# WTR-1 — THRUST RESTRAINT (TEES)

**GENERAL NOTES**

1. THE VALUES IN THE TABLE WERE ESTABLISHED FOR DISTANCE 'Lr' EQUAL TO 'L'. OTHER VALUES OF 'L' MAY BE CALCULATED FOR VARYING DISTANCES OF 'Lr'.
2. ALL JOINTS WITHIN DISTANCE 'L' OF A TEE SHALL BE RESTRAINED USING AN APPROVED MECHANICAL RESTRAINT SYSTEM.
3. NO JOINTS, OTHER THAN RESTRAINED VALVES LOCATED ADJACENT TO THE TEE, ARE ALLOWED WITHIN DISTANCE 'Lr' OF A TEE.

| TEES | | |
|---|---|---|
| MAIN SIZE | BRANCH SIZE | 'L' AND 'Lr' |
| 6" | 4" | 4" |
| 6" | 6" | 7" |
| 8" | 4" | 3" |
| 8" | 6" | 6" |
| 8" | 8" | 10" |
| 10" | 6" | 5" |
| 10" | 8" | 8" |
| 10" | 10" | 11" |
| 12" | 6" | 4" |
| 12" | 8" | 7" |
| 12" | 10" | 10" |
| 12" | 12" | 13" |
| 16" | 6" | 3" |
| 16" | 8" | 5" |
| 16" | 10" | 8" |
| 16" | 12" | 10" |
| 16" | 16" | 17" |

NOTE: CALCULATIONS BASED ON A TEST PRESSURE OF 150 PSI, A SAFETY FACTOR OF 1.5 AND A BURY DEPTH OF 3.5'



City of BRENHAM — STANDARD CONSTRUCTION DETAILS — THRUST RESTRAINT (TEES) — DATE: 07/20/21 — REVISED DATE: 07/20/21 — WTR - 1

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# WTR-2 — THRUST RESTRAINT (HORIZONTAL BENDS)
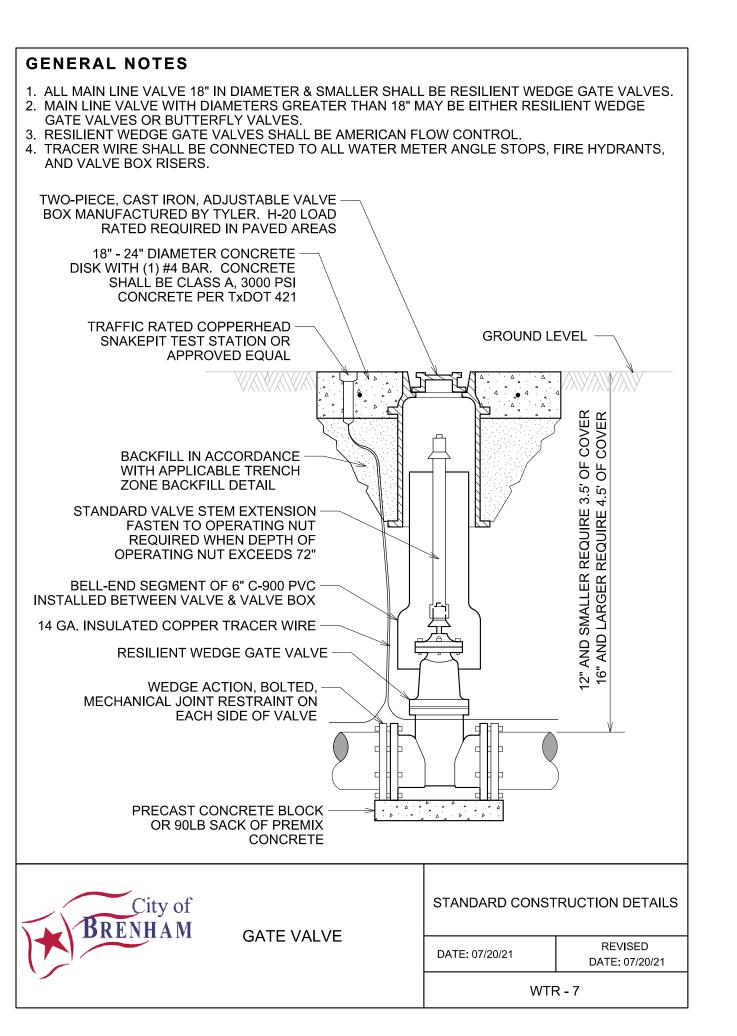
**GENERAL NOTES**

