrule or an adapter, flared and soldered to the bottom of each box. Cast iron or brass roof drains with domes or strainers shall be connected with oakum and lead caulked joints, screw threads or copper tube with soldered sweat joints.

- (h) **OUTSIDE LEADERS:** Outside rain leaders shall be installed as follows: Where located in a place accessible or exposed to contact with vehicles, cast iron shall be extended five feet above grade. All

other locations, cast iron shall extend at least one inch above grade. Install foot block at bottom of leader eight inches above grade and six inches beyond leader. Foot block shall be concrete.

- 3604.4 MATERIAL FOR CLEANOUTS: Cleanouts shall be a brass to iron or other approved connection and conform to the weight and materials required for pipe and fittings of the same metal, and extend not less than one-quarter inch above the hub.
- 3604.5 MATERIALS FOR VENTING:
- (a) VENTS: Pipe, tubing and fittings for the vent piping system shall comply with the standards and provisions of this Code. (See Table C.)
 - (b) PIPING ABOVE GROUND: Vent piping shall be of cast iron, galvanized wrought iron, galvanized steel, lead, brass, or copper tube, or Schedule 40 P.V.C.
 - (c) UNDERGROUND: Vent piping placed underground shall be cast iron soil pipe or Schedule 80 P.V.C.
 - (d) FITTINGS: Fittings shall conform to the type of pipe used in the vent system as required by Sub-Section 3604.2 Drainage pattern fittings shall not be required in a dry vent system.
 - (e) ACID SYSTEMS: Vent piping on acid-waste systems shall conform to that required for acid-waste piping specified in Sub-Section 3604.2 "MATERIALS FOR PIPING SYSTEMS."
- 3604.6 MATERIALS — SPECIAL REQUIREMENTS:
- (a) CAULKING FERRULES: Brass caulking ferrules shall be of brass pipe conforming to FS WW-P-351 or of heavy cast brass of weight and dimensions in accordance with the Table A. Seamless copper ferrules may be used in lieu of cast brass, provided they correspond in size and weight. (See Table C.)

**TABLE A
CAULKING FERRULES**

Pipe Size (Inches)	Actual Inside Diameter (Inches)	Length	Weight	
			lb	oz.
2	2-1/4	4-1/4	1	0
3	3-1/4	4-1/2	1	12
4	4-1/4	4-1/2	2	8

Materials	ASA (ANSI)	ASTM	NBS	Other Standards, Remarks
Non-Metallic Piping				
Clay Sewer Pipe		C13	SS-P-36lb	Standard strength
Concrete Sewer Pipe 4 to 24 inch	A106.3	C200 C76 C14	SS-P-36lb SS-P-375b SS-P-371c	Extra strength Reinforced Non-reinforced (Type I)
Concrete Drintile		C4		
Polyvinyl Chloride Pipe			CS-272	
Asbestos Cement Sewer Pipe			SS-P-351a SS-P-351b	
Ferrous Pipe and Fittings				
Cast Iron Soil Pipe and Fittings XH	A40.1	A74	WW-P-401c	
Cast Iron Soil Pipe and Fittings Service Wt.		A74		CS-188
Cast Iron Water Pipe	A21.2		WW-P-421b	AWWA C100
Cast Iron (Threaded) Pipe	A40.5		WW-P-356	
Cast Iron (Screwed) Fittings	B16.4		WW-P-501c	
Cast Iron Drainage Fittings	B16.12		WW-P-491a	
Wrought Iron Pipe	B36.2	A72	WW-P-44b	
Steel Pipe		A120	WW-P-406b	Type I and II
Open-Hearth Iron Pipe	B36.23		WW-P-406b	Type III only
Malleable Iron Fittings (150 lb.)	B16.3	A338	WW-P-521c	
Malleable Iron Fittings (300 lb.)	B16.19			
Non-Ferrous Pipe and Fittings				
Brass Tubing		B135	WW-T-791	
Brass Pipe	H27.1	B43	WW-P-351a	
Brass or Bronze Flanges and Flanged Fittings	B16.24			
Cast Brass Soldered Joint Fittings	B16.18			For copper water tube
Cast Brass Soldered Joint Drainage Fittings	B16.23			For DWV tube
Bronze Screwed Fittings	B16.15		WW-P460a	
Copper Pipe	H26.1	B42	WW-P-377d	
Seamless Copper Tubing		B75	WW-T-797c	
Copper Water Tube (KLM)	H23.1	B88	WW-T-799b	
Wrought Copper and Wrought Bronze Soldered Joint Fittings	B16.22			
Copper Drainage Tube (DWV) Flared Fittings for Copper		B306		
(water) Tubes	B16.26			
Lead Pipes and Traps			WW-P-325	CS-95 CS 96

Miscellaneous

Caulking Lead			QQ-C-40 (Type I)	CS-94
Sheet Lead			QQ-L-201	Grade A
Sheet Brass		B36	QQ-B-613b	
Sheet Copper		B152	QQ-C-576b	
Galvanised Iron and Steel Sheets	G8.2	A525	QQ-S-775c	
Galvanised Pipe and Fittings		A120	WW-P-406b	
Cement Lining	A21.4	A120	WW-P-406b	
Coal-Tar Enamel (protective coating)				AWWA C-203
Silver Solder		B260		
Soft Solder		B32	QQ-S-571d	
Fixture Setting Compound			HH-C-536a	
Air Gap Standards	A40.4			
Backflow Preventors	A40.6			
Valves—Bronze Gate			WW-V-54b	
Valves—Iron Gate			WW-V-58	
Vacuum Breakers				ASSE 1001
Ball Cocks				ASSE 1002
Relief Valves				ASSE 1003
Cast Iron Plumbing Fixtures				CS-77
Drinking Fountains	Z4-2			
Earthenware (Vitreous Glazed)				CS-111
Formed Steel Enameled Sanitary Ware			WW-P-542a	
Formed Metal Porcelain Enameled Sanitary Ware				CS-144
Plumbing Fixtures			WW-P-541b	
Domestic Hot Water Heaters	Z21.10.1		W-H-196b	UL-174
Corrosion Resisting Sinks*				

* Corrosion-resisting metal sinks shall be either stainless steel or monel metal. Alloy compositions conforming to Nickel-copper alloy or corrosion-resisting steel as specified in WW-P-541a Table VIII or type number 302 or 430 will be acceptable. For domestic use the minimum permitted metal thickness shall be 0.0375 inches (#20 U.S. Standard Gage for Sheet and Plate Iron and Steel) and for other than domestic use a minimum of 0.050 inches (#18 gauge). Bowls shall be seamless drawn welded with well rounded corners and edges. All exposed welds shall be made smooth and invisible and all visible surfaces shall have a smooth satin finish. The entire underside of fixture shall be coated with an adherent compound that will effectively deaden sound.

(b) **SOLDERING NIPPLES AND BUSHINGS:** Soldering nipples and bushings shall be brass pipe, standard size conforming to FS WW-F-351 or ASTM Specification B251-58 or of heavy cast brass of weight and dimensions in accordance with Tables B and C.

3604.7 **IDENTIFICATION OF MATERIALS:** Each length of pipe, and each pipe fitting, trap, fixture, and device used in a plumbing system shall have cast, stamped, or indelibly marked on it the maker's mark or name, the weight, type, and classes of the product, when such marking is required by the approved standard that applies.

3604.8 **SINKS AND SPECIAL FIXTURES:** Sinks and special fixtures may be made of soapstone, chemical stoneware, or may be lined with lead, copper-base alloy, nickel-copper alloy, corrosion-resisting steel or other materials especially suited to the use for which the fixtures are intended.

3604.9 **PERIODIC REVIEW:** The Minister shall periodically, at least once every two years, review the approved list of United States Standards for materials in plumbing installations and, if more recent revisions of such recognized standards are available and acceptable, adoption of such standards may be recommended.

3604.10 **SPECIAL MATERIALS:** Descriptive data and / or samples of materials for special piping systems as referenced in Section 3, GENERAL, shall be submitted to the BCO for approval.

3604.11 **EFFECTIVE STANDARDS:** The edition, or revision, to any Standard or Specification referenced in this Code which was in effect at the time that a Building Permit was actually issued shall be the governing document for the purposes of this Code. Most referenced standards in this Code are available for public inspection at the Ministry for Works. Addresses for procurement of copies of all referenced standards are available at the Ministry for Works.

SUB-INDEX

3605 DRAINAGE SYSTEM AND DISPOSAL

Paragraph No.	Paragraph Title	Page No.
3605.1	General Requirements	36-46
	(e) Encroachment on Private Property - Easement Required	36-46
	(f) Sewer Easement	36-47
	(g) Plans and Specifications and Information Required	36-47
3605.2	Regulations Governing the Discharge of Liquid Wastes and/or Sewage into the Public Sewer System	36-47
	(b) Approval and Permits Required Before Commencing	36-47
	(c) Prohibited Discharges to Sewers	36-47
	(d) Sewer Connections Required and Limited	36-47
	(e) Impeding, Impairing, or Surcharging Public Sewer Prohibited	36-48
3605.3	Sewage and Liquid Waste Disposal Where a Public Sewer is Available	36-48
	(b) Liquid Waste Disposal Where a Public Sewer is Available	36-48
3605.4	Conditional Retention and Time Discharge to Public Sewers	36-49
3605.5	Sewage and Liquid Waste Disposal Where a Public Sewer is Not Available	36-50
	(c) Dilution Tank Required for Corrosive Wastes	36-51
	(d) Independent Systems	36-52
	(e) Limits for Discharge of Liquid Waste Into Septic Tanks and Drainage Pipes	36-52
	(f) Discharge of Sewage or Liquid Waste Into Natural or Artificial Bodies of Water	36-52
	(g) Garbage Contributed to Sewers from Domestic and Commercial Food Grinders	36-52
3605.6	Fixture Units: Values for Fixtures	36-52
3605.7	Determination of Sizes for the Gravity Drainage System	36-54
	(a) Maximum Fixture-Unit Load	36-54
	(b) Sizes of Horizontal Sewers and Drains	36-54
	(c) Sizes of Vertical Soil and Waste Stacks	36-55
3605.8	Restrictions	36-56
	(a) Minimum Size of Vertical Soil and Waste Stacks	36-56

	(b) Future Fixtures	36-56
3605.9	Sumps and Ejectors—Drainage Below Street Level	36-56
	(a) Sumps, Sewage and Liquid Waste Ejectors	36-56
	(b) Minimum Number Ejectors Required	36-57
3605.10	Sump Construction	36-57
3605.11	Sump Vents	36-57
3605.12	Motors and Compressors for Ejectors	36-58
3605.12	(b) Connections	36-58
	(c) Subsoil Drains	36-58
	(d) Building Subdrains	36-58
3605.13	Vacuum Operated Drainage Systems	36-58
3605.14	Connections to Public Sewers	36-58

PLUMBING (Continued)

3605 DRAINAGE SYSTEM AND DISPOSAL

3605.1 GENERAL REQUIREMENTS:

- (a) Sewage and liquid waste shall be treated and disposed of as hereinafter provided in Section 3615, "Sewage and Liquid Waste Disposal Systems." Septic tanks, sewage treatment systems, soakage pits, drainage wells, and/or other drainage work on or from premises or building sites shall be constructed, installed and maintained as herein provided.
- (b) It shall be unlawful for any person to cause, suffer, or permit the disposal of sewage, human excrement and/or liquid waste in any place or manner except through and by means of an approved plumbing and drainage disposal system installed and maintained in accordance with the provisions of this Code, except for those buildings covered under the Small Building Code, Section 3617.
- (c) In areas where no public sewer is provided or where a connection to the public sewer is not permitted or where no sewer connection through an easement is available, plumbing and drainage of all properties shall be connected to a private disposal system constructed in compliance with the provisions hereinafter set forth. (NOTE): Some public sewers are surcharged or over-loaded. In some instances, therefore, the Minister may prohibit the disposal of additional waste to these sewers. Liquid wastes shall then be disposed of by means of an approved soakage pit, drainage well, or other means approved by the Minister of Health.
- (d) No septic tank, drainfield pipe, soakage pit, drainage well or water supply well or other drainage work shall be installed or discharged on any public property outside the property lines of the premises or structures served without first securing written approval from the Minister of Health.
- (e) ENCROACHMENT ON PRIVATE PROPERTY—EASEMENT REQUIRED: No sewer, septic tank, drainfield pipe, soakage pit, drainage well, water supply well or other drainage work shall be located or installed or discharged on any privately owned property outside the property lines of the premises or structures served except as specifically permitted herein. Permission for such installation may be granted upon presentation to the Minister of a

property executed easement which has been recorded with the Minister. Such easement properly executed and recorded as aforesaid must be filed before a permit for such work may be approved. The common ownership of the property for which such permit is approved and the property encumbered by such easement shall not waive any of the above requirements.

- (f) SEWER EASEMENT: At the option of the owner of a property which does not abut a public sewer but where a sewer connection can be secured through an adjoining lot or property whether of the same ownership or not, a connection to the public sewer may be made through such adjoining lot or property by virtue of a properly executed and recorded easement under such conditions as the Minister and The Registrar General shall permit.
- (g) PLANS AND SPECIFICATIONS AND INFORMATION REQUIRED: Complete and detailed specifications, plans and other information shall be provided as required in this Code from the person designing the work and/or by the owner of the premises desiring to dispose of liquid waste or sewage before a permit is approved and construction work of any nature is commenced.

3605.2 REGULATIONS GOVERNING THE DISCHARGE OF LIQUID WASTES AND/OR SEWAGE INTO THE PUBLIC SEWER SYSTEMS:

- (a) The volume of liquid waste discharged into the public sewer system shall be regulated in such manner as not to impede or overload or surcharge or cause the public sewer system to overflow or back up into private property or flood public thoroughfares or private property.
- (b) APPROVAL AND PERMITS REQUIRED BEFORE COMMENCING: No work shall be commenced before the approval of the BCO is secured in writing upon plans submitted or before a building and plumbing permit is issued. The Minister shall not give approval for the discharge of liquid waste to a public sewer except in accordance with the following terms and restrictions:
- (c) PROHIBITED DISCHARGES TO SEWERS: Storm or rainwater or other liquid waste shall not discharge into a sanitary sewer, nor shall sewage discharge into a public storm sewer, except as herein provided for.
- (d) SEWER CONNECTIONS REQUIRED AND LIMITED: Connection for the disposal of sewage and liquid waste shall be made to a public

sewer when and where such connection can be made without impeding, over-loading or surcharging the public sewer system.

- (e) IMPEDING, IMPAIRING, OR SURCHARGING PUBLIC SEWER PROHIBITED: Notwithstanding any other provisions of this Code, no person, firm or corporation shall permit any sewage, substance or liquid waste to discharge into a public or private sewer, which would injure, impede, impair, overflow, surcharge overload, stop or clog such sewer. No person, firm or corporation shall permit any explosive or volatile substances, cleaning fluids, solvents, gas, smoke, exhaust fumes, gasoline, benzine, naphtha, steam, acid, oil, grease, sand, glass or any other deleterious substances to enter or discharge into a plumbing system or a public sewer system.

3605.3 SEWAGE AND LIQUID WASTE DISPOSAL WHERE A PUBLIC SEWER IS AVAILABLE:

- (a) Sewage and liquid waste shall discharge into a public sewer if such sewer is available and abutting the property except as herein provided. Rainwater only may discharge to street gutters (not over sidewalks) if permitted by the Minister.
- (b) LIQUID WASTE DISPOSAL WHERE A PUBLIC SEWER IS AVAILABLE: Liquid waste may discharge into a public sewer only upon approval of the Minister. Such approval shall accompany request for plumbing plan approval and the permit therefor shall be obtained from the Minister of Works if not permitted to discharge into a public sewer, liquid waste may discharge to soakage pits or drainage wells; however, the responsibility for satisfactory operation shall rest upon the owner, and permits shall be issued conditionally with the owner (not the contractor or other person) assuming full responsibility for the maintenance and operation.

NOTE: Some types of liquid wastes cannot be successfully disposed of via pits or wells. Pits and wells receiving liquid wastes from establishment such as automobile wash floors, refrigerators, laundries, milk bottling plants, bars and food processing plants generally result in unsanitary conditions and public nuisance, and therefore must be abated by legal action. Soakage pits and drainage wells for rainwater or other clear water wastes have operated successfully in the majority of installations.

3605.4 CONDITIONAL RETENTION AND TIME DISCHARGE TO PUBLIC SEWERS:

(a) Where the Minister of Works determines a public sewer to be overloaded and /or surcharged at times of peak usage, said Department is hereby empowered and authorized to issue a conditional permit for the discharge of sewage or liquid waste to the public sewer system, provided that the owner and designer shall comply with all conditions and requirements set forth in said conditional permit and /or contained in this Code and before a sewer permit is issued. Conditional permits shall provide:

- (1) That a retention tank of suitable and acceptable size be provided, designed to hold and retain all of the sewage and liquid waste at times when the public sewer is overloaded and surcharged and to discharge the contents of said tank at such time as the Minister of Works may require and specify. See Section 3615, SEWAGE AND LIQUID WASTE DISPOSAL SYSTEMS.
- (2) That such tank be provided with an automatic time control device designed to limit and regulate the flow from the tank to the public sewer at a time when and in such quantity as within the capacity of the public sewer to care for same.
- (3) That the premises be open to inspection at such time and place as the Minister of Works may specify, and that the installation be maintained in good and proper working condition.
- (4) That upon a violation of any of the provisions herein contained the conditional permit shall be revoked and the sewer connection be removed and plugged as directed by the Minister.
- (5) That should such connection not be removed upon proper notice, the Minister of Works is hereby authorized to cause a disconnection and assess the cost of same to the owner and /or management of the property in accordance with the Rules and Regulations.
- (6) Any permit issued for connection to a public sewer under any of the conditions set forth in any of the foregoing sections, shall be issued and accepted conditionally.

- (b) Such conditional permit shall be issued in writing by the Minister of Works and the acceptance of the terms and conditions of issuance shall be indicated thereon by the signature of the person to whom such permit is granted. It is expressly provided, however, that in the event of change of ownership and/or occupancy of the property and/or premises for which such permit has been granted then such permit shall become void and of no effect, unless renewed by the Minister of Works. Upon the change of ownership and/or occupancy the person to whom a conditional permit is granted shall forthwith surrender such conditional permit to the Minister for regranting and/or cancellation.

3605.5 SEWAGE AND LIQUID WASTE DISPOSAL WHERE A PUBLIC SEWER IS NOT AVAILABLE:

- (a) Where a public sewer is not available, sewage, all waste from plumbing fixtures, except liquid waste of a non-fecal character, shall discharge into a septic tank or other acceptable method of sewage disposal as hereinafter provided. Liquid wastes of a non-fecal character shall discharge into an approved soakage pit, drainpipe field or bed or drainage well for that purpose only and/or shall be disposed of by a form of treatment acceptable to the Minister of Health. Rainwater soakage pits shall be separate structures used only for the purpose of rainwater disposal.
- (b) Where a permit to connect to a public sewer is refused, or where no public sewer is available, the factors in Table E shall govern and apply in the disposal of liquid wastes from establishments as herein set forth or similar establishments.

Type of Liquid Waste	Type of Establishment	Method of Disposal
(a) Liquid wastes containing appreciable amounts of grease, oil, solids or other material in suspension or liquid wastes of like character from establishments such as:	Auto Wash Floors Bakeries Bottling Plants Candy Manufacturing Plants Dry Cleaning Plants Restaurants or places preparing or serving food Laundries Milk Plants Food Processing Plants	To separate disposal systems for such waste only.
(b) Liquid wastes which ordinarily do not contain appreciable amounts of oil, grease, solids or other materials in suspension from establishments such as:-	Air Conditioning Equipment Liquor or Beer Bars Juice Bars Soda Fountains not preparing or serving food Condensation from Refrigeration Boiler or Clothes Pressing Blow-Off Exhausts Ice Plants Fire Sprinkler Drains Drip or Overflow Pans Condensers Dehumidifiers	May be discharged to disposal system combined for liquid waste as defined in Paragraph 3605.5.
(c) DILUTION TANK REQUIRED FOR CORROSIVE WASTES: No corrosive waste which has a pH of less than 5.0 shall discharge into any plumbing pipe or any house drain or a house sewer of standard material and construction without first discharging into a neutralizing tank or basin. Every neutralizing tank or basin used for this purpose shall be constructed of earthenware or glass or other non-corrosive material and shall be provided with a standing waste and overflow or other approved means to insure neutralization. A chamber shall be provided to retain a sufficient quantity of lime or other approved neutralizing material which shall be removed as often as may be necessary to render such neutralization effective. Such neutralizing tank or basin shall be provided with a controlled supply of water or neutralizing medium to make its contents non-injurious to an ordinary plumbing system		

or to the public sewer system. All pipes and fittings to neutralizing tanks and to a point of approved neutralization in a plumbing system, including the connecting fitting in a main drain or sewer, shall be 14% silicon cast iron, schedule 80 P.V.C., vitrified clay pipe, or equal.

- (d) INDEPENDENT SYSTEMS: The septic tank and drainage system of each building shall be separate and independent of any other building except that where buildings are built on single lot or building site of single ownership and it is apparent that the lot cannot be subdivided and result in dual ownership, one septic tank and drainage system may be installed.
- (e) LIMITS FOR DISCHARGE OF LIQUID WASTE INTO SEPTIC TANKS AND DRAINAGE PIPES: Liquid waste shall not discharge into an existing septic tank or drainpipe thereof when such septic tank and drainpipe constitute the minimum requirement of this Code for the disposal of sewage.
- (f) DISCHARGE OF SEWAGE OR LIQUID WASTE INTO NATURAL OR ARTIFICIAL BODIES OF WATER: The discharge of any sewage or liquid waste (as herein defined) whether treated or untreated into any body of water natural or artificial is hereby prohibited except as expressly permitted by the Minister of Health.
- (g) GARBAGE CONTRIBUTED TO SEWERS FROM DOMESTIC AND COMMERCIAL FOOD GRINDERS: Garbage contributed from domestic and commercial food grinders shall not enter a sewer which conveys same to a sewer treatment plant unless approved by the Minister of Works.3605.6

3605.6 FIXTURE UNITS: VALUES FOR FIXTURES: Fixture unit values as given in Table G designate the relative load weight of different kinds of fixtures which shall be employed in estimating the total load carried by a soil or waste pipe and shall be used in connection with the tables of sizes for soil, waste, and drain pipes for which the permissible load is given in terms of fixture units.

Fixture Type	Fixture Unit Value as Load Factors	Minimum Size of Trap Inches
Bathtub (with or without overhead shower)	2	1-1/2
Bidet	2	1-1/2
Dental unit or cuspidor	1	1-1/4
Dental lavatory	1	1-1/4
Drinking fountain	1/2	1-1/4
Dishwasher domestic	2	1-1/2
Floor drains	3	3 or 4
Lavatory	1 (Small P.O.)	1-1/4
Lavatory	2 (Large P.O.)	1-1/2
Lavatory, barber, beauty parlor	2	1-1/2
Lavatory, surgeon's	2	1-1/2
Laundry tray (1 or 2 compartments)	2	1-1/2
Shower stall domestic	2	2
Showers (group) per head	3	2
SINKS		
Combination sink-and-tray	3 (Nominal)	2
Combination sink-and-tray with food disposal unit	3	1-1/2
Kitchen sink, domestic	2	1-1/2
Kitchen sink, domestic with food waste grinder	3	1-1/2
Surgeon's sink	3	3
Flushing rim sink (with valve)	8	3 or 4
Service sinks, combination trap standard	3	2
Service sink (P Trap) ordinary	2	1-1/2 or 2
Pot, scullery, etc., sink	4	1-1/2
Wash sink (circular or multiple) each set of faucets	1	3
Urinal, pedestal	8 (Nominal)	2
Urinal, wall	4	2
Urinal stall, washout	4	2
Water closet, tank operated	4 (Nominal)	3
Water closet, valve-operated	8 (Nominal)	3
Automatic-dish washer (domestic)	2	1-1/2
Automatic clothes washer	4	1-1/2

Fixtures Drain or Trap Size	Fixture Unit Value
1-1/4 inches and smaller	1
1-1/2 inches	2
2 inches	3
2-1/2 inches	4
3 inches	5
4 inches	6

3605.7 DETERMINATION OF SIZES FOR THE GRAVITY DRAINAGE SYSTEM:

- (a) **MAXIMUM FIXTURE-UNIT LOAD:** The maximum number of fixture units that may be connected to a given size gravity drain line are given in Tables I and J.
- (b) **SIZES OF HORIZONTAL SEWERS AND DRAINS:** The required sizes of horizontal building drains, building sewers, and horizontal branches shall be determined on the basis of the total number of fixture units drained by them in accordance with Tables G and H.

Maximum Number of Fixture Units That May Be Connected to any Portion of the Building Drain or the Building Sewer

Diameter of Pipe Inches	Fall Per Foot		
	1/16 Inch	1/8 Inch	1/4 Inch
1-1/4	1	1	1
1-1/2	2	4	6
2	4	10	21
2-1/2	12	18	24
3	22	28	36
3	60	180	216
5	150	390	480
6	360	700	840
8	1,400	1,600	1,920
10	2,500	2,900	3,500
12	3,900	4,600	5,600
15	7,000	8,300	10,000

NOTATIONS:

- (1) Not over two fixtures having integral traps requiring three or four-inch waste connection (residential buildings only), may connect to a 3-inch horizontal drain. No water closets may discharge into a 3" line graded at less than 1 / 8" per foot.

- (2) Size building sewers shall be a minimum of 4-inches with the exception that if connecting to a septic tank and if the developed length measured along the pipe and fittings from the exterior of the building wall to the septic tank does not exceed 10 feet, the building sewer may be sized the same as the building drain. Septic tanks located more than 20-feet from a building shall be provided with a 4-inch diameter local vent.

- (3) No water closets in Commercial, Catering, or Industrial Buildings shall be connected to less than a 4-inch horizontal drain.

- (c) **SIZES OF VERTICAL SOIL AND WASTE STACKS:** The required sizes and permitted lengths of vertical soil or waste stacks shall be independently determined by the total fixture units of all fixtures connected to the stack in accordance with Tables G and H. as permitted in Table J.

Diameter of Pipe in Inches	Maximum Number of Fixture Units	Permitted Length in Feet	Total Fixture Units at One Story or Branch Interval
1-1/4	1	45	1
1-1/2	8	60	6
2	24	80	12
2-1/2	36	105	18
3	72	150	36
4	500	225	120
5	1,100	300	200
6	1,900	400	350
8	3,600	600	600

NOTATIONS:

No kitchen sinks or other sinks receiving greasy wastes shall be installed in a waste stack less than 2" in diameter, nor on any wet vent 2" or less in diameter except as set forth for "Food Waste-Disposal Connections" specified hereinafter. No pump discharge fixtures shall be installed on a cross less than 2 1/2" stack diameter. Domestic food grinders and domestic dish washing machines shall not be considered as pump discharge fixtures.

3605.8 RESTRICTIONS: No water closet shall discharge into a stack less than three inches in diameter. Not more than two water closets shall discharge into a three-inch stack at the same point. Not more than four water closets shall discharge into a three-inch stack at the same level. All horizontal soil and waste sections shall be governed by Table I.

(a) MINIMUM SIZE OF VERTICAL SOIL AND WASTE STACKS: No vertical soil or waste stack shall be smaller than the largest horizontal branch connected thereto except that a 3x4 one quarter bend connected to a water closet outlet shall not be considered as a reduction in pipe size.

(b) FUTURE FIXTURES: When provision is made for the future installation of fixtures, those provided for shall be considered in determining the required sizes of drain pipes. Construction to provide for such future installation shall be terminated with a plugged fitting or fittings.

3605.9 SUMPS AND EJECTORS — DRAINAGE BELOW STREET LEVEL:

(a) SUMPS, SEWAGE AND LIQUID WASTE EJECTORS: In all buildings, in which the whole or part of the plumbing or drainage system serving fixtures or appliances lies below the crown level of the street, sewage or liquid waste shall discharge into a sump or receiving tank by gravity from which sump or receiving tank the sewage or liquid waste shall be lifted and discharged into the building sewer or drain by ejectors. Such ejectors shall automatically empty the sump, which shall be large enough to receive peak flow for 30 minutes, unless approved in writing for smaller sizes by the Buildings Control Officer. Sump discharge pipes shall be provided with a check valve located on the sump side of a gate valve located as close to the sump as possible.

- (b) **MINIMUM NUMBER EJECTORS REQUIRED:** Single ejector for one or two family buildings. Duplex ejectors for all other buildings for sumps collecting sewage. (See definition of sewage.) One ejector permitted for liquid waste provided such a single ejector is not located in a place where failure to operate will flood a place where food or drink is stored or prepared. A single air ejector, with duplex air compressors, may be provided for public buildings provided the ejector can pass 3 inch diameter solids.

3605.10 **SUMP CONSTRUCTION:** Sump basins or receivers shall be waterproof concrete adequately reinforced with steel rods, cast iron, or vitrified clay. If of vitrified clay pipe the bottom shall rest on a concrete base extending at least six inches laterally from the pipe. All basins and receivers shall be water tight. Due to the high salt content of most waste water, steel basins are subject to special approval by the Buildings Control Officer.

3605.11 **SUMP VENTS:**

- (a) Plumbing fixtures discharging into a sump shall be vented.
- (b) All sumps receiving the discharge from plumbing fixtures shall be vented as follows:
 - (1) No less than a three-inch vent for sumps receiving body waste from plumbing fixtures.
 - (2) For clear water liquid waste, separate sump vent optional, no cover required.
 - (3) Vents from pneumatic ejectors or similar equipment shall be carried separately through the roof.
- (c) Such sump and fixture vents may be connected to the plumbing system discharging into a public sewer or septic tank or extended independently to above the roof.
- (d) All sumps for other than clear wastes, shall be provided with a metal cover. Sumps receiving sewage or liquid waste shall be provided with a gas and air tight metal cover securely fastened in place and provided with an air and gas tight manhole for access for repairs.

3605.12 MOTORS AND COMPRESSORS FOR EJECTORS:

- (a) All motors, air compressors, and air tanks shall be located where they are open for inspection and repair at all times. The air tanks shall be so proportioned as to be of equal cubic capacity to the ejectors connected therewith, in which there shall be maintained an air pressure of not less than two pounds per square inch for each foot of height the sewage is to be raised.
- (b) CONNECTIONS: No direct connection of a steam exhaust, blowoff, or drip pipe shall be made with the building drainage system. Waste water when discharged into the building drainage system shall be at a temperature not higher than 140°F. When higher temperature exists, approved cooling methods shall be provided.
- (c) SUBSOIL DRAINS: Where subsoil drains are placed under the cellar or basement floor or are used to surround the outer walls of a building, they shall be made of open-jointed or horizontally split or perforated clay tile, or perforated bituminized fiber pipe or asbestos cement pipe, not less than four inches in diameter. When the building is subject to backwater, the subsoil drain shall be protected by an accessibly located backwater valve. Subsoil drains may discharge into a properly trapped area drain or sump. Such sumps do not require vents.
- (d) BUILDING SUBDRAINS: Building subdrains located below the public sewer level shall discharge into a sump or receiving tank the contents of which shall be automatically lifted and discharged into the drainage system as required for building sumps.

3605.13 VACUUM OPERATED DRAINAGE SYSTEMS: Plumbing systems employing a vacuum to evacuate the contents of plumbing fixtures may be installed in lieu of gravity drainage systems. Such systems shall be considered special design and will require approval of the Minister of Works and the Minister of Health. Specifications and design calculations will be required for these systems, together with completely detailed plans and diagrams.

3605.14 CONNECTIONS TO PUBLIC SEWERS: Where a sewer or drain from a building is to be connected to a public sewer the plumber or the owner of the building shall complete the work as prescribed by the Minister of Works.

SUB INDEX

3606 INDIRECT WASTE PIPING AND SPECIAL WASTES

Paragraph No.	Paragraph Title	Page No.
3606.1	Indirect Waste Piping	36-60
	(a) General	36-60
	(b) Food Handling	36-60
	(c) Connection	36-60
	(d) Sterile Materials	36-60
	(e) Drips	36-60
3606.2	Material and Size	36-60
3606.3	Clear Water Wastes	36-61
3606.4	Steam Connections	36-61
3606.5	Drinking Fountains	36-61
3606.6	Special Wastes	36-61
3606.6	(c) Neutralizing Device	36-61
3606.7	Air Conditioning Condensate Drains	36-62

PLUMBING (Continued)

3606 INDIRECT WASTE PIPING AND SPECIAL WASTES

3606.1 INDIRECT WASTE PIPING:

- (a) GENERAL: Wastes from the following shall discharge, to the building drainage system, through an indirect waste pipe serving the individual fixtures, devices, appliances or apparatus.
- (b) FOOD HANDLING: Establishments engaged in the storage, preparation, selling, serving, processing, or otherwise handling of food shall have the waste piping from all refrigerators, ice boxes, cooling or refrigerating coils, laundry washers, extractors, steam tables, egg boilers, coffee urns or similar equipment discharge indirectly into a floor drain or as otherwise provided in this Code, or as permitted by the Minister of Health.
- (c) CONNECTION: Indirect waste connections shall be provided for drains, overflows, or relief vents from the water supply system.
- (d) STERILE MATERIALS: Appliances, devices or apparatus such as stills, sterilisers, and similar equipment requiring water and waste connections and used for sterile material shall be indirectly connected and provided with an air gap between the trap and the appliance.
- (e) DRIPS: Appliances, devices, or apparatus not regularly classed as plumbing fixtures but which have drips or drainage outlets and condensate drain from air-conditioning equipment, may be drained by indirect waste pipes discharging into an open receptacle, or as permitted by the Buildings Control Officer.

3606.2 MATERIAL AND SIZE:

- (a) Indirect wastes, when above the floor, shall be a minimum of three-quarter inches diameter, but not less than the size of fixture or appliance outlet and if less than one and one quarter inches diameter shall be of copper tube or Schedule 40 P.V.C. If galvanized waste pipe is used below floor in slab or fill, shall be encased in concrete throughout. If waste is below slab or in fill, it shall be a minimum of one and one-quarter inches in diameter and shall be cast iron pipe, Schedule 80 P.V.C. or Type "L" copper tube with drainage fittings. Indirect waste piping shall be so installed as to permit ready access for flushing and cleansing.
- (b) Indirect waste pipes shall be sized in accordance with Tables I and

J, except drains above floors from defrosting pans may be a minimum of three-quarter inch tubing.

- (c) Drip pipes from walk-in refrigerator floors or store room floors where food is stored shall be installed as indirect wastes and such drip pipes shall discharge into an approved fixture. The drip pipe shall be equipped with a flap check as close as possible to the drain outlet. Such floors shall be two inches above overflow point or receiving fixture.
 - (d) Any fixture or appliance where food or drink is stored, and which is equipped with a drain, shall be independently and indirectly connected to an approved fixture or receptacle whose overflow level is below the bottom of such fixture or receptacle.
- 3606.3 CLEAR WATER WASTES: Water lifts, expansion tanks, cooling jackets, sprinkler systems, drip or overflow pans, or similar devices, which waste clear water only shall discharge into the building drainage system through an indirect waste, as permitted by the Buildings Control Officer.
- 3606.4 STEAM CONNECTIONS: No live steam pipe shall connect directly to any part of a drainage or plumbing system.
- 3606.5 DRINKING FOUNTAINS: Drinking fountains may be installed with indirect waste only for the purpose of resealing required traps of floor drains installed to receive other clear wastes.
- 3606.6 SPECIAL WASTES:
- (a) Acid and chemical indirect waste pipe and fittings shall be of materials unaffected by the discharge of such wastes.
 - (b) Liquid wastes having a pH of less than 5 or more than 10 shall be properly neutralized and diluted before being discharged into any soil or waste pipe or any building drain or sewer.
 - (c) NEUTRALIZING DEVICE: In no case shall corrosive liquids, spent acids, or other harmful chemicals which might destroy or injure a drain, sewer, soil or waste pipe and fittings or which might create noxious or toxic fumes, discharge into the plumbing system without being thoroughly diluted or neutralized by passing through a properly constructed and acceptable dilution or neutralizing device. Such device shall be automatically provided with a sufficient intake of diluting water or neutralizing medium, so as to make its contents non-injurious before being discharged into the soil or sewage system. See Sub-section 3605.5 (c).

3606.7 AIR CONDITIONING CONDENSATE DRAINS:

- (a) Condensate drains shall be a minimum of 3/4 inch diameter for one unit or any number of connected units totalling not over 10 tons of refrigeration capacity, where the length of piping to the point of disposal is no more than 20 feet.
- (b) Air Conditioning condensate drains shall be a minimum of 1-1/4 inch diameter for one unit or any number of connected units totalling over 10 tons of refrigeration capacity, where piping runs exceed 20 feet.
- (c) Connections to the unit drain pans shall be either flexible connections or rigid piping. Flexible connections shall have a dip in the connection two diameters below the invert to top of flexible connection. Rigid piping on units larger than 3 tons shall be provided with a minimum three-inch trap seal and a union installed on pan side of trap. Flexible connections shall not exceed 18 inches in length.
- (d) Condensate drainage systems may be vented.
- (e) Air conditioning condensate drains for units with not more than 5 tons capacity may discharge upon a pervious area. Units with not more than ten tons capacity may discharge to a 10-inch diameter by 24-inch long pipe without cover, filled with 3/4 inch crushed rock.
- (f) Air conditioning condensate drains for units regardless of tonnage may discharge to a drainage well, storm sewer, adequate soakage pit, drainfield or the building drainage system where such discharge is approved by the Buildings Control Officer.

Connections to storm sewer or building drains shall be by indirect connections.

- (g) The materials to be used in condensate drains for air conditioning equipment shall comply with the minimum standards as set forth in Section 3604 or shall comply with the minimum standards for Schedule 40 PVC of Commercial Standard C272.

SUB-INDEX

3607 JOINTS AND CONNECTIONS

Paragraph No.	Paragraph Title	Page No.
3607.1	Tightness	36-63
3607.2	Types of Joints	
	(a) Caulked Joints	36-64
	(b) Threaded Joints—Screwed Joints	36-64
	(c) Wiped Joints	36-64
	(d) Soldered or Sweat Type Joints	36-64
	(e) Hot-Poured Joints	36-64
	(f) Precast Joints for Non-Metallic Pipe	36-65
	(g) Brazed Joints	36-65
	(h) Cement Mortar Joints	36-65
	(i) Burned Lead or Plastic Joints	36-65
	(j) Asbestos Cement Sewer Pipe Joints	36-65
	(k) Bituminized Fiber Pipe Joints	36-65
	(l) P.V.C. Joints	36-66
	(m) Mechanical Joints	36-66
3607.3	Special Joints	
	(a) Copper Tubing to Screwed Pipe Joints	36-66
	(b) Welding or Brazing	36-66
	(c) Slip Joints	36-66
	(d) Expansion Joints	36-66
	(e) Ground Joint Brass Connections	36-66
3607.4	Unions (Screwed)	
	(a) Drainage System	36-67
	(b) Water Supply System	36-67
3607.5	Floor Connected Fixtures with Integral Trap	36-67
3607.6	(a) Prohibited Joints and Connections in Drainage Systems	36-67
	(b) Exceptions	36-67
3607.7	Waterproofing of Openings	36-67
3607.8	Increases and Reducers	36-67

PLUMBING (Continued)

3607 JOINTS AND CONNECTIONS

- 3607.1 TIGHTNESS: Joints and connections in the plumbing system shall be gas-tight for the pressure required by test, or use, with the exceptions of those portions of perforated or open-joint piping which are installed for the purpose of collecting and conveying underground or seepage water.

3607.2 TYPES OF JOINTS:

- (a) **CAULKED JOINTS:** Caulked joints for cast-iron bell-and-spigot soil pipe shall be firmly packed with oakum or hemp and filled with molten lead not less than one inch deep and after the joint has been properly caulked the lead shall extend up to not less than one-eighth inch below rim of hub. No paint, varnish, or other coatings shall be permitted on the jointing material until after the joint has been tested and approved.
- (b) **THREADED JOINTS — SCREWED JOINTS:** Threaded joints shall conform to American National Taper Pipe thread, ASA B2, or FS GGG-P-351a. All burrs shall be removed. Pipe ends shall be reamed or filed out to size of bore and all chips removed. Pipe-joint cement and paint shall be used only on male threads.
- (c) **WIPED JOINTS:** Joints in lead pipe or fittings, or between lead pipe or fittings and brass or copper pipe, ferrules, solder nipples, or traps, shall be full wiped joints, rolled lead joints, or approved soldered, or burned lead joints.

Wall or floor flange lead-wiped joints shall be made by using a lead ring or flange placed behind the joints at wall or floor. Joints between lead pipe and cast-iron, steel, or wrought iron shall be made by means of a caulking ferrule, soldering nipple, or bushing. Minimum lengths of lead from joint to fixture connection shall be four inches.

- (d) **SOLDERED OR SWEAT TYPE JOINTS:** Soldered or sweat type joints for tubing shall be made with approved fittings. Surfaces to be soldered shall be cleaned bright. The joints shall be properly fluxed and made with approved solder in accordance with Table C. Screwed joints from copper to cast iron or steel pipe shall be made by the use of approved adaptors.
- (e) **HOT-POURED JOINTS:** Hot-poured compound for clay or concrete sewer pipe shall not be water absorbent and when poured against a dry surface shall have a bond of not less than 100 psi. All surfaces of the joint shall be cleaned and dried before pouring. If wet surfaces are unavoidable, a suitable primer shall be applied. Compound shall not soften sufficiently to destroy the effectiveness of the joint when subjected to a temperature of 160 deg. F. nor be soluble in any of the waste carried by the drainage system. Approximately 25 per cent of the joint space at the base of the socket shall be filled with jute or hemp. A pouring collar, rope or other device shall be used to hold the hot compound during pouring. Each joint shall be poured in one operation until the joint is filled. Joints shall not be tested until one hour after pouring.

- (f) **PRECAST JOINTS FOR NON-METALLIC PIPE:** Precast collars shall be formed in both the spigot and bell of the pipe in advance of use. Collar surfaces shall be conical with side slopes of 3 degrees with the axis of the pipe and the length shall be equal to the depth of the socket. Prior to making joint contact, surfaces shall be cleaned and coated with solvents and adhesives as recommended in the standard. When the spigot end is inserted in the collar, it shall bind before contacting the base of the socket. Material shall be inert and resistant to both acids and alkalis.
- (g) **BRAZED JOINTS:** Brazed joints shall be made in accordance with the provisions of Section 6 of the Code for Pressure Piping. ASA B31.1.
- (h) **CEMENT MORTAR JOINTS:** Cement joints shall be used only when specifically permitted in other chapters of this Code or when approved by the Buildings Control Officer, as sufficient to accomplish the purpose of this Code. A layer of jute or hemp shall be inserted into the base of the joint space and rammed to prevent mortar from entering the interior of the pipe. Jute or hemp shall be dipped into a slurry suspension of Portland cement in water prior to insertion into bell. Not more than 25 per cent of the joint space shall be used for jute or hemp. The remaining space shall be filled in one continuous operation with a thoroughly mixed mortar composed of one part cement and two parts sand, with only sufficient water to make the mixture workable by hand. After one-half hour of setting, the joint shall be rammed around entire periphery with a blunt tool to force the partially stiffened mortar into the joint and to repair any cracks formed during the initial setting period. Pipe interior shall be swabbed to remove any material that might have fallen into the interior. Additional mortar of the same composition shall then be troweled so as to form a 45 degree taper with the barrel of the pipe.
- (i) **BURNED LEAD OR PLASTIC JOINTS:** Burned (welded) lead or plastic joints shall be lapped and fused together to form a uniform weld at least as thick as the material being joined.
- (j) **ASBESTOS CEMENT SEWER PIPE JOINTS:** Joints in asbestos cement pipe shall be made with sleeve couplings of the same composition as the pipe, sealed with rubber rings. Joints between asbestos cement pipe and metal pipe shall be made by means of an adapter coupling properly caulked. All installations to be made in accordance with manufacturer's specifications.
- (k) **BITUMINIZED FIBER PIPE JOINTS:** Joints in bituminized fiber

pipe shall be made with tapered type couplings of the same material as the pipe. Joints between bituminized fiber pipe and metal pipe shall be made by means of an adapter coupling properly caulked. All installations to be made in accordance with manufacturer's specifications.

- (l) P.V.C. JOINTS for assembling P.V.C. piping shall be in accordance with the piping material and installation standards of the manufacturer. All P.V.C. joints shall be made with solvent cement, or by thermal welding. Threaded joints shall be used with Schedule 80 only. Threaded joints shall be used only in systems requiring frequent disconnection for service or cleaning.
- (m) MECHANICAL JOINTS: Mechanical joints shall be of the type approved by the Buildings Control Officer.

3607.3 SPECIAL JOINTS:

- (a) COPPER TUBING TO SCREWED PIPE JOINTS: Joints from copper tubing to threaded pipe or threaded connection shall be made by the use of brass copper converter fittings. The joint between the copper pipe and the fittings shall be properly soldered, and the connection between the threaded pipe and the fitting shall be made with a standard pipe size screw joint. In order to minimize electrolysis, except for valves, all connections between copper and iron or steel shall be by using male copper adapters into female ferrous fittings, or by means of insulating bushings or unions. All connections to domestic water heaters shall be by means of insulating fittings.
- (b) WELDING OR BRAZING: Brazing or welding shall be performed in accordance with requirements of recognized published standards of practice.
- (c) SLIP JOINTS: In drainage systems, slip joints may be used only on the inlet side of the trap or in the trap seal except by specific approval by the Buildings Control Officer. In water piping, only one slip joint connection shall be allowed on each exposed supply to a fixture.
- (d) EXPANSION JOINTS: Expansion joints must be accessible and may be used where necessary to provide for expansion and contraction of the pipes. Expansion bends need not be accessible.
- (e) GROUND JOINT BRASS CONNECTIONS: Ground joint brass connections which allow adjustments of tubing but provide a rigid joint when made up shall not be considered as slip joints.

- 3607.3 UNIONS (SCREWED):
- (a) DRAINAGE SYSTEM: Unions may be used in the trap seal and on the inlet side of the trap. Unions shall have metal-to-metal seats.
 - (b) WATER SUPPLY SYSTEM: Unions in the water-supply system shall be metal-to-metal with ground seats.
- 3607.5 FLOOR CONNECTED FIXTURES WITH INTEGRAL TRAP: A brass floor flange shall be wiped or soldered as required. The connection shall be bolted, with an approved gasket or washer or setting compound between the earthenware and the connection. The floor flange shall be set on an approved firm base. The use of commercial putty or plaster is prohibited.
- 3607.6 PROHIBITED JOINTS AND CONNECTIONS IN DRAINAGE SYSTEMS:
- (a) Any fittings or connection which has an enlargement, chamber, or recess with a ledge, shoulder, or reduction of pipe area, that offers an obstruction to flow through the drain, is prohibited.
 - (b) EXCEPTIONS: Floor or urinal strainers may be caulked. A directional fitting may be used to connect a domestic food-waste disposal unit in a two-compartment sink.
 - (c) The drilling and tapping of drains, sewers, soil leaders, waste or vent pipes and the use of saddle hubs and bends is prohibited, except for repair work in existing system and then only after specific approval from the Buildings Control Officer.
- 3607.7 WATERPROOFING OF OPENINGS: Joints at the roof, around vent pipes, shall be made watertight by the use of lead, copper or pitch pan. Exterior-wall openings shall be made watertight.
- 3607.8 INCREASERS AND REDUCERS: Where different sizes of pipes, or pipes and fittings are to be connected, the proper size increasers or reducers or reducing fittings shall be used between the two sizes.

SUB-INDEX

3608 TRAPS AND CLEANOUTS

Paragraph No.	Paragraph Title	Page No.
3608.1	Traps	36-68
	(a) Fixture Traps	36-68
	(b) Table K	36-69
	(c) Horizontal Distance of Fixture Trap from Vent	36-69
	(d) Traps Protected	36-69
	(e) Relation to Fixture Drains	36-69
	(f) Type of Traps	36-69
	(g) Traps Prohibited	36-69
3608.2	General Requirements	36-69
	(a) Trap Seal	36-69
	(b) Trap Cleanouts	36-69
	(c) Trap Level and Protection	36-70
3608.3	Cleanouts	36-70
	(b) Exceptions for One Storey Dwellings, Motels and Apartment Houses	36-71
3608.4	Cleanout Sizes	36-71

PLUMBING (Continued)

3608 TRAPS AND CLEANOUTS

- 3608.1 TRAPS:
- (a) FIXTURE TRAPS: Plumbing fixtures, excepting those having integral traps, shall be separately trapped by a water seal trap.

TABLE K

HORIZONTAL DISTANCE OF FIXTURE TRAP FROM VENT OPENING

Size of Fixture Drain Inches	Distance Trap to Vent Feet
1-1/4	5 feet
1-1/2	5 feet
2	5 feet
Floor connected fixtures with integral traps	5 feet
Floor drains and interceptors	15 feet

- (b) The top of the vent pipe opening serving a future branch, except water closets, floor drains and similar fixtures, shall not be below the crown weir of the fixture trap. The vertical drop of a pipe serving a floor connected integral trap fixture shall not exceed twenty-four inches. Floor drains requiring a vertical drop greater than eighteen inches on the inlet side of the trap may be installed by a vertical rise not to exceed 6 feet from the horizontal drain except, that the horizontal section of the rise shall be a minimum of three feet from the outlet of the trap to the vertical section. Other fixture trap inlets shall not be more than eighteen inches measured vertically from the bottom of the future to the top of trap seal.
- (c) HORIZONTAL DISTANCE OF FIXTURE TRAP FROM VENT: The distance shall be measured along the centre of the fixture branch from the crown weir of the trap to the vent opening except for fixtures with integral traps in which case the horizontal distance shall not exceed (Table K) from the vent to the downstream edge of the vertical section of the fixture outlet branch. The total grade of a fixture branch to the vent shall not exceed the internal diameter of the branch.
- (d) TRAPS PROTECTED: Every fixture trap shall be protected against siphonage and back pressure; and air circulation shall be assured by means of a soil vent, waste vent, revert, stack vent, a common vent, loop, circuit or wet vent. No crown vent shall be installed.
- (e) RELATION TO FIXTURE DRAINS: No trap outlet shall be larger than the fixture branch to which it is connected.
- (f) TYPE OF TRAPS: Fixture traps shall be self-cleaning, except interceptor traps.
- (g) TRAPS PROHIBITED: No form of trap which depends for its seal upon the action of movable parts shall be used. No bell trap, 3/4 S trap, drum trap, pot trap, or bottle trap shall be used. Traps in covered or concealed places shall be of cast iron, cast brass or lead. Accessible traps except integral traps, including tail pieces, trap arms, overflow and trap assembly, shall be of cast iron, cast brass, lead or (.045) 17 gauge brass or copper.

3608.2 GENERAL REQUIREMENTS:

- (a) TRAP SEAL: Each fixture trap shall have a water seal of not less than two inches and not more than four inches, except when deeper seals are required for interceptors, or special-purpose fixtures.
- (b) TRAP CLEANOUTS: Trap cleanouts are prohibited on all concealed traps.

- (c) TRAP LEVEL AND PROTECTION: All traps shall be set level in relation to their water seals and protected from siphonage. See Subsection 3613.13 (c) for re-seal requirements.

3608.3 CLEANOUTS:

- (a) A cleanout shall be required at the base of each soil and waste stack excluding interior rain water leaders.
 - (1) Every building drain or branch drain shall have an accessible cleanout every 50 feet. Such cleanout shall be located in a basement, or flush with finished floor or outside of building and brought to finish grade or, in a vertical stack, not more than five feet above finished floor.
 - (2) No cleanout will be required in the base of a stack rising vertically from a horizontal building drain provided the building drain cleanout is upstream from the vertical stack connection.
 - (3) All cleanouts shall be accessibly located and have 18 inches clearance to permit downstream rodding. Wall cleanouts shall be flush with, or protrude beyond finished walls, or made accessible through access doors. Floor cleanouts shall be flush with finished floor and furnished with flush type plugs.
 - (4) In lieu of a cleanout at the base of a stack, or in the vertical section of the stack, the cleanout may be extended from the upstream side of the stack base to the finished floor level, or to outside of building and brought to finish grade level, or to outside of building into a pit or box with metal cover brought to finish grade.
 - (5) The base of a stack shall be deemed to mean the lowest point of any vertical soil or waste stack inclusive of horizontal section in such vertical stacks.
 - (6) Maximum distance between cleanouts on a building sewer shall be 75 feet.
 - (7) Where cleanout plugs are installed in horizontal underground lines outside the building, they shall be encircled with a 12 inch diameter concrete marker for protection and ready visibility.
 - (8) Every manhole or cleanout shall permit ready access to the pipe for inspection and cleaning purposes; shall be of

sufficient strength, watertight, and in the case of manholes, shall have suitable channels and eloping benchings for smooth flow.

(b) EXCEPTIONS FOR ONE STOREY DWELLINGS, MOTELS AND APARTMENT HOUSES: In lieu of cleanouts at base of stack, cleanout locations may be as follows:

- (1) Full size cleanout located outside, in building sewer line and within five feet of building wall from point of exit of house sewer and which permit upstream rodding to the base of the stack and downstream rodding, provided that the building drain or sewer has no more than one 90 degree change of direction. Such cleanout shall be brought to grade.
- (2) Any trapped opening in a vertical stack receiving an exposed screwed fixture trap and which has no arms or bends between the trap outlet and stack opening.
- (3) A waste stack extending full waste stack size through the roof and which is vertical throughout.
- (4) Grease interceptor cleanout shall be located in the stack above the interceptor waste branch connection.
- (5) A cleanout fitting shall be provided in the horizontal arm sections of grease interceptors.
- (6) Test fittings shall be placed at property line with suitable cleanout fittings. Such cleanout need not be brought to grade.

3608.4 CLEANOUT SIZES: Cleanouts shall be the same nominal size as the pipe into which they are installed up to six inches and not less than six inches for larger pipe.

SUB-INDEX

3609 HANGERS AND SUPPORTS

Paragraph No.	Paragraph Title	Page No.
3609.1	Strains and Stresses	36-72
3609.2	Vertical Piping	36-72
	(a) Attachment	36-72
	(b) Cast-Iron Soil Pipe	36-72
	(c) Screwed Pipe Cold	36-73
	(d) Screwed Pipe Hot	36-73
	(e) Copper Tubing	36-73
	(f) Copper Tubing	36-73
	(g) Lead Pipe	36-73
	(h) Plastic Piping	36-73
3609.3	Horizontal Piping	36-73
	(a) Supports	36-73
	(b) Cast-Iron Soil Pipe	36-73
	(c) Screwed Pipe	36-73
	(d) Copper Tubing	36-73
	(e) Lead Pipe	36-73
	(f) In Ground	36-73
3609.4	Hangers and Anchors	36-73
	(a) Material	36-73
	(b) Attachment	36-65
3609.5	Bases of Stacks	36-65
	(a) Supports	36-65
	(b) Piping Material	36-65
3609.6	Wood Supports	36-65

PLUMBING (Continued)

3609 HANGERS AND SUPPORTS

- 3609.1 STRAINS AND STRESSES: Piping in a plumbing system shall be installed without undue strain and stresses and provisions shall be made for expansion, contraction and structural settlement.
- 3609.2 VERTICAL PIPING:
- (a) ATTACHMENT: Vertical piping shall be secured at sufficiently close intervals to keep the pipe in alignment and carry the weight of the pipe and contents.
 - (b) CAST-IRON SOIL PIPE: Cast-iron soil pipe shall be supported at not less than at every storey height and its base.

- (c) SCREWED PIPE COLD: Screwed pipe (I.P.S.) shall be supported at not less than every other storey height.
- (d) SCREWED PIPE HOT: Screwed pipe (I.P.S.) shall be properly supported to provide for expansion.
- (e) COPPER TUBING: Cold copper tubing shall be supported at each storey.
- (f) COPPER TUBING: Hot copper tubing shall be properly supported to provide for expansion, and contraction.
- (g) LEAD PIPE: Lead pipe shall be supported at intervals not exceeding four feet.
- (h) PLASTIC PIPING: Plastic piping shall be supported at maximum 5 feet intervals, or less spacing depending on size. Full allowance for expansion and contraction based on a potential temperature differential of 50°F. Installation shall conform to latest, published recommendations of the manufacturer.

3609.3 HORIZONTAL PIPING:

- (a) SUPPORTS: Horizontal piping shall be supported at sufficiently close intervals to keep it in alignment and prevent sagging.
- (b) CAST-IRON SOIL PIPE: Cast-iron soil pipe shall be supported at not more than five foot intervals.
- (c) SCREWED PIPE: Screwed pipe (I.P.S.) shall be supported at approximately ten foot intervals.
- (d) COPPER TUBING: Copper tubing shall be supported at approximately eight foot intervals.
- (e) LEAD PIPE: Lead pipe shall be supported for its entire length.
- (f) IN GROUND: Piping in the ground shall be laid on a firm bed for the entire length, except where support is otherwise provided which is adequate in the judgement of the Buildings Control Officer.

3609.4 HANGERS AND ANCHORS:

- (a) MATERIAL: Hangers and anchors shall be of metal of sufficient strength to support the pipe and contents in proper alignment and to prevent rattling. Hangers and anchors shall be of the same material as being supported, or if different materials, they shall not be subject to electrolysis.

- (b) ATTACHMENT: Hangers and anchors shall be securely attached to the building construction in an approved manner.

- 3609.5 BASES OF STACKS:
 - (a) SUPPORTS: Bases of cast-iron soil stack shall be supported on masonry construction, metal brackets attached to the building construction, or by other methods approved by the Buildings Control Officer.

 - (b) PIPING MATERIAL: Other piping materials shall be supported and/or anchored as required by the Buildings Control Officer.

- 3609.6 WOOD SUPPORTS: No wooden supports shall be used except where attachment is made to wood frame construction. Platforms, or equipment bases may be wood unless prohibited by fire-resistive standards in other chapters of the Building Code.

SUB-INDEX

3610 VENTS AND VENTING SYSTEM

Paragraph No.	Paragraph Title	Page No.
3610.1	Vent Terminals	36-75
	(c) Flashings	36-76
	(d) Flag Poling	36-76
	(e) Roof Terminal	36-76
3610.2	Vent Grades and Connections	36-76
	(a) Grade	36-76
	(b) Vertical Rise	36-76
	(c) Height Above Fixtures	36-76
3610.3	Common Vent	36-76
3610.4	Wet Venting	36-76
3610.5	(a) Circuit or Loop Vent	36-77
	(b) Size of Circuit or Loop Vent	36-77
3610.6	Cabana Showers	36-78
3610.7	Fixtures Washed by Water Closets	36-78
3610.8	Combination Waste and Vent	36-78
3610.9	Main Vents to Connect at Base	36-79
	(c) Size of Individual Vents	36-79
	(d) Size of Vent Piping	36-79
3610.10	Soil Waste and Vent Stacks	36-80

PLUMBING (Continued)

3610 VENTS AND VENTING SYSTEM

- 3610.1 VENT TERMINALS:
- (a) Extensions of vent pipe through a roof shall be terminated at least six inches above the roof.

 - (b) All extensions of soil, waste, and vent stacks shall extend full size at least one-half foot above the roof. Vent stacks on the exterior walls of a structure with parapet walls shall extend six inches above same. Vent extensions above the roof shall not exceed three feet if of cast-iron or ten feet if of screw pipe or copper tube. Screw pipe or copper tube shall extend in one piece at least five feet under the roof and be securely fastened to prevent wind damage. Where roofs are used for sun decks, solariums or similar purposes all vents shall extend not less than seven feet above the deck and shall be properly supported at, and below, the roof level.

- (c) FLASHINGS: Each vent terminal shall be made water-tight with the roof by proper lead or copper flashings or pitch pan. Where vent pipes extend more than 12 inches above the roof a collar or draw band shall be installed around the top of the lead flashing and thoroughly caulked in place.
- (d) FLAG POLING: Vent terminals shall not be used for the purpose of flag poling, TV aerials, or similar purposes.
- (e) ROOF TERMINAL: The roof terminal of any vent pipe if within 10 feet of any door, window or ventilating opening shall extend at least three feet above such door, window or ventilating opening. No vent terminal of a sanitary system of a building shall be within 15 feet developed distance of any mechanical air intake opening unless approved by the Buildings Control Officer and Minister of Health.

3610.2 VENT GRADES AND CONNECTIONS:

- (a) GRADE: All vent and branch-vent pipes shall be 80 graded and connected as to drain dry, and provide for free un-impeded circulation of air within the vent.
- (b) VERTICAL RISE: Where dry vent pipes connect to a horizontal soil or waste pipe, the vent shall be taken off above the centre line of the soil pipe, and the vent pipe shall rise vertically, or at an angle not more than 45 degrees from the vertical to a point at least six inches above the flood-level rim of the fixture it is venting before offsetting horizontally or before connecting to the branch vent. The fitting installed at the connection of both wet, or dry vents shall have a sanitary pattern, in the direction of flow of the horizontal drain.
- (c) HEIGHT ABOVE FIXTURES: A connection between a vent pipe and a vent stack or stack-vent shall be made at least six inches above the flood-level rim of the highest fixtures served by the vent. Vent pipes above this height may be horizontal (graded) and fittings can be straight pattern.

3610.3 COMMON VENT: Where fixtures are located directly adjacent to one another, and connect to a vertical stack at the same level, the fixture traps may be served by a common vent, sized in accordance with TABLE M.

3610.4 WET VENTING:

- (a) Horizontal wet vents shall not exceed 15 feet and shall receive discharge from fixture branches only. Wet vent piping fittings shall be sanitary or drainage pattern, up to, and including the connection of the highest fixture.

- (b) Vertical wet vents connecting to a horizontal wet vent shall not exceed six feet. (EXCEPTION: See Combination Waste and Vent Subsection).
- (c) The following table shall be used to determine the minimum size and the maximum capacity of wet vents:
 - 2" Vent: Four fixture units. (Exception: No sinks or urinals or pressure discharge fixtures.)
 - 2 1/2" Vent: Ten fixture units, no water closets or fixtures requiring a waste opening greater than two inches shall be permitted.
 - 3" Vent: Sixteen fixture units, no water closets or fixtures having an opening greater than 3 inches.
 - 4" Vent: Thirty-two fixture units, no water closets or fixtures having an opening greater than 4 inches.
- (d) Above the points of intersection of fixtures in wet vents, vent size can be reduced to minimum requirements for dry vents providing all fixtures are on the same floor level.
- (e) Two water closets on a horizontal section may be vented by a wet or dry vent stack taken off between the two water closets, providing the vent intersection is within five feet horizontal developed length from each water closet vertical outlet, and all fixtures are on same storey level.

3610.5 CIRCUIT OR LOOP VENT:

- (a) A series of adjacent fixtures may be installed on a horizontal drain. A vent shall be installed vertically within five feet downstream from the first fixture branches, and another vent installed vertically between the last two water-supplied fixture branches connected to the horizontal drain section provided all fixtures are located in the same or adjoining toilet rooms at the same level. The horizontal drain shall not exceed a distance of 24 feet between the initial and terminal, vents. If a change in direction (horizontal plane only) is required, a 2 diameter vent shall be installed within 12 inches of each change in direction.
- (b) SIZE OF CIRCUIT OR LOOP VENT: The pipe of the dry vent section of a circuit or loop vent may have a diameter of one pipe size less than the diameter of the pipe of the horizontal soil or waste drain it serves.

TABLE 1

SIZES OF CIRCUIT AND/OR LOOP VENTS

Size of Drain	Number of Traps	Size of Dry Vent Pipe
2"	Six 1-1/4" traps or four 1 1/2" traps other than sink traps. No urinal traps allowed	1-1/2"
3"	Thirty (30) waste Fixture units, other than urinal traps, or six (6) urinal traps	2"
4"	Twelve (12) water closets and, in addition, thirty-six (36) waste fixture units* may waste into such soil pipe	3"

*Eight (8) of the allowable thirty-six (36) waste fixture units maybe connected into either the initial vent, or the terminal vent serving a 4" horizontal drain, by means of waste arms only provided that the total of 36 units in the horizontal drain is not exceeded, and the size of the vent pipe is increased from 3" to 4".

3610.6 CABANA SHOWERS: Multiple cabana showers may be installed on a circuit or loop vented branch and not limited as to distance between fixture branches, provided all cabana shower drains shall waste through an approved sand interceptor before entering the sewer, drainage or disposal system.

3610.7 FIXTURES WASHED BY WATER CLOSETS: Urinal traps and floor drains installed downstream from a water closet in a circuit or loop vent group shall be three inches. Any other fixture trap installed downstream from a water closet shall be reverted.

3610.8 COMBINATION WASTE AND VENT:

(a) In buildings for residential occupancy only, fixture branches other than water closets or fixtures requiring a flushometer valve on the water supply and requiring a waste opening not greater than two inches may be installed on a combined waste and vent stack as follows: Such branches will be allowed to discharge into a waste stack extended undiminished in size through the roof according to the following table provided that the stack is vertical throughout, and that no kitchen sinks be placed on a two inch combined waste and vent stack. All fixture branches shall be connected to the main stack by means of combination wye and 1/8 bends.

TABLE 2

SIZES OF COMBINATION WASTE & VENT

Diameter of Stack	Fixture units on Stack	Maximum Length
2 inch (no kitchen sinks)	4	30 feet
2-1/2 inch	10	40 feet
3 inch	16	50 feet
3-1/2 inch	25	75 feet
4 inch	32	100 feet
5 inch	50	200 feet

NOTATIONS:

For drinking fountains and fountain cuspidors, the fixture units may be increased ten times and the permitted length increased two times above those specified.

3610.9 MAIN VENTS TO CONNECT AT BASE:

- (a) All main vents or vent stacks shall connect full size at their base to the main soil or waste stack, at or below the lowest fixture branch of such waste stack. Such base shall be washed by a fixture or group of fixtures. The diameter of the vent pipe shall not exceed the diameter of the soil or waste stack to which it connects.
- (b) All soil, waste and vent stacks carried to the second floor level of a building shall extend full size above the roof, or shall be connected to a vent stack of the same diameter or larger. In a multi-storey building soil and waste stacks may enter a horizontal building drain suspended below the second floor level and such horizontal section shall be considered a part of the building drain.
- (c) **SIZE OF INDIVIDUAL VENTS:** The diameter of an individual vent shall be not less than 1-1/4 inches nor less than one-half the diameter of the drain to which it is connected. No vent for a water closet shall be less than two inches in diameter.
- (d) **SIZE OF VENT PIPING:** The nominal size of vent piping shall be determined from its developed length and the total of fixture units connected thereto, as provided in Table M. Fixture unit shall be taken from Table G or Table H. Section 3605.

TABLE M

SIZE AND LENGTH OF VENT PIPING

Diameter of Soil or waste Stack	Maximum Fixtures Units	Size and Maximum Length of Vent (Feet)							
		1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	5"	6"
1-1/4	1	70							
1-1/2	4	70	190						
1-1/2	6	50	175						
2	8	50	150	400					
2	12	45	75	300					
2	24	20	50	200					
2-1/2	36		35	140	400				
3	12		30	100	300	1200			
3	36			50	200	800			
3	72			40	70	400			
4	100			35	150	300	1200		
4	200			30	100	240	900		
4	500			20	45	100	150		
5	200				35	80	450	1300	
5	500				30	70	300	1000	
5	1100				20	45	180	600	
6	350				30	50	200	600	1300
6	620				15	30	150	400	1100
6	960					25	100	300	1100
6	1900					15	80	250	700
8	600						80	200	500
8	1400						50	100	400
8	2200						40	80	350
8	3600						30	60	250

Horizontal section not to exceed 20 percent of the above total lengths for a particular vent size.

3610.10 SOIL WASTE AND VENT STACKS:

- (a) For each building having a single building sewer receiving the discharge of a water closet there shall be at least one minimum size vent stack, extending above the building roof no less than three inches in diameter, or of a larger diameter, as set out in Table M.
 - (1) Main vent stack size for buildings having multiple building sewers. In buildings having more than one building sewer, each building sewer receiving the discharge of a water closet shall have at least one minimum size vent stack, no less than three inches in diameter or that of a larger diameter extending above the building roof as set out in Table M.

- (2) Vent stacks for accessory buildings. For accessory buildings on a lot or building site connected by a common building sewer, the minimum size for a vent stack shall be as provided for in Table M. If a water closet is installed in an accessory building the minimum size vent shall be two inches.

NOTES

SUB-INDEX

3611 STORM DRAINAGE SYSTEM

Paragraph No.	Paragraph Title	Page No.
3611.1	General: Roof Drainage	36-83
3611.2	Size of Gutters and Vertical Leaders	36-84
3611.3	Minimum Number of Roof Drains	36-84
3611.4	Design of Roof Drain Strainers	36-85
3611.5	Connections with Leader Prohibited	36-85
3611.6	Requirements Governing the Disposition of Rainwater	36-85
3611.7	Protection from Mosquitoes	36-88
3611.8	Soakage Pit Lids	36-88
3611.9	Disposal to Pervious Ground	36-90
3611.10	Soakage Pit Sizes	36-90

PLUMBING (Continued)

3611 STORM SYSTEM

3611.1 GENERAL: ROOF DRAINAGE: Where public water supply is judged to be in limited quantity, rainwater collection and storage tanks shall be required as defined in Section 3617, Plumbing Code for Small Buildings. The required sizes of storm water drains and sewers for roofs shall be determined on the basis of the total drained area in horizontal projection except that where a building will extend above the roof or court in such a manner as to drain onto the roof or court, one third of the vertical section shall be added to the horizontal projection and sized in accordance with Table O (1). When roof drains are to be installed, in lieu of exterior gutters and leaders, installation in accordance with Sub-Section 3611.3 shall be required. Each roof drain shall be provided with a clamped flashing not less than 30 inches diameter, of 14 oz. copper, 4 lb. sheet lead, or approved composition material extended under the normal roofing material.

TABLE O (1)

SIZE OF STORMWATER DRAINS, VERTICAL LEADERS AND GUTTERS

Nominal Pipe Size (Inches)	Building Storm Sewers and Drains			Gutters	Leaders
	1/8" per ft. slope	1/4" per ft. slope	1/2" per ft. slope		
3	745	1,080	1,270	635	1,270
4	1,560	2,210	3,080	1,540	3,080
5	2,810	4,000	5,620	2,810	5,620
6	4,450	6,290	8,880	4,440	8,880
8	9,460	13,760	18,950	9,975	18,950
10	18,100	25,600	36,400	18,200	36,400
12	30,000	42,000	60,000		
14	38,500	54,700	76,000		
15	55,400	78,400	109,000		

NOTATIONS:

For required sizes of ground surface drainage, see Table O (2)

3611.2 SIZE OF GUTTERS AND VERTICAL LEADERS:

- (a) No gutter or leader shall be less than set forth in Table O (1). Areas in excess of those shown are not permitted for gutters or leaders.
- (b) There shall be no reduction in size of rainwater leaders or drains in the direction of flow.
- (c) The above sizes of rain leaders are based on diameter of circular rain leaders, and gutters based on semicircular sheet-metal gutter with the top dimension given. Other shapes shall have the same cross sectioned area, except that the aspect ratio of rectangular leaders shall not exceed 2 to 1. For example, 4"x8" leaders would be permitted, but 4"x 9" would not.
- (d) Gutters and exterior leaders shall not be used on buildings over six (6) stories. Interior leaders and roof drains shall be required for buildings seven (7) stories and higher.

3611.3 MINIMUM NUMBER OF ROOF DRAINS: When the roof perimeter has a parapet, or other raised construction, a minimum of two (2) roof drains shall be provided, and in addition a minimum of two overflow scuppers, each with a free area of not less twice that of each roof drains (or leader size) to be provided. Scuppers shall conform to the requirements in Chapter 30, Section 3010.

- 3611.4 DESIGN OF ROOF DRAIN STRAINERS: Where roof surfaces drain through the roof, as to the inside leader, a strainer shall be provided and such strainer shall extend not less than four inches above the surface of the roof immediately adjacent to the roof drain. Furthermore, such strainers shall have an available inlet area, of not less than two and one-half times the area of the conductor or leader to which the drain is connected, with the exception that roof drain strainers for use on sun decks, parking decks, and similar areas, normally serviced and maintained, may be of the flat surface type.
- 3611.5 CONNECTIONS WITH LEADER PROHIBITED: Leader pipes shall not be used as soil, waste or vent pipes; nor shall any soil waste or vent pipes be used as leaders. Air conditioning equipment shall not discharge or overflow upon any roof where rain water leaders discharge into any surface or curb gutter at grade except by specific approval by the Minister of Works.
- 3611.6 REQUIREMENTS GOVERNING THE DISPOSITION OF RAINWATER:
- (a) Rainwater or other liquid wastes from any premises shall be disposed of where same originates and/or falls in such manner as herein provided. The disposal of any rainwater or other liquid wastes by causing or allowing same to be disposed of or flow on or across any adjoining property or sidewalk, either public or private, shall be deemed a nuisance, and shall be corrected by properly disposing of same in accordance with the provisions of this Code and/or as directed by the Minister of Works and Minister of Health.
 - (b) Rainwater shall be disposed of as follows with required preference in order listed:
 - (1) To a storm sewer or a storm sewer catch basin where permitted.
 - (2) To a street gutter but only if first approved.
 - (3) Into a drainage well, if approved. Drainage wells shall have sufficient depth to extend to salt or brackish water.
 - (4) Into a soakage pit.
 - (5) Upon pervious ground.
 - (6) All rainwater drainage openings which discharge objectionable gases, and which are within 15 feet of adjacent building openings, interior courts or air share, windows, ventilating openings, air intake equipment, or where roof is used by human beings for sun bathing or other purposes,

shall be protected from discharging such gases by installation of accessibly located back water valves or automatic self sealing traps. Back water valves shall be so constructed as to remain in a closed position when not discharging liquids.

- (7) All rain or storm water drains shall be installed to drain dry.
- (c) Rainwater pipes shall not discharge over sidewalks.
- (d) No liquid waste, except rainwater, shall be discharged into rainwater pipes which terminate at a street or sidewalk or above the ground surface.
- (e) The following table based on rainfall statistics of one-half inch rain in five minutes over one square foot of roof or impervious, or paved area shall be used to compute the drainage requirements for the disposal of rainwater.

1 minute .00833 cu. ft. or 14.4 cu. inches or .0625 gallons

2 minutes .01667 cu. ft. or 28.8 cu. inches or .1260 gallons

5 minutes .0417 cu. ft. or 72.0 cu. inches or .3126 gallons

- (f) (1) Pipe to carry rainwater only, where located under a sidewalk and discharging into a street gutter, shall be cast iron pipe with oakum and lead caulked and or one ring oakum and one-half cement and one-half sand mortar joints. Where such pipe cannot be installed by reason of the depth of the curb being less than the pipe, diameter plus the necessary concrete cover over such a pipe, bituminous fiber pipe, a 14-inch gauge (5/64) galvanised sheet metal flume box, P.V.C. plastic of equivalent cross sectional area may be substituted for the pipe.

- (2) The following table shall be used to compute such cross sectional area:

Diameter of Pipe	Area in Inches
4"	12,566
5"	19,635
6"	29,274
8"	50,265

- (3) A concrete cover not less than two inches thick, reinforced with 6"x6" No.10 gauge road mesh wire shall be required over a pipe or flume box under a public sidewalk. The bottom and sides of a flume box through which bituminous fiber or P.V.C. pipe pass shall be of poured concrete at least four inches thick and the concrete shall be of not less strength than 3000 psi in 28 days.
- (4) In the construction and installation of flume boxes and/or pipe under sidewalks to or street gutter for disposal of rainwater, all plumbing permits and inspection for work inside the property line shall be secured from the Minister of Works. Permits and inspection for work outside the property line shall be secured from the Minister of Works.
- (g) No public sidewalk or driveway may be patched. Public sidewalks and driveways which are cut, tunneled, channeled or which have a pipe driven under same shall be replaced with full size blocks.
- (h) The minimum size for sloping rainwater drains and storm sewers for surface drainage (not including pipes or building drains for roof drainage) shall be not less than the following size based on the horizontal projection of the surface area drained:

**TABLE O (2)
MINIMUM PIPE SIZES AND SLOPES FOR GROUND SURFACE
STORM SEWERS**

Diameter of Pipe in Inches	Maximum Ground Surface Area for Storm Sewers of Various Slopes		
	1/8" per ft. slope	1/4" per ft. slope	1/2" per ft. slope
4	2,470	2,930	3,600
6	7,110	8,360	11,400
8	15,900	18,400	22,600
10	30,200	34,300	42,300
12	49,800	57,000	68,600
15	87,800	107,000	130,000
18	150,000	167,600	210,000
21	226,000	268,000	326,000
24	326,000	377,000	463,000
27	463,000	510,000	630,000
30	586,000	670,000	837,000

NOTATIONS:

Where ground surface storm sewers are connected to the buildings storm sewer, the size of the combined storm sewer shall be as set forth in Table O (1). Use Table O (1) for drainage of roofs, and portions of structures.

3611.7 PROTECTION FROM MOSQUITOES:

- (a) A film or oil or other equally effective substance shall be maintained on the surface of all liquids in any exposed basin, trap, tank, or receptacle not in regular use.
- (b) A flap check or flapper valve shall be placed on each soakage pit pipe inlet connection from rainwater surface catch basin and such flap or flapper shall be suitable to prevent the passage of mosquitoes and vermin. The flap check shall be hung so as to completely close the pipe inlet when not in use.
- (c) Emergency inverted overflow fittings of the same size as the leader pipe up to and including four inch shall be provided at the base of each rainwater leader discharging directly into soakage pits. In lieu of an overflow on each leader, one overflow of the same size as the largest pipe, extending from such pipe, may be provided. Such fittings shall discharge at points which, in the opinion of the Minister of Health, are the least possible to become a nuisance to the public, to occupants of a premises, or to neighbouring property. Should the overflow from such a fitting become a nuisance, it shall be sealed and some other acceptable method of disposal be provided. For leaders five inches and over, the emergency overflow shall be a minimum of four inches. All overflow openings shall be screened to prevent entrance of mosquitoes. Screens shall be brass or stainless steel.

