

ARTICLE 2-122.2

The average daily demand design figures for individual systems within the Town of Leesburg are as follows:

| <u>Establishment</u> | <u>Usage</u> |
|--|--------------------|
| Single-family, duplex | 350 gpd/unit |
| Apartment and townhouse and condominiums | 300 gpd/unit |
| Office/employment | 0.1 gpd/gross s.f. |
| Shopping center/retail | 0.3 gpd/gross s.f. |
| Hotel | 100 gpd/room |
| Nursing home | 200 gpd/bed |
| Schools without showers and cafeterias | 5 gpd/student |
| School with showers and cafeterias | 10 gpd/student |
| Light/medium industry/warehouse | 1000 gpd/acre |
| Commercial | 770 gpd/acre |
| Park, recreation | 500 gpd/acre |
| Swimming pools | 10 gpd/swimmer |
| Dentist office | 60 gpd/operative |

Notes: For uses other than those listed above, refer to Commonwealth of Virginia Sewerage and Water Works Regulations.

The peak hour demand and maximum day figures can be achieved by multiplying the average day demand by the factors shown below which have been obtained from the Town's Water and Sewer Master Plan.

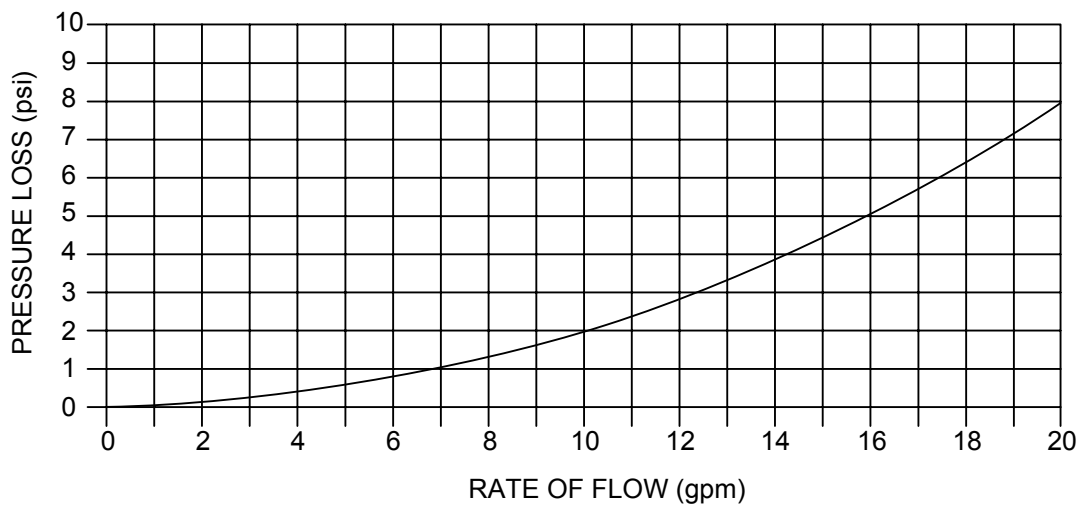
Maximum Day Factor = 1.75
Peak Hour Factor = 2.70

The water system must be designed based on the worst condition which normally equates to peak hour pressure.

| REVISIONS | | WATER DEMAND | DRAWING WD-1 PAGE 53 |
|-----------|----------|---------------------|-----------------------------------|
| NO. | DATE: | | |
| 1 | | | |
| 3 | 04/27/10 | | |
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ARTICLE 2-122.4D(3)

| | | | | | | |
|---------------------|-----|-----|-----|-----|-----|-----|
| GPM | 10 | 12 | 14 | 16 | 18 | 20 |
| PRES. DROP (psi) | 2.0 | 2.8 | 3.9 | 5.0 | 6.4 | 8.0 |



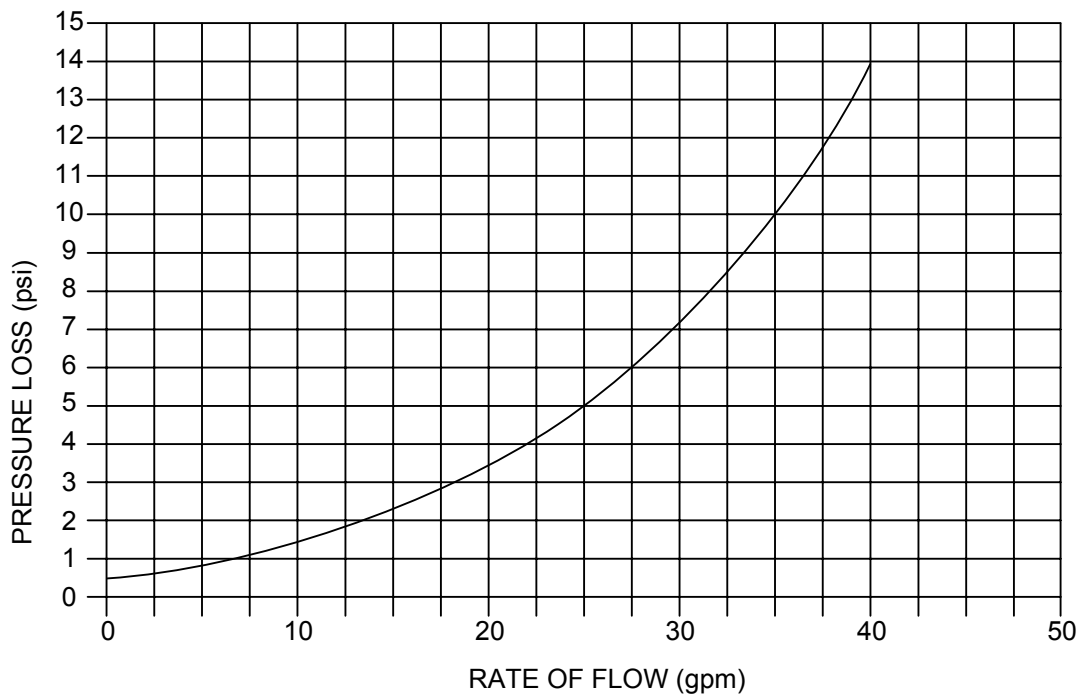
Note:

A. Contact the Utilities Department for manufacturer's literature for water meter accuracy.

| REVISIONS | | 5/8" WATER METER HEAD LOSS CHART | DRAWING WD-2 PAGE 54 |
|-----------|----------|---|-----------------------------------|
| NO. | DATE: | | |
| 1 | | | |
| 3 | 04/27/10 | | |
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ARTICLE 2-122.4D(3)

| | | | | | | | |
|------------------|-----|-----|-----|----|-----|----|----|
| GPM | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
| PRES. DROP (psi) | 1.4 | 2.2 | 3.5 | 5 | 7.0 | 10 | 14 |



