Standard Water Detail Drawings

W-1  Standard Concrete Payment Patch
W-2  Standard Asphalt Pavement Patch
W-3  Trench Bottom Dimensions & Backfilling Requirements for Ductile Iron Pipe
W-4  Standard Fire Hydrant Installation (restrained joint)
W-4a Standard Fire Hydrant Installation (rodding)
W-5  Standard Fire Hydrant with 5" Storz Pumper Nozzle
W-6  Hydrant Operating Nut and 2 ½ " Outlet Threads
W-7  Thrust Blocking Design Data for Water Mains
W-8  Standard Thrust Block Installation for Valves and Dead End Mains
W-9  Standard Thrust Blocking Views
W-10 Thrust Blocking Design Quantity Table
W-11 Thrust Blocking Design Quantity Table
W-12 Standard Vertical Bend
W-13 Standard Main & Valve Markers for Potable & Reuse Water Easements
W-14 Standard Tapping Sleeve & Valve Assembly (4"-24")
W-15 Restrained Tee and Valve Installation on Dead Lines (4"-24")
W-16 Butterfly Valve Manhole (16" & Larger Mains)
W-17 Valve Box Installation and Extension
W-18 5 ¾ " Valve Box Drop Lid with 4" Skirt
W-19 Standard Water Air Release Valve
W-20 Standard Manhole Cover
W-21 Temporary Water Main Blow Off Assembly
W-22 Permanent Water Main Blow Off Assembly
W-23 Standard ¾" & 1" Water Service Installation
W-24 Single Family, Residential, New Construction Back flow Prevention/Meter Assembly Installation
Standard Water Detail Drawings

W-25  Water Meter Box Detail
W-26  Standard Gang Meter Assembly
W-27  Gang Meter Addressing Single Story Building
W-28  Gang Meter Addressing Multi-Story Building
W-29  Typical 4"-8" Domestic Water Meter Bypass Installation
W-30  Typical 6"-10" Fire Service & Domestic Service w/ Bypass
W-31  Typical 1 ½ "- 2" Water Meter Box Installation
W-32  Typical 4" Water Meter Vault
W-33  Typical 6" thru 10" Water Meter Vault
W-34  Fire, Domestic & Irrigation Options Schematic
W-35  Irrigation Tap on New and Existing Services
W-35T Termination of Irrigation Meter
W-36  Reduced Pressure Backflow Preventer
W-37  Typical Fire Main Double Detector Check Valve Assembly
W-38  Standard Double Check Valve Assembly
W-39  Below Ground DDCV & DCV
W-40  Pipe Alignment Guides (Spiders)
W-41  Concrete Cradle Protection for Water Line Crossings
NEW CONC. TO BE 3000 PSI EXISTING CONC. 

SAW CUT AND REMOVE EXISTING PAVEMENT

1'-0" TYP.

2" BELOW EXISTING

6" COMPACTED NO. 67 STONE

BACKFILL, TAMPED IN 6" LIFTS

PIPE

NOTE:
1. SEE CITY OF RALEIGH STANDARDS FOR TRENCHES AND PIPE BEDDING W-3 FOR ADDITIONAL DETAILS
2. PAVEMENT CUTS WITHIN NCDOT ROW SHALL CONFORM TO THE APPROVED ON SITE ENCROACHMENT PERMIT.
3. THE PAVEMENT CUT SHALL BE DEFINED BY A STRAIGHT EDGE AND CUT WITH AN APPROVED SAW CUT MACHINE.
4. THE TRENCH SUBGRADE MATERIAL SHALL BE BACKFILLED WITH SUITABLE MATERIAL AND COMPACTED TO A DENSITY OF AT LEAST 95% OF THAT OBTAINED BY COMPACTING A SAMPLE OF THE MATERIAL IN ACCORDANCE WITH AASHTO T-99 AS MODIFIED BY NCDOT.
5. THE FINAL 6" OF FILL SHALL CONSIST OF ABC MATERIAL COMPACTED TO A DENSITY EQUAL TO 100% OF THAT OBTAINED BY COMPACTING A SAMPLE OF THE MATERIAL IN ACCORDANCE WITH AASHTO T-80 AS MODIFIED BY NCDOT.

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES
STANDARD CONCRETE PAVEMENT PATCH DETAIL

<table>
<thead>
<tr>
<th>DWG. NO.</th>
<th>REVISIONS</th>
<th>DATE</th>
<th>REVISIONS</th>
<th>DATE</th>
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<td>3-31-00</td>
<td>A.B.B.</td>
<td>10-29-10</td>
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<td>A.B.B.</td>
<td>2-8-05</td>
<td>MAB</td>
<td>10-31-13</td>
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</table>
EXISTING PAVEMENT

NEW ASPHALT SURFACE COARSE
2" MINIMUM

EXISTING PAVEMENT

EXISTING SUBGRADE

COMPACTED FILL IN 6" LIFTS

UNDISTURBED SOIL

PIECE

REFER TO W-3

NOTES:

