Illustrated Guide to the 2006
International Plumbing and Sewage Codes
ABOUT THE AUTHOR

Terry L. Patterson is a licensed architect and the W. Edwin Bryan, Jr. Professor of Architecture at the University of Oklahoma. He has more than thirty years of professional and teaching experience, and is the author of a dozen books on subjects including Frank Lloyd Wright, the philosophy of building materials, the teaching and practice of architectural technology, and building codes.
Illustrated Guide to the 2006 International Plumbing and Sewage Codes

Terry L. Patterson, NCARB
University of Oklahoma
To Drew Wolfard
Scott Wolfard
and
Nick Raymond
## Contents

<table>
<thead>
<tr>
<th>Preface</th>
<th>xxv</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acknowledgments</td>
<td>xxvii</td>
</tr>
<tr>
<td>Introduction</td>
<td>xxix</td>
</tr>
</tbody>
</table>

### PART I: PLUMBING

#### Chapter 1: Administration

106 Permits 4
- 106.3.1 Construction documents 4
- 106.5.2 Validity 4
- 106.5.6 Retention of construction documents 4

#### Chapter 2: Definitions

202 General Definitions 6

#### Chapter 3: General Regulations

301 General 46
- 301.2 System installation 46
- 301.3 Connections to the sanitary drainage system 46
- 301.4 Connections to water supply 46
- 301.6 Prohibited locations 46

303 Materials 47
- 303.1 Identification 47
- 303.4 Third-party testing and certification 47

304 Rodentproofing 48
- 304.1 General 48
- 304.2 Strainer plates 48
- 304.3 Meter boxes 48
- 304.4 Openings for pipes 48

305 Protection of Pipes and Plumbing System Components 49
- 305.1 Corrosion 49
- 305.4 Sleeves 49
### ILLUSTRATED GUIDE TO THE 2006 INTERNATIONAL PLUMBING AND SEWAGE CODES

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>305.5</td>
<td>Pipes through or under footings or foundations walls</td>
</tr>
<tr>
<td>305.6</td>
<td>Freezing</td>
</tr>
<tr>
<td>305.7</td>
<td>Waterproofing of openings</td>
</tr>
<tr>
<td>305.8</td>
<td>Protection against physical damage</td>
</tr>
<tr>
<td>306</td>
<td>Trenching, Excavation and Backfill</td>
</tr>
<tr>
<td>306.1</td>
<td>Support of piping</td>
</tr>
<tr>
<td>306.2</td>
<td>Trenching and bedding</td>
</tr>
<tr>
<td>306.2.1</td>
<td>Overexcavation</td>
</tr>
<tr>
<td>306.2.2</td>
<td>Rock removal</td>
</tr>
<tr>
<td>306.2.3</td>
<td>Soft load-bearing materials</td>
</tr>
<tr>
<td>306.3</td>
<td>Backfilling</td>
</tr>
<tr>
<td>306.4</td>
<td>Tunneling</td>
</tr>
<tr>
<td>307</td>
<td>Structural Safety</td>
</tr>
<tr>
<td>307.2</td>
<td>Cutting, notching or bored holes</td>
</tr>
<tr>
<td>307.4</td>
<td>Alterations to trusses</td>
</tr>
<tr>
<td>307.5</td>
<td>Trench location</td>
</tr>
<tr>
<td>308</td>
<td>Piping Support</td>
</tr>
<tr>
<td>308.5</td>
<td>Interval of support</td>
</tr>
<tr>
<td>308.6</td>
<td>Sway bracing</td>
</tr>
<tr>
<td>308.7</td>
<td>Anchorage</td>
</tr>
<tr>
<td>308.7.1</td>
<td>Location</td>
</tr>
<tr>
<td>308.8</td>
<td>Expansion joint fittings</td>
</tr>
<tr>
<td>308.9</td>
<td>Parallel water distribution systems</td>
</tr>
<tr>
<td>309</td>
<td>Flood Hazard Resistance</td>
</tr>
<tr>
<td>309.1</td>
<td>General</td>
</tr>
<tr>
<td>309.2</td>
<td>Flood hazard</td>
</tr>
<tr>
<td>309.3</td>
<td>Flood hazard areas subject to high-velocity wave action</td>
</tr>
<tr>
<td>310</td>
<td>Washroom and Toilet Room Requirements</td>
</tr>
<tr>
<td>310.5</td>
<td>Urinal partitions</td>
</tr>
<tr>
<td>312</td>
<td>Tests and Inspections</td>
</tr>
<tr>
<td>312.1</td>
<td>Required tests</td>
</tr>
<tr>
<td>312.1.1</td>
<td>Test gauges</td>
</tr>
<tr>
<td>312.2</td>
<td>Drainage and vent water test</td>
</tr>
<tr>
<td>312.3</td>
<td>Drainage and vent air test</td>
</tr>
<tr>
<td>312.4</td>
<td>Drainage and vent final test</td>
</tr>
<tr>
<td>312.5</td>
<td>Water supply system test</td>
</tr>
<tr>
<td>312.6</td>
<td>Gravity sewer test</td>
</tr>
<tr>
<td>312.7</td>
<td>Forced sewer test</td>
</tr>
<tr>
<td>312.8</td>
<td>Storm drainage system test</td>
</tr>
<tr>
<td>312.9.1</td>
<td>Inspections</td>
</tr>
<tr>
<td>314</td>
<td>Condensate Disposal</td>
</tr>
<tr>
<td>314.1</td>
<td>Fuel-burning appliances</td>
</tr>
<tr>
<td>314.2.1</td>
<td>Condensate disposal</td>
</tr>
<tr>
<td>314.2.2</td>
<td>Drain pipe materials and sizes</td>
</tr>
<tr>
<td>314.2.3</td>
<td>Auxiliary and secondary drain systems</td>
</tr>
</tbody>
</table>
Chapter 4: Fixtures, Faucets and Fixture Fittings

