

Code Study IBC Building, NFPA Life Safety			NA = Not Applicable NR = No Requirement
Project: <b>84 Marginal Way</b> Location: <b>Portland, ME</b> No. of Stories: <b>10</b>	Scope New Construction	General Requirements Fully Sprinklered per NFPA 13 Standpipes to be installed per NFPA 14 Natural Gas to be installed per NFPA 54 Portland Fire Hose max length 150'-0"	Date: <b>1 October 2007</b> Project No: <b>06196-00</b>
	IBC 2003	NFPA 101 - 2003	CONCLUSION
Use Group / Occupancy Classification	Chapter 3 – Use or Occupancy  304 – Group B – Business  309 – Group M - Mercantile (allowed by waiver – see attached)  311 – Group S2 - Storage (open parking garage)	Chapter 6 – Classification of Occupancy  6.1.6 – Ambulatory Health Care – partial Level 7 (Chapeter 20)  6.1.10 – Mercantile (Chapeter 36)  6.1.11 – Business (Chapeter 38)  6.1.13 – Storage – open parking structures (Chapter 42)	
Specific Occupancy Areas	Table 302.1.1 Incidental Use Areas  <u>All Use Groups:</u> <b>Waste Rooms &gt; 100 sf:</b> 1 hour or provide automatic fire-extinguishing system  <b>Furnace Room with equipment &gt; 400,000 BTU per hour input:</b> 1 hour or automatic fire-extinguishing system  <b>Boiler Room with boiler &gt; 15psi and 10 horsepower:</b> 1 hour or automatic fire-extinguishing system	Ordinary Hazard in accordance with 6.2	

	<p><b>Parking Garage (406):</b> 2 hours or 1 hour and provide automatic fire extinguishing system</p> <p><b>Storage Rooms &gt; 100 sf</b> 1 hour or provide automatic fire-extinguishing system.</p> <p><b>Waste and Linen Collection Rooms &gt; 100sf</b> – 1 hour or provide automatic fire-extinguishing system.</p>			
<b>Occupancy Separations</b>	<p><b>302.3.1</b> <b>Non Separated Use Group – Fire Separation are not required between uses.</b></p>			
<b>Allowable Height and Building Areas</b>	Group	Construction Type 1B		<i>S–2 Open Parking is most Restrictive</i>
	Business	11 Stories / UL area		
	S-2 Open Parking	11 Stories / 79,000 SF		
	M Mercantile	UL height / UL area		
<b>Non Separated Uses</b>	<p><b>302.3.1</b> Most restrictive requirements of 403 and Chapter 9.</p> <p>Chapter 403 – High Rise (in order to be classified as non separated use group the building must following provisions for high-rise construction. (see high rise requirements in separate section of this code).</p> <p>Chapter 9 – Fire Protection Systems (the most restrictive requirements for the building systems for use groups B, S-2 and M must be applied to the entire building to be considered non-separated use group)</p> <p>903 – Automatic Sprinkler System Required</p>			

	<p>905 – Standpipe System Required</p> <p>907 – Fire Alarm and Detection Systems – Required</p> <p>909 – Smoke Control Systems –</p> <p>911 - Fire Command Center – Required</p> <ol style="list-style-type: none"> <li>1 - The emergency voice/alarm communication system unit.</li> <li>2 - The fire department communications unit.</li> <li>3 - Fire detection and alarm system annunciator unit.</li> <li>4 - Annunciator unit visually indicating the location of the elevators and whether they are operational.</li> <li>5 - Status indicators and controls for air-handling systems.</li> <li>6 - The fire-fighter's control panel required by Section 909.16 for smoke control systems installed in the building.</li> <li>7 - Controls for unlocking stairway doors simultaneously.</li> <li>8 - Sprinkler valve and water-flow detector display panels.</li> <li>9 - Emergency and standby power status indicators.</li> <li>10- A telephone for fire department use with controlled access to the public telephone system.</li> <li>11 -Fire pump status indicators.</li> <li>12 -Schematic building plans indicating the typical floor plan and detailing the building core, means of egress, fire protection systems, fire-fighting equipment and fire department access.</li> <li>13- Worktable.</li> <li>14 -Generator supervision devices, manual start and transfer features.</li> </ol>		<p><b>907</b> see analysis for sections 403.5, 403.6 and 403.7 (below)</p> <p><b>909</b> see analysis for sections 403.13 (below)</p>
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**Area Modifications**

**506.2 Street Frontage Increase**

$$If = 100 \times \left[ \frac{F}{P} - 0.25 \right] \frac{W}{30}$$

$$16.675 = 100 \times \left[ \frac{426}{852} - 0.25 \right] \frac{20}{30}$$

*If* = Area increase due to frontage.  
*F* = Building perimeter which fronts on a public way or open space having 20 feet (6096 mm) open minimum width (feet).  
*P* = Perimeter of entire building (feet).  
*W* = Width of public way or open space (feet) in accordance with Section 506.2.1.