1. THE PAVEMENT CUT SHALL BE DEFINED BY A STRAIGHT EDGE AND CUT WITH AN APPROPRIATE SAW CUT MACHINE.
2. THE TRENCH SUBGRADE MATERIAL SHALL BE BACKFILLED WITH SUITABLE MATERIAL AND COMPACTED TO A DENSITY OF AT LEAST 95% OF THAT OBTAINED BY COMPACTING A SAMPLE OF THE MATERIAL IN ACCORDANCE WITH AASHTO T-99 AS MODIFIED BY NCDOT.
3. THE FINAL 1' OF FILL SHALL CONSIST OF ABC MATERIAL COMPACTED TO A DENSITY EQUAL TO 100% OF THAT OBTAINED BY COMPACTING A SAMPLE OF THE MATERIAL IN ACCORDANCE WITH AASHTO T-80 AS MODIFIED BY NCDOT.
4. THE ENTIRE THICKNESS/ VERTICAL EDGE OF CUT SHALL BE TACKED.
5. THE SAME DEPTH OF PAVEMENT MATERIAL WHICH EXISTS SHALL BE REINSTALLED, BUT IN NO CASE SHALL THE ASPHALT BE LESS THAN 2" THICK.
6. THE ASPHALT PAVEMENT MATERIAL SHALL BE INSTALLED AND COMPACTED THOROUGHLY WITH A SMOOTH DRUM ROLLER TO ACHIEVE A SMOOTH LEVEL PATCH.
7. REFER TO CITY OF RALEIGH STANDARDS FOR TRENCHES AND PIPE BEDDING, W-3. FOR ADDITIONAL DETAILS.
8. NO HAND PATCHING ALLOWED.
9. PAVEMENT CUTS WITHIN NCDOT ROW SHALL CONFORM TO THE APPROVED ON SITE ENCROACHMENT PERMIT.
NOTES:
1. TRENCHES REQUIRING SHORING AND BRACING, DIMENSIONS SHALL BE TAKEN FROM THE INSIDE FACE OF THE SHORING AND BRACING.
2. NO ROCKS OR BOULDERS 4" OR LARGER TO BE USED IN BACKFILL.
3. ALL BACKFILL MATERIAL SHALL BE SUITABLE NATIVE MATERIAL.
4. BACKFILL SHALL BE TAMPOED IN 6" LIFTS.
5. ACHIEVE 95% COMPACTION IN BACKFILL.

6" OF #67 STONE WHEN ROCK OR WATER IS ENCOUNTERED

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES
TRENCH BOTTOM DIMENSIONS & BACKFILLING REQUIREMENTS FOR DUCTILE IRON

<table>
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<td>RRH</td>
<td>3-31-00</td>
<td>J.P.S.</td>
<td>10-29-10</td>
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</tbody>
</table>
NOTES:
1. FIRE HYDRANT SHALL BE AS MANUFACTURED: MUELLER, AMERICAN DARLING, KENNEDY, M&H, WATEROUS, CLOW, EAST JORDAN IRON WORKS, OR US PIPE.
2. BRANCH PIPE SHALL BE DUCTILE IRON AWWA C 150-96
3. 6" GATE VALVE SHALL BE AWWA C500-86 OPEN LEFT
4. STEEL RODS AND BOLTS SHALL BE 3/4" HOT DIPPED GALVANIZED
5. FIRE HYDRANTS WILL BE INSTALLED IN TRUE VERTICAL POSITION
   RODS SHALL NOT BE COUPLED MORE THAN ONCE. IF THE LENGTH FROM THE VALVE TO THE HYDRANT EXCEEDS 20' THEN A MECHANICAL RESTRAINING GLAND WITH A REBAR CAGE SHALL BE INSTALLED NO MORE THAN 10' FROM HYDRANT AND POURED IN CONCRETE.
   FIRE HYDRANTS TO BE LOCATED IN ROW OR 2 FOOT EASEMENT ADJACENT TO ROW.

ANYTIME SITE WORK, CONSTRUCTION, ROAD WORK, OR ANY OTHER WORK CHANGES THE GRADE OF THE FIRE HYDRANT, THE PERSON RESPONSIBLE FOR THE WORK IS RESPONSIBLE FOR ADJUSTING THE FIRE HYDRANT TO STAY WITHIN COMPLIANCE.
NOTES:
1. FIRE HYDRANT SHALL BE AS MANUFACTURED: MUELLER, AMERICAN DARLING, KENNEDY, M&H, WATEROUS, CLOW, EAST JORDAN IRON WORKS, OR US PIPE.
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   INSTALLED NO MORE THAN 10' FROM HYDRANT AND POURED IN CONCRETE.
   FIRE HYDRANTS TO BE LOCATED IN ROW OR 2 FOOT EASEMENT ADJACENT TO ROW

ANYTIME SITE WORK, CONSTRUCTION, ROAD WORK, OR ANY OTHER WORK
CHANGES THE GRADE OF THE FIRE HYDRANT, THE PERSON RESPONSIBLE
FOR THE WORK IS RESPONSIBLE FOR
ADJUSTING THE FIRE HYDRANT TO STAY
WITHIN COMPLIANCE.

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES
STANDARD FIRE HYDRANT
INSTALLATION DETAIL

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<td>W-40</td>
<td>ABB</td>
<td>4-6-04</td>
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</table>
NOTES:
1. RALEIGH PUBLIC HYDRANTS SHALL BE PAINTED SOLID RED.
2. KNIGHTDALE, & ROLESVILLE PUBLIC HYDRANTS SHALL BE PAINTED RED W/SILVER OPERATING NUTS.
3. ZEBULON PUBLIC HYDRANTS SHALL BE PAINTED RED W/SILVER BONNETS AND OPERATING NUTS.
4. WAKE FOREST AND GARNER, AND WENDELL PUBLIC AND PRIVATE HYDRANTS TO BE PAINTED SAFETY YELLOW W/SILVER CAPS AND OPERATING NUTS.
5. OPERATING NUTS ON HYDRANTS CONNECTED TO PUBLIC MAINS LARGER THAN 12" SHALL BE PAINTED BLACK.