402 Fixture Materials
  402.1 Quality of fixtures
  402.2 Materials for specialty fixtures
  402.3 Sheet copper
  402.4 Sheet lead

403 Minimum Plumbing Facilities
  403.1 Minimum number of fixtures
  403.1.1 Unisex toilet and bath fixtures
  403.2 Separate facilities
  403.3 Number of occupants of each sex
  403.4 Required public toilet facilities
  403.4.1 Location of toilet facilities in occupancies other than covered malls
  403.4.2 Location of toilet facilities in covered malls
  403.4.3 Pay facilities
  403.5 Signage

405 Installation of Fixtures
  405.1 Access for cleaning
  405.2 Setting
  405.3.1 Water closets, urinals, lavatories and bidets
  405.3.2 Public lavatories
  405.4 Floor and wall drainage connections
  405.4.1 Floor flanges
  405.4.2 Securing floor outlet fixtures
  405.4.3 Securing wall-hung water closet bowls
  405.5 Water-tight joints
  405.6 Plumbing in mental health centers
  405.7 Design of overflows
  405.7.1 Connection of overflows
  405.8 Slip joint connections
  405.9 Design and installation of plumbing fixtures

406 Automatic Clothes Washers
  406.1 Approval
  406.2 Water connection
  406.3 Waste connection

407 Bathtubs
  407.1 Approval
  407.2 Bathtub waste outlets
  407.3 Glazing
  407.4 Bathtub enclosure

412 Floor and Trench Drains
  412.1 Approval
  412.2 Floor drains
  412.3 Size of floor drains
  412.4 Public laundries and central washing facilities

413 Food Waste Grinder Units
  413.1 Approval
  413.2 Domestic food waste grinder waste outlets
### Illustrated Guide to the 2006 International Plumbing and Sewage Codes

#### 413.3 Commercial food waste grinder waste outlets
- Page 107

#### 413.4 Water supply required
- Page 107

#### 416 Lavatories

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>416.1</td>
<td>Approval</td>
</tr>
<tr>
<td>416.2</td>
<td>Cultured marble lavatories</td>
</tr>
<tr>
<td>416.3</td>
<td>Lavatory waste outlets</td>
</tr>
<tr>
<td>416.4</td>
<td>Movable lavatory systems</td>
</tr>
<tr>
<td>416.5</td>
<td>Tempered water for public hand-washing facilities</td>
</tr>
</tbody>
</table>

- Page 108

#### 417 Showers

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>417.1</td>
<td>Approval</td>
</tr>
<tr>
<td>417.2</td>
<td>Water supply riser</td>
</tr>
<tr>
<td>417.3</td>
<td>Shower waste outlet</td>
</tr>
<tr>
<td>417.4</td>
<td>Shower compartments</td>
</tr>
<tr>
<td>417.4.1</td>
<td>Wall area</td>
</tr>
<tr>
<td>417.5.2</td>
<td>Shower lining</td>
</tr>
<tr>
<td>417.5.2.1</td>
<td>PVC sheets</td>
</tr>
<tr>
<td>417.5.2.2</td>
<td>Chlorinated polyethylene (CPE) sheets</td>
</tr>
<tr>
<td>417.5.2.3</td>
<td>Sheet lead</td>
</tr>
<tr>
<td>417.5.2.4</td>
<td>Sheet copper</td>
</tr>
<tr>
<td>417.6</td>
<td>Glazing</td>
</tr>
</tbody>
</table>

- Page 109

#### 419 Urinals

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>419.2</td>
<td>Substitution for water closets</td>
</tr>
<tr>
<td>419.3</td>
<td>Surrounding material</td>
</tr>
</tbody>
</table>

- Page 114

#### 420 Water Closets

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>420.1</td>
<td>Approval</td>
</tr>
<tr>
<td>420.2</td>
<td>Water closets for public or employee toilet facilities</td>
</tr>
<tr>
<td>420.3</td>
<td>Water closet seats</td>
</tr>
<tr>
<td>420.4</td>
<td>Water closet connections</td>
</tr>
</tbody>
</table>

- Page 115

#### 421 Whirlpool Bathtubs

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>421.1</td>
<td>Approval</td>
</tr>
<tr>
<td>421.2</td>
<td>Installation</td>
</tr>
<tr>
<td>421.3</td>
<td>Drain</td>
</tr>
<tr>
<td>421.4</td>
<td>Suction fittings</td>
</tr>
<tr>
<td>421.5</td>
<td>Access to pump</td>
</tr>
<tr>
<td>421.6</td>
<td>Whirlpool enclosure</td>
</tr>
</tbody>
</table>

- Page 116

#### 424 Faucets and Other Fixture Fittings

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>424.3</td>
<td>Individual shower valves</td>
</tr>
<tr>
<td>424.4</td>
<td>Multiple (gang) showers</td>
</tr>
<tr>
<td>424.5</td>
<td>Bathtub and whirlpool bathtub valves</td>
</tr>
</tbody>
</table>

- Page 117

#### 425 Flushing Devices for Water Closets and Urinals

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>425.2</td>
<td>Flushometer valves and tanks</td>
</tr>
<tr>
<td>425.3</td>
<td>Flush tanks</td>
</tr>
<tr>
<td>425.3.1</td>
<td>Fill valves</td>
</tr>
<tr>
<td>425.3.2</td>
<td>Overflows in flush tanks</td>
</tr>
</tbody>
</table>

- Page 118

### Chapter 5: Water Heaters

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>501</td>
<td>General</td>
</tr>
<tr>
<td>501.2</td>
<td>Water heater as space heater</td>
</tr>
</tbody>
</table>