3611.8 SOAKAGE PIT LIDS:

- (a) Soakage pit lids shall be designed to support the anticipated loadings but not less than that of a 10 - ton truck. Not less than the following minimum slab thickness and reinforcement areas shall be permitted: Each lid shall have an access manhole not less than 18"x24".

Trench Span	Slab Thickness		Reinforcement					
			#3	#4	#5	#6	#7	#8
2'	5"	Bottom Bars	6"	12"	12"	12"	12"	12"
3'	6"	" "	3"	7"	10"	12"	12"	12"
4'	7"	" "	No	6"	7"	10"	12"	12"
5'	7"	" "	No	No	6"	7"	10"	12"
6'	8"*	" "	No	No	No	6"	8"	10"

* Eighth-inch slab over six-foot trenches require additional No. 5 bars six inches o.c. placed 3/4 inch from top of slab.

- (b) Reinforcing across trench is to be placed 3/4 inch up from bottom of slab. Temperature reinforcing lengthwise in the lid shall be No. 4 bars 9 in. o.c.

- (c) Support of slab lid shall be on block walls or on rock trench walls.
- (d) If slab lid is supported on block walls, such walls shall be laid on an 8 in. deep by 10 in. wide footing and a reinforced beam, not less than 12 inches deep with not less than 4 No. 5 bars, shall be poured over the block. Vertical support shall be provided about every 15 feet by reinforcing two adjacent block cells with one No. 5 vertical bar, and filling the cell with concrete.
- (e) Support may be on rock trench walls, provided the rock is solid and free from honeycombing. A footing, 10 inches deep (including slab thickness) by sixteen inches wide with two No. 5 bars, shall be provided. Trench width shall be computed from the centre of such footing for the table given above.
- (f) Any reasonable combination of these methods may be used. Under unusual conditions on filled soil where the entire pit will rest on such fill, a design by a qualified engineer approved by the Minister of Works shall be required.
- (g) When the block wall bearing is used it is necessary that a properly designed cantilever, 18 inches in width, be constructed to retard or prevent back wash and honeycombing. Such cantilever shall be of the same thickness as the slab and the principal slab reinforcing shall be alternately bent bars.
- (h) Concrete blocks shall be laid on mortar with the block cells vertical and with the vertical block intersection having a one-fourth inch gap without mortar.
- (i) Inspection shall be required and requested when blocks are in place and sewer is connected to soaking pit, and before top form is placed over soakage pit.
- (j) No concrete shall be poured until steel is tied and in place and approved. Concrete shall be 3000 p.s.i., in 28 day strength.

3611.9 DISPOSAL TO PERVIOUS GROUND:

- (a) Rainwater may be disposed to uncovered, pervious areas where not otherwise disposal of as set forth above.
- (b) Sufficient uncovered pervious areas for rainwater seepage shall be provided on each building sib on a minimum ratio of ten square feet of impervious area to one square foot of pervious area, of suitable porosity.
- (c) For the purposes of this Code, pervious area shall be deemed to mean ground unpacked by traffic or uncoated by any material, and of suitable porosity.
- (d) Where there is reason to believe the ground is of low porosity, the Minister of Works may require that the owner submit the results of a percolation test to support his request for disposal thereto.

3611.10 SOAKAGE PIT SIZES: The net, effective internal capacity in cubic feet, or U.S. gallons, shall be determined by multiplying the total area to be served by 0.0417 cubic feet per square foot to obtain internal capacity in cubic feet. To obtain the required capacity in U.S. gallons, multiply the total area by 0.3125 U.S. gallons per square foot. Capacities determined by the factors, above, should be considered to be minimum, and in areas of low porosity percolation test may be required with resultant increases in capacity.

SUB-INDEX

3612 INTERCEPTORS AND SEPARATORS

Paragraph No.	Paragraph Title	Page No.
3612.1	General Requirements	36-91
	(a) Interceptors Required	36-91
	(b) Approvals	36-92
	(c) Separation	36-92
	(d) Interceptor Efficiency	36-92
	(e) Accessibility	36-92
	(f) Maintenance	36-92
	(g) Venting Interceptors	36-92
3612.2	Commercial Grease Interceptors	36-92
	(a) When Required	36-92
	(b) Minimum Size	36-92
	(c) Venting Grease Interceptors	36-93
	(d) Structural Design	36-93
3612.3	Gasoline, Oil and Sand Interceptors	36-93
	(a) Required	36-93
	(b) Floor Drains	36-93
	(c) Minimum Dimension	36-93
	(d) Pipe Connections	36-93
3612.4	Laundry Interceptors	36-94
3612.5	Bottling Establishments Interceptors	36-94
3612.6	Slaughter Interceptors	36-94

PLUMBING (Continued)

3612 INTERCEPTORS AND SEPARATORS

3612.1 GENERAL REQUIREMENTS:

- (a) INTERCEPTORS REQUIRED: Interceptors (including grease, oil and sand interceptors), shall be provided where required herein for the interception and the separation from liquid wastes materials such as grease, flammable wastes, sand, plaster, ground glass and all other ingredients or liquids considered harmful to the building drainage system, the public sewer or sewage plant or processes. The terms interceptor and separator may be used interchangeably and may be prefaced by a term indicating the material separated or the location or use. See Section 3615, SEWAGE AND LIQUID WASTE DISPOSAL SYSTEMS.

- (b) APPROVALS:
 - (1) Interceptors shall not be installed unless approved by the Buildings Control Officer and Minister of Health.
 - (2) The size, type and location of each interceptor together with drawings including all pertinent information, shall be submitted to the Buildings Control Officer, and Minister of Health for approval before installation.
 - (3) Manufactured grease interceptors shall not be approved unless of a type having been tested by an approved laboratory and found to conform to all applicable requirements of this Code, and the Buildings Control Officer.
- (c) SEPARATION: A mixture of light and heavy solids or liquids and solids having various specific gravities may be treated and then separated in an interceptor. Wastes not requiring treatment or separation shall not be discharged into or through an interceptor.
- (d) INTERCEPTOR EFFICIENCY: Interceptors shall be rated and approved for their efficiency in accordance with accepted practice, and as required by the Minister of Works.
- (e) ACCESSIBILITY: Interceptors shall be so installed as to provide ready accessibility to the cover and contents and means of servicing and maintaining the interceptor in working and operating condition.
- (f) MAINTENANCE: Interceptors shall be maintained in efficient operating condition by periodic removal of accumulated contents.
- (g) VENTING INTERCEPTORS: Interceptors shall be so designed and installed that they shall not become air-bound if closed covers are used.

3612.2 COMMERCIAL GREASE INTERCEPTORS:

- (a) WHEN REQUIRED: A grease interceptor may be omitted for single family residences but shall be installed in the waste line leading from sinks, drains or other fixtures in the following establishments; restaurants, hotel kitchens or bars, factory cafeterias or restaurant, clubs, processing plants or other establishment where grease can be introduced into the drainage system in quantities that can affect line stoppage or hinder sewage disposal.
- (b) MINIMUM SIZE: Exterior Concrete interceptors shall be of not less size than set forth in Section 3615, "SEWAGE AND LIQUID WASTE DISPOSAL."

- (c) VENTING GREASE INTERCEPTORS: Grease interceptors shall be vented.
- (d) STRUCTURAL DESIGN: Interceptors shall in general comply structurally with the requirements set forth for septic tanks, except that the outlet shall extend to within 8 inches of the bottom of the tank and the invert shall discharge a minimum of 2-1/2 inches above the liquid level line. Lids may be of any material providing structural stability for the location. A 22 inch diameter, or 18"x24" rectangular, clean-out manhole brought to grade shall be provided.

3612.3 GASOLINE, OIL AND SAND INTERCEPTORS:

- (a) REQUIRED: An approved gasoline, oil and sand interceptor shall be provided in the following places:
 - (1) Public storage garages where floor drainage is to be provided.
 - (2) Where motor vehicles are washed; private individuals excluded.
 - (3) Any place where motor vehicles are repaired and floor drainage is provided.
 - (4) Shops, manufacturing and assembly plants where parts are washed to remove oil and or greasy substances or anything deleterious to any public sewer.
 - (5) Where oil, gasoline or other volatile liquid becomes a nuisance.
- (b) FLOOR DRAINS: Floor drains shall be of a bucket type with minimum 4 inch diameter outlet.
- (c) MINIMUM DIMENSION: Oil interceptors shall have a minimum depth of not less than 2 feet below the invert of the discharge drain and a minimum capacity of 18 cubic feet per twenty gallon per minute flow. See Drawing No. 11 in Appendix B.
- (d) PIPE CONNECTIONS:
 - (1) The minimum inlet, outlet and vent pipes shall be 4 inches except as otherwise set forth herein.
 - (2) The 4 inch outlet shall be taken off the outer wall at the bottom of the interceptor basin at a 45 degree angle in such manner as to provide a trap seal of approximately 24 inches.
 - (3) The invert of the 4 inch drain inlet to interceptor basin shall

be located not less than one inch above the water line.

- (4) The interceptor local vent for the interceptor basin shall be taken off vertically not more than 6 inches below the cover.
- (5) Approved commercial interceptors may be used.
- (6) The local vent for the interceptor basin shall be a minimum size of 3 inches, and shall not be interconnected with other venting systems.
- (7) When service sinks, drinking fountains or novelty boxes are installed in or adjacent to wash areas, the interceptor local vent may be installed on the drain line for the purpose of receiving the wastes from such fixtures.
- (8) STRUCTURAL DESIGN: Interceptors shall be structurally adequate to support the loads superimposed thereon dependent on their location. A 5/8" thick removable metal cover may be used under vehicular traffic loads where the interceptor area does not exceed 9 square feet. A 3/8" thick removable metal cover may be used where vehicle traffic loads are not possible and the interceptor area does not exceed 9 square feet. For larger areas or greater load capacities or at the option of the designer, concrete lids may be used but cast iron manholes brought to grade must be provided. All covers must be accessible and brought to grade.

3612.4 LAUNDRY INTERCEPTORS: Commercial laundries shall be equipped with an interceptor having a non-removable one-half inch mesh screen metal basket or similar device that will prevent strings, rags, buttons or other materials detrimental to the collection and treatment system from passing into the drainage system. Such 1/2 inch screen metal basket or similar device shall be designed to be easily cleaned without completely removing such basket or device.

3612.5 BOTTLING ESTABLISHMENTS INTERCEPTORS: Bottling plants shall discharge their process wastes into an interceptor designed to provide the separation of broken glass or other solids, before discharging liquid wastes into the drainage system.

3612.6 SLAUGHTER INTERCEPTORS: Slaughtering rooms and dressing rooms shall be provided with floor drains equipped with metal screen type baskets piped to separators which shall prevent the discharge into the drainage system of feathers, entrails or other materials likely to clog the drainage system. Metal screen type baskets shall prevent passage into the drainage system of solids exceeding one half inch.

SUB INDEX

3613 PLUMBING FIXTURES AND REQUIREMENTS

Paragraph No.	Paragraph Title	Page No.
3613.1	General Requirements	36-96
3613.2	Overflows	36-96
	(a) Design	36-96
	(b) Connection	36-97
3613.3	Special Fixtures and Specialties	36-97
	(a) Water and Drain Connections	36-97
	(b) Approval	36-97
	(c) Vacuum Operated Plumbing Fixtures	36-97
3613.4	Installation	36-97
	(a) Cleaning	36-97
	(b) Grouting or Sealing	36-97
	(c) Securing Fixtures	36-97
	(d) Wall-Hung Fixtures	36-97
	(e) Setting	36-98
3613.5	Prohibited Fixtures and Connections	36-98
3613.6	Water Closets	36-98
	(a) Public Use	36-98
	(b) Flushing Device	36-98
	(c) Float Valves	36-98
	(d) Close-Coupled Tanks	36-98
	(e) Automatic Flush Valve	36-98
3613.7	Urinals	36-98
3613.8	Lavatories	36-98
	(a) Lead	36-99
	(b) Copper	36-99
3613.9	Shower Receptors and Compartments	36-99
	(a) Shower	36-99
	(b) Dimensions	36-99
	(c) Public or Institution Showers	36-99
	(d) Walls	36-100
	(e) Joints	36-100
3613.10	Sinks	36-100
	(a) Waste Outlets	36-100
	(b) Food Grinders	36-100
3613.11	Food Grinders—Where Permitted	36-100
	(a) Food Grinders	36-100
	(b) Food-Waste-Disposal Connections	36-100
	(c) Grease Interceptors	36-100
	(d) Commercial-Type Grinders	36-100
3613.12	Drinking Fountains	36-101
	(a) Design and Construction	36-101

	(b) Protection of Water Supply	36-101
3613.13	Floor Drains and Back Water Valves	36-101
	(a) Prohibited Location	36-101
	(b) Floor Drain Traps	36-101
	(c) Water Trap Supplies	36-101
	(d) Floor Drains	36-101
	(e) Floor Drains Shall Be Provided With Traps and Strainers	36-102
	(f) Floor Drains Considered Fixtures	36-102
	(g) Backwater Valves	36-102
3613.14	Dishwashing Machines	36-102
3613.15	Multiple Wash Sinks	36-102
	(a) Circular Type	36-102
	(b) Straight-Line Type	36-102
3613.16	Garbage-Can Washers	36-103
	(a) Discharge	36-103
	(b) Baskets	36-103
	(c) Connections	36-103
3613.17	Laundry Trays	36-103
3613.18	Bathtubs	36-103
3613.19	Tabulation of Minimum Fixture Requirements	36-103 through 109

PLUMBING (Continued)

3613 PLUMBING FIXTURES AND REQUIREMENTS

3613.1 GENERAL REQUIREMENTS: Plumbing fixtures shall be constructed from approved materials, have smooth impervious surfaces, be free from defects and concealed fouling surfaces, and, except as permitted elsewhere in this Code, shall conform in quality and design to one of the standards in Table C. Fixtures shall not be constructed of pervious material. Fixtures equipped with a waste outlet to retain water, shall not be permitted, except where a drainage system is under a vacuum. For special types of fixtures, or fixture accessories see the requirements for water conservation in Section 3614, "WATER SUPPLY AND DISTRIBUTION."

3613.2 OVERFLOWS:

- (a) DESIGN: When any fixture is provided with an overflow, the waste shall be so arranged that the standing water in the fixture cannot rise in the overflow when the fixture is empty.

- (b) CONNECTION: The overflow pipe from a fixture shall be connected on the house or inlet side of the fixture trap, and it shall be unlawful to connect such overflows with any other part of the drainage system.

3613.3 SPECIAL FIXTURES AND SPECIALTIES:

- (a) WATER AND DRAIN CONNECTIONS: Baptistries, ornamental pools, aquaria, ornamental fountain basins, developing tanks or sinks and similar constructions when provided with water supplies shall be protected from back-siphonage as required in Section 3614 "WATER SUPPLY AND DISTRIBUTION."
- (b) APPROVAL: Specialties requiring water and waste connections shall be submitted to the Buildings Control Officer for approval before installation.
- (c) VACUUM OPERATED PLUMBING FIXTURES: Plumbing fixtures which are intended to be installed in a system which employs a vacuum shall be subject to all general requirements of this Section. Fixtures shall be designed, and/or connected in such a manner to positively prevent backflow of contents into the water supply system as required in Section 3614, "WATER SUPPLY AND DISTRIBUTION."

3613.4 INSTALLATION:

- (a) CLEANING: Plumbing fixtures shall be installed and spaced in a manner to afford easy access for cleaning and their intended use. Where practical, all pipes from fixtures shall be run to the nearest wall. Any closet bowl or closet bend shall be roughed in SO as to have not less than 16 inches from the centre of the closet bowl outlet to any finished wall which is set parallel to the long axis of the closet bowl.
- (b) GROUTING OR SEALING: Where a fixture surface comes in contact with a wall or floor, the point of contact shall be sealed watertight with white cement grout or other approved means.
- (c) SECURING FIXTURES: Floor-outlet fixtures shall be rigidly secured to the brass flange and floor by brass bolts and/or screws.
- (d) WALL-HUNG FIXTURES: Wall-hung water-closet bowls and urinals shall be rigidly supported by a concealed metal supporting member with brass bolts so that no strain is transmitted to the fixture pipe connection. Suitable backing shall be provided for other wall hung fixtures including shower rods.

- (e) SETTING: Fixtures shall be set level and in proper alignment with reference to adjacent walls.
- 3613.5 PROHIBITED FIXTURES AND CONNECTIONS: Fixtures, pan, valve, (except V.W.C.) plunger, offset, washout, latrine, frostproof, and other water closets having an invisible seal or an unventilated space or having walls which are not thoroughly washed at each discharge, shall be prohibited. Any water closet which might permit siphonage of the contents of the bowl back into the tank shall be prohibited. Through urinals are prohibited except for temporary use during construction. Pedestal urinals are prohibited in school installations.
- 3613.6 WATER CLOSETS:
- (a) PUBLIC USE: Water-closet bowls for public use shall be equipped with open front seats.
 - (b) FLUSHING DEVICE: Water-closet tanks shall have a flushing capacity sufficient to properly flush the water-closet bowls with which they are connected.
 - (c) FLOAT VALVES: Float valves in flush tanks shall close tight and provide water to properly refill the trap seal in the fixture.
 - (d) CLOSE-COUPLED TANKS: The flush-valve seat in close-coupled water-closet combinations shall be one inch or more above the rim of the bowl.
 - (e) AUTOMATIC FLUSH VALVE: Flush valves shall be so installed that they will be readily accessible for repairing. When the valve is operated, it shall complete the cycle of operation automatically, opening fully and closing positively under the service pressure. At each operation the valve shall deliver water in sufficient volume and at a rate that will thoroughly flush the fixture and refill the fixture trap. Means shall be provided for regulating flush-valve flow. Not more than one fixture shall be served by a single flush valve, except as approved by the Buildings Control Officer.
- 3613.7 URINALS: Tanks, or plumbing devices, flushing more than one urinal shall be automatic in operation and of sufficient capacity to provide the necessary volume to flush and properly cleanse all urinals simultaneously. All stall urinals shall be equipped with beehive strainers.
- 3613.8 LAVATORIES: Lavatories shall have waste outlets not less than one-and-one-fourth inches in diameter. Wastes may have open strainers or may be provided with stoppers.

- (a) LEAD: (See Table C). Sheet lead shall be not less than the following:

For safe pans, not less than 4 lbs. psf.

For flashings of vent terminals, not less than 3 lbs. psf.

Lead bends, lead stubs and lead straps shall not be less than 1/8 inch wall thickness. (8 lbs. psf.)
- (b) COPPER: Sheet copper shall be not less than the following: Safe pans—12 oz. per sq. ft. Vent terminal flashings—8 oz. per sq. ft.

3613.9 SHOWER RECEPTORS AND COMPARTMENTS:

- (a) SHOWER: All shower compartments, except free-standing, prefabricated shower compartments, shall have approved pans of lead, copper or other approved material and shall turn upon all sides at least two inches above the finished curb level or 3 1/2 inches above the rough curb level. A separate shower pan may be omitted for shower compartments built integrally with a concrete slab on the first floor level where the construction provides a concrete curb having a height on the enclosed sides at least one inch higher than the entrance curb finish height so that the water level may not rise to the height of any surrounding wood plates or studs. Lead and copper shower pans shall be protected against the corrosive effects of concrete or mortar by a coating of asphaltum paint inside and outside before being placed in position. Pans shall be securely fastened to the trap stubs at the invert of the weep holes, to provide a watertight joint between the pan and trap. Shower receptacle waste outlets on all showers shall be not less than two inch and shall have removable strainers. Before the completed pan is placed in the space provided for the shower stall, a 30-pound asphalt saturated felt or a 1/2 inch thick layer of sand shall be placed under the pan for protection against rough surfaces or projecting nails. Strainers for 2-inch stubs shall have a minimum three and one-half square inches of free area including the removable plate. All strainers and pans shall be installed and ready for inspection at time of tub and/or water-pipe inspection. Free standing prefabricated shower stalls or receptors shall require individual approval.
- (b) DIMENSIONS: Shower compartments shall be not less than 900 square inches in floor area, and shall measure not less than 30 inches x 30 inches.
- (c) PUBLIC OR INSTITUTION SHOWERS: Floors of public shower rooms shall be drained in such a manner that no waste water will pass over areas occupied by other bathers.

- (d) WALLS: Walls of smooth, non-corrosive and non-absorbent waterproof materials shall be provided at showers to a height of 6 feet above the floor for shower compartment and stalls not having a tub and to a height of 4 feet above the rim of the tub where a shower is provided in a tub.
- (e) JOINTS: Built-in tubs with overhead showers shall have waterproof joints between the tub and the wall.

3613.10 SINKS:

- (a) WASTE OUTLETS: Sinks shall be provided with waste outlets not less than one and one-half inches in diameter. Waste outlets may have open strainers or may be provided with stoppers.
- (b) FOOD GRINDERS: Where commercial food-waste grinders are installed, the waste from those units shall discharge direct into the building drainage system and not through a grease interceptor. Although connection to a public sewer may be allowed, it shall be mandatory that the owner or his agent secure written permission to connect commercial food grinders to a public sewer. Small residential grinders will generally be acceptable for connection to a public sewer.

3613.11 FOOD GRINDERS — WHERE PERMITTED:

- (a) FOOD GRINDERS: Sinks on which a food grinder is installed shall have a waste opening not less than three and one-half inches in diameter.
- (b) FOOD-WASTE-DISPOSAL CONNECTIONS: A domestic food-waste-disposal unit in a two-compartment sink on a 2 inch line shall waste through a 2"x 1 1/2" double tapped vertical sanitary tee fitting. The trappings shall be no more than 6 inches apart on the vertical, and each compartment shall be separately trapped and separately wasted to the stack or vented branch. In existing sink installations where the second waste opening is not available a domestic food grinder may be installed on a two-compartment sink and waste through a single 1 1/2-inch trap provided an approved directional tee or is used.
- (c) GREASE INTERCEPTORS: No food-waste grinder shall be connected through a grease interceptor.
- (d) COMMERCIAL-TYPE GRINDERS: Commercial-type food grinders shall be provided with a waste line equal in size to the discharge opening of the machine, but not less than two inch waste line. Each waste shall be trapped and vented as provided in other sections of this Code.

3613.12 DRINKING FOUNTAINS:

- (a) DESIGN AND CONSTRUCTION: Drinking fountains shall conform to American Standard Specifications for Drinking Fountains.
- (b) PROTECTION OF WATER SUPPLY: Stream projectors shall be so assembled as to provide an orifice elevation as specified by American Standard Air Gaps in Plumbing Systems. Drinking fountains equipped with water heating devices shall be equipped with approved pressure and temperature valves.

3613.13 FLOOR DRAINS AND BACK WATER VALVES:

- (a) PROHIBITED LOCATION: Floor drains serving indirect waste pipes serving food or drink storage rooms or appliances shall not be installed in any toilet room nor in any inaccessible or unventilated space such as a closet or store room. No floor drain or other plumbing fixture shall be installed in a room containing air handling machinery, even where the room is not an air plenum. Equipment drains shall be conveyed through an indirect waste to a floor drain located outside such room or other approved point of disposal.
- (b) FLOOR DRAIN TRAPS: A floor drain shall connect into a trap so constructed that it can be readily cleaned and of a size to serve efficiently the purpose for which it is intended. The floor drain inlet shall be so located that it is at all times in full view. When subject to backflow or back pressure; such drains shall be equipped with an approved backwater valve. One or more floor drains may be connected to the same fixture branch without a revert provided that all traps are within 15 feet measured horizontally from the vented sewer line.
- (c) WATER TRAP SUPPLIES: Every trap which is directly connected to the drainage system, shall be provided with a permanent water seal, fed from an approved source water, or by means of an approved automatic priming device designed and installed for that purpose, except where in the opinion of the Buildings Control Officer such water seal is not necessary for safety or sanitation.
- (d) FLOOR DRAINS: Floor drains sized three inches and larger may be installed within 15 feet, measured horizontally, from a vented sewer line without a revert; provided that no floor drain shall connect to a soil line within five feet of the base of a soil stack, serving more than six water closets or equivalent fixture units. Except for individual showers all floor drains shall be 3" minimum.

- (e) FLOOR DRAINS SHALL BE PROVIDED WITH TRAPS AND STRAINERS: Approved bucket type traps shall be provided for filling stations, garages, garbage areas, chicken and fish cleaning arena, bottling plants, food processing plants and other floor areas where solids could find entry into a drainage system.
- (f) FLOOR DRAINS CONSIDERED FIXTURES: A floor drain shall be considered a plumbing fixture. See Table G.
- (g) BACKWATER VALVES:
 - (1) Backwater valves shall be so constructed as to insure a mechanical seal against backflow.
 - (2) Backwater valves, when fully opened, shall have a capacity not less than that of the pipes in which they are installed.
 - (3) Backwater valves shall be so installed as to provide ready accessibility to their working parts.

3613.14 DISHWASHING MACHINES:

- (a) Domestic dishwashing machines shall comply with the requirements set forth in Section 3614 "WATER SUPPLY AND DISTRIBUTION."
- (b) Gravity discharge dishwashing machines installed on ground floors shall have an emergency overflow not less than one inch diameter connected to the machine tailpiece and terminating outside of building wall above grade.
- (c) Wastes from dishwashers with pump discharges shall rise to a height equal to the height of the underside of dishwasher top and may connect to the tailpiece of the sink by means of a "Y" connection. If a food-disposal unit is provided, the domestic dishwasher shall connect to the inlet side of the food-disposal-unit.

3613.15 MULTIPLE WASH SINKS:

- (a) CIRCULAR TYPE: Each 18 inches of wash sink circumference (circular type) shall be equivalent to one lavatory.
- (b) STRAIGHT-LINE TYPE: Multiple wash sinks of the straight-line type shall have hot and cold combination spouts not closer than 18 inches from adjacent similar spouts and each spout shall be considered the equivalent of one lavatory.

- 3613.16 GARBAGE-CAN WASHERS:
- (a) DISCHARGE: Garbage-can washers shall not discharge through a trap serving any other device or fixture.
 - (b) BASKETS: The receptacle receiving the wash from garbage cans shall be provided with a bucket type strainer or similar device to prevent the discharge of solids into the building drainage system.
 - (c) CONNECTIONS: Water supply connections shall conform to Section 3614 "WATER SUPPLY AND DISTRIBUTION."
- 3613.17 LAUNDRY TRAYS: Each compartment of a laundry tray shall be provided with a waste outlet not less than one end one-half inches in diameter and with a stopper.
- 3613.18 BATHTUBS: Bathtubs shall be provided with waste outlets not less than one and one-half inches in diameter.
- 3613.19 TABULATION OF MINIMUM FIXTURE REQUIREMENTS.

TABLE P (1)
MINIMUM FIXTURE REQUIREMENTS—GENERAL

(Applicable to factories, stores offices buildings, places of employment not serving food or drink, and residential).

1-5 Employees—1 Water Closet and 1 Lavatory for the use of both sexes (Males and Females).					
Males			Females		
No. of Persons	Water Closets	Urinals	Lava-tories	Water Closets	Lava-tories
1-15	1	1	1	1	1
16-30	1	2	2	2	2
31-60	2	3	3	3	3
61-80	3	4	3	4	4
81-100	3	6	4	6	5
1 Water Closet and 1 Lavatory for each 25 Females over 100.					
1 Water Closet or 1 Urinal, and 1 Lavatory for each 25 Males over 100.					
1 Shower shall be provided for each 20 persons subject to excess heat or to contamination, infections or irritating material.					

NOTATIONS:

- (1) Every dwelling unit for residential occupancy shall have one water closet, one lavatory, 1 tub or shower and 1 kitchen sink, except for those dwellings covered in Section 17, covering Small Buildings. At least 1 laundry tub or the roughing for a washing machine is required for each duplex dwelling unit. Apartments require 1 laundry tub or wash machine for the first 5 and 1 for each additional 10 apartments.

- (2) See "Small Buildings Plumbing Code" for requirements for small buildings.
- (3) If employees exceed 5 persons, separate rooms and facilities shall be provided for each sex, and for more than 5 males, add a urinal.
- (4) Female urinals may be substituted for required water closets up to one-half.
- (5) Wash-up sinks may be substituted for lavatories where type of employment would warrant.
- (6) For factories the listed fixtures are minimum and may be adjusted upward depending upon the type of operation, when it is considered minimum requirements will not be adequate.
- (7) Provide one drinking fountain within 50 feet of all operational processes, and at least one for each 75 persons.
- (8) Toilet facilities shall be provided on each floor for each sex using that floor and shall be readily accessible except where there is a mezzanine, occupied by a single tenant and the toilet facilities are not for public use. Toilet facilities accessible only through private offices shall be considered in addition to the above minimum requirements and the personnel occupying such offices may be subtracted from the total employment. EXCEPTION: Toilet facilities for public use in places of public occupancy, restaurants, bars, transportation terminals and similar locations shall be provided on each floor for each sex.
- (9) In any building, one drinking fountain shall be provided if there are over 10 employees and a minimum of one conveniently located for each 75 employees; not to be located in any toilet room or vestibule to a toilet room.
- (10) Where there are 10 offices or more, and 26 occupants, a service sink shall be provided on each floor.
- (11) Arcades with stores 400 sq. ft. or less in area may have centrally located toilet facilities.
- (12) Filling stations shall be provided with a minimum of 1 water closet and 1 lavatory for each sex and at least 1 basket type floor drain connected to a gas and oil interceptor, and a service sink in the wash area.

TABLE P (2)
MINIMUM FIXTURE REQUIREMENTS
PATRONS OF CATERING ESTABLISHMENTS

(Applicable to Restaurants, Bowling Alleys, Beer and Liquor Bars, Clubs, and Eating and Drinking Establishments)

Males				Female		
No. of Males	Water Closets	Urinals	Lava-tories	No. of Females	Water Closets	Lava-tories
1-25	1	1	1	1-20	1	1
26-40	1	2	1	21-52	2	1
41-60	2	2	2	53-80	3	2
61-80	2	3	2	81-117	4	2
81-140	3	3	2	118-150	5	3
141-180	3	4	3	151-180	6	3
181-250	4	4	4	181-260	7	4

FOR GREATER NUMBER OF PATRONS, AND FOR SERVICE SINK REQUIREMENTS CONTACT THE MINISTER OF HEALTH

NOTATIONS: Where beverages of any kind are served, 18" of counter or bar space and/or 15 square feet of serving area equals one person. All toilet rooms shall be of easy and convenient access to both patrons and employees on the same floor with and under the responsible direction of the management of the premises served, and shall not be over 50 feet developed length from the nearest exit to the dining room, bar or food service area.

Provide one 3-compartment sink (16"x16"x16") minimum size.

Provide a floor drain for each 50 square feet of back-bar or back-counter working space.

Sinks must have a constant supply of 180 F. water.

TABLE P (3)
MINIMUM FIXTURE REQUIREMENTS
EMPLOYEES OF CATERING ESTABLISHMENTS

(Applicable to Restaurants, Bowling Alleys, Beer and Liquor Bars, Clubs, and Eating and Drinking Establishments)

No. of Persons	Males			Females	
	Water Closets	Urinals	Lava-tories	Water Closets	Lava-tories
1-5	Patrons sanitary accommodations may be accepted.				
6-10	1	1	1	1	1
11-15	1	2	2	2	2
16-25	2	2	2	3	2
26-40	2	3	3	4	3

NOTATIONS: Where beverages of any kind are served, 18" of counter or bar space and/or 15 square feet of serving area equals one person. All toilet rooms shall be of easy and convenient access to both patrons and employees on the same floor with and under the responsible direction of the management of the premises served, and shall not be over 50 feet developed length from the nearest exit to the dining room, bar or food service area.

Provide one 3 compartment sink (16"x16"x16"), minimum size.

Provide a floor drain for each 50 square feet of back-bar or back-counter working space.

Sinks must have a constant supply of 180° F. water.

TABLE P (4)
MINIMUM FIXTURE REQUIREMENTS—PLACES OF PUBLIC ASSEMBLY

(Applicable to Theatres, Churches, Arenas, Stadiums, Lodge Halls, etc.)

Males				Females		
No. of Males	Water Closets	Urinals	Lava-tories	No. of Females	Water Closets	Lava-tories
1-100	1	1	1	1-50	1	1
101-250	2	1	2	51-140	2	2
251-360	2	2	3	141-250	3	3
361-470	2	3	3	251-360	4	3
471-580	3	3	3	361-470	5	3
581-700	3	4	3	471-690	6	3
701-820	3	5	3	691-960	7	4
821-975	4	5	4	961-1300	8	4
976-1150	4	6	4	1301-1640	9	5
1151-1325	4	7	4	1641-2000	10	6
1326-1490	5	7	5	2001-2350	11	7
1491-1675	5	8	5	2351-2700	12	8
1676-1875	5	9	5			
1876-2075	6	9	6			
2076-2250	6	10	6			
2251-2475	6	11	6			
2476-2700	6	12	7			
Above 2700 add 1 water closet and 1 lavatory for each additional 500 males and 1 urinal for each additional 300 males.				Above 2700 add one water closet for each additional 350 females and one lavatory for each additional 500 females. Female urinals may be substituted for water closets up to one-half of the required number of water closets.		

NOTATIONS: Hotels, places of public assembly, public toilet rooms, places of employment, stores, hospitals, convalescent homes, schools, dormitories, day nurseries, rooming houses, filling stations, places of detention community toilet and all locations that may be classed as other than private residential or private apartments shall have open-front seats on all water closets.

Drinking fountains shall be provided at a ratio of 1 for each 200 persons up to 800 total number of persons, over 800 to be considered a special problem and design is to be submitted for approval.

The occupancy total of drive-in theatres shall be based on 3 persons per parking space.

TABLE P (5)
MINIMUM FIXTURE REQUIREMENTS - DORMITORIES

Males			Female		
Water Closets	Urinals	Lava-tories	Water Closets	Lava-tories	Drink-ing Fountains
1 for the first 10 males. Over 10, 1 for each additional 25 males.	1 for each 25 males up to 150 males. Over 150 males add 1 for each 50 additional males.	1 for the each 12 males up to 75 males. Over 75, 1 for each 20 males. Additional separate dental lavatories should be provided in communal toilet rooms at 1 for each 20 males.	1 for the first 8 females. Over 8, and for each additional 20 females.	1 for each 12 females up to 75 females. Over 75, one for each additional 15 females. Additional separate dental lavatories should be provided in communal toilet rooms at 1 for each 20 females.	One per each 75 persons and a minimum of one per floor and a minimum of 2 per dormitory.
Note: Bath or shower requirements same as for lavatories.					

NOTATION: Where there are 10 offices or rooms or more, and 25 employees or persons, a service sink shall be provided on each floor.

TABLE P (6)
MINIMUM FIXTURE REQUIREMENTS
NURSERIES AND NURSERY SCHOOLS

Total No. of Children	Water Closets	Lava-tories	Bathtubs or Showers	Drinking Fountains
<i>Day Care</i>				1 for each 50. Minimum of 2; 1 inside building and one on play-ground.
1-10	1	1	1	
11-15	1	2	1	
16-30	2	3	2	
31-50	3	4	2	
<i>Night Care</i>				
1-8	1	1	1	
9-18	2	2	2	
19-30	3	3	3	
31-60	4	4	3	

NOTATION: Toilets shall be accessible from the playground as well as from inside building; 10" rim height on water closets for children under 8 years; 13" rim height for children 8 years or over.

TABLE P (7)
MINIMUM FIXTURE REQUIREMENTS—SCHOOLS

1) WASHING FACILITIES

Basins should be set at a suitable height for the children who are to use them. For infants they should be at varying heights between 18 and 22 inches. For older children they should be at varying heights up to, but not exceeding 32 inches. For the first 30 pupils there should be two basins for each sex, one additional basin for each sex for every additional 30 pupils up to a total of 300 and then one additional basin for each sex for every additional 60 pupils.

2) DRINKING FACILITIES

There should be an adequate supply of drinking water obtained from fountain of the bubble or spray type, thus eliminating drinking cups. The most suitable patterns are of the upward jet variety from which the water is delivered from a covered orifice, and one should be provided for every 100 children in large schools and small schools should have at least two.

3) TOILET FACILITIES

In the case of infants there may be a common approach but internal separation of boys and girls accommodation is necessary. Each closet should be at least 2 feet 6 inches wide and should be provided with a door and a partition not less than 6 feet high. For pupils over the age of 12, doors should have inside fastenings. Accommodation on the following scale should be provided: —

GIRLS — For the first forty (40) pupils, three (3) toilets; every additional forty (40), two toilets up to three hundred and twenty (320), thereafter one extra toilet for every additional fifty (50) pupils.

BOYS—For the first forty (40) pupils, three (3) toilets; every additional forty (40) two toilets up to three hundred and twenty (320), thereafter one additional toilet for every fifty (50) pupils. One third of the required sanitary facilities for boys shall be water closets the remainder shall be urinal stalls.

4) SERVICE SINKS: Contact the Minister of Health.

NOTATIONS: For shower facilities, hot water facilities or other sanitary facilities for special-purpose schools, contact the Minister of Health and Minister of Education.

NOTES

SUB-INDEX

3614 WATER SUPPLY AND DISTRIBUTION

Paragraph No.	Paragraph Title	Page No.
3614.1	Quality of Water Supply	36-112
	(a) Public Water Service Required	36-112
	(b) Approval	36-113
	(c) Acceptable Sources	36-113
	(d) Potable Water Conservation and Storage	36-113
	(1) When Required	36-113
	(2) Dual Systems	36-113
	(3) Potable Water Storage Required	36-113
	(4) Flow Control Devices	36-114
	(5) Leak Detection	36-114
	(6) Unnecessary Use of Potable Water	36-115
3614.2	Water Supply Mandatory	36-115
3614.3	Protection of Potable Water Supply	36-115
	(a) Water Discharge Outlets	36-115
	(b) Approval of Devices	36-116
	(c) BackFlow	36-116
	(d) Special Devices	36-116
3614.4	Vacuum Breakers and Air Gaps	36-116
	(a) Flushometer	36-116
	(b) Flushing Tanks	36-116
	(c) Equipment Water Connections	36-116
	(d) Valve Outlet	36-117
3614.5	Water Service Pipe	36-117
	(b) Stop-and-Waster Valve Combination	36-117
	(c) Private Water Supply	36-117
3614.6	Water Pumping and Storage Equipment	36-118
	(a) Pumps and Other Appliances	36-118
	(b) Water-Supply Cisterns or Tanks	36-118
	(c) Cleaning, Painting, Repairing Water Tanks	
3614.7	Water-Supply House Cisterns or Tanks	36-118
	(a) When Required	36-118
	(b) Surge Tanks	36-118
	(c) Auxiliary Pressure: Supplementary Tank	36-118
	(d) Support	36-118
	(e) Overflow for Water-Supply Tanks	36-118
	(f) House Tanks Supply	36-119
	(g) Drains	36-119
	(h) Size of Overflow	36-119
	(i) Pressure Tanks	36-119
3614.8	Water-Distribution Pipe, Tubing and Fittings	36-119
3614.9	Allowance for Character of Water	36-119

	(a) Selection of Materials	36-119
	(b) Used Piping	36-120
3614.10	Water Supply Control	36-120
3614.11	Water Supply Distribution	36-120
	(a) Water-Service Pipe	36-120
	(b) Demand Load	36-121
3614.12	Procedure in Sizing the Water Distribution System of a Building	36-121
3614.13	Size of Fixture Supply	36-124
3614.14	Minimum Pressure	36-125
3614.15	Variable Street Pressures	36-125
3614.16	Hazard and Noise	36-125
3614.17	Hot-Water Distribution	36-125
3614.18	Safety Devices	36-125
	(a) Pressure-Relief Valve	36-125
	(b) Temperature Relief Valves	36-125
	(c) Approvals	36-125
	(d) Relief-Valve Location	36-126
	(e) Relief Outlet Wastes	36-126
	(f) Drips—Location for Buildings	36-126
	(g) Relief Valve Discharge Lines	36-126
3614.19	Storage Tanks	36-127
	(a) Applicable Requirements	36-127
	(b) Marking	36-127
	(c) Minimum Pressures	36-127
	(d) Drain Cock	36-127
	(e) Line Valves	36-127
	(f) Water Used for Processing	36-127

PLUMBING (Continued)

3614 WATER SUPPLY AND DISTRIBUTION

3614.1 QUALITY OF WATER SUPPLY:

- (a) PUBLIC WATER SERVICE REQUIRED: Except for small buildings whose water supply requirements are defined in section 3617, "PLUMBING CODE FOR SMALL BUILDINGS," all premises intended for human habitation or occupancy, including but not limited to, establishments to be used for household, domestic, food

processing, food handling, restaurant, dairy or bottling purposes, public buildings and places of assembly or other establishments where a water supply is or may be used for human consumption, shall be supplied from the approved public water mains, where such mains are available. Where a water supply is not available from approved public water mains such premises shall be supplied with potable water (as herein defined) from a privately owned well or other source which has been properly approved by the Minister of Works and Minister of Health. "WATER SUPPLY AND DISPOSAL WELLS" shall be as set forth in Section 361

- (b) APPROVAL: No water supply of a non-potable nature shall be used for commercial or industrial purposes unless such use and the source of supply has first been approved by the Minister of Works and Minister of Health.
- (c) ACCEPTABLE SOURCES: Where a public supply of potable water is not available, the requirements of the Minister of Works and Minister of Health shall be satisfied. All wells intended as a supply for dietetic use shall be inspected before use and treatment facilities shall be installed to the satisfaction of the Minister of Works and Minister of Health.
- (d) POTABLE WATER CONSERVATION AND STORAGE:
 - (1) WHEN REQUIRED: All new structures, whether public or private, where the use of five or more vacuum type or conventional water closets is contemplated, shall be subject to the following requirements for conservation of water.
 - (2) DUAL SYSTEMS: Dual piping systems which provide for collection, storage, treatment, and eventual re-use of water from fixtures not specifically intended to receive fecal wastes, such as lavatories, tubs, showers, or similar usage shall be incorporated in the design of a building plumbing system containing 5 or more water closets. Quantity of storage for water intended for re-use shall be selected by the design engineer, but shall not be less than an 8 hour supply to the water closets and urinals, calculated for peak conditions. Auxiliary potable water supplied to the cistern through automatic float valves with 6-inch air gap will be permitted. Cased salt water supply wells with duplex pumps and piping system serving water closets and urinals may be used in lieu of collection and re-use facilities.
 - (3) POTABLE WATER STORAGE REQUIRED: In addition to the requirement for dual systems and re-use of waste water, all

multi-family buildings with five or more units shall be provided with potable water storage tanks and attendant pumping systems. The tanks shall be sized on a basis of 100 gallons of effective capacity per dwelling unit. Tanks shall be filled from the public mains by gravity through float valves with a minimum 6-inch air gap to prevent back-siphonage. All house pumping facilities shall be fully automatic and shall employ duplex pumping. All hotels or motels which maintain complete food service facilities shall maintain a 24-hour potable water supply. Piping connections to cisterns shall be designed in such a manner to prevent stagnation of tank contents by means of cross withdrawal to system.

- (4) **FLOW CONTROL DEVICES:** All conventional plumbing fixtures shall be designed to limit flow rates (at any reasonable system pressure) to an amount not in excess of that required for satisfactory operation and acceptable use as intended. Flow control devices may be pressure regulators, variable orifice, or other approved devices to limit flow to the following values (plus or minus 10%):

***Rate depends on the type of head.**

Fixture	Flow Rate U.S. GPM
Lavatories (Regular)	1.5
Lavatories (Large)	2.0
Sinks (Small)	2.0
Domestic Kitchen Sinks	3.0
Commercial Kitchen Sinks	4.0
Slop Sinks	4.0
Service Sinks	4.0
Showers	2.0, 2.5, 3.0, 4.0*
Showerheads	2.0, 3.0, 4.0*
Showerheads (Institutional)	2.0, 3.0*
Ice Water Taps	0.5
Drinking Fountains (Small)	0.5
Drinking Fountains (Large)	0.75
Closet Tanks (Small)	3.0
Closet Tanks (Large)	4.0

Any device which conserves water is strongly recommended for installation in The Bahamas, and will be given consideration.

- (5) **LEAK DETECTION:** Any system with 24 water closets or more of any type shall have the water supply system arranged

in such a manner to allow “check metering” of the entire system in a minimum of 25 per cent sections, as follows: The main water service line shall be divided into four individual services. Each service shall be provided with two valves and a removable section of pipe eighteen inches long with a pair of unions at two elbows for removal of the section and temporary insertion of a check meter. Actual meters are not required to be installed by the Owner.

- (6) UNNECESSARY USE OF POTABLE WATER: It shall be construed to be a violation of the intent of this Code where excess potable water is used except where no other reasonable means is available for a particular system. Types of water use which are not allowable include the following:
- (a) Condensing water for air conditioning equipment. (Cooling towers with drift eliminators are acceptable).
 - (b) No swimming pools shall be filled with potable water from a public supply.
 - (c) Decorative fountains shall have pumps for recirculation of fresh water.
 - (d) Laundries with 6 or more 18 lb. machines must filter, treat and recirculate water.
 - (e) Commercial car wash establishments are prohibited unless equipment for re-claiming filtering and re-use is provided.
 - (f) Process cooling which is designed for non-circulated and auxiliary cooling of water shall be prohibited.
 - (g) No lawn or ground sprinkler systems will be permitted where the source of supply is a public system, except where water has been used initially for sanitary purposes and has been collected, properly treated, and filtered.

3614.2 WATER SUPPLY MANDATORY: Every building in which plumbing fixtures are installed and are for human occupancy or habitation shall be provided with an ample supply of water meeting the standards set forth by the Minister of Health.

3614.3 PROTECTION OF POTABLE WATER SUPPLY:

- (a) WATER DISCHARGE OUTLETS: Potable water supply piping and

water discharge outlets shall have backflow prevention devices or similar equipment and shall not be so located as to make possible their submergence in any liquid or substance.

- (b) **APPROVAL OF DEVICES:** Before any device for the prevention of backflow or back-siphonage is installed, it shall have first been certified as meeting the requirements of ASA A40.6 by a recognized testing laboratory acceptable to the Minister of Works. Devices installed in a potable water supply for protection against backflow shall be maintained in good working condition by the person or persons having control of such devices. The Minister of Works may inspect such devices and, if found to be ineffective or inoperative shall require the replacement thereof.
- (c) **BACKFLOW:** The water-distributing system shall be protected against backflow. Every water outlet shall be protected from backflow preferably by having the outlet end from which the water flows spaced a distance above the flood-level rim of the receptacle into which the water flows sufficient to provide a "minimum required air gap" as defined in ASA A40.4. Where it is not possible to provide a minimum air gap, the water outlet shall be equipped with an accessibly located backflow preventer complying with ASA A40.6, installed on the discharge side of the manual control valve.
- (d) **SPECIAL DEVICES:** Where it is not possible to provide either a minimum air gap or a backflow preventer, as may be the case in connection with cooling jackets, condensers or other industrial or special appliances, the Minister of Works shall require other approved means of protection.

3614.4 **VACUUM BREAKERS AND AIR GAPS:**

- (a) **FLUSHOMETER:** A flushometer shall be equipped with an approved vacuum breaker. The vacuum breaker shall be installed on the discharge side of the flushing valve with the critical level at least one inch above the top of any fixture or appliance with integral waterway except such fixtures as conform to ASA Standard A40.4 for required air gaps.
- (b) **FLUSHING TANKS:** Flushing tanks shall be equipped with an approved ball-cock. The ball-cock shall be installed with the critical level of the vacuum breaker at least one inch above the full opening of the overflow pipe. In cases where the ball-cock has no hush tube, the bottom of the water supply inlet shall be installed one inch above the full opening of the overflow pipe.
- (c) **EQUIPMENT WATER CONNECTIONS:** Connections of potable water to cooling towers, expansion tanks, boilers, chillers or any

piece of equipment whose contents could contaminate a potable water system shall have backflow preventers as approved by the Minister of Works.

- (d) VALVE OUTLET: The hot and cold-water supply to fixtures with hose attachments, and other appliances physically connected to a water supply system, shall be protected from backflow, back-siphonage and back pressure. Where hot and cold water valves are connected to supply tempered water to another valve for use in fixtures such as bed pan washers, bidets and needle showers, check valves or combined valve and check devices shall be provided to prevent the cross flow of water in the water distributing system.

3614.5 WATER SERVICE PIPE:

- (a) The water-service pipe may be placed in the same trench with the building drain and building sewer provided the following conditions are satisfied:
 - (1) The water-service pipe and all other pipe or piping or conduit, shall be placed on a solid shelf excavated at one side of the common trench, above the sanitary sewer line, with a minimum of ten inches between pipes or conduits.
 - (2) The number of joints in the service pipe shall be kept to a minimum.
 - (3) The materials and joints of sewer and water-service pipe shall be installed in such manner and shall possess the necessary strength and durability to prevent the escape of solids, liquids, and gases, therefrom, under all known adverse conditions such as corrosion, strains due to temperature changes, settlement, vibrations and superimposed loads.
- (b) STOP-AND-WASTE VALVE COMBINATION: Combination stop-and-waste valves and cocks shall not be installed in an underground service pipe.
- (c) PRIVATE WATER SUPPLY:
 - (1) No private water supply shall be interconnected with any public water supply.
 - (2) Where temporary approval in writing has been granted to provide for emergency use of public-private water supplies either a multi-port valve or a piped jumper connection designed to preclude simultaneous use of public or private supplies shall be provided.

- 3614.6 WATER PUMPING AND STORAGE EQUIPMENT:
- (a) PUMPS AND OTHER APPLIANCES: Water pumps, tanks, filters, softeners, and all other appliances and devices shall be protected against contamination.
 - (b) WATER-SUPPLY CISTERNS OR TANKS: Potable-water-supply tanks shall be properly covered and screened to prevent the entrance of foreign material or insects into the water supply. Soil or drainage lines shall not pass directly over such tanks.
 - (c) CLEANING, PAINTING, REPAIRING WATER TANKS: A potable-water-supply tank used for domestic purposes shall not be lined, painted, or repaired with any material which will affect either the taste, colour, or the potability of the water supply when the tank is returned to service. Tanks shall be disconnected from the system during such operations, to prevent any foreign fluid or substance from entering the distribution piping.
- 3614.7 WATER-SUPPLY HOUSE CISTERNS OR TANKS:
- (a) WHEN REQUIRED: When the water pressure from the community mains during flow is insufficient to supply all fixtures freely and continuously, the rate of supply shall be supplemented by a gravity house tank or booster system even where less than 5 water closets are to be installed.
 - (b) SURGE TANKS: In any structure that requires an auxiliary pump to supplement the available water supply, such pump shall be supplied from a surge tank to be supplied with water from public or private main through a float valve with a 6 inch air gap. The minimum size of a surge tank shall provide sufficient volume for ten minutes operation of booster pumps at peak flow rate.
 - (c) AUXILIARY PRESSURE: SUPPLEMENTARY TANK: If the residual pressure in the system, regardless of size of the building, is below the minimum allowable at the highest water outlet when the flow in the system is at peak demand, an automatically controlled pressure tank or gravity tank shall be installed, of sufficient capacity to supply sections of the building installation which are too high to be supplied directly from the public water mains.
 - (d) SUPPORT: All water-supply tanks shall be supported in accordance with the building code.
 - (e) OVERFLOW FOR WATER-SUPPLY TANKS: Overflow pipes for gravity tanks shall discharge to a visible point of disposal. Rain water gutters discharging into a street gutter are not considered

approved points of disposal. Adequate overflow pipes properly screened against the entrance of insects and vermin shall be provided.

- (f) HOUSE TANK SUPPLY: The water-supply inlet within the house tank shall be at an elevation not less than is required for an air gap in an open tank with overflow, but in no case shall the elevation be less than four inches above the overflow. If a drop pipe is added to the ball cock or filling device an air inlet shall be inserted in the drop pipe at least six inches above the overflow.
- (g) DRAINS: Water-supply tanks shall be provided with valved drain lines located at their lowest point and discharged as an indirect waste or as required for overflow pipes in paragraph 3614.7 (e).
- (h) SIZE OF OVERFLOW: Overflow drain openings for water supply tanks shall not be less than twelve square inches of free opening or as required to preclude rim overflow.
- (i) PRESSURE TANKS: Pressure tanks used for supplying water to the domestic water distribution system, combined supply to fire standpipes and domestic water systems, or to supply standpipes for fire equipment only, shall be equipped with an accessible water and pressure gauge.

3614.8 WATER-DISTRIBUTION PIPE, TUBING AND FITTINGS:

- (a) Materials for water-distributing pipes and tubing shall be as specified in Section 3604.
- (b) Pipes conveying fire and domestic water shall not be installed underneath a concrete slab on fill in any location inside the building walls of buildings on filled ground where the presence of hydrogen sulfide gas or other injurious elements is known, and in areas being or having been recently filled below high tide areas. Such piping and fittings may be installed in concrete trenches with removable covers or in an approved conduit. Fire lines shall be of metallic materials.

3614.9 ALLOWANCE FOR CHARACTER OF WATER:

- (a) SELECTION OF MATERIALS: When selecting the material and size for water-supplying pipe, tubing, or fittings, due consideration shall be given to the action of the water on the interior and of the soil, fill or other material on the exterior of the pipe. No material that would produce toxic conditions in a potable-water-supply system shall be used for piping, tubing, or fittings.

- (b) USED PIPING: No piping material that has been used for other than potable-water-supply system shall be re-used in the potable-water-supply system.

3614.10 WATER SUPPLY CONTROL:

- (a) In addition to the requirements for leak detection, each building shall have a separate water control valve, independent of the meter valve. Each apartment or store in a building shall have a separate independent control valve or individual fixture control valve controlling all the fixtures in such apartment or store. Main control valves shall be located at or near the foundation line outside the building above the ground or in a separate box with cover. Such box shall be constructed in accordance with the drawing in Appendix C.
- (b) Supply lines taken from pressure or gravity tanks shall be valved at or near the tank. Tanks in connection with a domestic water system shall have a drain cock installed on the discharge side of such valve.
- (c) Each water closet and urinal supply shall have an independent water control valve placed above the floor and all single fixtures or groups of fixtures in hotels, office buildings, hospitals, clinics, places of public assembly and manufacturing plants shall either have separate fixture control valves or a single control valve for each group of fixtures in a single room. Each water storage tank shall have a water control valve and draw off valve.
- (d) A shut-off valve minimum size three-quarter-inch, shall be provided in the cold water branch line, accessible and adjacent to each water-storage tank of each water heater.
- (e) Sillcocks for all multiple residential occupancies of more than two units served by a single water service shall be separately and individually valved or otherwise arranged to shut off the supply to the sillcocks without interrupting water supply to the resident units.

3614.11 WATER SUPPLY DISTRIBUTION:

- (a) WATER-SERVICE PIPE: The water-service pipe from the street main to the water-distribution system for the building shall be of sufficient size to furnish an adequate flow of water to meet the requirements of the building at peak demand, and in no case shall be less than three-quarters-inch nominal diameter. If flushometers or other devices requiring a high rate of water flow are used, the water-service pipe shall be designed to supply this flow.

- (b) DEMAND LOAD: The demand load in the building water-supply shall be based on the number and kind of fixtures installed and the probable simultaneous use of these fixtures.

3614.12 PROCEDURE IN SIZING THE WATER DISTRIBUTION SYSTEM OF A BUILDING: The sizing of the water distribution system shall conform to good engineering practice. Methods used to determine pipe sizes shall be approved by the Minister of Works, and shall be in accordance with BMS66, National Bureau of Standards, or the following tables:

THE TABLES ARE APPLICABLE TO ONLY THE MOST FAVOURABLE CONDITIONS, WHERE WATER MAIN PRESSURE DOES NOT FALL BELOW 50 P.S.I AT ANY TIME, AND ARE INTENDED AS A GUIDE ONLY.

IN GENERAL FOR 3 OR 4-STOREY BUILDINGS, OR WHERE MAIN PRESSURE FALLS BELOW 50 P.S.I., THE NEXT LARGER SIZE GROUP SHOULD BE USED. SIZES SHOWN FOR COPPER ARE APPLICABLE TO P.V.C. PIPING.

WHERE CONDITIONS DO NOT CONFORM TO THE FOLLOWING TABLE, THE PROVISIONS OF BMS-66 NATIONAL BUREAU OF STANDARDS PUBLICATIONS SHALL APPLY. IT SHALL BE THE RESPONSIBILITY OF THE DESIGN ENGINEER TO DETERMINE PREVAILING WATER PRESSURES IN ANY PARTICULAR AREA. FURTHER, IT SHOULD BE NOTED THAT NOISE DUE TO VELOCITY OF FLOW MAY RESULT FROM THE USE OF PIPE SIZES LISTED.

TABLE Q

MINIMUM WATER SERVICE PIPE SIZE FOR
ONE AND TWO-STOREY BUILDINGS

<i>Hotel, Motel and Residential Occupancy Only</i>						
No. of Bathrooms and Kitchens <i>Tank Type Closets</i>		Diameter of Water Services Pipe	Recommended Meter Size	Approx. Pressure Loss-Meter and 100' of Pipe	No. of Bathrooms and Kitchens Flush Value Closets	
Copper	Galv.	inches	inches	p.s.i.	Copper	Galv.
1-2	....	3/4	5/8	27	....	....
....	1-2	3/4	5/8	40	....	....
....	....	1	1	30	1	....
3-4	....	1	1	22	....	....
....	3-4	1	1	24	....	....
....	....	1 1/4	1	32	2-3	....
....	....	1 1/4	1	36	....	1-2
5-9	....	1 1/4	1	28	....	....
....	5-8	1 1/4	1	32	....	....
....	....	1 1/2	1 1/2	29	4-10	....
....	....	1 1/2	1 1/2	30	....	3-7
10-16	....	1 1/2	1 1/2	17	....	....
....	9-14	1 1/2	1 1/2	21	....	....
....	....	2	1 1/2	26	11-18	....
....	....	2	1 1/2	32	....	8-18
17-38	....	2	1 1/2	27	....	....
....	15-38	2	1 1/2	32	....	....
....	....	2	2	25	19-33	....
....	....	2	2	24	....	19-24
39-56	....	2	2	25	....	....
....	39-45	2	2	24	....	....
....	....	2 1/2	2	28	34-57	....
....	....	2 1/2	2	32	....	25-27
57-58	....	2 1/2	2	28	....	....
....	46-78	2 1/2	2	32	....	....
....	46-78	2 1/2	2	32	....	....
....	....	3	3	16	58-95	....
....	....	3	3	19	....	58-95
79-120	....	3	3	16	....	....
....	19-120	3	3	19	....	....

TABLE R

MINIMUM WATER SERVICE PIPE SIZE FOR ONE AND TWO STOREY BUILDINGS

<i>Commercial</i>						
No. of Fixture Units Flush Tank Water Closet		Size Service	Size Meter	Appr. Loss	No. of Fixture Units Flush Valve Water Closets	
Copper	Galv. Iron or Steel	Nom. Size inches	Nom. Size inches	p.s.i.	Copper	Galv. Iron or Steel
18	....	3/4	5/8	30	....	....
....	15	3/4	5/8	30	....	....
19-55	....	1	1	30	....	....
....	16-36	1	1	30	....	....
....	....	1	1	30	9	....
56-85	....	1 1/4	1	30	....	....
....	37-67	1 1/4	1	30	....	....
....	....	1 1/4	1	30	10-20	....
....	....	1 1/4	1	30	....	14
86-255	....	1 1/2	1 1/2	30	....	....
....	68-175	1 1/2	1 1/2	30	....	....
....	....	1 1/2	1 1/2	30	21-77	....
....	....	1 1/2	1 1/2	30	....	15-52
226-350	....	2	1 1/2	30	....	....
....	176-290	2	1 1/2	30	....	....
....	....	2	1 1/2	30	78-175	....
....	....	2	1 1/2	30	....	53-122
351-550	....	2	2	30	....	....
....	291-450	2	2	30	....	....
....	....	2	2	30	176-315	....
....	....	2	2	30	....	123-227
551-640	....	2 1/2	2	30	....	....
....	451-580	2 1/2	2	30	....	....
....	....	2 1/2	2	30	316-392	....
....	....	2 1/2	2	30	....	288-343
641-1340	....	3	3	22	....	....
....	581-1125	3	3	22	....	....
....	....	3	3	22	393-940	....
....	....	3	3	22	....	344-785

**TABLE S
REQUIRED PRESSURE DURING FLOW FOR DIFFERENT FIXTURES**

Fixtures	Flow Pressures p.s.i.
Ordinary basin faucet	8
Self-closing basin faucet	12
Sink faucet.....3/8 inch	10
Sink faucet.....1/2 inch	5
Bathtub faucet	5
Laundry tub cock.....1/2 inch	5
Shower	12
Ball-cock for closet	15
Flush valve for closet	10-20
Flush valve for urinal	15
Garden hose, 50 ft. and sill cock	30
*Flow pressure is the pressure in the pipe at the entrance to the particular fixture considered.	

3614.13 **SIZE OF FIXTURE SUPPLY:** The minimum size of a fixture-supply pipe from the riser or main to the wall opening shall be as follows:

**TABLE T
MINIMUM FIXTURE SUPPLY PIPE SIZES**

Bathtubs	1/2 inch
Combination sink and tray	1/2 "
Drinking fountain	3/8 "
Dishwater (Domestic)	1/2 "
Hot water heaters	3/4 "
Kitchen sink, residential	1/2 "
Kitchen sink, commercial (over one compartment)	1/2 "
Lavatory	3/8 "
Laundry tray, 1, 2 or 3, compartments	1/2 "
Shower (single head)	1/2 "
Sinks (service, slop)	1/2 "
Sinks flushing rim	1 "
Urinal (flush tank)	1/2 "
Urinal(direct flush valve)	3/4 "
Water closet (tank type)	1/2 "
Water closet (flush valve type)	1 "
Hose bibbs	1/2 "

A group of not more than two fixtures shall be connected to a half-inch, cold water supply.

- 3614.14 **MINIMUM PRESSURE:** Minimum, fairly constant, service pressure, at the point of outlet discharge shall not be less than 8 p.s.i. for all fixtures except for direct flush valves, for which it shall be not less than 15 p.s.i. for all fixtures except for direct flush valves, for which it shall be not less than 15 p.s.i., and except where special equipment is used requiring higher pressure. In determining the minimum pressure, allowance shall be made for the pressure drop due to friction loss in the piping system during maximum demand periods as well as head, meter, and other losses in the system.
- 3614.15 **VARIABLE STREET PRESSURES:** When the street main has a wide fluctuation in pressure during the day, the water distribution system shall be designed for minimum pressure available.
- 3614.16 **HAZARD AND NOISE:** Water pipe installations shall be adequately protected from water hammer by use of air chambers or other approved devices. Air chambers shall be installed in such manner that will permit draining without disconnecting fixture supply. Air chambers or shock absorbers shall be installed and air chambers shall be not less in volume than a 12-inch length of pipe one size larger than the pipe it serves.
- 3614.17 **HOT-WATER DISTRIBUTION:** The sizing of the hot-water distribution piping shall conform to good engineering practice.
- 3614.18 **SAFETY DEVICES:**
- (a) **PRESSURE-RELIEF VALVE:** Pressure-relief valves shall be installed for all equipment used for heating or storage of hot water. The rate of discharge of such a valve shall limit the pressure rise for any given heat input within ten per cent of the pressure at which the valve is set to open.
 - (b) **TEMPERATURE RELIEF VALVES:** Temperature relief valves shall be installed for equipment used for the heating or storage of domestic hot water. Each temperature relief valve shall be of the reseating type and be rated as to its BTU capacity. In all cases the BTU rating of the temperature relief valve shall be greater than the BTU input rating of the appliance.
 - (c) **APPROVALS:** Combination pressure and temperature relief valves separate pressure and temperature relief valves, which have been tested and approved by, or meet the specification requirements of the American Gas Association, A.S.M.E., or other recognized approval authorities, shall be considered acceptable. **THE USE OF ELECTRICAL HIGH LIMIT SWITCHES DOES NOT ALLOW OMISSION OF SAFETY VALVES.**

- (d) RELIEF-VALVE LOCATION: Combination pressure and temperature valves, or temperature relief valves shall be located in the tank, or in hot water outlet from tank so as to be actuated by the water in the top of the tank served and in no case more than four inches developed length away from such tank. Pressure-relief valves may be located adjacent to the equipment they serve. There shall be no check valve or shut-off valve between a relief valve and the heater or tank for which it is installed.
- (e) RELIEF OUTLET WASTES: The outlet of a pressure, temperature, or other relief valve shall not be connected to the drainage system as a direct waste. THE RELIEF LINES SHALL NOT BE SMALLER THAN THE OUTLET FROM THE VALVE.
- (f) DRIPS—LOCATION FOR BUILDINGS: Each temperature and pressure relief valve or combination thereof shall be provided with a drip pipe connected to the valve discharge outlet. Drip pipes shall discharge as follows:
 - (1) For hot water storage tanks placed above the roof: as in (2) and (3) or upon the roof, on a concrete block.
 - (2) In cases where a building covers an entire lot; to any suitable plumbing fixture or floor drain terminating above the floor level except a water closet, urinal, bidet, bath or shower.
 - (3) In all other buildings except those described in the foregoing; to an observable point outside a building. The terminus of all drip pipes shall be without a thread. Where terminated outside a building; pointing down to within six inches of ground level.
- (g) RELIEF VALVE DISCHARGE LINES: Relief valve discharge line shall be sized as follows:

Up to 69,000 B.T.U.	3/8 inch ID Minimum
Above 69,000 to 127,000 B.T.U.	1/2 inch ID Minimum
Above 127,000 to 340,000 B.T.U.	3/4 inch ID Minimum
Above 340,000 to 600,000 B.T.U.	1 inch ID Minimum

SIZES SHOWN ABOVE ARE MINIMUM—NO RELIEF LINE SHALL BE SMALLER THAN A VALVE OUTLET.

This table shall be applicable for the relief line from single valves

or where the lines are manifolded. The manifold size shall be determined by the cumulative B.T.U. total of the relief valves served thereby, except that no discharge pipe shall be smaller than the largest valve outlet size discharging through that relief line or manifold.

3614.19 STORAGE TANKS:

- (a) APPLICABLE REQUIREMENTS: All storage tanks for domestic hot water shall meet the applicable A.S.M.E. and listed requirements. It shall be unlawful to install any water heaters in the attic of any structure.
- (b) MARKING: Any tank hereafter installed for the storage of domestic hot water shall have clearly and indelibly stamped in the metal of the tank, or marked upon a plate welded thereto, or otherwise permanently affixed, the maximum allowable working pressure and the hydrostatic test pressure which the tank is cosigned to withstand, and the year of manufacture. Such marking shall be placed in an accessible position so inspection and reinspection shall be readily accomplished.
- (c) MINIMUM PRESSURES: The minimum hydrostatic test pressure shall be 300 lbs. per square inch and the working pressure shall be not more than 42 1/2 per cent of the indicated hydrostatic test pressure.
- (d) DRAIN COCK: All storage tanks shall be equipped with adequate accessible drain cocks.
- (e) LINE VALVES: Valves in the water-supply distribution system, including hot water heaters and group shut-off valves, except those immediately controlling one fixture supply, when fully opened shall have a cross-sectional area of the smallest orifice or opening through which the water flows at least equal to 80 per cent of the cross-sectional area of the nominal size of the pipe in which the valve is installed.
- (f) WATER USED FOR PROCESSING: Water used for cooling of equipment or similar purposes shall not be returned to the potable-water distributing system. When permitted, the waste water shall be discharged through an indirect waste pipe or air gap to the drainage system or other approved point of disposal.

NOTES

SUB-INDEX

3615 SEWAGE AND LIQUID WASTE DISPOSAL SYSTEMS

Paragraph No.	Paragraph Title	Page No.
3615.1	Size of Septic Tanks	36-130
	(a) General	36-130
	(b) Small Apartment Houses and Hotels	36-130
	(c) Public Buildings	36-130
3615.2	Approvals	36-130
3615.3	Unlawful to Sell	36-130
3615.4	Building Permits	36-131
3615.5	Location, Design, Construction and Specifications	36-131
3615.6	(a) Factors Covering the Type and Method of Disposal of Sewage and Liquid Waste	36-134
	(b) Absorption of Drainage	36-136
	(c) Exception to Drainfield Requirements	36-136
	(d) Percolation Tests Required	36-136
	(e) Disposition of Sludge and Contents from Septic Tanks	36-136
	(f) Minimum Disposal Facilities	36-136
	(g) Design and Construction of Grease Trap Tanks	36-137
3615.7	General Provisions Covering the Construction of Drainfields	36-138
3615.8	Compression and Strength Tests	36-140
3615.9	Construction and Installation	36-140
3615.10	Disposal of Domestic Clothes Washers Liquid Waste for Single and Duplex Residences	36-141
3615.11	Testing, Strength Requirements and Reporting of Tests	36-143
	(a) Three-Quarter Inch Drainfield Rock	36-143
	(b) Four-Inch Drintile for Non-Vehicular Traffic Areas	36-144
	(c) Reservoir Drainfield Unit	36-144
	(d) Tests and Reports	36-144
	(e) Test Result	36-145
3615.12	Waste Water Treatment Plants	36-145
	(a) General	36-145
	(b) Prefabricated Plants	36-145
3615.13	Minimum Standards	36-146
3615.14	Septic Tank Operators	36-146

PLUMBING (Continued)

3615 SEWAGE AND LIQUID WASTE DISPOSAL SYSTEMS

3615.1 SIZE OF SEPTIC TANKS:

- (a) **GENERAL:** The minimum effective capacity of any septic tank installation shall be 750 U.S. gallons. There must be strict adherence to the Requirements of the Minister of Health on all sewage and liquid waste disposal systems. Buildings with a daily flow of more than 6,000 U.S. gallons shall be provided with disposal systems as required by the Minister, as specified in Sub-Section 3615.12 Waste Water Treatment Plants.
- (b) **SMALL APARTMENT HOUSES AND HOTELS:** Septic tank installations for hotels, apartment houses, and similar establishments shall be based on the following requirements: 1,200 U.S. gallons total capacity for the first four persons served plus an additional 75 U.S. gallons effective capacity for each person over four, unless otherwise specifically shown in Tables. The number of persons to be served shall be computed on the basis of two persons per bedroom, or on the basis of the actual number of persons to be served by the tank; whichever may be greater.
- (c) **PUBLIC BUILDINGS:**
 - (1) Public buildings, such as assembly halls, office buildings, and similar structures requiring septic tanks in excess of 2,500 U.S. gallons, total capacity shall be considered special problems and complete plans and specifications for the installation of any sewage and/or liquid waste disposal system for such structures shall be submitted to the Ministry of Health.
- (d) **EFFECTIVE AND TOTAL CAPACITY:** Effective capacity, for purposes of this section shall mean the "design" capacity plus 10 per cent added for sludge storage in the first compartment. Total capacity shall mean the total septic tank volume which would allow for sludge storage and final compartment space. See Appendix B.

3615.2 **APPROVALS:** For septic tanks over 2,100 gallon capacity, calculations, plans and specifications shall be submitted to the Minister of Health and the Buildings Control Officer for approval before construction work of any kind shall be commenced or a permit issued.

3615.3 **UNLAWFUL TO SELL:** No person, firm or corporation shall install, contract for, sell, manufacture or offer for sale within the area of jurisdiction

of this code, any septic tank, liquid waste or sewage treatment system or similar device, including chemical additives, which does not conform to the requirements of the Code, and who has not received approval therefor from the Minister of Works and Minister of Health.

3615.4 BUILDING PERMITS: No tank shall be installed until a permit for construction or installation has been obtained.

3615.5 LOCATION, DESIGN, CONSTRUCTION AND SPECIFICATIONS:

(a) The siting of sewage and liquid waste disposal systems shall be such that no insanitary condition, nuisance or hazard to fresh water supply occurs.

(1) A minimum distance of 6 ft. (for tanks up to 2,100 U.S. gallons) shall from a dwelling house, public building or any habitable structure, and the boundary of the property. Tanks over 2,100 U.S. gallons shall be sited as approved by the Minister of Health.

(2) A minimum distance of 12 ft. shall be maintained from any water storage tank.

(3) A minimum distance of 60 ft. shall be maintained from any fresh water supply well or spring.

(4) It is recommended that siting of septic tanks be on sides of a property adjacent to public streets, or easements to facilitate future connection to a public sewer system.

(5) The siting, construction or method of construction shall not pollute any water storage tank, well or spring.

(6) Septic tanks, shall be constructed of concrete or other approved impervious materials.

(7) The excavation for a septic tank shall be properly protected and covered pending completion of the septic tank system.

(b) Concrete septic tanks shall be pre-cast or poured in place construction. All concrete used in the construction of septic tanks shall have a strength of not less than 3000 p.s.i. in 28 days. Tests to determine water-tightness where required shall be made by filling tank with water to overflow point at the time inspection is called for. The interior wall of all septic tanks shall be finished smooth and impervious. Voids, pits, or protuberances on or in the inside walls of septic tanks are prohibited. The Minister may require that

plans for new buildings or additions bear a statement, by a person known to be qualified, as to the character of the soil under the bottom of the proposed septic tank to assure sufficient support for same. Water test of tanks may be required.

- (c) Precast septic tanks shall have a minimum wall thickness of two inches. Sectional precast tops poured in place shall have a minimum thickness of three inches. One-piece tops poured in place shall have a minimum thickness of four inches, and all tops shall be reinforced with #3 bars set laterally and longitudinally on six-inch centres where non-traffic loads are anticipated. All septic tank tops shall be of reinforced concrete, reinforced as stated above, and provided with an 18"x 24" manhole, and 12"x 12" inspection openings. Precast tanks shall be sufficiently reinforced to resist cracking during handling or installation with a minimum reinforcement of 6x6 — 10/10 wire mesh or mesh of equivalent area. Precast septic tanks shall have a monolithically poured bottom. Precast septic tanks shall not be located where vehicular traffic or other overburden loads are anticipated unless a permanent above grade construction arrangement is erected to guard the tank, or a positive arrangement is provided to prevent such loads from bearing on the tank. Where such support over the tank is required, it shall be on block walls or rock trench as set forth in the Sub-section describing SOAKAGE PIT LIDS. The method of construction shall be approved by the Buildings Control Officer.
- (d) (1) Cast-in-place septic tanks shall have a minimum wall thickness of 4" and a floor or lid thickness of 6 inches of concrete.
- (2) Cast-in-place septic tanks subject to overburden e not in excess of 2 feet of fill and not subject to vehicular loads shall be as follows:
- Walls and floors shall be reinforced with #4 bars 6" on centres each way with continuity around corners. Bars shall be located in the centre of the wall or floor slab. Lids spanning not more than 4 feet 6 inches may be reinforced with #4 bars 6" on centres short way end #3 bars 6" on centres long way and such bars shall be located one inch from the bottom of the dab.
- (3) Cast-in-place septic tanks subject to overburden loads in excess of the loads set forth in Sub-paragraph (2) above shall support the load of a ten-ton truck and shall have poured concrete lids having not less than the following thickness and reinforcing.

TABLE U

TRAFFIC LIDS FOR SEPTIC TANKS AND SOAKAGE PITS

Span of Lids	Slab Thickness	Bottom Reinforcing – spacing				
		#4	#5	#6	#7	#8
4'	7"	6"	7"	10"	12"	12"
5'	7"	–	5"	7"	10"	12"
6'	8"*	–	–	6"	8"	10"

*In addition to the bottom bars shown in the table, place #4 bars 6 inches o.c. in top of slab parallel to the bottom bars. Bottom bars shall be pieced 3/4 inches from bottom of slab.

Temperature reinforcing lengthwise in the lid shall be #4 bars spaced 10" o. c.

Traffic lids for cast-in-place septic tanks subject to loads other than those described in this Sub-section shall, when deemed necessary in the opinion of the Buildings Control Officer, be designed by an engineer recognized by the Minister.

- (e) Ventilation of septic tanks and drainpipes shall be provided through septic tank inlet and outlet tees thence through the plumbing system. Where a tank is over 20 feet from the building a 4" local vent shall be provided.
- (f)
 - (1) Inlets and outlets shall be of T junction pipes, open at the top, with the invert of the outlet pipe 3 in. below the level of the invert of the inlet pipe. These pipes may be made, of cast iron, pitch fibre, salt glazed ware, concrete, or P.V.C. plastic. A 12"x12" (minimum) inspection opening shall be placed over the inlet and outlet tees.
 - (2) The floor shall be of concrete at least 6 in. thick. The walls shall be of concrete plain or reinforced as approved by the Buildings Control Officer, at least 6 in. thick of concrete. The covering slab shall be of reinforced concrete, either precast or cast in place. Where precast slabs are used they shall be readily removable to provide access. Where cast-in place slab is used it shall have an access opening at least 18 in. by 24 in. with a metal cover or a concrete cover slab over it.

- (3) There shall be at least 11 in. clear between the top of the liquid and the underside of the slab.
- (4) All inside surfaces shall be rendered smooth with mortar mix.
- (g) Any person wishing to supply or install precast concrete septic tanks or septic tanks constructed of other impervious materials, shall apply in writing to the Minister of Health. The Minister of Health, if satisfied with the proposal, may approve the use of the septic tank with or without conditions.
- (h) Septic tanks, drainfields, soakage pits, and drainage wells shall not be located within any structure, nor under any roof or projection of any building structure except with the express approval of the Minister of Health and the Buildings Control Officer.
- (i) Unless otherwise approved by the Buildings Control Officer, by reason of special design, no excavation shall be made within the angle of pressure as transferred from the base of an existing structure to the sides of an excavation on a 45 degree angle.
- (j) Physical sizing of septic tanks shall be accomplished by proportioning the dimensions of the first compartment to contain a volume equal to a 24 hour design flow plus 10% added for sludge space. The final compartment shall be approximately 50% of the required capacity of the first compartment.
- (k) Drainfield relays for commercial occupancies shall be equivalent to the requirements as set forth for new installations. Drainfield relays for single-family or duplex occupancies shall comply with the requirements in effect at the time the drainfield being replaced was installed. In the event same drainfield locations are used, a percolation test may be required.

3615.6 FACTORS COVERING THE TYPE AND METHOD OF DISPOSAL OF SEWAGE AND LIQUID WASTE:

- (a) Any person or persons designing, constructing and/or installing sewage and/or liquid waste disposal systems shall in the design, installation or construction of such systems be governed by the following factors:

Where a public sewer exists, factors governing shall include:

- (1) The character and quality of sewage and/or liquid waste.
- (2) The availability of a public sewer.
- (3) The design or unused flow capacity of the available public sewer as set forth in Section 3605 DRAINAGE SYSTEM AND DISPOSAL.