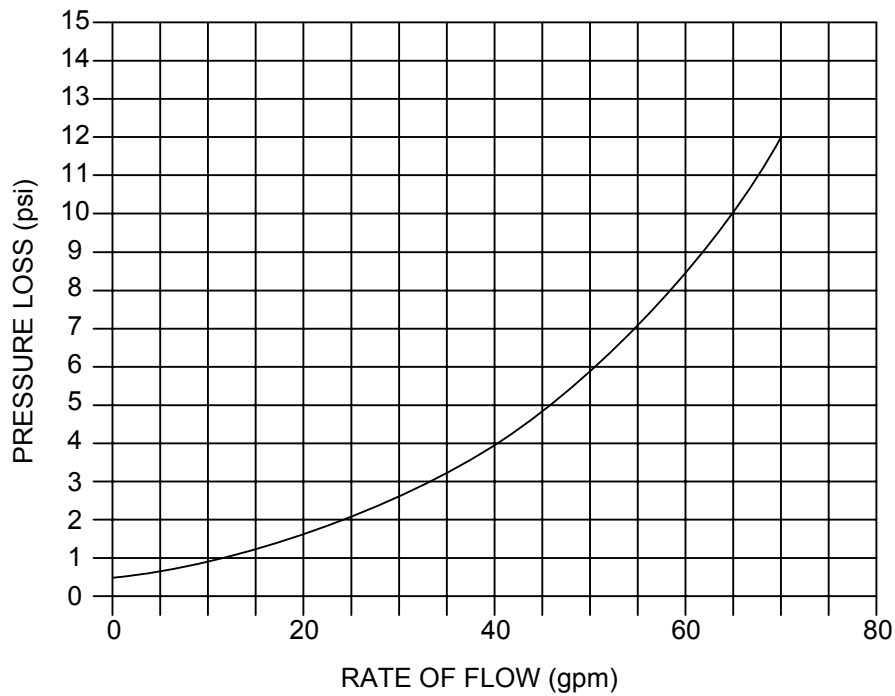
Note:

A. Contact the Utilities Department for manufacturer's literature for water meter accuracy.

| | | | | | |
|-----------|----------|--|--|---|-----------------------------------|
| REVISIONS | | | | 3/4" WATER METER HEAD LOSS CHART | DRAWING WD-3 PAGE 55 |
| NO. | DATE: | | | | |
| 1 | | | | | |
| 3 | 04/27/10 | | | | |
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ARTICLE 2-122.4D(3)

| | | | | | | | |
|---------------------|-----|-----|-----|-----|-----|-----|------|
| GPM | 10 | 20 | 30 | 40 | 50 | 60 | 70 |
| PRES. DROP (psi) | 0.9 | 1.5 | 2.5 | 4.0 | 5.9 | 8.3 | 12.0 |



Note:

A. Contact the Utilities Department for manufacturer's literature for water meter accuracy.

| | | | |
|------------------|----------|---|-----------------------------------|
| REVISIONS | | 1" WATER METER HEAD LOSS CHART | DRAWING WD-4 PAGE 56 |
| NO. | DATE: | | |
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| 3 | 04/27/10 | | |
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ARTICLE 2-310-17

Allowable Leakage per 1000 ft. of Pipeline - gph

| Average Test Pressure psi | Nominal Pipe Diameter - in | | | | | | | | | | | | | | | |
|---------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 | 30 | 36 | 42 | 48 | 54 |
| 450 | 0.48 | 0.64 | 0.95 | 1.27 | 1.59 | 1.91 | 2.23 | 2.55 | 2.87 | 3.18 | 2.82 | 4.78 | 5.73 | 6.69 | 7.64 | 8.60 |
| 400 | 0.45 | 0.60 | 0.90 | 1.20 | 1.50 | 1.80 | 2.10 | 2.40 | 2.70 | 3.00 | 3.60 | 4.50 | 5.41 | 6.31 | 7.21 | 8.11 |
| 350 | 0.42 | 0.56 | 0.84 | 1.12 | 1.40 | 1.69 | 1.97 | 2.25 | 2.53 | 2.81 | 3.37 | 4.21 | 5.06 | 5.90 | 6.74 | 7.58 |
| 300 | 0.39 | 0.52 | 0.78 | 1.04 | 1.30 | 1.56 | 1.82 | 2.00 | 2.34 | 2.60 | 3.12 | 3.90 | 4.68 | 5.46 | 6.24 | 7.00 |
| 275 | 0.37 | 0.50 | 0.75 | 1.00 | 1.24 | 1.49 | 1.74 | 1.99 | 2.24 | 2.49 | 2.99 | 3.73 | 4.48 | 5.23 | 5.98 | 6.72 |
| 250 | 0.36 | 0.47 | 0.71 | 0.95 | 1.19 | 1.42 | 1.66 | 1.90 | 2.14 | 2.37 | 2.85 | 3.56 | 4.27 | 4.99 | 5.70 | 6.41 |
| 225 | 0.34 | 0.45 | 0.68 | 0.90 | 1.13 | 1.35 | 1.58 | 1.80 | 2.03 | 2.25 | 2.70 | 3.38 | 4.05 | 4.73 | 5.41 | 6.03 |
| 200 | 0.32 | 0.43 | 0.64 | 0.85 | 1.06 | 1.28 | 1.48 | 1.70 | 1.91 | 2.12 | 2.55 | 3.19 | 3.82 | 4.46 | 5.09 | 5.73 |
| 175 | 0.30 | 0.40 | 0.59 | 0.80 | 0.99 | 1.19 | 1.39 | 1.59 | 1.79 | 1.98 | 2.38 | 2.98 | 3.58 | 4.17 | 4.77 | 5.36 |
| 150 | 0.28 | 0.37 | 0.55 | 0.74 | 0.92 | 1.10 | 1.29 | 1.47 | 1.66 | 1.84 | 2.21 | 2.76 | 3.31 | 3.86 | 4.41 | 4.97 |
| 125 | 0.25 | 0.24 | 0.50 | 0.67 | 0.84 | 1.01 | 1.18 | 1.34 | 1.51 | 1.68 | 2.01 | 2.52 | 3.02 | 3.53 | 4.03 | 4.53 |
| 100 | 0.23 | 0.30 | 0.45 | 0.60 | 0.75 | 0.90 | 1.05 | 1.20 | 1.35 | 1.50 | 1.80 | 2.25 | 2.70 | 3.15 | 3.60 | 4.05 |