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES
RALEIGH, GARNER, KNIGHTDALE, ROLESVILLE, WAKE FOREST, WENDELL & ZEBULON

STANDARD FIRE HYDRANT WITH 5" STORZ PUMPER NOZZLE

<table>
<thead>
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<td>DHL</td>
<td>2-18-08</td>
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<tr>
<td></td>
<td>3-1-87</td>
<td>ABB</td>
<td>7-21-05</td>
<td></td>
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</tbody>
</table>
1 9/16" OPERATION NUT

2 1/2" NATIONAL STANDARD OUTLET THREADS

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES

HYDRANT OPERATING NUT AND 2 1/2" OUTLET THREADS

<table>
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<th>DWG. NO.</th>
<th>REVISIONS</th>
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<th>REVISIONS</th>
<th>DATE</th>
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<td>A.B.B</td>
<td>4-13-04</td>
<td>J.P.S</td>
<td>11-1-10</td>
<td></td>
</tr>
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</table>
NOTES:
1. SEE STANDARD DETAIL W-9 FOR THRUST BLOCK LOCATIONS.
2. CONCRETE SHALL BE 3000 PSI AND TRANSIT MIXED.
3. REINFORCING BARS SHALL BE DEFORMED AND TIED TOGETHER.
4. TRENCH BOTTOM WIDTH IN VICINITY OF THRUST BLOCK INSTALLATION
   SHALL BE THE MINIMUM WIDTH AS SHOWN ON STANDARD DETAIL W-3.
5. BACKFILL TAMPERED IN 6" LIFTS PER
   STANDARD DETAIL W-3.
6. THRUST COLLAR MUST BE FACTORY WELDED ON BOTH SIDES ALONG BOTH
   EDGES OF COLLAR AROUND CIRCUMFERENCE.

<table>
<thead>
<tr>
<th>I.D. PIPE</th>
<th>&quot;A&quot;</th>
<th>&quot;B&quot;</th>
<th>&quot;C&quot;</th>
<th>&quot;D&quot;</th>
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<tbody>
<tr>
<td>6&quot; - 36&quot;</td>
<td>1'-4&quot;</td>
<td>1'-7&quot;</td>
<td>2&quot;</td>
<td>3/8&quot;</td>
</tr>
<tr>
<td>48&quot; &amp; greater</td>
<td>1'-8&quot;</td>
<td>1'-9&quot;</td>
<td>6&quot;</td>
<td>7/8&quot;</td>
</tr>
<tr>
<td>20&quot; - 24&quot;</td>
<td>1'-4&quot;</td>
<td>1'-7&quot;</td>
<td>3&quot;</td>
<td>1/2&quot;</td>
</tr>
<tr>
<td>30&quot; - 36&quot;</td>
<td>1'-4&quot;</td>
<td>1'-7&quot;</td>
<td>4&quot;</td>
<td>5/8&quot;</td>
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REINFORCING REQUIREMENTS

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<tr>
<th>I.D. PIPE</th>
<th>&quot;A&quot;</th>
<th>&quot;B&quot;</th>
<th>&quot;X&quot; BAR LENGTH</th>
<th>&quot;X&quot; BAR WEIGHT</th>
<th>&quot;Y&quot; BAR LENGTH</th>
<th>&quot;Y&quot; BAR WEIGHT</th>
<th>NO. REQUIRED</th>
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</thead>
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<tr>
<td>6&quot; - 36&quot;</td>
<td>#5</td>
<td>2'-2&quot;</td>
<td>O.D. PIPE</td>
<td>1.043 LBS/FT</td>
<td>1'-1&quot;</td>
<td>1.1 LBS, EACH</td>
<td>X-24, Y-12</td>
</tr>
<tr>
<td>48&quot; &amp; greater</td>
<td>#6</td>
<td>3'-0&quot;+ O.D. PIPE</td>
<td>1.502 LBS/FT</td>
<td>1'-3&quot;</td>
<td>1.9 LBS, EACH</td>
<td>X-24, Y-12</td>
<td></td>
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</tbody>
</table>

THRUentiful COROLL, AND THRUST SCHEDULE

<table>
<thead>
<tr>
<th>I.D. PIPE</th>
<th>&quot;X&quot; BAR WEIGHT</th>
<th>&quot;Y&quot; BAR WEIGHT</th>
<th>NO. REQUIRED</th>
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</thead>
<tbody>
<tr>
<td>1.043 LBS/FT</td>
<td>1.1 LBS, EACH</td>
<td>X-24, Y-12</td>
<td></td>
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</tbody>
</table>
STANDARD THRUST BLOCK INSTALLATION FOR 16" AND LARGER VALVES AND DEAD END MAINS

16" MAIN - 1 THRUST BLOCK REQUIRED ON MAINS GREATER THAN 16". 2 THRUST BLOCKS REQUIRED.

THRUST BLOCKING AT VALVES

16" AND LARGER

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES

STANDARD THRUST BLOCK INSTALLATION FOR 16" AND LARGER VALVES AND DEAD END MAINS

<table>
<thead>
<tr>
<th>DWG NO.</th>
<th>REVISIONS</th>
<th>DATE</th>
<th>REVISIONS</th>
<th>DATE</th>
</tr>
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<tr>
<td>W-8</td>
<td>Y.C.A.</td>
<td>4-12-90</td>
<td>D.W.C.</td>
<td>9-7-99</td>
</tr>
<tr>
<td></td>
<td>6-92</td>
<td>RRH</td>
<td>3-31-00</td>
<td></td>
</tr>
</tbody>
</table>
NOTES:
1. CONCRETE SHALL BE 3000 PSI
2. CONCRETE SHALL NOT CONTACT BOLTS OR ENDS OF MECHANICAL JOINT FITTINGS.
3. TRENCHES SHALL CONFORM TO STANDARD DETAIL W-3.
4. SEE STANDARD THRUST BLOCK TABLES, W-10 THRU W-11, FOR AREA OF CONCRETE REQUIRED.
5. ALL BENDS AND INTERSECTIONS SHALL HAVE CONCRETE THRUST BLOCKING.