NOTE 1: All buildings with more than 5 water closets shall be provided with a 24 hour holding tank, prior to the connection to the sewer.

- (4) For rainwater disposal Section 3605 DRAINAGE SYSTEM AND DISPOSAL.
- (5) The design or unused flow capacity of the existing plumbing system; whether such system is capable of accommodating the load as determined by the Minister of Works, and as other-wise limited by this Code.

NOTE 2: Details of manhole are given in Appendix B.

- (6) No sewage shall be pumped directly into any sewer. A manhole shall be installed by the owner at his property boundary and a gravity feed shall extend from the man hole to the sewer.

Where no public sewer exists or where a public sewer or plumbing system is inaccessible or is not capable of accommodating an added load, governing factors shall include:

- (1) The character and quality of sewage and/or liquid waste.
- (2) Location of the disposal system.
- (3) Soil porosity.
- (4) Underground water level.
- (5) Underground potable water.
- (6) Chloride content of underground water.
- (7) The design or unused flow

capacity of the existing plumbing system; whether such system is capable of accommodating the proposed load as determined by the Buildings Control Officer and as otherwise limited by this Code.

(8) Elevation of ground level.

- (b) ABSORPTION OF DRAINAGE: Any liquid wastes containing material which retards or prevents absorption or drainage in the ground shall be disposed of and treated in a manner acceptable in the Minister of Health.
- (c) EXCEPTION TO DRAINFIELD REQUIREMENTS: Where ground is exceptionally impervious; where the water table is too close to the surface; in an old installation to correct an insanitary condition; or where other exceptional conditions prevail making the installation of a drain or disposal well, in accordance with the provisions of this Code impractical, then the Minister of Health may waive the requirements herein and permit installation of such type of drainfield or substitute therefor as may be deemed practical.
- (d) PERCOLATION TESTS REQUIRED: Where soil porosity appears to be of a less than usual character, the Minister of Works may require, when in his opinion it is necessary, a percolation test and/or core boring to be made. The results or such tests shall be submitted to the Minister of Works, and shall determine deviation from requirements as set forth in this Code. The person designing such work and/or the owner shall furnish and supply such information.
- (e) DISPOSITION OF SLUDGE AND CONTENTS FROM SEPTIC TANKS: Sludge and contents from septic tanks shall not be deposited in any canal, reservoir, bay or other water, nor upon the top of the ground nor buried under the ground without approval. Method of disposal of sludge and contents from septic tanks and grease traps shall be approved by the Minister of Health.
- (f) MINIMUM DISPOSAL FACILITIES: Disposal of non-sanitary waste containing grease or oil, or other industrial wastes, not otherwise specifically mentioned in this chapter shall have the approval of the Minister of Health.

TABLE V

MINIMUM DISPOSAL FACILITIES FROM CATERING ESTABLISHMENTS

(Non-Sanitary)**	Up to 25 Persons	26 to 50 Persons	51 to 100 Persons	101 to 150 Persons
Liquid capacity of Greece Trap tank in U.S. gals	600	700	900	1300
Capacity of Septic Tank (Effective) in U.S. gallons	1000	1200	1400	1600
Square feet drain field* 12" of Drainfield Rock	200	400	800	1200
Capacity of Soakage Pit* In U.S. gallons	1000	2000	4000	6000

*Either drainfields or soakage pits may be used.

**See Table W for Sanitary Waste Disposal.

- (g) **DESIGN AND CONSTRUCTION OF GREASE TRAP TANKS:** Grease tanks shall be of the same design as septic tanks except that the outlet tee shall be extended to within eight inches of bottom of tank. Liquid capacities of grease tanks are based on a single or multiple tanks connected in series. The occupant content shall be determined on the basis of 18 linear inches of counter length per person and 15 sq. ft. of dining room area per person.

Establishments serving more than 150 persons shall be considered a special problem and the determination of disposal requirements shall be established by the Minister of Works and Minister of Health after site consideration.

TABLE W

MINIMUM EFFECTIVE CAPACITIES FOR SEPTIC TANKS AND SQUARE FEET OF DRAINFIELDS FOR WATER CLOSETS, URINALS AND LAVATORIES IN CATERING ESTABLISHMENTS (SANITARY WASTE DISPOSAL)

(See Separate Liquid Waste Disposal Requirements, as set forth in Table V.)

Up to 25 Persons	26 to 50 Persons	51 to 100 Persons	Tanks over 1250 gallons, require special approval.
1,000 gallon Septic Tank, with 100 sq. ft. drain-field.	1,150 gallon Septic tank with 175 sq. ft. drain-field.	1,250 gallon Septic Tank with 250 sq. ft. drain field.	

NOTATIONS:

- (1) Septic tank capacity for non-sanitary wastes from Table V must be added to capacity listed herein if combined septic tank is used.
- (2) Drainfield area from Table V must be added to area listed herein if combined septic tank is used.

NOTATIONS (Continued):

- (3) Drive-in restaurants: One person per 100 square feet of parking area. Occupancy content shall be determined on the basis of 18 linear of counter length per person plus 10 sq. ft. of dining area per person.

3615.7 GENERAL PROVISIONS COVERING THE CONSTRUCTION OF DRAINFIELDS: The following provisions shall apply to and govern the installation, design and method of all work and material in connection with septic tanks, drainfields, soakage pits and drainage wells:

- (a) Drainfields from private sewage and liquid waste disposal systems shall not be placed under any impervious paving or in an area where they may be subject to damage by vehicles.
- (b) To provide equal distribution of effluent from a septic tank, distribution boxes having a minimum size of 18 inches by 18 inches inside dimension shall be in all installations as follows:
 - (1) Where more than two branch lines are taken from the main effluent line of a septic tank, all branches shall be taken from the main line within ten feet of the tank outlet.
 - (2) Where more than one reservoir type lateral is required, each field lateral line shall be connected separately to the distribution box and shall not be subdivided.
 - (3) The invert of all box outlets shall be level and the inlet invert of all lines shall be at least one inch above the invert of the box outlet.
- (c) The minimum requirements for septic tanks and square feet of drainfield shall be as set out in Tables T, U, V, W and as shown in the Appendix B.
- (d) Minimum spacing of tiles from contra to centre when laid in trenches shall be 32 inches.
- (e) Minimum cover over drainfield tile shall be 10 inches.
- (f) Maximum cover over drainfield tile shall be 20 inches.
- (g) Grade of drainfield tile shall be not less than two inches nor more than four inches per 100 feet.

NOTE: A grade of two inches 100 feet is approximately one-sixteenth inch per three feet; four inches per 100 feet is approximately one-eighth inch per three feet.

- (h) Maximum length of a single drainfield tile line shall be 50 feet.
- (i) Minimum width of drainfield tile trenches shall be 16 inches, measured at the trench bottom.

NOTE: One drainfield tile in a 16-inch wide trench shall be considered equivalent to one square foot trench.

- (j) Minimum inside diameter of drainfield tile shall be four inches.
- (k) Minimum depth of washed drainfield rock required under drainfield tile for the full width of a sixteen-inch trench shall be 6 inches, except where grease or oil is in the waste from commercial buildings, where 12" shall be used.
- (l) Drainfield tile shall be enclosed in washed drainfield rock for the full width of the trench and brought up to the top of the drainfield tile.
- (m) The space between ends of drainfield tiles shall be one-fourth inch.
- (n) Minimum width and length of bituminous saturated paper (or equal) required over space between drainfield tiles shall be four inches by sixteen inches.
- (o) Minimum weight of bituminous saturated paper shall be thirty pounds per square.
- (p) Minimum distance from structure foundation for any drainfield shall be 6 feet.
- (q) Minimum distance of edge of excavation for septic tanks, drainfields drainage wells and soakage pits to lot lines shall be 6 feet.
- (r) Minimum distance, as measured horizontally, from septic tanks, drainfields drainage wells and soakage pits from any domestic water supply well shall be 50 feet.
- (s) Minimum distance from all sewage and liquid waste disposal systems shall be 12 feet.
- (t) Minimum distance from all sewage and liquid waste disposal system to basement walls or to lower terraced area shall be 10 feet.

- (u) The reservoir type drainfield may be substituted for four-inch draitile under the following conditions:
 - (1) The units comprising the reservoir in this type of drainfield shall have an internal or storage capacity of area equivalent to four times that of the internal area or capacity of four-inch draitile.
 - (2) The excavation for the reservoir type drainfield shall be a maximum width of four feet and a minimum length consistent with Tables V, W, X and Y, based on the square feet area of the trench bottom.

3615.8 COMPRESSION AND STRENGTH TESTS: For compression and strength tests and testing procedure see Sub-section 3615.11.

3615.9 CONSTRUCTION AND INSTALLATION:

- (a) The minimum width of reservoir drainfield trench shall be four feet. The minimum depth of drainfield rock under the reservoir unit shall be six inches.
- (b) Minimum drainfield rock on both sides of the reservoir unit shall extend the full width of the trench and to a height not lower than the top of the reservoir unit.
- (c) Grade away from the septic tank or distribution box shall be a minimum of two inches per 100 feet and a maximum of four inches per 100 feet.
- (d) The length of a single reservoir drainfield line shall be a maximum of 75 feet.
- (e) Adjacent reservoir units shall be butted to each other where a suitable slot or fixed opening is provided in the construction of the reservoir unit for effluent seepage. Where such slot or opening is not provided, a distance of one-quarter inch shall be maintained between adjacent reservoir units.
- (f) The top seam created by the joining of adjacent blocks shall be covered by one of the following methods:
 - (1) Each seam shall be covered by a strip of 30 pounds per square bituminous saturated paper four inches by suitable length to cover the top, seam, and four inches down each side.
 - (2) The reservoir unit shall be covered for the entire length of

the field with a piece of 30 pounds bituminous saturated paper of suitable width to cover the top and four inches down each side.

- (3) The joints shall be mortared.
- (g) A strip of bested paper 48 inches wide shall be placed over the rock area the entire length of the field before backfilling.
- (h) A tight-jointed pipe, from either the septic tank or the distribution box, shall be laid into the fixed reservoir unit and the pipe mortared closed.
- (i) The tight-jointed pipe shall enter or connect with the reservoir unit to make usable, without flooding the inlet pipe to the septic tank, the storage capacity used in calculating the required capacity of the reservoir unit.

EXCEPTION: Officially designated critically low areas as decided by the Minister of Works and the Minister of Health.

- (j) The lower end or terminus of the reservoir drainfield shall be sealed by mortar or by mortaring a concrete block across the opening.
- (k) No single change of direction of a reservoir drainfield shall exceed 90 degrees.
- (l) The minimum cover over the top of the reservoir unit shall be 6 inches.
- (m) The maximum cover over the top of the reservoir unit shall be 12 inches.

3615.10 DISPOSAL OF DOMESTIC CLOTHES WASHERS LIQUID WASTE FOR SINGLE AND DUPLEX RESIDENCES: Liquid waste discharged from domestic clothes washers may be disposed of as follows:

- (a) One machine — 40 square feet area of drainfield.
- (b) Two machines — 60 square feet area of drainfield.

TABLE X

MINIMUM REQUIREMENTS FOR SEPTIC TANKS FOR NORMAL RESIDENTIAL USE UP TO 6 BATHROOMS

(Based on 2 persons per bedroom) and 1,200 Gallons Total Capacity (Tanks over 2,100 Gallons require Special Approval)

Persons Connected	Total Capacity (U.S. Gallons)	Length Inside	Width Inside	Top Slab Section**	Air Space	Min. Liquid Depth	Bathrooms Served	Minimum Drainfield Requirements
1-4	1,200	8'-0"	4'-0"	4"	12"	5'	1	50 sq. ft.
5-6	1,350	9'-0"	4'-0"	4"	12"	5'	2	75 sq. ft.
7-8	1,500	10'-0"	4'-0"	4"	12"	5'	3	100 sq. ft.
9-10***	1,800	12'-0"	4'-0"	4"	12"	5'	4	125 sq. ft.
11-12	1,980	10'-6"	5'-0"	4"	12"	5'	5	150 sq. ft.
13-14	2,100	11'-4"	5'-0"	4"	12"	5'	6	175 sq. ft.

*The minimum requirement for residences are based upon the following factors: 1200 gallon capacity and 50 sq. ft. of drainfield for the first bathroom.

**Top slabs require No. 3 steel set six inches on centres each way for normal overbearing loads. For tanks placed under driveways, or elsewhere where overbearing load is above normal, see Paragraph 3615.5.

***See Minimum Standard Drawings in the Appendix to the Small Buildings Code, Section 3617, for septic tanks and drain requirements up to 4 bathrooms.

TABLE Y

MINIMUM EFFECTIVE CAPACITIES UP TO 2,100 U.S GALLONS FOR SEPTIC TANK AND LENGTH OF DRAIN TILE FOR SINGLE STORE, FACTORIES AND/OR OTHER PLACES OF EMPLOYMENT, NOT INCLUDING STORES OCCUPIED AS BARS, AND/OR CATERING ESTABLISHMENTS

10 person occupancy** or 1 store	20 person occupancy** or 2 stores	30 person occupancy** or 3 stores	40 person occupancy** or 4 stores	60 person occupancy** or 5 stores	Over 60 person occupancy**
750 gallon Septic Tank, 50 square feet draintile.***	950 gallon Septic Tank, 75 square feet draintile.***	1,200 gallon Septic Tank, 100 square feet draintile.***	1,800 gallon Septic Tank, 125 square feet draintile.***	2,100 gallon Septic Tank, 150 square feet draintile.***	Tanks over 2,100 gallons require special approval.

*See separate liquid disposal requirements as set forth in Paragraph 3615 6(f).

**Occupancy shall be deemed to mean the number of persons who work in a store.

***Reservoir Drain may be substituted as shown in Appendix B and Sub-Section 3615.9.

TABLE Z

MINIMUM QUANTITIES OF SEWAGE ANTICIPATED FOR DESIGN OF DISPOSAL SYSTEMS ON LARGE UNITS

TYPE	U.S. GAL/DAY/PERSON
NOTE: This table is to be used as a general guide only, and can be used for facilities beyond the scope of Tables V, W, X & Y.	
RESIDENCES—MULTIPLE AND HOTELS	
Apartment houses	75
Rooming houses	40
Boarding houses	50
Hotels (Small Commercial—less Restaurant)	50
Hotels (Luxury—less Restaurant and Laundry)	75
SCHOOLS, THEATRE, CHURCH	
Day schools without cafeterias or gym showers	5-8
Day schools without cafeterias but with gym showers	15
Day schools with cafeterias but no gym showers	12-15
Day schools with cafeterias and gym showers	20
Day workers at schools and offices	15
Boarding schools	75
Theatre (per seat)	3
Church (per seat)	3
MISCELLANEOUS	
Hospitals	150-250
Public institutions (other than hospitals)	75-125
Public picnic parks (toilet wastes only) per picnicker	5
Public picnic parks with bathhouse, showers, toilets	10
Swimming pools & bathing places	10
Country clubs (per resident member)	100
Country clubs (per member present)	25-50
Factories (per person per shift)	15-35
Restaurants (per meal served)	10
Luxury residences and estates	100-200

- 3615.11 TESTING STRENGTH REQUIREMENTS AND REPORTING OF TESTS:
- (a) **THREE-QUARTER INCH DRAINFIELD ROCK:** All rock referred to herein which is designed as a filter material for use in connection with drainage works shall meet the specifications of 3/4 inch drainfield rock. Three-quarter inch drainfield rock shall be held to mean washed rock 100 per cent of which shall pass a one-inch screen and 0 to 10 percent of which will pass a one-half inch screen.
 - (b) **FOUR-INCH DRAINTILE FOR NON-VEHICULAR TRAFFIC AREAS:** Four-inch draitile for non-vehicular traffic areas shall conform to A.S.M.E. specifications for draitile (C4). Physical test requirements shall not be less than those of standard draitile.

- (c) RESERVOIR DRAINFIELD UNIT: Reservoir drainfield units shall conform to or exceed the following strength requirements where the unit is to be installed in a traffic area where anticipated loads will not be in excess of 10 ton trucks. The provisions of C4 shall apply where applicable. Physical tests shall be conducted as follows:
- (1) Where the unit is of one piece construction, the lower surface (which in actual installation would be in contact with the gravel bed) shall be tested in a plaster of parts bed, or placed in a sand box having a sand bed not less than two-inches thick.
 - (2) Where the unit is made up of component parts these components shall be assembled as in an actual installation and bedded as above.
 - (3) The application of the test load shall be as set forth in C4 and the load transmitted through an eight-inch by eight-inch steel plate sufficiently thick to uniformly transmit the anticipated loads. The eight-inch by eight-inch plate may be bedded to compensate for inequalities of the upper surface and shall be so placed on the upper surface of the reservoir unit as to render the most severe test conditions.
 - (4) Tests shall be made on not less than five individual specimens of random selection. The average load sustained shall be 5,500 pounds total load and no single specimen shall fall below 25 percent of the average.
 - (5) Where there is a single span and vertical supporting sides to the reservoir unit, the above provision shall apply. Where uniqueness of shape or multiple spans indicate deviation from the above provisions then such additional information shall be supplied by the manufacturer or his agent to the satisfaction of the Buildings Control Officer. Such information and /or evidence shall be provided prior to consideration for acceptance and the requirement of test procedure and strength shall become a condition of acceptance and/or continued acceptance.
- (d) TESTS AND REPORTS: All persons, firms or corporations selling or offering for sale three-fourths-inch drainfield rock, four-inch draitile or reservoir drainfield unite or components of reservoir drainfield units shall have such tests made as are necessary to maintain product control within the limits set forth above.

- (e) TESTS: RESULTS: Any product, the required periodic reports of which do not show maintenance of minimum product standards as set forth in this Code shall not be approved for use. If the products in such installation fail to comply, the Buildings Control Officer shall order removal of the products from the site or redesign based on the qualities indicated by test.

3615.12 WASTEWATER TREATMENT PLANTS:

- (a) GENERAL: Where the average daily flow is greater than 6,000 U.S. gallons per day the Minister may require the installation of secondary, (or tertiary treatment) where any question of contamination of ground water, or surface water resources exists. Treatment plants meeting the minimum criteria in paragraph (b) are strongly recommended for flows exceeding 6,000 U.S.G.P.D. Septic tanks in combination with disposal wells may be installed only after special approval from the Minister of Health and Minister of Works. The effluent quality specified below shall be considered minimum, and higher efficiencies of treatment may be required by the Minister of Health in some installations where reasons of public health so require.
- (b) TREATMENT PLANTS: Prefabricated "packaged type," or field-erected extended aeration type plants shall be used when the average daily flow does not exceed 20,000 U.S.G.P.D. Where relatively constant flows in excess of 20,000 U.S.G.P.D. are expected "Contact-stabilization" systems, or extended-air may be used.

Any plant of this type shall include at least the following components

- (1) Screening and/or comminution.
- (2) Aeration section.
- (3) Final settling compartment.
- (4) Sludge recirculation.
- (5) Chlorination.
- (6) Flow measurement.
- (7) Test kit.

Any plant of this type shall at least meet the following criteria:

- (1) Aeration time—18 to 24 hours based on design flow.
- (2) Final Settling—3 to 6 hours based on design flow.

Any plant of this type shall be capable of producing an effluent from the unit which will satisfy the following criteria:

- (1) Maximum 5 day 20°C biochemical oxygen demand—35 mg/1.
- (2) Maximum suspended solids—30 mg/1.
- (3) Chlorine residual after 15 minutes detention—0.5 mg/1. Disposal of the effluent from this type of plant shall be in one of the following manners:
 - (1) Cased well to salt water.
 - (2) Drain field in accordance with the criteria specified herein-before.
 - (3) Lagoon with 1-3 days detention.
 - (4) Sand filter.

The request for approval of this type of plant shall include a certification of design by an engineer recognized by the Minister, manufacturer's brochures, design information, construction details, and operating instructions. Also, the developer or owner shall specifically designate what person shall be charged with the responsibility of operating and maintaining the plant. Material of construction shall be corrosion resistant and suitable for the characteristics of the waste water being treated. Where high concentrations of chlorides are present in the influent, or where brackish or salt water flushing systems are used in the system, tanks shall be precast concrete a minimum of 3" thick, or poured-in-place a minimum of 6 inches thick. Steel tanks shall require special approval.

3615.13 MINIMUM STANDARDS: Minimum standards for guidance to the construction of small septic tanks, drainfields and disposal wells pertinent to this section are included in Appendix B.

3615.14 SEPTIC TANK OPERATORS: Any person receiving a license from the Minister of Health as a septic tank operator shall comply with the following before any application for permits may be accepted or such permits issued:

- (a) Maintain a vehicle equipped with a sewage-tight tank of not less than 1,000 U.S. gallons capacity, equipped with suitable pumps and at least 80 feet of three-inch-minimum diameter suction hose.
- (b) Have at least the following centrifugal pump equipment: one two-inch hose and one 10,000 U.S. gallon per hour centrifugal pump.

NOTES

SUB-INDEX

3616 SUPPLY AND DISPOSAL WELLS

Paragraph No.	Paragraph Title	Page No.
3616.1	Potable Water Supply Wells	36-131
	(a) Permit Required	36-131
	(b) Well Construction	36-131
	(c) Development of Well	36-131
	(d) Drawdown	36-131
	(e) Access to Well	36-131
	(f) Siting	36-131
	(g) Disinfection	36-131
3616.2	Salt Water Supply Wells	36-131
3616.3	Disposal Wells	36-131
3616.4	Closed Well Systems	36-132
3616.5	Minimum Standards	36-132

PLUMBING (Continued)

3616 SUPPLY AND DISPOSAL WELLS

3616.1 POTABLE WATER SUPPLY WELLS:

- (a) **PERMIT REQUIRED:** A permit must be obtained from the Minister of Health before any well is constructed. Written application shall be made to the Minister of Health stating the proposed use, desired rate of withdrawal, proposed construction features, exact geographic location, elevation relative to mean sea level, and additional data as may be required by the Minister of Health and the Minister of Works. Design of potable water wells located in known fresh water producing land areas shall be based on a maximum withdrawal of 1200 U.S. gallons per acre per day. Current and future Acts for Conservation of ground water as a natural resource may require rejection of an application for a well. Periodic renewal of a permit to operate a well will be required.
- (b) **WELL CONSTRUCTION:** Supply wells for potable water may be open drilled holes with surface concrete cap and drop pipes. Casings will be required if natural rock formation is not sufficiently stable to prevent cave-in of open bore holes.
- (c) **DEVELOPMENT OF WELL:** Wells shall be developed and free of all loose sand and sludge. The method of developing must be approved to prevent salt water intrusion.

- (d) **DRAWDOWN:** Draw down shall be a function of toe design of the well.
- (e) **ACCESS TO WELL:** A tee, of the same size as the drop-pipe, shall be installed on the top of the well to allow for proper inspection, introduction of disinfecting agents, and for measurements of depth and static water level. In lieu of a be on the drop pipe other means of access may be approved.
- (f) **SITING:** Wells shall be so sited as to be free of danger of contamination from unsafe water supply and shall be at least 50 feet from a septic tank, drainfield, soakage pit or disposal well and of sufficient depth to preclude surface water contamination, and provide constant supply of water.
- (g) **DISINFECTION:** Before a new potable water supply well, or one which has been repaired, is placed in use, it shall be disinfected in accordance with the method approved by the Minister of Health and shall be pumped clear of the disinfecting agent after disinfection has been completed.

3616.2 **SALT WATER SUPPLY WELLS:** Wells for salt or brackish water shall be cased as required for disposal wells. Salt water supply wells shall be approved by the Minister of Health before a permit is issued. All data required for supply wells in Sub-section 3616.1 shall be submitted for salt water supply wells.

3616.3 **DISPOSAL WELLS:**

- (a) A disposal well shall be drilled to a stratum yielding water having a content of not less than 1500 P.P.M. of chloride iron. A disposal well for septic tank effluent, waste water, or storm water, shall be continuous, new, six (6) inches minimum size, cased hole drilled to a depth to reach broken rock strata suitable for drainage i.e. underground cavities of not less than 18 inches drop of the drilling bit. Casings for disposal wells shall be standard-weight, schedule 40, wrought iron, or steel pipe with welded joints. The well shall furnish upon a pump test not less than five hundred (500) U.S. gallons per minute with a draw down not exceeding three (3) feet from standing water level over a period of thirty (30) minutes. The annular space between the casing and the bore hole shall be continuously sealed with high strength cement grout. The method of grouting shall be approved. A discharge well for an area drain, rain water or roof water disposal shall be preceded by a settling tank, of approved design and capacity.
- (b) Disposal wells shall be approved by the Minister of Health before

a permit is issued. All data required for supply wells in Sub-section 3616.1 shall be submitted for disposal wells.

3616.4 CLOSED WELL SYSTEMS:

- (a) Location of air conditioning supply wells shall be as distant as practicable or as necessary from disposal wells to minimize cross-circulation. Only salt water wells may be used for air conditioning systems.
- (b) Air conditioning supply wells shall be located not less than 25 feet horizontally from a septic tank, drain field or soakage pit.

3616.5 MINIMUM STANDARDS: See drawings for supply and disposal wells in Appendix B. These relate to single family residences only.

NOTES

SUB-INDEX

3617 PLUMBING CODE FOR SMALL BUILDINGS

Paragraph No.	Paragraph Title	Page No.
3617.1	Administrative	36-154
3617.2	Definitions	36-154
	(a) Accessible	36-154
	(b) Branch	36-155
	(c) Cross-Connection	36-156
	(d) Floor Drain	36-157
	(e) Plumber Master	36-158
	(f) Plumber Journeyman	36-158
	(g) Private Sewer	36-159
	(h) Stack Vent	36-161
	(i) Water Main	36-162
3617.3	Application for Permits	36-162
3617.4	Multiple Dwellings	36-162
3617.5	Materials and Workmanship	36-162
3617.6	Existing Plumbing Systems	36-163
3617.7	Maintenance of Systems	36-163
3617.8	Insanitary Conditions	36-163
3617.9	Right of Entry	36-163
3617.10	Medium Plumbing Fixtures	36-163
3617.11	Waste or Soil Water Disposal	36-165
	(a) Minimum Requirements	36-165
	(b) Sewers and Drain	36-166
	(c) Materials and Installation	36-168
	(d) Ventilation of Sewers and Drains	36-169
	(e) Septic Tanks-General	36-170
3617.12	Rainwater•Disposal	36-172
	(a) Minimum Requirements	36-172
	(b) Field Drains	36-172
	(c) Gutters	36-173
	(d) Rainwater Drain Lines	36-173
	(e) Sizes of Rainwater Lines and Gutters	36-173
	(f) Sizes of Outside Ground Surface Storm Sewers	36-174
	(g) Materials for Rainwater Conveyors	36-174
	(h) Rainwater Storage Tanks	36-174
	(i) Open Drains	36-175
	(j) Ground Water Drains	36-175
	(k) Soakaways	36-176
	(l) Drainage Wells	36-176
3617.13	Water Supply Systems	36-176
	(a) Minimum Requirements	36-176
	(b) Fresh Water Wells	36-176
	(c) Dual Water Systems	36-177
3617.14	Drainage Piping Test	36-178

PLUMBING (Continued)

3617 PLUMBING CODE FOR SMALL BUILDINGS

3617.1 ADMINISTRATIVE: This Section is applicable to Small Buildings. The purpose of this Section is to set forth general plumbing requirements for small buildings such as one and two family dwellings, dry goods stores, hardware shops, or other small, single storey structures not exceeding 2600 square feet in area where plumbing facilities consist of fewer than eight fixtures. Buildings, regardless of size, such as restaurants, bars, gasoline and diesel service stations involving other than conventional plumbing fixtures shall be subject to all requirements of The Bahamas Plumbing Code as defined in other Sections of this Code. Whether a proposed building plumbing system is applicable to these regulations, or to those of The Bahamas Plumbing Code shall be decided by the Buildings Control Officer.

3617.2 DEFINITIONS: Wherein a definition set forth in this Section varies from a definition set forth in other sections of the Building Code, the definition set forth as follows shall be applicable only to the Plumbing Code for Small Buildings.

ACCESSIBLE: Visible, unobstructed and within physical reach.

ACT: The Buildings Regulation Act 1971.

AIR GAP: An air gap in a water-supply system is the unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture, or other device and the flood level rim of the receptacle.

APPROVED: Approved means accepted under an applicable specification stated or cited in this Code, or accepted as suitable for the proposed use under procedures and powers of the Minister of Works and Minister of Health.

AREA DRAIN: An area drain is a receptacle designed to collect surface or rain water from an open area.

BACKFLOW: Backflow is the flow of water or other liquids, mixtures or substances into the distributing pipes of a potable supply of water, and any other fixture or appliance, from any source or sources other than its intended path of flow. (See Back-siphonage.)

BACKFLOW CONNECTION: Backflow connection or condition is any arrangement whereby backflow can occur.

BACKFLOW PREVENTER: A backflow preventer is a device or means to prevent backflow into the potable water system.

BACK-SIPHONAGE: Back-siphonage is the flow of water or other liquids, mixtures or substances into the distributing pipes of a potable supply of water, or any other fixture, device, or appliance, from any sources other than its intended path of flow, due to a negative or lower differential pressure in such pipe.

BRANCH: A branch is any part of the piping system other than a main.

BRANCH, FIXTURE: See Fixture Branch.

BRANCH, HORIZONTAL: See Horizontal Branch.

BRANCH VENT: A branch vent is a vent connecting one or more individual vents with a vent stack or stack vent.

BUILDING: A building is a structure built, erected, and framed of component structural parts designed for the housing, shelter, enclosure, or support of persons, animals, or property of any kind. For further definition see The Act.

BUILDING DRAIN: The building (house) drain is that part of the lowest horizontal soil piping of a building drainage system, including first floor soil branches, exclusive of storm sewer, which receives the discharge from soil, waste, and other drainage pipes inside the walls of the building and conveys it to the building (house) sewer beginning five feet outside the building wall.

BUILDING SEWER: The building (house) sewer is that part of the horizontal piping of a drainage system which extends from the end of the building drain and which receives the discharge of the building drain and conveys it to a public sewer, approved by (private sewer, or individual sewage disposal system).

BUILDING STORM DRAIN: A building (house) storm drain is a drain used for conveying rain water, surface water, ground water, subsurface water, condensate, cooling water, or other similar discharge to a building storm sewer or a combined building sewer, extending to a point not less than five feet outside the building wall.

BUILDING STORM SEWER: A building (house) storm sewer is the extension from the building storm drain to the public storm sewer, combined sewer, or other point of disposal.

BUILDING SUBDRAIN: A building (house) subdrain is that portion of a drainage system which cannot drain by gravity into the building sewer.

CODE: The word "Plumbing Code" or "Code" when used alone shall mean these regulations, subsequent amendments thereto, or any emergency rule or regulation which may be lawfully adopted.

COMMON VENT: A common vent is a vent above the junction of two fixture drains installed at the same level in a vertical stack and serving as a vent for both fixture drains.

CONDUCTOR: A "Leader." (Usually for rain water.)

CONTINUOUS WASTE: A continuous waste is a drain connecting the compartments of a combination fixture to its trap or connecting other permitted fixtures to a common trap.

CROSS-CONNECTION: A cross-connection is any physical connection or arrangement between two otherwise separate piping systems, one of which contains potable water and the other water of unknown or questionable safety, or any other kind of matter, whether element, compound or mixture, whereby water may flow from one system to the other, the direction of flow depending on the pressure differential between the two systems. (See Backflow and Back-siphonage.)

DEVELOPED LENGTH: The developed length of a pipe is length measured along the centre line of the pipe and fittings.

DIAMETER: Unless specifically stated, the term "diameter" is the nominal diameter as designated commercially.

DOWNSPOUT: A "Leader." (Usually for rain water.)

DRAIN: A drain is any pipe which carries liquid, waste water or water borne wastes to an approved point of disposal approved by the Buildings Control Division, Department of Environmental Health, and the Water and Sewerage Corporation.

DRAINAGE SYSTEM: A drainage system (drainage piping) includes all the piping within public or private premises, which conveys sewage, rain water, or other liquid wastes to a legal point of disposal approved by the Buildings Control Division, the Department of Environmental Health, and the Water and Sewerage Corporation, to ensure the legal point of disposal is satisfactory to the public's health.

DRAINAGE WELL: A drainage well, referred to in this Code is any cavity, drilled driven or natural, which taps the under ground water and into which surface waters; waste waters or industrial wastes are placed.

EFFECTIVE OPENING: The effective opening is the minimum cross-sectional area at the point of water-supply discharge, measured or expressed in terms of: the diameter of a circle of equivalent cross-sectional area. (This is applicable to air gap.)

FIXTURE BRANCH: A fixture branch in a drainage system is the drain from the trap of a fixture to the junction of that drain with a vent.

FIXTURE DRAIN: A fixture drain is the drain from the fixture branch to the junction of that drain with any other drain pipe.

FIXTURE UNIT: A fixture unit is a design factor so chosen that the load-producing values of the different plumbing fixtures can be expressed approximately as multiples of that factor. For the purposes of this Code, one fixture unit flow rate shall be deemed to be one cubic foot or 7.5 United States gallons of water per minute.

FLOOD-LEVEL RIM: The flood-level rim is the top edge of the receptacle from which water or other liquids overflow.

FLOOR DRAIN: A floor drain is an opening or receptacle located at approximate floor level connected to a trap to receive the discharge from indirect waste and floor drainage.

GALLONS: Gallons as used in this Code is a United States Gallon. One cubic foot is equal to 7.5 U.S. Gallons, for purposes of this Code.

GRADE: Grade is the slope or fall of a line of pipe in reference to a horizontal plane. In drainage it is usually expressed as the fall in a fraction of an inch per foot length of pipe.

GUTTER: An open channel for carrying away rainwater or any other waste that comes it's path (example leaves).

HORIZONTAL PIPE: Horizontal pipe means any pipe or fitting which makes an angle or more than 45 degrees with the vertical.

HORIZONTAL BRANCH: A horizontal branch is a drain pipe extending laterally from a soil or waste stack or building drain, with or without vertical sections or branches, which receives the discharge from one or more fixture drains and conducts it to the soil or waste stack or to the building (house) drain.

INDIRECT WASTE: An indirect waste pipe is a pipe that conveys liquid wastes (other than body wastes) by discharging them into an open plumbing fixture or receptacle, the overflow point of which is at a lower elevation than the item drained and which is properly connected to the drainage system, soakage pit or discharge well.

INSANITARY: Contrary to sanitary principles — injurious to health.

LEADER: A leader (downspout) is the vertical water conductor from the roof to the building storm drain, combined building sewer, or other means of disposal.

LIQUID WASTE: Liquid waste is the discharge from any fixture, appliance, or appurtenance, in connection with a plumbing system which does not receive body waste.

MANHOLE (OR CLEANOUT): Means any chamber or opening constructed on a sewer or drain to provide access for inspection and cleaning.

MAY: The word “may” is a permissive term.

OPEN AIR: Means the air over a street, yard or other open space.

PERSON: Person is a natural person, his heirs, executors, administrators or assigns; and includes a firm, partnership or corporation, its or their successors or assigns. Singular includes plural; male includes female.

PITCH: “Grade.”

PLUMBER—MASTER: A Master Plumber is a person at least 25 years of age holding a Certificate of Competency issued by the Minister to engage in plumbing work in all its branches and aspects. For further definition and interpretation see The Act and Rules.

PLUMBER—LICENCED: A Licensed Plumber is a person who, on or before the 31st day of December, 1969, had passed the Bahamas Licenced Plumbers Examination of the Ministry of Works. A Licenced Plumber holding a Certificate of Competency issued by the Minister is entitled to engage in plumbing work in all its branches and aspects. For further definition and interpretation see the Act and Rules.

PLUMBER—JOURNEYMAN: A Journeyman Plumber is a person at least 21 years of age holding a Certificate of Competency issued by the Minister to engage in the business of a plumbing contractor in respect of only of such building operations as may be specified in the “Small Buildings”

part of the Code. A Journeyman Plumber may engage in the physical or mechanical execution of plumbing work in all its branches and aspects only under the supervision and responsibility of Master Plumbers and or Licenced Plumbers holding current Certificates of Competency issued by the Minister. For further definition and interpretation see the Act end Rules

PLUMBER-JOURNEYMAN (RESTRICTED): A Journeyman Plumber (Restricted) is a person who on, or before, the 31st day of March, 1974 had passed a qualifying examination set by the Ministry of Works. A Journeyman Plumber (Restricted) holding a Certificate of Competency issued by the Minister may engage in plumbing work as a journeyman plumber (as set out above) in the island, or district, for which his Certificate is restricted.

PLUMBING FIXTURES: Plumbing fixtures are receptacles, devices, or appliances which are supplied with water or which receive or discharge liquids or liquid borne wastes, with or without discharge into the drainage system with which they may be directly or indirectly connected.

PLUMBING SYSTEM: The plumbing system under the jurisdiction of the Small Buildings Plumbing Code, includes the drainage system; water-supply and water-supply distribution pipes; plumbing fixtures and traps; soil, waste, and vent pipes; building drains and building sewers; building storm drains and building storm sewers; liquid waste piping, and appliances and appurtenances; including their respective connections and devices, with the private property limits of the premises, and water and sewer-treating or water and sewer-using equipment approved by the Buildings Control Officer, the Department of Environmental Health, and the Water and Sewerage Corporation.

POTABLE WATER: Potable water is water which is satisfactory for drinking, culinary and domestic purposes, and meets the requirements of the Minister of Health.

PRIVATE PROPERTY: Private property for the purpose of this Code shall mean all property except streets or roads dedicated to the public and easements (excluding easements between private parties). (See definition of Plumbing.)

PRIVATE OR PRIVATE USE: In the classification of plumbing fixtures private applies to fixtures in residences and apartments and to fixtures in private bathrooms of similar installations where the fixtures are intended for the use of a family or an individual example: toilets, tubs, lavatories etc.

PRIVATE SEWER: A private sewer is a sewer privately owned and not directly controlled by public authority.

PUBLIC SEWER: A public sewer is a common sewer directly controlled by Government.

RIM: For the purpose of this Code a rim is an unobstructed open edge at the overflow point of a fixture.

ROCK DRAINFIELD: Three-quarter inch drainfield rock 100 percent passing a one inch screen and a maximum of ten percent passing a one-half inch screen.

ROOF-DRAIN: A roof drain is an outlet installed to receive water collecting on the surface of a roof and to discharge it into the leader (downspout).

ROUGHING-IN: Roughing-in is the installation of all parts of the plumbing system which can be completed prior to the installation of fixtures. This includes drainage, water-supply, and vent piping, and the necessary fixture supports.

SANITARY SEWER: A sanitary sewer is a pipe which carries sewage and excludes storm, surface and ground water.

SECOND HAND: Second hand as applied to material or plumbing equipment is that which has been installed, and has been used or removed.

SEPTIC TANK: A septic tank is a watertight receptacle which receives the discharge of a drainage system or part thereof, and is designed and constructed so as to separate solids from the liquid, digest organic matter through a period of detention, and allow the liquids of discharge into the soil outside of the tank through a subsurface system of open-joint or perforated piping, or other approved methods.

SEWAGE: Sewage is any liquid waste containing animal, mineral or vegetable matter in suspension or solution, and may include liquids containing chemicals in solution.

SHALL: The word "shall" is a mandatory term.

SOIL WATER: Soil water is waste water which contains human or animal excretions.

SOAKAWAY: A pit or channel suitably prepared to receive water for seepage into the surrounding ground.

SOIL PIPE: A soil pipe is any pipe which conveys the discharge of water closets or fixtures having similar function, with or without the discharge from other fixtures, to the building drain or building sewer.

STACK: A stack is the vertical pipe of a system of soil, waste, or vent piping.

STACK VENT: A stack vent (sometimes called a waste vent or soil vent) is the extension of a soil or waste stack above the highest horizontal drain connected to the stack.

STORM DRAIN: See Building Storm Drains.

STORM SEWER: A storm sewer is a sewer used for conveying rain water and/or surface water.

SUBSURFACE DRAIN: A subsurface drain is a drain which receives only subsurface or seepage water and conveys it to a place of disposal.

SUPPORTS: Supports, hangers, and anchors are devices for supporting and securing pipe and fixtures to walls, ceilings, floors, or structural members.

SUPPLY WELL: Any artificial opening in the ground designed to conduct water from a source bed through the surface when water from such well is used for public, semi-public or private use.

TRAP: A trap is a fitting or device so designed and constructed as to provide a liquid seal which will prevent the back passage of air without materially affecting the flow of sewage or waste water through it.

TRAP SEAL: The trap seal is the maximum vertical depth of liquid that a trap will retain, measured between the crown weir and the top of the dip of the trap.

VACUUM BREAKER: See Backflow preventer.

VENT STACK: A vent stack is a vertical vent pipe installed primarily for the purpose of providing circulation of air to and from any part of the drainage system.

VENT SYSTEM: A vent system is a pipe or pipes installed to provide a flow of air to or from a drainage system or to provide a circulation of air within such system.

VERTICAL PIPE: A vertical pipe is any pipe or fitting which is installed in a vertical position or which makes an angle of not more than 45 degrees with the vertical.

WASTE WATER: Waste water is water which does not contain human or animal excretions.

WASTE PIPE: A waste pipe is any pipe which receives the discharge of any fixture, except water closets or fixtures having similar functions and conveys it to the building drain or to the soil or waste stack.
WATER-DISTRIBUTING PIPE: A water-distributing pipe in a building or premises is a pipe which conveys water from the water-service pipe to the plumbing fixtures, appliances and other water outlets.

WATER MAIN: The water (street) main is a water supply pipe for public or community use.

WATER OUTLET: A water outlet, as used in connection with the water-distributing system, is the discharge opening for the water; (1) to a fixture; (2) to atmospheric pressure (except into an open tank which is part of the water-supply system); (3) to any water-operated device or equipment requiring water to operate.

WATER SERVICE PIPE: The water-service pipe is the pipe from the water main or other source of water supply to the building served.

WATER-SUPPLY SYSTEM: The water-supply system of a building or premises consists of the water-service pipe, the water-distributing pipes, standpipe system and the necessary connecting pipes, fittings, control valves, and all appurtenances in or on private property.

WET VENT: A wet vent is a waste pipe which serves to vent and convey waste from fixtures other than water closets.

- 3617.3 **APPLICATION FOR PERMITS:** Every application for a permit to install plumbing in a new or existing small building shall be on the prescribed form and shall show all the particulars required on that form. No plumbing work shall be started until a plumbing permit is issued. Applications for inspection at certain stages of the work and for permission to occupy and use the building shall be on the prescribed forms furnished by the Ministry of Works.
- 3617.4 **MULTIPLE DWELLINGS:** Where more than five dwellings are to be developed, or constructed on one property, such dwellings and their means for water supply and sewage disposal shall be erected in compliance with the full requirements of the Bahamas Plumbing Code.
- 3617.5 **MATERIALS AND WORKMANSHIP:** All materials and workmanship shall be to the satisfaction of the Buildings Control Officer. New plumbing or drainage systems or parts thereof, or additions alterations, repairs or

changes to existing plumbing or drainage installations or fixtures or appliances shall conform to the requirements of this Plumbing Code.

- 3617.6 EXISTING PLUMBING SYSTEMS: Nothing contained in this Code shall be deemed to require any plumbing or drainage system or part thereof, or any other work regulated by this Code, to be altered, changed, reconstructed, removed or demolished if such work was installed in accordance with all applicable laws in effect prior to the date this Code became effective except when any such plumbing or drainage system or other work regulated by this Code is dangerous, unsafe, insanitary or a menace to life, health, or property, in the opinion of the Minister of Works and Minister of Health.
- 3617.7 MAINTENANCE OF SYSTEMS: All installations regulated by this Code shall be maintained and executed in such a manner as not to constitute a nuisance or to threaten or impair the health of any individual or the public in general.
- 3617.8 INSANITARY CONDITIONS: It shall be unlawful for any person, firm, or corporation, whether owner or agent of owner, to create, keep, cause, maintain, propagate or permit the existence of an insanitary condition. The Minister of Health shall have the power to abate any violation of this Code by the issuance of a notice in writing, to correct and/or eliminate the violation within a reasonable length of time.
- 3617.9 RIGHT OF ENTRY: Upon presentation of proper credentials, duly authorized representatives of the Minister of Health or the Minister of Works may enter, at any reasonable time, any building, structure or premises for the purpose of inspection or to prevent violations of the Plumbing Code. Representatives from these Ministries may enter singularly, or jointly this entire section needs to be publicised, newspaper, radio and t.v.
- 3617.10 MEDIUM PLUMBING FIXTURES:
- (a) RESIDENCES: Every small home for private use, shall be provided with sanitary facilities as deemed necessary by the Enforcing Authority. Where any plumbing installation is proposed to be installed in a new residence the minimum facilities shall be a water closet, a shower or tub, a lavatory, and a kitchen sink. See typical pipe drawings or isometric for acceptable layouts in Appendix B to the Code.
 - (1) Kitchen Sink: Every kitchen shall be provided with a sink which measures on the inside not less than 15 inches by 14 inches by 6 1/2 inches deep, with a draining board fixed on one side of the sink and having an area of not less than three square feet.

- (2) Sinks shall be of fireclay, porcelain enamelled cast iron, porcelain enamelled pressed steel or stainless steel, or fibre-glass, and be provided with a 1 1/2 waste outlet.
 - (3) Draining boards shall have an upper surface of cast iron enamelled with porcelain, fireclay, plastics pressed steel sheet enamelled with porcelain, stainless steel hard-wood, or monel metal and shall be securely mounted.
 - (4) Every bathroom shall contain either a bath of rectangular or tub pattern at least 4 ft. 6 in. long overall, or a 5" high curbed shower bath fabricated or smooth, impervious materials, and not less than 30 inches minimum sides.
 - (5) Any shower bath provided shall be equipped with a spray operated (where hot water is provided) by a suitable mixing shower valve, or a single shower valve for cold water only.
 - (6) Every bathroom shall contain a lavatory not less than 14 in. by 9 in. internal dimensions.
 - (7) Where deemed necessary by the Minister of Health each small house shall be provided with a water-flushed closet, of conventional design.
 - (8) Every bath, shower bath, lavatory and sink shall have a piped supply of water with tap or spray outlet, installed in an approved manner to prevent contamination of the water supply system.
 - (9) In every kitchen sink there shall be a clearance of at least 12 inches between the outlet at the tap supplying water to the sink and the bottom of the inside of the sink, unless otherwise approved by the Buildings Control Officer.
- (b) SMALL BUILDINGS: Plumbing fixtures shall be provided in small, light-commercial buildings in accordance with the following table.

MINIMUM FIXTURE REQUIREMENTS - GENERAL

(Applicable to factories, stores, office buildings, places of employment not serving food or drink, and residential)

No. of Persons	Males			Females	
	Water Closets	Urinals	Lava-tories	Water Closets	Lava-tories
1-15	1	1	1	1	1
16-30	1	2	2	2	2

NOTES:

- (1) Wash-up sinks may be substituted for lavatories where type of employment would warrant.
 - (2) Provide one drinking fountain within 50 feet of all operational processes.
 - (3) Shower shall be provided for each 15 persons subject to excess heat or to contamination, infections or irritating material
 - (4) Where no more than 5 persons of both sexes are employed toilet facilities may consist of one water closet and one lavatory for both sexes.
 - (5) Water-closet bowls for public use shall be equipped with open frost seats.
- (c) PROHIBITED FIXTURES AND CONNECTIONS: Water closets having an invisible seal or an unventilated space or having walls which are not thoroughly washed at each discharge, shall be prohibited. Any water closet which might permit siphonage of the contents of the bowl back into the tank shall be prohibited. Through urinals are prohibited except for temporary use during construction.

3617.11 WASTE OR SOIL WATER DISPOSAL:

- (a) MINIMUM REQUIREMENTS:
- (1) Every small building shall be provided with an adequate and hygienic system for the disposal of soil or waste water.
 - (2) Every house sewer shall be connected to a public sewer if one exists at a suitable level and within a reasonable distance from the building.
 - (3) Where access to a public sewer is not reasonably practicable, soil or waste water shall be conveyed by a drain to a septic tank.
 - (4) Effluent from a septic tank shall be conveyed by a sewer to a soakaway pit, drainfield, or disposal well. See minimum standards in Appendix B.
 - (5) No sewer shall be connected to a public storm or surface drain.

- (b) SEWERS AND DRAINS:
- (1) Where a sewer from a small building is to be connected to a public sewer the licensed plumber or the owner of the building shall complete the work as prescribed in the Act and Rules.
 - (2) Every sewer and every drain shall be sized in accordance with the following. Fixture unit values as given in the Table designate the relative load weight of different kinds of fixtures which shall be employed in estimating the total load carried by a soil or waste pipe and shall be used in connection with the tables of sizes for soil, waste, and drain pipes for which the permissible load is given in terms of fixture units.
 - (3) The Minister of Works shall make the connection as soon as practicable after payment of the connection charge.
 - (4) The above procedures shall be followed where a drain from a small building is to be connected to a public drain or sewer.

FIXTURE UNITS PER FIXTURE

Fixture Type	Fixture Unit Value as Load Factors	Min. Size Of Trap Inches
Bathtub (with or without overhead shower)	2	1 1/2
Bidet	2	1 1/2
Drinking Fountain	1/2	1 1/4
Dishwasher domestic	2	1 1/2
Floor Drains	3	3 or 4
Lavatory	1 Small P.O.	1 1/4
Lavatory	2 Large P.O.	1 1/2
Lavatory (barber, beauty parlor)	2	1 1/2
Laundry tray (1 or 2 compartments)	2	1 1/2
Shower stall, domestic	2	2
Combination sink-and-tray	3 Nominal	1 1/2
Combination sink-and-tray with food disposal units	3	1 1/2
Kitchen sink, domestic	2	1 1/2
Kitchen sink, domestic with food waste grinder	3	1 1/2
Service sinks, combination trap standard	3	3 or 4
Service sink (P Trap ordinary)	2	2
Wash sink, (circular or Multiple) each set of faucets	1	1 1/2
Urinal, wall	4	2
Urinal stall, washout	4	2
Water closet, tank-operated	4 Nominal	3
Water closet, valve-operated	8 Nominal	3
Automatic dish washer (domestic)	2	1 1/2
Automatic clothes washer	4	1 1/2

GRAVITY BUILDING DRAINS, SEWERS AND HORIZONTAL BRANCHES

Maximum Number of Fixture Units That May Be Connected to any Portion of the Building Drain or the Building Sewer

Diameter of Pipe Inches	Fall per Foot	
	1/8 Inch	1/4 Inch
1 1/4	1	1
1 1/2	4	6
2	10	21
2 1/2	18	24
3	28	36
4	180	216

NOTES:

- (1) Two fixtures having integral traps requiring three or four inch waste connection may be installed on a 3" line in residential buildings only.

- (2) Size of building sewers shall be a minimum of 4 inches with the exception that if connected to a septic tank and if the developed length measured along the pipe and fittings from the exterior of the building wall to the septic tank does not exceed 10 feet, the building sewer may be sized the same as the building drain.

The required sizes of vertical soil or waste stacks shall be independently determined by the total fixture units of all fixtures connected to the stack in accordance with the following table.

SIZE OF VERTICAL SOIL OR WASTE STACKS

Diameter of Pipe in Inches	Maximum Number of Fixture Units
1 1/4	1
1 1/2	8
2	24
2 1/2	36
3	72
4	100

NOTES:

- (1) No kitchen sinks or other sinks receiving greasy wastes shall be installed in a waste stack less than 2" in diameter. No pump discharge fixtures shall be installed on a cross less than 2 1/2" stack diameter. Domestic food grinders and domestic dish washing machines shall not be considered as pump discharge fixtures.

- (2) No water closet shall discharge into a stack less than three inches in diameter. No more than two water closets shall discharge into a three inch stack at the same point.
 - (3) No soil or waste stack shall be smaller than the largest horizontal branch connected thereto except that a 3"x 4" one quarter bend connected to a water closet outlet shall not be considered as a reduction in pipe size.
- (c) MATERIALS AND INSTALLATION:
- (1) Drain lines under a floor slab shall be cast iron, copper, or Schedule 80 P.V.C. P.V.C. pipes shall be encased in a 6 inch envelope of concrete at each change in direction greater than 45°.
 - (2) Sewer or drain pipes not under a floor slab shall be of concrete, salt glazed ware, cast iron, Schedule 40 Polyvinyl Chloride Plastic P.V.C. or pitch fibre, and, in the case of pitch fibre or P.V.C. pipes they shall be bedded in sand and topped with sand.
 - (3) Pipes shall be laid at gradients not flatter than 1/8" per ft.
 - (4) Where the pipes are not made of metal and the top of the barrel is shallower than 3 ft. 0 in. under roads which could be used by motor vehicles, such pipes shall be protected either by reinforced concrete slabs or by strengthening the pipe with concrete.
 - (5) Trenches wherever possible at the level of the top of the pipe shall not be more than 12 in. wider than the outside diameter of the pipe collars hubs or joints. Trenches for non-metallic lines shall be excavated at least 4 in. below the underside of the pipe and this space refilled with well-compacted fill, free from large rocks or boulders. After pipelaying the trench shall be refilled up to the level of the middle of the pipes with fill free from large rocks or boulders, carefully compacted. From this level to a height of 12 in. above the top of the pipes the trench shall be refilled with fill carefully compacted by hand in layers of not more than 6 inches.
 - (6) Where slabs are used to protect a shallow pipeline they shall be made of reinforced concrete, the thickness and reinforcement being decided by the Buildings Control Officer, supported on unexcavated ground on each side of the trench;

and set with the underside of the slabs not less than 2 in. above the tops of the pipe collars.

- (7) All fittings or joints shall form a smooth bore with no obstruction to flow.
 - (8) A manhole or cleanout plug shall be provided at each point where there is a change in direction greater than 90°, and at no more than 50 ft. spacing when inside a building and 75 ft. spacing when outside of a building.
 - (9) Where cleanout plugs are installed in horizontal underground lines outside the building, they shall be encircled with a 12 inch diameter concrete marker for protection and ready visibility.
 - (10) Every manhole or cleanout shall permit ready access to the pipe for inspection and cleaning purposes, shall be of sufficient strength, water-tightness, and in the case of manholes, shall have suitable channels and doping benchings for smooth flow.
 - (11) Where a pipe passes through the wall it shall not have any joint within the thickness of the wall. Exterior walls shall not be chased to greater than 1/3 their thickness. No chasing whatsoever is permitted in any structural member unless part of a specific design and no chasing is permitted in any belt beam or tie column.
 - (12) All pipes shall be suitably supported and attached to the building so as to permit movement. All pipes shall be so placed as to be reasonably accessible for maintenance and provided with such means of access as are necessary for internal cleaning to take place.
 - (13) Access panels shall be provided to repair or replace all tub waste and overflow fittings.
- (d) VENTILATION OF SEWERS AND DRAINS:
- (1) Every sewer or section of a sewer shall be ventilated as near as is practicable to its highest part.
 - (2) No sewer shall be extended to the open air except through an approved vent.
 - (3) Ventilation of a sewer shall be through a soil pipe, a soil-waste pipe or other approved vent.

- (4) There shall be an easily accessible two inch deep trap between every sanitary appliance and the sewer through which the effluent from the sanitary appliance is conveyed; this trap may be an integral part of the appliance.
- (5) Ventilation of fixtures shall conform to the drainage and vent diagrams in Appendix B. Every water closet shall be served by a minimum size 2" vent.
- (6) Every system of ventilation pipes shall prevent, under working conditions, the destruction of the water seal in any trap.
- (7) Ventilation pipes shall be taken up to a point above the level of the eaves or 10 inches above a flat roof and in no case not less than 3 ft. above the head of any window within a horizontal distance of 10 ft. from the ventilation pipe.
- (8) For each building having a single building sewer receiving the discharge of a water closet there shall be at least one vent stack, extending above the building roof no less than three or four inches in diameter.
- (9) Vents in small buildings shall be sized in accordance with the following Table.

SIZES OF VENT PIPING

Maximum Fixture Units	Size of Vents
1	1 1/4"
6	1 1/2" (No W.C. vents)
24	2"
72	3"

- (e) **SEPTIC TANKS-GENERAL:** Septic tanks shall be constructed of poured in place concrete, or of precast concrete or other impervious materials as approved by the Minister of Health.
 - (1) Poured in place concrete septic tank disposal systems for residences shall be sized and constructed in accordance with minimum standards as shown in Appendix B. Septic tank disposal systems for small commercial buildings shall be sized as required by the Minister of Health for the particular type of business or occupancy.

- (2) Adequate precautions shall be taken to prevent the entry of surface, tidal, or flood water or the entry of mosquitoes or other insects.
- (3) Septic tanks shall be of the double chamber type.
- (4) All dimensions shall be adequate depending on the intended service. The depth of liquid in it shall be at least 5 ft. and the length of the tank should be about 2 1/2 times the width.
- (5) Inlets and outlets shall be of T junction pipes, open at the top, with the invert of the outlet pipe 3 in. below the level of the invert of the inlet pipe. These pipes may be made of cast iron, pitch fibre, salt glazed ware, concrete, or P.V.C. plastic.
- (6) The floor shall be of concrete at least 6 in. thick. The walls shall be of concrete, plain or reinforced as approved by the Buildings Control Officer and at least 4 in. thick. The covering slab shall be of reinforced concrete, either precast or cast in place. Where precast slabs are used they shall be readily removable to provide access. Where a cast-in place slab is used it shall have an access opening at least 20 in. by 20 in. with a metal cover or a concrete cover slab over it.
- (7) There shall be at least 12 in. clear between the top of the liquid and the underside of the slab.
- (8) All inside surfaces shall be rendered smooth with mortar mix.
- (9) Pre-cast concrete septic tanks or septic tanks of other impervious materials shall not be installed unless they are of a type approved by the Minister of Health.
- (10) The siting of septic tanks, soakaway pits, drainage wells, and drainfields shall be such that no insanitary condition, nuisance or hazard to fresh water supply occurs.
- (11) A minimum distance of 6 ft. shall be maintained from a dwelling house, public building or any habitable structure, or the boundary of the property.
- (12) A minimum distance of 12 ft. shall be maintained from any water storage tank.
- (13) A minimum distance of 50 ft. shall be maintained from any fresh water supply, well or spring.
- (14) The siting, construction or method of construction shall not pollute any water storage tank, well or spring.

3617.12 RAINWATER • DISPOSAL:

(a) MINIMUM REQUIREMENTS:

- (1) Adequate means should be provided for the collection and disposal of any rain water which may fall on a small building so as to prevent any dampness in, or damage to, any building.
- (2) Rain water may be either collected on roofs and conveyed to storage tanks or connected to drains which lead to public drains, soakaways, or storm drains. Recommended sizes of rain water storage tanks are shown in Appendix B. Rainwater storage tanks are strongly recommended for any small building, however installation is not mandatory. Further information on the sizing of rainwater tanks is given in Appendix E.
- (3) Rainwater may be allowed to fall from the roof on to an open drain or a filled drain leading to a soakaway or to a public open drain, where permitted.
- (4) Rain water shall be discharged on to a public highway, or into a public sanitary sewer.
- (5) Where approved by the Minister of Works, rain water may discharge to an open pervious area within the limits of the property.
- (6) Where approved by the Minister of Works rain water may discharge to a drainage well to salt water.

(b) FIELD DRAINS:

- (1) Field drains for collecting rain water from a roof shall be provided so that the side of the drain nearer the building will catch drops falling from the eaves, and the width of the drain shall be sufficient for the outer side of the drain to catch the runoff from the eaves during periods of heavy rainfall. The width of the drain shall in no case be less than 30 inches.
- (2) FIELD DRAINS: Field drains may be used which consist of a trench filled with clinker, rubble, broken stone or other coarse material of 3 in. gauge at the bottom of the trench graded to finer material at the top. The length of each trench shall be decided by the Buildings Control Officer.

- (c) **GUTTERS:**
- (1) Every enclosed roof, parapet gutter and valley gutter shall be provided with adequate outlets.
 - (2) Every gutter and channel provided for collecting or conveying rain water from roofs, canopies or balconies shall be made of durable materials with suitable watertight joints; and shall be of adequate size, securely attached to the building, and provided with adequate outlets.
- (d) **RAINWATER DRAIN LINES:**
- (1) Every rain water pipe shall be made of durable materials with suitable joints; and shall be of adequate size; be securely attached to the building; and shall discharge over a lower roof, over an open drain, over a gutter leading to a drain, to a public drain where this is permitted by the Minister of Works, or to a rainwater storage tank.
 - (2) No rain water pipe shall also be used for soil water or waste water, or as a ventilating pipe.
 - (3) No rain water pipe shall discharge on to a public highway, public footway, sidewalk, or path or onto another persons property.
- (e) **SIZES OF RAINWATER LINES AND GUTTERS:** The required sizes of storm water drains and gutters for roofs shall be determined on the basis of the total drained area.

SIZE OF RAINWATER DRAINS, VERTICAL LEADERS AND GUTTERS

MAXIMUM ROOF AREA (Square Feet)

Nominal Pipe Size (Inches)	Building Storm Sewers and Drains			Gutters	Leaders
	1/8" per ft. slope	1/4 "per ft. slope	1/2" per		
1 1/2	127	190	222		222
2	270	380	460		460
2 1/2	413	610	700		700
3	745	1,080	1,270	635	1,270
4	1,560	2,210	3,080	1,540	3,080
5	2,810	4,000	5,620	2,810	

NOTE: The size in this table are for the building only.

- (f) SIZES OF OUTSIDE GROUND SURFACE STORM SEWERS: The required size of lines removing exterior surface drainage shall be in accordance with the following table

MINIMUM PIPE SIZES AND SLOPES FOR GROUND SURFACE STORM SEWERS

Diameter of Pipe in Inches	Maximum Ground Surface Area for Storm Sewers of Various Slopes		
	1/8" per ft. slope	1/4" per ft. slope	1/2" per ft. slope
3	1,360	1,590	1,930
4	2,470	2,930	3,600
5	4,270	5,020	6,030
6	7,110	8,360	11,400

- (g) MATERIALS FOR RAINWATER CONVEYORS: Acceptable Materials for rainwater lines are aluminum, copper, cast iron, galvanized steel, wrought zinc, or plastics. Gutters made of plastics shall be supported not more than 3 ft. apart; supports for gutters made of other materials shall not be more than 6 ft. apart.
- (h) RAINWATER STORAGE TANKS:
- (1) Every rain water storage tank shall be made of durable materials, be watertight and be of a capacity approved by the Minister of Works and Minister of Health. Tanks shall be provided with an overflow pipe, the end of which is covered with mosquito gauze and discharges over an open drain or a gutter to a drain. All storage tanks shall be covered and provided with means of access for internal cleansing. All storage tanks shall be properly sited relative to the building or sources of contamination. See drawing for Minimum Standards for Rainwater Storage Tanks in Appendix B.
 - (2) Any draw-off tap or the end of any suction pipe shall be not less than 3 inches above the bottom of the tank.
 - (3) Pipes conveying rain water to a tank the top of which is above ground level shall discharge in the open air over an inlet which is covered with mosquito gauze.
 - (4) All pipes connected to a tank which is wholly below groundlevel shall be of metal and the joint between any pipe and the tank shall be watertight.

- (5) Each rain water storage tank shall require a building permit.
 - (6) All tanks which are wholly above ground shall be made of treated wood, Galv. mild steel, concrete, or other approved materials.
 - (7) Tanks which are wholly or partly below ground level shall be made of burnt brick in mortar mix, or concrete, in such a manner as to be impervious. All inside surfaces shall be rendered with mortar mix with all internal corners rounded to facilitate cleaning.
 - (8) The external surfaces of any metal used underground shall be galvanized or suitably painted.
 - (9) Tanks shall be a minimum of 12 ft. from any source of contamination.
 - (10) NO SEWERS OR DRAINS SHALL PASS OVER OR THROUGH A TANK.
- (i) OPEN DRAINS:
- (1) Open drains shall be bricks laid in mortar mix, concrete slab 1 1/2 in. thick, concrete inverts made of concrete, cast in place concrete, or any two of the items preceding in combinations.
 - (2) Covers where required shall be reinforced concrete slabs, and shall be fixed or anchored where required by the Buildings Control Officer.
- (j) GROUND WATER DRAINS:
- (1) Groundwater drains for subsurface drainage shall be either pipe drains with open joints or Field drains as decided by the Minister of Works.
 - (2) Pipes for groundwater drains shall be of any durable material, porous or otherwise, and shall be at least 2 1/2 inches internal diameter.
 - (3) Pipes shall be laid with open joints to line and gradient, and shall be not less than 1 ft. 6 in. deep to invert. They may have saw cuts or holes in the lowest third of the pipe spaced not more than 12 in. apart.
 - (4) The width of the trench shall not exceed the external diameter of the pipe by more than 6 in.

- (5) After laying the pipes they shall be covered with a layer at least 3 in. thick of stone, gravel, broken brick or rubble to prevent silt entering the joints. Trench refilling shall be done with care to prevent displacement of the pipes.
- (k) SOAKAWAYS:
 - (1) Soakaways shall be of either the bore well pit or the field type and conform to the details in Appendix B.
 - (2) No part of a soakaway shall be within 6 ft. of a small building.
 - (3) Soakaway pits shall be constructed as shown in Appendix B.
 - (4) A field soakaway shall be not less than 20 ft. long, 1 ft. 3 in. wide and 2 ft. 0 in. deep.
- (l) DRAINAGE WELLS:
 - (1) Drainage or disposal wells where permitted, shall be installed in a manner to prevent contamination of the fresh water, as shown in Appendix B and as required in Section 3616, SUPPLY AND DISPOSAL WELLS.
 - (2) Any drainage well shall be carried to the cavernous area.
 - (3) Approval of the proposed installation shall have been received from the Minister of Health.
 - (4) A permit shall have been issued by the Minister of Health.

3617.13 WATER SUPPLY SYSTEMS:

- (a) MINIMUM REQUIREMENTS:
 - (1) Every small building with plumbing fixtures shall have an approved water supply.
 - (2) The flow capacity, flowing pressure and overall design of the system shall be sufficient to properly operate all installed sanitary fixtures.
 - (3) All water systems shall be designed, and installed, to prevent undue waste, undue consumption, misuse, or contamination, whether from public or private source.
- (b) FRESH WATER WELLS: A fresh water well supply system to serve a small building shall be a type, and in a location approved by the Minister of Health.

- (1) A fresh water well shall be at least 50 ft. from a septic tank, drainfield, or soakaway.
 - (2) The maximum flow rate, and the method and details of installation shall be approved by the Minister of Health.
 - (3) A permit shall be received from the Minister of Health.
 - (4) All wells shall be tested. All well water intended for dietetic use shall be potable water. Treatment facilities shall be installed to the satisfaction of the Minister of Health.
 - (5) Any emergency, connection between a public water supply and a well water supply shall be installed in a manner so as to prevent cross-flow of the two supplies, as directed by the Minister of Works.
- (c) DUAL WATER SYSTEMS: A dual system of freshwater to serve lavatories, sinks and showers, and collect and re-use waste water or rainwater, for flushing water closets and urinals, in a small building, shall be a type approved by the Buildings Control Officer.
- (1) All pipes in a dual system both where concealed and exposed, shall be colour coded as directed by the Buildings Control Officer to clearly show which pipes are for freshwater and which are for waste water.
 - (2) There shall be no actual physical connection whatever, between freshwater piping and waste water, flushing piping.
 - (3) The freshwater supply portion of the dual system shall comply with all requirements for public or well water supply systems.
 - (4) Where either a freshwater storage tank and/or rainwater storage tank are installed, they shall be separated by not less than 12 ft., if underground, and 2 feet, if aboveground, from a tank for collection and/or storage of waste water. No common wall, between fresh storage and waste water storage tanks, will be permitted.
 - (5) A water supply system, in a small building, installed to plumbing fixtures from a rainwater storage tank shall be a type approved by the Buildings Control Officer.
 - (6) Where a rainwater storage tank is to be used, the collection surfaces of the roof, or other collecting areas, shall not be painted with any injurious, or toxic substance.

- (7) The rainwater storage system may be supplemented by a well system, provided the installation complies with the requirements for protection from sources of contamination.
- (8) The rainwater storage system may be in combination with a waste water flushing system provided the installation complies with the requirements for protection from contamination of freshwater systems.
- (9) There shall be no actual physical connection whatever between a public water supply and the rainwater storage system, except that an approved float valve connection from a public supply through a 6 inch air gap may be permitted for use as a supplemental supply to the storage tank.
- (10) A building permit will be required prior to construction of a rainwater storage tank.
- (11) A brackish water supply system to serve a small building may be installed and shall be a type approved by the Minister of Works.
- (12) A brackish water supply shall be considered to be the same as waste water and shall be installed in accordance with all requirements for protection of the freshwater supply system.
- (13) A brackish water supply well shall not be sited within the boundaries of a Public Freshwater Supply Area; except with the approval of the Minister of Health, and the Minister of Works.

3617.14 DRAINAGE PIPING TEST: PART I —Alternative tests for drains which are to carry no soil or sewage water.

TEST 1: The drain or section thereof to be tested shall be suitably plugged and filled with water at a pressure equivalent to a head of 2 feet of water at the highest part of the drain or section under test. The test shall be so arranged that a pressure of 3.4 pounds per square inch (equivalent to a head of 8 feet of water) is not exceeded at any point in the drain or section under test. After sufficient time has elapsed to permit the absorption of water by the pipes, joints and fittings the pressure shall be restored to that equivalent to a minimum head of 2 feet of water.

This test shall be satisfied if the drain thereafter maintains that pressure for a period of at least 10 minutes.

TEST 2: At the option of the BCO, the drain or section thereof to be tested shall be suitably plugged and filled with air (with or without smoke) at a pressure equivalent to a head of 2 inches of water (.07 pounds per square inch).

This test shall be satisfied if the drain for 5 minutes thereafter maintains a pressure equivalent to a head of at least 1 1/2 inches of water. (.054 pounds per square inch.)

PART II—Alternative tests for drains to carry soil or sewage water.

TEST 3: The drain or section thereof to be tested shall be suitably plugged and filled with water at a pressure equivalent to a head of 5 feet of water at the highest part of the drain or section under test. The test shall be so arranged that a pressure of 3.4 pounds per square inch (equivalent to a head of 8 feet of water) is not exceeded at any point in the drain or section under test. After sufficient time has elapsed to permit the absorption of water by the pipes, joints and fittings the pressure shall be restored to that equivalent to a minimum head of 2 feet of water.

This test shall be satisfied if the drain thereafter maintains that pressure for a period of at least 10 minutes.

TEST 4: At the option of the BCO, the drain or section thereof to be tested shall be suitably plugged and filled with air (with or without smoke) at a pressure equivalent to a head of 4 inches of water (.14 pounds per square inch).

This test shall be satisfied if the drain for 5 minutes thereafter maintains a pressure equivalent to a head of at least 3 inches of water (.108 pounds per square inch).

PART III—Test for soil pipes, soil-waste pipes, waste pipes and ventilating pipes.

TEST 5: The soil pipes, soil-waste pipes, waste pipes and ventilating pipes or any section thereof to be tested, shall be suitably plugged and filled with air (with or without smoke) at a pressure equivalent to a head of 2 inches of water (.07 pounds per square inch.)

This test shall be satisfied if this pressure remains constant for a period of 5 minutes thereafter.

NOTE: Flexible joints trap air at the crown of each pipe and a water test is not decisive unless this air is expelled.

NOTE: All test equipment shall be furnished by the licensed plumber or owner.

NOTES

CHAPTER 37 FIRE PROTECTION AND EMERGENCY LIGHTING SYSTEMS

- 3701 GENERAL
- 3702 AUTOMATIC FIRE EXTINGUISHING SYSTEMS
- 3703 AUTOMATIC SPRINKLER SYSTEMS
- 3704 CARBON DIOXIDE, DRY CHEMICAL, HALON, EXPANDING FOAM OR APPROVED EXTINGUISHING AGENT
- 3705 STANDPIPES
- 3706 WATER SUPPLY FOR FIRE FIGHTING
- 3707 FIRE-DEPARTMENT CONNECTIONS
- 3708 YARD HYDRANTS
- 3709 PORTABLE FIRE EXTINGUISHERS
- 3710 INSPECTIONS AND TESTS
- 3711 ALARM, FIRE DETECTION AND SMOKE VENTING SYSTEMS
- 3712 EXIT & EMERGENCY LIGHTING SYSTEMS
- 3713 AUXILIARY STAND-BY EMERGENCY SERVICE

3701 GENERAL

- 3701.1 *SCOPE: This Chapter prescribes requirements for fire protection equipment in buildings and structures regulated by this Code.*
- 3701.2 (a) *APPLICATION: Every building subject to compliance with this Code, shall comply with the requirements of applicable Sections of this Chapter.*
 - (b) *Any building added to, repaired or altered as set out in Section 104 of this Code shall comply with the requirement of this chapter.*
- 3701.3 *DEFINITIONS AND STANDARDS:*
 - (a) *The terms in this Chapter shall be defined as set forth herein and in Chapter 2 of this Code, and the Standards referenced herein shall be those set forth herein or in Appendix A of this Code.*
 - (b) *Combustible goods or merchandise, as used herein, shall include goods or merchandise made of wood, plastics, cloth or rubber; those containing flammable liquids; those packed with excelsior, paper or moss; those packaged or packed in paper, cardboard or wood containers and other goods or merchandise of equivalent, or greater combustibility.*

3702 AUTOMATIC FIRE-EXTINGUISHING SYSTEMS

3702.1 GENERAL:

- (a) *Approved automatic-sprinkler systems in accordance with NFPA 13 shall be installed and maintained as provided in this Chapter, except that the Buildings Control Officer may require or may permit approved alternative automatic fire extinguishing systems, to be used in lieu of sprinklers as provided in Paragraph 3802.2(b) herein. Sprinkler systems in buildings over 60'-0" in height shall also comply with Chapter 39 of this Code.*
- (b) *The installation of fire extinguishers or standpipes shall not preempt or mitigate the requirements for automatic fire extinguishment systems required by this Chapter or Chapter 39 of this Code.*
- (c) *Plans and specifications for automatic fire extinguishment systems shall be prepared by an Engineer recognised by the Minister.*

3703 AUTOMATIC-SPRINKLER SYSTEMS:

3703.1 *In new buildings, or buildings altered to increase the area or height, and in existing buildings, approved automatic-sprinkler systems shall be installed as required by the BCO and the Director of Fire Services, and maintained in accordance with the following paragraphs, except that the BCO and the Director of Fire Services may require, or may permit a fire extinguishing system, as set forth in Section 3702, to be used in lieu of such sprinkler system. The areas referred to shall be the areas set forth in "Groups of Occupancy," as allowable floor areas for the various Types of Construction. Combustible goods or merchandise shall include those made of wood, cloth or rubber; those containing flammable liquids; those packed with excelsior, paper or moss; and other goods or merchandise of equivalent, or greater combustibility. Approved automatic sprinkler systems shall be required as follows: -*

(1) GROUPS A AND B OCCUPANCIES:

- (a) *In the following locations of Groups A and B Occupancies having a stage:*
 - (i) *In projection booths where nitrocellulose film is used.*
 - (ii) *In all accessible locations on the stage side of a proscenium opening, including under the stage floor, gridiron, and tie and fly galleries.*

(iii) In dressing rooms, workshops and storerooms.

A line of sprinklers shall be installed on the stage side and immediately to the rear of the proscenium curtain and not more than five feet above the proscenium arch.

(b) For an alternate sprinkler protection to proscenium openings see Section 507.1(e)(ii).

(c) In projection booths of Groups A and B Occupancy buildings not having a stage and seating more than 500 persons.

(2) GROUP C OCCUPANCIES: Auditoriums having a stage shall be protected throughout by an approved automatic sprinkler system.

(3) GROUP D AND E OCCUPANCIES:

(a) In Groups D and E Occupancy buildings or portions of buildings having an area of more than 1,500 square feet and having hazardous uses such as, but not limited to, planning mills, wood working shops, dry goods and apparel manufacturing shops, mattress factories, box factories, film exchanges, dry cleaning plants using flammable liquids, paint spray rooms, paint manufacturers or storage rooms, rooms where combustible fibres or dust is manufactured, processed or generated and rooms for processing and storage of waste paper and rags.

(b) In buildings, or within fire divisions, of buildings one and two stories in height used for the manufacture, sale or storage of combustible goods or merchandise and exceeding 20,000 square feet in area. In buildings, or within fire divisions, of buildings three or more stories in height used for the manufacture, sale or storage of combustible goods or merchandise and exceeding 10,000 square feet in area.

Any goods or merchandise packaged or packed in paper, cardboard or wood containers and similar packing or packaging shall be considered combustible.

(c) In repair garages over one storey in height, repair garages exceeding 8,000 square feet in area and located in a building of mixed occupancy, and one-storey repair garages exceeding 15,000 square feet in area.

(d) In all portions of flammable film-storage rooms, other high-

hazard spaces, and in basements used for storage or maintenance workrooms in all buildings more than two stories in height.