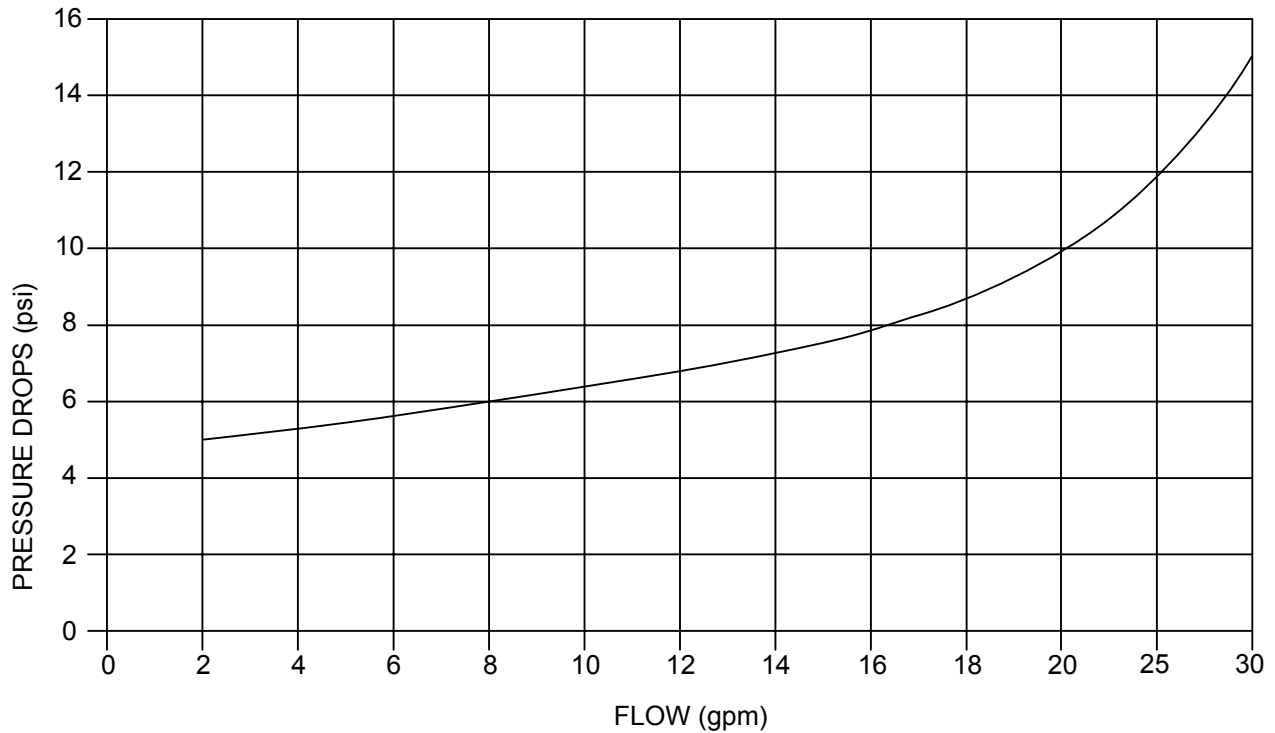
If the pressure under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each pipe.

To obtain leakage rates in liters/hour multiply the values in the table by 3.785.

| REVISIONS | | | | ALLOWABLE LEAKAGE CHART | DRAWING WD-5 |
|-----------|-------|--|--|------------------------------------|-----------------|
| NO. | DATE: | | | | |
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ARTICLE 2-122.4D(2)

| | | | | | | | | | | | | |
|---------------------|---|-----|-----|---|-----|-----|-----|-----|-----|----|----|----|
| GPM | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 25 | 30 |
| PRES. DROP (psi) | 5 | 5.3 | 5.6 | 6 | 6.4 | 6.8 | 7.3 | 7.8 | 8.5 | 10 | 12 | 15 |



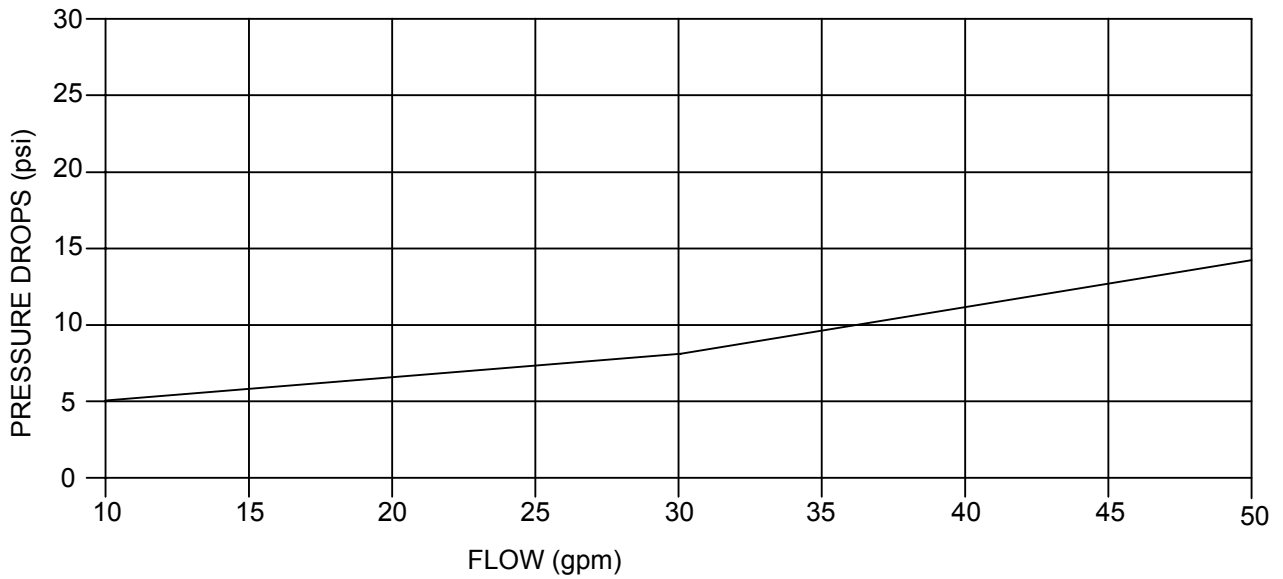
NOTE:

A. The 3/4" meter setters which are equipped with 3/4" check valve will accommodate 5/8" or 3/4" meters.

| | | | |
|------------------|----------|------------------------------------|-----------------|
| REVISIONS | | 3/4" ANGLED CHECK VALVE | DRAWING WD-6 |
| NO. | DATE: | | |
| 1 | | | |
| 3 | 04/27/10 | | |
| | | | |
| | | | |
| | | PAGE 58 | |