- Page 120
## CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>501.3 Drain valves</td>
<td>120</td>
</tr>
<tr>
<td>501.6 Water temperature control in piping from tankless heaters</td>
<td>120</td>
</tr>
<tr>
<td>501.7 Pressure marking of storage tanks</td>
<td>120</td>
</tr>
<tr>
<td>502 Installation</td>
<td>121</td>
</tr>
<tr>
<td>502.2 Rooms used as a plenum</td>
<td>121</td>
</tr>
<tr>
<td>502.3 Water heaters installed in attics</td>
<td>121</td>
</tr>
<tr>
<td>504 Safety Devices</td>
<td>122</td>
</tr>
<tr>
<td>504.1 Antisiphon devices</td>
<td>122</td>
</tr>
<tr>
<td>504.2 Vacuum relief valve</td>
<td>122</td>
</tr>
<tr>
<td>504.3 Shutdown</td>
<td>122</td>
</tr>
<tr>
<td>504.4 Relief valve</td>
<td>122</td>
</tr>
<tr>
<td>504.4.1 Installation</td>
<td>123</td>
</tr>
<tr>
<td>504.5 Relief valve approval</td>
<td>123</td>
</tr>
<tr>
<td>504.7 Required pan</td>
<td>123</td>
</tr>
<tr>
<td>504.7.1 Pan size and drain</td>
<td>123</td>
</tr>
<tr>
<td>504.7.2 Pan drain termination</td>
<td>124</td>
</tr>
</tbody>
</table>

### Chapter 6: Water Supply and Distribution

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>602 Water Required</td>
<td>126</td>
</tr>
<tr>
<td>602.2 Potable water required</td>
<td>126</td>
</tr>
<tr>
<td>602.3 Individual water supply</td>
<td>126</td>
</tr>
<tr>
<td>602.3.1 Sources</td>
<td>126</td>
</tr>
<tr>
<td>602.3.2 Minimum quantity</td>
<td>126</td>
</tr>
<tr>
<td>602.3.3 Water quality</td>
<td>126</td>
</tr>
<tr>
<td>602.3.5 Pumps</td>
<td>127</td>
</tr>
<tr>
<td>602.3.5.1 Pump enclosure</td>
<td>127</td>
</tr>
<tr>
<td>603.2 Separation of water service and building sewer</td>
<td>128</td>
</tr>
<tr>
<td>604 Design of Building Water Distribution System</td>
<td>130</td>
</tr>
<tr>
<td>604.3 Water distribution system design criteria</td>
<td>130</td>
</tr>
<tr>
<td>604.4 Maximum flow and water consumption</td>
<td>131</td>
</tr>
<tr>
<td>604.5 Size of fixture supply</td>
<td>131</td>
</tr>
<tr>
<td>604.6 Variable street pressures</td>
<td>132</td>
</tr>
<tr>
<td>604.7 Inadequate water pressure</td>
<td>133</td>
</tr>
<tr>
<td>604.8 Water-pressure reducing valve or regulator</td>
<td>133</td>
</tr>
<tr>
<td>604.8.1 Valve design</td>
<td>133</td>
</tr>
<tr>
<td>604.8.2 Repair and removal</td>
<td>133</td>
</tr>
<tr>
<td>604.9 Water hammer</td>
<td>133</td>
</tr>
<tr>
<td>604.10 Gridded and parallel water distribution system manifolds</td>
<td>134</td>
</tr>
<tr>
<td>604.10.1 Manifold sizing</td>
<td>134</td>
</tr>
<tr>
<td>604.10.2 Valves</td>
<td>134</td>
</tr>
<tr>
<td>604.10.3 Access</td>
<td>134</td>
</tr>
<tr>
<td>604.11 Individual pressure balancing in-line valves for individual fixture fittings</td>
<td>134</td>
</tr>
<tr>
<td>605 Materials, Joints and Connections</td>
<td>135</td>
</tr>
<tr>
<td>605.1 Soil and ground water</td>
<td>135</td>
</tr>
<tr>
<td>605.2 Lead content of water supply pipe and fittings</td>
<td>135</td>
</tr>
<tr>
<td>605.3 Water service pipe</td>
<td>135</td>
</tr>
<tr>
<td>605.4 Water distribution pipe</td>
<td>136</td>
</tr>
<tr>
<td>605.5 Fittings</td>
<td>136</td>
</tr>
</tbody>
</table>
ILLUSTRATED GUIDE TO THE 2006 INTERNATIONAL PLUMBING AND SEWAGE CODES