- (4) **GROUP F OCCUPANCY:**
 - (a) *DIVISION 1 - Mercantile buildings having an area of more than 12,000 square feet, or a gross area of more than 24,000 square feet.*
 - (b) *Division 3 - Covered malls set forth in Section 1004.3(f)(iv).*
 - (c) *Automatic sprinkler systems in mercantile buildings of Division 1 and 3 of more than 30,000 sq. ft. or 3 floors shall be supervised as set forth in subsection.*
- (5) **GROUP G OCCUPANCY:**
 - (a) *Buildings up to three stories in height; no special provisions unless required by the BCO or Director of Fire Services.*
 - (b) *Buildings of four or more stories but with the floor level of the 'upper most' floor less than sixty feet above adjacent grade-all corridors, public areas and areas not occupied 24 hours a day.*
 - (c) *High rise buildings i.e. buildings with floors more than sixty feet above adjacent grade-shall be sprinkled throughout, except sprinklers may be omitted in: -*
 - (i) *Closets not over 24 square feet in area.*
 - (ii) *Bathrooms not over 55 square feet in area after deducting the area of the tub and shower.*
 - (iii) *Mechanical and electrical spaces as described elsewhere in this Code.*
- (6) **ATRIUMS AND PERMITTED UNENCLOSED VERTICAL OPENINGS:** *as set forth in Sections 515, 614, 714, 1012, 1112 and 1507.1(b) respectively.*

3703.2 BASEMENTS:

- (a) *In basements used as workshops or for storage of combustible goods in buildings of Groups A, B, C and G Occupancy buildings, that exceed 5,000 square feet in area.*

3703.3 REDUCTION IN FIRE PROTECTION:

- (a) *Where an approved automatic fire extinguisher system is installed in other than Group D Occupancies, the fire resistive requirements may be reduced by one hour in the area or portion of the buildings so protected provided: -*

 - (i) *such buildings are no more than 60 feet in height.*
 - (ii) *that no required fire rating shall be reduced to less than one hour.*
- (b) *In buildings over 60 feet in height, partitions (except those used for stair enclosures) trusses, columns, beams, floors and the protection of vertical openings, may have their fire rating reduced by one hour if the building has an approved automatic sprinkler system installed by "no component" or assembly shall be less than one hour protected.*
- (c) *Single storey buildings of Group E and F Division 1 Occupancies, that do not contain hazardous materials may be constructed of unprotected non-combustible materials, without restriction as to area provided that: -*

 - (i) *the building is fully protected with an approved automatic sprinkler system.*
 - (ii) *the distance separation to all boundaries shall be a minimum of 60 feet.*
 - (iii) *the building shall also be provided with an approved smoke venting system in accordance with Section 3711.10 and 4605*
- (d) *Single storey buildings of Group F Division III Occupancy that comply with (c)(i), (ii) and (iii) above, that do not contain any hazardous materials, may be erected without restriction as to area provided always that construction shall be of non-combustible materials that provide a minimum of one hour fire resistive construction.*

3703.4 DETAILED REQUIREMENTS:

- (a) *The "Standard for the installation of Sprinkler Systems" NFPA No.13 is as part of this Code and supplements, but does not supercede, the requirements set forth herein. Only "wet-pipe" systems may be used except with special approval of the BCO and Director of Fire Services.*

- (b) *The alarm valve required for a standard sprinkler systems shall be required only for more than 200 Person Occupancy and basements exceeding 3,000 square feet of other occupancies.*

3703.5 **WATER SUPPLY:** *The water supply for sprinkler systems shall be as set forth in Sub-Section 3706.*

- 3703.6 (a) **TRAVEL DISTANCE:** *Where a building is fully protected with an approved automatic sprinkler system the maximum travel distances given in Chapter 5-13 (Groups of Occupancy) may be increased as follows:*

TABLE 37-1*

GROUP OF OCCUPANCY	DISTANCE TO AN EXIT IN FEET (b)		REMARKS
	WITHOUT SPRINKLERS	WITH SPRINKLERS	
A	150	200	-
B	150	200	<i>Type I Construction. All other Types Construction.</i>
	100	150	
C	100	200	-
D	75	100	-
E DIV. 1	150	300	-
DIV. 2	100	150	-
DIV. 3	75	100	<i>Hazardous materials.</i>
F DIV. 1	100	150	<i>Less than 50 persons Hazardous displays. Plus 100' within store.</i>
	75	100	
DIV. 2	150	250	
DIV. 3	-	200	
G	100	150	<i>One (1) hour separation for Travel Distance up to 4 stories, two (2) hour separation for more than 4.</i>

- (b) *The measurement of travel distance shall be as set forth in Section 2801.3.*

- (c) *Travel distances in excess of those set forth above may be approved by the Buildings Control Officer and Director of Fire Services only if the building is fully protected by an approved automatic sprinkler system and in addition it is provided with an approved automatic smoke venting system.*

3704 CARBON DIOXIDE, DRY CHEMICAL, HALON, EXPANDING FOAM OR APPROVED EXTINGUISHING AGENT

3704.1 GENERAL: *Chemical type fire-extinguishing systems may be substituted for required sprinkler systems in places not commonly used by the Public as follows:*

- (a) The BCO or Director of Fire Services may require such substitution.*
- (b) The BCO or Director of Fire Services may approve such substitution.*

3704.2 DESIGN AND CONSTRUCTION:

- (a) Carbon dioxide fire extinguishing systems shall comply in all respects with the "Standard on Carbon Dioxide Extinguishing Systems" NFPA Code-12.*
- (b) Expanding foam fire extinguishing systems shall comply in all respects with the "Standard for Foam Extinguishing Systems" NFPA Code-11.*
- (c) Dry chemical fire extinguishing systems shall comply in all respects with the "Standard for Dry Chemical Extinguishing Systems" NFPA Code-17.*
- (d) Halogenated fire extinguishing systems shall comply in all respects with the "Standard on Halogenated Fire Extinguisher Agent Systems Halon 1301" NFPA Code-12 A, or halon 1211 NFPA Code-12 B.*

3704.3 WHERE PERMITTED: *Carbon dioxide, Dry Chemical or halon fire extinguishing systems may be used in rooms or enclosures containing flammable liquids in enclosed or open containers, ovens, dryers, electrical and other special machinery and apparatus and processes involving the use of flammable liquids, vapor or dusts, fur storage, lumber kilns, loose textile stocks, grain-handling machinery, and in other enclosures containing stocks through which gas may permeate and where protection by water or other means may be ineffective or undesirable; also, in vaults, library stockrooms, organs and other such places where fires may be extinguished by carbon dioxide gas with less loss than if water is used. Expanding foam may be used in all rooms or enclosures where no live electrical equipment is present, unless main disconnects are located accessible to fixed systems for foam.*

3704.4 *WHERE REQUIRED: Hazardous areas in large buildings, such as boiler rooms, equipment rooms, and similar spaces, may required to have built-in foam inlets with access doors on exterior walls, thereby allowing immediate connection of mobile foam generators from a Fire Service.*

Where important buildings having hazardous spaces are located remote from a Fire Service with Mobile foaming equipment, it is mandatory to provide for the installation of fixed foaming equipment which may be either automatic or semi-automatic. It is impossible to anticipate all types of hazards which would require these fixed systems, and such installations shall be considered special cases at the discretion of the BCO and the Director of Fire Services. Such facilities will require written application for consultation and decision by the BCO and the Director of Fire Services during initial planning of the specific type of system to be required in a new facility.

Consideration will be given by the BCO and the Director of Fire Services to architects, engineers, or builders who wish to present for approval plans using various types of chemical extinguishing systems, such as carbon dioxide, dry chemical, halon, or other approved extinguishing agent, in lieu of foam.

3705 STANDPIPES

Wet standpipes having a primary water supply constantly or automatically available at each hose outlet shall be provided as required in this Section in buildings hereafter erected, or existing buildings altered to increase the area or height or existing buildings where in the Occupancy is changed.

3705.1 *WHEN REQUIRED: One or more interior standpipes not less than 4-inch interior diameter for buildings not exceeding four stories in height and not less than 6-inch interior diameter for buildings exceeding 4 storeys in height shall be required as follows:*

- (a) In every building of 200 person Occupancy or more of any height.*
- (b) In every building of Assembly Occupancy of more than 200 persons having a stage and such requirement shall be only for standpipes on the stage side of the proscenium wall.*
- (c) In every building of Industrial, Institutional, Hazardous, Storage, or mercantile Occupancy where required by the BCO or Director of Fire Services.*
- (d) In every building of Residential Occupancy four or more storeys in height.*

- (e) *In every building of Residential or Business Occupancy three or more stories in height and having interior corridors.*
- (f) *EXCEPTION: In buildings of Assembly Occupancy which are 2 stories or less in height, not having a permanent stage and having an occupant content not exceeding 750 persons, 2-inch standpipes equipped with 1 1/2-inch hose connections and 75 feet of hose will be acceptable.*
- (g) *Public schools shall be excluded from the requirements herein and shall be considered individually by the BCO and Director of Fire Services.*

3705.2 *NUMBER REQUIRED: The number of standpipes and hose stations shall be such that all parts of every floor area can be reached within 20 feet by a nozzle connected to not more than 75 feet of hose connected to a standpipe.*

3705.3 *LOCATION:*

- (a) *In buildings of Assembly Occupancies, standpipes and hose stations shall be located on each side of the proscenium wall on each side of the stage entrance opening, on each side of the rear of the auditorium, and on each side of the balconies adjacent to the exit opening.*
- (b) *In buildings of General Occupancy having a stage, standpipes and hose stations shall be located on each side of the proscenium wall on each side of the stage entrance opening.*
- (c) *In buildings of Residential Occupancies, standpipes shall be located as follows:*
 - (1) *Where buildings are within 75 feet of a multi-storey building, standpipes for 2 1/2-inch streams shall be located to afford protection against exterior exposures as well as to the interior of the building.*
 - (2) *Standpipes shall be so located that they are protected against mechanical and fire damage, with outlets for hose stations located a minimum of three feet and a maximum of ten feet from each stairway door. There shall be no windows or glass between the stairway door and the hose station.*
 - (3) *In buildings divided by numerous partitions, standpipes shall be so located that the streams can be brought to bear in any room.*

- (4) *In buildings having larger areas, the standpipes for small hoses supplying first aid streams shall, under ordinary conditions, be located at the interior columns.*

3705.4 **STANDARDS:** *Standpipe systems and materials required by this Code shall comply in all respects with the requirements of NFPA 14 "Standard for the installation of Standpipe and Hose Systems", where not contrary to the specific requirements set forth herein.*

3705.5 **MATERIALS:** *Standpipes shall be of wrought iron or galvanized steel, and together with fittings and connections shall be of sufficient strength to withstand 200 pounds per square inch water pressure at the topmost outlet. P.V.C. piping will not be permitted.*

3705.6 **TESTS:**

(a) *Tests shall be conducted by the owner or contractor in the presence of the Fire Services Inspecting Officer whenever deemed necessary and ordered by the BCO or the Director of Fire Services. The tests shall be applied at the top or bottom connections of such standpipes, and the owner or contractor shall be responsible for any damage caused by breakage or faulty installation while such tests are being conducted.*

(b) *Standpipe system 4 inches in size and over shall be tested hydrostatically at not less than 200 pounds per square inch pressure at the top for at least two hours.*

(c) *Standpipe systems under 4 inches in size including service lines shall be tested at normal working pressures, or a minimum of 100 psi.*

3705.7 **OUTLETS:** *All standpipe hose stations shall be equipped with 2 1/2" inch valves adapted for 2 1/2" inch NST Fire Department hose connection in each outlet, including the basement and with the centreline of the 2 1/2 inch valve located not less than 5 feet and 6 inches nor more than 6 feet above the floor. Easily removable 2 1/2 inch by 1 1/2-inch adaptors may be placed in the valve outlets. All standpipes in buildings 4 or more stories in height shall extend above the roof a minimum of 28 inches and be equipped with 2 1/2 inch gate valve and a 2-way 2 1/2 inch outlet adapted for Fire Department 2 1/2 inch NST hose connection. See Sub-Section 3705.2.*

3705.8 HOSE STATIONS:

- (a) *HOSE STATIONS: Each hose station outlet shall be fitted with a rubber or neoprene lined hose not less than 1 1/2 inch minimum in diameter. Such hose shall be equipped with an approved brass or bronze diffuser nozzle and shall be not more than 75 feet in length. An approved standard form of wall-hose reel or rack, recessed in the wall or protected by suitable cabinet, shall be provided for the hose and shall be located to make the hose readily accessible at all times.*

- (b) *HOSE REELS (PERMITTED ONLY BY SPECIAL APPROVAL): Where water supply pressures are designed to provided a minimum of 50 psi residual pressure at the hose station, hose reels with automatic control valves may be provided. Hoses shall consist of 3/4 inch or 1-inch diameter, non-kinking rubber hose, not more than 75 feet long. Approval shall be obtained from the Director of Fire Services.*

3706 WATER SUPPLY FOR FIRE FIGHTING

- 3706.1** *REQUIRED: All sprinkler systems, standpipes and yard hydrants shall be connected to the public water supply. "Available" shall be considered to be within 150 feet from a street watermain of not less than four-inch diameter as measured from the nearest point of the building. Where public water service is not available or where the water pressure is insufficient to maintain 65 pounds pressure at the topmost outlet, connections to a gravity tank, pressure tank or fire pump shall be required; and such supply shall be sufficient to furnish 65 pounds of residual pressure at the topmost outlet, with a flow of not less than 250 U.S. G.P.M.*

- 3706.2** *ACCEPTABLE WATER SUPPLY: Connection to a public water supply shall be equipped with control valve located in the public street or other public space, and an Underwriter's approved horizontal check valve protecting the main and accessibly located inside the property line. Fire wells may be provided after special approval, in accordance with the requirements and limitations of Chapter 36 -"PLUMBING."*

- 3706.3** **STORAGE TANKS:**
 - (a) *Tanks shall have a capacity of not less than 2,500 U.S. Gallons of rainwater for the first standpipe plus 1,000 U.S. gallons for each additional standpipe and/or an amount to operate the sprinkler system (if any) on any one floor for a period of not less than 10 minutes. Such tanks shall be located to provide not less than 65 pounds pressure at the topmost outlet for its entire supply; and where storage tanks are used for domestic purposes, the supply*

pipe for domestic purposes shall be located to maintain such minimum-required fire-fighting capacity. Where required by the Building Control Officer major buildings which require standpipes shall have a minimum storage of 5,000 U.S. Gallons of rain water.

- (b) Tanks shall be equipped with a ladder and platform, drain pipe, water and pressure gauges. Non-combustible supports shall be provided for all supply tanks. Supply pipes for fire-extinguishing apparatus shall lead from the bottom of the tank and shall be provided with a check valve protecting the tank.*
- (c) Buildings which have sufficient potable water in storage may be indirectly connected to a fire protection system to satisfy the requirement for fire storage. Swimming pools, re-use water storage, or wells may satisfy storage requirements.*
- (d) Where buildings have swimming pools, it is recommended that bypass pipe connections be installed to allow withdrawal of the pool contents for emergency supply to the standpipe system. Standpipe systems shall normally be charged with fresh water to minimize interior pipe corrosion. Pipe accessories shall be provided to facilitate draining and recharging of a system which has been supplied during an emergency with salt or brackish water. A piping system and accessory equipment for charging a standpipe system with fresh water shall be constructed in such manner to preclude contamination of the fresh water piping system.*

3706.4 *PRESSURE TANKS: Detailed plans shall be submitted to the BCO where pressure tanks are proposed. Pressure tanks shall be permitted only where a qualified building superintendent, acceptable to the inspector having jurisdiction, is employed. Pressure tanks shall be designed and maintained as set forth for gravity tanks and shall be tested and proved tight at a hydrostatic pressure of 50 percent in excess of the working pressure required.*

- (a) Where the pressure at any fire hose outlet exceeds 65 p.s.i., an approved calibrated, pressure-reducing valve shall be installed.*

3706.5 *FIRE PUMPS:*

- (a) Detailed plans shall be submitted to the BCO where fire pumps are proposed such installations shall comply with N.F.P.A. 20. Fire pumps shall be permitted only where a full time building superintendent is employed. Fire pumps serving standpipes, shall be capacities of not less than 65 p.s.i. at 250 U.S. G.P.M. per standpipe, measured at the topmost outlet. The source of water supply shall be a private water main of not less than four-inch*

diameter or a well or cistern containing 5,000 U.S. gallons. Pumps shall be supplied with an adequate source of power and shall be automatic in operation. Where approved by the BCO smaller capacity fire pumps designed for combination fire-domestic use may be used, in small buildings only.

- (b) Where a capacity of 500 gpm or more is required, fire pumps shall be UL listed.*
- (c) Fire pump controllers shall be UL listed and may be of limited service for motors of 30 HP or less.*
- (d) The source of water supply for a fire pump shall be a street main of not less than 4" diameter and capable of supplying the quantity of water at which the pump, or pumps, will operate; or shall be a well or cistern having not less than a 1/2-hour supply.*
- (e) Electric motor-driven fire pumps shall be supplied with a separate electric service and where a standby generator is provided, or otherwise required by this code, shall be connected through a separate automatic transfer switch to such standby generator, as required by NFPA 20.*
- (f) Fire pumps shall be automatic in operation.*
- (g) A minimum pressure on a standpipe system of 15 lbs psi at the roof shall be maintained by a jockey pump actuated by a pressure switch; or by connection to a suitable domestic system through two 170 psi check valves, one with a soft seat and one with a hard seat.*
- (h) Fire pump installations shall be fitted with a full-size bypass provided with approved gate and check valves.*

3707 FIRE-DEPARTMENT CONNECTIONS

- 3707.1** (a) *One Siamese (duplex) Fire Department connection shall be provided for the first three required standpipe risers except that a single standpipe not exceeding 2 1/2 inches in diameter need not have a Fire Department connection when in the opinion of the BCO or Director of Fire Services, sufficient pressure or volume is provided. When a building is required to have two or more Siamese connections such connections shall be located remote from each other and where a building faces on two or more streets a connection shall be located on each street exposure. All standpipes*

shall be cross-connected at their bases. Siamese (duplex) connections shall be of the same pipe diameter as the largest diameter of any standpipe connected thereto and shall be protected by a U.L. Listed check valve. Additional connections may be required at the discretion of the Director of Fire Services.

(b) One Siamese (duplex) Fire Department connection shall be provided for each sprinkler system. Where a building faces on two or more streets there shall be not less than two Siamese connections located remote from each other on separate street exposures. Siamese connections shall be not less than four-inch diameter.

3707.2 Fire Department connections shall be 2 1/2-inch hose connections located on the street-front wall not less than one foot nor more than three feet above grade. Piping shall not project over public property and recesses shall be provided in property line walls. Connections shall be 2 1/2 inch American National Standard Fire Hydrant Thread. Written approval of the Director of Fire Services shall be secured for every connection.

3707.3 A permanent, legible sign with letters at least one inch high shall be attached to the exterior of the building adjacent to the connection, and such sign shall read "STANDPIPE" and/or "SPRINKLER" as applicable.

3707.4 Location of all Siamese connections shall be approved by the Director of Fire Services.

3708 YARD HYDRANTS

3708.1 WHERE REQUIRED: Yard Hydrants shall be required in boatyards, school yards, oil storage tanks, lumber yards or exhibition parks or other similar enclosures, when deemed necessary by the BCO or Director of Fire Services. These shall be not less than one yard hydrant and hose for each 20,000 square feet of area.

3708.2 DETAILED REQUIREMENTS: When required, yard hydrants shall not be located over 250 feet apart. Dockside hydrants with 75 feet of hose shall be provided.

The piping for yard hydrants shall be not less than four inches and shall be connected by screw fittings, flanges or unions.

Hydrants shall have two and one-half inch American National Standard Fire Hydrant Threads, uniform with that of the local fire-department; with not less than 100 feet of standard two and one-half inch fire hose and an approved-type nozzle. A hose house and equipment shall be

provided at each hydrant, unless well located portable hose reels and equipment are accepted by the Director of Fire Services. Hose houses shall have painted thereon brightly the word, "FIRE HOSE," in legible letters not less than six inches high on all exposed sides. Location of all yard hydrants shall be approved by the Director of Fire Services.

3709 PORTABLE FIRE EXTINGUISHERS

3709.1 *WHERE REQUIRED: Portable fire extinguishers shall be installed and maintained in buildings intended for Commercial or Multi-Residential Occupancy.*

3709.2 *QUANTITY: At least one extinguisher shall be provided for every 2,000 square feet of floor area in locations to be decided by the Director of Fire Services.*

3709.3 *DETAILED REQUIREMENTS: A portable fire extinguisher shall consist of a container or containers having a capacity of not less than one unit of fire protection, as defined by the National Fire Protection Association, so arranged and equipped that pressure may be generated and the contents discharged through a hose and nozzle, or a portable extinguisher of other type, approved as equal by the Inspector having jurisdiction. The design and construction of portable fire extinguishers shall comply with the National Fire Protection Association's recommendations and be approved by the Director of Fire Services.*

Portable fire extinguishers, where required, shall be mounted in corridors or other approved locations generally accessible to the occupants of the building. Where they are placed in cabinets, they shall be visible, and the doors shall be unlocked or of glass which can be broken to give access to the extinguisher in case of fire.

3710 INSPECTIONS AND TESTS

3710.1 *GENERAL: All required fire extinguishing apparatus shall be inspected, and maintained as defined in the Act and Rules.*

3710.2 *PRESSURE TESTS: Every system of automatic sprinklers, standpipes or yard hydrants and all parts thereof except linen hose, shall satisfactorily meet a pressure test of 100 pounds per square inch in excess of the static pressure due to height of the water, except as may be otherwise set forth herein.*

3710.3 PORTABLE FIRE EXTINGUISHERS: *The maintenance of all portable fire extinguishers shall comply with the National Fire Protection (NFPA) Code 10.*

3711 ALARM, FIRE DETECTION AND SMOKE VENTING SYSTEMS

3711.1 ALARM SYSTEMS - GENERAL:

- (a) *Manually operated fire alarm equipment shall be provided as specified by the applicable provisions of Sections 38 - Heat Producing Apparatus, 39 - Special Hazards, 40 - Mechanical Ventilation, 41 - Air Conditioning and Refrigeration, and 43 - Elevators and Escalators, and as specified herein.*
- (b) *Where a building is divided by fire walls into separate fire sections with adequate safeguards against the spread of fire from one section to another, each section may be considered a separate building for the purposes of application of fire alarm system requirements based on size of building or population content, or Occupancy.*
- (c) *All required fire alarm and detection systems shall comply with the following NFPA publications: -*
 - (1) *NFPA 71, Standard for the Installation, Maintenance and use of Central Station Signaling Systems;*
 - (2) *NFPA 71, Standard for the Installation, Maintenance and use of Local Protective Signaling Systems for Fire Alarm and Supervisory Service;*
 - (3) *NFPA 71, Standard for the Installation, Maintenance and use of Auxiliary Protective Signaling Systems for Fire Alarm Service;*
 - (4) *NFPA 71, Standard for the Installation, Maintenance and use of Remote Station Protective Signaling Systems;*
 - (5) *NFPA 71, Standard for the Installation, Maintenance and use of Proprietary Protection Signaling Systems;*
 - (6) *NFPA 71, Standard on Automatic Fire Detectors;*
 - (7) *NFPA 71, Standard for the Installation, Maintenance and use of Household Fire Warning Equipment; and*
 - (8) *NFPA 71, Public Fire Service Communications.*

- (d) *Every alarm system shall be under the supervision of a responsible person who shall cause proper tests to be made at intervals as specified by the Director of Fire Services and have general charge of all alterations and additions. A current log book shall be maintained.*
- (e) *Fire alarm signaling equipment shall be restored to service as promptly as possible after each test or alarm, and shall be kept in normal condition for operation. Equipment requiring rewinding or replenishing shall be rewound or replenished as promptly as possible after each test or alarm. Any major repairs shall be completed within one week. Simple reset shall be completed within 24 hours and the Director of Fire Services shall be so informed.*
- (f) *Each manually operated sending station and alarm sounding device in a single system shall be of the same general type.*
- (g) *The fire alarm system in a Type G Occupancy building shall be subject to the full audio test, witnessed by the Director of Fire Services.*

3711.2 ALARM SENDING STATIONS - GENERAL:

- (a) *A manually operated sending station shall be provided near each main exit and in the natural path of escape from fire, at readily accessible and visible points which are not likely to be obstructed.*
- (b) *Each sending station shall be so located that from any part of the building not more than 100 feet will have to be traversed in order to reach a sending station on the same floor.*
 - (1) *A station shall be located opposite the main elevator access to each floor, so that it is clearly visible to all persons arriving at that floor.*
 - (2) *They should be located at a maximum of 100 feet on centres along the corridors.*
 - (3) *They are to sound initially upon that floor giving alarm and activate the main fire alarm panels located in the telephone exchange and the front desk and Superintendent's or Engineer's Office.*
 - (4) *The alarm on every floor shall be fitted with a key type lock, which can activate the general alarm for the whole building.*

- (c) *The arrangement of sending stations, and the manner of their connection with sounding devices shall be such that there will be no difference between the sounding of actual alarms and drill signals.*
- (d) *A manual fire alarm station shall be provided in the natural path of escape near each required exit from an area.*
- (e) *Each manual fire alarm station on a system must be accessible, unobstructed, visible, and of the same general type.*
- (f) *Where sprinkler system provides automatic detection and alarm system initiation it shall be provided with an approved alarm initiation device that will operate when the flow of water is equal to or greater than that from a single automatic sprinkler.*

3711.3 SOUNDING DEVICES - GENERAL:

- (a) *A required sounding device shall be used for fire alarm purposes only.*
- (b) *Alarm sounding devices shall be provided of such character and so distributed as to be effectively heard in every room above all other sounds. Alarm devices shall be horns or bells. Horns shall be used where bells are used for normal signal purposes, and bells where horns are normally used. Visible alarm devices may be used in lieu of audible devices only where specifically permitted by detailed requirements for institutional occupancies, for places of assembly and special hazard occupancies.*
- (c) *Every alarm sounding device shall be distinctive in pitch and quality from all other sounding devices and shall be clearly audible in any part of the building under conditions or normal occupancy.*
- (d) *A code signal indicating where the alarm originates shall not be used except to such extent as specifically authorized by the BCO or the Director of Fire Services.*
- (e) *Each system shall be so arranged that no manual intervention will be required, following the actuation of a sending station, for causing effective response of all required sounding devices. No facilities shall be provided whereby such response can be controlled or modified except where otherwise specifically permitted by the Building Control Officer and the Director of Fire Services.*
- (f) *Pre-recorded or live voice evacuation instructions to occupants shall be permitted. Pre-recorded instructions shall be preceded by*

not less than 5 seconds or more than 10 seconds of a continuous alerting signal. Upon completion or failure of pre-recorded instruction, the fire alarm evacuation signal shall sound. Pre-recorded instructions shall be repeated 2 or more times. Live voice instructions shall be permitted to interrupt, delay or discontinue the pre-recorded message or the fire alarm evacuation signal.

3711.4 AUTOMATIC FIRE DETECTION - GENERAL:

- (a) *An automatic fire detection system, where installed to meet specific requirements specified herein, shall be of a standard approved by the BCO and the Director of Fire Services and shall be so installed as to provide effective warning of incipient fire in any part of the premises.*
- (b) *A connection may be made between a required manually operated alarm system and automatic fire detection system or automatic sprinkler system, provided that the effectiveness and dependability of operation of the alarms from manual sending stations is not thereby impaired.*

3711.5 INCIDENTAL FUNCTIONS - GENERAL: *A manually or automatically operated fire alarm system may be arranged for the accomplishment of incidental functions such as the release of self-opening or self-closing doors, cutting off supplies of gas, fuel oil, or electric power, switching on emergency lights, the stopping of air supply ventilating fans, and the like, in so far as the accomplishment of such incidental functions does not in any way impair the effectiveness or reliability of the required sounding devices in response to the required sending stations.*

3711.6 FIRE DEPARTMENT NOTIFICATION:

- (a) *It is strongly recommended that future arrangements shall be made for the prompt notification of the public fire department or such other outside assistance as may be available in case of fire or other emergency.*
- (b) *Automatic fire department connections when installed shall be so arranged as to permit drills to be conducted by those in authority without calling out the fire department, and so that the actuation of any required alarm sending station will call such department.*

3711.7 BUILDING SERVICE EQUIPMENT (GENERAL): *No air conditioning, ventilating, heating, cooking, or other service equipment shall be so installed or operated as to endanger ways of exit, spread fire or smoke through buildings, or otherwise create an abnormal hazard to occupants such as to endanger their safety before they have opportunity to utilize available exit facilities.*

3711.8 AIR CONDITIONING AND VENTILATING - GENERAL:

- (a) *Every air conditioning and ventilating system shall be so installed and maintained as to minimize the danger of spread of fire or smoke thereby from one floor or fire area to another, or from outside into any occupied building or structure.*
- (b) *Each air conditioning and ventilating system circulating air to more than one floor or fire area shall be provided with dampers designed to close automatically in case of fire and thereby prevent spread of fire or smoke, and shall also be provided with automatic controls to stop fans in case of fire.*
- (c) *Any air conditioning system serving places of assembly, department stores or hotels shall be provided with effective means for preventing circulation of smoke through the system in case of fire in air filters or from other sources drawn into the system even though there is not sufficient heat to actuate heat sensitive devices controlling fans or dampers.*

Such means shall consist of an approved photo-electric or other smoke sensitive control or, subject to the approval of the BCO and Director of Fire Services, may be manually operated controls in cases where qualified personnel responsible for operation of controls are continuously on duty while the premises are occupied.

3711.9 ALARM SYSTEMS BASED UPON OCCUPANCY

- (a) **GROUPS A AND B OCCUPANCIES.**
 - (i) *Buildings of Groups A and B Occupancy shall be provided with approved manual stations.*
 - (ii) *An activated alarm shall not sound automatically in audience areas, but shall alert a constantly manned position with an audio or visual signal.*
 - (iii) *The manned position shall replay alarm by voice message to audience areas by Public Address system by pre-recorded type.*
 - (iv) *The P A system shall be connected to the emergency power supply.*
 - (v) *Activation of the sprinkler system shall initiate the alarm system.*

(b) **GROUP C OCCUPANCY**

- (i) *Buildings of Group C Occupancy shall be provided with approved manual stations, where acceptable to the BCO and Director of Fire Services.*
- (ii) *The actual alarm should not be a bell in order to avoid confusion with the normal audio controls in the building.*

(c) **GROUP D OCCUPANCY**

The alarm systems for Group D Occupancy building shall be as directed by the BCO and Director of Fire Services based upon the design and usage of the building.

(d) **GROUP E OCCUPANCY**

- (i) *Buildings of Group E - Division 1 Occupancy shall have approved manual stations, or an automatic system which shall activate a continuous signal.*
- (ii) *Buildings of Division 2 Occupancy shall have approved manual stations, that activate an alarm in a continuously manned position for the purpose of initiating emergency action. In High Hazard Industrial Occupancies the system shall initiate an evacuation alarm signal. The alarm shall also sound at the continuously manned position.*

(e) **GROUP F OCCUPANCY**

- (i) *Buildings of Group F - Division 1 Occupancy shall be provided with a manual fire alarm system where the floor area exceeds 2,500 square feet.*
- (ii) *Buildings of Group F - Division 2 Occupancy shall be provided with a manual fire alarm system where: -*
 - (aa) *there are two or more storeys above the level of exit discharge or*
 - (bb) *where the total occupant content exceeds 100 persons.*

EXCEPTION No. 1 - buildings protected throughout by an approved automatic fire detection and alarm initiation system.

EXCEPTION No. 2 - buildings protected throughout by an approved automatic sprinkler system fitted with an alarm initiation device.

(iii) Buildings of Group F - Division 3 Occupancy shall be provided with an approved automatic fire detection and alarm initiation system throughout. Activation of the sprinkler system shall also initiate the alarm.

(f) GROUP G OCCUPANCIES

(Hotels, apartment hotels, and apartment blocks with accommodation for more than 10 hotel bedrooms or 10 apartment units.)

(1) Direct access - single and two storey buildings - Manual fire alarms throughout.

(2) Direct access - three storeys and up - Manual fire alarms throughout, plus: -

(a) in dormitory areas one smoke detector in each bedroom or apartment, such detector shall not be subject to the loss of power from a wall switch.

(b) in other areas of the building smoke detector shall be installed in areas not occupied 24 hours per day.

(3) Corridor access - One and two storey buildings - Manual fire alarms throughout, plus smoke detector initiated alarms in dormitory corridors.

(4) Corridor access - Three storey buildings - Manual fire alarms throughout, plus smoke detector initiated alarms in dormitory corridors and areas not occupied 24 hours per day plus smoke detectors as in (2)(a).

(5) Corridor access - Four floors and up in hotels an apartment hotels, shall be protected as in (4) above except all manual stations and all smoke detectors including those in apartments, but not those in individual rooms, shall be connected not only to the relevant floor alarms but also to an annunciator panel located in an area manned 24 hours per day. Activation of the sprinkler system shall also initiate the alarm system.

- (6) *Corridor or lobby access in apartment blocks of seven or more storeys shall be protected as in (5) above.*
- (7) *High rise hotels, apartment hotels and apartment blocks shall, in addition to fire alarm systems as set forth in (5) and (6) above, have voice communication from a central control point to all corridors, elevators, lobbies, assembly areas and other areas as may be designated by the Buildings Control Officer or Director of Fire Services.*

(g) **GROUP H OCCUPANCY**

Buildings shall be provided with at least one smoke detector on every level, installed to the ceiling or to the wall within 12 inches below the ceiling, such that the alarm is readily audible in all sleeping areas.

3711.10 SMOKE VENTING:

- (a) *Smoke Venting facilities shall be required in all windowless buildings, underground structures, atriums, shopping malls and all industrial, storage and mercantile buildings exceeding 40,000 square feet in area. The Buildings Control Officer or the Director of Fire Services may also require smoke venting in any building or part of a building where, due to the nature of the design and usage rapid smoke build-up could interfere with prompt access to exits. Smoke vents shall be initiated by automatic means. Such means shall consist of an approved photo-electric or other smoke sensitive control, or subject to the approval of the Buildings Control Officer and Director of Fire Services, may be manually operated in cases where qualified personnel responsible for operation of controls are continuously on duty while the premises are occupied.*
- (b) *Natural draft smoke venting shall utilize roof vents or vents in walls at or near the ceiling level; such vents to be normally open or if closed shall be designed for automatic opening by approved means in case of fire.*
- (c) *Where smoke venting facilities are installed for purposes of exit safety they shall be adequate to prevent dangerous accumulations of smoke during the period of time necessary to evacuate the area served, using available exit facilities with a margin of safety to allow for unforeseen contingencies.*
- (d) *The discharge apertures of all natural draft smoke vents shall be so arranged as to be readily accessible for opening by Fire Services personnel working from the exterior.*

- (e) *A power-operated smoke exhausting system may be substituted for required natural draft vents only by specific permission of the Buildings Control Officer and Director of Fire Services.*
- (f) *NFPA No.204 "Guide for Smoke and Heat Venting" is hereby adopted as part of this Code and supplements, but does not supercede the requirements set forth herein.*

3711.11 HEATING AND COOKING EQUIPMENT: *No portable or open flame heating or cooking equipment shall be located in exits, in ways of approach thereto or in any other location potentially endangering the safe use of exits.*

3711.12 HIGH PRESSURE EQUIPMENT: *No high pressure boiler, air compressor or other high pressure equipment shall be located in or under main exits.*

3711.13 FLAMMABLE LIQUIDS, GASES, CHEMICALS, EXPLOSIVES: *No flammable liquid, compressed gas, hazardous chemical or explosive material shall be stored or used in such a manner as to endanger the safety of exits. See Act No.13 of 1967 for complete requirements.*

3711.14 RUBBISH CHUTES, LINEN CHUTES, AND FLUED INCINERATORS: *No such chutes or incinerator flues shall, in new construction, open directly on any exit, or corridor to an exit, but shall be in a separate room or closet separated from the exit (or from the corridor) by an approved self-closing fire door, except that this requirement shall not apply to private dwellings and that in apartment houses, automatic sprinkler protection may be provided in lieu of the self-closing fire door. All terminal trash or linen collection rooms shall be provided with approved photo-electric, or smoke sensitive devices connected to the alarm system. All rubbish or linen chutes shall be provided with automatic fire sprinkler heads at the top, and at intervals not to exceed three floors.*

3712 EXIT & EMERGENCY LIGHTING SYSTEMS

3712.1 EXIT ILLUMINATION:

- (a) *Illumination of means of egress to exit doorways shall be provided for buildings and structures where artificial lighting is provided for normal use and occupancy. However, no artificial lighting for means of egress shall be required in any building that is designed solely for occupancy during daylight hours, and its use, as such, has been approved by the BCO.*
- (b) *Every exit and necessary means of egress thereto shall be illuminated to facilitate egress thereto. Such illumination shall be continuous during the time that the conditions of occupancy require*

that the means of egress be available for use. Artificial lighting shall employ electric service to such places and for the periods of time as required to maintain the illumination to the minimum foot candle value set forth as follows.

- (c) Floors and exit ways shall be illuminated at all points such as angles and intersections of corridors and passageways, stairways, landings on stairs and exit doorways, to a value of not less than one (1.0) foot candle measure 30 inches above the floor on a horizontal plane with such floor area.*
- (d) The normal lighting service for such means of egress shall be from a source of assured reasonable lighting service such as from a public utility service company or other assured reliable service.*
- (e) Artificial lighting for the lighting of exit signs and directional exit signs, may be provided by any method that will produce the desired results, subject to the approval of the BCO and the Director of Fire Services such as, an arrangement whereby the exit signs are fed from an emergency lighting panel.*
- (f) In auditoria or other assembly places where motion pictures or other projections are made by directional light, the illumination at the floors of the exit ways therefrom may be reduced during such projection periods to not less than one-fifth foot candle.*
- (g) No luminescent, fluorescent, or reflective material may be used as a substitute for any required illumination herein specified for artificial lighting or emergency light.*
- (h) No battery operated lighting device, nor any portable type lamp or lantern shall be used for primary exit egress lighting.*

3712.2 PANIC EMERGENCY LIGHTING:

- (a) Emergency standby lighting to prevent panic and injury shall be provided as set forth herein subject to the approval of the BCO or Director of Fire Services as to the suitability of the equipment used for the intended use, and its reliability to perform and its dependability to be maintained in working order at all times.*
- (b) Panic emergency lighting facilities shall be provided to maintain the specified illumination for a period of not less than one hour in the event of failure to the normal lighting service.*
- (c) Battery operated emergency lighting equipment shall use only reliable type storage batteries, nickel cadmium or lead acid types*

and provided with suitable charging equipment to recharge the batteries from complete discharge to full charge within 12 hours and with trickle rate of charge to maintain the batters at full charge during standby use. Batteries shall be provided of capacities to carry the connected loads for the period of one hour to not less than 91% of the systems voltage rating.

- (d) For Battery systems serving central emergency systems, the battery and charging equipment shall be housed in a separate room, adequately ventilated to the outdoors and kept under lock and key condition to be secured at all times against unauthorized entry; limited quantity banks of 3 or 4 batteries for generator starting, or other localized usage, may not require a separate room if approved by the B.C.O.*
- (e) The emergency lighting shall be so arranged as to provide the required illumination automatically in the event of any failure to the normal lighting system due to the failure of the main electrical service.*
- (f) Where continuous illumination depends on the changing from one source of electric power to another standby source, there shall be no delay or interruption of the lighting during the 'change over'.*

3712.3 PERMISSIBLE TYPES OF EMERGENCY LIGHTING EQUIPMENT:

- (a) Two separate electric lighting systems, with entirely independent wiring, each adequate to provide the specified egress lighting, one supplied from an outside source such as a public utility service and the other from an electric generator on the premises and driven by an independent source of power, both sources of illumination being in regular use and capable of simultaneous operation whenever the building is occupied during periods of darkness.*
- (b) Two separate electric systems, with entirely independent wiring, each adequate to provide the specified egress lighting, one supplied from an outside source such as a public utility service and the other an approved rechargeable battery system, nickel cadmium or lead acid battery type, with suitable provided charging equipment to maintain the batteries in a fully charged condition and with trickle rate of charge to maintain the battery at full charge. Such battery systems to be provided with automatic controls so that after the battery comes into use after a failure to the normal lighting service, or due to the turning off of the primary source for any exit areas, it will be shut off automatically when the electric service is restored.*
- (c) Unit devices (six volt units) with individual batteries in each and with chargers to maintain the batteries at full charge and with*

automatic means for turning on the emergency lights after each normal lighting service failure and with automatic means to turn off the emergency lights when the normal service is restored. Batteries shall be either nickel cadmium or lead acid types.

- (d) Unit devices shall be limited to not more than four lamps lighted therefrom and with a limit of two lamps allowed to be remote from the basic unit. Remote lamps shall not exceed a distance of 15 feet from the basic unit.*
- (e) Unit devices utilizing extension cords for connection into the outlets of the normal lighting service shall have extension cords limited to not over 36 inches in length and shall be wired permanently into the AC outlets. Plug in type cords will be permitted.*

3712.4 INTENSITY OF EMERGENCY ILLUMINATION FOR PANIC LIGHTING:

- (a) Emergency lighting systems, other than the unit device types utilizing flood or spot light type of distribution shall produce and maintain for a period of not less than one hour, a minimum intensity of illumination measured on a horizontal plane 30 inches from the floor as follows:*
 - (1) Five-tenths(.5) of a foot candle of light at exit doors, hallways, corridors, passageways, stairways, runways, ramps, etc., leading to the outside building exits.*
 - (2) Twenty-five hundredths(.25) of a foot candle of light at other locations requiring emergency panic lighting.*
 - (3) Fifteen-hundredths(.15) of a foot candle of light with special permission of the BCO or Director of Fire Services in motion picture theaters where arrangements have been made to continue the performance through a normal electric lighting power failure.*
 - (4) Unit storage battery devices shall be installed with the lighting fixtures thereon directed towards the exits and located so as to provide distribution of light over the areas with glare and sharp shadows kept to a minimum. The minimum allowable operating lamp load measured at the end of one hour battery operation shall be in accordance with the following:*

One-tenth(.1) watt per square foot area of Hallways,

Passageways, stairways, ramps, corridors, etc., leading to the outside building exits; and Five-hundredths(.05) watt per square foot area at all other areas requiring emergency panic lighting.

3712.5 WIRING AND OTHER REQUIREMENTS FOR PANIC EMERGENCY LIGHTING:

- (a) *Branch circuits intended to supply emergency lighting service shall be so installed to provided emergency lighting service immediately when the normal lighting service fails to any such location within the building such as stairways, hallways, ramps, passageways, corridors, etc.*
- (b) *Emergency circuit wiring shall be kept entirely independent of any and all other wiring and equipment and shall not enter into the same raceway, box, or cabinet, except in transfer switches and in Exit signs or emergency lighting fixtures supplied from two sources of electric power.*
- (c) *Wiring of all emergency lighting circuits shall have wires of proper thickness (gauge) to maintain the voltage to not more than a five-percent voltage drop measured at the battery and compared with the voltage at the most distant lamp.*
- (d) *No appliances or lamps, other than those specified as necessary for emergency lighting shall be connected into an emergency lighting circuit.*
- (e) *Emergency lighting shall include all required exit signs and their fixtures and lights specified as required for emergency lighting to allow for safe and orderly passage from the building when the normal lighting service fails.*
- (f) *Emergency lighting systems shall be so designed that the failure of any single element such as the burning out of a single lamp bulb, will not leave any place in total darkness.*

3713 AUXILIARY STAND-BY EMERGENCY SERVICE

- 3713.1 (a) *As noted under 3712.3, electric generators, driven by an independent source combustible fuel engine may be utilize for panic emergency lighting provided that both systems (consisting of the normal lighting service and the engine drive generator) are capable of being operated simultaneously whenever the building is being occupied during periods of darkness and provided the generator service is*

wired to provide service to also meet the requirements of Section 3711.5 during failure of the normal lighting service within the building as well as to the incoming service to the building and provided that the use of such generator meets the requirements of 3712.3 whereby the two wiring systems are called for independent of each other, one for normal lighting and one for emergency lighting. Generators shall comply with the following.

- (i) Generator Sets: Generator sets shall be housed in a separate masonry enclosure of two hour fire resistant construction, with a self closing door of fire resistance construction. Such room or compartment shall not be located beneath any large assembly room or corridor that leads therefrom unless ceiled over by a concrete slab of not less than four inches in thickness.*
- (ii) All fuel storage installations shall be in strict accordance with N.F.P.A. No. 30 The "Flammable and Combustible Liquids Code".*
- (iii) No reserve supply of gasoline shall be stored in the compartment of a building with the exception that a reservoir tank not exceeding one quart liquid capacity may be used to preclude delay in starting of the engine. The compartment shall not be used for storage of flammable oils or other combustible materials.*
- (iv) Proper and adequate ventilation to the outdoors shall be provided to prevent temperature rises in generators, engines, and controls in excess of manufacturers recommendations. The ambient room temperature shall not exceed 110 degrees Fahrenheit.*
- (v) Engines and generators shall be installed on solid foundations not likely to permit sagging of fuel, exhaust, or lubricating oil piping and damage to parts resulting in leakage at joints. Such foundations shall be raised at least 6 inches above the floor level.*
- (vi) Engine generators and controls shall be installed in a location that will permit of ready accessibility parts for repairs, maintenance, cleaning or replacement.*
- (vii) A strainer shall be provided in the fuel supply line through which the fuel shall pass before reaching the valve parts*

which are likely to become clogged. This strainer shall be readily accessible for cleaning.

- (viii) Gravity feed of the fuel to the carburetion or compression ignition engines shall not be permitted except that a reservoir tank as provided for 3713.1(d) may be used.*
- (ix) Combustible fuel engine generator systems when placed within the walls of the building shall be placed in a room or compartment and separated from the remainder of the building by partitions at least equivalent to an eight-inch masonry wall.*
- (x) Exhaust pipes shall be of sufficient length to withstand the service and shall be connected to the engine so that the emission of sparks, flames or gas within the building is prevented. They shall be adequately supported throughout their run to terminate outside the building at a point where the hot gases or sparks will be discharged harmlessly and not against any combustible materials, or in close proximity to fuel lines. If necessary to prevent obnoxious gases from entering into the building proper, an exhaust stack shall be installed to emit the gases above the roof of the building. An effective device shall also be provided to permit prompt removal of the exhaust condensation.*

3713.2 OCCUPANCY REQUIREMENTS:

- (a) Occupancy Types A, B and F Division 3 shall have both stand-by generator and battery powered emergency exit signs and lighting as required by the BCO and Director of Fire Services.*
- (b) Occupancy Type C shall have an emergency lighting system except where the building is not to be used at night. If the building is used at night, emergency lighting systems shall be provided at the time the occupancy is extended to night time, as approved by the BCO.*
- (c) Occupancy Types D and E shall be provided with both battery powered emergency exit lights and standby generator equipment.*
- (d) Occupancy Type F Divisions 1 and 2 shall have battery powered emergency lighting only for two floor buildings or for greater than 1000 square feet. No stand-by generator will be required unless special occupancies are incorporated which require stand-by generators, or if fire pumps, emergency elevators, or other special*

equipment is installed. Neither battery or stand-by generators, will be required for single floor shops or stores with less than 100 square feet, unless special occupancies are incorporated which require battery or stand-by generator systems. Office occupancies exceeding 2,000 square feet, and more than one floor shall have Emergency Battery operated lighting systems, unless special occupancies require stand-by generator systems.

- (e) *Occupancy Type G - All buildings of four or more storeys shall have emergency power generation systems installed that comply with the Canadian Electrical Code Part I and with the following:-*
- (1)
 - (i) *Such systems shall be equipped with suitable means for automatically starting the generator-set upon failure of the normal electrical service and for automatic transfer and operation of all required electrical functions at full power within 60 seconds of such normal service failure.*
 - (ii) *Two independently operated transfer switches shall be provided; one for the fire pump and the other for elevators, emergency lighting and required mechanical ventilation.*
 - (iii) *Transfer switches shall provide approved means to manually transfer from emergency to normal operation.*
 - (2) *An on-premises fuel supply sufficient for not less than 24 hours full-demand operation of the system shall be provided.*
 - (3) *All power, lighting, signal and communication facilities provided in this Chapter and in Chapters 28 and 46 of this Code shall be transferable to the emergency power system. The single station smoke detectors in hotel bedrooms need not be transferable to the emergency power system.*
 - (4) *The power requirements shall be determined so as to provide service to, but not limited to, the following:*
 - (i) *Fire Alarm System*
 - (ii) *Exit and Emergency lighting*
 - (iii) *Fire Protective Equipment*

- (iv) Required Mechanical Ventilation*
- (v) Fire Department Use Elevators*
- (vi) Water flow indicators and supervisory switches*
- (vii) Fire Pump*
- (viii) Voice Communication System (where applicable)*

(5) Emergency power generating equipment, including transfer switches, and fire pump operation shall be inspected semi-annually at full connected load under the direction and supervision of qualified personnel and approved written records of the inspections shall be maintained.

(6) All buildings of Group G Occupancy of three stories or less where smoke detectors are required, other than those in bedrooms, shall have a battery back-up operated Fire alarm panel. All smoke detectors, other than those in bedrooms, and all manual alarms shall be connected to that panel. The capacity of such panel shall be at least six hours.

All required emergency lighting may be battery operated.

- (f) Occupancy Type H does not require battery back-up or standby generator systems.*
- (h) Occupancy Type I shall have systems as required by the BCO.*

CHAPTER 38

HEAT-PRODUCING APPARATUS

- 3801 GENERAL
- 3802 GAS-BURNING APPLIANCES
- 3803 OIL-BURNING APPLIANCES
- 3804 FRESH-AIR SUPPLY
- 3805 SPACE HEATERS
- 3806 RANGES
- 3807 GAS WATER HEATERS
- 3808 BOILERS
- 3809 INCINERATORS
- 3810 SOLAR HEATERS
- 3811 BUILDING EXITS

3801 GENERAL

- 3801.1 SCOPE: Heat-producing appliances and apparatus, other than electrical appliances, shall conform to the requirements of this Chapter and Act No. 13 of 1967.
- 3801.2 STANDARDS: The following standards are hereby adopted to supplement, but not supercede, requirements set forth here-in:
 - (a) The National Fire Protection Association pamphlets: —
 - No. 31 “Standards for the Installation of Oil Burning Equipment”.
 - No. 54 “Standards for the Installation of Gas Piping and Gas Appliances in Buildings”.
 - No. 58 “Standards for the Storage and Handling of Liquefied Petroleum Gases”.
 - No. 59 “Standards for the Storage and Handling of Liquefied Petroleum Gas at Utility Plants”.
 - No. 89M “Standards for Clearances for Heat Producing Appliances”.

- (b) The American Standards Association, "Code for Pressure Piping" ASA B 31.1."
- 3801.3 APPROVALS: All heat-producing appliances and accessories, other than domestic gas appliances, installed or offered for sale within the jurisdiction of this code shall be inspected, tested and listed as defined in the Act and Rules.
- 3801.4 SLEEPING ROOMS: There shall be no exposed or open flame heating apparatus in bedrooms and rooms normally used for sleeping.
- 3801.5 GARAGES: Appliances may be installed on the floor of a residential garage provided a door or the garage opens to an adjacent ground or driveway level that is at or below the level of the garage floor. Where this condition does not exist, appliances shall be installed not less than 18 inches above the floor.
- 3801.6 TYPE OF FUEL: No appliance shall be converted from the fuel specified on the rating plate for use with a different fuel without consulting the manufacturer's instruction and /or securing approval of the fuel supplier.
- 3801.7 INSTALLATION: The installation of heat producing appliances, whether or not specifically mentioned in thus Chapter shall conform to the conditions of approval as specified in the manufacturer's instructions attached to the appliance. All heat producing apparatus shall, where applicable, be securely anchored to prevent overturning. All such apparatus shall be corrosion resistant.
- 3801.8 LABELLING: Every heating device delivered and installed as a manufactured article shall bear a permanent and legible nameplate on which shall appear the following descriptive data where applicable. Such plate or plates shall be appropriately located on the appliance, and lettered and positioned to be legible to the operator.
- (a) The manufacturer's name.
- (b) The manufacturer's rating of the appliance.
- (c) A model and serial number.
- (d) Instructions for the lighting, operation and shutdown of the appliance.
- (e) The type of fuel approved for use in the appliance.
- (f) A seal of approval to the appliance by an approved testing laboratory if acceptance is based on such approval.

- (g) Data on electric-power demand and output.

3801.9 ACCESSIBILITY: Every heat-producing appliance shall be accessible for inspection, service, repair and replacement without removing permanent construction. Sufficient room shall be available to enable the operators to observe the burner, control and pilot while starting the appliance. The operating instructions must be in a position where they can be easily read.

3801.10 SPECIAL REQUIREMENTS:

- (1) Where heat-producing apparatus is installed in locations where the occupants of the space for reasons of age or physical limitations may, in the opinion for the BCO or Chief Fire Officer, be required to be protected by additional safeguards, controls and devices shall be designed and installed to be inaccessible or inoperative to unauthorized persons and protective guards or screens installed to prevent physical contact with heated parts, Where necessary to prevent injury. Steam, hot water or other hot lines shall be insulated.

3802 GAS-BURNING APPLIANCES:

(1) GENERAL:

- (a) Gas-burning appliances shall comply with the requirements of *Act No. 14 of 1988*.
- (b) All domestic gas appliances, devices or accessories, offered for sale or installed shall bear the stamp or seal of approval of the American Gas Association Laboratories or the Underwriters' Laboratories, Inc. and shall have been approved by the BCO. Domestic gas appliances, devices or accessories without the said stamp or seal of approval shall not be installed.

3803 OIL-BURNING APPLIANCES

(1) GENERAL:

- (a) Oil-burning appliances shall conform to the requirement of NFPA Code No. 31 "Installation of Oil Burning Equipment."

3804 FRESH-AIR SUPPLY:

- (1) All fuel-burning appliances shall be assured a sufficient supply of fresh air for proper fuel combustion.
- (2) VOLUME: Combustion air shall be supplied or provided at the rate of 8 Cubit feet per minute (CFM) per boiler horsepower plus an additional two CFM ventilation.

(3) **METHODS OF SUPPLYING FRESH AIR:** Where provisions for fresh air are required in this section, the BCO shall specify which of the following methods shall be used:

- (a) Permanent openings or ducts leading from the appliance location to the outside of the building. For gas-burning appliances, such openings or ducts shall have a total unobstructed area of not less than one square inch per 1000 British Thermal Units (BTU's) maximum-input rating of all such appliances in the space; and for space heaters the area of openings shall be a minimum of 100 square inches. For liquid fuel-burning appliances, such openings or ducts shall have a total unobstructed area of not less than one and one-half times the area required for gas-burning appliances.
- (b) Permanent openings or ducts leading from the appliance location to other interior areas which meet the minimum-required volume specified in Sub-section 3804(2), except for those other interior areas where combustible liquids are stored or noxious gases may be produced. Such openings or ducts shall be not less in size than those specified in Paragraph 3804 (3) (a).

Where openings or ducts are used, they shall consist of two or more of approximately equal area, one or more within six inches of the ceiling of the appliance enclosure, and one or more within six inches of the floor of the appliance enclosure.

3805 SPACE HEATERS:

- (1) **GENERAL:**
 - (a) Gas or oil burning space heaters shall be vented as set forth in Sections 3802 and 3803.

3806 RANGES:

- (1) **COMMERCIAL:** Stoves and ranges such as used in kitchens of restaurants, hotels, clubs and similar establishments shall be supported on floors of not less than two-hour fire resistive construction.
- (2) **DOMESTIC:** Wood ceiling, shelving or cabinets over domestic appliances, used for a single family, shall not be less than 30 inches above an appliance burning solid, liquid or gas fuel, not less than 24 inches above an electric range of hot plate.
- (3) **VENTILATION:**
 - (a) All ranges, except those for single-family use shall be provided with hoods as set forth in Chapters 39 and 40.

- (b) When range hoods and/or ducts are used for single-family residences they should be constructed of non-combustible materials tightly fitted, and when vented they shall extend to the outside of the building.
- (4) SMOKE CONNECTIONS: All ranges which use solid or liquid fuels shall be connected directly or by means of smoke-pipes to a Type A flue or vent, as set forth in Section 3803. No such connection shall be to any flue or vent to which a gas-burning appliance is connected.

3807 GAS WATER HEATERS:

- (1) LOCATION:
 - (a) The location of water heaters shall comply with the standard set forth in *Act No. 14 of 1988*.
 - (b) Water heaters which burn solid, liquid or gas fuel shall not be installed in bathrooms, bedrooms, or any occupied rooms normally kept closed. Listed water heaters shall be installed in accordance with their listing and the manufacturer's instructions. In no case shall the clearances be such that as to interfere with the requirements for combustion air, draft hood clearance and relief, and accessibility for servicing. See following table for minimum clearances for listed water heaters:

Type of Heaters	Distance from Combustible Material	
	Nearest Part of Jacket	Flat Side
Type A	6 Inches	-
Type B	2 Inches	-
Type C	-	Flush
Counter Type Unit	In accordance with manufacturer's instructions.	

Type A — Miscellaneous (including circulating tank, instantaneous uninsulated, underfired).
 Type B — Underfired, insulated, automatic storage heaters.
 Type C—Type B units with one or more flat sides and tested for installations flush to wall.
 Counter Type—Type B units specifically designed for installation in or beneath a counter.

- (2) VENTILATION:
 - (a) All enclosures for water heaters using solid, liquid or gas fuel shall be provided with an adequate system of ventilation as set forth in Chapters 39 and 40, located at or near the floor and ceiling levels; and the area of such openings shall be not less than 36 square inches, independent of doors and windows. Louvred doors will be acceptable.

- (b) All water heaters which use solid, gas or liquid fuels shall be connected, either directly or by means of smokepipes, to flues or vents, as set forth in Chapters 39 and 40.

3808 BOILERS AND UNFIRED PRESSURE VESSELS

3808.1 STANDARDS:

- (a) *The design, installation, alteration, location, operation and inspection of all boiler and pressure vessels, including boilers generating steam under pressure, unfired pressure vessels, and related piping installation for such boilers and vessels shall be as set forth herein.*
- (b) *The American Society of Mechanical Engineers(ASME International) Boiler and Pressure Vessel Code as amended prior to the publication of the Code is hereby adopted as set forth in Appendix A of this Code.*
- (c) *The ASME International code for Pressure Piping, Building Services Piping (ANSI/ASME B31.9) as set forth in Appendix A of this Code, is hereby adopted.*

3808.2 CLASSIFICATION:

- (a) *A high-pressure steam boiler is any boiler generating steam or vapor at pressures over 15 pounds-per-square-inch (psi).*
- (b) *A low-pressure steam boiler is any boiler generating steam or vapor at 15 psi or less.*
- (c) *A hot-water heating boiler operating at pressures under 160 psi and temperatures under 250 degrees F, is classified as a low-pressure boiler.*
- (d) *A hot-water heating boiler operating at pressures of 160 psi or higher and at temperatures of 250 degrees F or higher, shall be classified as a high-pressure boiler.*
- (e) *A hot-water supply boiler having a BTU rating of more than 200,000 BTU per hour or having a capacity of 120 gallons or more or operating at a temperature of more than 200 degrees F, is classified as a low-pressure boiler.*

3808.3 ENCLOSURES FOR HIGH-PRESSURE BOILERS:

- (a) *High pressure boilers shall be enclosed and separated from the rest of the building by walls, floors and ceilings of not less than 2-hour fire-resistive construction.*

- (b) *There shall be no openings in such enclosure except for doors and as required for ventilation.*
- (c) *There shall be not less than 2 doors remotely located and all doors to the inside of the building shall be a one-hour fire-resistive assembly complying with Section 3206 of this Code.*
- (d) *Clearances or boiler appurtenances shall be a minimum of 18" all around the boiler. Where a manhole opening is provided in the top of a boiler shell a minimum clearance to ceiling shall be 36".*
- (e) *Boilers of 3 HP or less generating steam at less than 100 psi may be installed without enclosures but; shall not be placed on combustible flooring; and shall comply with the standard set forth in Paragraph 3808.1(b) herein.*

3808.4 ENCLOSURES FOR LOW-PRESSURE BOILERS:

- (a) *Low pressure boilers shall be enclosed and separated from the rest of the building by walls, floors and ceiling of not less than one-hour fire-resistive construction.*
- (b) *There shall be no openings in such enclosure except doors and as required for ventilation.*
- (c) *Doors to the inside of the building shall be a one-hour fire-resistive assembly complying with Section 3206 of this Code.*
- (d) *Clearances from boiler appurtenances shall be a minimum of 18" all around the boiler. Where a manhole opening is provided in the top of the boiler shell a minimum clearance to ceiling shall be 36".*
- (e) *Boilers of 3 HP or less generating steam at less than 100 psi may be installed without enclosures; shall not be placed on combustible flooring; and shall comply with the standard set forth in Paragraph 3808.1(b) herein.*

3808.5 DETAILED REGULATIONS:

- (a) *High pressure steam boilers may be blown off only to a blow-off tank complying with the requirements of the pamphlet entitled, "Blower Blow-Off Equipment" NBBPVI, as set forth in Appendix A of this Code.*
- (b) *Boilers shall be connected to an approved flue or vent where required and as set forth in this Chapter.*
- (c) *Combustion air shall be supplied or provided as the rate of 8 cubic*

feet per minute (CFM) per boiler horsepower (hp) plus an additional 2 CFM per hp per minute of ventilation.

- (d) *Any person manufacturing or dealing in the sale of boilers or pressure vessels shall, on sale or delivery of such apparatus, notify the Buildings Control Officer, giving the name and address of the purchaser.*
- (e) *Second-hand or used boilers and pressure vessels shall be inspected by an agency approved by the Buildings Control Officer and a certificate shall be applied for and approved by the Buildings Control Officer before such apparatus is painted or offered for sale.*

3808.6 CERTIFICATE OF INSPECTIONS:

- (a) *A Certificate of Inspection shall be required, stating the maximum allowable approved pressures, and shall be conspicuously posted.*
- (b) *The Certificate of Inspection for a steam boiler operating in excess of 15 pounds per square inch, or for a boiler not having an unassisted gravity return, or for a pressure vessel operating in excess of 60 pounds per square inch and having a volume in excess of five cubic feet, shall be for a fixed period not exceeding six months. Semi-annual inspection and compliance with this code for renewal of the Certificate of Inspection shall be required.*
- (c) *The BCO shall require tests for new installations and for the annual inspection, as well as at any time as is, in his opinion, necessary in the interest of safety. The proposed installation of boilers of any size and pressure shall be considered to be a special case and special installation requirements may be required.*

3809 INCINERATORS:

- (1) GENERAL: Incinerators for the reduction of refuse, garbage, or other waste materials shall not be permitted where, in the opinion of the Minister of Health, BCO, or Chief Fire Officer, a nuisance or fire hazard may result. Incinerators, where permitted, shall be located as required by the Minister of Health.

3810 SOLAR HEATERS:

- (1) It is recommended that provision be made during the construction of new buildings for the installation, or eventual installation, of solar heating.
- (2) Solar tanks, coils and systems shall be as set forth herein and in Chapter 36, Plumbing.

- (3) Coil boxes shall be made of not less than 24-gage, corrosion resistant metal, securely constructed, supported and anchored. Anchorage to sloping roofs shall be by bolting through the roof to the supporting members of rafters; and standard anchorage to wood-raftered roofs shall be by means of a 7/16-inch J-bolt through the frame of the coil box and under the rafter, for each four square feet of coil box, but not less than four bolts. Anchorage for coil boxes, where the slope is different from that of the roof, shall be through back braces of 1 1/4" x 1 1/4" x 1/8" steel angle iron, spaced not more than four feet apart and bolted with not less than 7/16-inch bolts to the coil box and roof. Pitch pans shall be provided at roof anchor points where through bolts penetrate roofing felts.
- (4) Tanks for solar heaters shall be of corrosion-resistant metal and shall be securely supported and anchored. No single tanks shall exceed 60 gallons unless the supports are designed therefor.

Tanks shall be designed to operate under pressure not less than 100 pounds per square inch. Enclosures for tanks may be of wood, provided such wood is suitably treated for decay and water repellency. Enclosures for tanks, of wood, shall be not less in size than a 2" x 4" and sheathed with one-inch sheathing or one-half inch, exterior-grade plywood, either of which is protected by expanded wire lath and stucco; or shall be a metal frame of 1 1/4" x 1 1/4" x 1/8" steel angle iron covered with expanded-wire lath and stucco; or shall be a cover box of .027-inch thickness of corrosion-resistant sheet metal. Tanks and enclosures shall be bolted through the roof to the supporting members with not less than four bolts, 7/16-inch in diameter.

3811 BUILDING EXITS:

No boilers, furnaces or direct fired equipment shall be installed in building exits.

NOTES

CHAPTER 39

SPECIAL HAZARDS

3901 TRANSFORMER VAULTS

3902 FLAMMABLE AND COMBUSTIBLE LIQUIDS

3903 VENTILATING DUCTS

3904 FILM

3905 EXPLOSIVES

3906 AIR CONTAMINANTS

3907 RADIATION PROTECTION

3908 PAINT SPRAY BOOTHS AND DIP TANKS

3909 RESTAURANT HOODS, AUTOMATIC FIRE EXTINGUISHER SYSTEMS

3901 TRANSFORMER VAULTS

3901.1 STANDARDS: Sub-Section 26-150 through 216-164 “Electrical Equipment Vaults” of the Canadian Electrical Code, Part I herein supplements, but does not supersede, the requirements set forth herein for transformer vaults. Transformer vaults will normally be designed by The Bahamas Electricity Corporation in consultation with the Architect or the Engineer.

3901.2 LOCATION: Wherever such arrangement is practicable, transformer vaults shall be at or near the point of entrance of the service conductors to the building, ventilated to the outside air without the use of ducts and with unimpeded access and egress directly to and from the exterior at all times.

3901.3 CONSTRUCTION:

(a) Transformers vaults shall be constructed in accordance with the following:

- (1) Required Thickness of Walls—Transformers Vaults: All transformer vaults shall be 6 inch reinforced concrete, 8 inch solid masonry or 12 inch hollow-unit masonry.

Transformer-vault floors on the ground shall be of reinforced concrete, not less than 6 inches thick. Floors with open spaces below, and ceilings, shall be of reinforced concrete not less than six inches thick. Vault walls of hollow-unit masonry shall have a stuccoed surfacing not less than ‘three fourths’ inch in thickness on the inside. All openings in walls, floors or

ceilings shall be protected by approved fire doors or wire-glass windows, with a two (2) hour rating, except that the ventilating openings to the exterior of the building may be provided with corrosion-resistant, non-combustible louvers.

- (b) A sill of sufficient height to confine within the vault one-third more oil than the capacity of the largest transformer, but not less than four inches high, shall be provided across all doors.
- (c) Entrance doors shall be provided with a hasp for padlocking and shall be kept locked, with access available only to authorized persons.
- (d) Where transformer vaults are installed within the confines of a building, the access door shall have a two (2) hour rating. Where the door is used for ventilation, the ventilation openings shall have an automatic means of tight closure, such as approved dampers, or other devices as may be approved by the BCO.
- (e) *As set forth in Section 3702 of this Code, transformer vaults shall not be sprinklered by an automatic-sprinkler system.*

3901.4 DRAINAGE: *A transformer vault, located below ground water level or which, for other reasons, may be subject to flooding or water infiltration, shall be provided with an adequate system of drains and/or automatic ejectors. Floors of above-grade vaults shall slope to a minimum 24" x 24" x 10" deep sump which shall be provided with a pressure-lock type cover installed flush with the vault floor. Such sump shall be located in accordance with the requirements of the Bahamas Electricity Corporation, constructed of concrete of same thickness as the vault floor, and shall be provided with a minimum 2" diameter pump-out pipe extending out of the sump and terminating outside the vault wall. The pipe shall be provided with a strainer at the sump terminus, and a 2" threaded cap with a chain at the pump-out terminus. All vault-drainage installations shall be subject to the approval of the Minister responsible for the Bahamas Electricity Corporation.*

3901.5 VENTILATION:

- (a) Vaults shall be so designed that there shall be adequate air space around all equipment to allow for heat dissipation and personnel access. This space shall not be less than six inches between any heat source and a wall and not less than twelve inches between adjacent heat sources, for heat dissipation only.
- (b) The location and dimensions of ventilation openings in transformer vaults shall be such as to prevent an air temperature rise in excess

of 15°F based on the total full load losses of installed transformers and having due regard to the possibility of transformer capacity increase in the future.

- (c) Ventilation openings shall be located as far as practicable from adjacent doors, windows, exit facilities and combustible materials. Such openings shall be covered with suitable grates, screens or louvres, constructed of corrosion-resistant, non-combustible materials.
- (d) Where mechanical ventilation is proposed the quantity of air flow shall be designed for a 15°F temperature rise, and the ventilation system shall include automatic firestat cut-out, air inlet filters, and special approval from the BCO is required. No aluminum ducts may be used. Automatic fire dampers shall be installed where ducts penetrate vault walls. Guillotine type dampers shall be adequately screened to protect personnel if damper operates.

3901.6 SPECIAL RESTRICTIONS: No pipes for sanitary plumbing, water or gas supply or for any other purposes foreign to the vault installation shall pass through or under a transformer vault. No toilets or wash basins shall be installed in the vault. Any conduit or piping required in connection with sump pumps or similar necessary equipment shall be insulated electrically from the exterior of the vault. Vaults shall not be used for storage, nor for any other purpose than to contain and protect the transformers and the necessary equipment incident thereto.

3902 FLAMMABLE AND COMBUSTIBLE LIQUIDS

3902.1 *STANDARDS: The Flammable and Combustible Liquids Code, National Fire Protection Association (NFPA) 30, and the Standard for the Installation of Oil Burning Equipment, NFPA 31, are hereby adopted, as set forth in Appendix A.*

3902.2 SCOPE: These provisions shall apply to new buildings, equipment and installations and to existing buildings, equipment and installations which constitute a hazard.

3902.3 CLASSIFICATION:

- (a) FLAMMABLE LIQUID: — means a liquid having a flash point below 100°F (37.8°C) and having a vapour pressure not exceeding 40 pounds per square inch (absolute) at 100°F shall be known as a Class I liquid.

Class I Liquids shall be further subdivided as follows:

Class I A shall include those having flash points below 73°F (22.8°C) and having a boiling point below 100°F (37.8°C).

Class I B shall include those having flash points below 73°F (22.8°C) and having a boiling point at or above 100°F (37.8°C).

Class I C shall include those having flash points at or above 73°F (22.8°C) and below 100°F (37.8°C).

- (b) **COMBUSTIBLE LIQUID:** — means a liquid having a flash point at or above 100°F (37.8°C).

Combustible liquids shall be further subdivided as follows: —

Class II liquids shall include those having flash points at or above 100°F (37.8°C) and below 140°F (60°C).

Class III A liquids shall include those having flash points at or above 140°F (60°C) and below 200°F (93.4°C).

Class III B liquids shall include those having flash points at or above 200°F (93.4°C).

- (c) This Code does not cover Class III B liquids. Therefore where the term combustible liquids is used, it shall mean Class II and III A liquids, similarly the use of the term Class III liquids shall mean Class III A only.
- (d) Any manufactured liquid or fluid commodity, such as paint, varnish, dry-cleaning, cleaning solution and polishing liquid, which contains flammable liquids, shall be considered a flammable liquid and shall be classified according to the flash point of the mixture.

3902.4 **DETAILED REGULATIONS:**

- (a) No Class I, II or III liquids shall be stored in glass containers, except containers approved by (ICC) regulations.
- (b) No Class I or Class II liquids shall be kept or stored in any building of Public Assembly occupancy nor in School occupancies except in laboratories for experimental purposes.
- (c) Except in sealed containers, no Class I or II liquids shall be stored within ten feet of any stairway or other path of egress unless separated therefrom by a four-hour fire-resistive wall or partition.
- (d) In buildings of other than residential occupancy, there shall be not

less than two remote paths of egress from the point of storage or use of Class I or II flammable liquids; except that a single exit from a room may be permitted where the travel distance does not exceed 15 feet.

- (e) Flammable liquid for agriculture use (at the point of use) shall be exempted from the requirements of this Section, subject to the approval of the BCO based on location and hazard.
- (f) Fuel-oil tanks shall not be located in garages attached to buildings of Residential occupancies, or on the roof of any building.
- (g) Containers of Class I or Class II liquids shall not be filled, or used to fill other containers or appliances, unless outside of the building. Containers of Class III liquids of over five-gallon capacity shall not be filled, or used to fill other containers and appliances, unless outside of the building.
- (h) All containers of Class I or Class II liquids shall be properly labelled and conspicuously marked or painted, as set forth in the standards, subsection 3902.1, to indicate danger.
- (i) In all rooms or parts of buildings which contain flammable liquids in open containers or in which the vapours from flammable liquids are present, or in which flammable liquids are used in any manufacturing process; open flame, sparks or smoking shall be prohibited. Suitable "NO SMOKING" signs shall be displayed.
- (j) Flammable liquids shall not be stored, drawn or handled in the presence of open flame or fire, nor shall they be stored, drawn or handled in garages and utility rooms of Residential Occupancies which contain heat producing appliances or other sources of ignition. Where the storage, drawing or handling of flammable liquids is permitted under this Code and other appropriate laws, lighting shall be by explosion-proof incandescent lamps.
- (k) Pumps for dispensing gasoline to the tanks of operating equipment shall not be located inside of buildings or sheds that are more than 50 percent enclosed with walls, and such pumps shall be not less than 15 feet from property lines and not less than ten feet from any building opening.
- (l) Underground tanks shall be protected from damage caused by above-grade or lateral loads, shall be placed on a firm and well-tamped earth foundation and, where necessary to prevent flotation, shall be securely anchored and weighed.

(m) (1) **LOCATION AND ARRANGEMENT OF VENTS FOR CLASS I LIQUIDS:** *Vent pipes from underground storage tanks storing Class I liquids shall be so located that the discharge point is outside of buildings, higher than the fill pipe opening, and not less than 12'-0" above the adjacent ground level. Vent pipes shall not be obstructed by devices provided for vapor recovery or other purposes unless the tank and associated piping and equipment are otherwise protected to limit back-pressure development of less than the maximum working pressure of the tank and equipment by the provision of pressure-vacuum vents, rupture discs or other tank venting devices installed in the tank vent lines. Vent outlets and devices shall be protected to minimize the possibility of blockage from weather, dirt, or insect nests, and shall be so located and directed that flammable vapors will not accumulate or travel to an unsafe location, enter building openings, or be trapped under eaves. Tanks containing Class IA liquids shall be equipped with pressure and vacuum venting devices which shall be normally closed except when venting under pressure or vacuum conditions. Tanks storing Class IB or Class IC liquids shall be equipped with pressure-vacuum vents or with listed flame arrestors. Tanks storing gasoline are exempt from the requirements for pressure and vacuum venting devices, except as required to prevent excessive back pressure, or flame arrestors, provided the vent does not exceed 3" nominal inside diameter.*

(2) **LOCATION AND ARRANGEMENT OF VENTS FOR CLASS II OR CLASS IIIA LIQUIDS:** *Vent pipes from tanks storing Class II or Class IIIA liquids shall terminate outside of building and higher than the fill pipe opening. Vent outlets shall be not less than 6" above normal ground level. They may be fitted with return bends, coarse screens or other devices to minimize ingress of foreign material.*

Vent pipes shall be laid as to drain toward the tank without sags or traps in which liquid can collect. They shall be located so that they will not be subjected to physical damage. The tank end of the vent pipe shall enter the tank through the top.

(n) *Underground storage tanks shall be filled only through fill spouts, terminating outside of buildings at a point at least five feet from any building opening at the same, or at a lower level. Fill terminals shall be closed tight when not in use. Fill terminals shall be identified and at a location free from any source of ignition.*

- (o) *Underground tanks temporarily out of service for a period not exceeding 90 days shall immediately have the fill line, gage openings and pump suction capped and secured against tampering. The vent lines shall be left open. Underground tanks out of service for a period of 90 days to one year shall be removed or filled with sand or water or other non-combustible material. Underground tanks out of service for more than one year shall be considered permanently abandoned and shall be removed or filled with sand. The responsibility for such protective measures shall be that of the owner of the property.*

- (p) *Underground tanks installed in soil known to be unusually corrosive due to the conditions hereinafter set forth shall be protected from corrosion based on evaluation and design by an Engineer recognized by the Minister:*
 - (1) *Low soil resistivity to current flow.*
 - (2) *Very acid or very alkali soil.*
 - (3) *Excessive anaerobic bacteria.*
 - (4) *High water table.*
 - (5) *Backfill and land fill areas with high organic content.*
 - (6) *Location near water front areas.*
 - (7) *Any condition known to cause an abnormal breakdown of standard metal or non-metal underground tanks.*

3903 VENTILATION & EXHAUST DUCTS

3903.1 STANDARDS: The following “Standards” of the National Fire Protection Association (NFPA) are hereby adopted as part of this code to supplement, but not supercede the requirements set forth herein: —

No. 90A For the Installation of ‘Air Conditioning’ and Ventilating Systems (Non-Residential),

No. 90B For the Installation of Residential Warm Air Heating and Air Conditioning Systems,

No. 96 For Ventilation of Restaurant Cooking Equipment;

No. 91 For the Installation of Blower and Exhaust Systems for Dust Stock and Vapour Removal,

No. 644 Code for the Prevention of Dust Explosions in Wood Working and Wood Floor Manufacturing Plants,

The following standards of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA),

- (i) Fibrous Glass Duct Construction Standard 15d. Fifth Edition, and*
- (ii) The HVAC Duct Construction Standard, Metal and Flexible; and*
- (iii) The Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems*

are hereby adopted as part of this Code to supplement, but not to supercede the requirements set forth herein.

3903.2 GENERAL:

- (a) All air ducts shall be constructed in accordance with the Standards in Paragraph 4102.1.*
- (b) In attic fan installations used to ventilate living areas through the attic, a firestat shall be installed to shut off the fan and a fusible link installed to close the opening. Attic fans used solely to ventilate the attic space shall be exempt from this requirement.*
- (c) Ducts shall be tight throughout, with no openings except those essential to the required functioning of the system. Ducts shall be substantially braced or supported by metal hangers, brackets or their equivalents from substantial structural members. No combustible materials shall be used for hangers, supports or bracing.
- (d) Ducts shall not pass through fire walls unless unavoidable, and, in such cases, approved, automatic fire doors or shutters shall be provided.
- (e) All ventilating ducts shall be extended, continuous, to the exterior of the building, or to an accepted location approved by the BCO.
- (f) Ducts shall be constructed of metal or other non-combustible materials to provide structural strength and durability at least equal to the requirements set forth in NFPA Code 90A.

3903.3 HOODS OVER RESTAURANT EQUIPMENT:

- (a) HOODS REQUIRED: Restaurant-type ranges, candy kettles and appliances for the frying of bakery or confectionery products shall be provided with ventilating hoods and ducts to take off the smoke gases and vapours, unless such appliances are enclosed and vented in an approved manner.