1. ALL JOINTS WITHIN DISTANCE 'L' OF A HORIZONTAL BEND SHALL BE RESTRAINED USING AN APPROVED MECHANICAL RESTRAINT SYSTEM.

| HORIZONTAL BENDS | | | |
|---|---|---|---|
| PIPE SIZE | BEND | 'L' PVC PIPE | 'L' D.I. PIPE W/ POLY |
| 6" | 11-1/4 DEG | 2' | 2' |
| 8" | | 2' | 2' |
| 10" | | 3' | 3' |
| 12" | | 3' | 3' |
| 16" | | 4' | 4' |
| 6" | 22-1/2 DEG | 3' | 3' |
| 8" | | 4' | 5' |
| 10" | | 5' | 6' |
| 12" | | 6' | 7' |
| 16" | | 8' | 9' |
| 6" | 45 DEG | 6' | 7' |
| 8" | | 9' | 10' |
| 10" | | 10' | 12' |
| 12" | | 12' | 14' |
| 16" | | 16' | 18' |
| 6" | 90 DEG | 16' | 18' |
| 8" | | 21' | 23' |
| 10" | | 25' | 28' |
| 12" | | 29' | 33' |
| 16" | | 38' | 43' |

NOTE: CALCULATIONS BASED ON A TEST PRESSURE OF 150 PSI, A SAFETY FACTOR OF 1.5 AND A BURY DEPTH OF 3.5'



City of BRENHAM — STANDARD CONSTRUCTION DETAILS — THRUST RESTRAINT (HORIZONTAL BENDS) — DATE: 07/20/21 — REVISED DATE: 07/20/21 — WTR - 2

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# WTR-3 — THRUST RESTRAINT (REDUCERS)

**GENERAL NOTES**

1. ALL JOINTS WITHIN DISTANCE 'L' ON THE LARGE PIPE SIDE OF A REDUCER SHALL BE RESTRAINED USING AN APPROVED MECHANICAL RESTRAINT SYSTEM.

| REDUCERS | | L | |
|---|---|---|---|
| LARGE PIPE SIZE | SMALL PIPE SIZE | PVC PIPE | D.I. PIPE W/ POLY |
| 6" | 4" | 26' | 40' |
| 8" | 6" | 27' | 42' |
| 10" | 8" | 26' | 41' |
| 12" | 10" | 46' | 70' |
| 16" | 12" | 51' | 78' |

NOTE: CALCULATIONS BASED ON A TEST PRESSURE OF 150 PSI, A SAFETY FACTOR OF 1.5 AND A BURY DEPTH OF 3.5'