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES

STANDARD THRUST BLOCKING VIEWS

<table>
<thead>
<tr>
<th>DWG. NO.</th>
<th>REVISIONS</th>
<th>DATE</th>
<th>REVISIONS</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>W-9</td>
<td>D.W.C.</td>
<td>3-1-87</td>
<td>RRH</td>
<td>3-31-00</td>
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<tr>
<td></td>
<td>9-7-99</td>
<td>D.H.L.</td>
<td></td>
<td>6-18-08</td>
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</table>
### Reaction Bearing Areas for Horizontal Water Pipe Bends

**Based on Test Pressure of 200 P.S.I.**

**All Areas Given in Square Feet.**

<table>
<thead>
<tr>
<th>Size and Degree of Bend</th>
<th>6&quot;</th>
<th>8&quot;</th>
<th>12&quot;</th>
<th>16&quot;</th>
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<tbody>
<tr>
<td><strong>1 1/4°</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2&quot;</td>
<td>1,108</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>22 1/2°</td>
<td>2,207</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>45°</td>
<td>4,328</td>
<td>2</td>
<td>3</td>
<td>3</td>
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<tr>
<td>90°</td>
<td>7,996</td>
<td>2</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Plug</td>
<td>5,655</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

| **1 1/4°**              |    |    |     |     |
| 8"                      | 1,970 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 1 |
| 22 1/2°                 | 3,922 | 1 | 2 | 3 | 1 | 1 | 1 | 4 | 1 |
| 45°                     | 7,694 | 2 | 4 | 5 | 1 | 1 | 2 | 8 | 1 |
| 90°                     | 14,215 | 4 | 8 | 9 | 2 | 2 | 4 | 15 | 2 |
| Plug                    | 10,053 | 3 | 5 | 6 | 2 | 2 | 3 | 10 | 1 |

| **1 1/4°**              |    |    |     |     |
| 12"                     | 4,433 | 2 | 3 | 3 | 1 | 1 | 2 | 5 | 1 |
| 22 1/2°                 | 8,826 | 3 | 5 | 6 | 2 | 2 | 3 | 9 | 1 |
| 45°                     | 17,312 | 5 | 9 | 11 | 3 | 3 | 5 | 18 | 2 |
| 90°                     | 31,983 | 8 | 16 | 19 | 4 | 4 | 8 | 32 | 4 |
| Plug                    | 22,619 | 6 | 12 | 14 | 3 | 3 | 6 | 23 | 3 |

| **1 1/4°**              |    |    |     |     |
| 16"                     | 7,881 | 2 | 4 | 5 | 1 | 1 | 2 | 8 | 1 |
| 22 1/2°                 | 15,691 | 4 | 8 | 10 | 2 | 2 | 4 | 16 | 2 |
| 45°                     | 30,779 | 8 | 16 | 19 | 4 | 4 | 8 | 31 | 4 |
| 90°                     | 56,861 | 15 | 29 | 35 | 8 | 8 | 15 | 57 | 6 |
| Plug                    | 40,213 | 10 | 21 | 25 | 5 | 5 | 10 | 41 | 5 |

Reaction bearing areas are in square feet measured in a vertical plane in the trench side at an angle of 90° to the thrust vector.

Use 6" - 90° bend value for hydrants for additional safety factor.
<table>
<thead>
<tr>
<th>SIZE AND DEGREE OF BEND</th>
<th>STATIC THRUST IN POUNDS</th>
<th>MODERATELY DRY CLAY 4000 LBS/FT²</th>
<th>2000 LBS/FT²</th>
<th>SOFT CLAY 1500 LBS/FT²</th>
<th>GRAVEL/COURSE SAND 8000 LBS/FT²</th>
<th>DRY CLAY ALWAYS DRY</th>
<th>SAND COMPACT FIRM 2000 LBS/FT²</th>
<th>SAND CLEAN DRY 4000 LBS/FT²</th>
<th>SOIL 1000 LBS/FT²</th>
<th>QUICKSAND - VERY POOR</th>
<th>ROCK - POOR 10,000 LBS/FT²</th>
</tr>
</thead>
<tbody>
<tr>
<td>24&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>5</td>
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<td>22 1/2°</td>
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<td>5</td>
<td>9</td>
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<td>9</td>
<td>9</td>
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<td>128</td>
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<td>PLUG</td>
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<td>46</td>
<td>55</td>
<td>12</td>
<td>12</td>
<td>23</td>
<td>91</td>
<td>10</td>
<td></td>
<td></td>
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<tr>
<td>11 1/4°</td>
<td>27,709</td>
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<td>14</td>
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<td>7</td>
<td>2</td>
<td>3</td>
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</tr>
<tr>
<td>22 1/2°</td>
<td>55,163</td>
<td>14</td>
<td>28</td>
<td>34</td>
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<td>14</td>
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<tr>
<td>45°</td>
<td>108,206</td>
<td>28</td>
<td>55</td>
<td>65</td>
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<td>362</td>
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</tbody>
</table>

**REACTION BEARING AREAS ARE IN SQUARE FEET MEASURED IN A VERTICAL PLANE IN THE TRENCH SIDE AT AN ANGLE OF 90° TO THE THRUST VECTOR.**

**USE 6" - 90° BEND VALUE FOR HYDRANTS FOR ADDITIONAL SAFETY FACTOR.**

---

**CITY OF RALEIGH**

**DEPARTMENT OF PUBLIC UTILITIES**

**THRUST BLOCKING DESIGN QUANTITY TABLE**

<table>
<thead>
<tr>
<th>DWG. NO.</th>
<th>REVISIONS</th>
<th>DATE</th>
<th>REVISIONS</th>
<th>DATE</th>
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<tbody>
<tr>
<td>W-11</td>
<td>D.W.C.</td>
<td>6-23-99</td>
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</tbody>
</table>
GENERAL NOTES:
1. STEEL RODS AND BOLTS SHALL BE 3/4" HOT DIPPED GALVANIZED.
2. CONCRETE SHALL NOT CONTACT BOLTS OR ENDS OF MECHANICAL JOINT BENDS.
3. RESTRAINED MECHANICAL GLANDS TO BE USED AT ALL FITTINGS.
4. MUST USE DUCTILE IRON EYE BOLTS WHERE NECESSARY.
5. 3' MINIMUM COVER MUST BE MAINTAINED ON ALL WATER MAINS

### ROD REQUIREMENTS

<table>
<thead>
<tr>
<th>SIZE OF 45° BEND</th>
<th>STATIC THRUST IN POUNDS</th>
<th>NO. OF RODS REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>6&quot;</td>
<td>4,328</td>
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<td>24&quot;</td>
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</table>

THRU W-10 THRU W-11

ADD MECHANICAL JOINT RETAINER GLANDS THROUGHOUT ASSEMBLY.