EXCEPTIONS:

- (1) Hoods shall not be required in kitchens having natural light and ventilation to the outside used solely for the preparation of food for one family.
- (2) Hoods to carry off heat only from kitchen units such as dish-washers, coffee urns and water heaters, and where grease is not anticipated, may be exempt from the provisions of this sub-section.
- (b) LOCATION: Such hoods shall not be raised more than seven feet from the floor. The length and width of kitchen hoods shall extend a minimum of 12 inches beyond the appliance over which they are installed. Where space conditions permit, range hoods shall be not less than two feet high to provide a reservoir to confine momentary bursts of smoke and steam until the exhaust system can evacuate the hood. Range hoods shall be located as low as possible to increase their effectiveness. Exhaust connections to range hoods shall be made at the top and/or back of the hoods.
- (c) GAS - APPLIANCE VENTS: Vents of gas-burning cooking appliances other than ovens shall extend through or beyond the grease screen or filter and shall be further regulated as set forth in Chapter 38, and Act No. 13 of 1967.
- (d) HOOD DESIGN:
- (1) Hoods over kitchen-cooking equipment shall be constructed of non-combustible materials, with tight joints and having a clearance of at least 18 inches from all unprotected combustible material.
- (2) Duct systems shall create a conveying air velocity in the exhaust system of not less than 1,500 feet per minute and not more than 2,200 feet per minute. The average air velocity across the face of any hood in the exhaust system shall be not less than 100 feet per minute.
- (3) Range or grease filters or equally-effective grease traps shall be installed in all commercial-use installations and shall be

of non-combustible construction, proportioned not to decrease the air velocity in the duct along the limit set forth in Paragraph 3903.3 (d) (2). Grease filter efficiency shall be a minimum of 98%.

- (4) In range hoods where mechanical draft is used, a suitable safety control shall be installed.
- (e) DUCTS:
- (1) Ducts from hoods shall be constructed of 20 U.S. standard gauge or heavier sheet metal, with tight joints and separated at least 18 inches from all unprotected combustible material. Inside laps in duct joints shall project in a direction against the air flow.
 - (2) Ducts shall lead as directly as possible to outside.
 - (3) The ducts shall constitute an independent system in no manner connected with any other ventilating system.
 - (4) Access for inspection and cleaning purposes, equipped with tight fitting sliding or swinging doors and latches, shall be provided in horizontal sections of exhaust ducts. Such openings should be at the side of the horizontal run in order to prevent dripping of residue. Spacing of such openings shall not exceed 20 feet.
 - (5) Vertical risers located outside of buildings shall be adequately supported by the exterior walls. Risers located inside of buildings shall be enclosed in a shaft of fire-resistive material, as set forth herein.
 - (6) At the base of each vertical riser, a residue trap shall be provided, with provisions for cleanout.
 - (7) Exhaust ducts shall not pass through firewalls. Where ducts pass through partitions of combustible construction, the clearance shall be 18 inches unless insulated to provide at least one-hour fire-resistive protection; in which case, the clearance may be reduced to three inches.
- (f) FIRE EXTINGUISHING SYSTEM REQUIRED: All commercial hoods shall be protected by automatic fire extinguishing systems in accordance with the requirements of Chapter 37, "FIRE PROTECTION AND EMERGENCY LIGHTING SYSTEMS," Section 3702, and Sections 3903 and 4005.

- 3903.4 HOODS AND VENTILATING DUCTS OVER DOMESTIC RANGES: Hoods and ventilating ducts over domestic ranges shall be as set forth in Sub-section 3806.3.
- 3903.5 EXHAUST SYSTEMS FOR FLAMMABLE VAPOURS: Exhaust systems for flammable vapours shall be as set forth in the "Standards for Blowers and Exhaust Systems for Dust, Stock and Vapour Removal," NFPA Code No. 91 of the National Fire Protection Association. Where fans are used in connection with the exhausting of flammable vapours protective devices shall be installed to stop the operation of the fan in event of fire.

3904 FILM

The storage and handling of cellulose nitrate motion-picture film shall conform to the "Standards of Storage and Handling of Cellulose Nitrate Motion Picture Film," NFPA Code No. 40 of the National Fire Protection Association, except that the provision of this section does not apply to the following:

- (a) Films for amateur photographic use in original packages of "roll" and "film pack" films in quantities of less than 50 cubic feet.
- (b) Safety film (cellulose—acetate base).
- (c) Dental X-ray film.
- (d) Films stored or being used in standard motion-picture booths.

3905 EXPLOSIVES

The transportation, handling and use of explosives shall comply with the requirements of the Explosives Act 1968 and the rules made there-under.

3906 AIR CONTAMINANTS

Air contaminants shall be subject to the requirements, and regulations of the Minister of Health.

3907 RADIATION PROTECTION

Radiation apparatus and devices for medical or industrial uses shall comply with the recommendations of the Minister of Health.

3908 PAINT SPRAY BOOTHS AND DIP TANKS

- 3908.1 SCOPE: The application of flammable or combustible paint, varnish, lacquer, stain or other flammable or combustible liquid applied as a spray in continuous or intermittent processes; and dip tank operations in which articles or materials are passed through contents of tanks, vat or containers of flammable or combustible liquids, including coating, finishing, treating and similar processes shall comply with the requirements of this section.
- 3908.2 PAINT SPRAY BOOTHS:
- (a) WHERE REQUIRED:
 - (1) Paint spraying, spray finishing, or dipping operations shall not be conducted in a Group A, B, C, G or H Occupancy except in a room complying with the standards as set forth herein, and protected with an approved system of automatic sprinklers, of a type approved by the BCO and the Chief Fire Officer and separated vertically and horizontally from other areas by construction having not less than 2 hours fire resistance.
 - (2) In buildings of Group D, E and F Occupancy where spraying apparatus is used repeatedly, such operations shall be conducted in spray booths or spray areas constructed as set forth herein.
 - (3) Spraying operations shall be confined to the smallest practicable space commensurate with the operation.
 - (4) Where quantity of spraying or dipping materials used in a day does not exceed 2 quarts and the total amount of materials stored does not exceed 20 gallons, the BCO and/or the Chief Fire Officer may waive or vary these requirements subject to the consideration of safety.
 - (b) STANDARDS: Paint spraying and spray finishing shall comply with the standard, "Spray Finishing" NFPA Code No. 33 of the National Fire Protection Association which is hereby adopted to supplement, but not supersede the requirements set forth herein.
- 3908.3 DIP TANKS: Dip tank operations shall conform to the Standard "Dip Tanks" NFPA Code No. 34 of the National Fire Protection Association, which is hereby adopted to supplement but not supersede the requirements set forth herein.

3909 RESTAURANT HOODS, AUTOMATIC FIRE EXTINGUISHING SYSTEM

- 3909.1 SCOPE: All commercial cooking grease exhaust hoods, ducts, deep fat fryers, complete range top, upright broilers, griddles, and char-broilers shall be protected against fire by the installation of automatic dry chemical fire extinguishing systems. Each system shall be installed in accordance with Underwriter's Laboratories and Factory Mutual's listings and to conform to all requirements of the BCO and Chief Fire Officer.

Automatic fuel shut-off, gas and/or electric, shall be provided for all cooking appliances that are protected by the dry chemical system. Fuel shut-off shall automatically operate upon the actuation of the system.

- 3909.2 CONSTRUCTION: The system cylinder shall be of the stored pressure type of sufficient capacity, as determined by Underwriters' Laboratories' listing, to provide a high concentration of dry chemical in the plenum area/ areas and exhaust duct system. The dry chemical shall be stored in a spun metal, ICC tested cylinder, pressured with dry nitrogen at no less than 350 psi and equipped with a pressure gauge to verify operational readiness. Nozzles located in the plenum/ plenums and grease exhaust duct shall be of the spring loaded, self-closing type, capable of functioning with a heavy accumulation of grease. Nozzles for deep fat fryer and other associated cooking equipment shall be either of the self-closing type or shall be fitted with nozzle covers as supplied by the manufacturer. The entire system shall be self-purging. All splitting of Dry Chemical piping shall be by Venturi assemblies only to assure proper dry chemical distribution to each nozzle.

Persons or firms making the installation of such equipment shall be approved by the Minister.

- 3909.3 ALTERNATE SYSTEMS: Alternate systems utilizing other approved extinguishing agents may be considered for approval by the BCO and Chief Fire Officer after submission of details.

NOTES

CHAPTER 40

MECHANICAL VENTILATION

4001 SCOPE

4002 APPLICATION

4003 REQUIREMENTS BASED ON USE

4004 VENTILATING DUCTS

4005 HOODS OVER RESTAURANT EQUIPMENT

4006 EXHAUST SYSTEMS FOR FLAMMABLE VAPOURS

4007 EXHAUST SYSTEMS FOR SPECIAL HAZARDOUS STORAGE AREAS

4008 MINIMUM STANDARDS FOR PUBLIC SANITARY FACILITIES

4009 FIRE CONTROL

4001 SCOPE

4001.1 SCOPE: All portions of buildings customarily occupied by human beings shall be provided with natural ventilation by openings to the exterior as set forth in "Requirements Based on Occupancy," Chapters 5 through 13, inclusive, or by mechanical ventilation, and defined herein.

4002 APPLICATION

4002.1 APPLICATION: Mechanical ventilation shall be forced ventilation supplying outside air, as set forth in this chapter or shall be air conditioning as set forth in Chapter 41. Required forced ventilation supplying outside air shall be in operation when the building or portion thereof is occupied by human beings, and each room or space shall be separately considered; except that closets and similar minor spaces connected to the properly-ventilated main rooms need not be individually ventilated. The Minister of Health may waive or vary the requirements for forced ventilation and the supply of outside air or the exhaust of noxious, hazardous or otherwise objectionable fumes or vapors, subject to the consideration of the hazards, arrangement of building components and equipment, and of special equipment for specific conditions of use. The published "Standards" of the National Fire Protection Association and the "Guide" as published by the American Society of Heating and Refrigerating and Air Conditioning Engineers, Inc., shall be accepted as standards of good practice. Standards of the National Fire Protection Association pertinent to this Chapter shall be as follows:

NFPA No. 90A—Installation of Air Conditioning and Ventilating Systems.

NFPA No. 91—Installation of Blower and Exhaust Systems.

NFPA NO. 96—Ventilation of Cooking Equipment.

NFPA NO. 101—The Code for Safety to Life from Fire in Buildings and Structures.

NFPA No. 204—Guide for Smoke and Heat Venting.

The following Standards of the sheet Metal and Air Conditioning Contractors National Association (SMACNA) are hereby adopted: -

(aa) Fibrous Glass Duct Construction Standard 15d, Fifth Edition;

(bb) The HVAC Duct Construction Standard, Metal and Flexible;

(cc) The Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems.

4003 REQUIREMENTS BASED ON USE

4003.1 Subject to the consideration of the standards of good practice as set forth in sub-section 4002, there shall be not less than one complete change of air in each occupied room or space every 30 minutes except as follows:

- (a) In buildings which include assembly uses such as theatres, auditoria, motion-picture houses, exhibition halls, skating rinks, gymnasia, bowling alleys, pool rooms, restaurants, kitchens, churches dance halls, club rooms, night clubs, meeting rooms, passenger rooms, recreation piers, and similar uses there shall be a minimum of ten cubic feet per minute of outside air per occupant but not less than one change of air every 30 minutes. If the velocity at the intake exceeds ten feet per second, the intake shall be placed not less than eight feet above the floor directly beneath.
- (b) In all buildings used for storage or handling of automobiles operating under their own power, and in all buildings where flammable liquids are used or stored, exhaust ventilation shall be provided to produce one complete change of air every ten minutes. Such exhaust ventilation shall be taken from a point at or near the floor.
- (c) In buildings or portions thereof used for dry-cleaning plants, there shall be a complete change of air every three minutes.

- (d) In public toilet rooms there shall be a complete change of air every three minutes.
- (e) In below-grade vaults and equipment rooms, unless continuous ventilation is provided, there shall be a complete change of air every three minutes during periods of human occupancy.
- (f) In paint-spray booths, woodworking shops with fixed or portable power equipment or tools exceeding a combined total of 20 HP, manufacturing places using plastics and similar hazardous locations, there shall be a complete change of air every minute.

4004 VENTILATING DUCTS

- 4004.1 (a) GENERAL: All air ducts shall be constructed entirely of metal or other approved non-combustible materials of suitably equal strength.
- (b) In attic-fan installations, a firestat shall be installed to shut off the fan and a fusible link to close the opening in lieu of the aforementioned requirements.
- (c) *Ducts shall be tight throughout, with no openings except those essential to the required functioning of the system. Ducts shall be substantially braced or supported by metal hangers, brackets or their equivalents from substantial structural members.*
- (d) Ducts shall not pass through fire walls unless unavoidable, and in such cases, approved automatic fire dampers or shutters shall be provided.
- (e) Ducts shall be constructed of metal or other non-combustible materials to provide structural strength and durability at least equal to the requirements set forth in the "Standards" referenced in Sub-section 4002.1.

4005 HOODS OVER RESTAURANT EQUIPMENT

- 4005.1 (a) HOODS REQUIRED: Restaurant-type ranges, candy kettles and appliances for the frying of bakery or confectionery products shall be provided with ventilating hoods and ducts to take off the smoke, gases and vapours. See the parallel, and supplemental requirements, stipulated in Sections 3903 and 3909 herein before.

- (1) EXCEPTIONS: Hoods shall not be required in kitchens used solely for the preparation of food for one family.
 - (2) Hoods to carry off heat only from kitchen units such as dishwashers, coffee urns and water heaters, and where grease is not anticipated, may be exempt from the provisions of this sub-section.
- (b) LOCATION: Such hoods shall not be raised more than seven feet from the floor. The length and width of kitchen hoods shall extend a minimum of 12 inches beyond the appliance over which they are installed. Where space conditions permit, range hoods shall be not less than two feet high to provide a reservoir to confine momentary bursts of smoke and steam until the exhaust system can evacuate the hood. Range hoods shall be located as low as possible to increase their effectiveness. Exhaust connections to range hoods shall be made at the top and/or back of the hoods.
- (c) GAS-APPLIANCE VENTS: Vents of gas-burning cooking appliances other than ovens shall extend through or beyond the grease screen or filter.
- (d) HOOD DESIGN:
- (1) Hoods over kitchen-cooking equipment shall be constructed of non-combustible materials, with tight joints and having a clearance of at least 18 inches from all unprotected combustible material.
 - (2) Duct systems shall create a conveying air velocity in the exhaust system of not less than 1500 feet per minute and not more than 2200 feet per minute. The average air velocity across the face of any hood in the exhaust system shall not be less than 100 feet per minute.
 - (3) Range or grease filters or equally-effective grease traps shall be installed in all commercial-use installations and shall be of non-combustible construction, proportioned not to decrease the air velocity in the duct below the limit set forth in Paragraph 3903.3 (d).
 - (4) In range hoods where mechanical draft is used, a suitable firestat shall be installed.
- (e) DUCTS:
- (1) Ducts from hoods shall be constructed of 20 U.S. standard gauge or heavier sheet metal, with tight joints and separated

at least 18 inches from all unprotected combustible material. Inside laps in duct joints shall project in a direction against the air flow.

- (2) Ducts shall lead as directly as possible to outside.
- (3) The ducts shall constitute an independent system in no manner connected with any other ventilating system.
- (4) Access, for inspection and cleaning purposes, equipped with tight-fitting sliding or swinging doors and latches, shall be provided in horizontal sections of exhaust ducts. Such openings should be at the side of the horizontal run in order to prevent dripping of residue. Spacing of such openings shall not exceed 20 feet.
- (5) Vertical risers located outside of buildings shall be adequately supported by the exterior walls. Risers located inside of buildings shall be enclosed in a shaft of fire-resistive material, extending continuously through the roof.
- (6) At the base of each vertical riser, a residue trap shall be provided with provisions for cleanout.
- (7) Exhaust ducts shall not pass through firewalls. Where ducts pass through partitions of combustible construction, the clearance shall be 18 inches unless insulated to provide at least one-hour fire-resistive protection; in which case, the clearance may be reduced to three inches.

4006 EXHAUST SYSTEMS FOR FLAMMABLE VAPOURS:

Exhaust systems for flammable vapours shall be as set forth in the "Standards for Blowers and Exhaust Systems for Dust, Stock and Vapour Removal," NFPA Pamphlet No. 91 or "Dip Tanks," No. 34. Where fans are used in connection with the exhausting of flammable vapors, protective devices shall be installed to stop the operation of the fan in event of fire.

4007 EXHAUST SYSTEMS FOR SPECIAL HAZARDOUS STORAGE AREAS:

Exhaust systems for toxic substances, explosives, radio-active materials or similar special hazard shall be subject to the special approval by the B.C.O. and Minister of Health for the particular facility.

4008 MINIMUM STANDARDS FOR PUBLIC SANITARY FACILITIES:

Minimum standards for arrangement shall conform to the specification herein and to the general requirements shown in Appendix C. All public spaces adjacent to sanitary facilities, shall be separated from the water closet compartment by an Intervening Ventilated Space similar in plan to that shown in Appendix C.

4009 FIRE CONTROL:

Where deemed necessary by the Buildings Control Officer, the exhaust portion of a ventilating system shall be fitted with a smoke detector immediately adjacent to the ventilating unit. Activation of the smoke detector shall cause the automatic shut down of the ventilation system and the sounding of the fire alarm. Provision for the re-activation of the system, or part thereof, by the Chief Fire Officer may also be required.

CHAPTER 41

AIR CONDITIONING AND REFRIGERATION

4101 GENERAL

4102 STANDARDS

4103 DETAILED REQUIREMENTS

4104 FIRE CONTROL

4101 GENERAL

- 4101.1 (a) *PURPOSE: The purpose of this Chapter is to provide certain minimum Standards, regulations and requirements for safe and adequate design, methods of construction and uses of materials in mechanical apparatus and equipment to secure the expressed intent for reasons of public safety.*
- (b) *SCOPE: All air conditioning and refrigeration equipment shall be as herein set forth and existing installations not conforming with the requirements of this Chapter shall be made to comply, when relocated, re-sized, or when altered or repaired, the cost of which exceeds 25% of the value of the existing installations.*
- 4101.2 (a) *A permit, as set forth in Chapter 3 of this Code, shall be required for the installation, alteration or major repair of any air conditioning or refrigeration system. A permit shall not be required for repairs that do not change the location, size, or capacity of a compressor, coil, or duct.*
- (b) *An application for a permit will be accepted from only qualified persons or firms.*
- (c) (1) *An application for a permit shall be accompanied by sufficient description to clearly define the proposed work and when such work is for the installation or major alteration of a system of more than 1-1/2 ton capacity or is connected to two or more separately occupied areas, application for permit shall be accompanied by plans describing that work.*
- (2) *When any of the following parameters are exceeded, plans and specification for heating, ventilation and air conditioning and refrigeration work shall be prepared by and each sheet bear the impress seal and signature of an Engineer recognised by the Minister.*

- (i) *The system exceeds a total of more than 15 tons capacity.*
- (ii) *The system's capacity is designed to accommodate 100 or more persons.*
- (iii) *The work is proposed in a structure for public assembly that exceeds 5000 sq. ft. in area.*
- (d) *Plans and specification for heating, ventilation and air conditioning and refrigeration work for any new building or addition that includes a medical, gas, steam, vacuum, toxic air filtration, Halon, fire alarm, or security alarm system shall be prepared by, and each sheet bear the impress seal and signature of an Engineer recognised by the Minister.*

4101.3 (a) INSPECTIONS AND TESTS:

- (1) *INSPECTIONS: All materials and installations covered by the Mechanical Code shall be inspected by the Buildings Control Officer to insure compliance with the requirements of this Code.*

The Contractor shall notify the Buildings Control Officer when the work is ready for test and inspection.

- (2) *FINAL INSPECTION: When the work for which a permit is issued is completed, the Builder shall request final inspection and such request shall be made before the air conditioning or refrigeration system is used and not more than 30 days after completion of the work.*
- (3) *TESTS: Before approving any Air Conditioning System or part thereof for use the Buildings Control Officer may require that such system, in whole or in part, be tested to prove its sufficiency.*
- (4) *INSPECTION: Inspections shall be requested and made at the following stages:*
 - (a) *Before concealing any portion of the system.*
 - (b) *The time of final inspection.*

4101.4 WORKMANSHIP: Air Conditioning and Refrigeration Systems shall be installed in conformance with the tolerances, quality, and methods of construction as set forth in Standards referenced in this Chapter and in Appendix A.

4102 STANDARDS

4102.1 *The following Standards, as set forth in Appendix A of this Code, are hereby adopted for this Chapter.*

- (a) *The Safety Code for Mechanical Refrigeration. ANSI/ASHRAE 15.*
- (b) *The Standard for the Installation of Air Conditioning and Ventilating Systems. NFPA 90A (See also Sections 1504 and 3206 of this Code.)*
- (c) *The Standard for the Installation of Warm Air Heating and Air Conditioning Systems. NFPA 90B.*
- (d) *The following ANSI Standards:*
 - (1) *National Fuel Gas Code. ANSI Z223.1.*
 - (2) *AMSE Code for Pressure Piping, Building Services Piping, ANSI/ASME B31.9.*
 - (3) *Code for Refrigeration Piping, ANSI/ASME B31.5.*
 - (4) *Chillers and other related, unfired pressure vessels shall comply with the applicable provisions of the ANSI/ASME Boiler and Pressure Vessel Code.*
 - (5) *Chemical Plant and Petroleum Refinery Piping, ANSI/ASME B31.3.*
- (e) *The Standard on Water-Cooling Towers, NFPA 214.*
- (f) *The following standards of the Sheet metal and Air Conditioning Contractors National Association (SMACNA):*
 - (1) *Fibrous Glass Duct Construction Standard 15d, Fifth Edition; and*
 - (2) *The HVAC Duct Construction Standard, Metal and Flexible; and*
 - (3) *The Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems.*
- (g) *The Code for Safety to Life from Fire in Buildings, NFPA 101.*

- 4102.2 (a) **MAINTENANCE RESPONSIBILITY:** *Beyond the scope of this installation standard lies the responsibility for the maintenance of equipment including air filters, motors, fire dampers and controls, and cleanliness of ducts and plenums. There shall be developed a greater awareness by owners, of the potential hazards of duct systems which do not receive periodic attention by qualified personnel.*

4103 DETAILED REQUIREMENTS

- 4103.1 (1) **WINDOW TYPE AIR CONDITIONING UNITS:** *All individual air conditioning units installed in walls or windows shall be securely anchored to the walls by approved methods. Units installed over public property, paths of egress or more than 10'-0" above grade shall be secured to the structure by bolts or screws to resist horizontal wind loads. Such units cantilevering more than 8" on the exterior of a building shall be supported by steel angle brackets secured by bolting. Bolts in masonry shall be set in lead shields or similarly rot-resistant fastenings.*

- (2) **NOISE CONTROL:** The following special requirements should apply to the control and regulation of noise nuisance from air-conditioning machinery:

- (a) All equipment, existing or hereafter installed, regardless of location, shall be maintained in good working order. Equipment so located that normal operating noises create a nuisance to adjacent owners or occupants shall be provided with sound proofing, or sound absorbing baffles, or enclosures, as approved, to insure maintenance of a reasonable noise level.
- (b) All equipment on outer walls, on roofs, or in other exposed locations, which are unduly noisy, and which cause valid complaints from adjoining property owners or occupants, may be required to be relocated, redesigned and/or enclosed in noise retarding materials when, in the opinion of the B.C.O. and Minister of Health, such enclosure is necessary or would be effective.
- (c) Special consideration shall be given to the planning of all future installations to minimize the noise nuisance to adjoining property owners or occupants, and the B.C.O. and Minister of Health shall have authority to reject or require the re-design, of any system which, in his opinion, would cause such a noise nuisance.

- (3) WASTE WATER: Special consideration shall be given to the disposal of waste and over flow water, and means of disposal shall be subject to approval of the B.C.O. and Minister of Health.
- (4) MAINTENANCE OF SYSTEMS: All refrigerating systems shall be maintained by the user in a clean condition free from accumulation of oily dirt, waste, and other debris, and shall be kept readily accessible at all times.
- (5) SIGNS REQUIRED:
 - (a) Each refrigerating system shall be provided with a legible and securely attached permanent sign indicating thereon the names and addresses of the manufacturer and installer, the kind and total number of pounds of refrigerant required in the system for normal operations, and the refrigerant leak field test pressure applied.
 - (b) It shall be the duty of the person in charge of the premises on which a refrigerating system containing more than 50 pounds of refrigerant is installed, to maintain a conspicuously posted card as near as practicable to the refrigerant compressor giving directions for the operation of the system, including preparations to be observed in case of a breakdown or leak as follows:
 - (1) Instructions for shutting down the systems in case of an emergency.
 - (2) The name address, and day and night telephone numbers for obtaining service.
- (6) LOCATION AND ACCESS:
 - (a) All air-conditioning and /or refrigerating equipment shall be located to be readily accessible for inspection or repair. To be accessible, such equipment shall have reasonable and adequate work room on all sides and above with all parts capable to being readily reached.
 - (b) No corridor, stair enclosure, passageway or other path of egress in a building, any part of which is normally used for sleeping purposes, shall be used for the supply or return of air, nor shall any air-conditioning or refrigeration equipment be installed therein.
 - (c) No attic, basement or concealed space in a building shall be used as an integral part of a duct system, unless it conforms to all the requirements for ducts.

4103.1 (7) OUTSIDE AIR SUPPLY:

- (a) All air conditioning or mechanically refrigerated spaces normally occupied by persons shall be provided with outside air in accordance with ASHRAE Standards.*

EXCEPTIONS:

- (1) Outside air shall not be required where a unit or units serve Group H Occupancy.*
- (2) Outside air shall not be required for single-family units of Group G Occupancy where each such single-family unit is served by a closed system for that unit only, the unit has not less than 2 exterior walls and complies with Section 1105 of this Code.*
- (b) The point of air intake shall be separated from any vent terminal of a sanitary plumbing system in accordance with Paragraph 3610.1(e) of this Code.*
- (8) DUCTS:** *All ducts used shall comply with the requirements in Sections 3903 of this Code and 4102 hereinabove.*
- (9) COOLING TOWERS:**
- (a) The Standard for Water Cooling Towers, NFPA 214, as set forth in Appendix "A" of this Code, is hereby adopted.*
- (b) Induced draft cooling towers of combustible construction, the main structure of which has a volume of greater than 2000 CF shall be protected with automatic sprinklers as set forth in NFPA 214.*
- (10) NON-METALLIC PIPING SYSTEMS:**
- (a) Prefabricated insulated non-metallic piping systems shall be approved for exterior underground use and shall terminate at a point inside and within 12" of the exterior mass and above the lowest building level, but in no case shall there be more than 5'-0" of this piping material within the building.*
- (b) Drawings for approval of such systems shall include all necessary calculations required to properly size and locate all thrust blocks, anchor points, expansion loops or joints, and all pertinent data that may be required.*
- (c) Underground piping shall have a minimum cover of 12" of backfill.*

- (d) *All water service piping shall have a minimum working pressure of 160 psi with permanent identification markings.*
- (e) *All prefabrication insulated non-metallic piping systems shall be installed as recommended by the manufacturer and/or the Plastic Pipe Institute.*

4104 FIRE CONTROL

4104.1 FIRE CONTROL: Where deemed necessary by the Buildings Control Officer a return air system shall be equipped with a smoke detector immediately adjacent to the air handling unit. Activation of the smoke detector shall cause the automatic shut down of the air conditioning system and the sounding of the fire alarm. Provision for the reactivation of the system or part thereof by the Chief Fire Officer may also be required.

4104.2 FIRE RESISTIVE RATINGS:

- (a) *Where walls and ceilings are required by this Code to be fire resistive, the ducts and other appurtenances of an air conditioning or ventilating system within or penetrating such fire resistive assemblies shall comply with Chapter 32 of this Code, or other applicable Sections of this Code and the Standards set forth in Section 4102 hereinabove.*
- (b) *Such wall and ceiling assemblies shall be constructed in accordance with the conditions of the approved fire test made with such assemblies.*
- (c) *Fire dampers shall not be required where duct systems penetrate 1-hour rated walls or partitions.*

EXCEPTION: Where fire resistance reductions for sprinklering are employed, duct penetrations of 2-hour rated walls or partitions reduced to 1-hour based on such fire resistance reductions shall require a fire damper.

- (d) *Where a building partition requires a fire damper, a smoke damper shall also be required.*

NOTES

CHAPTER 42

SWIMMING POOLS

4201 DEFINITIONS

4202 SWIMMING POOLS GENERAL

4203 SWIMMING POOL—APPLICATIONS

4204 SWIMMING POOL CONSTRUCTION

4205 SWIMMING POOL WATER QUALITY

4206 SWIMMING POOL RECIRCULATION SYSTEM REQUIREMENTS

4207 SWIMMING POOL—PIPING AND HYDRAULICS REQUIREMENTS

4208 SWIMMING POOL—FILTRATION SYSTEMS

4209 SURFACE SKIMMING FOR POOLS

4210 PIPING FOR POOLS

4211 SWIMMING POOL—EQUIPMENT ROOMS

4212 SWIMMING POOL—DIVING AREAS

4213 SWIMMING POOL LIGHTING

4214 SWIMMING POOL—DRESSING ROOMS AND SPECTATOR PROVISIONS

4215 SWIMMING POOL—SANITARY FACILITIES

4216 HOT TUBS AND SPAS

4201 DEFINITIONS

- 4201.1 (a) *“Swimming Pool” means a structure of concrete masonry or other approved material and finish, located either indoors or outdoors used or designed to be used for bathing or swimming purposes by humans, and filled with a controlled water supply, together with buildings, appurtenances and equipment used in connection therewith. All swimming pools shall conform to the requirements of the Minister of Health.*
- (b) *“Public Pool” means a swimming pool operated by a hotel, motel, apartment house, club, school, college or institution to which patrons, guests, members, students or the public are admitted with, or without payment.*
- (c) *“Private Pool” means a facility used only by an individual citizen and his family or house guests and shall not include any type of cooperative housing or joint tenancy of two or more families.*

4202 SWIMMING POOLS—GENERAL

- 4202.1 The requirements of this Chapter are for the purpose of ensuring that all swimming pools, in so far as their design, construction, operation and maintenance do not threaten or impair the life or health of the user.

4203 SWIMMING POOL—APPLICATIONS

- 4203.1 A building permit application shall be required for the construction of any swimming pool.

- 4203.2 (a) The application shall contain three sets of detailed drawings and, in the case of a public pool, isometric mechanical drawings. Electrical drawings may also be required, together with such other details and specifications as may be requested by the Minister of Health or the Buildings Control Officer, these may include tests by a recognized Testing Agency and/or engineering calculations by an engineer recognized by the Minister.
- (b) PERMITS AVAILABLE AT WORK SITE: All permits and approved drawings shall be kept at the work site and shall be exhibited on request to do so by an authorized person.
- (c) INSPECTIONS AND TESTS: All materials and installations covered by the Mechanical Code shall be inspected by the B.C.O. to insure compliance with the requirements of the Code. All matters pertaining to operation, and/or sanitary conditions shall be inspected by the Ministry of Health.
- (d) FINAL INSPECTION: When the work for which a permit is issued is completed, the permit holder shall request final inspection and such request shall be made before the pool is used and not more than 30 days after completion of the work.
- (e) TESTS: Before approving any plumbing system or addition thereto or part thereof for use, the B.C.O. may require that such system, in whole or in part, be tested to prove its sufficiency.

4204 SWIMMING POOL CONSTRUCTION

- 4204.1 Pools shall be constructed of concrete or other impervious materials with a finish adapted to the bathing demands of different areas of the pool. All side walls and the bottom surfaces in areas where the depth of water is greater than five and one-half (5 1/2) feet shall be as smooth as possible.

Bottom surfaces in areas of five and one-half (5 1/2) feet depth or less shall be smooth but have a non-slip finish. Floors and walls shall be light in colour. A suitable paint shall be used as often as necessary to maintain the walls in good condition and to facilitate cleanliness.

- (a) Shape and size — Pools shall be constructed of such shape and size as to be efficiently and safely controlled. Size shall be adapted to the anticipated bathing load. Proportioning of the deep and shallow water shall be in accordance with the anticipated uses of the swimming pool.
- (b) *Depth — Other than zero entry pools, the minimum depth of water in any public swimming pool shall be three (3) feet. The minimum depth at the deep end or deep portion of any public pool shall be six (6) feet. The depth at the slope break shall be five feet six inches except in pools fifty feet or less in length in which this depth may be reduced to five feet. The depth of water in the diving pool shall be as stipulated in Section 4212. Permanent depth markings shall be provided on both sides of the pool and on the immediate walkway surface, at the shallow end, slope break and diving depth. Such markings shall be readily visible from the inside or outside of the pool.*
- (c) Slopes — The floor slope in the shallow end of pools shall not be steeper than one foot in fifteen (15) feet. Designs incorporating steeper slopes involving possible greater hazards to bathers and hence possibly greater liability to pool owner, will be considered on the basis of one foot in twelve (12) feet for pools fifty (50) feet or less in length but greater than or equal to thirty-eight (38) feet in length and one foot in ten (10) feet for pools less than thirty eight (38) feet in length.
- (d) Steps and ladders — Steps and/or ladders shall be so located to provide adequate exit from the pool. They shall be of an easily cleaned impervious material having a nonslip finish. They shall be so designed and constructed that no water is left on them when the pool is emptied. Handrails shall be provided on all steps and shall be anchored in the bottom step and extend over the coping and anchor in the deck. Ladders shall also extend over the coping and anchor in the deck.
- (e) Walk areas — Walk areas around the pool shall be ample for bathing loads and adequately drained. The decks shall be a minimum width of four (4) feet and have a nonslip finish.
- (f) Outdoor pools: the walkway shall have a minimum pitch of three

(3) inches in ten (10) feet away from the pool or to deck drains and the pool shall be protected with a curb at least six (6) inches high and twelve (12) inches wide.

- (g) Indoor pools: the walkway may drain to the scum gutters at the same minimum pitch and no curb is required.
- (h) Overflow gutters — Overflow gutters shall be constructed of material which shall be of sufficient size to prevent normal overflow from washing back into the pool, and have the lip of the gutter uniformly level. The bottom of the gutter shall slope approximately one-half inch from the high point to the drains. The spacing between drains shall not exceed ten (10) feet for two (2) inch drains nor fifteen (15) feet for two and one-half (2 1/2)-inch drains. Either recessed type or open type gutters shall be used on outdoor pools; however, special designs may be considered. Recessed type gutters shall be not less than four (4) inches deep and four (4) inches wide, and no part of the recessed gutter shall be visible down the edge of the curb coping. Open type gutters shall be not less than six (6) inches deep and twelve (12) inches wide, and the lip of the gutter shall slope one (1) to two (2) inches towards the drains. The drain lines shall be designed to carry the overflow to waste or return the flow to the recirculation system.

4205 SWIMMING POOL WATER QUALITY

- 4205.1
- (a) The water supply for all pools shall be clean, clear, and reasonably free of objectionable minerals and physical characteristics, meeting the bacteriological requirements of the Ministry of Health for a domestic water supply. No swimming pool may be filled with public water. See Chapter 36, Plumbing.
 - (b) To avoid a cross-connection, an atmospheric break must be provided in each potable water line. Minimum break shall be six (6) inches.
 - (c) Where separate water wells are used as a source of water, the colour shall not exceed 100 and the iron content 0.3 ppm before filtration.
 - (d) Raw water not meeting these requirements shall be given approved preliminary treatment prior to its introduction to the pool.
 - (e) Bacteriological quality — A sufficient number of bacteriological water samples shall be taken each month to ascertain adequately the sanitary quality of the pool water and aid in proper control.

These samples shall be taken while the pool is in use and preferably at peak bathing load.

- (f) Chemical quality — The pool shall be maintained in an alkaline condition at all times with the pH between 7.2 and 8.0. Chemicals used in controlling algae and the quality of the water shall be those which have been specifically approved for the purpose by the Ministry of Health, after having been demonstrated as not imparting toxic or potentially toxic properties to the water.
- (g) Cleanliness — The bottom and side walls of pools shall be kept free from sediment and visible dirt by frequent brushing and vacuum cleaning. Visible scum shall be removed at least daily. Pools shall be emptied and scrubbed or painted when so required by the Ministry of Health.
- (h) Clearness — At all times when the pool is in use the water shall be sufficiently clear to permit a black disc six (6) inches in diameter on a white field, when placed on the bottom of the pool at the deepest point, to be clearly visible from the sidewalks of the pool at all distances up to ten (10) yards measured from a line drawn across the pool through side disc.

4206 SWIMMING POOL RECIRCULATION SYSTEM REQUIREMENTS

4206.1 A recirculation system, consisting of pumps, piping, filters, water conditioning and disinfection equipment and other accessory equipment shall be provided which will clarify, condition and disinfect the pool volume of water. The equipment shall be operated on a twenty-four (24) hour basis to obtain the required number of turnovers per day. The pattern of recirculation developed in the pool shall be either recirculation through the main drain or partial flow through the main drain and the remainder through the over flow gutters. A surge tank shall be provided on pressure filter systems utilizing over-the-gutter recirculation. When over-the-gutter recirculation is not used, sufficient make-up water shall be added to maintain the water level at the weir edge of the overflow gutter. Unless specifically approved by the Ministry of Health the required minimum complete turnover of the pool contents shall be in an eight-hour period.

- (a) Pumps — Pump(s) shall be of adequate size and capacity to provide the required pool turnover rate and whenever possible shall be so located as to eliminate the need for priming. If pump or suction piping is located above the overflow level of pool, the pump

shall be self-priming. The pump or pumps shall supply the recirculation rate of flow or backwash flow at a dynamic head sufficient to overcome the friction losses in the piping, appurtenances, and the maximum headloss through the filter.

- (b) Filters — Filter(s) sized to handle the required recirculation flow shall be provided. The tank on pressure filters and its integral parts shall be constructed of substantial material capable of withstanding continuous anticipated usage and shall be designed for a pressure safety factor of four (4) based on the maximum shutoff head of the pump. This shutoff head for design shall not be considered less than fifty (50) pounds per square inch.
- (c) Piping — The hydraulic considerations for the piping shall be in accordance with the requirements set forth in Section 4210.
- (d) Inlets — Adjustable inlets shall be located in conjunction with proposed method of recirculation to provide effective and uniform circulation of the incoming water throughout the pool and prevent unnecessary deadspots. The maximum spacing of inlets shall be twenty (20) feet based on the pool perimeter.
- (e) Outlets — All pools shall be provided with an outlet(s) at the deepest point to permit the pool to be emptied completely and easily. Outlets must be covered by an acceptable grating which is not readily removable by bathers. The open area of grating shall be at least four (4) times the cross-sectional area of the discharge pipe or provide sufficient area so that the maximum velocity of water passing through the openings will not exceed 1 1/2 feet per second. Multiple outlets shall be installed in pools when pool width is greater than thirty (30) feet at its widest point. Pools not designed for hydraulic uplift shall be provided with a hydrostatic relief valve if area is subject to high ground water.
- (f) Hair and lint strainer — A strainer shall be provided on the suction side of the recirculation pump if the pump takes suction directly from the pool. In such cases, the strainer shall be one full size larger than the main drain (suction) line. Secondary pumps on vacuum filter systems should be protected by a strainer sized to protect the pump adequately.
- (g) Vacuum cleaning system — A vacuum cleaning system shall be provided. When the system is an integral part of the recirculation piping; vacuum fittings shall be located to allow cleaning the pool with fifty (50) feet of hose. Portable pump operated cleaners are acceptable; however, the use of bag type cleaners which operate as ejectors on portable water supply pressure is not permitted.

- (h) Rate of flow indicators — A rate of flow indicator, reading in U.S. G.P.M., shall be installed on sand and gravel filters or filters with similar material so that the rate of recirculation and backwash rate will be indicated. On diatomaceous earth and cartridge type filters the indicator should be installed on the pool return line and indicate the recirculation rate only. The indicator shall be capable of measuring at least 1 1/2 times the design flow rate. The clearances upstream from the indicator shall comply with the manufacturers' requirements. Rate of flow controllers are recommended on pools over one hundred thousand (100,000) U.S. gallons capacity.
- (i) Heaters — Pools equipped with heaters shall have a fixed thermometer in the recirculation line at the heater outlet. Valves and piping adequate to remove the heater from the system shall be provided. All heaters shall be provided with a safety relief valve.

4207 SWIMMING POOL— PIPING AND HYDRAULIC REQUIREMENTS

- 4207.1 Piping shall be of non-toxic material, able to withstand the maximum operating pressures and designed to reduce friction loss to a minimum.
- (a) Pressure lines — The velocity in pressure piping shall not exceed ten (10) feet per second.
 - (b) Main drain or suction line — The size of the main drain line on pressure filters shall be based on a total of five (5) feet of handpipe all fittings and the hair and lint strainer. Negative elevation head shall be included in the losses; however, positive elevation head shall not be considered. The main drain shall be designed on full flow when over-the-gutter recirculation is used. Plastic pipe used on this line shall have a collapse rating in excess of the external pressures on the installed pipe.
 - (c) Gravity lines — The main drain line on vacuum or gravity filters shall be sized to obtain the required flow with the elevation head available. The collapse rating shall also be used in the design of plastic pipe for this line.
 - (d) Waste lines — Pool waste may be discharged to disposal wells, storm sewers, settling tanks for diatomaceous earth removal and dry wells. Waste lines shall be sized to handle the expected flow. There shall be no direct physical connection between the sewer system and any drain from the pool or recirculation system.
 - (e) Piping details — Engineering plans on all types of installations must include complete details of the main drain line. The pipe sizes

must be shown for all lines. Pertinent elevations shall be included on the drawings. Plastic pipe shall be supported in accordance with manufacturer's schedule.

4208 SWIMMING POOL FILTRATION SYSTEMS

4208.1 GENERAL:

- (a) *Filtration equipment for public pools shall be in accordance with Standard set forth in Appendix A.*
- (b) *Filtration equipment for residential pools shall be in accordance with provisions set forth herein.*
- (c) *All filtration equipment used on swimming pools constructed and installed in accordance with this Chapter shall be approved by the Ministry of Health.*

4208.2 RAPID SAND FILTERS:

- (a) *Pressure rapid sand filters shall have a filtration rate not to exceed 5 gpm per sq. ft. of filter area.*
- (b) *Pressure rapid sand filters shall have a backwash rate not less than 12 gpm per sq. ft. of filter area.*
- (c) *Filtering materials shall consist of not less than 19 inches of suitable grades of screened, sharp silica sand properly supported on a graded silica gravel bed, with the effective size of particles of sand from 0.4 to 0.5 mm and with a uniformity coefficient of 1.5 to 2.0.*
- (d) *There shall be a sufficient free-board above the surface of the sand and below the overflow troughs or pipes of the filter to permit a 50% expansion of the sand during backwash cycles without loss of sand.*
- (e) *A pressure gauge shall be installed on the pressure side of each filter tank.*
- (f) *A sight glass shall be installed on the backwash line if discharge is not visible.*
- (g) *All filter tanks shall be tested to a pressure of 50 psi.*
- (h) *An inlet baffle shall be provided.*

- (i) *An indirect under-drain shall be provided to prevent loss of sand and re-entry into the pool.*
- (j)
 - (i) *Steel tanks placed underground shall be not less than 10 gauge material, and with non-corrosive exterior coating except that such tanks may be of not less than 14 gauge steel where such tanks are hot-dip, zinc-coated (galvanised) after fabrication with not less than 1.25 ounces of zinc psf of surface.*
 - (ii) *A manhole 11"x 15" minimum, and cover shall be provided.*
- (k) *Tanks of construction other than steel may be used subject to approval by the Buildings Control Officer.*

4208.3 HI-RATE SAND FILTERS:

- (a) *Hi-rate sand filters shall be sand type filters in which the total sand bed is used as a filter.*
- (b) *Pressure hi-rate sand filters shall have a maximum filtration and backwash rate not to exceed 20 gpm psf of filter area.*
- (c) *Filtering materials shall consist of suitable grades of screeded sharp silica sand with effective size of the particles of sand from 0.4 to 0.5 mm and a uniformity coefficient of 1.5 to 2.0.*
- (d) *There shall be sufficient free-board above the surface of the sand and below the overflow troughs or pipes of the filter to permit expansion of the sand during backwash cycles and to prevent loss of sand during these cycles. The effective depth of the sand filter bed shall not be less than 12" as measured up from the top point of the under-drain system.*
- (e) *A pressure gauge shall be installed on the pressure side of each filter tank.*
- (f) *A sight glass shall be installed on the backwash line if discharge is not visible.*
- (g) *All filter tanks shall be tested to a pressure of 50 psi.*
- (h) *An inlet baffle to ensure laminar flow shall be provided.*
- (i) *An indirect under-drain shall be provided to prevent loss of sand and to prevent re-entry of sand into the pool.*
- (j) *A manhole permitting complete access and service to the parts of the filter shall be provided in all tanks.*

- (k) *The filter pump for this system shall be capable of full design flow at a minimum of 60-feet Total Dynamic Head (T.D.H.)*

4208.4 DIATOMACEOUS EARTH FILTERS:

- (a) *Diatomite-type filters shall be either pressure or vacuum.*
- (b) *The filtration rate shall not exceed 2 gpm psf of effective filter area.*
- (c) *Provision shall be made to introduce filter aid into the filter in such a way as to evenly precast the filter septum or element at the beginning of the filter cycle.*
- (d) *There shall be provisions for removing the cake by either backwash, flushing or simple disassembly.*
- (e) *Filters shall be so designed and installed to permit ready disassembly and removal of filter elements.*
- (f) *Filters shall be equipped with pressure or vacuum gauges and such gauges shall be located to determine the need for cleaning.*
- (g) *For pressure diatomite filters, pumps shall have the capacity to provide design flow at a minimum of 60'-0" T.D.H. Vacuum diatomaceous earth filters shall have pumps capable of the design flow at a minimum of 50'-0" T.D.H.*
- (h) *All pressure filter tanks shall be tested to a minimum pressure of 50 psi.*
- (i) *Filter elements shall have a minimum of 1" clear spacing from face to face.*
- (j) *A sight glass in the backwash line shall be provided if discharge is not visible.*

4208.5 CARTRIDGE FILTERS:

- (a) *Cartridge type filters may be either pressure or vacuum.*
- (b) *The filtration rate shall not exceed 1 gpm psf of actual effective filter area.*
- (c) *The cartridge must be manufactured of materials suitable for use in potable water.*
- (d) *Filters shall be so designed and installed as to permit ready disassembly and removal of cartridges for cleaning.*

- (e) *Filters shall be equipped with a pressure or vacuum gauge and such gauges shall be located to determine the need for cleaning.*
- (f) *Filter tanks shall be hydrostatically tested to a minimum pressure of 50 psi.*
- (g) *For pressure or vacuum cartridge filters pumps shall be capable of providing a design flow at a minimum of 50'-0" T.D.H.*

4208.6 PUMPS:

- (a) *Pumps shall be capable of filtration and backwash when required at a head, pressure and rate adequate for the filter and piping system.*
- (b) *Swimming pool pumps shall have hair and lint strainers with a basket not less than 4" in diameter.*
- (c) *Pumps shall be mounted on a solid formed base elevating the bottom of the motor at least 4" above the surrounding area.*

4208.7 AIR RELIEF:

All pressure filter tanks shall be designed to remove air from the tank by an approved method or device.

4208.8 OTHER EQUIPMENT:

Other types of filtration equipment may be used, if shown by test to be equal in efficiency as compared to an approved filter system.

4209 SURFACE SKIMMING FOR POOLS

- (a) *At least one skimming device shall be provided for each 600 sq. ft. of surface area or fraction thereof.*
- (b) *Skimmers shall be built into the pool wall and shall meet the following general specifications.*
 - (i) *The rate of flow through the skimming devices should be adjustable up to at least 50% of the swimming pool filter system.*
 - (ii) *Skimmer weirs shall be automatically adjustable to variations in water level over a range of 3" and shall be a minimum of 5" in width.*
 - (iii) *An easily removable basket with a minimum volume of 75 cubic inches shall be provided and this basket shall be accessible through a deck opening with a minimum diameter of 5".*

- (c) *An overflow gutter for at least one end of the pool with drainage grates, piping and connections, may be substituted.*

4210 PIPING FOR POOLS

4210.1 MATERIALS:

- (a) *The materials of swimming pool piping shall be as approved for use in potable water and as specified in Appendix A.*
- (b) *Where dissimilar metals are used, insulating dielectric fittings between the two shall be provided.*

4210.2 INSTALLATIONS:

- (a) *Pool piping shall be as set forth herein.*
- (b) *Thermoplastic pipe and fittings shall be installed and supported in accordance with the manufacturers recommendations and as set forth herein.*
- (c) *Pool piping, except where supported directly on existing ground, or incorporated into the pool structure, the pipe and fittings shall be supported around pool perimeter by pipe hangers or heavy duty plumber straps, which shall be secured to the pool structure at a maximum of 4'-0" o/c.*
- (d) *Where thermoplastic pipe and fittings are used all pipe trenches and backfill around the piping shall be free of rocks larger than $\frac{3}{4}$ " in diameter.*
- (e) *Short Radius 90 degree piping elbow fittings shall not be installed on any suction piping below grade.*
- (f) *The filter piping shall be so designed that there will be the capability of vacuuming to waste, vacuuming while filtering, the normal filtration cycle, and backwash if required.*
- (g) *Valves, pumps, filters and other equipment shall be installed so as to be readily accessible for operation maintenance and inspection.*
- (h) *Below-ground level equipment room shall be provided with an access cover and adequate drainage.*
- (i) *All suction piping and valves shall be not less than 2" in size.*

4211 SWIMMING POOL— EQUIPMENT ROOMS:

- 4211.1 Pumps, chlorinators and other electrical equipment shall be enclosed on at least three sides and above. The fourth side may be a wire gate or open if otherwise protected from unauthorized entrance.
- (a) Ventilation and drainage — Above grade installations with cross draft ventilation are recommended. Where the equipment room must be recessed, stairway access and suitable drainage (sump pump if necessary) shall be provided. If an open stairwell is used, ventilation through a fully louvered door and a permanently open louvered vent on at least one other side is required. Enclosed stairways require louvered vents on three sides of the room and/or an exhaust fan. The access opening shall be a minimum size of three by six feet.
 - (b) Equipment clearance — Sand filter tanks shall be at least six (6) inches apart and eighteen (18) inches clear distance from the walls and ceiling. Pressure diatomite filters shall be at least eighteen (18) inches from the wall and adequate clearance between the wall or ceiling shall be provided as prescribed by the manufacturer to dismantle the tank and remove the filter elements. Clearance on vacuum filters shall be sufficient to allow normal maintenance operation.
 - (c) Size of room — The size of the filter room shall be determined under (b) above with additional working space adequate to perform routine operations. Space shall also be provided for storage of chemicals and auxiliary equipment. In rooms with fixed ceilings, the minimum height shall be seven (7) feet.

4212 SWIMMING POOL— DIVING AREAS:

- 4212.1 The width, depth and length of the diving area should be commensurate with the anticipated uses of the pool.
- (a) Diving depth — The minimum depth of water for any board placed one meter or less above the water shall be eight (8) feet. Where one meter standard with competitive boards are used, special consideration should be given to the depth. The diving depth for boards above one meter shall be increased one foot for each meter or fraction thereof above one meter.
 - (b) Length of diving area — The minimum distance from the deep end wall to the slope break for height of boards one meter or less shall be twenty (20) feet with special consideration given to com-

petitive boards set on one meter standards, this length shall be increased two (2) feet for each one foot or fraction thereof of the board height above one meter. The minimum required width shall be maintained throughout the entire length of the diving area.

- (c) Width and clearances — Horizontal separation of ten (10) feet shall be provided between adjacent diving boards and between any diving board and side wall. This distance may be reduced to eight (8) foot for boards set two (2) feet or less above the water.
- (d) Wall depths — The minimum depth of water at the deep end wall shall be six (6) feet for boards up to and including one meter. For curved wall construction the six (6) foot depth shall be no further than fifteen (15) inches from a vertical projection of the lip of the gutter. This depth shall be maintained across the deep end wall and along the side walls to a point opposite the maximum depth. This minimum depth shall be increased one foot for each meter of diving board height above one meter. At least fifteen (15) feet of free and unobstructed clearance shall be provided above diving boards and platforms.
- (e) Safety ledges — Safety ledges may be used only in special training pools. The minimum depth of ledges shall be four and one-half (4 1/2) feet and the width shall be between four (4) and six (6) inches. Ledges shall not overhang into pool and they shall slope one-half inch toward the outside edge.
- (f) Diving boards — Diving boards and platforms shall have a non-slip finish, and if covered with absorbent materials, such covers shall be disinfected daily.
- (g) Special provisions — Where diving platforms higher than three (3) meters are constructed, the use of such facilities shall be limited to adequately / trained personnel and not open to the general public. In all competitive type pools special considerations should be given to the diving facilities and also the depths and areas should comply with the competitive rules and regulations under which the pool will operate.
- (h) *Signage — In all public pool areas there shall be clear, highly visible signage indicating whether or not: -*
 - (1) *A lifeguard is on duty.*
 - (2) *The pool is suitable for diving and if so at which end.*

4213 SWIMMING POOL LIGHTING

4213.1 *The installation of all electrical work and fittings, used in connection with any swimming pool, shall comply with Chapter 44.*

4213.2 Inspections shall be required as follows:

- (a) Main shell for the bonding of all reinforcement, pipes and fittings.
- (b) Final.

4214 SWIMMING POOL— DRESSING ROOMS AND SPECTATOR PROVISIONS

4214.1 Dressing room shall be sanitary and proportioned to the maximum bathing load, with entirely separate provisions for men and women. Provisions made for spectators shall be outside the pool areas, completely separated from facilities used by swimmers and no access shall be available to bather facilities.

- (a) Floors — Floors in dressing rooms shall be of smooth, impervious material with nonslip surface. They shall slope to drains and coved at the wall junction for thorough cleaning
- (b) Walls — Partition walls shall terminate at least six (6) inches above the floor or shall be placed on continuous raised masonry or concrete bases at least four (4) inches high.
- (c) Waiver — When facilities are conveniently available to pool patrons the requirements of this section may be waived.
- (d) Water Fountains — Water for drinking purposes should be conveniently accessible to all bathers. Where food or drink is proposed in the immediate area of the pool, such facilities shall be approved by the Ministry of Health.

4215 SWIMMING POOL— SANITARY FACILITIES

4215.1 The sanitary facilities shall be proportioned to the maximum bathing load with separate facilities provided for men and women. In determining the number of units required, the bathing load shall be considered as three-fifths men and two-fifths women. The Ministry of Health may require additional facilities to suit particular construction and/or special conditions.

- (a) Toilets — One toilet shall be provided for each sixty (60) men or forty (40) women or fractions thereof.
- (b) Urinals — One urinal shall be provided for each sixty (60) men or fraction thereof.
- (c) Lavatories — One lavatory shall be provided for each sixty (60) men or women or fraction thereof.
- (d) Showers — One shower shall be provided for each forty (40) men or women or fraction thereof.
- (e) Layout — The layout of the bathhouse shall be such that the bathers on leaving the dressing room pass the toilets and showers enroute to the pool.
- (f) Floors — Toilet room floors shall have a pitch of five (5) inches in ten (10) feet to drain and hose connections shall be provided for frequent cleaning.

4216 HOT TUBS AND SPAS

4216.1 GENERAL:

Persons wishing to install public hot tubs or spas shall contact the Buildings Control Office with outline details prior to making a formal application.

CHAPTER 43

ELEVATORS AND ESCALATORS

4301 STANDARDS

4302 DEFINITIONS

4303 GENERAL

4304 ELEVATORS

4305 ESCALATORS, DUMBWAITERS AND MOVING STAIRWAYS

4306 TRANSPORTING ASSEMBLIES

4307 COMPLIANCE WITH OTHER SECTIONS

4308 SPECIAL REQUIREMENTS

4309 FIREMAN CONTROL ELEVATORS

4301 STANDARDS

4301.1 SCOPE:

- (a) *Elevators, dumbwaiters, escalators, inclined stairway chairlifts, inclined and vertical wheelchair lifts and transporting assemblies shall be designed and constructed of the material, proportions and strength admitting of rational analysis based on established principles of mechanics and shall be maintained and operated in a manner to insure public safety.*
- (b) *Elevators, dumbwaiters, escalators, inclined stairway chairlifts, inclined and vertical wheelchair lifts and transporting assemblies shall comply with ANSI/ASME A17.1, except as they may be modified herein.*

4301.2 STANDARDS:

- (a) *Elevators, dumbwaiters, escalators, inclined stairway chairlifts, inclined and vertical wheelchair lifts shall conform to the American Standard Safety Code for Elevators, Dumbwaiters, Escalators and Moving Walks, hereinafter referred to as "The Elevator Safety Code", ANSI/ASME A17.1, as set forth in Appendix A.*
- (b) *Manlifts shall conform to the American Standard Safety Code for Manlifts, ANSI A90.1, as set forth in Appendix A.*

4302 DEFINITIONS

Definition of terms shall be as set forth in Chapter 2 or in the Elevator Safety Code ANSI/ASME A17.1 or as follows: -

ALTERATION: Shall mean any change to an existing installation other than repair or replacement of worn or broken parts necessary for normal operation.

TRANSPORTING ASSEMBLIES: Shall mean any permanent or semi-permanent device, manually or power-operated, other than elevators, dumbwaiters or escalators used for transporting material or persons in any horizontal, inclined or vertical direction, and such assemblies shall include but shall not be confined to the following:

- (a) Amusement devices used to convey persons as a form of amusement.
- (b) Inclined devices, with or without seats, but not considered as escalators.
- (c) Man hoists, stage and orchestra lifts, tiering and piling machines, skip hoists and wharf ramps.
- (d) Belt, buckets, scoop, roller or similarly inclined or vertical freight conveyers.
- (e) Hoists which are used for handling material during construction of buildings and structures.

4303 GENERAL

4303.1 PERMITS: Any elevator, dumbwaiter, escalator or transporting assembly shown on the approved drawings, that form part of a valid building permit, shall not require any other approval or permit. In the case of the installation in an existing building of a new elevator, dumbwaiter, escalator or transporting assembly, or the relocation thereof, a building permit shall be required.

- (1) Servicing and repairs and replacements necessary for normal maintenance, which are made with parts of equivalent materials, strength and design to those replaced shall not require a permit.
- (2) Installation or alteration of several amusement devices shall be considered for the purposes of a permit as one installation.
- (3) Material hoists for construction operations shall be exempted from the need for a permit, but such exemption shall not relieve the

owners thereof from the provisions herein nor from the responsibility of requesting inspection and securing approval of such device from the B.C.O. before its use or service.

Nothing in this section shall exempt the above from complying with safety requirements.

4303.2 APPROVED CONTRACTORS:

(a) The instruction and/or maintenance of any elevator, dumbwaiter or escalator shall only be undertaken by an elevator contractor currently approved as such by the Minister.

(1) Any elevator or escalator, other than one located, in a single family residence, shall be serviced and maintained by an approved elevator contractor under the terms of a full maintenance contract.

(2) It shall be the duty of the owner to inform the B.C.O. in writing as to the name of the approved elevator contractor duly appointed by him to maintain his equipment.

(b) The installation of transporting assemblies shall only be undertaken by persons or firms who manufacture, or who are qualified to install, such devices; except that for relatively minor installations not to be permanently incorporated into building structures and not involving the transporting of persons, application may be accepted by the B.C.O. from bona-fide general contractors.

4303.3 RESPONSIBILITY: Responsibility for the care, operation and maintenance of elevators, dumbwaiters, escalators, transporting assemblies and amusement devices, shall be as follows:

(1) EQUIPMENT MANUFACTURER: The manufacturer and the elevator contractor whose qualifications have been approved by the Minister shall be responsible for the failure of the equipment or any part thereof, until the installation has been approved. The manufacturer and the elevator contractor shall be responsible for all tests of new and altered equipment until the installation has been approved.

(2) THE OWNER: The owner or his duly appointed elevator contractor shall be responsible for the safe operation and proper maintenance of the elevators, dumbwaiters, escalators, transporting assemblies and amusement devices after the installation has been approved. The owner and the elevator contractor shall also make and be responsible for all routine tests.

- (3) ELEVATOR CONTRACTOR: Shall be responsible for sending to the B.C.O. a quarterly report covering all elevators that he maintains. The report shall give full details of work performed and indicate which parts may have been replaced. The report shall also include details of any major maintenance or replacement of parts planned for the next quarter.
- 4303.4 ACCIDENTS: The owner or his elevator contractor shall promptly notify the Minister of each and every accident involving the equipment wherein any person is injured to the extent of requiring the services of a physician or disability exceeding one day, or damage exceeding one hundred Bahamian dollars or more has been done to the equipment, and shall afford the B.C.O. access for inspection of damage or cause of damage and shall prevent the use of such equipment or assembly until its use is approved. The B.C.O. will inspect the site of an accident and record in detail all material facts and information available and the cause or causes, insofar as they can be determined, and said site shall be open to official inspection at all reasonable hours. Any damaged construction or operating mechanism shall not be removed from the premises until inspection by the B.C.O.
- 4303.5 (a) *INSPECTIONS: The Buildings Control Officer shall inspect or cause to be inspected any new elevator, dumbwaiter, escalator, transporting assembly or amusement device during erection, for compliance with this Code or the Elevator Safety Code.*
- (b) TESTS AND CERTIFICATES REQUIRED: Any new, altered or moved elevator, dumbwaiter, escalator, transporting assembly or amusement device shall not be placed in operation until such equipment has been tested, inspected and approved as requested by this section and a certificate so stating has been issued.
- (c) ELEVATORS, DUMBWAITERS AND ESCALATORS: The elevator contractor installing, moving or altering elevators, dumbwaiters or escalators shall notify the B.C.O. in writing at least three days before completion of the work, and shall, in the presence of the official or his representative, subject the new, moved or altered portions of the equipment to tests required to show that such equipment meets the requirements of this code.
- (d) TRANSPORTING ASSEMBLIES AND AMUSEMENT DEVICES: The permit holder installing, moving or altering transporting assemblies or amusement devices shall, in the presence of the B.C.O. or his representative, make such tests as the official may prescribe in order to determine the safety of such equipment.

- (e) CERTIFICATES OF INSPECTION:
- (1) ISSUING OF CERTIFICATES: The B.C.O. shall file a full report of each and every inspection made, showing the exact condition of the equipment, with a statement of any repairs or replacements required. If this report indicates that the equipment meets the requirements of this Code and is in a safe operating condition, the B.C.O. will issue a certificate of operation for a load capacity not to exceed that named in the report of inspection. This certificate shall be valid for six months after the date of inspection for freight elevators, escalators, building hoists and manlifts, and twelve months after date of as to dumbwaiters of either electric or hand powered type, freight elevators of the hand power type or other lifting apparatus, unless subsequent inspections indicate an unsafe condition.

No passenger elevator, freight elevator, dumbwaiter, escalator, hoist or other lifting apparatus may be operated without this certificate first having been conspicuously posted.

A new certificate shall be issued or an endorsement made on the existing certificate by the B.C.O. following each inspection period.

- (2) POSTING OF CERTIFICATES: The required certificate shall be posted in a conspicuous location in the elevator car, and on, near or plainly visible from the dumbwaiter, escalator, amusement device or transporting assembly. The certificate shall be suitably framed with a glass cover.

4303.6 ROUTINE INSPECTION, TESTS AND MAINTENANCE:

- (a) ELEVATORS, DUMBWAITERS AND ESCALATORS: Elevators, dumbwaiters and escalators shall be inspected by the B.C.O. and tested by the owner or his elevator contractor in the presence of a representative of the B.C.O. in accordance with the requirements set forth in the elevator Safety Code.
- (b) AMUSEMENT DEVICES AND SPECIAL EQUIPMENT
Amusement devices and special equipment shall be tested and inspected on a semi-annual schedule in accordance with such requirements and procedures as the Buildings Control Officer may reasonably request.

4303.7 EXISTING INSTALLATIONS:

- (a) Existing installations of elevators, dumbwaiters, escalators and man hoists, legally instated before the adoption of this Code, may be used without being reconstructed to comply with the requirements of the Elevator Safety Code as herein adopted except as follows:
 - (1) Within a period of two years all power attachments on hand power elevators shall be removed.
 - (2) Within a period of three years all elevators and dumbwaiter hoistway entrance doors or gates shall be made to meet the requirements of this Code, and the Act and Rules.
- (b) Existing installations may be altered to obtain the advantage of any provisions of this Code, and the Act and Rules, provided the safety requirements covering such provisions are met and permit secured.

4303.8 REPAIRS AND REPLACEMENTS: Ordinary repairs and replacements of damaged, broken or worn parts, necessary for normal maintenance, may be made with parts of equivalent material, strength and design, except that replacement of wood overhead beams, guide rails and wood car frames shall be made with metal meeting the requirements of the Elevator Safety Code. Broken or damaged parts subject to tension, torsion or bending or parts on which the support of the elevator car depends, shall not be repaired by welding.

4303.9 UNSAFE EQUIPMENT:

- (a) *Whenever an elevator, dumbwaiter, escalator or transporting assembly is, in the opinion of the Buildings Control Officer, in an unsafe condition, he shall have the authority to order the discontinuance of use of such assembly until repaired, replaced or tested, or he may order demolition.*
- (b) *For the consideration of unsafe equipment, Section 104.3 herein, as it pertains to buildings, shall be applied to elevator and escalator installations based on the total cost of such installation exclusive of the hoistway.*

4304 ELEVATORS

4304.1 ENCLOSURES:

- (a) The enclosure of elevator hoistways shall be as specified in Part III—Requirements Based On Occupancy and Part IV—Types of Construction.

- (b) Unenclosed Elevators may be permitted within an atrium provided that the installation complies in all respects to the Elevator Safety Code.
- (c) All elevator shafts exceeding two stories in height shall be vented at their uppermost point to facilitate evacuation of smoke in the event of fire.
- (d) Elevator lobbies in high rise buildings shall be protected as set forth in Section 513.
- (e) An elevator connecting only one floor and a mezzanine common to that floor need not be enclosed.

4304.2 Guide rails for cars and counterweights shall be of steel.

4304.3 *When there are three or fewer elevator cars in a building, they may be located within the same hoistway enclosure. When there are four elevator cars, they shall be divided in such a manner that at least two separate hoistways enclosures are provided. When there are more than four elevators, not more than four elevator cars shall be located within a single hoistway enclosure. Hoistway enclosures shall be protected in accordance with Section 1507.*

4304.4 Elevators shall not be included in the calculation of required stairways.

4304.5 Elevator call buttons, for routine operation (if of a type actuated by heat) shall be designed, and guaranteed by the manufacturer not to function if the temperature at any particular landing is in excess of 150°Fahrenheit. The key-operated switch, located within the car, as defined in Section 4309(a)(4), shall not be rendered inoperative by the temperature limiting feature of the exterior call button.

- 4304.6 (a) (1) All elevators having automatic operation shall be arranged for Fire Department emergency use, as set forth in the Standard provided in Paragraph 4301.2(a).
- (2) There shall be a legible and permanent sign affixed to the wall in a conspicuous location at such elevators at each floor reading—

IN CASE OF FIRE DO NOT USE ELEVATORS
USE STAIRWAYS

4304.7 (a) Passenger elevators in public buildings shall be made accessible to the physically handicapped person.

- (b) Unless all elevators provided meet the requirements of this section, those made accessible shall be identified at each level.

4305 ESCALATORS, DUMBWAITERS AND MOVING STAIRWAYS

4305.1 Escalators, dumbwaiters and moving stairways moved from one shaft or location to another shall conform to the requirements of Subsection 4301.2.

- 4305.2
- (a) *No escalator shall serve as a component of a required means of egress.*
 - (b) *Treads shall not be less than 22 inches in length.*
 - (c) *There shall be an unobstructed space of at least 4 inches outside the grip-rail and above the grip-rail for the full length of the escalator.*
 - (d) *No single escalator shall have an uninterrupted vertical travel of more than one storey.*

4306 TRANSPORTING ASSEMBLIES

4306.1 TEMPORARY MATERIAL LIFTS:

- (a) Temporary material lifts for construction work on multiple-storey buildings having a hoistway and platform may be constructed without a permit therefor, but shall not be assembled or constructed without the written approval of the B.C.O.
- (b) All temporary material lifts for the work of construction shall be as set forth in this chapter and in, "Precautions During Building Operations."
- (c) Service and inspection shall be each three months.

4306.2 AMUSEMENT DEVICES: Amusement devices shall not be placed in operation until the design, materials of construction and operation are approved by the B.C.O. in accordance with such regulations or requirements as he may deem necessary in the interest of public safety.

Amusement devices shall be equipped with safety clutches. The care or receptacles which persons are permitted to occupy shall have handrails of sufficient number and height, or other approved appliances or safeguards, to prevent persons from being thrown therefrom or from coming in contact with structural members.

- 4306.3 INCLINED STAIRWAY CHAIRLIFTS:**
- (a) *Inclined chairlifts shall be installed only within living units of Groups G and H occupancies.*
 - (b) *Inclined stairway chairlifts shall meet the requirements of Section 4301 and shall comply with ANSI/ASME A17.1.*
- 4306.4 INCLINES AND VERTICAL WHEELCHAIR LIFTS:**
- (a) *Inclined and vertical wheelchair lifts shall meet all the applicable requirements of this Chapter and Code.*
 - (b) *Inclined and vertical wheelchair lifts, where used or installed, shall not obstruct the required width of any means of egress.*
- 4306.5 OTHER DEVICES:** *Other devices shall be serviced and inspected not less frequently than annually, or at such periods as may be required by the B.C.O.*

4307 COMPLIANCE WITH OTHER SECTIONS

Construction and installation of equipment covered by this chapter shall incorporate and comply with the requirements of other sections of this Code. In particular reference is made to the requirements of Section 3710 'EXIT AND EMERGENCY LIGHTING SYSTEMS' and Section 3711 'AUXILIARY STAND-BY EMERGENCY SERVICE'.

4308 SPECIAL REQUIREMENTS

- 4308.1 Where elevators are installed in buildings containing four floors or more, at least one elevator shall be connected to an emergency source of power. In multi-storey buildings, with multiple elevators, the B.C.O. or the Chief Fire Officer may require that additional elevators be connected to emergency power.
- 4308.2 It is mandatory that vertical safety screens between adjacent elevators be installed in all new installations. It is recommended (in compliance with Sub-section 4303.7) that vertical safety screens be installed in all existing installations. A maximum of two elevators shall be installed in any single elevator shaft in any new installation.
- 4308.3 Escalators shall operate between two floors only, from one floor to the next. Escalators to additional floors shall be treated as enclosed stairways.
- 4308.4 Exterior elevator shafts shall have fire doors plus elevator door.

4308.5 All buildings shall maintain suitable ladders for use in access to emergency openings in elevators.

4309 FIREMAN CONTROL ELEVATORS

4309.1 GENERAL:

- (a) In any building equipped with automatic elevators, all elevators shall descend to the main lobby floor, to discharge passengers immediately upon activation of the fire alarm system, all existing car calls shall be cancelled. The elevators shall remain at the lobby level unless reactivated as in (b) below.
- (b) In any building where all the elevators have automatic operation, one elevator or more than one elevator, if necessary to provide access to all landings, shall be arranged for use by firemen as follows:
 - (1) A key-operated switch with light jewel shall be provided adjacent to the elevator at the street floor landing subject to the discretion of the B.C.O. or Chief Fire Officer the key operated switch shall remove the elevator from normal service and place it on firemen's service.
 - (2) The key-operated switch shall, when operated, cancel existing car calls, prevent registration of further car calls, prevent the opening of the elevator door except at the landing at which the switch is located and cause the car to travel to that landing bypassing other landing calls. The light jewel shall be illuminated when the car is returning to the firemen's landing in response to the operation of the key-operated switch.
 - (3) When the car arrives at the firemen's landing, the doors shall open and remain open until closed by the operation of the elevator from the car.
 - (4) A key-operated switch shall be provided in the car which can be operated only by the key which operates the firemen's landing switch and which, when operated, shall permit operation of the elevator only from the car-operating buttons and cause the elevator to bypass landing calls.
 - (5) Emergency power generators shall be provided for any elevators equipped for "fireman's" control.

- (6) Operation of the key-operated firemen's switch shall initiate a signal to the central control panel or annunciator station, when the building has a central alarm system.
- (7) In all emergency elevators provide speaker panel to main control panel in lobby or switchboard.
- (8) Emergency lighting shall be provided in all emergency elevators.
- (9) Firemen's control system shall be on emergency power.
- (10) The elevator car having a firemen's control system shall be clearly identified as such by a permanent sign.
- (11) A minimum of two keys for firemen's use shall be housed in a "breakglass" front cabinet located a minimum of 6'-6" and a maximum of 7'-0" from the floor level sited adjacent to each group of elevators, on street floor landing, subject to the discretion of the B.C.O. or Chief Fire Officer. Two spare keys for test purposes shall be maintained at each building site at the switchboard, chief engineer's office, or other location approved by the B.C.O. and the Chief Fire Officer.
- (12) The elevator, or elevators, designated for fireman use shall have an inbuilt communication system between the lobby area and the elevator for emergency use.

NOTES

PART X
ELECTRICAL AND TELEPHONE SERVICES

CHAPTER 44

ELECTRICAL AND TELEPHONE SERVICES

4401 ELECTRICAL

4402 TELEPHONE SERVICES

4403 TELEPHONE SWITCHBOARD INSTALLATIONS

4404 TELEPHONE INSTALLATIONS WITHOUT SWITCHBOARDS

4405 TELEPHONE INSTALLATIONS IN DWELLING HOUSES

4401 ELECTRICAL

4401.1 GENERAL: The requirements contained herein supplement but do not supercede the following:

The Buildings Regulation Act
The Electricity Act
The Out Islands Electricity Act

and any Rules or Regulations made thereunder. In addition to the foregoing the Canadian Electrical Code Part I has been adopted for use in the Bahama Islands.

4401.2 GROUNDING: A rod electrode shall be driven to a depth of 12 inches below mean water table level.

4401.3 EQUIPMENT AND METER ROOMS:

- (a) The electrical Meter Room shall be accessible to authorised persons at all times.
- (b) Electrical Equipment or Meter Rooms shall be provided with adequate ventilation.

4401.4 PORTABLE WIRING: Wiring used in connection with motion picture, stage and television production sets, including wiring not fixed as to location, shall be of approved flexible cables and cords. Flexible cords used to supply such sets may be spliced or tapped provided: -

- (a) the circuits are protected at not more than 20 amperes, and
- (b) only approved devices are used.

4401.5 PLANS AND SPECIFICATIONS:

- (a) *Plans and specifications shall be submitted to the Buildings Control Officer for approval prior to the issuance of a building permit. Plans shall be mechanically reproduced prints on substantial paper or cloth, drawn to scale, except that an isometric or riser diagram need not be scaled. Designated electrical equipment rooms shall be drawn at a minimum of 1/2" = 1'-0" scale.*

When any of the following parameters are not exceeded, plans and specifications for electrical work may be prepared by any competent person:

- (i) *The system requirements do not exceed a total connected electrical load of more than 1,000 amperes.*
- (ii) *The systems capacity is designed to accommodate not more than 100 persons.*
- (iii) *The work is proposed in a structure for public assembly which does not exceed 5,000 sq. ft. in area.*

However, the BCO shall reserve the right to request the services of an engineer recognized by the Minister in that discipline where he deems necessary for any particular application.

Where the services of a registered professional are required then that pertinent parts of the works shall be supervised by that professional.

- (b) *The plans shall show the size of service and feeder wires and conduit, the location of service switches and centers of distribution, the arrangement of circuits showing the number of outlets connected thereto, and a load schedule for each panel.*
- (c) *Plans for electrical work for any new building or addition that includes a medical gas, oxygen, steam, vacuum, toxic air filtration, Halon, fire alarm or security and security alarm system, the cost of which exceeds \$5,000.00 shall bear the signature of an Engineer recognised by the Minister.*

4402 TELEPHONE SERVICES

4402.1 GENERAL:

- (a) *The following requirements supplement but not supercede the Telecommunications Act and the Rules made thereunder. More detailed information is contained in "Facilities for telephones in New Buildings and Subdivisions" which is available from the main office of The Bahamas Telecommunications Company (BTC/BaTelCo) on John F. Kennedy Drive, Nassau.*
- (b) *The applicant for a major project i.e. one that involves a switchboard, or an apartment block or condominium of more than six units, is advised to contact an Authorized Telecommunications Utility at the earliest opportunity in order that the detailed service drawings, containing telephone layouts, are prepared based upon consultation with that Department.*
- (c) *The examination of the mechanical and electrical drawings submitted to the Building Control Division of the Ministry of Public Works, in connection with the building permit application, does not include a plan-check for telephone services. The applicant for any major project should therefore submit four sets of the drawings detailing the telephone layouts to an Authorized Telecommunications Utility. One set of such drawings will be retained by that utility, one set will be filed in the Building Permit records at the Building Control Division and two sets will be returned to the applicant for his use.*
- (d) *No overhead service will be provided to any building containing more than two dwelling units.*

4402.2 SAFETY OF CIRCUITS:

- (a) *Telephone cables shall be kept entirely apart from the electrical supply services, by the use of separate conduits.*
- (b) *Where it is necessary for an electrical supply cable or service to cross a telephone cable the following minimum separations shall apply:*
 - (i) *Low and Medium Voltage Cables.....2"*
(less than 650 V)
 - (ii) *High Voltage Multicore Cables.....12"*
(exceeding 650 V)
 - (iii) *High Voltage Single Core Cables.....18"*
(exceeding 650 V)

- (c) *No telephone cable shall be installed in any area or space containing hazardous fuels or gases without the prior approval of the Buildings Control Officer and an Authorized Telecommunications Utility.*
- (d) *Where a building, or part of a building, contains a system of communication circuits in addition to an Authorized Telecommunications Utility circuits, such circuits shall be separated one from another wherever possible.*
- (e) *The telephone system in any building shall be provided with an adequate earth connection.*
- (f) *In addition to the above, all telephone-related interior wiring or cabling requirements of the Canadian Electrical Code, Part 1.*
- (g) *All interior wiring or cabling related to the telephone system shall be installed under the supervision and responsibility of a Licensed Electrical Contractor.*

4403 TELEPHONE SWITCHBOARD INSTALLATIONS

4403.1 GENERAL:

The requirements set out herein are for installations using switchboards such as offices, hotels and other similar occupancies.