**506.1 Maximum Floor Area Increase**

$$Aa = At + \left[ \frac{At * If}{100} \right] + \left[ \frac{At * Is}{100} \right]$$

$$250,172 = 79,000 + \left[ \frac{79,000 * 16.675}{100} \right] + \left[ \frac{79,000 * 200}{100} \right]$$

*Aa* = Allowable area per floor (square feet).  
*At* = Tabular area per floor in accordance with Table 503 (square feet).  
*If* = Area increase due to frontage (percent) as calculated in accordance with Section 506.2.  
*Is* = Area increase due to sprinkler protection (percent) as calculated in accordance with Section 506.3.

*Building Qualifies as Non Separated Use Group*



	<p><b>403.3 – Reduction in fire-resistance rating allowed in buildings that have sprinkler control valves equipped with supervisory initiating devices and water-flow initiating devices for each floor.</b></p> <p>403.3.1 Type of Construction 1B can be reduced to 2A</p> <p>403.3.2 Shafts (other than exits and elevators) can be reduced to 1 hour.</p> <p><b>403.4 – Emergency Escape and rescue openings per Section 1025 are not required.</b></p> <p><b>403.5 – Automatic fire detection – smoke detection shall be provided in accordance with Section 907.2.12.1.</b></p>		<p><b><i>403.3</i></b> <i>The office tower area will have sectionalizing valves and tamper switches per floor, as required.</i></p> <p><b><i>403.5</i></b> <i>There will be smoke detectors in the elevator machine room, each elevator lobby and at the top of each stair tower. Each HVAC unit will have smoke detectors in the supply and return ducts. Mechanical equipment, electrical, transformer, telephone equipment, and other similar rooms will not be provided with smoke detectors because there is sprinkler protection in these spaces</i></p>
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	<p><b>403.6 – Emergency voice/alarm communication systems – shall be provided per Section 907.2.12.2.</b></p> <p><b>403.7 – Fire department communication system shall be provided per Section 907.2.12.3.</b></p> <p><b>403.8 – Fire command center per Section 911 shall be provided in a location approved by the fire department.</b></p> <p><b>403.9 – Elevators – per Section 30 shall be provided.</b></p> <p><b>403.10– Standby power shall be provided per Section 2702.</b></p>		<p><i><b>403.6</b> Activation of any automatic detector, manual pull station or sprinkler water flow device will sound an alert tone followed by voice instructions giving approved information and directions for evacuation of alarming floor and the floors above and below the floor in alarm.</i></p> <p><i><b>403.7</b> Two way fire department communications system will be provided for fire department use that will allow communications between command center and elevators, elevator lobbies, emergency power electrical room and inside enclosed stairways.</i></p> <p><i><b>403.8</b> The fire command center location and all features adjacent to the Lobby on the ground floor has been reviewed and approved by Captain Cass.</i></p> <p><i><b>403.10</b> Emergency power system shall be provided that will provide power for command center power and lighting, stair pressurization fans and all elevators.</i></p>
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	<p><b>403.11 – Emergency power system per Section 2702 shall be provided.</b></p> <p><b>403.12 – Stairway door operation are permitted to be locked from stairway side of door but must be unlatched from signal from fire command center.</b>  402.12.1 – 2 – way communication system must be provided on every 5<sup>th</sup> floor when doors are locked.</p> <p><b>403.13 – Smokeproof exit enclosures per Section 909.20 and 1019.1.8.</b></p> <p><b>403.14 – Seismic considerations per Chapter 16.</b></p>		<p><b><i>403.11.</i></b>Emergency power system shall be provided that will provide power for (in addition to the loads described above) exit signage, egress lighting, elevator cab lighting, emergency communications system, automatic fire detection and alarm systems.</p> <p><b><i>403.12.</i></b>Stairway doors are controlled at the fire command center and will unlatch from signal.</p> <p><b><i>403.13</i></b> The stairwells will be in a 2-hour rated smoke proof enclosure. The stair wells will be pressurized to a minimum of 0.15 inch of water (37 Pa) and a maximum of .35 inch of water (87 Pa) in the shaft relative to the building measured with all the stairway doors closed under maximum anticipated stack pressures.</p>
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	<p><b>404.0 – Atriums</b> A floor opening or series of floor openings which connects two or more stories</p> <p>404.4 – smoke control system not required per Exception 1.</p> <p>404.5 – Enclosure – separated from adjacent spaces by 1-hour fire barrier wall.</p> <p>404.7 – Interior finish shall not be less than Class B.</p>	<p><b>8.6.7 – Atriums</b> Separated from adjacent space by fire barriers with not less than 1-hour fire resistive rated construction</p>	
<p><b>Open Parking Structures</b></p>	<p><b>406.3.3.1 Openings</b> The area of such openings in exterior walls on a tier must be at least 20 percent of the total perimeter wall area of each tier. The aggregate length of the opening shall be at least 40 percent of the perimeter of the tier.</p>	<p><b>3.3.217.7 Open Parking Structure</b> Each parking level has walls opening to the atmosphere, for an area of not less than 1.4 sq ft for each linear foot of its exterior perimeter. Openings are distributed over at least 40% of the building perimeter.</p>	