ARTICLE 2-122.4D(2)

| | | | | | | | |
|---------------------|----|----|----|----|----|----|----|
| GPM | 10 | 15 | 20 | 25 | 30 | 40 | 50 |
| PRES. DROP (psi) | 5 | 6 | 7 | 8 | 9 | 10 | 14 |



| REVISIONS | | | |
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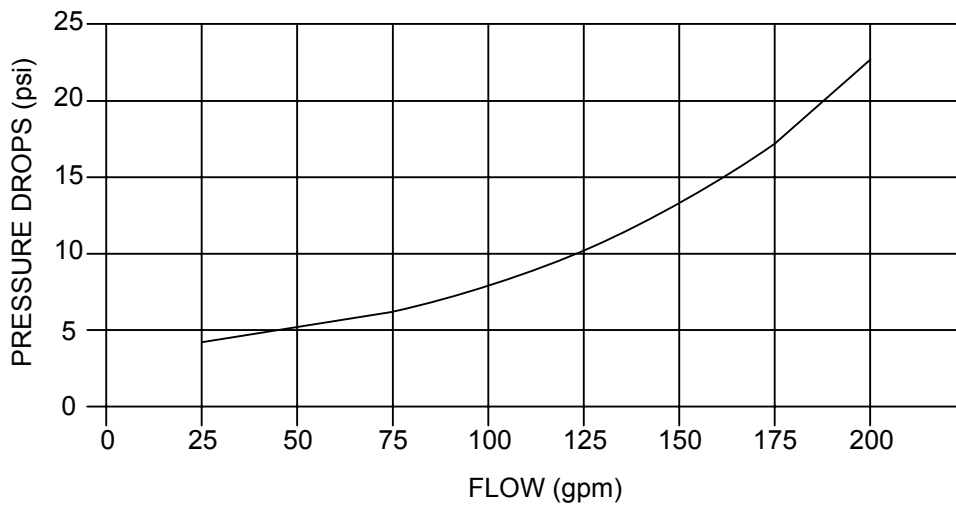
**1" ANGLED
CHECK VALVE**

DRAWING
WD-7

PAGE
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ARTICLE 2-122.4D(2)

| | | | | | | | | |
|---------------------|-----|-----|-----|-----|------|------|------|------|
| GPM | 25 | 50 | 75 | 100 | 125 | 150 | 175 | 200 |
| PRES. DROP (psi) | 4.2 | 5.0 | 6.2 | 8.5 | 10.2 | 13.7 | 17.2 | 22.7 |



| REVISIONS | | | |
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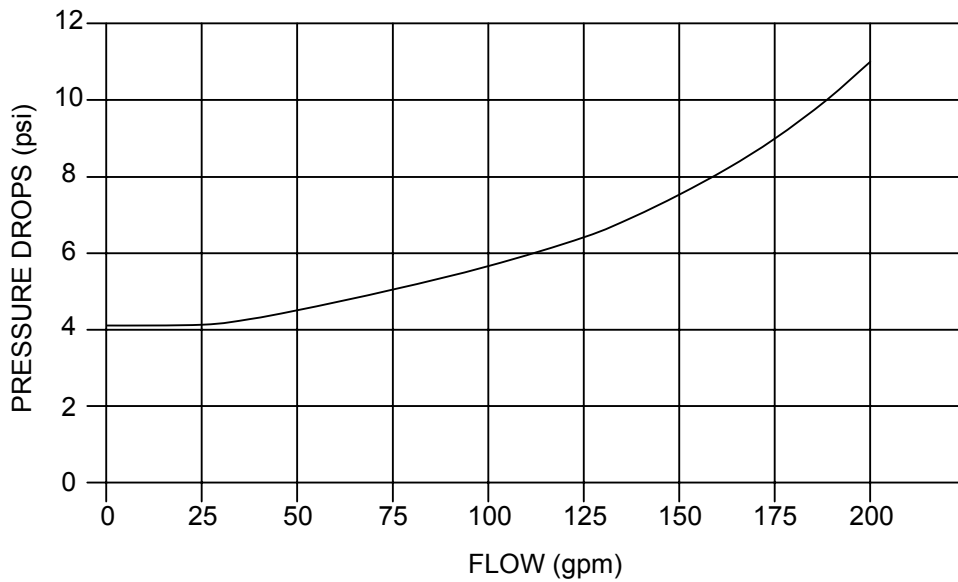
**1 1/2" DOUBLE
CHECK VALVE**

DRAWING
WD-8

PAGE
60

ARTICLE 2-122.4D(2)

| | | | | | | | | |
|---------------------|-----|-----|-----|-----|-----|-----|-----|------|
| GPM | 25 | 50 | 75 | 100 | 125 | 150 | 175 | 200 |
| PRES. DROP (psi) | 4.3 | 4.8 | 5.0 | 5.8 | 6.5 | 7.5 | 9.0 | 11.0 |



| REVISIONS | | | |
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| NO. | DATE: | | |
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| 3 | 04/27/10 | | |
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**2" DOUBLE
CHECK VALVE**

DRAWING
WD-9

PAGE
61

ARTICLE 2-340.2

GENERAL NOTES FOR WATER SERVICE CONNECTIONS

The following is a listing of hardware that is available in the market. The criteria listed below must be used when sizing water meters and service lines.

1. The Town supplies the contractor with the meter crock, lid, copper setter, and water meter. The contractor supplies the corporation stop and the copper pipe, makes the tap, and installs all of the appurtenances. The Town will **install** the water meter once the availability fees are paid.
2. The Town allows taps of 1", 1½" and 2" sizes. One inch service lines may utilize a corporation stop or tapping stainless steel (SS) saddle. Service lines 1½" and 2" will require the installation of a tapped mechanical joint tee when installing a new pipe. The use of SS saddles may be considered when connection is made to an existing pipe. Service connections 3" or larger will require installation of a tee.
3. The Town does not allow the use of 1¼" service lines, meters, etc. The supplies are difficult to locate.
4. Type "K" seamless copper pipe is available in the following lengths:
 - a. 1" pipe - 100' or 60' rolls
 - b. 1½" pipe - 40' or 60' rolls
 - c. 2" pipe - 40' or 60' rolls