**MECHANICAL JOINT RETAINER GLAND**

5' MIN.

TOP OF GROUND

CONCRETE THRUST BLOCK AT ALL 45° BENDS SEE W-10 AND W-11.

STANDARD VERTICAL BEND

CITY OF RALEIGH

DEPARTMENT OF PUBLIC UTILITIES

<table>
<thead>
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<td>ABB</td>
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<td>J.P.S.</td>
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<td></td>
<td>D.H.L.</td>
<td>6-18-08</td>
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<td></td>
</tr>
</tbody>
</table>
NOTES
1. POTABLE WATER MARKER TO BE BLUE IN COLOR.
2. POTABLE WATER MARKER TO BE LABELED "RALEIGH WATER".
3. TO BE SPACED ALONG CENTERLINE OF MAIN EVERY 300 FEET.
4. MARKERS TO BE ROUND AND 4" IN DIAMETER.
NOTES:
1. CONCRETE SHALL NOT CONTACT BOLTS OR ENDS OF MECHANICAL JOINT FITTINGS.
2. SEE STANDARD REACTION BLOCK TABLES, W-10 AND W-11 FOR AREA OF CONCRETE REQUIRED.

3000 PSI SOLID CONCRETE SHALL BE USED AS FOOTING FOR DUCTILE IRON PIPE.

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES

4" - 24" STANDARD TAPPING SLEEVE AND VALVE ASSEMBLY

<table>
<thead>
<tr>
<th>DWG. NO.</th>
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<th>DATE</th>
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<th>DATE</th>
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**ROD REQUIREMENTS**

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<tr>
<th>NO. OF RODS</th>
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</tr>
<tr>
<td>30&quot;</td>
<td>8</td>
</tr>
<tr>
<td>36&quot;</td>
<td>8</td>
</tr>
</tbody>
</table>

**NOTES:**
1. STEEL RODS AND BOLTS SHALL BE 3/4" HOT DIPPED GALVANIZED.
2. SEE STANDARD THRUST BLOCK, TABLES W-10 AND W-11 FOR CONCRETE.
3. CONCRETE SHALL NOT CONTACT BOLTS OR ENDS OF MECHANICAL FITTINGS.
4. THIS RODDING REQUIREMENT DOES NOT APPLY TO FIRE HYDRANTS.
NOTES:

1. USE STANDARD PRECAST ECCENTRIC TOP.
2. BASE SECTION SHALL BE OF "DOG HOUSE" TYPE TO FIT OVER MAIN.
3. PROVIDE A MIN. OF 12" OF #67 STONE FOR POSITIVE DRAINAGE IN BOTTOM OF MANHOLE.
4. GROUT RISER/BASE SECTION AS NECESSARY.
5. MANHOLE LID SHALL SAY "WATER".
6. FLAT TOP MAY BE USED IN NON-PAVED AREAS WHEN NECESSARY TO MATCH GRADE.

<table>
<thead>
<tr>
<th>VALVE SIZE</th>
<th>&quot;X&quot;</th>
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<tbody>
<tr>
<td>16&quot;</td>
<td>5' M.H.</td>
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<tr>
<td>24&quot;</td>
<td>6' M.H.</td>
</tr>
<tr>
<td>30&quot; OR GREATER</td>
<td>8' M.H.</td>
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</tbody>
</table>
NOTE: 2' x 2' x 6" concrete pad required on all valves. No precast concrete doughnut allowed.

NOTES:
1) Valve box not to contact water main
2) All traffic castings must be Class 35 or greater.
3) For any valves over 10' deep, a valve stem extension must be used to bring to a depth of no more than 5', extension must be a minimum of 1" solid stock.
4) Total valve box weight: minimum of 85 lbs.

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES

VALVE BOX INSTALLATION AND EXTENSION DETAIL

<table>
<thead>
<tr>
<th>DWG. NO.</th>
<th>REVISIONS</th>
<th>DATE</th>
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<th>DATE</th>
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<tr>
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<td>RRH</td>
<td>3-31-00</td>
<td>DHL</td>
<td>8-16-07</td>
</tr>
</tbody>
</table>
NOTE 1 - "WATER" LETTERING MUST BE 1" RAISED (RECESSED FLUSH)
NOTE 2 - VALVE COVER SHALL BE DOMESTICALLY CAST.
NOTE 3 - COVER MUST HAVE A MINIMUM WEIGHT OF 25 POUNDS.
NOTE 4 - COVER MUST BE CLASS 35 OR GREATER.
NOTE 5 - COVER MUST MEET OR EXCEED AASHTO H-20 LOAD REQUIREMENTS.

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5 1/4" VALVE BOX DROP LID
WITH 4" SKIRT

DWG. NO. W-18
NOTE:
1. AIR VALVE TO BE P-20 WITH VACUUM CHECK BY CRISPIN OR VALMATIC VM 45.
2. THE AIR RELEASE MANHOLE SHALL BE INSTALLED IN THE SHOULDER OR AS DIRECTED BY THE ENGINEER.
3. FOR MAINS LOCATED OUTSIDE OF STREET RIGHT-OF-WAYS THE MAXIMUM DISTANCE BETWEEN THE MANHOLE AND THE VALVE BOX SHOULD BE THREE (3) FEET.
4. MAIN SHALL BE DEEP ENOUGH TO ACCOMODATE INSTALLATION AS SHOWN.