City of BRENHAM — STANDARD CONSTRUCTION DETAILS — THRUST RESTRAINT (REDUCERS) — DATE: 07/20/21 — REVISED DATE: 07/20/21 — WTR - 3
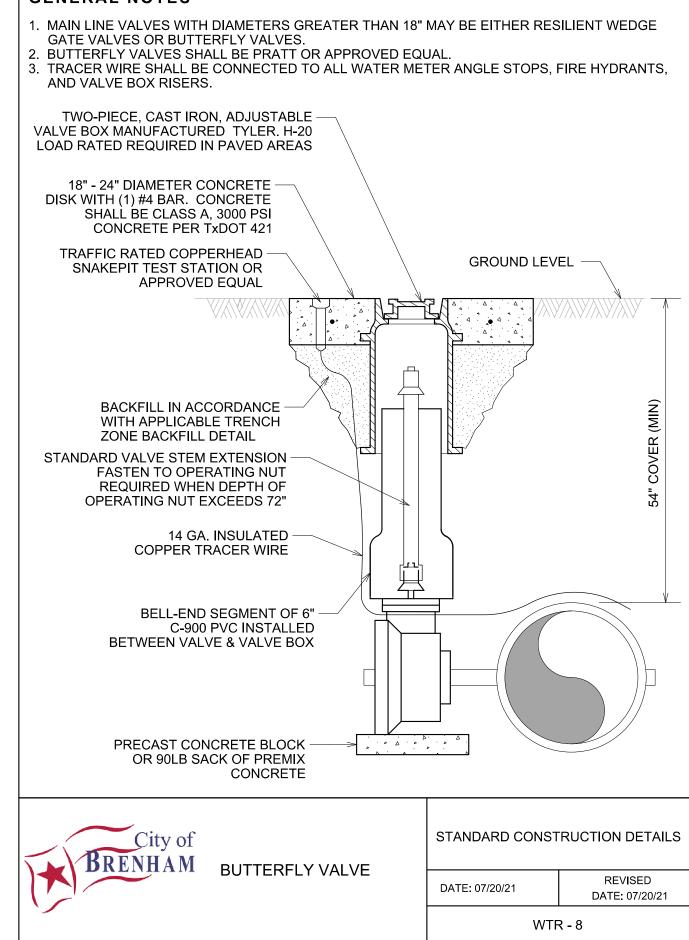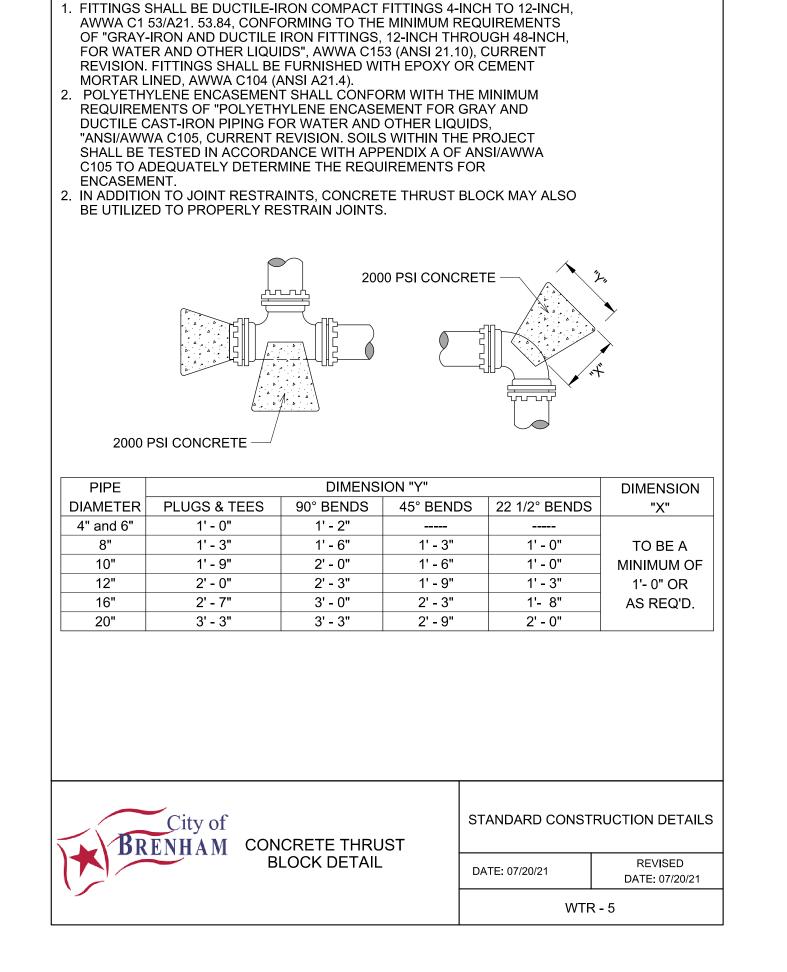
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# WTR-4 — THRUST RESTRAINT (VERTICAL OFFSETS)

**GENERAL NOTES**

1. ALL JOINTS WITHIN DISTANCE 'L' OF A VERTICAL BEND SHALL BE RESTRAINED USING AN APPROVED MECHANICAL RESTRAINT SYSTEM.

| VERTICAL BENDS | | | |
|---|---|---|---|
| PIPE SIZE | BEND | PVC PIPE | D.I. PIPE W/ POLY |
| 6" | 45 DEG | 6' | 7' |
| 8" | | 9' | 10' |
| 10" | | 10' | 12' |
| 12" | | 12' | 14' |
| 16" | | 16' | 18' |
| 6" | 90 DEG | 16' | 18' |
| 8" | | 21' | 23' |
| 10" | | 25' | 28' |
| 12" | | 29' | 33' |
| 16" | | 38' | 43' |

NOTE: CALCULATIONS BASED ON A TEST PRESSURE OF 150 PSI, A SAFETY FACTOR OF 1.5 AND A BURY DEPTH OF 3.5'