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>605.5.1</td>
<td>Mechanically formed tee fittings</td>
<td>136</td>
</tr>
<tr>
<td>605.5.1.1</td>
<td>Full flow assurance</td>
<td>136</td>
</tr>
<tr>
<td>605.5.1.2</td>
<td>Brazed joints</td>
<td>136</td>
</tr>
<tr>
<td>605.6</td>
<td>Flexible water connectors</td>
<td>136</td>
</tr>
<tr>
<td>605.7</td>
<td>Valves</td>
<td>137</td>
</tr>
<tr>
<td>605.9</td>
<td>Prohibited joints and connections</td>
<td>137</td>
</tr>
<tr>
<td>605.10.1</td>
<td>Mechanical joints</td>
<td>137</td>
</tr>
<tr>
<td>605.10.2</td>
<td>Solvent cementing</td>
<td>137</td>
</tr>
<tr>
<td>605.10.3</td>
<td>Threaded joints</td>
<td>138</td>
</tr>
<tr>
<td>605.11</td>
<td>Asbestos-cement</td>
<td>138</td>
</tr>
<tr>
<td>605.12.1</td>
<td>Brazed joints</td>
<td>138</td>
</tr>
<tr>
<td>605.12.2</td>
<td>Mechanical joints</td>
<td>138</td>
</tr>
<tr>
<td>605.12.3</td>
<td>Threaded joints</td>
<td>138</td>
</tr>
<tr>
<td>605.12.4</td>
<td>Welded joints</td>
<td>138</td>
</tr>
<tr>
<td>605.13</td>
<td>Gray iron and ductile iron joints</td>
<td>139</td>
</tr>
<tr>
<td>605.14.1</td>
<td>Brazed joints</td>
<td>139</td>
</tr>
<tr>
<td>605.14.2</td>
<td>Mechanical joints</td>
<td>139</td>
</tr>
<tr>
<td>605.14.3</td>
<td>Soldered joints</td>
<td>139</td>
</tr>
<tr>
<td>605.14.4</td>
<td>Threaded joints</td>
<td>140</td>
</tr>
<tr>
<td>605.14.5</td>
<td>Welded joints</td>
<td>140</td>
</tr>
<tr>
<td>605.15.1</td>
<td>Brazed joints</td>
<td>140</td>
</tr>
<tr>
<td>605.15.2</td>
<td>Flared joints</td>
<td>140</td>
</tr>
<tr>
<td>605.15.3</td>
<td>Mechanical joints</td>
<td>140</td>
</tr>
<tr>
<td>605.15.4</td>
<td>Soldered joints</td>
<td>141</td>
</tr>
<tr>
<td>605.16.1</td>
<td>Mechanical joints</td>
<td>141</td>
</tr>
<tr>
<td>605.16.2</td>
<td>Solvent cementing</td>
<td>141</td>
</tr>
<tr>
<td>605.16.3</td>
<td>Threaded joints</td>
<td>142</td>
</tr>
<tr>
<td>605.17.1</td>
<td>Flared joints</td>
<td>142</td>
</tr>
<tr>
<td>605.17.2</td>
<td>Mechanical joints</td>
<td>142</td>
</tr>
<tr>
<td>605.18.1</td>
<td>Threaded joints</td>
<td>142</td>
</tr>
<tr>
<td>605.18.2</td>
<td>Mechanical joints</td>
<td>142</td>
</tr>
<tr>
<td>605.19.1</td>
<td>Flared joints</td>
<td>143</td>
</tr>
<tr>
<td>605.19.2</td>
<td>Heat-fusion joints</td>
<td>143</td>
</tr>
<tr>
<td>605.19.3</td>
<td>Mechanical joints</td>
<td>143</td>
</tr>
<tr>
<td>605.20.1</td>
<td>Flared joints</td>
<td>143</td>
</tr>
<tr>
<td>605.20.2</td>
<td>Heat-fusion joints</td>
<td>143</td>
</tr>
<tr>
<td>605.20.3</td>
<td>Mechanical joints</td>
<td>144</td>
</tr>
<tr>
<td>605.20.4</td>
<td>Installation</td>
<td>144</td>
</tr>
<tr>
<td>605.21.1</td>
<td>Heat-fusion joints</td>
<td>144</td>
</tr>
<tr>
<td>605.21.2</td>
<td>Mechanical and compression sleeve joints</td>
<td>144</td>
</tr>
<tr>
<td>605.22.1</td>
<td>Mechanical joints</td>
<td>145</td>
</tr>
<tr>
<td>605.22.2</td>
<td>Solvent cementing</td>
<td>145</td>
</tr>
<tr>
<td>605.22.3</td>
<td>Threaded joints</td>
<td>145</td>
</tr>
<tr>
<td>605.23.1</td>
<td>Mechanical joints</td>
<td>145</td>
</tr>
<tr>
<td>605.23.2</td>
<td>Welded joints</td>
<td>146</td>
</tr>
<tr>
<td>605.24</td>
<td>Joints between different materials</td>
<td>146</td>
</tr>
<tr>
<td>605.24.1</td>
<td>Copper or copper-alloy tubing to galvanized steel pipe</td>
<td>146</td>
</tr>
</tbody>
</table>
605.24.2 Plastic pipe or tubing to other piping material 146
605.24.3 Stainless steel 146

606 Installation of the Building Water Distribution System 147
606.1 Location of full-open valves 147
606.2 Location of shutoff valves 147
606.3 Access to valves 147
606.4 Valve identification 147
606.5.1 Water pressure booster systems required 148
606.5.3 Covers 148
606.5.4 Overflows for water supply tanks 148
606.5.5 Low-pressure cutoff required on booster pumps 149
606.5.6 Potable water inlet control and location 149
606.5.7 Tank drain pipes 149
606.5.8 Prohibited location of potable supply tanks 149

607 Hot Water Supply System 150
607.1 Where required 150
607.2 Hot water supply temperature maintenance 150
607.2.1 Piping insulation 150
607.2.2 Hot water system controls 150
607.2.3 Recirculating pump 151
607.3.1 Pressure-reducing valve 151
607.3.2 Backflow prevention device or check valve 151
607.4 Flow of hot water to fixtures 151

608 Protection of Potable Water Supply 152
608.2 Plumbing fixtures 152
608.3 Devices, appurtenances, appliances and apparatus 152
608.3.1 Special equipment, water supply protection 152
608.5 Chemicals and other substances 153
608.6 Cross-connection control 153
608.6.1 Private water supplies 153
608.7 Stop-and-waste valves prohibited 153
608.8 Identification of potable and nonpotable water 153
608.8.1 Information 154
608.8.2 Color 154
608.8.3 Size 155
608.9 Reutilization prohibited 156
608.10 Reuse of piping 156
608.11 Painting of water tanks 156
608.12 Pumps and other appliances 156
608.13.1 Air gap 156
608.13.2 Reduced pressure principle backflow preventers 157
608.13.3 Backflow preventer with intermediate atmospheric vent 157
608.13.4 Barometric loop 157
608.13.5 Pressure-type vacuum breakers 157
608.13.6 Atmospheric-type vacuum breakers 158
608.13.7 Double check-valve assemblies 158
608.13.8 Spillproof vacuum breakers 158
608.13.9 Chemical dispenser backflow devices
608.15.1 Protection by air gap
608.15.2 Protection by a reduced pressure principle backflow preventer
608.15.3 Protection by backflow preventer with intermediate atmospheric vent
608.15.4 Protection by a vacuum breaker
608.15.4.1 Deck-mounted and integral vacuum breakers
608.15.4.2 Hose connections
608.16.5 Connections to lawn irrigation systems
608.16.6 Connections subject to backpressure
608.17.1 Well locations
608.17.2 Elevation
608.17.3 Depth
608.17.4 Water-tight casings
608.17.5 Drilled or driven well casings
608.17.6 Dug or bored well casings
608.17.7 Cover
608.17.8 Drainage