BILL OF MATERIALS

1. PRECAST MANHOLE, SEE STANDARD DETAIL S-20
2. TRASH HOOD
3. 2" AIR RELEASE VALVE
4. 2" CURB STOP BALL VALVE
5. ADAPTER
6. 2" MECHANICAL JOINT BRASS PIPE AND FITTINGS
7. 2" TYPE "K", SOFT COPPER WITH FLARED ELBOW
8. CORPORATION COCK
9. 6" DIAMETER DRAIN
10. GROUT, 1/8" TO 1'-0" MIN. SLOPE TO DRAIN
11. PIPE CAP
12. 2'-GATE VALVE

SEE STANDARD DETAIL W-3 TO INSURE PROPER BACKFILL.
NOTES:

1) ALL MANHOLE FRAMES SHALL BE
    BE DOMESTICALLY CAST
2) FRAME SHALL BE A MINIMUM
    WEIGHT OF 182 LBS.
3) COVER SHALL WEIGH A
    MIN. OF 120 LBS.
4) MANHOLES WITHIN PAVED
    SURFACES SHALL BE
    CONSTRUCTED IN ACCORDANCE
    WITH S-29.

LAGSHIELDS MAY ONLY
    BE USED IN ROADWAY
    APPLICATIONS.

5/8"X3" LAGSHIELD IN HOLE
    DRILLED INTO CONE OR RING
    WITH ANCHOR SUNK TO DEPTH
    RECOMMENDED BY
    MANUFACTURER, AND 3/8"X3"
    HOT DIPPED GALVANIZED LAG
    BOLT AND WASHER.
TEMPORARY WATER MAIN BLOW OFF ASSEMBLY

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES

MAIN SIZE
6" - 12" MAIN SIZE
6" - GREATER

MIN. 5'
MAX. 10'

END PIPE SIZE
6" - MIN.

APPROVED BY PUBLIC UTILITIES DEPT.

NOTE:
1) NO ROD COUPLINGS ALLOWED

BLIND FLANGE WITH 2" THREADED PLUG
GROUND LINE OR PAVEMENT
3000 PSI CONCRETE WITH 4" THICKNESS
RODDING

DETAILS W-7, W-8 & W-9 FOR THRUST
GALVANIZED STEEL RODS AND BOLTS SHALL
BE 3/4 HOT DIPPED

VALVE BLOW OFF
GROUNDB LINE OR PAVEMENT
3000 PSI CONCRETE WITH 4" THICKNESS
RODDING

BLOCK INFORMATION SEE DETAILS W-7, W-8 & W-9 FOR THRUST

MECHANICAL RESTRAINING GLAND

MAPLE LEAF PIPE:
PLAIN END
#67 STONE

NOTES:

X FLANGE PIPE:
PLAIN END

LP OR PHASE LINE

3000 PSI CONCRETE PAD BENEATH FRAME,
4" THICK
CONCRETE PAD AROUND VALVE AT FINISHED GRADE

2-FLANGE X FLANGE ELBOWS BOLT TOGETHER

CONCRETE BLOCKING

6"X8'X8' CONCRETE PAD DIRECTED TO NATURAL DRAINAGE AREA (SEE NOTE #3)

#67 WASH STONE (SEE NOTE #1)

4" DIA. WATER MAIN MARKER

BLIND FLANGE WITH TWO BOLTS

MIN. 2 X DIAMETER

2-FLANGE X FLANGE ELBOWS BOLT TOGETHER

6"X8X8 CONCRETE PAD DIRECTED TO NATURAL DRAINAGE AREA (SEE NOTE #3)

CONCRETE PAD AROUND VALVE AT FINISHED GRADE

BLOW OFF VALVE

SEE DETAILS W-8 & W-9 FOR THRUST BLOCK INFORMATION

NOTES:
1. DRILL 1/4" WEEP HOLE FOR STACK DRAINAGE INTO STONE.
2. DOUBLE 3/4" BRIDLE RODS ON BOTH SIDES.
3. A RIP-RAP SWALE FROM CONCRETE SPLASH PAD TO POSITIVE DRAINAGE AREA IS REQUIRED.
4. BOTTOM 90° ELBOW SHALL HAVE BLIND FLANGE ATTACHED WITH TWO BOLTS.
5. INSTALL WATER MAIN MARKER AT R/W OR P/L TO LOCATE MAIN.
6. 3/4" RODS AND BOLTS TO BE HOT DIPPED GALVANIZED.
7. END PIPE SIZE 6" MIN. OR AS APPROVED BY PUBLIC UTILITIES.
Curb Stop Box

Roadway

Sidewalk

Rod 4" to top of box

See detail W-25 for meter box

5/8" Meter

For future split

Top of valve needs to be 12" beneath top of meter box lid, and have lockable valve

3/4" or 1" type "K" soft copper pipe, no joints or couplings

Backfill, tamped in 6" lifts

45°

Main

Corporation cock

1. Water meter as manufactured by Sensus, or Schlumberger.
2. Direct tap allowed on mains no larger than 1.6" line.
3. Meter box to be located in RW adjacent to property or in approved easement adjacent to RW.
4. When the grade changes on existing services, a copper resetter can be used to adjust to grade. Copper resetters are prohibited on new services.
5. Curb stop box shall have plug style lid with pentagon bolt, 1-1/4" steel upper section, and arch style base. Steel stationary rod to be provided for curb stop operation.
The backflow preventer location is dependent on the type device proposed for use as follows:

<table>
<thead>
<tr>
<th>ONE OR TWO FAMILY RESIDENTIAL</th>
<th>COMMERCIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEVICE</td>
<td>LOCATION</td>
</tr>
<tr>
<td>&quot;A&quot;</td>
<td>FORD ANGLE CHECK OR OTHER APPROVED DUAL CHECK VALVES</td>
</tr>
<tr>
<td></td>
<td>&quot;A&quot;</td>
</tr>
<tr>
<td></td>
<td>BACKFLOW PREVENTION SHALL BE DETERMINED BY OCCUPANCY &amp; APPROVED BACKFLOW LIST.</td>
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</tbody>
</table>

Top of valve needs to be 12" beneath top of meter box lid.