Per the length limitations listed above, the water meters cannot be located any farther from the watermain than the roll lengths indicated for the size copper pipe to be used.
5. Double water meter installation, uses a 1" x ¾" branch with 2 - ¾" copper setters. This is the only arrangement allowed for double meters. If larger pipe or meter is required, double meters cannot be used. Refer to DCSM Drawing WS-23.
6. Pressure reducing valves (PRV's): the PRV's for new service connections will be installed within the building. The PRV's for existing system connections will be located within the meter crock.
7. The maximum meter size for residential units must not exceed 1" unless the conditions dictate. The designer should upsize the line between the house and the meter to compensate for the losses due to down sizing of the meter.
8. There will be no solder joints allowed underground except in a meter vault or crock.
9. Meter Location: All water meters must be located in the 2' utility strip. For areas where there are no utility strips, the meter must be at the property line or the edge of the easement.
10. The banking of water meters for shopping centers, and other locations, may be done provided that the minimum waterline size servicing the meter bank is 4" with a standard blowoff at the terminus contained within a public easement and that the taps for the meters are spaced in accordance with the pipe manufacturer's recommendations.
11. Water meter sizes for use in the Town of Leesburg are ⅝", ¾", 1", 1½", 2", 3", 4", 6", and increasing in even diameter pipe sizes.

| REVISIONS | | | | WATER SERVICE CONNECTION NOTES | DRAWING WD-10 PAGE 62 |
|-----------|----------|--|--|---|------------------------------------|
| NO. | DATE: | | | | |
| 1 | | | | | |
| 2 | 10/16/07 | | | | |
| 3 | 04/27/10 | | | | |
| | | | | | |

ARTICLE 2-340.2

| Water Meter Arrangements Commercial and Residential Service Combinations | | | |
|---|-----------------------------------|--|----------------------|
| Service line | Copper setter | Water meter | Supply line |
| 1" | $\frac{5}{8}$ " x $\frac{3}{4}$ " | $\frac{5}{8}$ " or $\frac{3}{4}$ " | $\frac{3}{4}$ " - 2" |
| 1" | Full $\frac{3}{4}$ " | Full $\frac{3}{4}$ " | $\frac{3}{4}$ " - 2" |
| 1" | 1" | $\frac{5}{8}$ ", $\frac{3}{4}$ ", or 1" | $\frac{3}{4}$ " - 2" |
| $1\frac{1}{2}$ " | 2" | $\frac{5}{8}$ ", $\frac{3}{4}$ ", 1", $1\frac{1}{2}$ " or 2" | $\frac{3}{4}$ " - 2" |
| 2" | 2" | $\frac{5}{8}$ ", $\frac{3}{4}$ ", 1", $1\frac{1}{2}$ " or 2" | $\frac{3}{4}$ " - 2" |

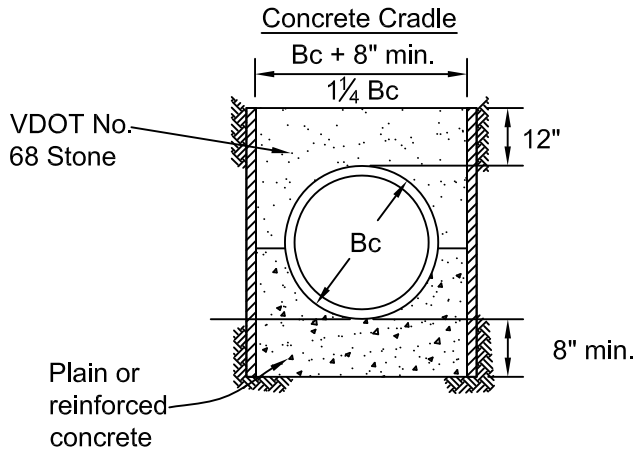
Notes:

- A. Refer to WS-1 and WS-2 for a schematic drawing of the water service and meter connection.
- B. Smaller meters can be used with larger setters. The meter will be supplied with adapters to accommodate the larger setter.

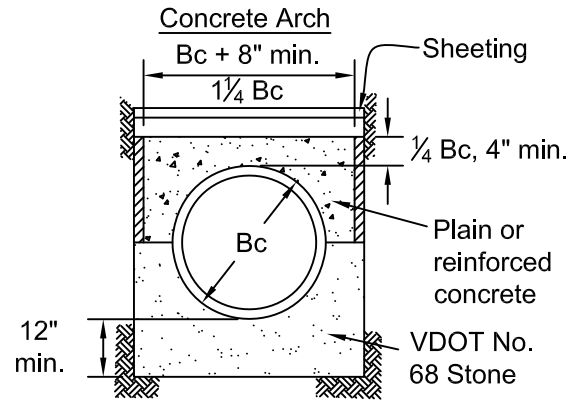
Not To Scale

| REVISIONS | | WATER SERVICE COMBINATIONS | DRAWING WD-11 PAGE 63 |
|-----------|----------|---------------------------------------|------------------------------------|
| NO. | DATE: | | |
| 1 | | | |
| 2 | 10/16/07 | | |
| 3 | 04/27/10 | | |
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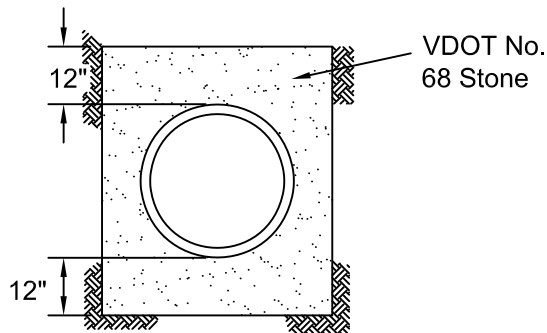
ARTICLE 2-310.5



CLASS A



CLASS B



NOTES:

- A. In rock trench, excavate at below the bell of the pipe except where concrete cradle is used.
- B. Compacted granular material for D.I.P. and P.V.C. pipe is VDOT crushed stone No. 68.