Chapter 7: Sanitary Drainage
701 General
701.3 Separate sewer connection
701.4 Sewage treatment
701.5 Damage to drainage system or public sewer
701.7 Connections
703 Building Sewer
703.1 Building sewer pipe near the water service
703.2 Drainage pipe in filled ground
703.3 Sanitary and storm sewers
703.4 Existing building sewers and drains
704 Drainage Piping Installations
704.1 Slope of horizontal drainage piping
704.2 Change in size
704.3 Connections to offsets and bases of stacks
705 Joints
705.2.1 Mechanical joints
705.2.2 Solvent cementing
705.2.3 Threaded joints
705.3 Asbestos cement
705.4.1 Brazed joints
705.4.2 Mechanical joints
705.4.3 Threaded joints
705.4.4 Welded joints
705.5.1 Caulked joints
705.5.2 Compression gasket joints
705.5.3 Mechanical joint coupling
705.6 Concrete joints
705.7.1 Mechanical joints
705.7.2 Solvent cementing
CONTENTS

705.8.1 Mechanical joints 179
705.8.2 Solvent cementing 180
705.9.1 Brazed joints 180
705.9.2 Mechanical joints 180
705.9.3 Soldered joints 180
705.9.4 Threaded joints 181
705.9.5 Welded joints 181
705.10.1 Brazed joints 181
705.10.2 Mechanical joints 181
705.10.3 Soldered joints 181
705.11 Borosilicate glass joints 182
705.11.1 Caulked joints 182
705.12.1 Threaded joints 182
705.12.2 Mechanical joints 182
705.13.1 Burned 183
705.13.2 Wiped 183
705.14.1 Mechanical joints 183
705.14.2 Solvent cementing 183
705.14.3 Threaded joints 184
705.15 Vitrified clay 184
705.16.1 Heat-fusion joints 184
705.16.2 Mechanical joints 185
705.17.1 Heat-fusion joints 185
705.17.2 Mechanical and compression sleeve joints 185
705.18 Joints between different materials 185
705.18.1 Copper or copper-alloy tubing to cast-iron hub pipe 186
705.18.2 Copper or copper-alloy tubing to galvanized steel pipe 186
705.18.3 Cast-iron pipe to galvanized steel or brass pipe 187
705.18.4 Plastic pipe or tubing to other piping material 187
705.18.5 Lead pipe to other piping material 187
705.18.6 Borosilicate glass to other materials 187
705.18.7 Stainless steel drainage systems to other materials 188
705.19 Drainage slip joints 188
705.20 Caulking ferrules 188
705.21 Soldering bushings 188
705.22 Stainless steel drainage systems 188

706 Connections Between Drainage Piping and Fittings 189
706.2 Obstructions 189
706.3 Installation of fittings 189
706.4 Heel- or side-inlet quarter bends 189

708 Cleanouts 190
708.2 Cleanout plugs 190
708.3.1 Horizontal drains within buildings 190
708.3.2 Building sewers 191
708.3.3 Changes of direction 193
708.3.4 Base of stack 194
708.3.5 Building drain and building sewer junction 195
708.3.6 Manholes 195
Chapter 8: Indirect/Special Waste
802 Indirect Wastes
  802.1.1 Food handling
  802.1.2 Floor drains in food storage areas
  802.1.3 Potable clear-water waste
  802.1.4 Swimming pools
  802.1.5 Nonpotable clear-water waste
  802.1.6 Domestic dishwashing machines
  802.1.7 Commercial dishwashing machines
802.2 Installation
  802.2.1 Air gap
  802.2.2 Air break
802.3 Waste receptors
  802.3.1 Size of receptors
  802.3.2 Open hub waste receptors
802.4 Standpipes

Chapter 9: Vents
903 Outdoor Vent Extension
  903.1 Required vent extension
  903.1.1 Installation
  903.1.2 Size
  903.2 Vent stack required
  903.3 Vent termination
  903.4 Vent connection at base
  903.5 Vent headers
904 Vent Terminals
  904.1 Roof extension
  904.2 Frost closure
  904.3 Flashings
  904.4 Prohibited use
  904.5 Location of vent terminal
  904.6 Extension through the wall
  904.7 Extension outside a structure
905 Vent Connections and Grades
  905.4 Vertical rise of vent
  905.5 Height above fixtures
  905.6 Vent for future fixtures
906 Fixture Vents
  906.1 Distance of trap from vent
906.2 Venting of fixture drains
906.3 Crown vent

908 Common Vent
  908.1 Individual vent as common vent
  908.2 Connection at the same level
  908.3 Connection at different levels

909 Wet Venting
  909.1 Horizontal wet vent permitted
  909.1.1 Vertical wet vent permitted
  909.3 Size

910 Waste Stack Vent
  910.3 Stack vent
  910.4 Waste stack size

911 Circuit Venting
  911.1 Circuit vent permitted
  911.1.1 Multiple circuit-vented branches
  911.2 Vent connection
  911.3 Slope and size of horizontal branch
  911.3.1 Size of multiple circuit vent
  911.4 Relief vent
  911.4.1 Connection and installation
  911.5 Additional fixtures

912 Combination Drain and Vent System
  912.1 Type of fixtures
  912.2 Installation
  912.2.1 Slope
  912.2.2 Connection
  912.2.4 Fixture branch or drain
  912.3 Size