**Open Parking Structures  
Free Area and LF  
Calculations at Exterior  
Walls**

FACADE	TOTAL AREA SF	FREE AREA SF	% FREE AREA	TOTAL LF	FREE LF	% FREE LF
<b>LEVEL P1</b>						
852 x 1.4 = 1,192 sf required free area per NFPA 101						
Mar. Way	3013	0	0%	243'-0"	0	0
Bayside	2272	977	43%	183'-0"	135'-0"	74%
I-295	3030	1585	52%	243'-0"	202'-8"	83%
Preble	2271	308	14%	183'-0"	58'-8"	32%
<b>TOTAL</b>		<b>2870</b>	<b>27%</b>	<b>852'-0"</b>		<b>47%</b>
<b>LEVEL P2</b>						
852 x 1.4 = 1,192 sf required free area per NFPA 101						
Mar. Way	2346	0	0%	243'-0"	0	0
Bayside	1717	519	30%	183'-0"	135'-0"	74%
I-295	2291	745	33%	243'-0"	202'-8"	83%
Preble	1717	268	16%	183'-0"	68'-0"	37%
<b>TOTAL</b>		<b>1532</b>	<b>20%</b>	<b>852'-0"</b>		<b>49%</b>
<b>LEVEL P3</b>						
852 x 1.4 = 1,192 sf required free area per NFPA 101						
Mar. Way	2368	480	20%	243'-0"	124'-0"	51%
Bayside	1717	519	30%	183'-0"	135'-0"	74%
I-295	2291	745	33%	243'-0"	202'-8"	83%
Preble	1717	268	16%	183'-0"	68'-0"	37%
<b>TOTAL</b>		<b>2012</b>	<b>25%</b>	<b>852'-0"</b>		<b>61%</b>
<b>LEVEL P4</b>						
852 x 1.4 = 1,192 sf required free area per NFPA 101						
Mar. Way	2805	1317	47%	243'-0"	152'-0"	63%
Bayside	2034	712	35%	183'-0"	92'-0"	50%
I-295	2713	2028	75%	243'-0"	243'-0"	100%
Preble	2038	825	40%	183'-0"	103'-8"	57%
<b>TOTAL</b>		<b>4882</b>	<b>49%</b>	<b>852'-0"</b>		<b>67%</b>
<b>LEVEL P5</b>						
<b>All Sides</b>			<b>100%</b>			<b>100%</b>

*Free Area at each Tier meets or exceeds 20% of total wall area as required.*

*Total Linear Footage of ventilated Space meets or exceeds 40% of total linear footage as required.*

*Free Area of each tier meets or exceeds the NFPA 101 requirement of 1.4 sq ft for each lf of of perimeter.*

Open Parking Structures		LEVEL	TOTAL SF OF WALL	OPENING SF	% OPEN	<i>Free Area of Interior Walls Exceed 20% Total Wall Area as required.</i>
<b>Free Area Calculations at Interior Walls</b>	<b>INTERIOR WALL N-S</b>	P1	1543	1035	<b>67%</b>	
		P2	1178	793	<b>67%</b>	
		P3	1382	998	<b>72%</b>	
		P4 (A-G)	940	651	<b>69%</b>	
	<b>INTERIOR WALLS E-W (Line G)</b> Level Decks looking to Marginal Way	P1	2720	969	<b>36%</b>	
		P2	2449	857	<b>35%</b>	
		P3	2467	857	<b>35%</b>	
		P4 (1-7)	1844	582	<b>32%</b>	
		P4 (7-11)			<b>100%</b>	
		P5			<b>100%</b>	
		Total wall	9866	3264	<b>33%</b>	
	<b>INTERIOR WALLS E-W (Line G)</b> Ramped Decks looking to I-295	P1 (7-11)	1036	491	<b>47%</b>	
		P2	2605	839	<b>32%</b>	
P3		2460	843	<b>34%</b>		
P4		2460	843	<b>34%</b>		
P5 (1-7)		1580	371	<b>23%</b>		
P5 (7-11)				<b>100%</b>		
<b>Height Limitations</b>	<b>Table 503 and 508.7:</b> Use Group: B – Business M – Mercantile S-2 - Storage  Const Type: 1B (reduced to 2A) Maximum Height: 11 Stories 160'-0"					