Not To Scale

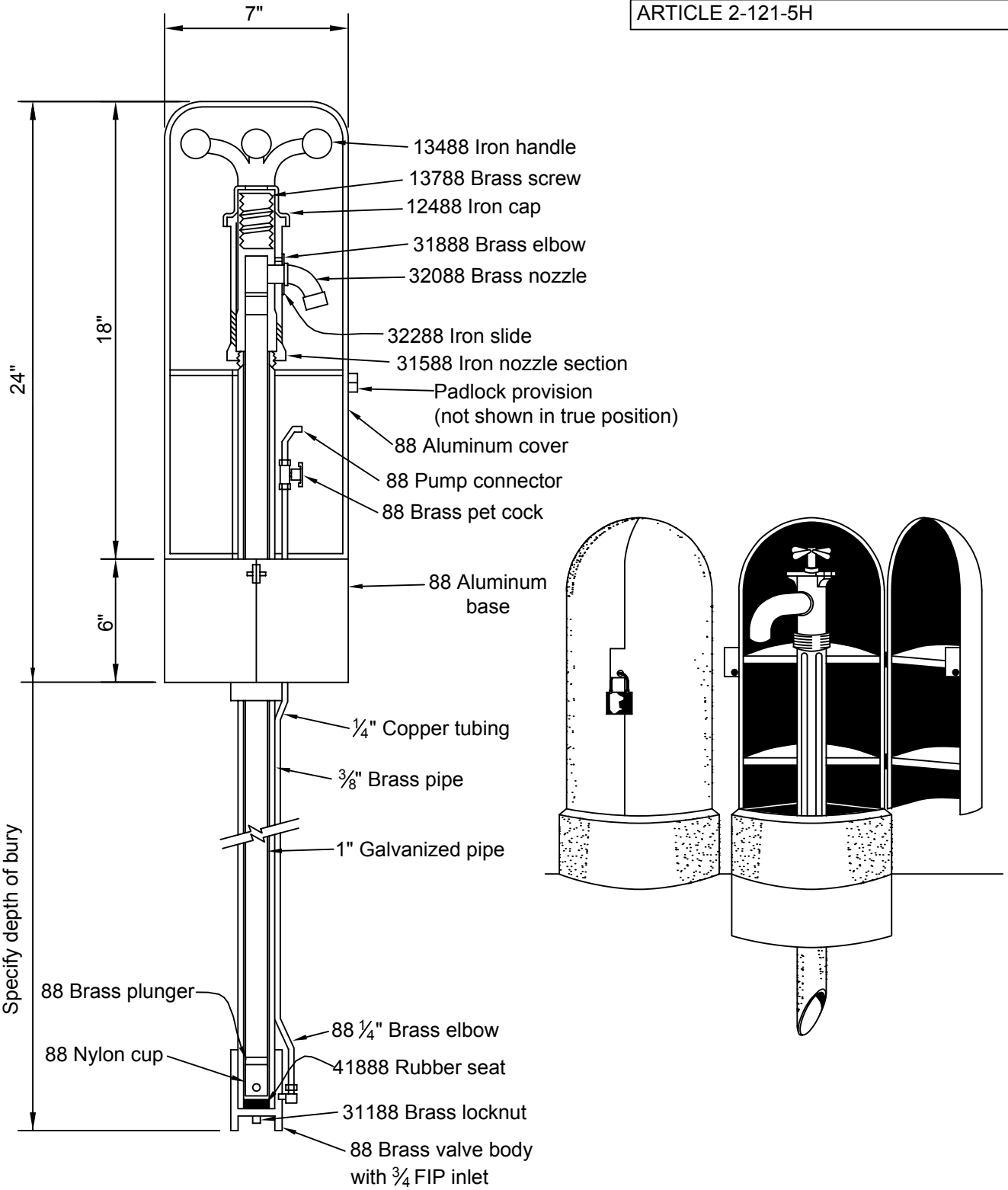
| REVISIONS | | | |
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| 2 | 04/09/24 | | |
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**PIPE BEDDING
WATER**

DRAWING
WD-12

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ARTICLE 2-121-5H



Not To Scale

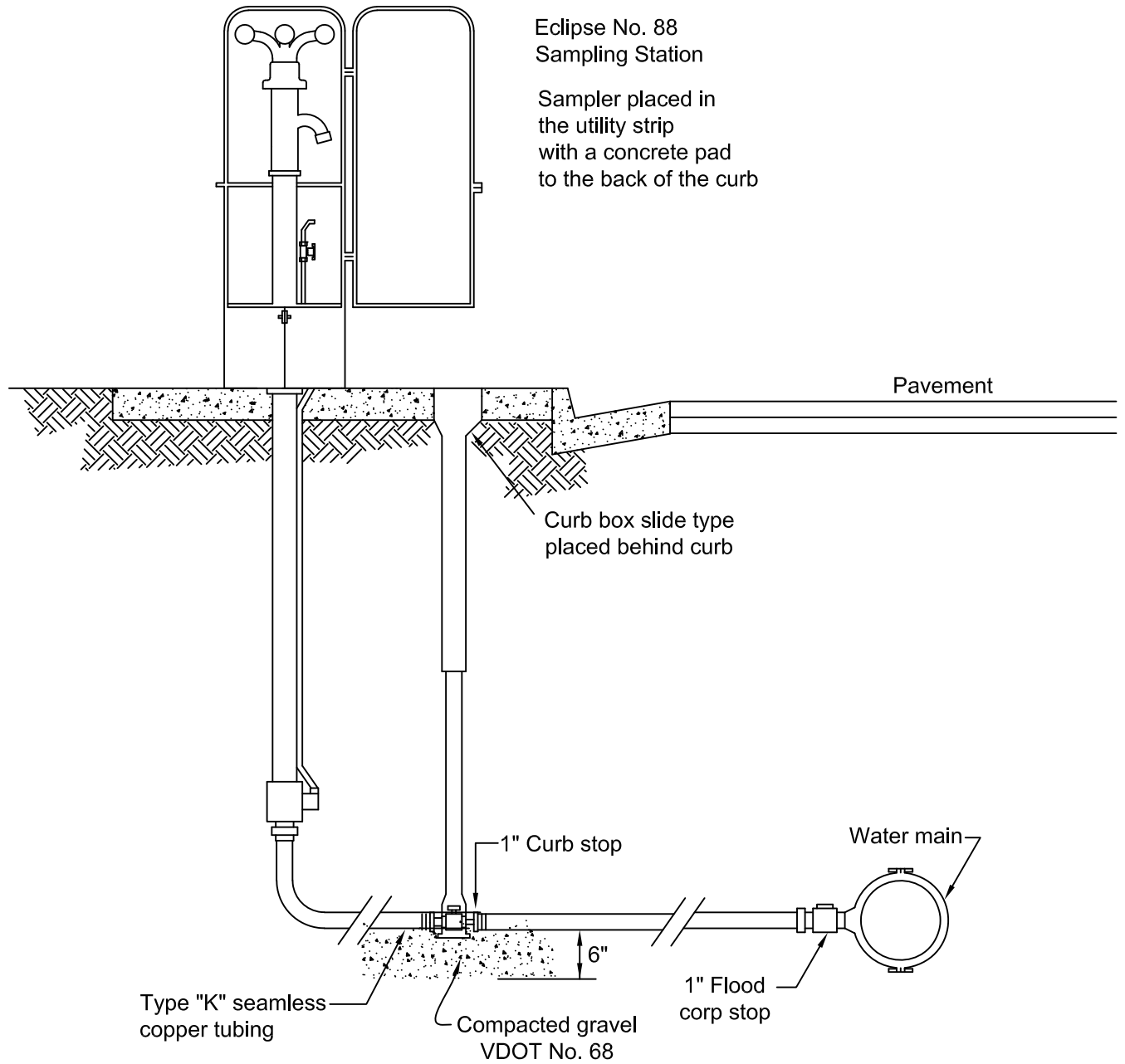
| REVISIONS | |
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**WATER
SAMPLING STATION**

DRAWING
WD-13

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65

ARTICLE 2-121-5H



NOTE:

- A. See drawing WD-13 for water sampling station schedule of materials.
- B. Concrete pad (24" x 24" x 4") to be poured at base of sampling station.
- C. The sampling station must be located as near as possible to a storm drain inlet.