913 Island Fixture Venting
  913.1 Limitation
  913.2 Vent connection
  913.3 Vent installation below the fixture flood level rim

914 Relief Vents—Stacks of More Than 10 Branch Intervals
  914.1 Where required

916 Vent Pipe Sizing
  916.1 Size of stack vents and vent stacks
  916.5.1 Sewage pumps and sewage ejectors other than pneumatic

917 Air Admittance Valves
  917.3 Where permitted
  917.3.1 Location of branch
  917.3.2 Relief vent
  917.3.3 Stack
  917.4 Location
  917.5 Access and ventilation
  917.6 Size
  917.7 Vent required
  917.8 Prohibited installations
## Chapter 10: Traps, Interceptors and Separators

1002 Trap Requirements
- **1002.1 Fixture traps**
- **1002.2 Design of traps**
- **1002.4 Trap seals**
- **1002.5 Size of fixture traps**
- **1002.6 Building traps**
- **1002.7 Trap setting and protection**
- **1002.8 Recess for trap connection**
- **1002.9 Acid-resisting traps**
- **1002.10 Plumbing in mental health centers**

1003 Interceptors and Separators
- **1003.1 Where required**
- **1003.2 Approval**
- **1003.3.1 Grease interceptors and automatic grease removal devices required**
- **1003.3.2 Food waste grinders**
- **1003.3.3 Grease interceptors and automatic grease removal devices not required**
- **1003.3.4 Grease interceptors and automatic grease removal devices**
- **1003.3.4.1 Grease interceptor capacity**
- **1003.3.3.4.2 Rate of flow controls**
- **1003.3.5 Automatic grease removal devices**
- **1003.4 Oil separators required**
- **1003.4.1 Separation of liquids**
- **1003.4.2.1 General design requirements**
- **1003.4.2.2 Garages and service stations**
- **1003.5 Sand interceptors in commercial establishments**
- **1003.6 Laundries**

## Chapter 11: Storm Drainage

1101 General
- **1101.2 Where required**
- **1101.3 Prohibited drainage**
- **1101.5 Change in size**
- **1101.7 Roof design**
- **1101.8 Cleanouts required**

1103 Traps
- **1103.1 Main trap**
- **1103.2 Material**
- **1103.3 Size**
- **1103.4 Cleanout**

1104 Conductors and Connections
- **1104.1 Prohibited use**
- **1104.2 Combining storm with sanitary drainage**
- **1104.3 Floor drains**
302.4 Detrimental or dangerous waste  
302.6 Water softener and iron filter backwash

Chapter 4: Site Evaluation and Requirements
403 Soil Borings and Evaluation
   403.1.1 Number
404 Percolation or Permeability Evaluation
   404.1 General
   404.2 Percolation tests and procedures
   404.2.1 Percolation test hole
   404.2.2 Test procedure, sandy soils
   404.2.3 Test procedure, other soils
   404.3 Permeability evaluation
405 Soil Verification
   405.2.4 Monitoring well design

Chapter 5: Materials
504 Tanks
   504.1 Approval
   504.2 Precast concrete and site-constructed tanks
   504.3 Steel tanks
   504.4 Fiberglass tanks

Chapter 6: Soil Absorption Systems
603 Residential Sizing
   603.1 General
604 Other Building Sizing
   604.1 General
605 Installation of Conventional Soil Absorption Systems
   605.1 Seepage trench excavations
   605.2 Seepage bed excavations
   605.3 Seepage pits
   605.5 Aggregate and backfill
   605.6 Distribution piping
   605.7 Observation pipes

Chapter 7: Pressure Distribution Systems
702 Design Loading Rate
   702.1 General
   702.2 Absorption area
704 Bed and Trench Construction
   704.1 General
706 Dosing
   706.1 General

Chapter 8: Tanks
802 Septic Tanks and Other Treatment Tanks
   802.1 General
ILLUSTRATED GUIDE TO THE 2006 INTERNATIONAL PLUMBING AND SEWAGE CODES

802.2 Design of septic tanks 328
802.3 Inlets and outlets 329
802.4 Manholes 330
802.5 Manhole covers 331
802.6 Inspection opening 331
802.7 Capacity and sizing 332
802.7.1 Sizing of tank 332
802.7.2 Other buildings 332
802.8 Installation 335
802.9 Backfill 336
802.10 Manhole riser joints 337
802.11 Dosing or pumping chambers 338
802.11.1 Capacity sizing 339
802.12 Design of other treatment tanks 339
805 Holding Tanks 340
805.1 Approval 340
805.2 Sizing 340
805.3 Construction 340
805.4 Installation 341
805.5 Warning device 342
805.6 Manholes 343
805.7 Septic tank 344
805.8 Vent 344

Chapter 9: Mound Systems
902 Soil and Site Requirements 346
902.1 Soil borings 346
902.2 Prohibited locations 346
902.3 Slowly permeable soils with or without high ground water 347
902.4 Shallow permeable soils over creviced bedrock 348
902.5 Permeable soils with high ground water 349
902.6 Depth to pervious rock 350
902.7 Depth to high ground water 351
902.8 Slopes 352
902.9 Location of mound on sloping sites 352
902.10 Depth to rock strata or 50 percent by volume rock fragments 353
903 System Design 354
903.1 Mound dimensions and design 354
903.2 Size of absorption area 389
903.3 Trenches 390
903.5.1 Fill depth 401
903.5.2 Bed or trench depth 403
903.5.3 Cap and topsoil depth 404
903.5.4 Mound lengths 405
903.5.5 Mound widths 407
903.6 Basal area 410
903.6.1 Basal area available in bed system 411
903.6.2 Basal area available in trench system 411
903.6.3 Adequacy of basal area 412