4403.2 LEADING-IN MAIN CABLE:

- (a) *The incoming cable shall be taken into the building through a duct located at a point at least 18" below sidewalk or adjacent grade level. Both location and size of the duct shall be approved by an Authorized Telecommunications Utility.*
- (b) *The electrical contractor shall leave a pull wire in the duct for pulling the external cable.*

4403.3 TERMINATION OF CABLES:

- (a) *The incoming cable and distribution cables within the building shall terminate on a distribution cabinet or frame depending upon the size of the system.*
- (b) *The distribution cabinet or frame shall be located in a dry, well ventilated room. Such room shall be secured from entry by unauthorised persons.*

EXCEPTION: In small buildings the distribution cabinet may be fitted into a wall in a convenient position.

4403.4 CABLING IN BASEMENTS:

All cabling in basements shall be run in PVC conduits.

4403.5 VERTICAL RISERS TO VARIOUS FLOORS:

- (a) *No telephone outlet on any floor shall require more than 90 feet of cable to connect it to the nearest riser.*
- (b) *The minimum size riser shall be 3 1/2" diameter PVC conduit.*
- (c) *Risers should be fixed to the permanent structure wherever possible.*
- (d) *Risers shall not be located in elevator shafts.*
- (e) *Risers sharing vertical openings with other services shall be separated as set forth in Section 4402.2.*
- (f) *Vertical openings containing risers shall be protected as set forth in Section 1507.*

4403.6 ACCESS TO RISER:

- (a) *Access to each riser should be provided at every floor level from a corridor or other similar common space.*
- (b) *Where the riser is located in a vertical opening any access shall be in accordance with Section 1507.2(d).*
- (c) *In other locations access should be by hinged door instead of a screw panel.*

4403.7 HORIZONTAL CABLE RUNS:

- (a) *It is not possible, before hand to set out the exact requirements as to where ducts or conduits should be run or where outlets should be located at each floor level, as these vary with the use and design of the building.*
- (b) *Corridor ducts or conduits shall have a minimum area of two square inches.*
- (c) *Ducts or conduits leading from a corridor duct or conduit to an outlet shall have a minimum area of one square inch.*

4403.8 LAYOUT OF DUCT OR CONDUIT SYSTEM:

The cross sectional area of the duct or conduit running from the riser to the first junction box shall be so sized as to avoid cable congestion. This may be achieved by either of the following methods:

- (a) *The installation of multi-way ducts between the riser and the first junction box, or*
- (b) *The linking of more than one junction box to a riser (see drawing in Appendix D).*

4403.9 SWITCHBOARDS:

- (a) *Switchboard accommodation should have ample natural lighting.*
- (b) *It should be located in a quiet area away from busy streets, corridors and elevator shafts, acoustical treatment is recommended.*
- (c) *Toilet facilities should be within easy reach.*
- (d) *A clock should be installed so that it is readily visible to the switchboard operator(s).*
- (e) *A three-pin socket outlet of standard pattern should be provided for a battery charger.*
- (f) *A second three-pin socket should be provided to facilitate the use of inspection lamps.*
- (g) *The minimum level of illumination on the horizontal key-shelf should be five lumens per square foot (54 lux) and the lamps should be located vertically above the front edge of the key-shelf.*

4403.10 APPARATUS ROOM:

- (a) *A separate apparatus room adjacent to the switchboard room will be required for all but the smallest PABX or PMBX installations.*
- (b) *The apparatus room should be located as close as possible to one of the risers.*
- (c) *The room should be reasonably dust-proof and be provided with normal ventilation.*
- (d) *Two-three pin socket outlets of standard pattern should be provided as in Section 4403.9(e) and (f).*

4404 TELEPHONE INSTALLATIONS WITHOUT SWITCHBOARDS

4404.1 GENERAL:

This category includes apartments, condominiums containing more than two family units and are without switchboard facilities.

4404.2 *Horizontal feeds to apartments need not be greater than 3/4" diameter PVC conduit.*

4405 TELEPHONE INSTALLATIONS IN DWELLING HOUSES

4405.1 UNDERGROUND SERVICE:

(a) *Where the external service is underground, a one inch PVC conduit shall be provided from a convenient point in the house to the street, or wayleave boundary of the lot.*

(b) *The Electrical Contractor shall leave a pull wire in the conduit.*

4405.2 OVERHEAD SERVICE:

(a) *Where the external service is overhead, a 3/4" inch diameter standard electrical conduit should be provided commencing at the eaves near the external wires, passing through the top of the outside wall and continuing inside the house to the telephone or distribution point.*

(b) *The drop wire shall be clamped at the eave and shall continue through the 3/4 inch conduit to terminate at the distribution panel.*

(c) *Precaution shall be taken to prevent water from entering the conduit (See drawing in Appendix D).*

4405.3 INTERNAL WIRING BETWEEN ROOMS

(a) *If full concealment of the telephone wire distribution system is desired, then conduits should be installed.*

(b) *Where conduits are provided they shall be of no less than 3/4 inch diameter PVC, run as straight as possible and should terminate at skirting level.*

(c) *Internal wire should be terminated in a flush plug similar to Drawing in Appendix D.*

NOTES

PART XI
ACCESSIBILITY FOR THE PHYSICALLY HANDICAPPED

CHAPTER 45

ACCESSIBILITY FOR THE PHYSICALLY HANDICAPPED

4501 APPLICATION

4502 GENERAL REQUIREMENTS

4503 EXCEPTIONS FOR SPECIFIC CONDITIONS AND OCCUPANCIES

4501 APPLICATION

- 4501.1 (a) *The accessibility provisions of this section shall be applicable to all new construction, including factory-built buildings, substantial improvements, alterations, additions, and changes in occupancy, as such terms are used in this section. Such standards shall apply as follows:*
- (1) *All new construction except as exempt herein.*
 - (2) *Existing buildings which are substantially improved shall be made to comply with the provisions of this section for new construction.*
- (b) *Private residences need not ordinarily be made to comply with accessibility requirements for physically handicapped.*

4502 GENERAL REQUIREMENTS

- 4502.1 (a) *The general requirements for accessibility set forth in this section shall apply to all buildings, subject to the application provisions of Subsection 4501.1 and the exceptions for specific conditions and groups of occupancy provided in Subsection 4503.1, both of this Code.*
- (b) **ACCESS ROUTES REQUIRED:**
- (1) *Accessibility to buildings shall be provided from rights-of-way and parking areas by means of walks, curb-cuts or ramps to at least one entrance generally used by the public and from such entrance to elevators, if any. Such pathways shall be at least 60" wide and shall be devoid of stairs/steps or other abrupt changes in elevation greater than one-half inch.*

- (2) *Accessibility in buildings shall be provided at each floor and accessible grade level, except as otherwise provided in this section.*
- (c) **INTERIOR CORRIDORS, AISLES AND HALLWAYS:**
 - (1) *Interior corridors shall conform to all applicable requirements and shall be at least 44" wide when part of a required means of egress. Other interior aisles, corridors and hallways shall be at least 36" wide.*
 - (2) *Where the configuration of a corridor, aisle or hallway requires the making of 180-degree turns, accessibility shall be provided by a space of at least 60" in diameter or, a space of at least 52" x 72".*
- (d) **FLOORS, SLIP RESISTANT:** *Floors shall have a slip resistance finish.*
- (e) **WALKWAYS:**
 - (1) *Walkways shall be at least 48" wide.*
 - (2) *Where doors swing out over a continuous walkway which runs perpendicular to the path of egress, the walkway shall be at least 60" wide.*
 - (3) *Walkways shall be of a continuing common plane and not interrupted by steps or abrupt changes in level.*
 - (4) *Walkways that are grade level leading to entrance doors shall have a level platform of at least 60" wide x 60" deep if the door swings out. The platform shall extend at least 24 inches beyond the latch side of the door. Above grade level, platforms shall have security rails or walls. If the door swings in, the platform shall be at least 60" wide x 60" deep, however if the door swings out the platform shall be at least 72" x 72".*
- (f) **FLOORS, COMMON LEVEL:** *All floors on a particular story of a building shall be of a common level or to be connected by a ramp or incline or vertical wheelchair lifts that are operated by a disabled person.*
- (g) **RAMPS:** *Ramps shall conform to the following requirements:*
 - (1) *Ramps shall have a slip resistant surface.*

- (2) *Ramps that are part of a required means of egress or are used by handicapped persons shall be at least 44" wide.*
- (3) *Ramps 30" in length or longer shall have a maximum gradient of '1:20' or the ramps shall have a level platform at least 60" deep in the direction of the ramp at 30'-0" intervals and at changes in direction over 15 degrees and shall be of a slope of no more than 1:12.*
- (4) *Ramps shall have a level platform at the top which is at least 72" wide x 72" deep, except as specified in this section. If the door swings out onto the platform, the platform shall extend at least 24" beyond the latch side of the door. If the door swing in, the level platform shall be at least 36" deep x 60" wide. All above-grade-level platforms shall have security rails or walls.*
- (5) *The bottom of each ramp shall have at least 72" of straight and level clearance.*
- (6)
 - (i) *Ramps shall have smooth handrails on both sides which are 32" above the upper surface of the ramp, measured vertically to the top of the rail, allowing a variation of not more than 1/2". Handrails on ramps shall be 1-1/2" round in outside diameter. Handrails that are not continuous between flights shall be extended horizontally at least 18" at the required height at the top and bottom landings if a guard or wall exists.*
 - (ii) *Ramps or curb-cuts from parking areas that are privately owned, to the walkway level, shall be provided and if more than one is provided, shall be spaced along such walkways at intervals of no more than 100'-0" and such ramps or curb-cuts shall be located as close as practical to main entrances and exits to buildings.*
- (7) *Handrails shall not be required on ramps 84" or less in length that are not integral to a walkway, platform, courtyard, or other paved area and if the sides of the ramp are protected with built-up curbs or flared sides.*
- (8) *Handrails are not required on curb-cuts with flared sides.*

- (9) *Curb-cuts used in lieu of ramps shall have a maximum rise of 8". If a curb-cut is located where pedestrians must walk across it, it shall have flared sides. The maximum slope of the flare shall not exceed 1" vertically for each 10" horizontally with respect to inclined curbs, or 1" vertically for each 12" horizontally for built up curbs. Curb-cuts shall have a level platform at the top of at least 60" x 60".*
- (h) **REQUIRED DOORS AND WALKTHROUGHS:** *Required doors and walkthroughs shall comply with the following requirements:*
- (1) *Single-leaf walk-through swinging doors and at least one leaf of manually operated multiple-leaf swinging doors shall be at least 32" wide.*
 - (2) *All walk-through openings shall have at least 32" in clear width.*
 - (3) *Handrails, pulls, locksets, and other operating mechanisms on entrance doors, restroom and toilet room doors, and other mechanisms or U-shaped handles shall have a shape that is easy to grasp with one hand and does not require tight grasping, tight pinching or twisting of the wrist to operate. The requirement shall be satisfied by the 5 foot-pound standard as described in National Institutes for Standards and Technology (NIST) (1986) Standard 4.13.11.*
 - (4) *A door that is not intended for regular use and that could prove dangerous if used by a blind person shall have a knurled handle or knob or a handle or knob coated with an abrasive plastic coating. Such doors shall also have warning signs as provided in this Section.*
 - (5) *Manoeuvring clearances at doorways shall be unobstructed.*
 - (6) *If a side-hinged swinging door is double-acting, there shall be at least 3" of horizontal clearance on the latch side both inside and outside the doorway. If an exterior side-hinged swinging door swings one way, there shall be, on the latch side, at least 24" of horizontal clearance on the pull side and at least 3" of horizontal clearance on the push side. There shall be, on the latch side of the interior side-hinged swinging doors, at least 12" of horizontal clearance on the pull side of the door.*
 - (7) *All doors shall be openable by a single effort. The maximum force required to open a door shall be as follows, except that*

such requirements do not apply to the effort required to retract latch bolts or disengage other devices which keep the door closed for safety reasons:

- (i) Exterior swinging doors shall be openable by a force of not more than 8.5 pounds applied to the latch stile.*
 - (ii) Interior swinging doors shall be openable by a force of not more than 8.5 pounds applied to the latch stile.*
 - (iii) Sliding or folding doors shall be openable by a force of not more than 5 pounds.*
 - (iv) If an automatic door is used it must comply with the American National Standard for power operated doors, ANSI A156.10-1979.*
- (i) PEDESTRIAN CONTROL DEVICES:*
- (1) Except as otherwise provided in this subsection, posts, bars, railings, and other similar barricades or pedestrian control devices shall not be placed in the common or emergency entranceways or exitways to buildings or in the exterior sidewalks, walkways or other public paths serving them which are located on private property.*
 - (2) Interior and exterior turnstiles are prohibited, except that, in occupancies serving over 100 persons, turnstiles may be used if there is available an alternate adjacent means of passage, unlocked, with operating mechanisms as set forth in this section, which provide at least 32" of clearance.*
 - (3) All stores shall have one check-out station with at least 36" inches of clear passage.*
- (j) REQUIRED RESTROOM AND TOILET ROOMS: Required restrooms and toilet rooms shall comply with the following requirements:*
- (1) Each restroom and toilet room shall have a minimum clear passage of at least 44" to the accessible toilet stall. If turns of 45 degrees or more are required, this passageway shall be at least 66" wide.*
 - (2) The accessible toilet stall shall be at least 68" wide x 72" in length and shall contain an accessible lavatory within it.*

- (3) *The accessible water closet shall be located in the corner diagonal to the stall door.*
- (4) *The stall door shall be located in the wall adjacent to the accessible lavatory, as far from the lavatory as possible. The accessible stall door shall swing out and shall be at least 32" wide and shall be of the self-closing type. Such lavatories shall be counted as part of the required fixture count for the building.*
- (5)
 - (i) *Accessible lavatories shall have lever operated faucets and narrow aprons which, when mounted, are at a height of from 28" to 34", measured vertically from the floor to the bottom of the apron, to allow for use of the lavatory by persons in wheelchairs.*
 - (ii) *Hot water and drain pipes under lavatories or sinks shall be insulated or otherwise protected. There shall be no sharp or abrasive surfaces under lavatories or sinks.*
- (6) *At a location adjacent to accessible lavatories there shall be at least one towel dispenser within the toilet stall or toilet room.*
- (7) *Accessible water closet seats shall be at a height of no less than 19" and no more than 20", measured vertically from the finished floor to the top of the seat.*
- (8) *A grabrail shall be provided, located 33" from and parallel to the finished floor measured vertically to the top of the rail with a variation of not more than 1/2", and:*
 - (i) *Shall have an outside diameter of 1-1/2" inches.*
 - (ii) *Shall provide 1-1/2" of clearance between the rail and the wall.*
 - (iii) *Shall be so designed and supported as to withstand a load of not less than 250 pounds applied at any point, downward or horizontally.*
 - (iv) *Shall be continuously graspable along the entire length.*
 - (v) *Shall be at least 24" long and shall be centered at the leading edge of the water closet.*

- (9) *Restrooms shall have an unobstructed space of at least 60" in diameter or 53" wide x 72" deep finished inside dimensions adjacent to the lavatory area.*
- (10) *Restroom vestibules having a series of doors shall have an unobstructed width of at least 52" and an unobstructed depth of at least 72", finished inside dimensions.*
 - (i) *The inside door must swing into the restroom.*
 - (ii) *There must be at least 12" of clear space on the latch side of the door, unless the door is double acting.*
- (k) *CONTROLS: Switches and controls for light, heat, ventilation, windows, and draperies, and all other controls of frequent or essential use, shall be placed between 42" and 52" from the floor.*
- (l) *DRINKING FOUNTAINS: Where water fountains or other means of dispensing water are provided, at least one such fountain or device shall be accessible and shall have up front spouts and either hand-operated or hand-and-foot-operated controls.*
- (m) *RETAIL CHANGING ROOMS: In retail occupancies providing changing rooms for the public, at least one changing room shall:*
 - (1) *Provide an opening of at least 29" clear width.*
 - (2) *Have unobstructed finished inside dimensions of at least 36" wide x 60" deep.*
 - (3) *If a door is provided, have a door that swings out.*
- (n) *SIGNAGE: Where room names or numbers are provided, raised, or recessed numbers shall be used. Such names or numbers shall whenever possible, be located adjacent to the door on the hinge side at a height between 54 and 66 inches from the floor.*
- (o) *WARNING SIGNALS: Where warning signals are used, audible signals shall be accompanied by visual signals for the benefit of the hearing-impaired, and visual signals shall be accompanied by audible signals for the benefit of the blind.*

4503 EXCEPTIONS FOR SPECIFIC CONDITIONS AND OCCUPANCIES

- 4503.1 (a) EXEMPT AREAS WITHIN BUILDING:** *If the owner of the building certifies that particular areas of the building are used only by employees and that the work performed in such areas cannot reasonably be performed by handicapped persons, such areas are exempt from this section unless they provide the only means of access from one area normally used by handicapped persons to another such area.*
- (b) TWO-STOREY BUILDINGS:** *The second storey of a building which is used other than for retail or office use, or which is used for retail or office use by a single tenant, shall be deemed to be in compliance with this section and need not be accessible when:*
- (1)** *The owner of the building provides an affidavit that the building will not be occupied for retail or office use or that the building will be occupied by a single tenant. The affidavit must be maintained on file with the occupancy certificate for the building.*
 - (2)** *The building provides accessibility at the habitable grade level in accordance with this section.*
 - (3)** *All building facilities and services normally sought and used by the general public or employees working in the building are accessible to, and usable by, the physically handicapped at habitable grade level.*
 - (4)** *There shall be no elevator in the building.*
- (c) USE OF WHEELCHAIR LIFTS:** *Wheelchair lifts may be used to provide accessibility to and within buildings and structures.*
- (d) GROUP A AND B OCCUPANCIES:**
- (1) PUBLIC FOOD SERVICE ESTABLISHMENT:** *Public food service establishments and establishments licensed under Law for consumption on the premises, which establishments use fixed tables or booths, shall comply with the following:*
 - (i)** *Aisles adjoining such booths or tables shall provide clear space for wheelchairs.*
 - (ii)** *Where there are open positions along both sides of such aisles, the aisles shall be at least 52" wide.*

All such designated rooms shall have the following in the 60" x 30" shower: shower curtains, grabrails, and accessible shower head controls. There shall be no curbs at shower entrances.

- (iii) Rooms shall have accessible mirrors, lavatories, and control switches as set forth in American National Standards Institute A117.1 (1986) Standard.*
- (iv) The toilet-room shall be at least 68" x 68".*
- (v) All beds in designated accessible guest rooms shall be open-frame type to permit passage of lift devices.*
- (vi) The toilet room door shall not swing into the toilet room.*

PART XII
APPENDICES

APPENDIX A

ENGINEERING PRACTICE STANDARDS

GENERAL:

- (a) The standards issued by the accredited authoritative agencies listed herein are intended to serve as criteria for accepted safe practice for various materials, products, systems of construction, or specific uses as required or used under the provisions of The Bahamas Building Code. The text of the Code referring to any standard indicates where conformance with that standard is mandatory or permissive.
- (b) The standards referred to shall always be the latest edition of those issued.

Name, Address and Standard Title	Symbol
Aluminum Association 750 Third Avenue, New York, New York, 10017	AA
Aluminum Construction Manual Specification for Aluminum Structures Aluminum Formed Sheet Building Sheathing Design Guide	
Commentary on Specifications for Aluminum Structures	
American Concrete Institution P. O. Box 19150, Redford Station, Detroit, Michigan, 48219	ACI
Manual of Standard Practice for Detailing Reinforced Concrete Structures	315
Building Code Requirements for Reinforced Concrete	318
Recommended Practice for Shotcreting	506
American Institute of Steel Construction 110 Park Avenue, New York, New York, 10017	AISC

Specification for Design,
Fabrication and Erection
of Structural Steel for Buildings

Specification for Structural
Joints Using ASTM A 325
or A 490 Bolts

Steel Construction Manual

American Institute of Timber Construction
333 West Hampden Avenue,
Englewood, Colorado, 80110

AITC

Typical Construction Details

AITC 104

Standards for the Design of
Structural Timber Framing

AITC 102

Code of Suggested Practices

AITC 106

Standard for Heavy Timber Construction

AITC 108

Treating Standard for Structural
Timber Framing

AITC 109

Standard Appearance Grades for
Structural Glued Laminated Timber

AITC 110

Standard for Tongue and Groove
Heavy Timber Roof Decking

AITC 112

Standard for Dimensions of
Glued Laminated
Structural Members

AITC 113

Standard Specifications for
Structural Glued
Laminated Timber of
Douglas Fir, Western
Larch, Southern Pine
and California Redwood

AITC 117

Standard Specifications for
Hardwood Glued Laminated
Timber

AITC 119

American Iron and Steel Institute
150 E 42nd Street, New York,
New York, 10017

AISI

Specification for the Design of Cold-Formed Steel Structural Members Addendum No. 1 Addendum No. 2	
Criteria for Structural Applications of Steel Cables for Buildings	
American National Standards Institute, Inc. 1430 Broadway, New York, New York, 10018	ANSI
Safety Code for Elevators, Dumbwaiters, Escalators and Moving Walks	A.17.1
Cast-Iron Pipe Centrifugally Cast for Metal Molds for Water or Other Liquids	A.21.6
Treated Cast-Iron Pipe for Drainage, Vent and Waste Systems	A.40.5
Backflow Preventors in Plumbing Systems	A.40.6
Reinforced Gypsum Concrete	A.59.1
Manlifts	A.90.1
Cast-Iron Soil Pipes and Fittings	A.112.5.1
Making Buildings and Facilities Accessible to and Usable by the Physically Handicapped	A.117.1
Aluminum Windows	A.134.1
Sliding Glass Doors	A.134.2
Pipe Threads (Except Dryseal)	B.2.1
Safety Code for Mechanical Refrigeration	B.9.1
Malleable-Iron Screwed Fittings, 150 and 300 lb.	B.16.3

Cast-Iron Screwed Fittings, 125 and 150 lb.	B.16.4
Cast-Iron Threaded Drainage Fittings	B.16.12
Cast-Bronze Screwed Fittings, 125 and 250 lb.	B.16.15
Cast-Bronze Solder-Joint Pressure Fittings	B.16.18
Wrought Copper and Bronze Solder Joint Pressure Fittings	B.16.22
Cast Bronze Solder-Joint Drainage Fittings-DWV	B.16.23
Bronze Flanges and Flanged Fittings, 150 and 300 lb.	B.16.24
Cast Bronze Fittings for Flared Copper Tubes	B.16.26
Code for Power Piping	B.31.1
Welded Wrought-Iron Pipe	B.36.2
Seamless Copper Water Tube	H.23.1
Standard Sizes Seamless Copper Pipe	H.26.1
Standard Sizes Seamless Red Brass Pipe	H.27.1
Transparent Safety Glazing Material Used in Buildings	Z.97.1
National Fuel Gas Code	Z.233.1

American Plywood Association 119 A Street, Tacoma, Washington, 98401	APA
Plywood Design Specification	Y.510
Plywood Construction Guide for Residential Buildings	C.300
Plywood Construction Systems for Commercial and Industrial Buildings	65-310
Adhesives for Field-Gluing Plywood to Wood Framing	AFG.01
U.S. Product Standard for Construction and Industrial Plywood	PS.1
APA Glued Floor Systems Sturd-I-Floor	C.420
Performance Standard and Policies for APA Structural-Use Panels	E.445
APA Glued Floor Systems	U.405
Fabrication of Plywood Sandwich Panels	SP-61 V.309
American Society of Heating Refrigerating and Air Conditioning Engineers, Inc. 345 E 47 Street, New York New York, 10017	ASHRAE
ASHRAE Handbook and Product Directory, Fundamentals Volume	
ASHRAE Handbook and Product Directory Applications	
ASHRAE Handbook and Product Directory, Systems Volume	
ASHRAE Handbook and Product Directory, Equipment Volume	
Natural and Mechanical Ventilation, ASHRAE Standard 62	

Thermal Environmental Comfort conditions for Human Occupancy ASHRAE Standard 55	
American Society of Mechanical Engineers 845 E 47th Street, New York, New York, 10017	ASME
Boiler and Pressure Vessel Code	
American Society for Testing Materials 1916 Race Street, Philadelphia, Pennsylvania, 19103	ASTM
General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use	A.6
General Requirements for Steel Bars, Carbon and Alloy, Hot Rolled and Cold Finished	A.29
Cast-Iron Soil Pipe and Fittings	A.74
Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles	A.90
Steel Pipe, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Use	A.120
Welded Steel Wire Fabric for Concrete Reinforcement	A.185
Welded and Seamless Steel Pipe Piles	A.252
Carbon Steel Bars Subject to Mechanical Property Requirements	A.306
High-Strength Bolts for Structural Steel Joints, Including Suitable Nuts and Plain Hardened Washers	A.325

Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process for Roofing and Siding	A.361
Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints	A.490
General Requirements for Zinc- Coated (Galvanized) Steel Sheets by the Hot-Dipped Process	A.525
Hot-Rolled Carbon Steel Sheets and Strip, Structural Quality	A.570
Steel, Cold-Rolled Sheet, Carbon Structural	A.611
Deformed Billet-Steel Bars for Concrete Reinforcement	A.615
Seamless Copper Pipe, Standard Sizes	B.42
Seamless Red Brass Pipe, Standard Sizes	B.43
Seamless Copper Tube	B.75
Seamless Copper Water Tube	B.88
Leaded Brass Plate, Sheet, Strip and Rolled Bar	B.121
Seamless Brass Tube	B.135
Copper Drainage Tube (DWV)	B.306
General Requirements for Wrought Seamless Copper and Copper-Alloy Tube	B.251
Quicklime for Structural Purposes	C.5
Concrete Sewer Storm Drain and Culvert Pipe	C.14
Gypsum Plasters	C.28

Making and Curing Concrete Compression and Flexure Test Specimen in the Field	C.31
Concrete Aggregates	C.33
Gypsum Wallboard	C.36
Gypsum Lath	C.37
Compression Strength of Cylindrical Concrete Specimens	C.39
Keene's Cement	C.61
Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe	C.76
Gypsum Sheathing Board	C.79
Hollow Load-Bearing Concrete Masonry Units	C.90
Masonry Cement	C.91
Ready-Mixed Concrete	C.94
Aggregate for Masonry Mortar	C.144
Portland Cement	C.150
Finishing Hydrated Lime	C.206
Insulating Board (Cellulosic Fibre) Structural and Decorative	C.208
Testing Insulating Board (Cellulosic Fibre) Structural and Decorative	C.209
Mortar for Unit Masonry	C.270
Clay Flue Linings	C.315
Lightweight Aggregates for	C.330

Structural Concrete

Concrete Drain Tile	C.412
Compression Joints for Vitrified Clay Bell and Spigot Pipe	C.425
Rubber Gaskets for Cast-Iron Soil Pipe and Fittings (Specs)	C.564
Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board	C.645
Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated	C.700
Round Timber Piles	D.25
Establishing Structural Grades and Related Allowable Properties or Visually Graded Lumber	D.245
Rate of Burning or Extent and Time of Burning, or Both, of Self-Supporting Plastics in a Horizontal Position	D.635
Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80	D.1527
Homogeneous Bituminized-Fibre Drain and Sewer Pipe	D.1861
Laminated-Wall Bituminized- Fibre Drain and Sewer Pipe	D.1862
Ignition Properties of Plastics	D.1929
Polyethylene (PE) Plastic Pipe Schedule 40	D.2104
Solvent Cement for Acrylonitrile-	D.2235

Butadiene-Styrene (ABS) Plastic Pipe and Fittings	
Polyethylene (PE) Plastic Pipe (SDR-PR)	D.2239
Poly (Vinyl Chloride) PVC Plastic Pipe (SDR-PR)	D.2241
Acrylonitrile-Butadiene- Styrene (ABS) Plastic Pipe (SDR-PR)	D.2282
Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80	D.2467
Solvent Cement for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings	D.2564
Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe	D.2609
Acrylonitrile-Butadiene- Styrene (ABS) Plastic Drain, Waste and Vent Pipe Fittings	D.2661
Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe and Fittings	D.2665
Density of Smoke from the Burning or Decomposition Of Plastic	D.2843
Chlorinated Polyvinyl Chloride (CPVC) Plastic Hot Water Distribution Systems	D.2846
Styrene Rubber Plastic Drain, and Building Sewer Pipes, and Fittings	D.2852
Accelerated Weathering on Fire- Retardant Treated Wood, for Fire Testing	D.2898
Establishing Design Stresses	D.2899

for Round Timber Piles	
Type PSM, Polyvinyl Chloride (PVC) Sewer Pipe and Fittings	D.3034
Surface Burning Characteristics of Building Materials	E.84
Fire Tests of Roof Coverings	E.108
Fire Tests of Building Construction and Materials	E.119
Non-Combustibility of Elementary Materials	E.136
Fire Tests of Door Assemblies	E.152
Fire Tests of Window Assemblies	E.163
American Welding Society 2501 N.W. 7th Street, Miami, Florida, 33125	AWS
Standard Qualification Procedure	B.3.0
Structural Welding Code - Steel	D.1.1
Specification for Welding Sheet Steel in Structures	D.1.3
Reinforcing Steel Welding Code	D.12.4
Standard for Qualification of Welding Procedures and Welders for Piping and Tubing	D.10.9
Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction	D.12.1
American Wood Preservers' Association 1625 Eye Street, N.W. Washington, D.C. 20006	AWPA

All Timber Products- Pressure Treatment (General Requirements)	C.1
Piles - Pressure Treatment	C.3
Plywood - Pressure Treatment	C.9
Piles and Timbers in Marine Construction, Pressure Treatment	C.18
Structural Lumber - Fire Retardant - Pressure Treatment	C.20
Structural Glued Laminated Members and Laminations Before Gluing - Pressure Treatment	C.28
American Wood Preserver's Bureau P. O. Box 6085 Arlington Virginia 22206	AWPB
Standard For Wood Treated for Salt Water Exposure	MLP
Architectural Aluminum Manufacturer's Association 35 East Wacker Drive, Chicago, Illinois, 60601	AAMA
Aluminum Prime Windows	A.134.1 ANSI/AAMA 302.9
Aluminum Sliding Glass Doors	A.134.1 ANSI/AAMA 402.9
Canadian Standards Association 178 Rexdale Boulevard Rexdale, Ontario Canada M9W 1R3	CSA
Canadian Electrical Code Part I	

Cast Iron Soil Pipe Institute 2029 K Street, N.W. Washington, D.C. 20006	CISPI
Hubless Cast-Iron Sanitary System With No Hub Pipe and Fittings	301
Neoprene Rubber Gaskets for Hub and Spigot Cast- Iron Soil Pipe and Fittings	HSN
Installation Suggestions for No Hub Pipe and Fittings	100 CISPI
Specifications for Rubber Gaskets for Cast-Iron Soil Pipe and Fittings	ASTM M 564
Standard Specifications for Cast-Iron Soil Pipe and Fittings	ASTM A.74
Gypsum Association 1603 Orrington Avenue, Evanston, Illinois, 60201	GA
Design Data - Fire Resistance	GA.600
National Bureau of Standards, Standards Development Services Section, Standards Application and Analysis Division, Washington, D.C. 20234	NBS
Plumbing Manual Basic	BMS
Basic Hardboard	PS 58
Structural Glued Laminated Timber	PS 56
Construction and Industrial Plywood	PS 1
American Softwood Lumber Standard	PS 20

National Fire Protection Association 470 Atlantic Avenue, Boston, Massachusetts 02110	NFPA
Installation of Portable Fire Extinguishers	10
Foam Extinguishing Systems	11
Carbon Dioxide Extinguishing Systems	12
Halogenated Fire Extinguishing Agent Systems, Halon 1301	12.A
Halogenated Extinguishing Agent Systems Halon 1211	12B
Installation of Sprinkler Systems	13
Installation of Standpipe and Hose Systems	14
Dry Chemical Extinguishing Systems	17
Installation of Centrifugal Fire Pumps	20
Water Tanks for Private Fire Protection	22
Flammable and Combustible Liquids Code	30
Installation of Oil Burning Equipment	31
Spray Finishing Using Flammable and Combustible Materials	33
Dip Tanks Containing Flammable or Combustible Liquids	34
Installation and Use of Stationary	37

Combustion Engines and Gas Turbines	
Storage and Handling of Cellulose Nitrate Motion Picture Film	40
National Fuel Gas Code	54
Storage and Handling of Liquefied Petroleum Gas	58
Liquefied Petroleum Gases at Utility Gas Plants	59
Central Station Protection Signalling Systems	71
Local Protective Signalling for Watchman, Fire Alarm and Supervisory Service	72.A
Auxiliary Protective Signalling Systems for Fire Alarm Service	72.B
Remote Station Signalling Systems	72.C
Proprietary Signalling Systems	72.D
Automatic Fire Detectors	72.E
Household Fire Warning Equipment	74
Fire Doors and Windows	80
Protection of Buildings from Exterior Fire Exposure	80.A
Clearance for Heat Producing Appliances	89.M
Installation of Air Conditioning and Ventilating System (Non-residential)	90.A
Installation of Residential	90.B

Warm Air Type Heating and Airconditioning Systems

Blower and Exhaust Systems	91
Removal of Smoke and Grease- Laden Vapours from Commercial Cooking Equipment	96
Life Safety Code ®	101®
Tents and Grandstands Used for Places of Assembly	102
Smoke and Heat Venting Guide	204
Water Cooking Towers	214
Fire Tests Door Assemblies	252
Test for Critical Radiant Flux of Floor Covering System	253
Building Materials, Tests of Surface Burning Characteristics	255
Fire Protection for Marinas and Boat Yards	303
Flame Resistant Textiles and Films	701
Public Fire Service Communications	1221
National Forest Products Association 1619 Massachusetts Avenue, Washington D.C. 20036	N For PA
National Design Specifications For Wood Construction	
Wood Structural Design Data	
Timber Construction Details	

Span Tables for Joists and Rafters	
Working Stresses for Joists and Rafters	
Steel Joists Institute 2001 Jefferson Davis Highway, Arlington, Virginia, 22202	SJI
Standard Specification for Longspan Steel Joists and Deep Longspan Steel Joists	LH & DLH Series
Standard Specifications for Open Web Steel Joists	H Series Joists
Standard Specification for Joist Girders	
Truss Plate Institute Inc. 7100 Baltimore Avenue College Park, Maryland 20740	TPI
Design Specification for Metal Plate Connected Wood Trusses	
Underwriters Laboratories, Inc. 207 E Ohio Street, Chicago, Illinois, 60611	UL
U L Fire Protection Equipment List	
U L Building Materials Directory	
U L Fire Resistive Index	
Materials for Built-Up Roof Coverings	55.A
Class C Asphalt Organic-Felt Sheetroofing and Shingles	55.B
Standard for Smoke Detectors, Photoelectric Type for	168

Fire Protective Signalling
System

Standards for Safety, Household
Electric Storage Tank
Water Heaters

174-Rev

Standards for Safety Single
and Multiple Station
Smoke Detectors

217

Test Methods for Fire Resistance
of Roof Covering Materials

790

APPENDIX B

MINIMUM STANDARD DRAWINGS: Drawings on the succeeding pages represent a basic guide to the minimum acceptable requirements for frequently used systems or equipment. Included are the following standards:

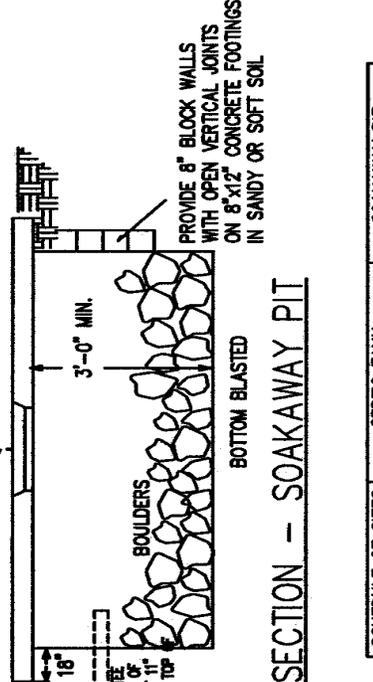
1. Minimum Standard - Septic Tank and Soakaway Pit
2. Minimum Standard - Septic Tank and Disposal Well
3. Minimum Standard - Drainfields
4. Typical "Flat" Drainage System
5. Typical "Flat" Drainage System
6. Typical "Vertical" Drainage System
7. Typical Duplex Drainage System
8. Minimum Standard - Rainwater Storage Tanks
9. Minimum Standard - Disposal Well
10. Minimum Standard - Potable Supply Well
11. Gas and Oil Interceptor
12. Minimum Standard - Manhole
13. Minimum Standard - Water Meter Connection
14. Minimum Standard - Grease Trap

APPENDIX B

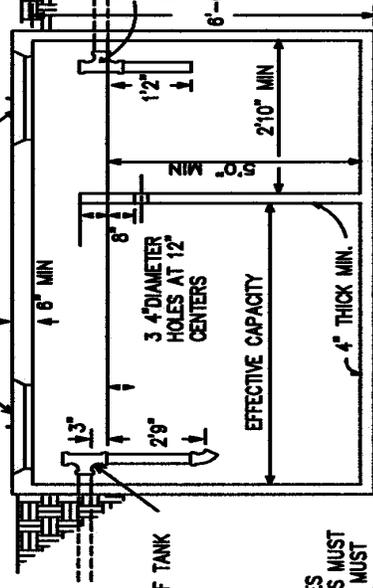
NOTE:
LOCATION OF SEPTIC TANK ON PLOT WITH RESPECT TO DWELLING HOUSE AND ADJACENT BUILDINGS MUST BE APPROVED BY THE MINISTER OF HEALTH AND ADDITIONAL DRAINAGE FIELD INSTALLED IF SO REQUIRED.

18"x24" MANHOLE WITH WATERTIGHT BUT EASILY REMOVABLE COVER WITH RING BOLT HANDLE

18"x24" MANHOLE WITH WATERTIGHT BUT EASILY REMOVABLE COVER WITH RING BOLT HANDLE



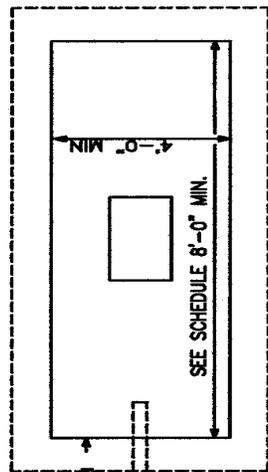
SECTION - SOAKAWAY PIT



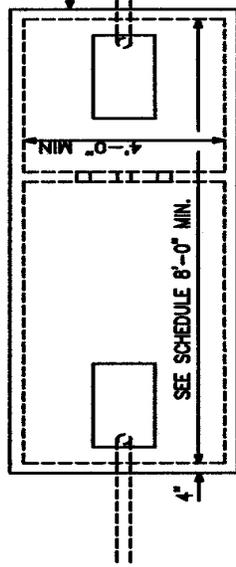
SECTION - SEPTIC TANK

NOTE:
COVERS ON MAN HOLES AND INSPECTION HOLES MUST BE WATER TIGHT, BUT MUST BE EASILY REMOVABLE.

SCHEDULE OF SIZES	SEPTIC TANK	SOAKAWAY PIT
ONE BATHROOM	8'-0" X 4'-0" X 6'-0"	8'-0" X 4'-0" X 3'-0"
TWO BATHROOMS	9'-0" X 4'-0" X 6'-0"	9'-0" X 4'-0" X 3'-0"
THREE BATHROOMS	10'-0" X 4'-0" X 6'-0"	10'-0" X 4'-0" X 3'-0"
FOUR BATHROOMS	12'-0" X 4'-0" X 6'-0"	12'-0" X 4'-0" X 3'-0"



PLAN SOAKAWAY PIT

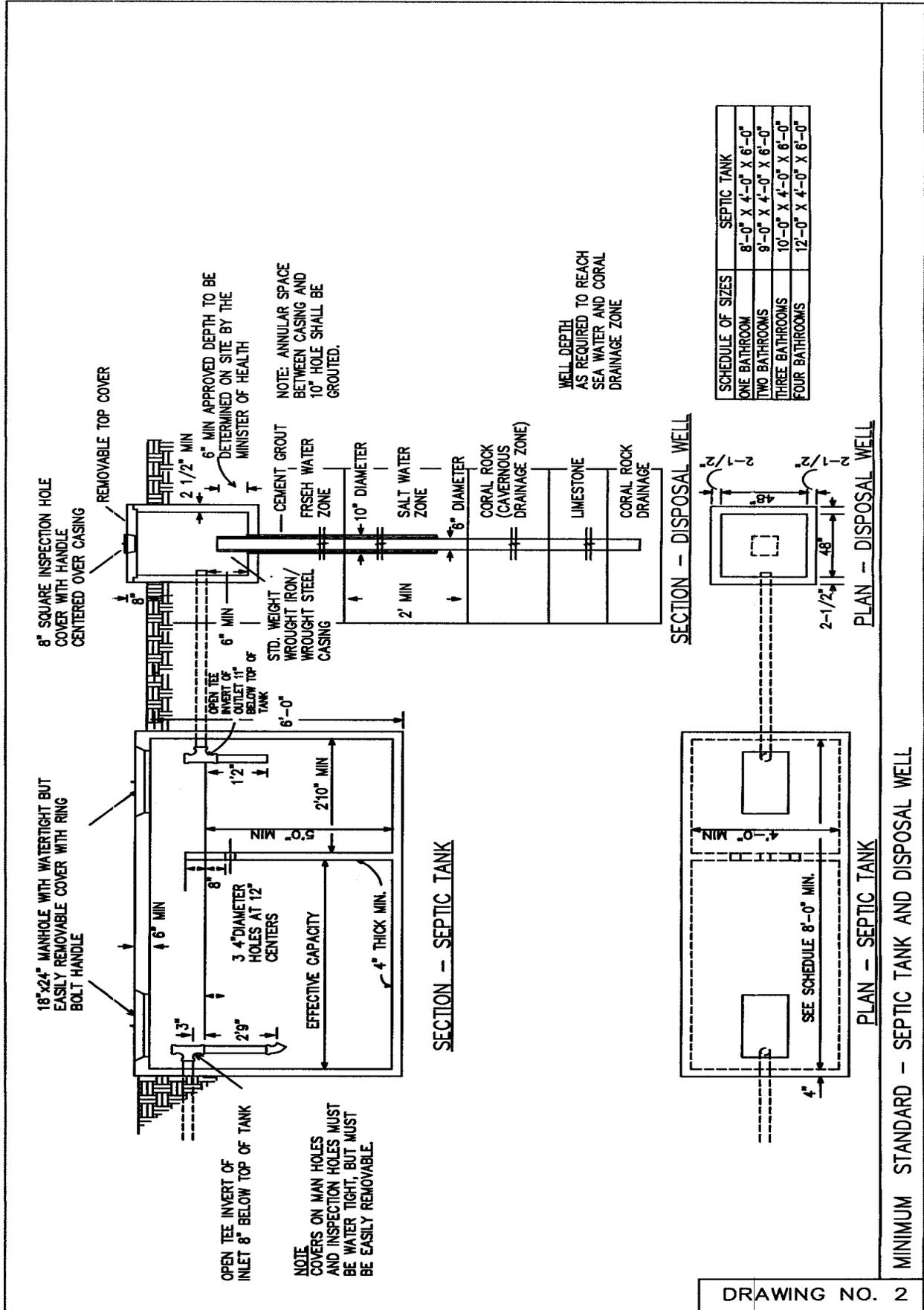


PLAN - SEPTIC TANK

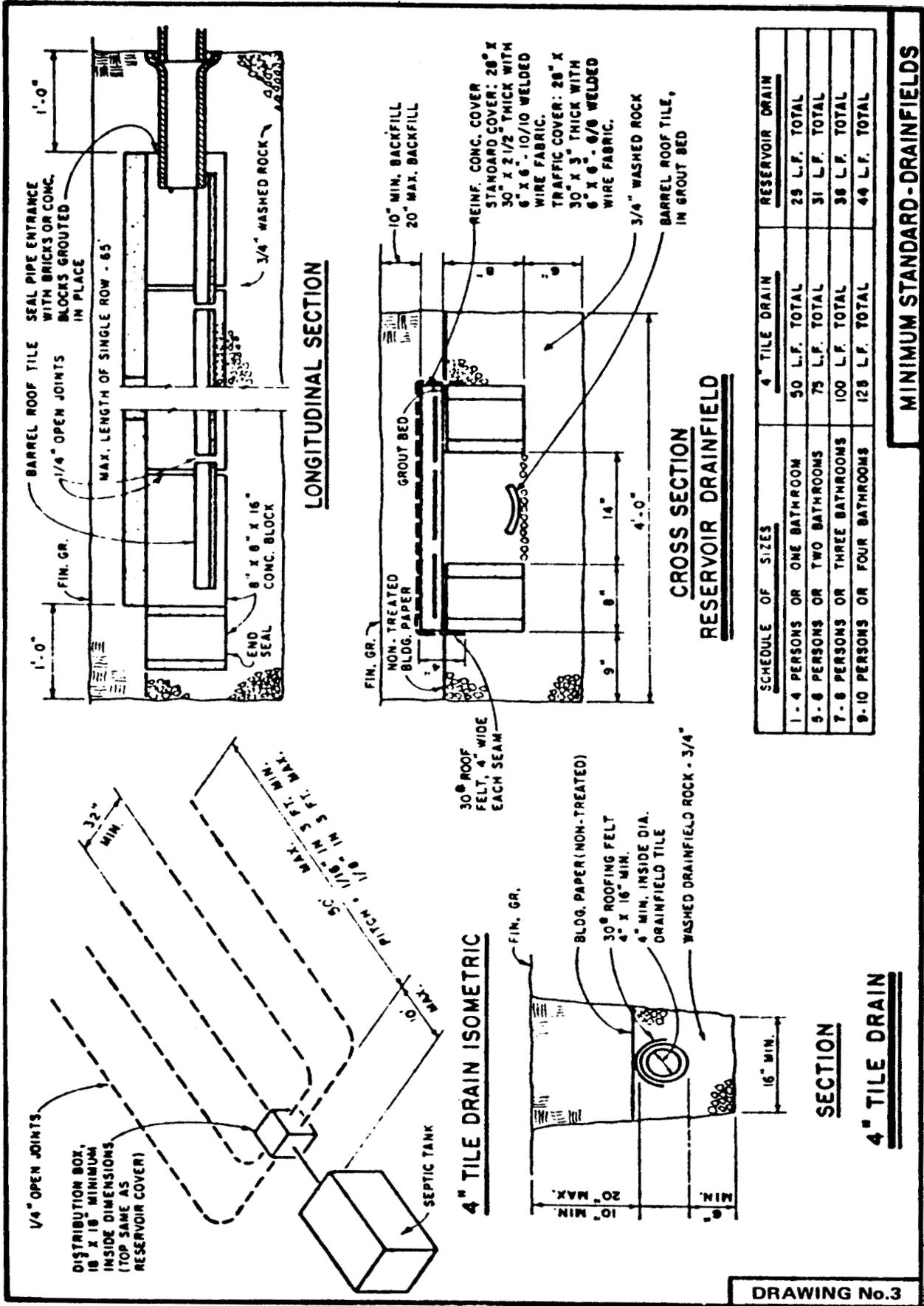
MINIMUM STANDARD - SEPTIC TANK AND SOAKAWAY PIT

DRAWING NO. 1

APPENDIX B

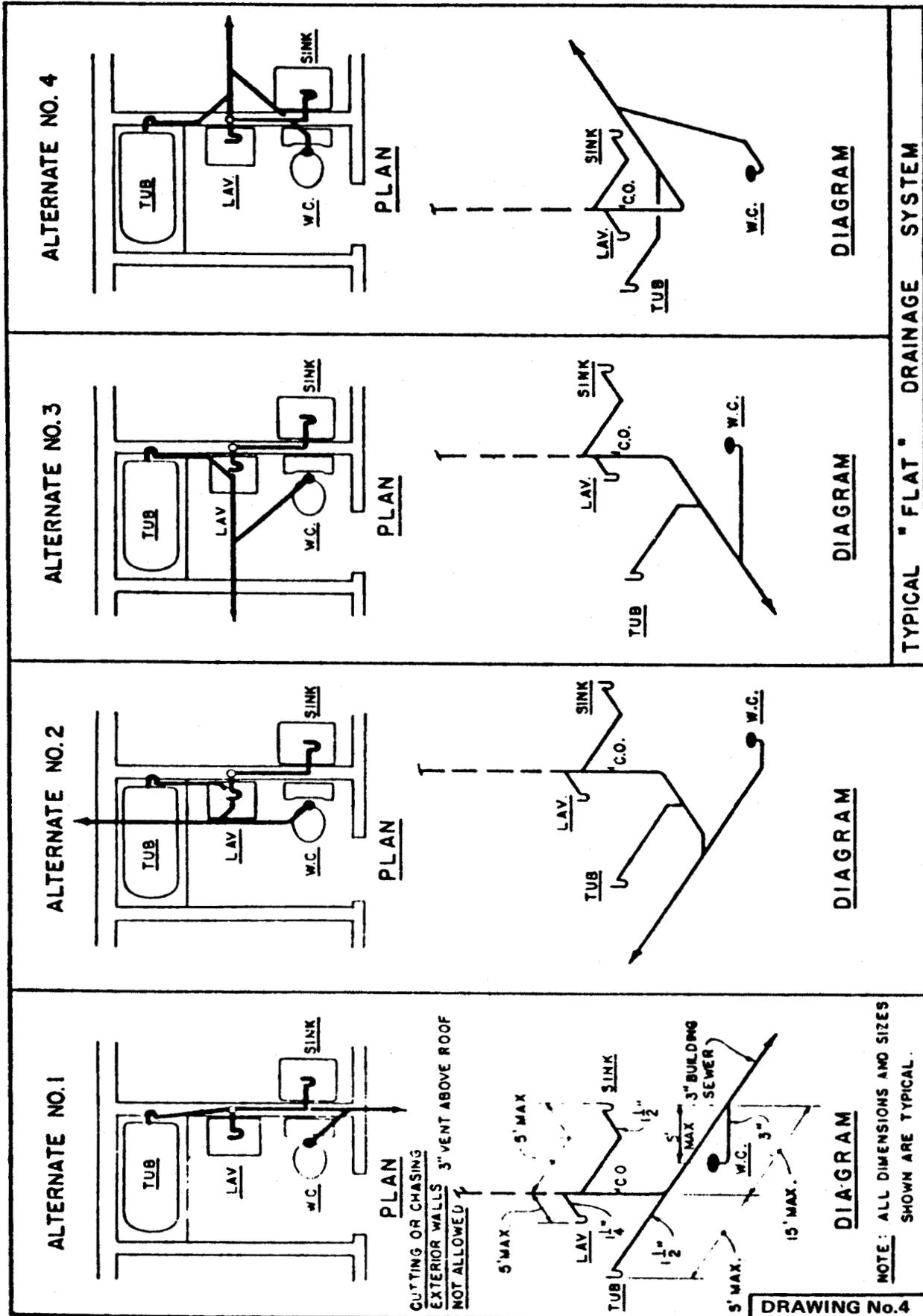


APPENDIX B

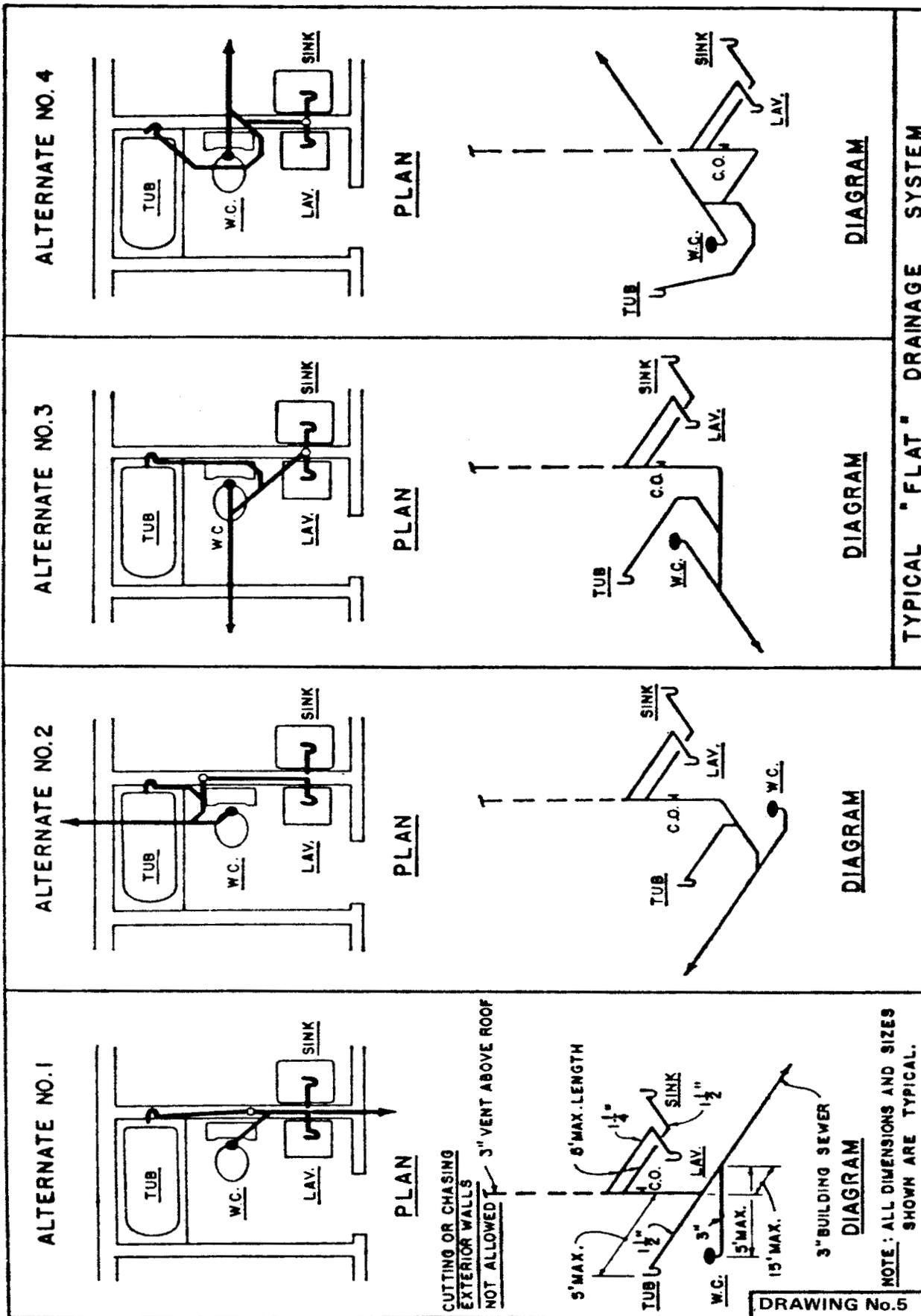


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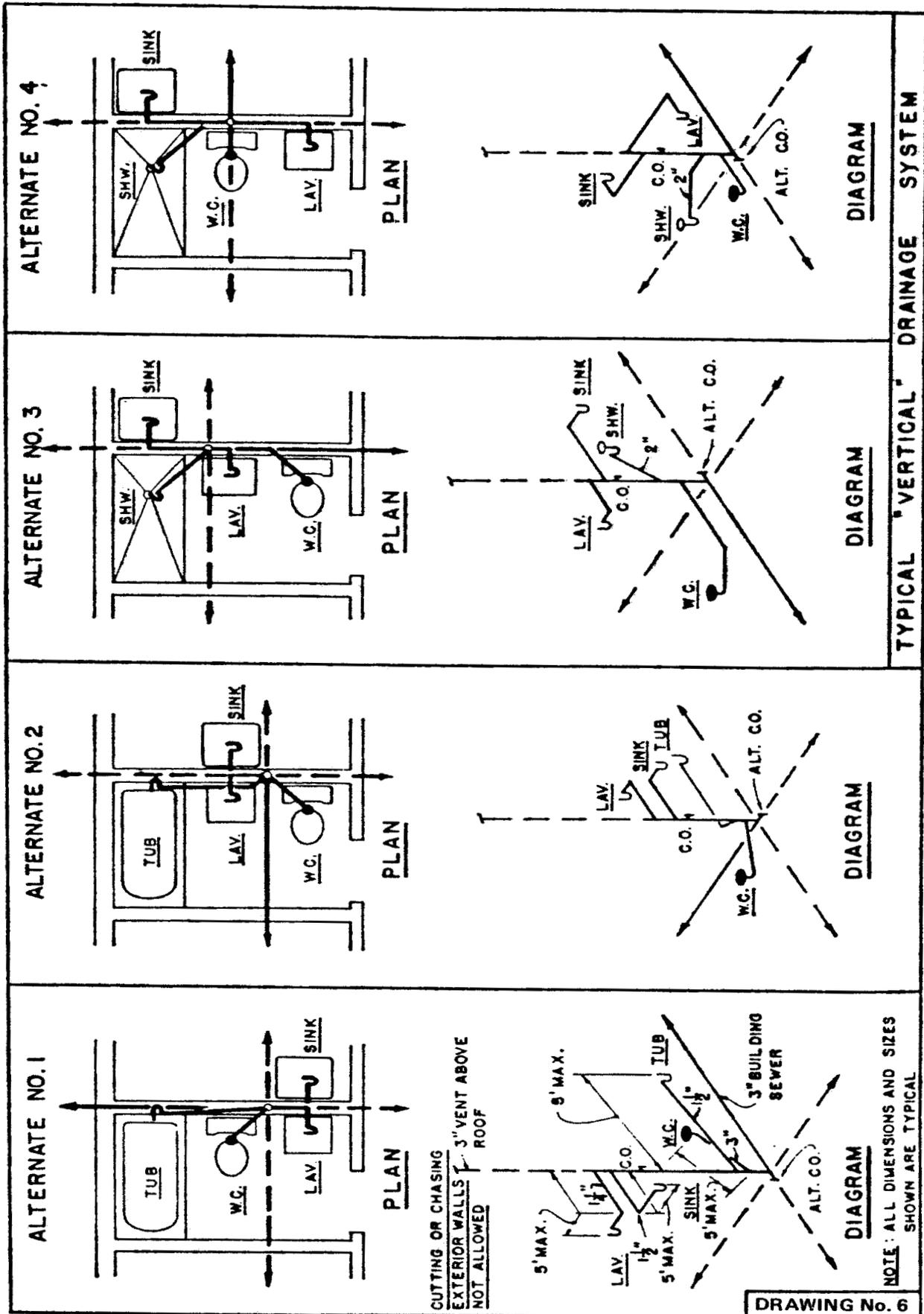
APPENDIX B



APPENDIX B

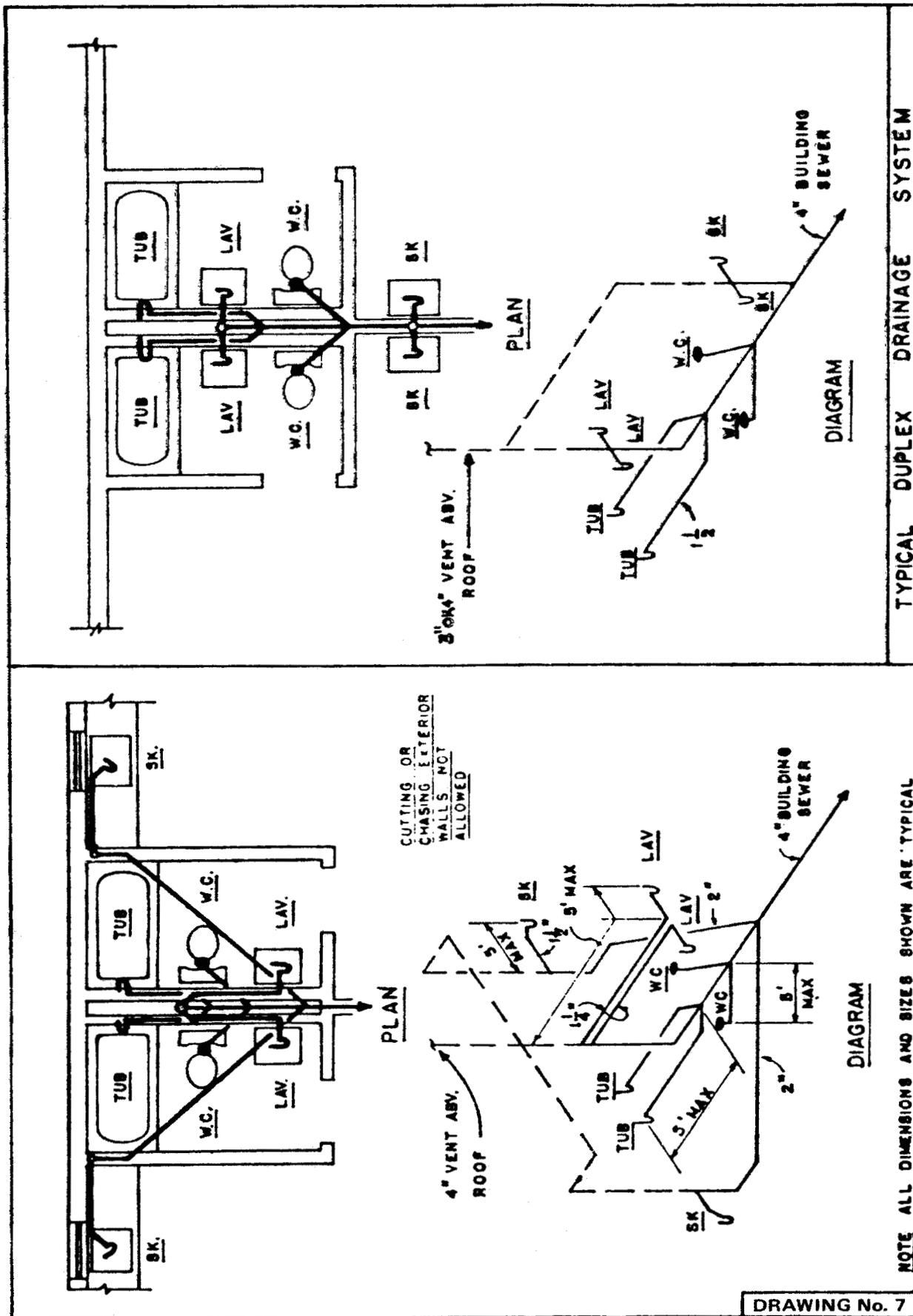


APPENDIX B

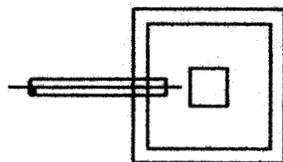


TYPICAL "VERTICAL" DRAINAGE SYSTEM

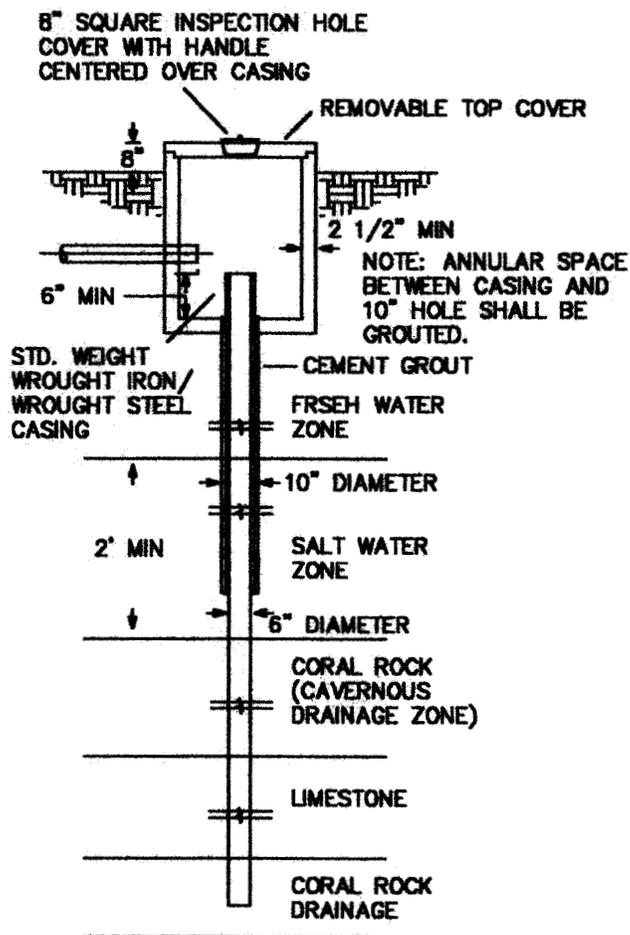
APPENDIX B



APPENDIX B



PLAN - DISPOSAL WELL

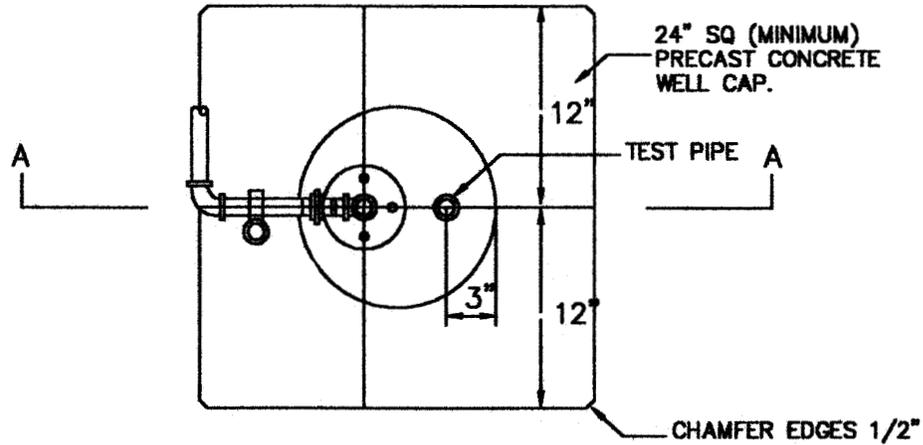


SECTION - DISPOSAL WELL

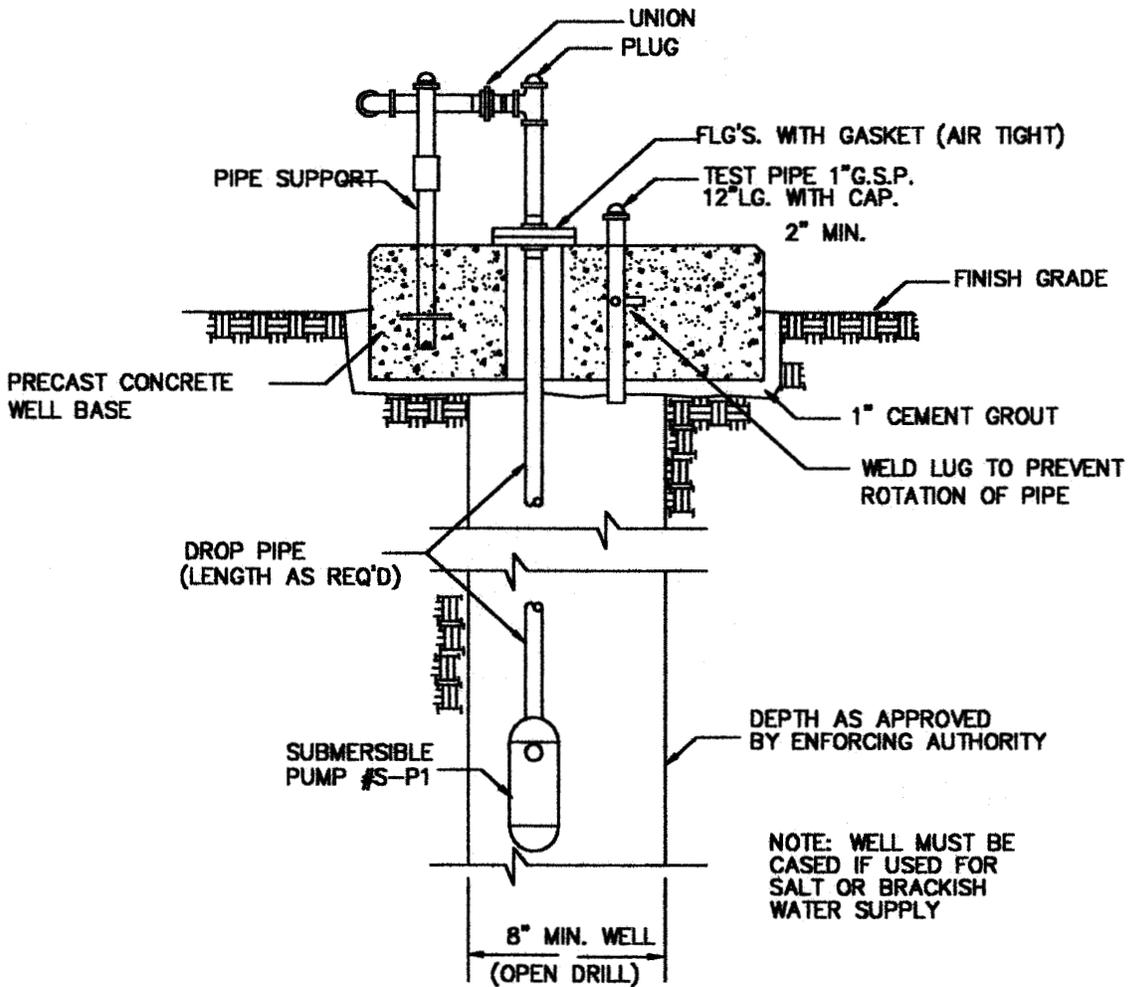
MINIMUM STANDARD - DISPOSAL WELL

DRAWING NO. 9

APPENDIX B



PLAN - WELL CAP



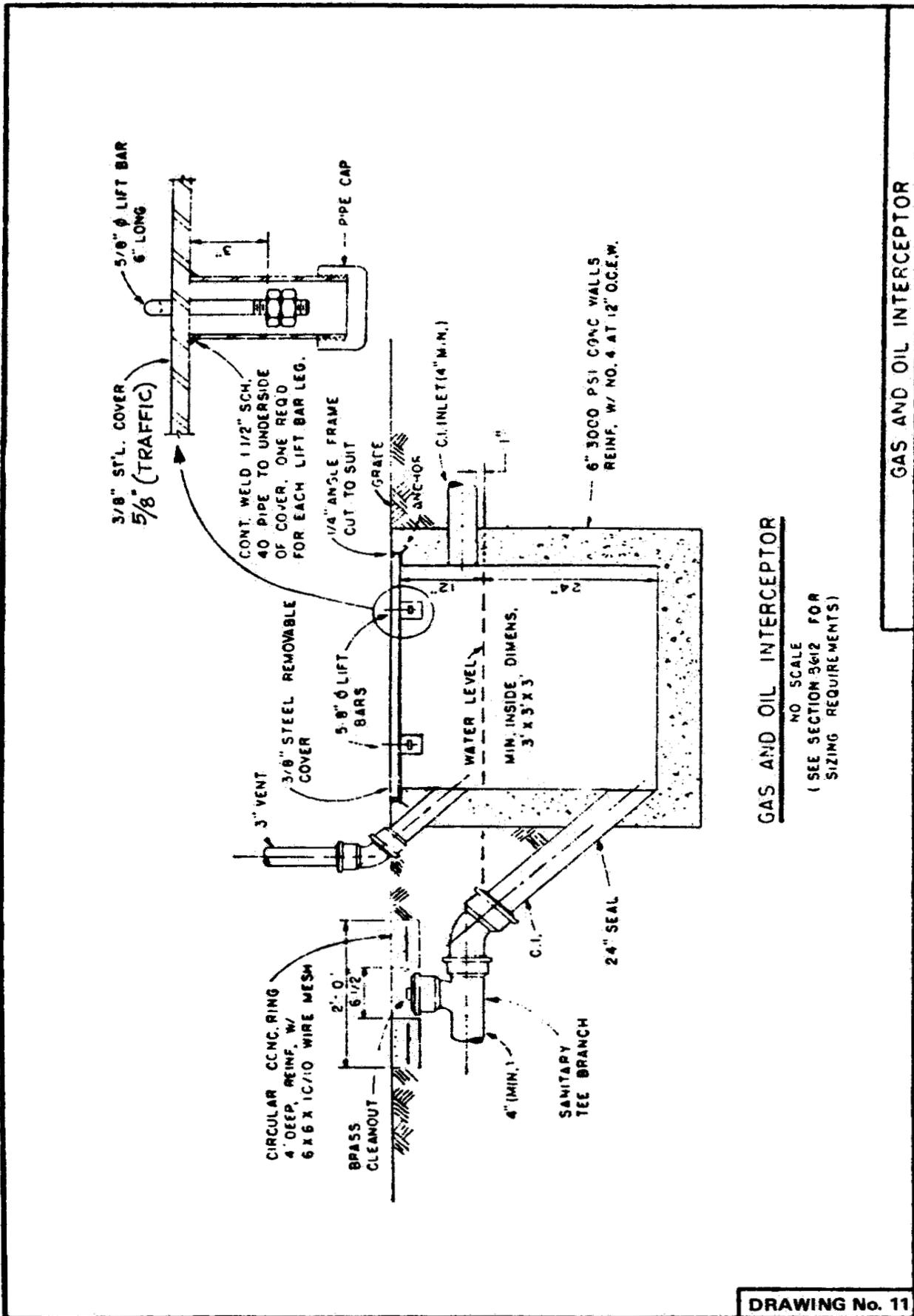
SECTION A-A

SUPPLY WELL (TYPICAL)

MINIMUM STANDARD - POTABLE SUPPLY WELL

DRAWING NO. 10

APPENDIX B



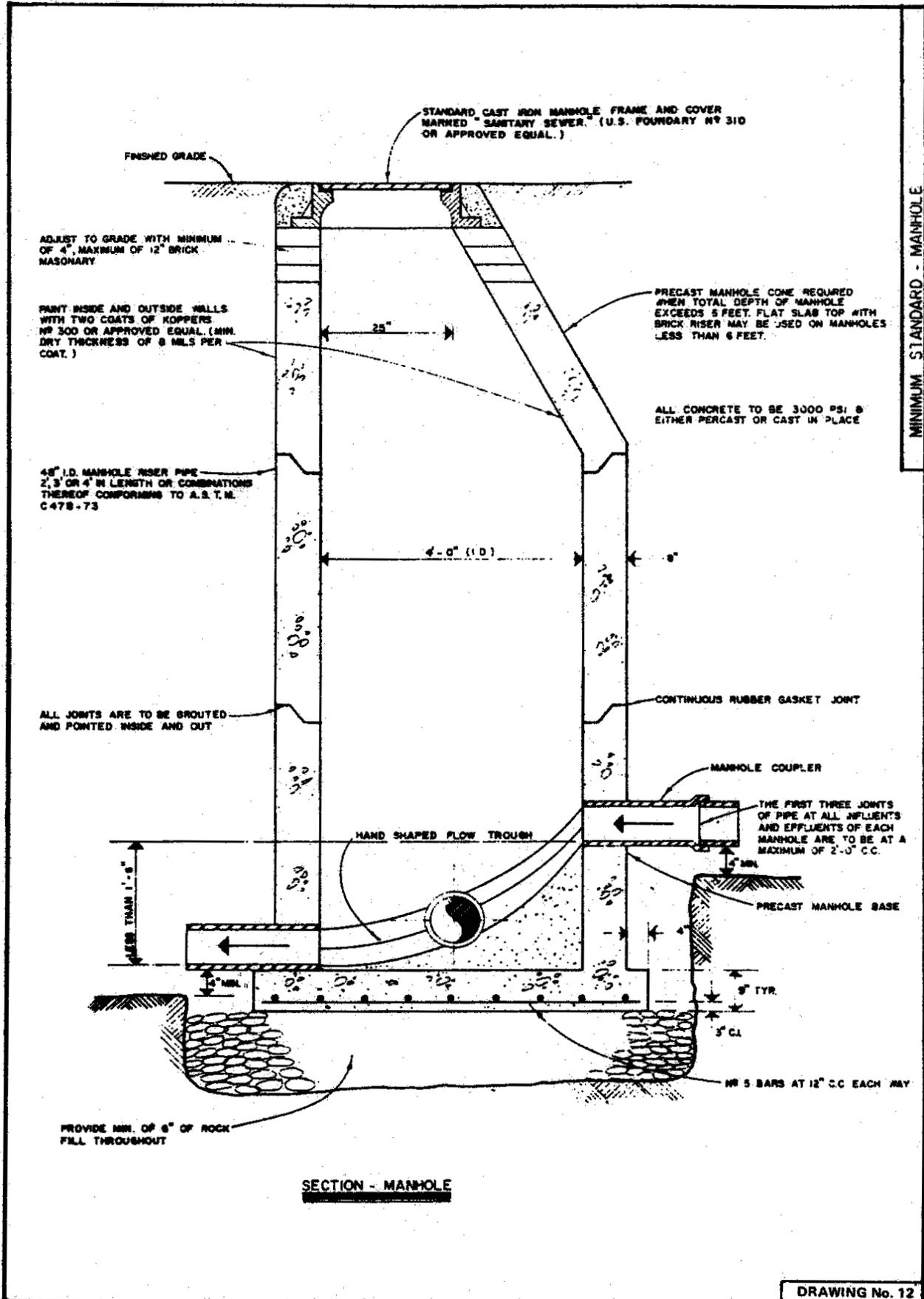
GAS AND OIL INTERCEPTOR

NO SCALE
 (SEE SECTION 3612 FOR
 SIZING REQUIREMENTS)

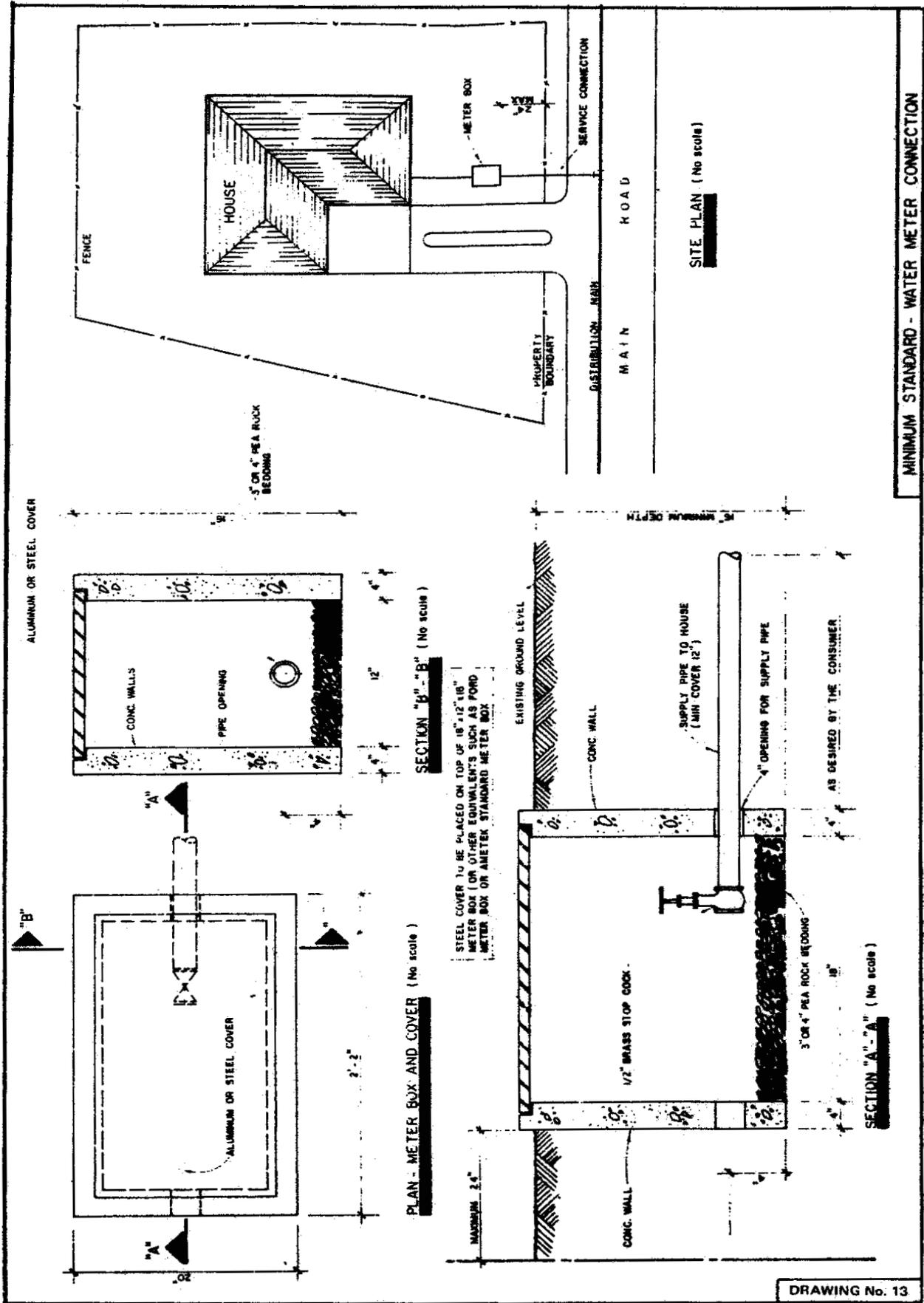
GAS AND OIL INTERCEPTOR

DRAWING No. 11

APPENDIX B



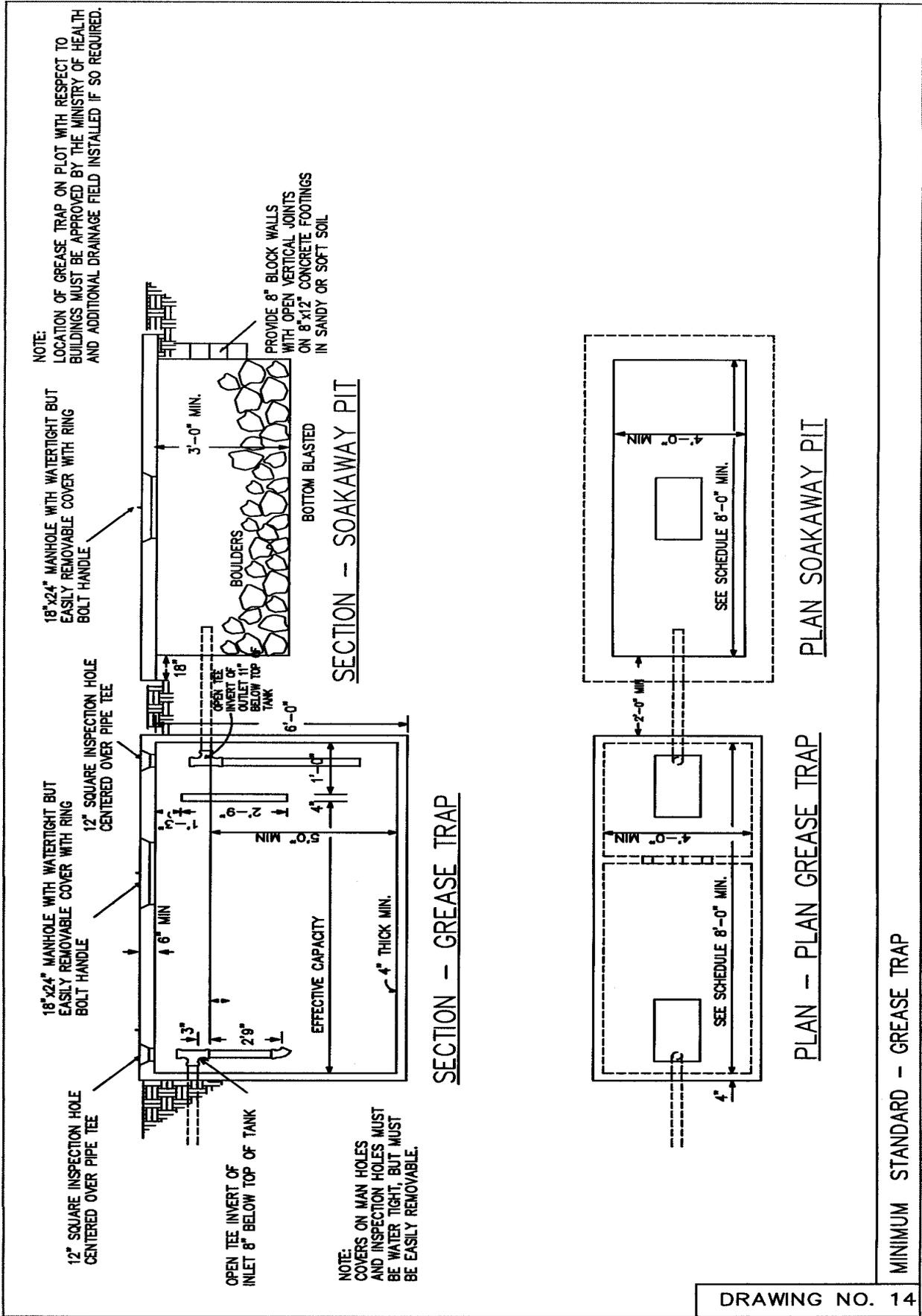
APPENDIX B



MINIMUM STANDARD - WATER METER CONNECTION

DRAWING No. 13

APPENDIX B

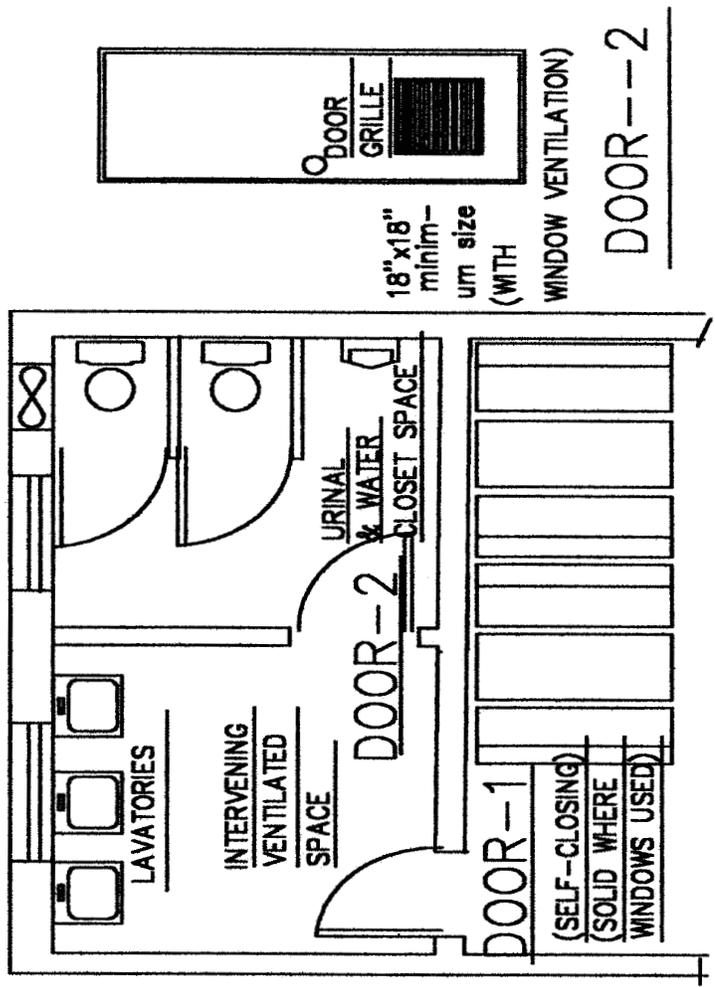


NOTES

APPENDIX C

This appendix relates to the provision of an intervening ventilated space (I V S) between a public area and the water closet/urinal space.

windows vent fan see notes



WINDOWS FOR NATURAL LIGHT & VENTILATION SHOULD ALWAYS BE INSTALLED WHEN POSSIBLE

NOTATIONS

- 1 WINDOWS, WHOSE MINIMUM SIZE SHALL BE 15% OF THE FLOOR AREA, SHALL BE INSTALLED WHEN POSSIBLE, WINDOWS SHALL BE AT LEAST ONE-HALF OPERABLE, AND LOCATED AS HIGH AS POSSIBLE
- 2 WHEN WINDOWS CANNOT BE INSTALLED, A COMMERCIAL TYPE VENT, FAN WITH AUTOMATIC WEATHER LOUVERS & SAFETY SCREENS, SHALL BE PROVIDED.
- 3 VENT FAN CAPACITY SHALL BE BASED ON A MINIMUM 1/4-INCH H2O STATIC PRESSURE WITH AN AIR FLOW SUFFICIENT TO PROVIDE A THREE (3) / W. C. COMPARTMENT & A FOUR (4) MINUTE CHANGE IN THE I. V. S.
- 4 BOTH DOORS 1 & 2 SHALL HAVE GRILLES (SIZED FOR 500 FT/MIN. MAX. VELOCITY) WHEN FAN IS USED.