<b>Area Limitations</b>	<b>Table 503:</b> Allowable Area: 79,000 sf (S-2)	Total wall	<b>Actual Area:</b> Level 1 44,580 s.f. Level 2 44,580 s.f. Level 3 44,580 s.f. Level 4 44,580 sf Level 4.5 12,200 sf Level 5 17,500 sf Level 6 17,500 sf Level 7 17,500 sf Level 8 17,500 sf Level 9 17,500 sf Level 10 17,500 sf Total = 295,520 sf	
<b>Fire-Resistance Rating Requirements</b>	<b>Table 601</b> Construction Type 2A	<b>Minimum Construction Requirements</b> 20.1.6.5 Ambulatory Care - Type II (000) if sprinklered 36.1.6 Mercantile – no special requirements 38.1.6.5 Business – no special requirements 42.1.6 Storage – no special requirements	<i>Type 2A is most restrictive</i>	
	Structural Frame Bearing Walls Exterior Interior Non bearing walls and partitions Exterior Non bearing walls and partitions Interior Floor Construction Roof Construction	1 - hour 1 - hour 1 - hour <b>Table 602</b> Fire separation Distance 0 – 30' Use Group All 1 - hour 30' + 0 0 1 - hour 1 - hour	0     0 0	 <i>Not Applicable</i>  <i>Not Applicable</i>    
<b>Standpipe System</b>			<i>Required</i>	

<b>Occupant Load</b>	<b>1004.0</b>		<b>20.1.7, 36.1.7 and 38.1.7 Table 7.3.1.2</b>	
	<b>Occupancy</b>	<b>SF/occupant</b>	<b>Occupancy</b>	<b>SF/occupant</b>
	Business	100	Business	100
	Parking Garages	200		

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	<u>Occupancy Area</u>	<u>Total No. Occupants</u>	<u>Stair Egress Width</u>		<u>Door Egress Width</u>		
			Req (.3)	Act	Req (.2)	Act	
			Level 1	44,000 sf / 200	220	66	
Level 2	44,000 sf / 200	220	66	144	44	108	
Level 3	44,000 sf / 200	220	66	144	44	108	
Level 4 and 4.5	56,000 sf / 200	220	66	144	44	108	
Level 5	16,000 sf / 100	160	48	96	32	72	
Level 6	15,900 sf / 100	159	48	96	32	72	
Level 7	15,900 sf / 100	159	48	96	32	72	
Level 8	15,700 sf / 100	157	48	96	32	72	
Level 9	15,700 sf / 100	157	48	96	32	72	
Level 10	15,550 sf / 100	155	48	96	32	72	
<b>Total Business Occupancy</b>		<b>947</b>					

<b>Locations of Means of Egress</b>	<b>1015.1</b> – exits to be located so they shall not exceed travel distance	<b>7.5.1.3.3</b> - Minimum distance between must be at least one third of the maximum diagonal dimension of the building
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<b>Travel Distance to Exits</b>	<b>Table 1015.1 (w/ sprinkler system)</b> Use Group B: 300' Use Group S-2: 450'	<b>20.2.6 Ambulatory Care:</b> 150' – 0" max <b>36.2.6 Mercantile:</b> 250' – 0" max <b>38.2.6 Business:</b> 300' – 0" max	<i>NFPA is most restrictive</i>
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	Use Group M: 250'	<b>42.2.6 Open Parking:</b> 200' – 0" max	
<b>Dead End Corridor</b>	<b>1016.3 -</b> Use Group B: 50' Use Group S-2 parking: 20' Use Group M: 20'	<b>20.2.5 Ambulatory Care</b> not allowed <b>36.2.5 Mercantile</b> 50' – 0" max <b>38.2.5 Business</b> 50' – 0" max <b>42.8.2.5.2 Open Parking</b> 50' – 0" max	<i>IBC is most restrictive</i>
<b>Common Path of Travel</b>	<b>1013.3 -</b> Use Group B: 100' Use Group S-2 parking: 100' Use Group M: 75'	<b>20.2.5.2 Ambulatory Care</b> not allowed <b>36.2.5 Mercantile</b> 100' – 0" max <b>38.2.5.5 Business</b> 100' – 0" max <b>42.8.2.5.1 Open Parking</b> 50' – 0" max	
<b>Area of Refuge</b>	Not required with a sprinkler system	Not required with a sprinkler system	<i>Not Required</i>