904 Construction Techniques 413
  904.1 General 413
  904.2 Site preparation 413
  904.3 Force main 413
  904.4 Plowing 414
  904.5 Sand fill material 415
    904.5.1 Placement of sand fill 415
  904.6 Installation of the absorption area 416
  904.7 Placement of the aggregate 416
  904.8 Distribution system 417
  904.9 Cover 418
  904.10 Maintenance 418

Chapter 10: Cesspools 420
  1001 General 420
    1001.2 Application 420
    1001.3 Construction 420

Chapter 11: Residential Waste Water Systems 422
  1101 General 422
    1101.2 Residential waste water treatment systems 422

Chapter 12: Inspections 424
  1202 Inspections 424
    1202.1 Initial inspection procedures 424
    1202.2 Preparation for inspection 424
    1202.3 Covering of work 424
    1202.4 Other inspections 424
    1202.5 Inspections for additions, alterations or modifications 424
    1202.6 Defects in materials and workmanship 424

Chapter 13: Nonliquid Saturated Treatment Systems 426
  1301 General 426
    1301.2 Nonliquid saturated treatment systems 426

Chapter 14: Referenced Standards 428
  Referenced Standards

Appendices
  Appendix A: Abbreviations 431
  Appendix B: Symbols 433

Index 437
Preface

This guide illustrates and clarifies the 2006 International Plumbing Code and the 2006 International Private Sewage Disposal Code.

Every effort has been made to provide accurate clarifications of the code sections selected, and to this end I have examined hundreds of code-change proposals from all the code development cycles from 2000 to 2005 to understand the motivation for changes to the previous editions. Proposal reasoning and comments of the technical committee were studied for insight to proposed changes; current wording was compared to previous editions of the codes, commentaries, and interpretations. In this way, subtleties of meaning were revealed in some cases, and errors were identified in others.

Materials included in the research for this guide were: the International Plumbing Code (1997, 2003); the International Plumbing Code Commentary (1997, 2003); the Uniform Plumbing Code Interpretations Manual (1997); the BOCA National Plumbing Code Commentary (1990); the BOCA Basic Plumbing Code (1981); the Basic Plumbing Code (1975); the International Private Sewage Disposal Code (2003); the BOCA National Private Sewage Disposal Code (1993); the National Private Sewage Disposal Code (1990); and the BOCA Basic/National Private Sewage Disposal Code (1984). Manufacturers were contacted for assistance, as were the staff at the International Code Council (ICC), and every cited plumbing code reference and private sewage disposal code reference was examined for content and accuracy. And lastly, all titles of the referenced standards were cross-checked on the sponsoring agencies’ web sites.

Terry L. Patterson
Norman, Oklahoma
Acknowledgments

A work such as this guide cannot be the result of a single person’s efforts; many people provided important assistance. First, I thank my wife, Jennie M. Patterson, for her significant and lengthy effort on this project. Jennie produced all the tables and supporting calculations, the index, and the table of contents. She edited the entire work and developed the raw manuscript into camera-ready format. She kept the computers running with the necessary maintenance and software management. This handbook would not be possible without Jennie’s competent and timely contributions.

Many thanks go to my graduate and research assistants for their significant help: Jennifer P. Morgan of St. Louis, Missouri, produced numerous illustrations as well as the line drawing appearing on the cover of this book; A. Morris of Norman, Oklahoma, produced many of the drawings and researched the content of all the referenced standards; and Yi Zhao of Beijing, People’s Republic of China, prepared a large number of the drawings for the book. All did their work accurately, on time, and without complaint, and I much appreciate the professionalism of their efforts.

I am grateful for the continued support of my research and writing by the University of Oklahoma College of Architecture, especially that of the Dean of the College, Bob G. Fillpot, FAIA, and that of the Director of the Division of Architecture, James L. Kudrna. The sabbatical leave granted to me for this project was much needed and appreciated, and the consideration of my publishing challenges in the assignment of teaching loads and the granting of student help were most important to the timely completion of this book.

I am also indebted to the benefactor of the W. Edwin Bryan, Jr. Professorship, of which I am the current recipient. The significant research support that comes with this title has been key to the quality and timeliness of the production of this publication.

And, special thanks go to Cary Sullivan, Senior Editor at McGraw-Hill, for her continued support of my work, and for her advice and assistance in seeing this guide book through to a successful conclusion. It has been a pleasure to work with her.
Introduction

Purpose.
This handbook clarifies the sections of the 2006 *International Plumbing Code* and the 2006 *International Private Sewage Disposal Code* that are the most useful to architects, detailers, estimators, and contractors. It is not directed to specifiers or engineers. It is not intended to be a substitute for the codes, but it is an aid to understanding them. (The *International Plumbing Code* and the *International Private Sewage Disposal Code* are owned by the International Code Council, Inc., of Falls Church, Virginia. This guide is neither sponsored nor approved by this agency, which has no relationship to this project.)

Code language.
The language used in all building-related codes is a pseudo-legal kind of language intended to minimize variations in interpretation and to withstand legal challenges. As in legal documents, the penalty for this special style is lack of clarity to people who are not specialists in the language. Codes have other readability problems: sentences are often long and convoluted; relationships between words can be difficult to identify and understand; and too much substantive content is joined by too few words of clarification. Furthermore, the knowledge base of statistics, tests, tradition, and other data and trends in life safety on which codes are based is not available to the average code user; therefore, he or she is left with no choice but to use the literal meaning of code statements without applying common sense. But because this literal approach is not 100-percent reliable, misunderstandings are common.

The language and format of this guide accommodate the needs of design and production professionals as well as of contractors. Text is supplemented with illustrations, tables, and lists. Common phrasing is substituted for legalistic wording. Lengthy and convoluted code sentences are broken down into line items. Quick and easy readability is the goal; therefore, some practical shortcuts have been employed to achieve that end.