Not To Scale

| REVISIONS | | | |
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| NO. | DATE: | | |
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| 2 | 10/16/07 | | |
| 3 | 04/27/10 | | |
| 4 | 04/09/24 | | |

**WATER SAMPLING
STATION INSTALLATION**

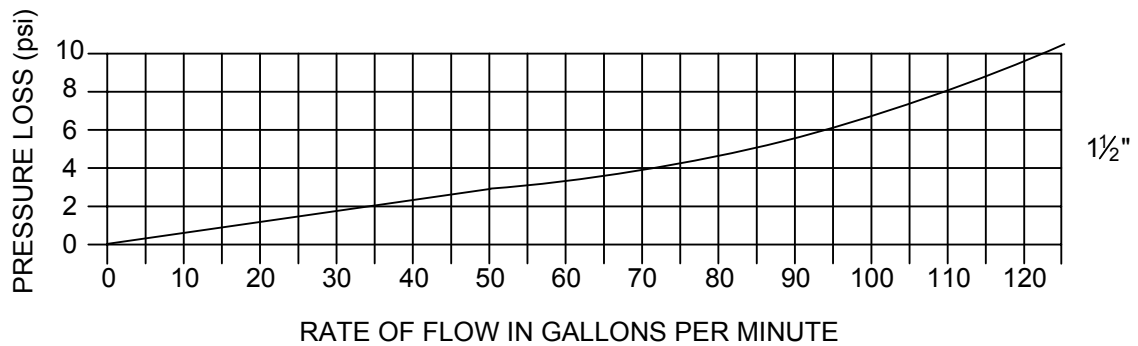
DRAWING
WD-14

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66

ARTICLE 2-122.4D(3)

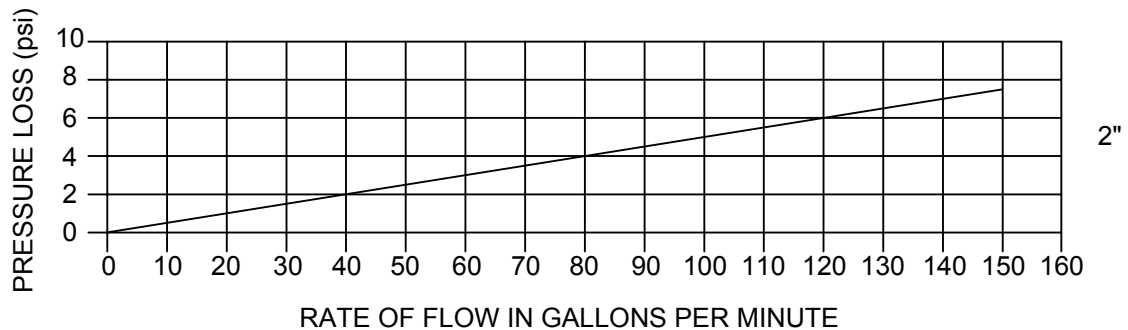
HEAD LOSS CHART FOR 1.5" METER

| | | | | |
|------------------|-----|-----|-----|------|
| GPM | 50 | 75 | 100 | 125 |
| PRES. DROP (psi) | 3.0 | 4.0 | 7.5 | 10.5 |



HEAD LOSS CHART FOR 2" METER

| | | | | | |
|------------------|-----|-----|-----|-----|-----|
| GPM | 50 | 75 | 100 | 125 | 150 |
| PRES. DROP (psi) | 2.0 | 2.5 | 4.0 | 5.0 | 7.5 |



Note:

A. Contact the Utilities Department for manufacturer's literature for water meter accuracy.

| | | | |
|------------------|----------|--|---|
| REVISIONS | | <p>1½" AND 2" WATER METER HEAD LOSS CHART</p> | <p>DRAWING WD-15</p> <p>PAGE 67</p> |
| NO. | DATE: | | |
| 1 | | | |
| 3 | 04/27/10 | | |
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ARTICLE 2-122-4.D

WATERMETER AND WATER SERVICE LINES SIZING WORKSHEET

Town Reviewer: _____
Project Name: _____
Design Engineer: _____

Date: _____
LMIS No.: _____
Type of Occupancy: _____

STEP

1. Total Water Supply Fixture Units from Worksheet: _____
2. Maximum Probable Flow from IPC Appendix E**: _____ gpm
3. Water meter Size: _____ inch
4. Pressure Loss Through Water meter from DCSM or Manufacturer's Literature: _____ psi
5. Pressure Loss Through Back flow Preventer from DCSM Drawing WD-6, 7, 8 or 9; or Manufacturer's Literature: _____ psi
6. Pressure Loss Through Any Special Fixtures (PRV*, filters, etc.): _____ psi
7. Total Pipe Friction Losses from Worksheet, WD-19: _____ psi
8. Total Pressure Losses from Appurtenances (sum of steps 4,5,6, and 7): _____ psi
9. Peak Hour Pressure at Town Water System Node _____: _____ psi
10. Elevation at Town Water System Node _____: _____ feet
11. Elevation at Highest Fixture: _____ feet
12. Static Pressure Loss ((Step 11-Step 10) x 0.4335): _____ psi
13. Pressure at Highest Fixture (Step 9 - Step 8 - Step 12): _____ psi

Step 13 must be: \geq 8 psi if flushometer-, or flush-tank water closets are used.
 \geq 15 psi if flushometer valve water closets are used.

The system must be redesigned if Step 14 is below the minimum required pressure.

The system design is: acceptable.
 not acceptable because _____

* A Pressure - Reducing Valve is required if the building is located within the:

Main Pressure Zone and any static pressure at the water main is greater than 80 psi.
Static Pressures at Node ___ for: Avg. Day: ___ psi; Max. Day: ___ psi; Peak Hour: ___ psi

Western Pressure Zone and the lowest fixture elevation is less than 363 feet.
Lowest Fixture Elevation: _____ feet

Route 643 Pressure Zone and the lowest fixture elevation is less than 386 feet.
Lowest Fixture Elevation: _____ feet

A Pressure - Reducing Valve is: required.
 not required.