PARTIAL FLOOR PLAN
PUBLIC SANITARY FACILITIES

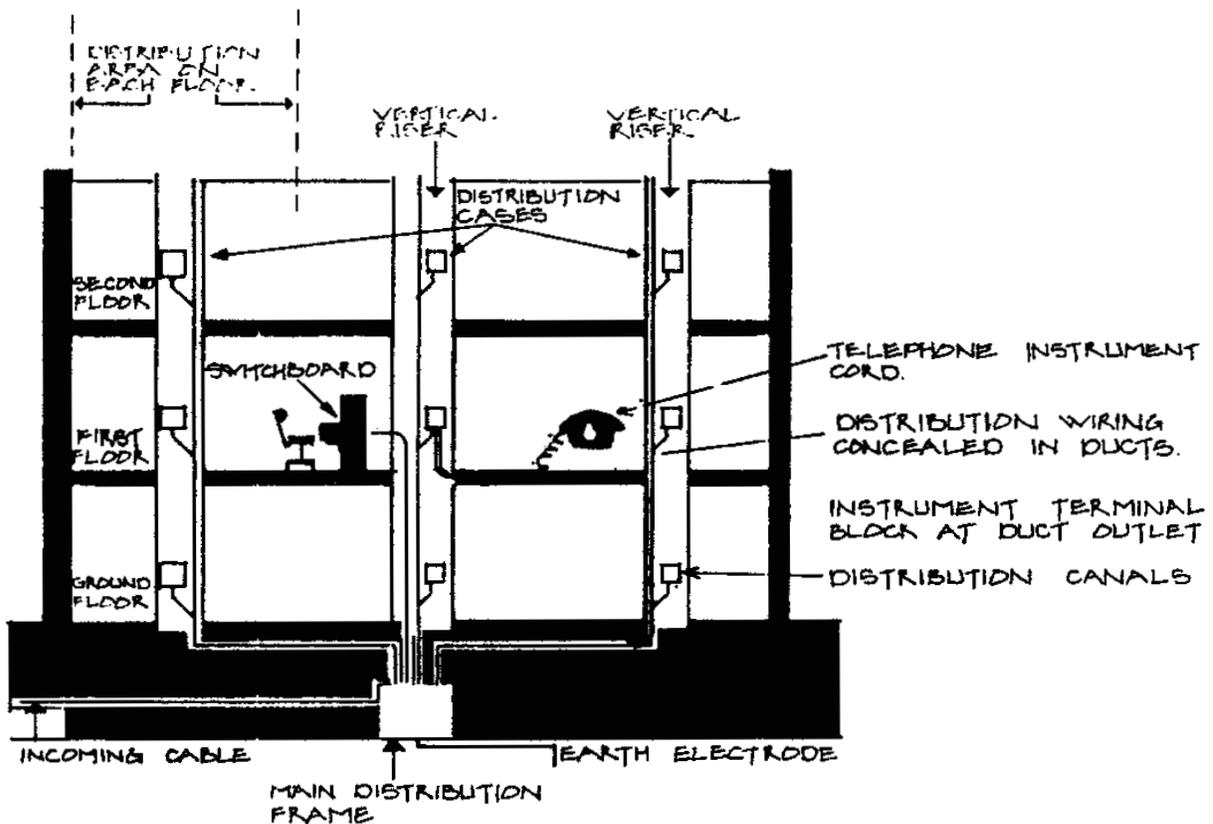
MINIMUM STANDARDS - VENTILATION OF PUBLIC SANITARY FACILITIES

APPENDIX D

This appendix has been included at the request of Batelco to facilitate the installation of telephone services in new buildings.

APPENDIX D

FIGURE 1: WHICH ILLUSTRATES A CABLE LAYOUT THAT IS FREQUENTLY USED WILL GIVE AN UNDERSTANDING OF THE LOCATION OF THE VARIOUS ITEMS OF APPARATUS MENTIONED IN THE TEXT.

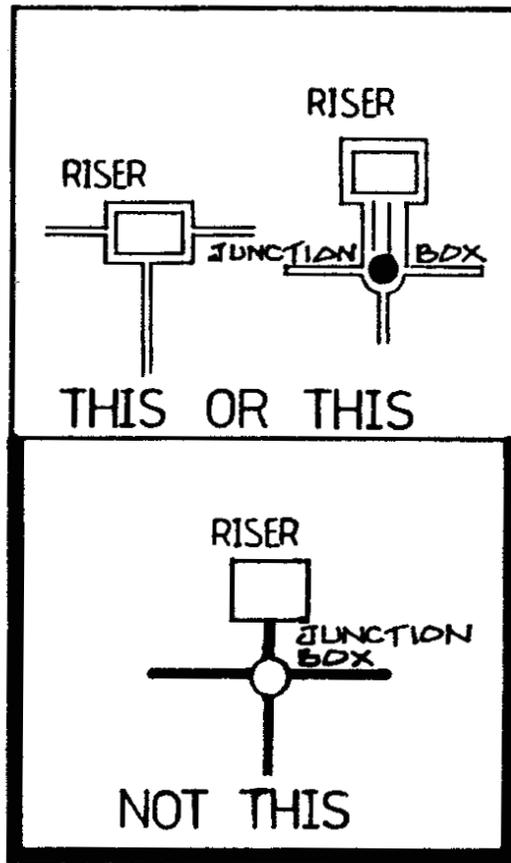


DIAGRAMMATIC ARRANGEMENT OF CABLES AND APPARATUS IN A LARGE BUILDING.

A COMMON TELECOMMUNICATION EARTH WIRE SHOULD ALSO BE DISTRIBUTED THROUGHOUT THE BUILDING ALONG WITH THE CABLING.

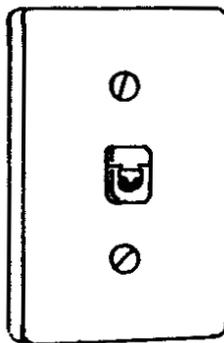
APPENDIX D

FIGURE 2.



DUCTS RUNNING FROM A RISER

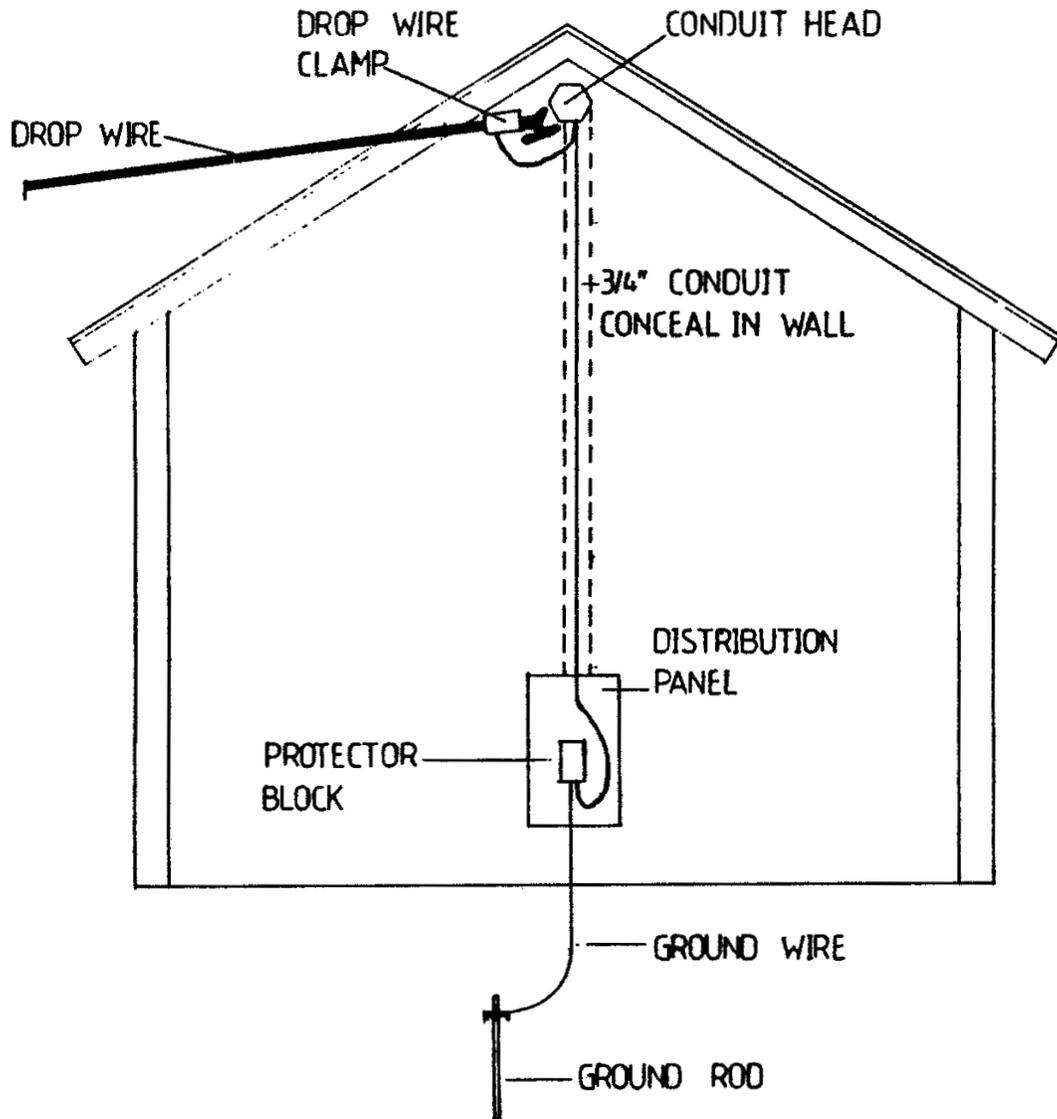
FIGURE 3.



TYPE 1

APPENDIX D

FIGURE 4



APPENDIX E

This appendix has been prepared by the Hydrologists in the Ministry of Works and Utilities to facilitate the design of rainwater tank capacities.

INTRODUCTION

Charts of required rainwater storage in U.S. gallons and U.S. gallons/square feet of roof area versus reliability and demand were generated for roof catchment areas of 750, 1,200 and 2,500 square feet, for three areas of The Bahamas.

The weekly demands in U.S. gallons/week used in the simulation exercise, and displayed on the charts, were selected to maximize the roof catchment potential. Weekly demands less than the lowest demand on the charts are easily met by the system. Weekly demands greater than the highest, shown in the charts, are not easily met by the system, or will be met at a lower reliability than that indicated. In this case consideration should be given to the installation of a brackish supply for toilet flushing purposes or of increasing the catchment area.

This analysis was intended for use as a general set of guidelines in the design of a Rainwater catchment and cistern system. It is recommended that the Government Hydrologist (Family Island Division, Ministry of Works and Utilities) be contacted if a more extensive analysis or evaluation is required.

Sizing of rainwater (cistern) tanks based on a 10 year rainfall simulation exercise for The Bahamas.

1. GENERAL COMMENTS

- (A) 10 year rainfall data for The Bahamas(1974 to 1983) provided by the Meteorological Department has been used in this simulation exercise. Green Turtle Cay was used to represent the Northern Bahamas, New Providence (the Nassau International Airport) represents the Central Bahamas and Matthew Town, Inagua represents the Southern Bahamas.
- (B) Reliability is defined here as the percentage of the 10 year simulation period that the system meets the demand placed on it. For example a reliability of 90% indicates that over a 10 year period, the system will meet the demand 90% of the time and fail or not meet the demand 10% of the time.
- (C) The reliability of the system is based on the number of failures (defined as no water) over the entire 10 year simulation period. Excess water or spills are not considered in the reliability calculations.
- (D) Alternate supply sources (eg: Public supplies or brackish supplies) are not considered.
- (E) Only system reliabilities of 50 to 95% are considered over a ten year period.
- (F) Required Storages between 1 and 30 (US gallon/sq. ft of roof area) were considered.
- (G) All volumes are in U.S. gallons.

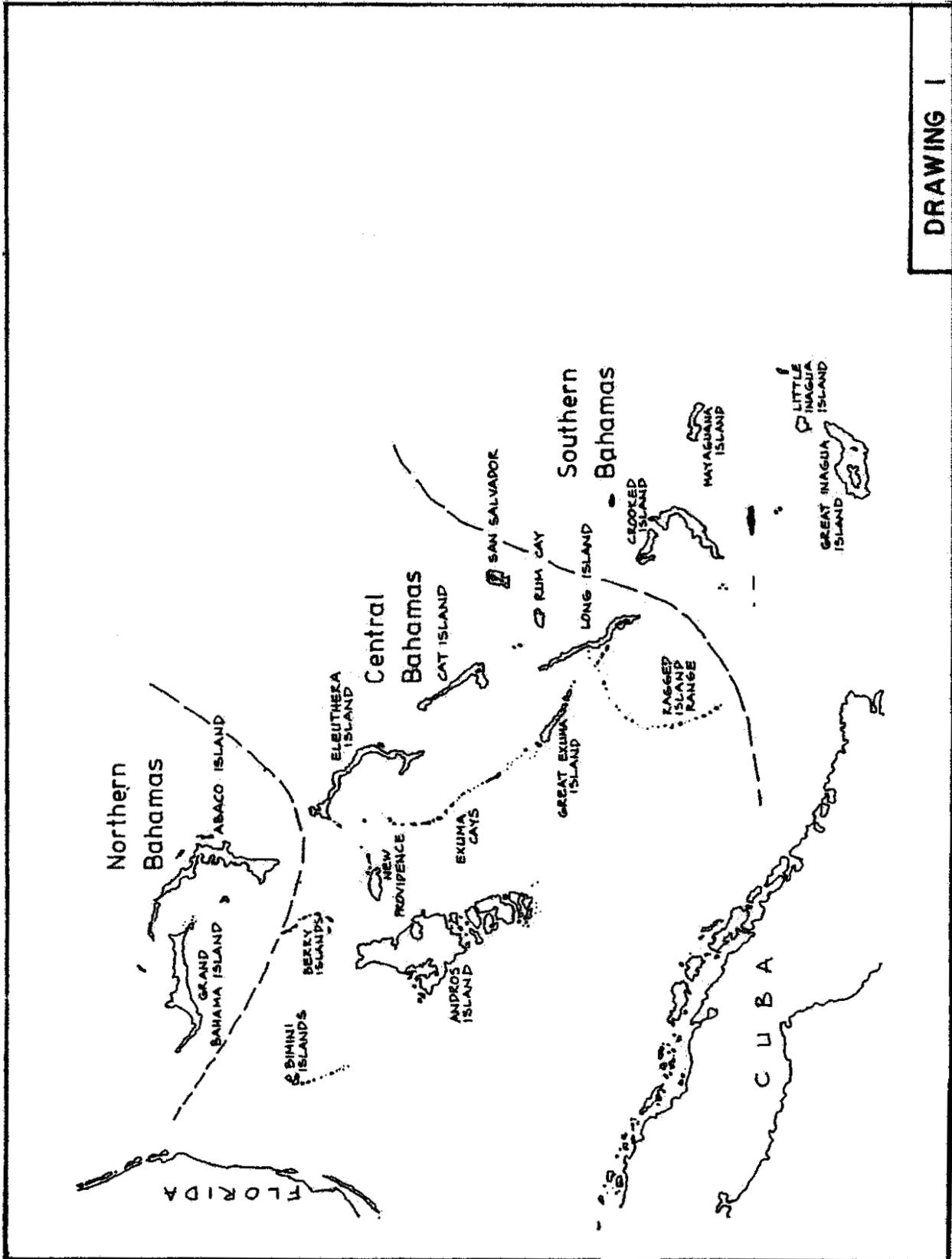
2. ASSUMPTIONS

- (A) The rainwater tank (or cistern) was assumed to be full at the beginning of the 10 year simulation exercise.
- (B) A roof catchment efficiency of 75% was assumed.
- (C) The weekly demand on the system is assumed to be constant.

3. HOW TO USE THE CHARTS

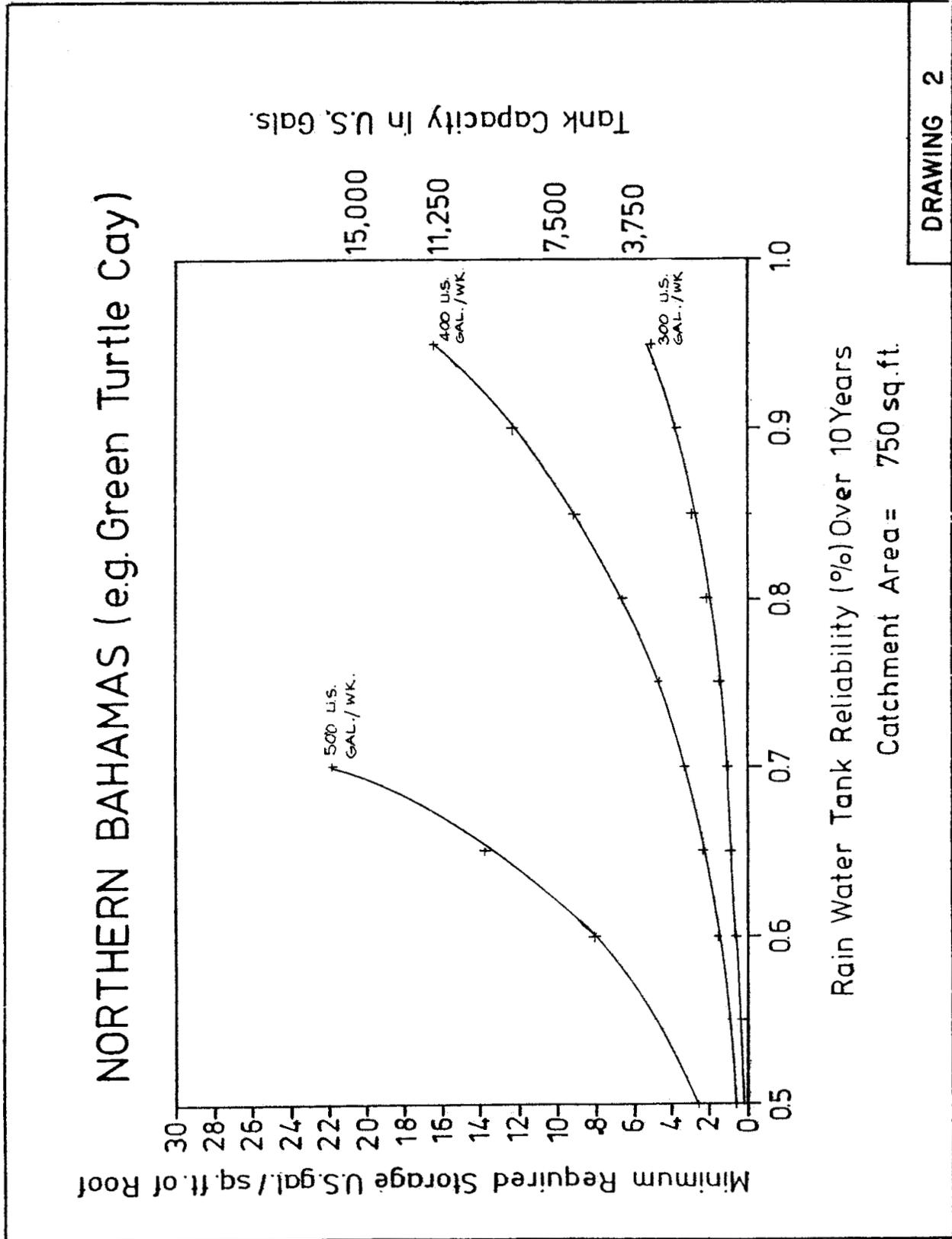
- (1) Select the general zone (i.e. Northern, Central or Southern Bahamas).
- (2) Select the charts of catchment area that is closest to the gross square foot area of the structure. Note that in two storied structures only the roof plan area should be considered.
- (3) Determine the weekly demand in U.S. gallons/week for the residence.
- (4) Determine the economically desired reliability of the system.
- (5) Plot the required storage in U.S. gallons/sq. ft. of roof area (left axis), or, tank size in U.S. gallons (right axis) by:
 - (i) drawing a vertical line through the required reliability (%) over 10 years and the weekly demand in U.S. gallons/wk,
 - (ii) drawing a line at right angles to the first line in (i),
 - (iii) reading off the required storage (in U.S. gallons/sq. ft.) on the left side and the tank size in U.S. gallons along the axis of the right side.

APPENDIX E



DRAWING I

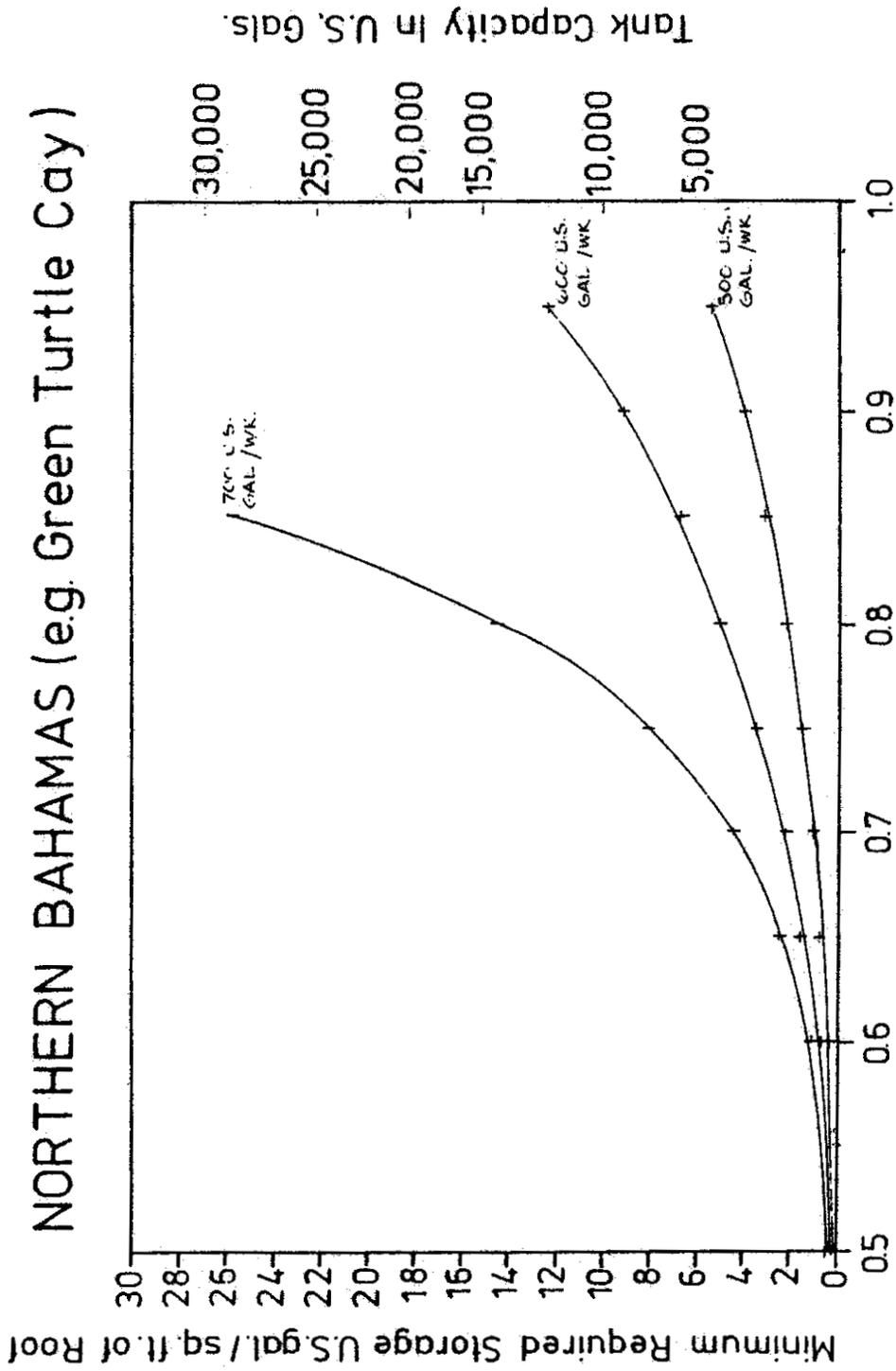
APPENDIX E



DRAWING 2

APPENDIX E

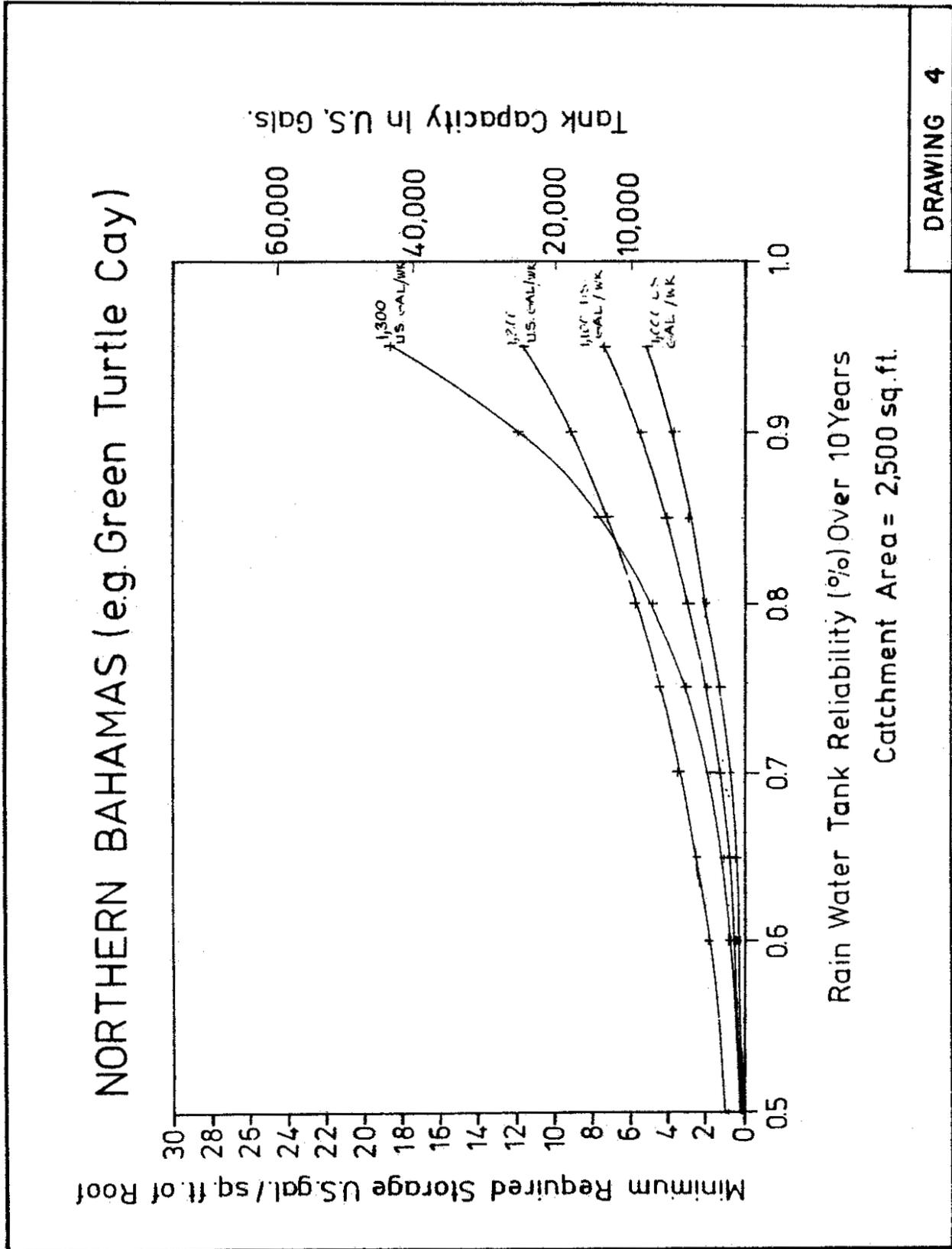
NORTHERN BAHAMAS (e.g. Green Turtle Cay)



Rain Water Tank Reliability (%) Over 10 Years
 Catchment Area = 1,200 sq.ft.

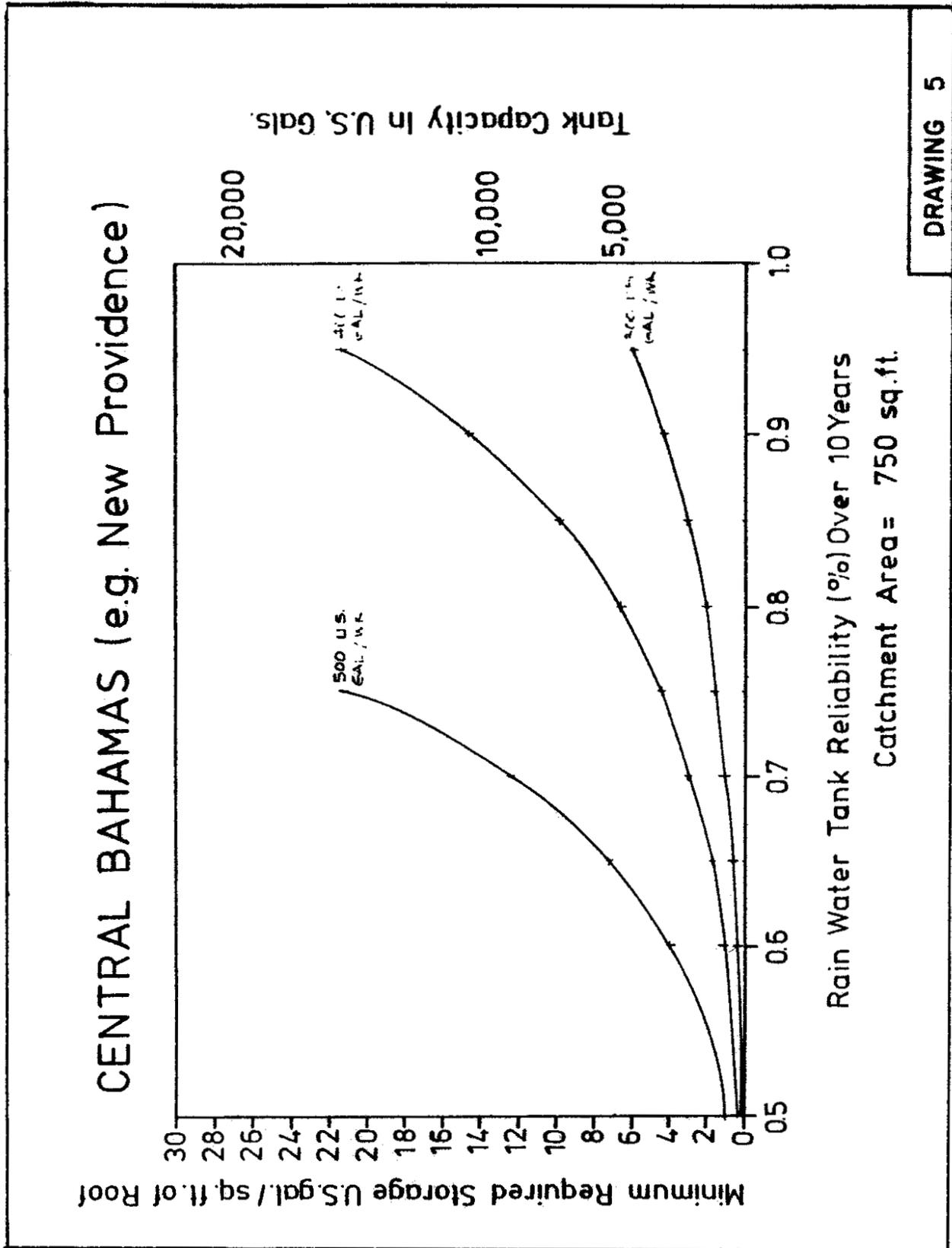
DRAWING 3

APPENDIX E

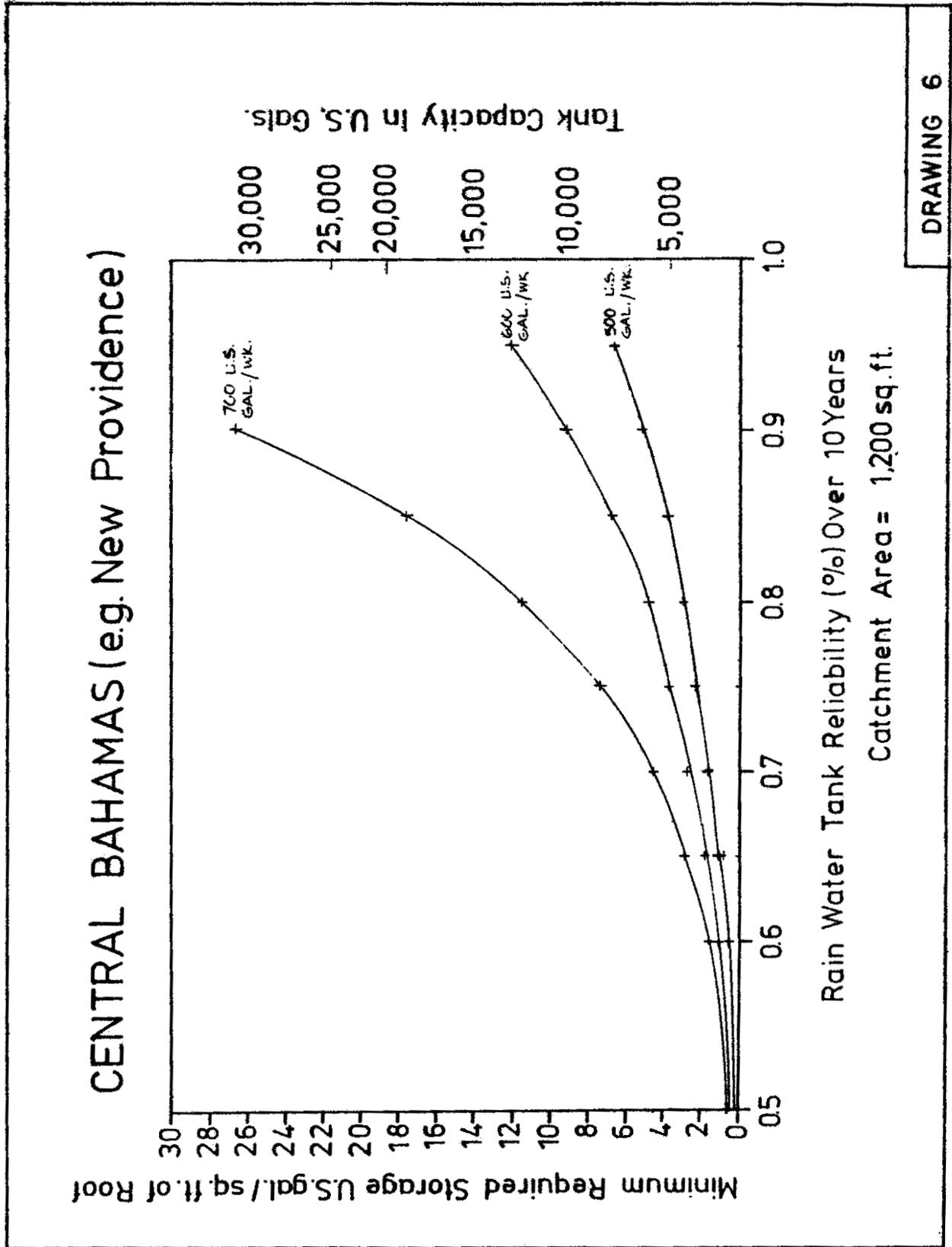


DRAWING 4

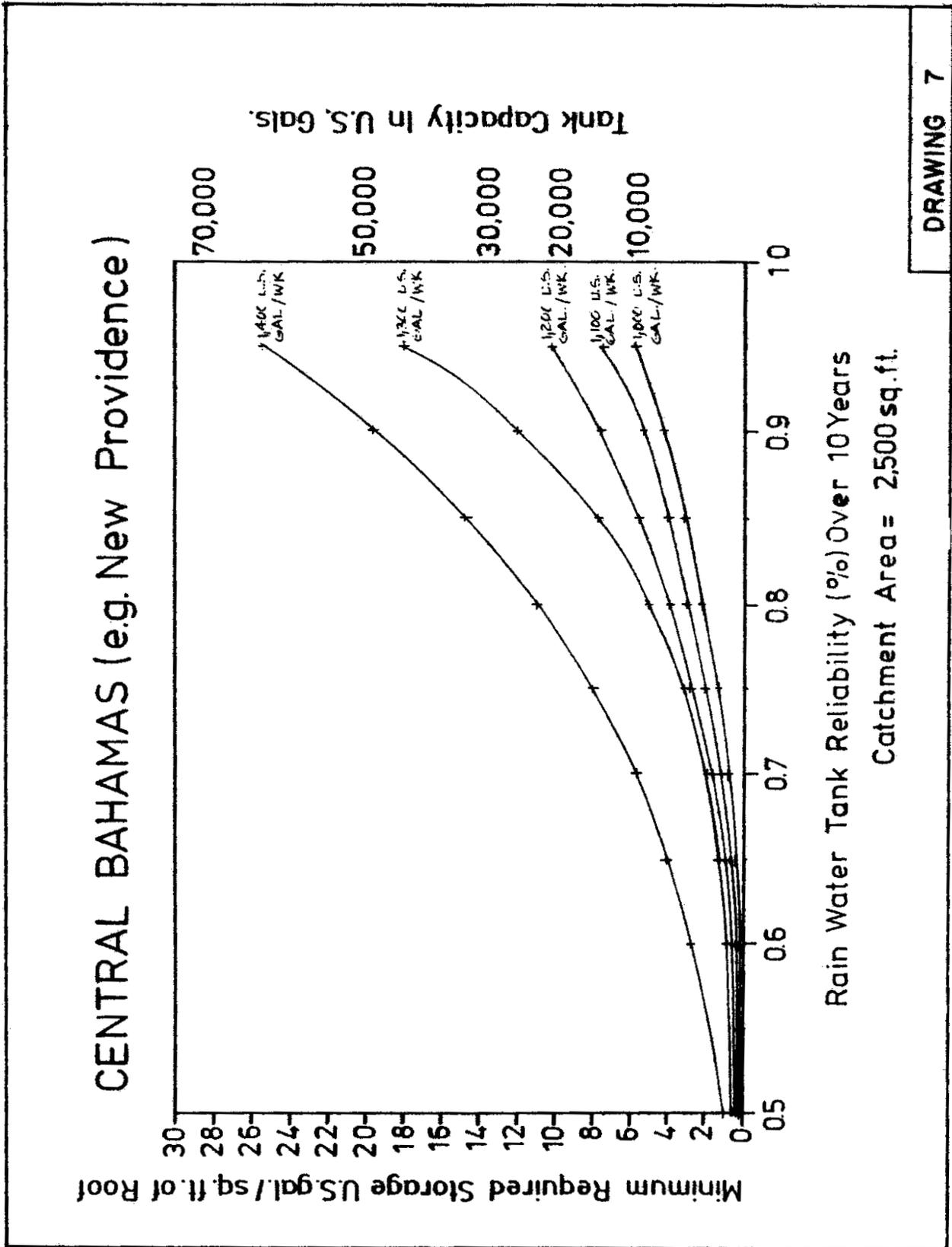
APPENDIX E



DRAWING 5

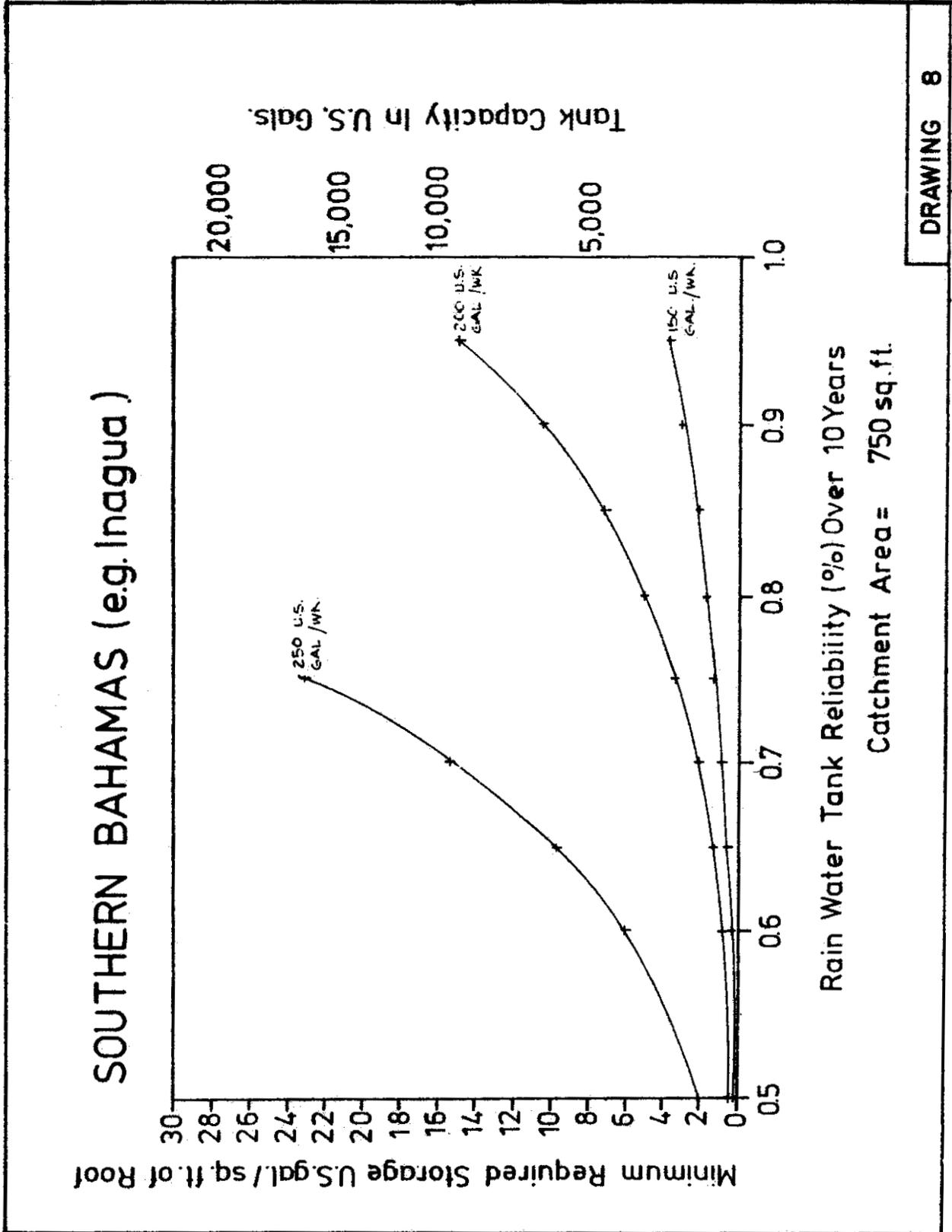


DRAWING 6



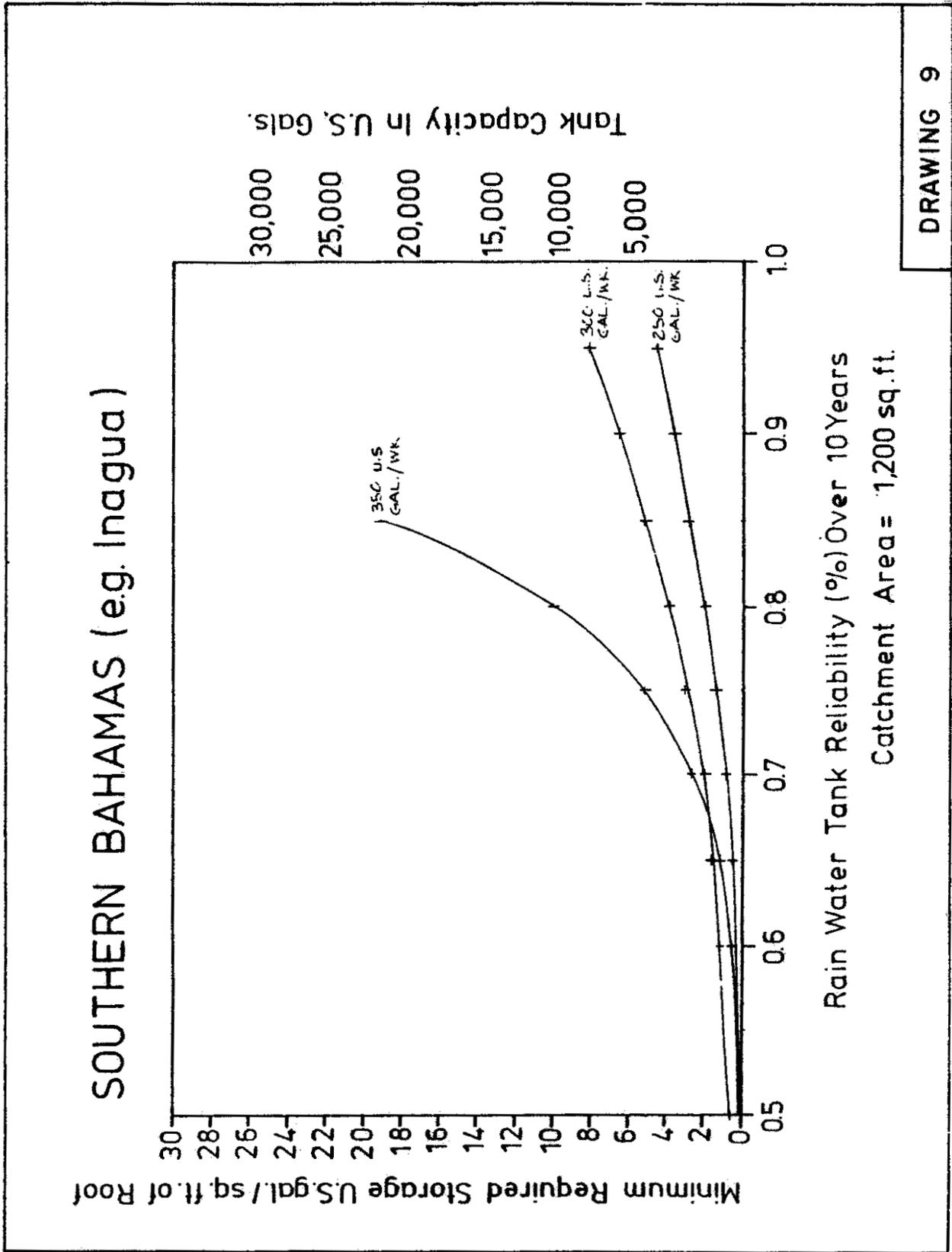
DRAWING 7

APPENDIX E



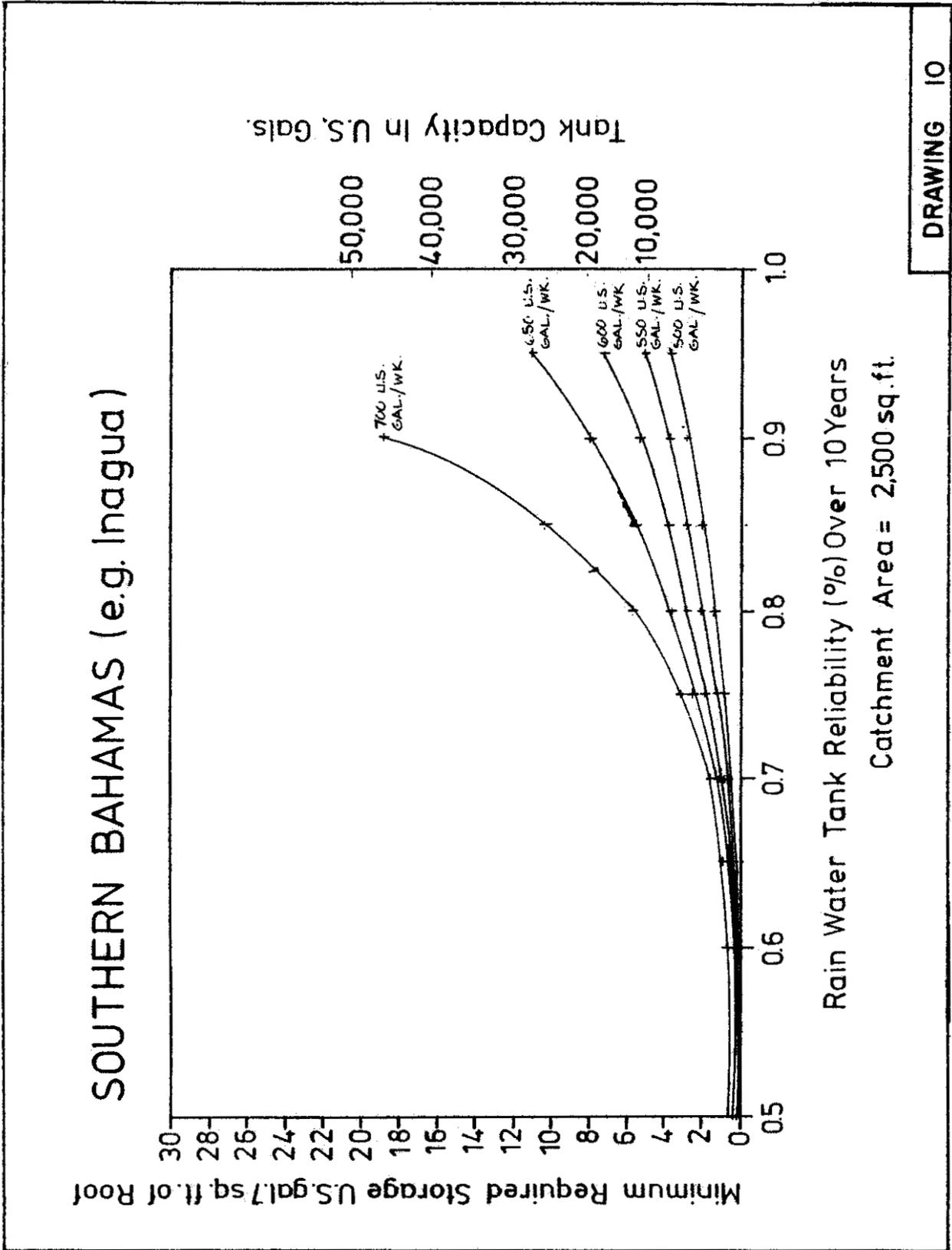
DRAWING 8

APPENDIX E



DRAWING 9

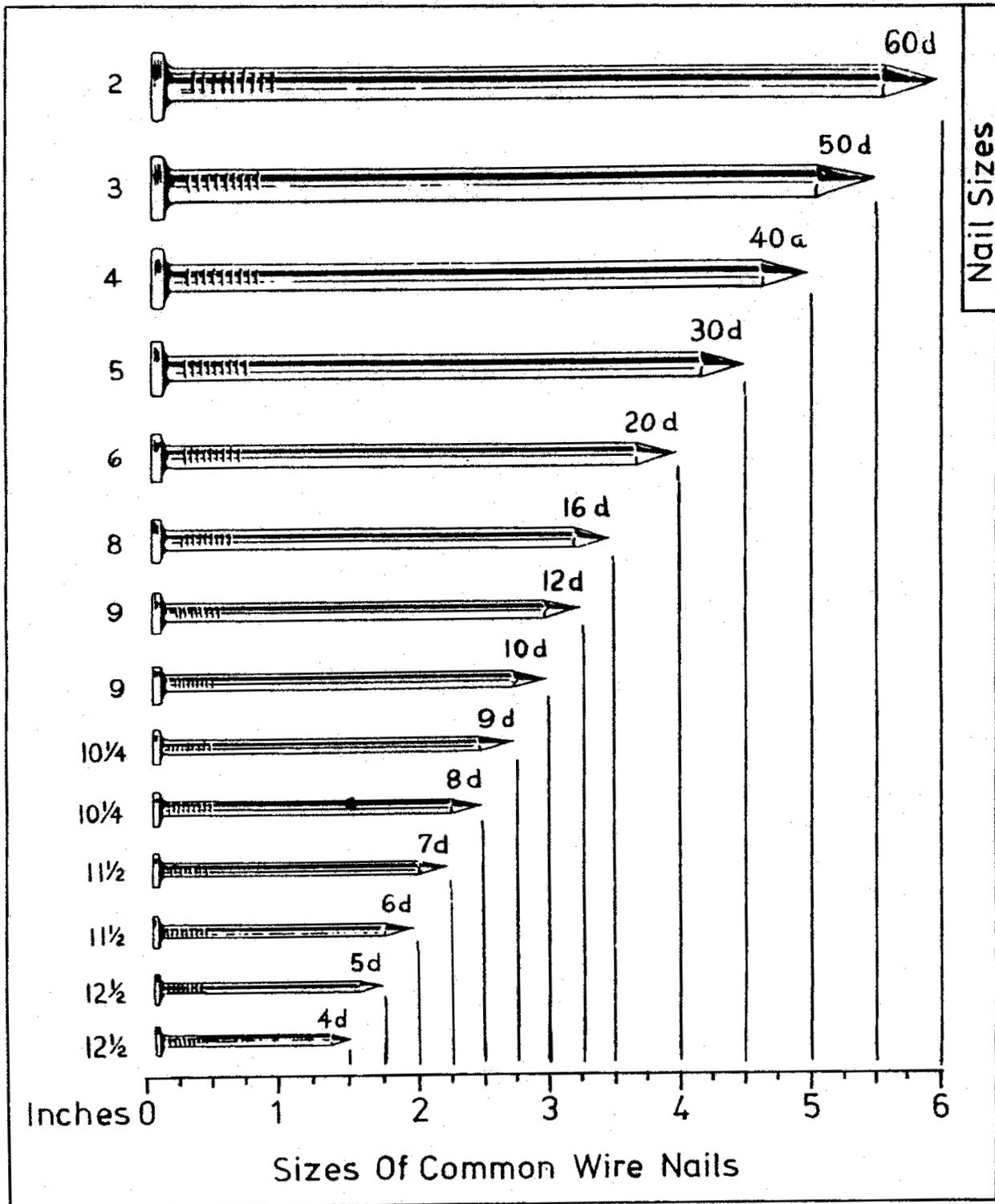
APPENDIX E



APPENDIX F

Nail and gauge sizes.

APPENDIX F



APPENDIX F

STEEL SHEET METAL GAUGES

U.S Standard Gage Number	U.S. Standard Gage (Uncoated Steel Sheets) Thickness (inches)	British Imperial or English Legal Standard Wire Gauge Thickness (inches)
4	0.2242	0.232
6	0.1943	0.192
8	0.1644	0.160
10	0.1345	0.128
12	0.1046	0.104
14	0.0747	0.080
16	0.0598	0.064
18	0.0478	0.048
20	0.0359	0.036
22	0.0299	0.028
24	0.0239	0.022
26	0.0179	0.018
28	0.0149	0.0148
30	0.0120	0.0124

NOTES

APPENDIX G

Conversion Factors - S.I. Units

Note: The units of measure used in the Code are Imperial except as follows:

- (1) All references to gallons means U.S. gallons.
1 gal. U.S. = 0.83 gal. Imperial
- (2) All references to metal guages are in U.S. gauges.
See Appendix F.

APPENDIX G

IMPERIAL AND S.I.

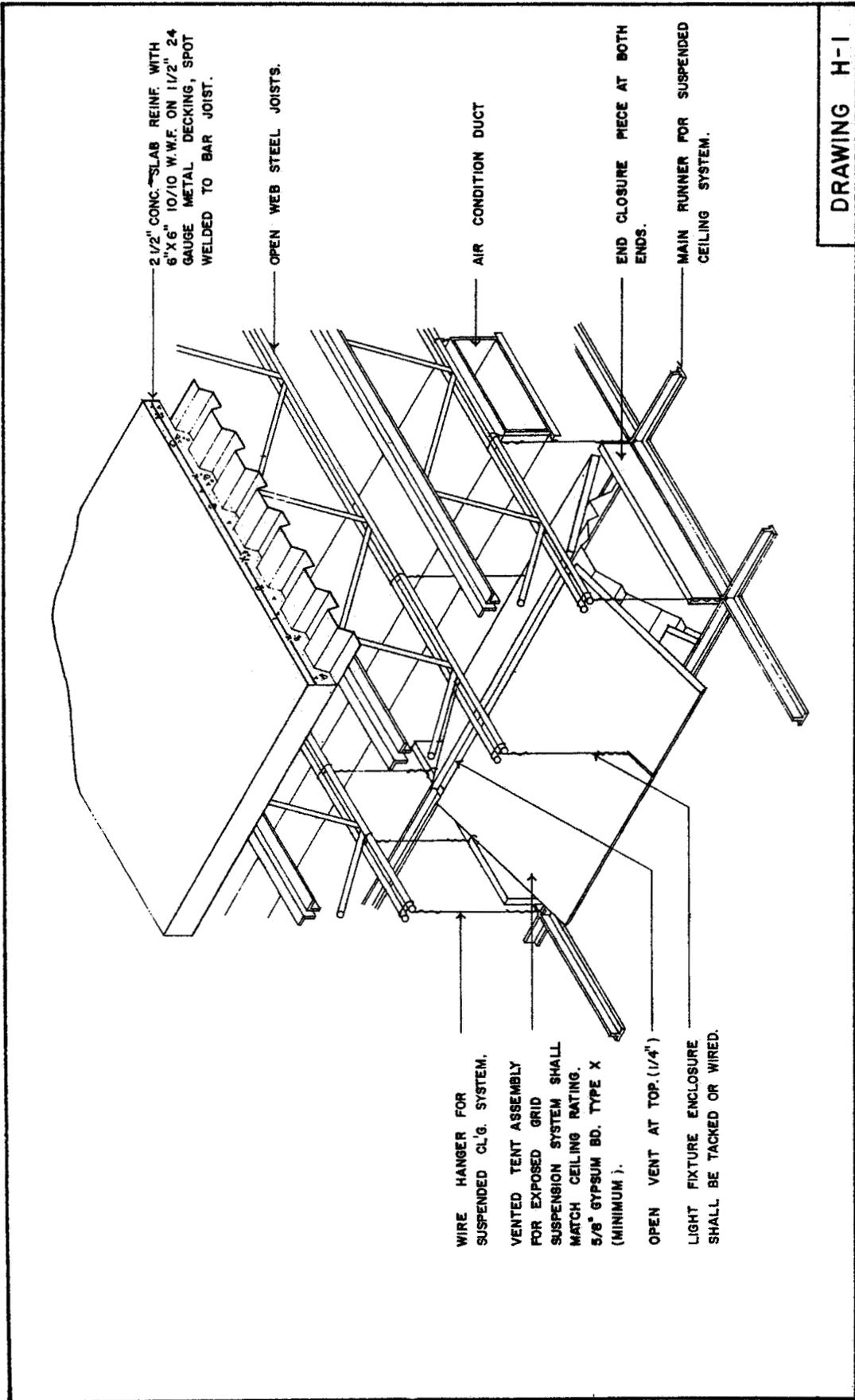
CONVERSION FACTORS

1 in.	=	25.4 mm
1 ft.	=	0.3048 m
1 lb.	=	0.4536 kg
1 lb.	=	4.448 N
1 mm	=	0.0394 in.
1 m	=	3.28 ft.
1 kg	=	2.2 lbs.
1 KN/m ²	=	20.89 psf
1 KN/m ³	=	6.365 pcf
1 lb/ft	=	14.59 N/m
1 KN/m	=	68.53 lb/ft
1 KNm	=	738 lb.ft.
1 kNm	=	8.787 inkip.
1 mph	=	0.413 m/s
1 lb/ft ²	=	0.0478 KN/m ²
1 psi	=	6.89 x 10 ⁻³ N/mm ²
1 in ² /ft	=	2116 mm ² /m
1 mm ² /m	=	4.724 x 10 ⁻⁴ in ² /ft.
# 2 bars	=	6 mm
#3 bars	=	10 mm
# 4 bars	=	12 mm
#5 bars	=	16 mm
# 6 bars	=	20 mm
# 8 bars	=	25 mm

APPENDIX H

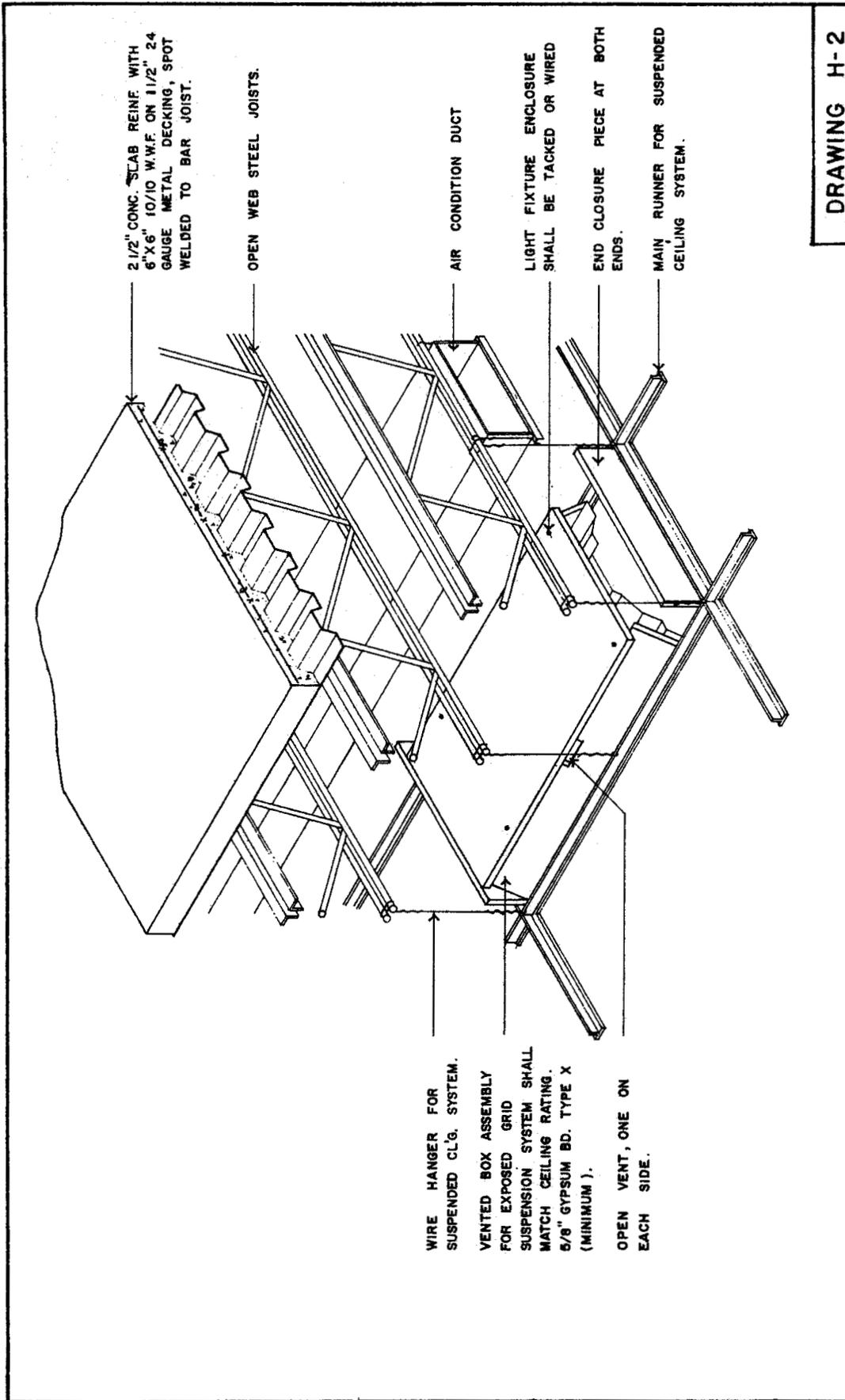
The following drawings show methods of providing fire protection for light fixtures that are recessed into fire-rated ceiling systems.