Standard meter box on concrete blocks.

#67 stone.

Threaded brass plug.

Standard 3/4" or 1" service size.

Set box on concrete blocks.

Flow.
NOTES:
1. COVER WEIGHT: 13 LBS +/- 5%
2. LIDS TO BE COATED WITH BITUMINOUS COAL TAR COATING
3. BOXES AND LIDS MUST BE MANUFACTURED FROM SAME DOMESTIC FOUNDRY.
NOTE:
TAPS MADE ON EXISTING PVC SHALL BE MADE USING A TAPPING SADDLE. TAPS MADE ON DUCTILE IRON CAN BE EITHER DIRECT OR WITH A TAPPING SADDLE.

SIZE "F" (I.D.)
(SERVICE TAP SIZE FROM MAIN)

<table>
<thead>
<tr>
<th>SIZE &quot;F&quot; (I.D.)</th>
<th>NUMBER OF METERED SERVICES ALLOWED</th>
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<td>3/4&quot;</td>
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<tr>
<td>2&quot;</td>
<td>9-16</td>
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<tr>
<td>1 1/2&quot;</td>
<td>5-8</td>
</tr>
<tr>
<td>1&quot;</td>
<td>4</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>2</td>
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</table>

SEE DETAIL FOR STANDARD WATER SERVICE INSTALLATION W-23
NOTES:
1. EVEN NUMBERED UNITS' METERS SHALL BE SET TO BE READ RIGHT TO LEFT (WHEN FACING BUILDING)
2. ODD NUMBERED UNITS' METERS SHALL BE SET TO BE READ LEFT TO RIGHT (WHEN FACING BUILDING)
3. IF IRRIGATION METER IS INCLUDED, IT SHALL BE THE LAST METER IN NUMBERING SEQUENCE.
4. UNIT 'Y' (FOR YARD METER) SHALL BE USED TO INDICATE IRRIGATION METER.
NOTES:

1. EVEN NUMBERED UNITS' METERS SHALL BE SET TO BE READ RIGHT TO LEFT (WHEN FACING BUILDING)

2. ODD NUMBERED UNITS' METERS SHALL BE SET TO BE READ LEFT TO RIGHT (WHEN FACING BUILDING)

3. IF IRRIGATION METER IS INCLUDED, IT SHALL BE THE LAST METER IN NUMBERING SEQUENCE.

4. UNIT "Y" (FOR YARD METER) SHALL BE USED TO INDICATE IRRIGATION METER.
3/4" STEEL RODS (TYP.) TO BE HOT DIPPED GALVANIZED

90° BENDS TO HAVE BLOCKING

NO FLANGE ON HOUSE SIDE, MIN. 9" OF PIPE INSIDE METER BOX

APPROPRIATE BACKFLOW PREVENTION DEVICE

FLANGED COUPLING ADAPTER IF NEEDED

METER AND TEE TO BE INSTALLED BY CITY

NOTES:
1) DOMESTIC METERS ONLY
2) ALL FITTINGS ARE TO BE MECHANICAL JOINT
3) BRONZE STRAINERS SHALL HAVE NON-THREADED BOLT HOLES.

<table>
<thead>
<tr>
<th>METER OPENING</th>
<th>4&quot; METER</th>
<th>6&quot; METER</th>
</tr>
</thead>
<tbody>
<tr>
<td>28&quot;</td>
<td>35&quot;</td>
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</table>
NOTES:
1) ALL FITTINGS ARE TO BE MECHANICAL JOINT
2) SERVICE LINE FOR 10" METER SHALL BE 12"

<table>
<thead>
<tr>
<th>METER OPENING</th>
<th>G&quot; METER</th>
<th>46&quot;</th>
<th>8&quot; METER</th>
<th>54&quot;</th>
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<tr>
<td>10&quot; METER</td>
<td></td>
<td>69&quot;</td>
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<td></td>
</tr>
</tbody>
</table>

PLAN VIEW
1. METER AS MANUFACTURED BY SENSUS OR NEPTUNE.
2. BACKFILL TAMPERED IN 6" LIFTS.
3. REINFORCEMENT: #4 @ 6" OCEW
4. CONCRETE: 4,000 PSI @ 28 DAYS
5. ALL RPZ BACKFLOW PREVENTION DEVICES MUST BE INSTALLED PRIOR TO METER BEING SET.
6) ALL COPPER SETTERS ARE TO HAVE A BALL TYPE SHUT-OFF VALVE ON BOTH SIDES OF COPPER SETTER WITH HIGH RISE BYPASS THAT IS MANUFACTURED BY FORD, MUELLER, OR AY MCDONALD. (NO EXCEPTIONS)
NOTES:
1) REINFORCEMENT: #4 @ 6" O.C.E.W.
2) CONCRETE: 4,000 PSI @ 28 DAYS
3) 6" OF #67 STONE SHALL BE PLACED IN BOTTOM OF VAULT
4) METER FLANGE SHALL BE PLACED 42" BELOW FINISHED GRADE
NOTES:
1) REINFORCEMENT: #4 @ 6" OCEW
2) CONCRETE: 4,000 PSI @ 28 DAYS
3) 6" OF #67 STONE SHALL BE PLACED IN BOTTOM OF VAULT
4) METER FLANGE SHALL BE PLACED 49" BELOW FINISHED GRADE