**Use appropriate table from most current International Plumbing Code (IPC) Appendix "E".

| REVISIONS | | | |
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| NO. | DATE: | | |
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| 3 | 04/27/10 | | |

**WATER SERVICE LINES
AND WATER METER
SIZING WORKSHEET**

DRAWING
WD-16

PAGE
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| REVISIONS | | | | BLANK | DRAWING WD-18 |
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| NO. | DATE: | | | | PAGE 70 |
| 1 | | | | | |
| 2 | 10/16/07 | | | | |
| 3 | 04/27/10 | | | | |
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ARTICLE 2-122-4.D

WATER DISTRIBUTION PIPE FRICTION LOSSES

Town Reviewer: _____
Project Name: _____
Design Engineer: _____

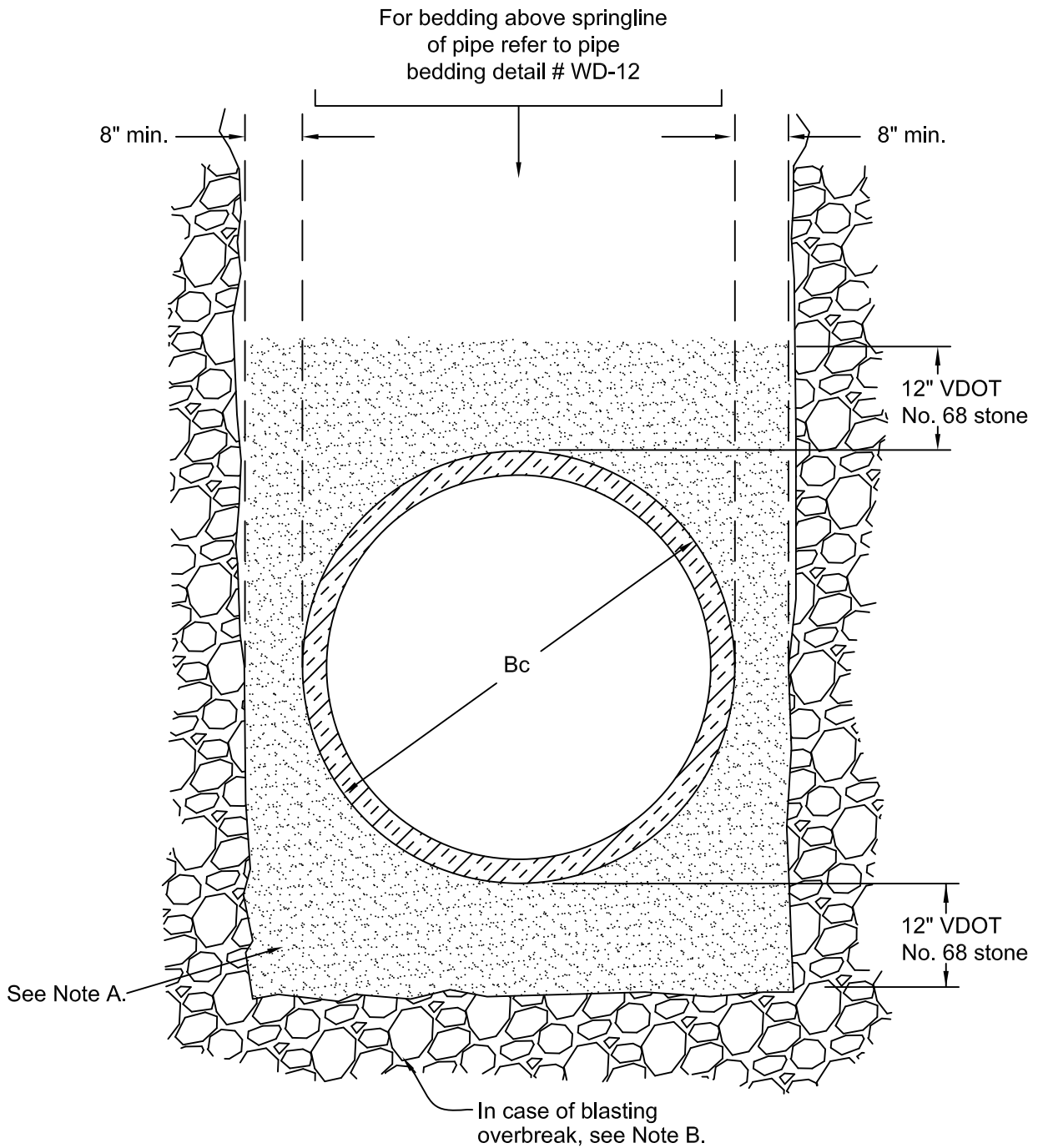
Date: _____
LMIS No.: _____
Type of Occupancy: _____

| Pipe Section Point to Point ¹ | | Pipe Diameter (inch) | Type of Pipe | International Plumbing Code Reference | Flow Demand (gpm) | Friction Loss (psi/100') | Pipe Section Length (FT) | Equivalent Length for Fittings ² (FT) | Total Equivalent Pipe Length (FT) | Friction Loss (psi) |
|--|-------|----------------------|--------------|---------------------------------------|-------------------|--------------------------|--------------------------|--|-----------------------------------|---------------------|
| Main | Tap | | Corp. Stop | Appendix E | | | | | | |
| Tap | Meter | | Copper - K | Appendix E | | | | | | |
| Meter | | | | | | | | | | |
| Cold Water Distribution Piping | | | | | | | | | Subtotal: ____ | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Hot Water Distribution Piping | | | | | | | | | Subtotal: ____ | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 1. See attached distribution piping diagram, entitled 2. Total from appropriate table from most current International Plumbing Code Appendix "E" or 25% of pipe section length. | | | | | | | | | Subtotal: ____ | |

Total: ____

| | | | |
|------------------|----------|---|---|
| REVISIONS | | <p>WATER DISTRIBUTION PIPE FRICTION LOSSES WORKSHEET</p> | <p>DRAWING WD-19</p> <p>PAGE 71</p> |
| NO. | DATE: | | |
| 1 | | | |
| 2 | 10/16/07 | | |
| 3 | 04/27/10 | | |

ARTICLE 2-310-5



Notes:

- A. Crushed stone VDOT size No. 68 in accordance with VDOT specifications.
- B. Blasting overbreak to be removed and replaced with compacted crushed stone.

Not To Scale

| REVISIONS | | | |
|-----------|----------|--|--|
| NO. | DATE: | | |
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| 3 | 04/27/10 | | |
| 4 | 04/09/24 | | |

**TYPICAL WATER MAIN
TRENCH IN ROCK**

DRAWING
WD-20

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