APPENDIX H



DRAWING H-1

APPENDIX H



DRAWING H-2

NOTES

PART XIII
INDEX

(For Index by Parts, Chapters and Sections, see Front of Book)

Section

A

A - OCCUPANCIES, Group A – Assembly
By 1,000 or more Chapter 5
Definition of 501

ACCESS
Accessibility to Exits2802.4
Accessibility for Handicapped415, 516
Attic1506.5
Panels, for Fire Department..... 1504.2(c)
Roof.....2803.2
Under Ground Floors..... 1705.1(c), 1904.3

ACCESSORY BUILDINGS1401.7

ACCESSORY USES 402.1

ACCIDENTS
During Construction (First Aid).....2920.1
Persons in Elevators4303.4
Precautions During ConstructionChapter 29

ACOUSTICAL CEILINGS..... 3110, 3205.5

ADDITIONS, extensions 104.2, 304

ADHESIVES
Glued Construction..... 2403, 2405.3, 2406.8(e)

ADJOINING BUILDING2101.1

ADJOINING OCCUPANCIES.....405, 407.2, 407.4, 408

ADMINISTRATIVE Chapter 3
Additions to Existing Buildings 104.2, 304, 305
Alterations (and Repairs).....104.1, 104.3, 304, 305
Change of Occupancy (Material Change of Use) 103.3, 309, 403.1
Historical Buildings..... 104.6
Hurricane Precautions2925, 3113
Purpose of Code 102
Repairs and Alterations 104.1, 104.3, 304, 305, 3001.1
Roofing Replacement3001.1
Scope of Code 103
Structural Defined 302.5
Title of Code..... 101

AGGREGATES
Concrete 2204
Masonry, Mortar.....2704.10

	Section
Plaster	3103.2(a)
Pneumatically placed concrete.....	2210.1, 2210.2
Precast concrete units.....	2208.1
AIR CONDITIONING	Chapter 41
Automatic cut-off	3711.8
AIRCRAFT HANGERS (Occupancy - Group E, Div. 1)	901
Exit Facilities	904
Special Provision	902.2, 902.3
Sprinkler Requirement.....	907.1
AIR INTAKES (see Ventilation all Occupancies)	
Boilers.....	3808
Projection Booths.....	508.4
Requirements based upon use	4003
AIR SPACE	
Under floors	2408.3
AISLES	504.9, 2810, 3407.5
ALARM SYSTEMS	
General	3711.1
Required - based upon occupancy.....	3711.9
ALLEY (Definition of)	Chapter 2
ALLOWABLE AREA	414, “*02” Section, Chapters 5 through 13
ALTERATIONS and extensions	304
ALUMINIUM	
Construction	Chapter 25
Design.....	2503
Roofing.....	3001.3(a), (b), 3001.8(b)
Roofing accessories	3007.1
Shingles	3004
Siding.....	3112.6
AMUSEMENT PARKS	
Devices for	4306.2
Electrical requirements for	Chapter 44
Special requirements for	4303.5
ANCHORING (Roofing)	
Built-up felts	3002
ANCHORS	
Concrete units.....	2208.6

	Section
Steel joists	2308.5
Wood components	2406.4(d)
ANNUAL INSPECTION	3808.6(c), 4303.5(e)
APARTMENT (Defined)	Chapter 2
APARTMENT BUILDING (Defined)	Chapter 2
Occupancy Group 'G'	Chapter 11
APPENDICES	
A - Engineering Practice Standards	A-1
B - Mechanical drawings.....	B-1
C - Ventilation of Public Sanitary Facilities.....	C-1
D - Telecommunication drawings.....	D-1
E - Rainwater tank sizes.....	E-1
F - Nail and gauge sizes	F-1
G - S.I. Unit Conversions	G-1
H - Tenting of Recessed Light Fixtures	H-1
APPLIANCES	
Gas-burning	3802
Oil-burning	3803
APPLICATION	
For Approved products	317
For Pre-Engineered buildings	311
To build	302
To existing buildings.....	104
To make alterations to and extensions of buildings.....	305
APPROVED (see Definitions)	Chapter 2
APPROVED PRODUCTS	317
ASBESTOS CEMENT PRODUCTS	
Use restricted	3106
ASPHALT	
Saturated felt and compounds	3002.4
Shingles	3002.5(f)
Roof flashings	3002.4(d)
ASSEMBLY BUILDINGS (Occupancy Groups A and B).....	501, 601
ASSUMPTIONS	
Dead loads	2002(l)(2), 2004.3, 2005.2
Live loads	2002(l)(1), 2004.1, 2005.1, 2008, 2010
Live loads posted.....	2010
Live load reductions.....	2008

	Section
Minimum loads	2004
Reinforced concrete design.....	Table 20-A4
Roof live loads	2007
Wind load.....	2009
 ATRIUMS	
Definition	Chapter 2
Requirements	515, 614, 714, 1012, 1112
 ATTACHMENTS	
Glass veneer	3109
Gypsum board	3110
Gypsum lath	3102.2
Metal and wire lath	3102.3
Roof insulation.....	3006
Suspended ceiling runners and furring.....	3102.5
 ATTIC	
Access to and division of	1706.5
Ventilation.....	2408.2
 AUDITORIA (Occupancy Groups A and B).....	
	501, 601
 AUTOMATIC FIRE-DETECTION SYSTEMS.....	
	3711.4, 3711.5
 AUTOMATIC FIRE-EXTINGUISHING SYSTEMS	
Automatic-sprinkler.....	3703
Carbon dioxide, dry chemical, halon, expanding foam.....	3704
 AWNINGS	
<i>Fabric</i>	3401
Definition	3402, 3501.2
Rigid	3501.1
 AUTOMOBILE GARAGES (Occupancy Group E, Division 1).....	
	901
Automatic sprinkler system, area increase	3703.3(c)
Minimum ceiling heights.....	413
Ramps, stairs, lifts and means of egress	904
Service Stations.....	902.3(a)
 AUXILIARY STAND-BY EMERGENCY SERVICE	
	3713

Section

B

B - OCCUPANCIES (Group B - Assembly of less than 1,000)..... 601

BALCONY

- Access balconies2803.9
- In places of assembly 504.6
- Width as exit 704.3(c)

BANDSHELLS..... 3505

BARRICADES - construction2905.2, 2918

BARS

- Concrete protection for2207.5
- Placing2207.3
- Splicing.....2207.4
- Reinforcing (see Reinforcing) Appendix A

BASEMENT

- Construction Type..... 502.2, 602.2(e), 702.2, 1102.3
- Definition Chapter 2
- Special provisions..... 502.2, 602.2, 802.3(a), 1004.3(e), 1104.8
- Sprinklers required.....3703.2

BATHROOMS (see Ventilation in Occupancy Group)

- Ceiling height - general..... 413
- Residential - minimum dimensions.....1105.2(d)
- Toilet rooms and facilities..... 412, 3613, Appendix C

BEAMS

- Grade - concrete or steel2105.3
- Laminated wood.....2405.3
- Live load reduction of..... 2008
- Protection of wood 2408
- Tie-concrete..... 2706.2(c)
- Wood 2407

BEARING

- Capacity of soil 2102
- Interior foundation walls supporting stud walls.....2405.2
- Interior wall2706.3
- Partition, (see definition) Chapter 2
- Steel joists2308.5
- Wood joists and rafters 2105.1(b), 2406.4(c)

BEARING WALLS, EXTERIOR

- Fire resistive ratings Table 32-B
- Types I, II and III Construction 1504
- Type IV Construction..... 1804

	Section
Type V Construction	1903
BEARING WALLS, INTERIOR	
Fire resistive rating.....	Table 32-B
General construction.....	1504.4, 1604.3, 1704.3, 1804.4, 1903.4
BLEACHERS (Occupancy Group I, Division 2)	1302.2
Definition	3402
Detailed requirements.....	3407
BLOCKS	
Concrete - General.....	2704.5(a)
Glass	2706.2(j)
Grill.....	2706.2(k)
Quality.....	2704.5(b)
BOILERS	3808
BOLTING	
Connections	2305
Open web steel joist anchorage.....	2308.5
Wood plates to masonry	2406.2(f), 2406.4(d), (e)
BOLTS, Anchor.....	2406.4(e)
High strength steel	2302.2
Protection of.....	2307
Ribbed	2302.3
BOND	
Concrete	2206.7
Construction joints	2207.6
Mortar.....	2704.10(c)
Pneumatically placed concrete.....	2210.8(j)
Reinforcing bars.....	2207.4, 2207.5(d)
Tie Beam concrete.....	2706.2(c)(6)
BORINGS	
Soil investigations.....	2102.1(b)
BOWLING CENTRES (Occupancy Groups A and B).....	501, 601
BRACING	
Concrete forms	2207.1
During erection.....	2003.1(b)
Frame construction.....	2405.4(1)(a), 2406.2(g), 2406.6(2)(b)
Masonry walls, lateral.....	2706.2(b)
BRICK.....	2704.2
Allowable stresses	2705.1
Walls	2706.2(g)

	Section
BRIDGING	
Concrete joists.....	2208.7
Steel joists.....	2308.4
Wood joists.....	2406.4(k)
BUILDING CODE	
Application to existing buildings.....	104, 1402
Exemptions	308
Purpose of	102
Scope.....	103
Title of.....	101
BUILDING PERMITS	
Alterations and extensions of buildings.....	304
Application to build	302
Application to make alterations to and extensions of buildings.....	305
Compliance with Code	314
Exemptions	308
Fees payable for building permits	310
General.....	301
Mandatory inspections	312
Material change of use	309
Materials used for construction.....	306
BUILDINGS	
Accessory	402.1, 1401.7
Classification by Types of Construction.....	1401
Classification by Group of Occupancy.....	402
Existing.....	104, 403.2, 1402
Precautions during building construction	Chapter 29
BUILDINGS CONTROL OFFICER (B.C.O.)	
Defined.....	Chapter 2

Section

C

C - OCCUPANCIES (Group C - schools) Chapter 7
 Definition of 701

CABLES, ROPES AND CHAINS 2911

CANOPIES
 Construction and design 3405, 3503
 Definition 3402, 3501.2
 Fabric 3401
 Over public property 3404.1, 3504.1
 Permit required 3403, 3502.1
 Rigid 3501

CARBON-DIOXIDE FIRE-EXTINGUISHING SYSTEMS 3704

CARPORTS (Occupancy Group I, Division 1) 1301

CASINOS (Occupancy Group A) 501

CAST STONE 2704.4

CEILINGS
 Design load 2003.3, Table 20-A3
 Fire resistive 3205
 Heights - Living areas 413, 1105.1, 1205.3
 One-storey churches 502.2, 602.2
 Special provisions 502.2, 602.2
 Suspended and furred 3102.5, 3111, 3205.5

CEMENT
 Asbestos 3106
 Plaster 3103
 Portland 2204.1, 2210.2
 Proportion of acceptable concrete 2205.2(c)
 Proportion of pneumatically placed concrete 2210.3

CERTIFICATE
 Of inspection - boilers 3808.6
 Of inspection - elevators 4303.5
 Of occupancy - (see Statute Law)

CHANGE IN USE 403

CHANGE OF OCCUPANCY (see Material Change of Use) 309

CHASES
 Fire resistive requirements 1507
 In masonry walls 2706.2(i)

	Section
CHIMNEYS, FLUES, VENTS AND FIREPLACES.....	Chapter 38
CHURCHES (Occupancy Groups A and B)	501, 601
Ceilings in	502.2, 602.2
CHUTES	
Enclosures for	1507
CLASSIFICATION	
Of buildings by Occupancy	402
Of buildings by Types of Construction	1401.2
Of materials and assemblies for fire resistance.....	3201
CLEAN-OUT	
In forms	2207.1
Plumbing.....	3604.4, 3608.3
CLEAN-UP	
Of building area before construction.....	2901
CLEARANCE	
For Heat Producing Appliances.....	Appendix A
Of wood flooring and masonry walls.....	2406.6(1)(h), 2407.2(f)
CLUBS (Occupancy Groups A and B).....	501, 601
CODE	
Application to existing buildings.....	104, 1402
Compliance with	314
Connected Legislation.....	106
Motion Picture and Television Production Sets	105
Purpose of	102
Scope of	103
Title of.....	101
COLUMNS	
Concrete filling effect on strength.....	2306.3
Concrete starter	2706.2(h)
Concrete tie	2706.2(b)
Isolated footings for	2103.3(b)
Live load reduction of.....	2008
Pipe, exterior, fire protection not required.....	3203.3(d)
Pipe requirements when concrete filled.....	2306.2
Precast concrete	2208
Steel, fire protection of	3203, Table 32-A
Tubular steel	2306
Wood	2406.1, 2407.2(a)
COMBINED STRESS.....	2009.3

	Section
COMBUSTIBLE	
Definition	Chapter 2
Interior finish, restrictions	3208
Liquids.....	3902.3(b)
Materials regulated	1512, 1612, 1712, 1810, 1910
COMPUTATIONS may be required	302.5
CONCENTRATED LOADS	
On floors.....	2003.2
On walls	2705.4
CONCRETE, BLOCKS - materials and dimensions of.....	2704.5
CONCRETE, BRICK - materials and dimensions of	2704.2
CONCRETE, PLAIN	2704.8
CONCRETE, PLAIN GYPSUM.....	2704.9
CONCRETE, reinforced.....	Chapter 22
Aggregates for	2204.1, 2208.2, 2210.2
Construction joints in.....	2207.6
Cover for reinforcement.....	2103.2(c), 2207.5, 3203.2
Fire resistive classification	3202.3
Footings	2103.1, 2103.2
Forms for	2207, 2210.6
Foundation walls	2105.1, 2105.2
Grade beams	2105.3
Gypsum.....	Chapter 26
Lightweight.....	2203, 2204.1
Lintels	2706.2(i)(2)
Mixing and placing	2206
Over wood	1705.1, 2406.9
Pile caps.....	2104.1(g)
Piles precast	2104.4
Piles prestressed	2104.5
Piles steel pipe-filled	2104.6
Pneumatically placed	2210
Precast units.....	2208, 2605.2
Prestressed	2209
Proportions for.....	2205, 2210.3
Protection from fire	3203
Quality and strength of.....	2205, 2205.2
Slabs on fill.....	2103.5
Superplasticizer	2206.3
Tests.....	2204.2, 2208.1(d), 2209.1(d), 2210.3
CONNECTED LEGISLATION	106

	Section
CONNECTIONS	
Dissimilar materials	2506
Electrical	4401
Fire protection of	3203.3(a)
Fire Department	3707
For precast units	2208.8
For structural steel.....	2305.1
For wood components	2406.4(d)
Gas appliance.....	3802
Nailed	2406.8(b)
Plumbing.....	3605.2(d), 3606.4, 3607, 3610.2, 3611.5, 3613.2(b) 3613.5, 3613.11(b), 3613.16(c), 3614.4(c)
Protection of.....	2406.8(c)
Siamese.....	3707.1
Smoke	3806(4)
Telephone.....	4402
Water meter	Appendix B
Welded	2305.2, 2309.7
 CONSTRUCTION HEIGHT AND AREA (see Occupancies by Group)	
CONSTRUCTION JOINTS concrete.....	2207.6, 2210.4
 CONSTRUCTION MATERIALS	
Fire resistive	3202
Safe use of	2003.1
Weights of	Table 20-A4
 CONTAMINANTS	
	3906, 3907
 COOLING TOWERS (see Types of Construction)	
	4103.1(9)
 CORRIDORS	
Assembly Occupancies	504, 604
Definition	Chapter 2
General	2810
Hazardous Occupancies	804
Mercantile, Business and Mall Occupancies	1004
Residential Occupancies	1104, 1204
School Occupancies.....	704
Storage and Industrial.....	904
 COURTS	
Exit - definition	2801.3
General	2807
 COVERED MALLS	
	1004.3(f)
 COVERINGS	
For fire protection, general	Chapter 32

	Section
For roofs	Chapter 30
For walls.....	Chapter 31
CRANES and derricks	2910
CRITICAL RADIANT FLUX Classifications	3208.2(b)
CURTAIN Proscenium	507.1(e)
CURTAIN WALL.....	3114
CUT-OFF, untreated wood piles.....	2104.3(b)

Section

D

D - OCCUPANCIES (Group D - Hazardous) Chapter 8
 Definition of 801

DAMPERS
 Air conditioning and ventilating 3711.8(b)
 Fire 1507.2(d), 3206

DANCE HALLS (Occupancy Groups A and B) 501, 701

DEAD ENDS 904.3(b), 1004.3(b), 1104.3(b)

DEAD LOAD
 Definition Chapter 2
 Weight of materials for calculation of 2010

DECORATIVE FINISHES, INTERIOR Chapter 33

DECORATIVE PROJECTIONS
 Combustible materials regulated 1512, 1612, 1712, 1810, 1910
 Design loads 2005.7

DEFINITIONS Chapter 2
 Of mandatory inspections 312
 Of Occupancies “*01” Sections - Chapters 5 through 13
 Of Types of Construction “*01” Sections - Chapters 15 through 19
 Of Plumbing 3602

DEFLECTION
 Allowable span of wood joists, regulated by 2405.1
 Exterior glass installation regulated by 3108
 In storm shutter design, where provided 3113
 Plywood allowable load based on 2406.6
 Structural members subjected to superimposed loads 2003.3
 Structural use panels allowable load based on 2406.6

DEMOLITION
 Permit required 2902.1
 Precautions 2902.3
 Public utilities 2902.2

DERRICKS and Cranes 2910

DESIGN
 Aluminium 2501.1, 2502.1
 Doors and operative windows 3108.3
 Elevators and escalators 4301.1
 Footings and foundations 2104, 2103
 Loads Chapter 20

	Section
Masonry	2701, 2705
Open web joists	2308.2
Plastics.....	3105
Precast concrete units.....	2208
Prefabricated roof trusses	2405.4
Prestressed concrete	2209
Proscenium curtain	507.1(e)
Reinforced concrete.....	2201, 2205
Reinforced gypsum concrete.....	2601.1, 2605.1(c)
Stages.....	507.1
Structural Steel.....	2301.2
Swimming pools.....	4202
Wood	2401
 DIP TANKS	 3908
 DISTANCE SEPARATION	 1504
 DOORS	
By Construction Classifications	1509, 1609, 1709, 1807, 1908
By Occupancy Group 'A'	504.7, 504.8
By Occupancy Group 'B'	604.3(c)
By Occupancy Group 'C'	704.3(e)
By Occupancy Group 'D'	804.3(c)
By Occupancy Group 'E'	904.3(c)
By Occupancy Group 'F'.....	1004.3(c)
By Occupancy Group 'G'	1104.3(c)
By Occupancy Group 'H'.....	1204.4(a)
Fire escapes	2805.2
Fire rated	2811.3, 3206, Table 32-I
General	2811.1
Glass panels in	3206.5, Table 32-I
Hardware	2811.4
Horizontal exits	2806.4
Outside open stairways	2803.9
Power-operated	2811.5
Smokeproof towers	2805.2
Tin clad.....	3206.8
Width.....	2811.2
 DOWNSPOUTS	
General	3611, Table O(1)
 DRAINAGE	
Roof.....	1506.4, 1606.4, 1706.4, 1806.3, 1905.3, 3611, 3617.12
Storm	3611
Swimming pool	4204.1(h), 4206.1(e), 4207.1(b)
System and disposal.....	3605, Appendix B
Transformer vaults.....	3901.4

Section

DRAWINGS required for
Awnings, canopies etc3403.1(b), 3502.1(b)
Building permits..... 302
Derricks and cranes..... 2910
Interior decorative finishes Occupancy Groups A, B, F and G 3301
Swimming pools..... 4203.2 (a)

DRESSING ROOMS..... 507.1(c), 507.2(c), 3701.3(1)(iii)

DRINKING WATER required for
Construction personnel..... 2921
Fountains (minimum required).....3613.12, Table P(1), Table P(7)
Premises for human habitation3614.1(a), 3617.13

DUCTS3903, 4004

DUMBWAITER..... 4301, 4302, 4303

DUPLEX Occupancy Group HChapter 12

DWELLING Occupancy Group H.....Chapter 12
Definition of Chapter 2

Section

E

E - OCCUPANCIES (Group E - Storage and Industrial) Chapter 9
 Definition of 901

EARTH PRESSURE
 Below grade structures, action on2005.5
 Foundations, action on2103.1, 2103.2(a)
 Precautions due to 2904

EAVES
 And gable drip3007.3
 Wind pressure coefficients 2009

ECCENTRIC LOAD
 On continuous footing2103.3
 On isolated footing2103.2(d)

EGRESS
 Definition (see Means of Egress) Chapter 2
 Facilities for, generalChapter 28
 Facilities for, mixed occupancy 410
 Illumination of 3712

ELECTRIC
 Appliances, heat producing3801.8
 Auxiliary Stand-by Emergency Service 3713
 General 4401
 Lighting-emergency and signs2812, 3712
 Lines and equipment, before demolition2902.2
 Lines, precautions during building operation 2901
 Signs2812, 3712
 Specifications and plans4401.5
 Wiring 4401

ELECTRICAL
 Calculations 302.5
 Chases for conduit2706.2(i)
 Code for The Bahamas 4401
 Equipment and Meter rooms4401.3
 Grounding4401.2
 Inspections312.11
 Plans 302.6(b), 4401.5
 Portable wiring 4401
 Standards 4401

ELEVATORS AND ESCALATORSChapter 43
 Enclosures 1507
 Fireman control 4309
 Lobbies, high rise buildings 513, 612, 1010, 1110

	Section
Shafts	1507.2
EMERGENCY LIGHTING	
Exit signs	2812
Exits	3712
Standby emergency service, auxiliary	3713
ENCLOSURE OF VERTICAL OPENINGS	
Fire resistive requirements	3204
Requirement as to Occupancy	"*06" Section, Chapter 5 through 13
Requirement as to Type Construction	1507, 1607, 1707
ENGINEERING (see also Design)	
Aluminium - allowable unit stresses	2502
Glass - maximum area of fixed exterior	3108.2
Live and Dead Loads	Chapter 20
Masonry - allowable unit stresses	2705
Pile driving formula load.....	2104.2
Reinforced unit masonry, general design	2706.1
Wood - allowable unit stresses.....	2405
Wood joists and rafters allowable span.....	Table 24-A
ESCALATORS	4305
EXCAVATIONS	2101, 2904
EXHAUST	
Systems.....	508.4, 3903
Ventilation (see Ventilation)	
EXISTING BUILDINGS	
Application of Code to.....	104
Classification by Occupancy	403.2
Classification by Types of Construction.....	1402
EXIT (see Means of Egress)	
EXIT COURT	
Defined.....	2801.3
EXIT FACILITIES	
Mixed Occupancies	410
Requirement as to Occupancy.....	"*04" Section, Chapter 5 – 13 inclusive
EXIT ILLUMINATION (lights)	2812
EXPLOSIVES (see also Occupancy Group D)	3905
EXTERIOR STAIRWAY	2803.9

	Section
EXTERIOR TRIM	1512.6, 1612.4
EXTERIOR WALL OPENINGS.....	1504.2(b), 1604.1, 1704.1, 1804.2, 1903.2
Protection of.....	1504.2(b)(2), 3206
EXTERIOR WALLS	
Construction of.....	1503.2, 1603.2, 1703.1, 1804.2, 1903.2
Masonry	2706.2
Protection of.....	1504.2, 1604.1, 1704.1, 1804.2, 1903.2
EXTERNAL WALL - Definition of	Chapter 2
EXTINGUISHING AGENTS.....	3704

Section

F

F - OCCUPANCIES, Group F - (Mercantile, Business and Covered Malls)Chapter 10

FACILITIES FOR PHYSICALLY HANDICAPPED 415

FACTORIES - (Occupancy Group E - Division 2) 901

FAMILY - Definition of..... Chapter 2

FASTENINGS (see Adhesives, Anchors, Attachments, Connections)

- Aluminium bolts and rivets 2505.2, 2505.3
- Awnings, *fabric*3405.3
- Glass block 2706.2(j)
- Ladders..... 2916
- Plastics3105.2
- Precast gypsum units 2605.2(c)
- Roofing 3002
- Roofing accessories, metal3007, 3010
- Roof tile3003, 3004
- Seats504.1, 504.9
- Shingles3002.5(d), (f), 3004, 3005

FEES, payable for building permits 310

FENCES.....302.1(f)

FILL, concrete slabs on2103.5

FILM

- Projection booths 508
- Slow burning..... 608
- Sprinklers required..... 3703.1(1)(a)(i)
- Storage and handling 3904

FINAL INSPECTION (mandatory)312.13

FINISHES, Interior (see also Interior Finishes).....3208, Chapter 33

FIRE ALARMS

- General 3711
- Required3711.9
- Tests3711.1(d), (e), (f), (h)

FIRE ASSEMBLY

- Automatic closing, when required3206.4
- Fire control4009, 4104
- Fire doors 3206.1, 3206.2, 3206.3, 3206.4, 3206.5, Table 32-I
- Fire rating determined by National Standards3206.3
- Fire windows3206.6

	Section
For protection of openings.....	3206.1
Glazed opening in	3206.7
Hardware	3206.4
Signs for.....	3206.10
Testing Agency label required	3206.2
Tin-clad doors.....	3206.8
 FIRE DAMPERS	 406.6, 1507.2(d), 4004.1(d)
 FIRE DEPARTMENT	
Connections	3707
Elevators, for emergency use by	4304.6, 4309
 FIRE DETECTION SYSTEMS.....	 3711
 FIRE DIVISIONS	
General	406
Ducts through.....	406.6
Openings in.....	406.2(b), 406.2(c)
 FIRE EXTINGUISHERS	
Automatic systems - Restaurant hoods.....	3909
Portable	3709
 FIRE EXTINGUISHING SYSTEMS	
Automatic sprinklers, where required	3703.1
Carbon dioxide	3704
Dry Chemical.....	3704
Expanding foam	3704
Halon.....	3704
Hydrants where required	3708
Inspections and tests	3710
Standpipes.....	3705
 FIRE PROTECTED PASSAGEWAYS (see exit passageway)	 2801.3
For exit courts	2807.5
Width.....	2807.4
 FIRE PROTECTION (see Types of Construction)	
Fire resistive standards	Chapter 32
 FIRE PROTECTION DURING CONSTRUCTION.....	 2924
 FIRE PUMPS.....	 3706.5
 FIRE RESISTIVE RATINGS	
Assemblies, general.....	3206.1
Building - (see Types of Construction).....	1401
Calculations of	3210
Ceilings.....	3110, 3203.2(f), 3205, Table 32-C

	Section
Combustible members	3204.2
Corridors	1504.5, 2810.2
Courts	2807
Definition	Chapter 2
Doors	2805.2, 2806.4, 2811, 3206, Table 32-I
Floor and roof systems.....	3205
Horizontal exits	2806
Interior Finishes.....	3208, Chapter 33
Lathing where rating is required	3101.1
Materials.....	3202
Passageways	2807
Protection of structural components.....	3203, Table 32-A
Roof coverings	3001, 3002, 3207
Smokeproof towers	1507.2(b), 1508, 2805
Stairways, outside open.....	2803.9
Vertical openings.....	1507
Walls and partitions	3204, Table 32-B
Windows	3206.6
 FIRE RESISTIVE STANDARDS.....	 3201.4, Appendix A
 FIRE SEPARATION	
Classification of	408.2
Design and materials of	408.3
Form of	408.1
Required between Occupancies	408, Table 4A
 FIRE WINDOWS.....	 3206.6
 FIRE-RETARDANT TREATED WOOD.....	 2409
 FIRESTOPS	 2406.3
 FIRE-WALLS	 2706.4
 FIRST AID, during construction.....	 2920.1
 FLAME SPREAD, Interior finishes.....	 3208, Chapter 33
Classification by Class.....	3208.2
Interior finish defined	3208.1
Requirements based upon Occupancy	Table 32-II
 FLAMMABLE, definition.....	 Chapter 2
 FLAMMABLE LIQUIDS.....	 3902
Classified.....	3902.3
Defined	3902.3(a)
Detailed regulations	3902.4

Section

FLASHING

Felt (membrane base)	3002.4(d)
Membrane base (felt).....	3002.4(d)
Metal base	3007.5
Metal counter	3007.6
Roof penetration	3007.7

FLOOR AREA, limitations	"*02" Section, Chapters 5 through 13
Allowable	414
Bedrooms	1205.2, Table 12-A
Definition (Area - whole or part of building)	Chapter 2
Kitchens, catering establishments	514, 613, 713, 910, 1011, 1111
Toilet rooms	1205.5

FLOOR CONSTRUCTION (see also Types of Construction)

Aircraft hangers, garages, service stations	902.3(d)
As form of separation.....	408
Below grade	2005.5
Concrete, pneumatically placed	2210.8(i)
Concrete, precast units.....	2208
Concrete, prestressed units.....	2209
Concrete, slab on ground.....	2103.5
Fill under wood over concrete	1505.1 (b)
Fire resistivity, how to obtain.....	3205.2, Table 32-A
Heavy timber	1703.3(c), 2407.2
Loading consideration	2003.2, 2003.3, 2005.4
Openings, protection of	408.2(c)(4)
Permanent elements under.....	1505.1
Plywood sheathing.....	2406.6
Projection room	508
Stages platforms and rostrums.....	507.1, 507.2, 507.3
Steel joists, open web	2308
Structural sheets	2309.4
Temporary.....	2912
Toilet room.....	412.2(c), 2406.9(b)
Wood floor joists.....	2406.4, 2406.9
Wood laminated	2405.3
Wood sheathing and flooring.....	2406.6(1)
Wood structural-use panel sheathing.....	2406.6(1)(i)

FLOOR LOADS

Assumed live	2003.2
Dead and live load defined	Chapter 2
Reductions allowed.....	2008
Required signs before occupancy	2010
Unit dead.....	2010
Unit live.....	2010, Table 20-A1

FLOOR OPENINGS

Fire resistive requirements	408.2(c)(4)
-----------------------------------	-------------

	Section
Protection during construction	2913
Protection during demolition.....	2902.3(i)
FLY GALLERIES	507.1(b)
FOOT BLOCK.....	3604.3(h)
FOOTINGS	
Continuous.....	2103.2
Elapsed time before use	2103.2(e)
General reinforced concrete.....	2103.1
Inspection (mandatory).....	312.1
Isolated	2103.3
Protection of.....	2101.1, 3603.15
Reinforcing for	2103.2(c)
FORCED VENTILATION (Mechanical ventilation)	Chapter 40
FORMS	
Application for permit	302
Excavation used as	2103.2(f)
For concrete.....	2207.1
For pneumatically placed concrete	2210.6
Removal of, concrete construction.....	2207.2
FOUNDATION	
Concrete, design of.....	2205.2
Excavation for	2101.1
Footing for.....	2103
Grade beams	2105
Inspection (mandatory).....	312.1
Liability of excavator.....	2101.1
Load test on piles.....	2104.2(c)
Opening in wall for ventilation.....	2408.3
Piling for.....	2104
Retaining	2106
Walls exterior	2105.1
Walls interior	2105.2
FOUNDATION WALLS.....	2105
FRAME BUILDINGS (see Type V Buildings).....	Chapter 19
FRAME INSPECTION (Mandatory)	312.7
FRESH-AIR SUPPLY	3804
FURRING	
Ceilings.....	2406.5, 3102.5, 3111, 3205.5, Table 32-C
Cross	3102.5(c)

	Section
Masonry walls	2406.7
FUSIBLE LINKS	
Attic fan opening	3903.2(b)
Openings in proscenium walls.....	507.1(e)
Projection booths	508
Stage ventilators	507.1(f)

G

G - OCCUPANCIES, (Group G, Multiple Residential).....	Chapter 11
GALLERIES, Fly.....	507.1(b)
GALVANISING	
Protection of metal	2309.6
GAUGES, sizes	Appendix F
GARAGE PARKING (Occupancy Group E, Division 1)	
Continuous belts or lifts.....	904.3(e)(4)
Exits	904
Floors	902.3(d)
Means of egress	904.3
Ramps.....	902.3(e)
Special Construction	902.3(c)
Stairs to be enclosed when.....	904.3(b)
Travel distances.....	904.3(d)
Ventilation.....	905
GARAGE, PRIVATE (Occupancy Group I - Division 1)	
Attached to residence, requirements	1307.2(a)(3)
Definition (see also carport)	Chapter 2
Fire extinguisher required when.....	1307.2(a)(1)
Floors	1307.2(a)(2)
Located under another Occupancy.....	1307.2(a)(4)
Ventilation.....	1305.1
GAS-LP (Liquefied Petroleum Gas Act No. 13 of 1967)	
Appliances	3802
Standards	3801.2
Water Heaters	3807
GLASS BLOCK MASONRY	2706.2(j)
GLASS VENEER.....	3109
GLAZING installations	
Area limits, exterior.....	Table 31-G
Details of	3108.2(a)(2)
Divided wind load	3108.1(d)
Doors sliding and swinging exterior	3108.3(a)
Doors without frames, exterior	3108.3(c)(2)
Fire windows	3206.6, 3206.7
Interior.....	3108.4
Openings, fire doors and windows	3206.5
Plastic.....	3108.5(d)
Protection by arrangement	3108.1(e)

	Section
Protection by marking, size and safety glazing.....	3108.3(d)(2), 3108.3(f), 3108.3(g), 3108.3(h), 3108.4
Replacement requirements.....	3108.1(f)
Safety glazing.....	3108.5
GLUE.....	2406.8(e)
GLUE LAMINATED MEMBERS.....	2403, 2405.3
GRADE OF LUMBER.....	2403
GRANDSTANDS (Occupancy Group I - Division 2).....	1301
Permanent.....	1302.2(b)
Standards.....	1302.2(a)
Temporary.....	1302.2(c)
GRAVITY TANKS.....	3706.3(a)
GRIDIRONS.....	507.1(b)
GROUND FLOOR - Definition.....	Chapter 2
GROUNDING.....	4401.2
GROUNDS, for plastering.....	3103.1(e)
GROUPS, BUILDING, classified.....	402
A - Assemblies of 1,000 persons or more.....	Chapter 5
B - Assemblies of less than 1,000 persons.....	Chapter 6
C - Schools.....	Chapter 7
D - Hazardous storage and handling.....	Chapter 8
E - Storage and industrial.....	Chapter 9
F - Mercantile, business and shopping malls.....	Chapter 10
G - Residential, multiple.....	Chapter 11
H - Residential, single family and duplex.....	Chapter 12
I - Miscellaneous.....	Chapter 13
GUEST, definition.....	Chapter 2
GUEST HOUSE, definition.....	Chapter 2
GUEST ROOM, definition.....	Chapter 2
GUNITE (see concrete pneumatically placed).....	2210
GUTTERS AND DOWNSPOUTS.....	3007.9, 3611
Definition.....	3602
Discharge over public property.....	3611.6(c)
Discharge under public property.....	3611.6(f)
Footblock required.....	3604.3(h)

	Section
GYMNASIUMS - Occupancy Groups A and B	501, 601
Special provisions.....	502.2, 602.2
GYPSUM	
Concrete plain.....	2704.9
Lathing	3102.2
Plaster	3103.1(b), 3103.3
Tile	2704.7
Wallboard.....	3110
GYPSUM BOARD PRODUCTS AND ACCESSORIES	3110
GYPSUM REINFORCED.....	Chapter 26
Limitations of use	2601.2
Poured-in-place	2605.1
Precast units	2605.2

H

H - OCCUPANCIES (Group H - Single family and duplex).....	Chapter 12
HABITABLE ROOM	
Bedroom, minimum size.....	1105.2, 1205.2
Bedroom temperature, protection.....	1105.1
Ceiling height.....	1105.2, 1205.2, 1205.3, 1205.4, 1205.5
Definition	Chapter 2
Fire protection and hazards.....	1107, 1207
Light and ventilation.....	1105, 1205
Means of egress	1104, 1204
Windows minimum area	1105.1, 1204.4, 1205.1
HANDBASINS (see lavatories)	
HANDRAILS	2808.3
HARDWARE	2811.1, 2811.4
HAZARD PROTECTION, Special	409
HAZARDOUS OCCUPANCIES (see Group D)	Chapter 8
HAZARDOUS UTILITIES	409.3
HEADERS	
Floor joists, wood	2406.4(c)(3)
General	2406.2(k)
HEAT-PRODUCING APPARATUS	Chapter 38
HEATERS	
Gas water	3807
Solar	3810
Space.....	3805
HEAVY TIMBER CONSTRUCTION	1703.3, 2407
HEIGHT, definition	
Awnings above grade	3404.1, 3504.1
Buildings	"*02" Sections, Chapters 5 - 13 inclusive
Ceilings, general	413
Ceilings, residential units	1105.2, 1205.2
Curb, rainwater control	1711.6(c)
Doors, minimum	2801.4(e)(i), 2811.2
For wind load.....	2009
Garage, residential occupancy	1302.1
Interior bearing wall.....	2706.3
Landings, maximum vertical.....	2803.7(f)

	Section
Parapets.....	1711.6(b)
Railings, horizontal.....	2808.2(b)
Stair-railings.....	2808.3(c)
Stairways.....	2801.4(e)(2)
Steel joists limitations.....	3205.1
Tie columns.....	2706.2(b)(2)
 HIGH RISE BUILDING definition.....	 Chapter 2
 HISTORICAL BUILDINGS.....	 104.6
 HOARDING.....	 2905
 HOIST TOWERS.....	 2909
 HOISTING MACHINERY.....	 2908
 HOLLOW-UNIT MASONRY	
Defined.....	2703
General.....	2704.5
Restrictions in height and area.....	2706.2(a)
Unit Stresses allowable.....	2705
 HOODS, RESTAURANT EQUIPMENT	
Automatic fire extinguishing systems.....	3909
Design.....	4005.1(d)
Ducts.....	4005.1(e)
Location.....	4005.1(b)
Required.....	4005.1(a)
Vents, gas appliance.....	4005.1(c)
 HORIZONTAL AREA SEPARATION	
Adjoining occupancy.....	405
Between mixed occupancies, required.....	Table 4A
Between tenants.....	407.4
Classification of.....	408.2
Fire divisions.....	406
Party walls.....	407.1, 407.2, 407.3
 HORIZONTAL EXITS	
Accessibility to.....	“*04” Sections, Chapters 5 - 13 inclusive, 2806, 2810
Aisles and Corridors.....	2810
Balconies.....	2803.9, 2806.2
Courts as a means of egress.....	2801.3, 2807
Dead ends.....	904.3(b), 1004.3(b), 1104.3(b)
Definition.....	2806
Emergency lighting of.....	3712
Enclosure wall protection.....	2810.2
Illumination of.....	2812, 3712.1
Opening protection, enclosure walls.....	3206

	Section
Opening protection, separation walls.....	2408.2
Passageways	2807
Ramps.....	2804
Signs required.....	504.8, 2812
Travel distance (defined)	2801.3
Travel distance maximum	504.5(b), 604.3(d), 704.3(f), 804.3(d), 904.3(d) 1004.3(d), 1104.3(d), 1204.2(e), 2801.4(i)
Travel distance, increase due to sprinklers	3703.6, Table 37-1
Used as required means of egress.....	410
Width of	504.2, 604.2, 704.2, 804.2, 904.2, 1004.2, 1104.2
HOSE, fire	
Cabinets.....	3705.8(a)
Connections	3705.7, 3707
Nozzles.....	3705.8(a)
Reels.....	3705.8(b)
Size of	3705.8(a)
Station location	3705.3
HOT TUBS	4216
HOT WATER	
Distribution.....	3614.17
Safety devices.....	3614.18
Storage tanks.....	3614.19
HOTELS (Occupancy Group G)	1101
HOUSE Apartment, Rooming, Fraternity - Group G	1101
HURRICANE PRECAUTIONS.....	2925, 3113
HYDRANTS, YARD	
Connections and hose requirements.....	3708.2
Hose houses and equipment	3708.2
Location.....	3708.1
Pipe size.....	3708.2
Signs required.....	3708.2
Where required.....	3708.1
HYDROSTATIC	
Pressure to be considered	2005.5(b)

I

I - OCCUPANCIES Group 1	Chapter 13
Division 1 - Garages for four or less motor vehicles and carports	
Division 2 - Stadiums reviewing stands, grandstands, bandstands & similar structures	
Division 3 - Cabanas and bath or pool houses and similar structures.	
ILLUMINATION	
During construction	2919
Means of egress	2812, 3712
Sign	504.8, 2812
INCINERATORS.....	3809
INCOMBUSTIBLE (see Non-combustible)	
INCREASE IN AREA, allowable	414
INDUSTRIAL (Occupancy Group E - Division 2).....	901
INFLAMMABLE (see Flammable)	
INFLAMMABLE LIQUIDS (see Flammable Liquids)	
INSPECTION	
Awnings and canopies.....	3403.2, 3502.2
Boilers	3808.6(a), (b), (c)
Building, mandatory general.....	312
Electrical.....	312.11
Final	312.13
Fire extinguishing.....	3710
Foundation.....	312.10
Mandatory.....	312
Other.....	312.12
Piling.....	312.2
Plumbing.....	312.9
Reinspections	312.14
Roof.....	312.8
Special.....	312.10
Structural beam and slab	312.6
Structural column.....	312.4
Structural framework.....	312.7
Tie beam	312.5
Tie column	312.3
INSULATING MATERIALS	3209
INSULATION	
Exhaust ducts.....	3903.3(e)(7)
Incombustibles used for fire protection.....	Table 32-A

	Section
Required when	1105.1(b), 1205.1
Roof.....	3006
INTERIOR FINISHES (see Flame-spread)	3208, 3301
Classified by flame-spread rating	3208.2
Defined	3208.1
Requirements, by occupancies	3208.2(c), Table 32-II
Requirements, for floor finishes	3208.2(b), Table 32-II
INTERIOR FOUNDATION WALLS	2105.2
INTERIOR PARTITION (a non-bearing separation)	
In Type I construction	1504.5
In Type II construction.....	1604.4
In Types III, IV and V construction.....	1704.3, 1804.4, 1903.4
Masonry	2706.7
INTERIOR STAIRWAYS (see also vertical openings)	1507.1(a)(3)
Enclosure construction.....	1507.2(b)
Enclosure design.....	2803.8
Enclosure required	1507, 1607, 1707, 2803.8
Protection to underside.....	2803.1(i)
Safeguards required	2808
Use of enclosure restricted.....	2803.8(b)
INTERIOR TRIM.....	1512.2

J

JOINTS

Construction in concrete.....	2207.6
Design considerations, concrete.....	2208.8
End lumber	2404.3(a)
Expansion glass block panels	2706.2(j)3(ee)
Expansion, glass veneer	3109.6
Glass block	2706.2(j)(1)
Masonry mortar.....	2704.10(c)(3)
Welded	2305.2

JOISTS

Anchorage (see Anchors).....	2208.6, 2406.4(d), 2406.4(e)
Bridging, concrete.....	2208.7
Bridging, steel	2308.4
Bridging, wood, nailing	2406.8(b)
Ceiling, wood.....	2406.4(h)
Concrete precast	2208
Concrete prestressed	2209
Floor; wood	2406.4(g)
Roof; wood	2406.4(i)
Steel, open web	2308
Steel, open web, height limitations	3205.1
Wood, allowable span.....	Table 24-A
Wood, allowable stresses	2405.1

K

KEENE'S CEMENT

Application	3103.4(b)(3)
Finish for masonry cement plaster.....	3103.3(b)(3)
Sand-float finish for gypsum plaster	3103.3(b)(2)
Specifications for	3103.2(d)

KITCHENS

Dishwashers.....	3613.14
Fixture units, plumbing	3605.6
Food disposal, domestic	3613.10(b)
Grease interceptors, required	3612.2(a)
Hoods, commercial	3903.3
Minimum height.....	413, 1105.2(c), 1205.4
Minimum sizes for catering establishments.....	514, 613, 713, 910, 1011, 1111
Outlets	4401.1
Plumbing, minimum facilities.....	3613.19
Prohibited (see Guest House).....	Chapter 2
Receptacles.....	4401.1
Screening.....	412.3
Supply pipe, sizes.....	3614.13
Surface finishes, ceilings	412.6
Surface finishes, floors	412.5
Surface finishes, walls	412.4
Ventilation.....	1105.1, 1205.1

L

LABELS

Fire assembly, required.....	Table 32-I, 3206.2
Fire door	Table 32-I, 3206.2
Fire window	3206.6
Issued by	3206.2(b)
Tin-clad doors.....	3206.8

LADDER

Permanent, roof equipment access	2803.2(b)
Swimming pool	4204.1(d)

LAMINATED

Glass	3108.2(a)(2)
Members.....	2403
Plywood	2404.3(b)
Structural use panels.....	2404.3(d)
Timber	2403

LANDINGS OF STAIRS

Length and width requirements	2803.7(a)
Reduction, due to door swing	2803.7(b)
Vertical distance between.....	2803.7(f)

LATERAL BRACING

Masonry walls	2706.2(b)(2), 2706.2(b)(3)
May be omitted.....	2406.6(2)(b)(4)
Stud walls.....	2406.2(g)

LATH

Attachment to metal supports.....	3102.2(b), 3102.3(f)
Attachment to wood supports	3102.2(b), 3102.3(e)
Corner bead and inside angle.....	3102.2(e)
Metal, wire and accessories	3102.3(a)
When not to be applied.....	3102.2(f)

LAVATORIES, (Sinks, Hand basins) minimum requirements	3613.19
---	---------

LEADERS (see Gutters and Downspouts)

LIGHT (see Illumination) Also see "*05" Sections, Chapters 5 – 13 inclusive

LIGHTING SYSTEMS, exit and emergency.....	3712
---	------

LIGHTWEIGHT AGGREGATES.....	2205.2(b)
-----------------------------	-----------

LIME.....	3103.2(c)
-----------	-----------

LIME PLASTER.....	3103.3(b)
-------------------	-----------

Section

LINTEL
Definition Chapter 2
Masonry opening 2706.2(i)(2)
Wood 2406.2(k)

LIQUEFIED PETROLEUM GAS (LPG)..... 3801.2, 3802

LIQUIDS (see Flammable Liquids)

LIVE LOAD
Consideration of2005.1
Definition Chapter 2
On screen enclosures..... 2007.1(c), 3503.1, 3503.4
Posting required 2010
Reductions allowed..... 2008
Roof..... 2007
Stress increase allowed2009.3
Wind 2009

LOAD, OCCUPANT
Definition Chapter 2
Determination of 404, 2801.5

LOAD (see Dead, Floor and Live Loads)
Allowable on soil.....2102.2
Bearing, pile 2104
Masonry wall, concentrated2705.4
Ornamental projection, design.....2005.7
Retaining wall, design..... 2106
Roof..... 2007
Safeguards.....2005.6
Special considerations..... 2005
Wind 2009

LOCATION ON PROPERTY
General 411
Walls and partitionsChapters 15 - 19 inclusive

LOCKS 2811

LOT, definition Chapter 2

LOT LINES, definition Chapter 2

LOT PLAN (site plan) required 302.2

LOT SURVEY, may be required 302.4

LUMBER
Allowable unit stresses 2405.1(a)

	Section
Grade and species.....	2404.1
Identification.....	2404.3
Moisture content.....	2404.1(b)
Protection of.....	2408
Sizes	2404.2
Sub-flooring	2406.6(1)

M

MALLS, covered (Occupancy Group F - Division 3)	1001
Area, allowable	1002
Construction	1002, 3701.3
Definition	Chapter 2
Exits	1004.3(f)(6), (7)
Smoke control system required.....	1004.3(f)(5)
Special requirements	1004.3(f)
Sprinklers required.....	1004.3(f)(4)
Travel distance.....	1004.3(f)(6)
MANDATORY INSPECTIONS	312
MANUFACTURING PLANTS (Occupancy Group E - Division 2).....	901
MASONRY	Chapter 27
Additions to existing walls.....	2706.2(h)
Aggregates mortar.....	2704.10(b)
Aggregates, concrete blocks	2704.5(a)(1)
Area of panels, 8 inches thick	2706.2(a)
Backing	2706.6(a)
Bearing walls, exterior	2706.2
Bearing walls, interior	2706.3
Bond.....	2706.1(f)
Brick and stone	2704.2, 2704.4, 2706.2(g)
Buildings, height allowable.....	2701.2
Chases, and recessed openings in.....	2706.2(i)
Copings, required on	2706.2(d), 2706.2(e)
Glass block	2706.2(j)
Mortar.....	2704.10(c)
Non-reinforced unit masonry, allowable unit stresses	2705
Parapet walls.....	2706.2(e)
Partitions (non-bearing separations)	2706.7
Plain concrete.....	2704.8
Plain gypsum concrete.....	2704.9
Stresses allowable in	2705
Supporting wood components.....	Chapter 29
Tests	2704.1(c)
Tie beams in	2706.2(c)
Tie column requirements may be relaxed	2706.2(b)(9)
Tie columns in.....	2706.2(b)
Tie columns not required when	2706.2(b)(l)
Tile	2704.6, 2704.7
Units for fire-resistive walls	2704.5(a)(2)
Units general.....	2704.5(a)
Units, modular dimensions	2704.5(a)(3), 2704.5(a)(4)
Unsupported height (partitions)	2706.7(c)
Unsupported height (walls)	2706.2(c)(l)
Unsupported width (partition)	2706.7(b)

	Section
Used as fire-resistive material	3203.2(b)
Used units	2706.1(e)
Wood supporting	2406.9
MASTIC	3109.3
MATERIAL CHANGE OF USE	103.3, 309, 403.1
MATERIALS	
Combustible, regulated.....	1512, 1612, 1712, 1810, 1910
Dissimilar	2506
Drainage.....	302.2(d), 302.2(e), 3605
Fire-resistive.....	3202
For concrete.....	2204
For pneumatically placed concrete	2210.2
For wall cladding and glazing.....	3112, Chapter 31
Non-combustible, definition	Chapter 2
Other than approved.....	2704.1(b), 3112.10
Used for construction.....	306
Weight of.....	2005.2(a)
MEANS OF EGRESS	
Aisles	504.9, 604.4, 2810
Building.....	3811
Corridors	704.3(b), 2810
Courts	2807
Definition	Chapter 2, 2801.3
Doors	2811
Emergency lights for	3712
Enclosures, exit.....	1507.1(a)(3), 1507.2(b), 1607, 1707, 2803, 2807
Escalators	2809, 4305
Exit discharge	2805.4
Exit signs and lights	2812
Exterior balconies	2803.9, 4305
Exterior stairways (see outside open stairways)	
Fire doors	3206
Horizontal exit.....	2806
Malls, covered.....	1004.3(f)
Outside open stairways	2803.9
Passageways	2807
Power-operated doors.....	2811.5
Ramps.....	2804
Signs for.....	504.8, 2812
Smokeproof towers	2805
Special requirements by Occupancy.....	"*04", Section, Chapters 5 - 13 inclusive
Stage	507.1(h)
Stairways.....	2803
Width of	"*04.2" Section, Chapters 5 - 13 inclusive
MECHANICAL VENTILATION	Chapter 40

	Section
MERCANTILE OCCUPANCY, (Group F - Division I).....	1001
METAL	
Aluminium.....	Chapter 25
Clad doors.....	3206.2(c)(2)(ii), 3206.8
Columns.....	2306
Doors, steel.....	3206.2(c)(2)(ii)
Joists, bar.....	2308
Lath.....	3102.3(b)
Reinforcing.....	2202
Roof accessories.....	3007
Roofing and siding.....	2309.5, 3112.5, 3112.6
Runners (suspended ceilings).....	3102.5(b), 3110.4
Shingles.....	3004
Steel and iron.....	Chapter 23
Studs.....	3110.4
Ties.....	3109.4
Wire lath.....	3102.3(e)
MEZZANINE	
Definition (Area limitation).....	Chapter 2
MILL CONSTRUCTION (Heavy Timber).....	2407
MINIMUM DIMENSIONS.....	1105.2, 1205
MIXED OCCUPANCIES.....	410, 512, 611, 712, 809, 909, 1009, 1109, 1209, 1309
MONASTERIES (Occupancy, Group G).....	1101
MORTAR, Masonry.....	2704.10
MOTELS, (Occupancy, Group G).....	1101
MOTION PICTURE AND TELEVISION PRODUCTION SETS.....	105
MOTION PICTURE HOUSES (Occupancy, Groups A and B).....	501, 601
MOVING STAIRS.....	4305
MULTIPLE-RESIDENTIAL (Occupancy, Group G).....	1101

N

NAILS

Galvanised, where used.....	2406.8(c)
Number required to connect wood members.....	2406.8
Sizes	Appendix F

NEW MATERIALS AND TYPES OF CONSTRUCTION	317
---	-----

NOMINAL DIMENSIONS

For masonry units	2704.5(a)(4)
For wood	2404.2(b)

NON-BEARING WALLS, EXTERIOR

Fire-resistivity ratings	Table 32-B
Type I Construction.....	1504.2(a)(2)
Type II Construction	1604.1
Type III Construction	1704.1
Type IV Construction.....	1804.2
Type V Construction	1903.2

NON-BEARING WALLS, INTERIOR

Fire-resistivity ratings	Table 32-B
Type I Construction.....	1504.5
Type II Construction	1604.4
Type III Construction	1704.3
Type IV Construction.....	1804.4
Type V Construction	1903.4
Unit masonry (other than fire-walls)	2706.7

NON-COMBUSTIBLE, defined	Chapter 2
--------------------------------	-----------

NOTICES

For inspections.....	312
Of completion	316
Of compliance.....	315

O

OCCUPANCY

Adjoining	405
Change in use	309, 403
Classified	402
Definition	Chapter 2
Mixed.....	see Chapters 5 through 13
Separations.....	408
When not specifically mentioned in Code	402.2

OCCUPANT LOAD

Definition	Chapter 2
Determination of	"*04.1" Section, Chapters 4 to 13 inclusive

OFFICE BUILDINGS (Occupancy Group F - Division 2)	1001
Special provisions.....	1002.2

OIL-BURNING APPLIANCES	3803
------------------------------	------

OPEN WEB STEEL JOISTS.....	2308
----------------------------	------

OPENINGS TO BE PROTECTED (see Types of Construction)

ORDINARY MASONRY CONSTRUCTION - Type III	Chapter 17
--	------------

OVERTURNING MOMENT AND UPLIFT	2009.2
-------------------------------------	--------

P

PAINT

Aluminium in contact with other metals	2506
Classified.....	3902.3
Not permitted, ladders.....	2916
Protection of metal (steel)	2307, 2309.6
Storage prohibitions	3902.4

PAINT SPRAY BOOTHS.....	3908
-------------------------	------

PANEL WALL

Bonding	2706.2(b)(8)
Definition	Chapter 2
Glass block	2706.2(j)
Openings	2706.2(i)
Reinforced concrete, thickness	2706.5(b)
Unit masonry, thickness	2706.5(a)

PANIC HARDWARE

Definition	2801.3
Description.....	2811.4
Required uses.....	504.7, 604.3(c), 704.3(e), 804.3(c), 904.3(c), .....1004.3(c), 1104.3(c)
Special locking delay.....	2811.1(d) Exception(2)

PARAPET WALL

Construction	2706.2(e)
Definition	Chapter 2
Required.....	1711.6

PARTY WALLS

Common, definition	Chapter 2
Details.....	407
External, definition.....	Chapter 2

PASSAGEWAYS

Exit, definition	2801.3
Requirements.....	2807

PEDESTRIAN PROTECTION.....	2905.1, 2905.2
----------------------------	----------------

PENTHOUSE, Definition	Chapter 2
-----------------------------	-----------

PERLITE

Fire protection for floor and roof systems.....	Table 32-C
Mixed with Portland cement for wall protection	Table 32-B
Plaster protection for primary steel members	Table 32-A
Proportions in plaster base coats	3103.3(a)
Proportions in plaster finish coats	3103.3(b)(5)

	Section
PERMIT	
Air conditioning	4101.2
Alteration (of structures)	304
Application for.....	302, 305
Awning.....	3403.1, 3502.1
Change of use, material	309
Demolition	2902
Does not permit violation of Code.....	314
Electrical.....	4401.1
Elevator	4303.1
Explosives	3905
Fees	310
Plans required for.....	302
Plumbing.....	307, 3601.5
Presentation of plans for.....	303
Roofing repairs, or re-roofing.....	3001.1
Swimming pool	4203.1
When required.....	301
 PHYSICALLY HANDICAPPED, FACILITIES FOR.....Chapter 45	
PIERS MASONRY.....	2706.2(f)
 PILES	
Allowable loads.....	2104.2(a)
Driving formula load	2104.2(b)
General	2104.1
Precast prestressed concrete.....	2104.5
Precast reinforced concrete.....	2104.4
Steel pipe, concrete filled	2104.6
Structural steel, rolled	2104.7
Tests.....	2104.2(c)
Wood	2104.3
 PIPE COLUMNS	
Attached metal members.....	3203.3(a)
Compression members, minimum dimensions.....	2306.3
Concrete filled, pressure relief requirements.....	2306.2
Concrete filling in lieu of one-hour protection	3203.3(d)
Jacketing.....	3203.2(e)
Protection required other than fire-resistivity	2307
Reinforcement of cast in place protection	3203.2(e)
Welding.....	2805.2
 PLAIN CONCRETE.....	 2704.8
 PLANS REQUIRED	
Air conditioning	4101.2(c), (d)
Awning.....	3403.1(b), 3502.1(b)
Building.....	302, 303

	Section
Electrical.....	302.1(e), 4401.1
Plumbing installations	302.1(d), 3601.5(c)
Screen enclosures.....	3503.4(d)
Survey.....	302.4
Swimming pools.....	4203.2(a)
 PLANTS MANUFACTURING (Occupancy Group E - Division 2).....	 901
 PLASTER AND PLASTERING	 3103
 PLASTERBOARD, GYPSUM (used with or without plaster)	 3110
 PLASTICS	 3105, 3108.5(d)
 PLATE GLASS	
Maximum area of fixed panels, exterior walls.....	3108.2
 PLATFORM HOISTS	 2907
 PLATFORM, loading	 1512.3, 1612.2, 1712.2, 1810
 PLATFORMS.....	 507.2
 PLOT PLAN (site, lot).....	 302
 PLUMBING	 Chapter 36
 PLUMBING, ADMINISTRATIVE	
Alternative materials and construction.....	3601.4
Application to existing installations	3601.1(d)
Certificate of approval	3601.6(o)
Concealed work.....	3601.6(h)
Fees	3601.5(f)
Final inspection.....	3601.6(a)
Insanitary buildings and premises	3601.3
Maintenance of installation	3601.1(e)
Permits required.....	3601.5(a)
Plans required (see plans).....	302.1(d), 3601.5(c), 3605.13
Powers and duties of Inspectors	3601.2
Purpose of Plumbing Code.....	3601.1(b)
Tests.....	3601.6(c)
Title of Plumbing Code.....	3601.1(a)
Workmanship	3601.6(n)
 PLUMBING, BUILDING CODE REFERENCES	
Automatic sprinkler system	3703
Carbon dioxide fire extinguishing systems.....	3704
Chases masonry.....	2706.2(i)
Cutting holes, concrete.....	2208.5
Facilities for the handicapped	415

	Section
Fire department connections	3707
Fire resistive floors, pipes in.....	3205.2
Hydrants	3708
Mandatory inspections	312
Notching of wood members.....	2406.2(i)
Pipes in walls, wood framing.....	2406.2(j)
Pressure tests	3710.2
Requirements by Groups of Occupancy.....	Chapters 5 - 13 inclusive
Sanitation	412
Sanitation during construction.....	2921
Solar tanks and systems.....	3810
Standpipes.....	3705
Swimming pool inspections	4203.2(c)
Swimming pool piping materials.....	4207
Swimming pool permit required	4203.1
Toilet rooms (based upon Occupancy).....	412, 415
Vent pipe flashing, roof	3007.7
Water supply, fire-fighting.....	3706
 PLUMBING DEFINITIONS	 3602
 PLUMBING REQUIREMENTS AND MATERIALS	
Backwater valve.....	3613.13(8)
Caulking Ferrules	3604.6(a)
Circuit loop vent.....	3610.5(a)
Cleanout and Traps	3608
Disposal and supply wells.....	3616
Drain fields.....	3615.6(b) to 3615.10 inclusive
Drainage system and disposal	3605
Ejectors	3605.9
Filters, swimming pool	4208
Fire extinguishing apparatus.....	3703
Fixtures minimum requirements	3613.19
Fixtures, plumbing	3613
Grease interceptors.....	3612
Hangers and supports.....	3609
Indirect waste piping	3606
Industrial wastes	3603.10
Interceptors	3612
Joints and connections	3607
Loop vents.....	3610.5(a)
Material Standards (see Standards)	3604
Mosquitoes, protection from	3611.7
Prohibited fittings.....	3603.3
Rainwater	3611
Retention and time discharge.....	3605.4
Safety relief devices.....	3614.18
Separator	3612
Septic tanks	3615, Appendix B
Service pipe sizing.....	3614.13

	Section
Sewer required.....	3603.17
Sinks, materials.....	3604.8
Small Buildings Plumbing Code.....	3617
Soakage pit lids.....	3611.8
Special wastes.....	3606.6
Standpipes.....	3705
Storage tanks, water.....	3614.19
Storm drainage system.....	3611
Structural safety.....	3603.6, 3603.8
Sump vents.....	3605.11
Supply wells.....	3616
Supports and hangers.....	3609
Swimming pools.....	Chapter 42
Tests (see Administrative).....	3601.6
Toilet facilities for workman.....	2921, 3603.21
Traps and cleanouts.....	3608
Used equipment and materials.....	3603.13
Vacuum operated drainage systems.....	3605.13
Vent stacks.....	3610.10
Venting materials.....	3604.5
Vents and venting systems.....	3610
Water supply.....	3614
Yard hydrants.....	3708
 PLUMBING STANDARDS.....	 3604.1(a), Appendix A
 PLUMBING WORK AND FITTINGS.....	 307
 PLYWOOD	
Exterior wall cladding.....	2406.6(2)(d)
Floor sheathing.....	2406.6(1)
Identification.....	2404.3
Protection of.....	2408
Quality.....	2404.4
Roof sheathing.....	2406.6(2)
Storm sheathing.....	2406.6(2)(b)
 PNEUMATICALLY PLACED CONCRETE.....	 2210
 PORTLAND CEMENT	
For concrete mixes.....	2204
For plaster mixes.....	3103.2(e)
 POSTING, live loads.....	 2010
 POSTS	
Wood not permitted.....	1904.2
Wood requirements.....	2406.1, 2408.1(c)
 POWER-OPERATED DOORS.....	 2811.5

	Section
PRE-ENGINEERED BUILDINGS.....	311
PRECAST CONCRETE UNITS.....	2208
Aggregates for	2208.3
Anchorage of.....	2208.6
Bridging, joist.....	2208.7
Connections of	2208.8
Cutting of	2208.5
Professional design required	2208.1(b)
Strength of.....	2208.2
Transportation, storage and erection of	2208.9
PRESTRESSED CONCRETE	2209
Calcium chloride prohibited	2209.2(b)
Deflection limited	2209.2(a)
Professional design required	2209.1(b)
PRESSURE TANKS.....	3706.4
PRIVATE GARAGES (see Garage, Private)	
PROJECTION BOOTHS	508, 608, 708
PROJECTIONS FROM THE BUILDING.....	1610, 1710, 1808, 1909
Awnings	3404, 3504
PROSCENIUM CURTAINS AND WALLS.....	507, 607, 707
PROTECTION OF WOOD	2408
PUMPS, FIRE.....	3706.5
PURPOSE OF CODE.....	102

Q

QUALITY AND DESIGN, materials of construction

Aluminium.....	2503
Glass	3108.1
Masonry	2701, 2704
Plastics.....	3108.5(d)
Reinforced Concrete.....	2205
Steel.....	2301.1, 2302
Wood	2401, 2404, 2405

R

RADIATION PROTECTION.....	3907
RAFTERS, Wood	
Anchorage.....	2406.4(d)
Bearing.....	2406.4(c)
Glued-laminated.....	2405.3
Heavy timber.....	1703.3, 2407
Nailing.....	2406.8
Roof.....	2406.4(j)
Size, minimum.....	2406.4(a)
Spacing, for plaster ceilings.....	2406.4(b), 3102.2
Spacing, for plywood sheathing.....	2406.6(2)(b)(4)
Supporting roof tile.....	2406.9(f)
Trusses, prefabricated roof.....	2405.4, 2406.4
RAINWATER TANK, capacities.....	Appendix E
RAMPS.....	2804
May be means of egress if.....	2804
Parking Garage.....	902.3(e)
Slope.....	2804(b), 2804(d)
RANGES.....	3806
READY MIXED CONCRETE.....	2206.2(d)
RECESSES in masonry.....	2706.2(i)
REDUCTIONS IN LIVE LOAD.....	2008
REINFORCED CONCRETE (see Concrete Reinforced)	
REINFORCEMENT	
Concrete, protection for.....	2207.5
Cast in place, protection for.....	3203.2(c)
Footing concrete.....	2103.2(c)
Pile caps.....	2104.1(g)
Piles, concrete (see Piles)	
Placing in concrete.....	2207.3
Protection for (Concrete cover).....	2207.5, 3203.3
Slabs, concrete on fill.....	2103.5
Splices.....	2207.4
RENDERING.....	3104
REPAIRS, of existing building.....	104.3
RESTAURANT HOODS.....	3909, 4005

	Section
RETAINING WALLS.....	2106
REVOLVING DOORS, prohibited as means of exit.....	2811.1(d)(f)
ROOF COVERINGS.....	Chapter 30
Anchoring built-up to concrete decks	3002.4(c)(1)
Anchoring built-up to wood decks.....	3002.4(b)(1)
Asphalt shingles	3002.5(f)
Attachment of anchor sheet to gypsum decks.....	3002.4(b)
Attachment of anchor to insulation	3006
Built-up.....	3002
Classifications	3001.2(a)(4)
Clay tile	3003
Concrete tile	3004
Fibre-cement shingle.....	3002.5(d)
Fire retardant required.....	3001.2(a)(10), 3001.3(a)
Gravel or pea rock surfacing, restricted use.....	3002.4(h)
Insulation	3002.4(g)
Membrane flashings.....	3002.4(d)
Metal accessories to.....	3007
Metal shingles.....	3004
Replacement, restrictions.....	3001.1
Wood shingles and shakes	3005
ROOF DRAINAGE	1506.4
ROOF FIREPROOFING.....	1506.2, 1606.2, 1706.2
(Exceptions due to height above floor included)	
ROOF MOUNTED EQUIPMENT.....	3008
ROOF STRUCTURES AND SKYLIGHTS	1511, 1611, 1711, 1809
ROOF TRUSSES, prefabricated wood	2405.4, 2406.4
ROOFING ACCESSORIES	3007
ROOM CONTENT (see Occupant Load)	
ROSTRUM	
Definition	Chapter 2
Construction	507.3
RUBBLE MASONRY (Tabby)	2706.2(g)

S

SAFEGUARDS	
During construction	Chapter 29
SAMPLES, taking	313
SAND	
Masonry	2204.1
Mortar	2704.10
Plaster	3103.3
SANITATION	412, 4008
SANITATION DURING CONSTRUCTION	2921
SCAFFOLDS	2917
SCHOOLS (Occupancy Group C)	701
SCOPE of Code	103
SCREEN ENCLOSURES	2007.1(c), 3503.4
SCREEN VENTS	
Attic spaces	2408.2
Under first floor, wood-frame	2408.3
SCREENS, Outdoor Theatres	3505
SEATING CAPACITY	504.1, 504.9, 604.4
SEATS	
Bleachers	3407
Fastening of	504.9
Increase in spacing	504.9
Standard spacing	504.9
SELF-CLOSING DOORS	Table 32-I
SEPARATION	
Between tenants	407.4
Distance	1504.1, 1604.1, 1704.1, 1804.1, 1903.1
Fire Divisions	406
Party Walls	407
SHAFT ENCLOSURES (see Vertical openings)	
SHEATHING	
Exterior wall	2406.6(2)(d)

	Section
Floor.....	2406.6(1)
Roof.....	2406.6(2)
Storm	2406.6(2)(b)
SHEDS, utility.....	3501, 3503.5
SHINGLES AND SHAKES, WOOD.....	3005
Application to buildings.....	1512.6
Exposure to weather, maximum.....	Table 30-C
SHOW CASES (and other movable appurtenances).....	1512.1
SHOW WINDOWS (shop front)	
Backing.....	1512.2
Bulkheads.....	1512.1
Glazing.....	3108.1, 3108.2
Replacement.....	3108.1(f)
SHUTTERS, STORM.....	3113
SIAMESE CONNECTIONS.....	3707
SIDEWALKS, COVERED, during construction	2905
SIDING	
Aluminium.....	3112.6
Steel.....	3112.5
SIGNS	
Exit.....	2812
Illuminated.....	3712.1(e)
SKYLIGHTS.....	1511, 1611, 1711, 1809
SLABS, CONCRETE, on fill.....	2103.5
SMOKE CONNECTIONS	3806(4)
SMOKE DOORS, required in corridors.....	1104.7
SMOKE VENTING	3711.10
SMOKEPROOF TOWERS (Stair towers)	2805
SOIL	
Bearing allowable.....	2102, 2103
Investigation required.....	2102.1
Plans to include statement of condition	2102.1
Retaining walls for	2106

	Section
SOLAR HEATERS.....	3810
SPACE UNDER FLOORS.....	2408.3
SPAS.....	4216
SPECIFICATIONS, PLANS (see Plans required)	
SHINGLES, METAL	3004
SPLICES	
Reinforcing bars.....	2207.4
Wood members.....	2406.2(h)
SPRAY PAINTING	
Hazardous use – Group D.....	801
Special requirements.....	3908
Sprinklers required.....	3703.1(3)(a)
SPRINKLERS, AUTOMATIC.....	3703
Floor area increase due to.....	3703
Reduction in interior finish requirements due to	Table 32-II Note 2
Required.....	3703.1
Travel distance increase due to	3703.6, Table 37-1
Where provided shall operate alarm system	3711.9
STAGES, PLATFORMS AND ROSTRUMS	507, 607, 707
Accessory rooms.....	507.1(c), 507.2(c)
Combustible regulated.....	507.1(g)
Construction	507.1(a), 507.2(a), (b), 507.3
Gridirons, fly galleries	507.1(b)
Means of egress, stage.....	507.1(h)
Other requirements	507.1(j)
Projection rooms.....	508, 608, 708
Proscenium curtains.....	507.1(e)
Proscenium walls	507.1(d)
Sprinkler requirements	507.1(e), 3703.1
Standpipes.....	507.1(i)
Ventilators.....	507.1(f)
STAIRWAYS (vertical openings)	
Access arrangements.....	“*04” Section, Chapter 5 – 13 inclusive
Access to roof.....	2803.2
Basement	1004.3(e), 1104.8, 2803.2(e)
Circular.....	2803.5
Enclosures for	1507.2(b), 2803.8
Exterior (open outside)	2803.9
Guardrails	2808.2
Handrails.....	2808.3
Headroom clearance	2801.4(e)(2)

	Section
Interior.....	1508, 1608, 1708, 1907
Landings.....	2803.7
Ramps, substitute for	2804
Signs required.....	2812
Smokeproof towers	2805
Spiral.....	2803.6
Width.....	2803.1(e)(f)(g)(h)
Winders.....	2803.4
 STANDARDS	 Appendix A
STANDPIPES AND HOSE STATIONS.....	3705
STEEL STRUCTURAL	Chapter 23
STORE FRONT (see Show Windows)	
STOREY, definition.....	Chapter 2
STORM SHUTTERS (see Shutters, storm)	
STRUCTURAL GLASS	3114
STRUCTURAL REQUIREMENTS FOR MULTIFLOOR FRAMED BUILDINGS.....	2003.1
STRUCTURAL USE PANELS	
Floor sheathing	2406.6(1)
Identification.....	2404.3(d)
Protection of.....	2408
Quality.....	2404.5
Roof sheathing.....	2406.6(2)
Storm sheathing.....	2406.6(2)(b)
STUCCO.....	3104
STUDS, WOOD	2406.2
SUPERPLASTICIZERS	2206.3
SURVEY required	302.4
SUSPENDED CEILINGS	3102.5, 3111, 3205.5, Table 32-C
SWIMMING POOLS.....	Chapter 42

T

TABBY MASONRY.....	2706.2(g)
TANKS	
Dilution	3605.5(c)
Dip	3908.3
Flushing.....	3614.4(b)
Hot water storage	3614.19
Pressure	3614.7(i)
Rainwater	Appendix E
Retention	3605.4
Septic	3615
Surge.....	3614.7(b)
Temporarily located, construction sites	2922
Underground	3902.4(l), (m), (n), (o), (p)
Water supply	3614.6(b), 3614.7(a)
TELEPHONE SERVICES..... 4402	
Drawings.....	Appendix D
Dwelling Houses	4405
Installations without switchboards.....	4404
Switchboard installation	4403
TELEVISION AND MOTION PICTURE PRODUCTION SETS	105
TENTS	3406
TESTS	
Boilers.....	3808.6(c)
Concrete	2204
Fire-resistive materials.....	3201.1
Gypsum.....	2604
Masonry	2704
May be required (taking of samples).....	306, 313
New materials and methods (Approved Products)	317
Piles.....	2104.2(c)
Roof tile	3003.2
Roof, proprietary coverings.....	3001.3(b)
Soil bearing	2102.1
Steel.....	2302.6
THEATRE, (Occupancy, Groups A and B)	501, 601
TILE	3107
TILE, ROOF	3003
TIMBER	
Glued-laminated.....	2405.3

	Section
Heavy construction	2407
TITLE OF CODE.....	101
TOILET ROOMS	412.2, 415, 1105.2(d), 1205.5
TRANSFORMER VAULTS.....	3901
TRANSPORTING ASSEMBLIES	4306
TRASH CHUTES.....	1507.1(a)(1), 1507.2(a), (e), (f), (g), (h), (i), (j)
TRAVEL DISTANCE	
Definition	2801.3
Maximum distances	504.5(b), 604.3(d), 704.3(f), 804.3(d), 904.3(d), .....1004.3(d), (f), 1104.3(d), 1204.2(e)
Increased distance allowed.....	3703.6, Table 37-1
TREADS, Stair	2803.3
TRIM.....	1512.2, 1512.6, 1612.4, 3208
TRUSSES, wood	2405.4
TYPES OF CONSTRUCTION	
Classification.....	1401
Type I – Fire-Resistive.....	Chapter 15
Definition	1501
Type II – Semi-Fire-resistive	Chapter 16
Definition	1601
Type III – Ordinary Masonry	Chapter 17
Definition-General.....	1701.1(a), (b)
Definition-Protected	1701.2(a)
Definition-Unprotected.....	1701.2(b)
Type IV Noncombustible.....	Chapter 18
Definition	1801
Type V Wood frame.....	Chapter 19
Definition	1901

U

UNDERGROUND TANKS3902.4(l), (m), (n), (o), (p)

UNDERWRITERS LABORATORIES INC. (UL) Appendix A

USE OF BUILDINGS, Material change of..... 309

UTILITIES, HAZARDOUS..... 409.3

UTILITY SHEDS.....Chapter 35

Section

V

VALVES, for hazardous utilities..... 409.3

VENEER

 Glass 3109
 Masonry backing for 2706.6(a)
 Plastic exterior3105.3

VENTILATED SPACE, INTERVENING.....412.2(d), 412.2(e), Appendix C

VENTILATING DUCTS3903, 4004

VENTILATION

 Air conditioningChapter 41
 Attic spaces2408.2
 Mechanical (forced).....Chapter 40
 Private garage1305.1
 Requirements based on Occupancy..... “*05” Section, Chapter 5 – 13 inclusive
 Under first floor, wood-frame2408.3

VENTS

 Plumbing..... 3610

VENT SHAFTS (see Vertical Openings)

VERTICAL OPENINGS

 By Occupancy Group..... “*06” Section, Chapters 5 – 13 inclusive
 Requirements for 1507
 Unenclosed openings permitted 1507.1 (b)

W

WALKWAYS

Covered mall.....	1004.3(f)
Covered mall, definition.....	Chapter 2
Covered, openings in	1504.1
During construction	2905

WALL (see also Partitions)

Anchoring of wood	2406.2(f)
Brick and stone	2706.2(g)
Chases, recesses and openings in masonry.....	2706.2(i)
Concrete, plain.....	2704.8
Decorative block (Grill block).....	2706.2(k)
Design of	2005
Enclosure construction.....	1507
Enclosure openings in.....	1507.2
Fire resistive	3204
Fire walls	2706.4
Foundation.....	2105
Gable end shed end walls.....	2706.2(d)
Glass block	2706.2(j)
Grill block (Decorative block).....	2706.2(k)
Interior bearing masonry	1504.4, 1604.3, 2706.3
Lath and plaster.....	3102, 3103
Masonry (see Masonry)	
Masonry faced	2706.6
Masonry, concentrated loads on	2705.4, 2308.5
Masonry, not listed.....	2706.8
New masonry connected to existing.....	2706.2(h)
Panel	2706.5
Parapet.....	2706.2(e)
Party	407
Piers in masonry	2706.2(f)
Projection booth.....	508, 608, 708
Smokeproof towers, construction	2805.5
Smokeproof towers, openings in	2805.2
Stucco.....	3104
Stud, steel	3102.2(c)(2), 3110.4
Stud, wood	2406.2
Thickness, masonry.....	2704.5, 2706.2(a)
Toilet, tiled	412.2(c)
Water curtain, protected	507.1(e)(2)(i), 515.3(b)
Wood sheathed.....	2406.6(2)(b), (d)
Wood supporting masonry	2406.9
Wood	Chapter 24

WALLBOARD Gypsum	3110
------------------------	------

WAREHOUSE (Occupancy Group E – Div. 1)	901
--	-----

	Section
WATER	
Cement ratio	2205.2(d)
Closets	412.2(b), 3613.6
Curtain.....	507.1(e)(2)(iii), 515.3(b)
Drinking (during construction).....	2921
Fountains (drinking)	3613.12, 3613.19
Heater	3614.19, 3807, 3810
Supply	302.6(d), 3706, 3614
Swimming pool	4205.1
Tanks (see Tanks)	
 WATER SUPPLY	 302.6(d), 3614, 3706
 WELDING STANDARDS	 2301.3, 2305, 2309.3, 2309.7
Bar joist connections.....	2308.3
Certified persons required.....	2305.2
Shop standards	2308.6
Steel joist anchorage	2308.5
 WET STANDPIPES	 3705
 WIDTH	
Aisle	504.9, 604.4, 2810.1
Atrium	515.1
Continuous footing	2103.2
Corridor.....	704.3(b), 2810.2
Cross aisles.....	504.9
Door, maximum and minimum	2811.2
Exit courts and exit passageways.....	2807
Malls	1004.3(f)(3)
Means of Egress, required	2802
Ramps, pedestrian.....	2804
Room and toilet doors for handicapped.....	415
Seating	504.9, 604.4
Stair treads	2803.3
Stairway landings.....	2803.7
Temporary sidewalks.....	2905
Tie beams, masonry.....	2706.2(c)
Tie columns, masonry	2706.2(b)
Toilet rooms, residential	1105.2(d), 1205.5
Unit of exit width	“*04.2” Section, Chapters 5-13 inclusive
Windows for rescue	1104.5
Yard may increase allowable area	“*02” Section, Chapters 5-13 inclusive
 WIND LOAD REQUIREMENTS	 2009
 WINDOWS	 1509, 1609, 1709, 1807, 1908
Area required.....	“*05” Section, Chapter 5-13 inclusive
Fire resistive assembly	3206.5, 3206.6, 3206.7
Installation details	3108

	Section
Rescue.....	1104.5
WIRE	
Supporting suspended ceiling components.....	3110.4, 3205.5
WIRE GLASS	
Glazing in fire windows	3206.5
WIRE LATH	3102.3
WOOD	Chapter 24
Allowable unit stresses	2405
Anchor bolts.....	2406.4(e)
Anchorage.....	2406.4(d)
Base plates.....	2406.2(f)
Bearing	2406.4(c)
Bridging.....	2406.4(k)
Ceiling joists.....	2406.4(h)
Columns and posts.....	2406.1
Connectors, (nailing).....	2406.8
Connectors, protection.....	2406.8(c)
Connectors, safe loads.....	2406.8(f)
Corners and bracing.....	2406.2(g)
Definitions.....	2403
Design.....	2401
Durable species.....	2408.1
Exterior wall cladding.....	2406.6(2)(d)
Fire-retardant treated	2409
Firestops	2406.3
Floor joists	2406.4(g)
Floor sheathing	2406.6(1)
Furring.....	2406.7
Glue	2406.8(e)
Glued-laminated members.....	2403, 2405.3
Grade and species.....	2403, 2404.1
Headers	2406.2(k)
Heavy timber construction.....	1703.3, 2407
Identification.....	2404.3
Joists entering masonry.....	2406.4(d)(1)
Ministry of Works Low Cost Housing Plans	2410
Moisture content.....	2404.1(b)
Nail penetration.....	2406.8(d)
Notching.....	2406.2(i)
Openings	2406.2(k)
Partitions, interior	2406.2(m)
Piles.....	2104.3
Pipes in walls	2406.2(j)
Placing studs.....	2406.2(d)
Plywood	2403, 2404.3, 2404.4, 2405.2, 2406.6
Prefabricated roof trusses	2405.4, 2406.4(l)

	Section
Preservative, treatment of.....	2408
Roof joists.....	2406.4(a), 2406.4(i)
Roof rafters.....	2406.4(a), 2406.4(j)
Roof sheathing.....	2406.6(2)
Sizes.....	2404.2
Spacing.....	2406.2(c), 2406.4(b)
Span tables.....	2406.6(1)(e), 2406.6(1)(i), 2406.6(2)(1), (3), Table 24-A
Splicing.....	2406.2(h), 2406.4(f)
Standards.....	2402
Storm sheathing.....	2406.6(2)(b)
Structural use panels.....	2403, 2404.3(d), 2406.6(2)(7)
Trusses.....	2405.4, 2406.4 (1)
Ventilation, attic spaces.....	2408.2
Ventilation, under floor.....	2408.3
Wood supporting masonry.....	2406.9

X

X-RAY FILM

Not classed like cellulose nitrate film 3904

Y

YARD HYDRANTS 3708

YARDS

Accepted as street for increase in area..... 502.1(b)(2)

Building location in..... “*03”Sections, Chapters 5-13 inclusive

NOTES