First, this guide refers to the *International Plumbing Code* or the *International Private Sewage Disposal Code* simply as “the code” within their respective parts of this book. Second, although the codes refer to buildings and structures (and sometimes facilities so as not to exclude any type of construction with plumbing), this guide usually refers only to “buildings,” which must be understood to include all the
ILLUSTRATED GUIDE TO THE 2006 INTERNATIONAL PLUMBING AND SEWAGE CODES

structures that the code governs. And third, this book utilizes mathematical and other symbols instead of words to the greatest extent possible so as to capitalize on their inherent qualities of clarity and efficiency, and also to provide visual relief from the text. For example, the symbols \( \geq \) and \( \leq \) are substituted for the terms “minimum” and “maximum.”

The reader should note, however, that the shortcuts and plain language used by this guide book lack the legal precision of the code: the code attempts to provide regulations that cannot be circumvented, while this guide does not. This book makes selected regulations more accessible to designers, detailers, estimators, and contractors. Consequently, common sense must be applied to the guidance provided herein.

Format.
Throughout this guide book, hundreds of drawings and tables are used to illustrate and clarify numerous code requirements. Some of the tables provide data based on mathematical equations that would otherwise require computation by the user. Other tables break down large and unwieldy tables of the code into smaller, more manageable ones with fewer variables to be reconciled.

Footnotes from the code are integrated into the body of each table or into the body of the text, which eliminates the fine print that is difficult to read and easily overlooked. Exceptions to the code are integrated into the body of the basic requirements, eliminating confusion from apparent reversals of requirements where exceptions supersede the main text.

The need to refer to other pages in order to grasp the concept of a code requirement is minimized by eliminating numerical references (to other code sections) from the main text. Descriptions of such referenced data, the data itself, or the subject of the referenced data is substituted. This results in a more easily read text without the disruption of referenced section numbers that add no apparent meaning to the paragraph. The cited section number along with its name of the section are listed below the body of the text in italics. Comments on the citation are added where necessary for clarification. The reader may identify the cited section or standard, if necessary, or may stop short of the listing if it is not applicable.

Code errors.
This guide book is based on the first printing of the codes, which contain errors. Among them are common typographical errors, obsolete section reference numbers, and the occasional, but more significant, error of content. Some of the errors can be found in the legacy codes dating back many years, and in some cases, the correct version can be found in a previous edition. Minor errors were corrected in this guide without comment.
Illustrated Guide to the 2006
International Plumbing and Sewage Codes
I

Plumbing
1
Administration
106 Permits

106.3.1 Construction documents

- This section does not apply if waived by the code official in the following case:
  - Where the official deems such submission to be unnecessary to evaluate code compliance.
- In all other cases submit the following with all permit applications:
  - 2 copies of the documents as follows:
    - Prepared by a registered design professional where required by state law.
    - Construction documents as follows:
      - To scale.
      - With adequate clarity to indicate the following about the work:
        - Location.
        - Nature.
        - Extent.
        - All aspects verifying compliance with the code.
      - Specifications.
      - Engineering calculations.
      - Diagrams.
      - Other similar data.
  - For buildings > 2 stories show the following on construction documents:
    - Penetrations by the following:
      - Pipe.
      - Fittings.
      - Other components.
    - Materials and methods for maintaining the following at penetrations:
      - Structural safety.
      - Fire-resistance ratings.
      - Fireblocking.

106.5.2 Validity

- A permit does not constitute permission to violate the following:
  - The code.
  - Other ordinances.
- A permit does not prohibit the code official from the following:
  - Requiring corrections to violations shown in the following:
    - Construction documents.
    - Other data submitted for the permit.
  - Stopping the work until violations to the following are corrected:
    - The code.
    - Other ordinances.

106.5.6 Retention of construction documents

- The code official keeps one set of approved construction documents as follows:
  - Until completion of the work is approved.
- The permit applicant keeps one set of approved construction documents as follows:
  - During the time the work as described by the documents is active.
Appendices
Appendix A:
Abbreviations

These abbreviated terms may appear in both upper- and lowercase forms in the text, tables, and drawings.

act         actual  ea         each
admin        administration  elec      electrical
dh          allowable  elev      elevation
db          board  eq         equal
dld          building  equip     equipment
bm           beam  exist      existing
Btu        British thermal unit  ext      exterior
cmu         concrete masonry unit  fdn     foundation
col         column  fe         fire extinguisher
concrete     concrete  fec       fire extinguisher cabinet
conf        conference  fin       finish
const       construction  flr      floor
cu ft       cubic foot or feet  fpm      feet per minute
cu in       cubic inch or inches  ft       foot or feet
df          drinking fountain  gal       gallon
dia         diameter  ga         gage
dim         dimension  galv      galvanized
dr          door  gpm       gallons per minute
Appendix B: Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>@</td>
<td>at</td>
</tr>
<tr>
<td>&lt;</td>
<td>less than</td>
</tr>
<tr>
<td>&gt;</td>
<td>greater than</td>
</tr>
<tr>
<td>≥</td>
<td>greater than or equal to; minimum</td>
</tr>
<tr>
<td>≤</td>
<td>less than or equal to; maximum</td>
</tr>
<tr>
<td>⊥</td>
<td>perpendicular to</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>°</td>
<td>degrees, temperature</td>
</tr>
<tr>
<td>°</td>
<td>degrees, radial</td>
</tr>
<tr>
<td>÷</td>
<td>divide by</td>
</tr>
<tr>
<td>×</td>
<td>multiply by</td>
</tr>
<tr>
<td>=</td>
<td>equal to</td>
</tr>
<tr>
<td>%</td>
<td>percent</td>
</tr>
<tr>
<td>'</td>
<td>foot or feet</td>
</tr>
<tr>
<td>&quot;</td>
<td>inch or inches</td>
</tr>
</tbody>
</table>
I'll illustrate Guid to the 2006 International Plumbing and Sewage Codes/Patterson/145547-7/BM1