WEIGHT: TOP:
10,600 LBS
BOTTOM:
8,700 LBS

TRAFFIC RATED ACCESS DOOR WITH SLAMLOCK CAST IN TOP

1-1/4"Ø BUTYL RUBBER SEALANT IN JOINT

LIFTERS

TYPICAL 6" THRU 10" WATER METER VAULT

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES

TYPICAL 6" THRU 10" WATER METER VAULT

<table>
<thead>
<tr>
<th>DWG. NO.</th>
<th>REVISIONS</th>
<th>DATE</th>
<th>REVISIONS</th>
<th>DATE</th>
</tr>
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<td>8-26-04</td>
<td>D.H.L.</td>
<td>6-18-08</td>
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14"W x 18"H DOGHOUSE

ALUMINUM LID 48"
1. Service taps for 2" and smaller domestic services may be by corporation cocks. Larger services will require a tee and gate valve or tapping sleeve and valve assembly and 90° bend.
2. Domestic service taps shall be allowed only on 6" or larger fire lines before the backflow assembly.
3. One domestic tap per fire line on street side of backflow.
4. Fire line shall have a fire hydrant or blow off assembly at its end to facilitate flushing when needed.
5. Irrigation meter shall be located on the side of domestic meter with increasing addresses.
6. The backflow shall be installed no more than 10' from the meter in a visible location.
7. Domestic/Irrigation backflow riser/standpipe shall be of copper or brass.
8. The RP relief valve shall be a minimum of 12" above any material (mulch included) or grade.
9. A service valve is required after the meter but before the backflow assembly for maintenance and replacement purposes.
10. The installation must also meet all code requirements per the NC plumbing code.

FIRE, DOMESTIC & IRRIGATION OPTIONS SCHEMATIC

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES

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<th>DWG. NO.</th>
<th>REVISIONS</th>
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<td>W-34</td>
<td>D.W.C.</td>
<td>11-18-99</td>
<td>A.B.B.</td>
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NOTES:
1. Irrigation meter shall be located on the side of domestic meter with increasing addresses.
2. The backflow shall be installed no more than 10’ from the meter in a visible location.
3. Backflow riser/standpipe shall be of copper or brass.
4. The RP relief valve shall be a minimum of 12” above any material (mulch included) or grade.
5. A service valve is required after the meter but before the backflow assembly for maintenance and replacement purposes.
6. The installation must also meet all code requirements per the NC plumbing code.
1. Remove tee fitting, repair stub with curb stop & valve box if not existing.
2. Work to be performed by licensed utility contractor, Stub permit inspection required.
3. For repair of existing service, one brass compression coupling and type K copper as needed to be used for repair.
4. Remove meter box and piping. (Prior to termination the meter division / utility billing must be contacted for meter removal & account closure).
1. ALL ABOVE GROUND ENCLOSURES MUST HAVE ADEQUATE DRAINAGE (TWICE THE DIAMETER OF THE SUPPLY PIPE) TO DAYLIGHT ABOVE GRADE.
2. REDUCED PRESSURE BACKFLOW PREVENTERS MAY BE LOCATED IN A BUILDING PROVIDED THERE ARE NO OTHER UNPROTECTED TAPS BETWEEN THE MAIN AND THE BUILDING. DRAINAGE IN A BUILDING MUST BE TWICE THE DIAMETER OF THE SUPPLY PIPE.
3. ABOVE GROUND INSULATED VAULTS MUST BE ASSE 1060 APPROVED ABOVE GROUND ENCLOSURES. SEE CROSS CONNECTION MANUAL FOR ENCLOSURE FREEZE PROTECTION AND CERTIFICATION REQUIREMENTS.
4. RESIDENTIAL LAWN IRRIGATION R.P. ASSEMBLIES THAT ARE REMOVED TO PREVENT FREEZING IN THE WINTER MONTHS MUST BE CAPPED OFF. ALL ABOVE GROUND ASSEMBLIES, EXCEPT RESIDENTIAL LAWN IRRIGATION ASSEMBLIES, MUST BE PROTECTED FROM FROST.
5. FOR ENCLOSURE DIMENSIONS SEE DETAIL W-34.
6. STEEL RODS AND BOLTS SHALL BE 3/4" HOT DIPPED GALVANIZED.
7. ALL ASSEMBLIES MUST BE ON THE CURRENT APPROVAL LIST.
NOTE: FIRE MAINS ARE TO BE PRESSURE TESTED AT 200 PSI.

If the tap is to a public main, a service valve must be placed behind the right of way prior to the BFP. 2 possible locations are shown.

If O.S. Y. rising stem or indicating butterfly valve.

All sides 12" min

R/W 90° BEND

DRAIN TO DAYLIGHT MIN. AREA OF 2X PIPE SIZE OR 4" DIAMETER.
1. SHUT-OFF VALVES, CHECK VALVES, AND TEST COCKS SHALL BE STANDARD TO THE APPROVED BACKFLOW ASSEMBLY.

2. ALL LARGE(2-1/2" - 10") ASSEMBLIES TO BE SUPPORTED BY A CRADLE.

3. ENCLOSURE FOUNDATIONS SHALL BE CONSTRUCTED OF 4" OF CONCRETE OR 6" OF STONE.

4. ASSEMBLIES MUST BE ON CURRENT APPROVAL LIST.

5. 2 1/2" AND LARGER ASSEMBLIES SHALL BE FUSION BONDED EPOXY COATED INCLUDING SHUTOFF VALVES.
NOTE:

1) USE A MINIMUM OF TWO SPIDERS PER PIPE JOINT ONE FOURTH OF THE PIPE JOINT LENGTH IN FROM BOTH THE BELL AND SPIGOT ENDS.
NOTE: NO ENCASEMENT REQUIRED FOR SPACE GREATER THAN 18 INCHES FOR WATER LINES

FLOWABLE FILL FULL TRENCH WIDTH

6" MIN 18" MAX

1" THICK COMPRESSIBLE JOINT FILLER MATERIAL

PROPOSED PIPELINE OVER EXISTING PIPE

PROPOSED PIPELINE UNDER EXISTING PIPE