USE APPROVED MECHANICAL JOINT RESTRAINT SYSTEM ON ALL JOINTS



City of BRENHAM — STANDARD CONSTRUCTION DETAILS — THRUST RESTRAINT (VERTICAL OFFSETS) — DATE: 07/20/21 — REVISED DATE: 07/20/21 — WTR - 4

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# WTR-5 — CONCRETE THRUST BLOCK DETAIL

**GENERAL NOTES**

1. FITTINGS SHALL BE DUCTILE-IRON COMPACT FITTINGS 4-INCH TO 12-INCH, AWWA C153/A21.53.84, CONFORMING TO THE MINIMUM REQUIREMENTS OF "GRAY-IRON AND DUCTILE IRON FITTINGS, 12-INCH THROUGH 48-INCH, FOR WATER AND OTHER LIQUIDS", AWWA C153 (ANSI 21.10), CURRENT REVISION. FITTINGS SHALL BE FURNISHED WITH EPOXY OR CEMENT MORTAR LINED, AWWA C104 (ANSI A21.4).
2. POLYETHYLENE ENCASEMENT SHALL CONFORM WITH THE MINIMUM REQUIREMENTS OF "POLYETHYLENE ENCASEMENT FOR GRAY AND DUCTILE CAST-IRON PIPING FOR WATER AND OTHER LIQUIDS, "ANSI/AWWA C105, CURRENT REVISION. SOILS WITHIN THE PROJECT SHALL BE TESTED IN ACCORDANCE WITH APPENDIX A OF ANSI/AWWA C105 TO ADEQUATELY DETERMINE THE REQUIREMENTS FOR ENCASEMENT.
3. IN ADDITION TO JOINT RESTRAINTS, CONCRETE THRUST BLOCK MAY ALSO BE UTILIZED TO PROPERLY RESTRAIN JOINTS.



2000 PSI CONCRETE

| PIPE DIAMETER | DIMENSION "Y" | | | | DIMENSION "X" |
|---|---|---|---|---|---|
| | PLUGS & TEES | 90° BENDS | 45° BENDS | 22 1/2° BENDS | |
| 4" and 6" | 1'-0" | 1'-2" | --- | --- | TO BE A MINIMUM OF 1'-0" OR AS REQ'D. |
| 8" | 1'-3" | 1'-6" | 1'-3" | --- | |
| 10" | 1'-9" | 2'-0" | 1'-6" | 1'-0" | |
| 12" | 2'-0" | 2'-3" | 1'-9" | 1'-3" | |
| 16" | 2'-7" | 3'-0" | 2'-3" | 1'-8" | |
| 20" | 3'-3" | 3'-3" | 2'-9" | 2'-0" | |

City of BRENHAM — STANDARD CONSTRUCTION DETAILS — CONCRETE THRUST BLOCK DETAIL — DATE: 07/20/21 — REVISED DATE: 07/20/21 — WTR - 5

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# WTR-6 — FIRE HYDRANT

**GENERAL NOTES**

1. FIRE HYDRANT SHALL BE MANUFACTURED BY MUELLER, OR AMERICAN DARLING.
2. FIRE HYDRANTS SHALL HAVE A THREE-WAY NOZZLE ARRANGEMENT, A 5-1/4 INCH COMPRESSION TYPE MAIN VALVE, A MECHANICAL JOINT (MJ) BOOT, AND CONFORM TO THE REQUIREMENTS OF AMERICAN WATER WORKS ASSOCIATION (AWWA) C502.
3. FIRE HYDRANT COLOR SHALL BE RED WITH YELLOW PUMPER CAPS AND SILVER STEAMER CAPS.
4. THE BONNET OF THE FIRE HYDRANT SHALL BE FACTORY PAINTED WHITE.
5. INSTALL WEDGE ACTION, BOLTED MECHANICAL JOINT RESTRAINT ON ALL PIPE JOINTS BETWEEN MAIN & HYDRANT.
6. CONTRACTOR SHALL INSTALL A BLUE REFLECTIVE PAVEMENT MARKER AT THE CENTERLINE OF EACH STREET IN LINE WITH THE HYDRANT.
7. HYDRANT WEEP HOLES SHALL BE WRAPPED WITH CONSTRUCTION GRADE PLASTIC.



FIRE HYDRANT AWWA C 502 WITH 5 1/4 " MAIN VALVE OPENING (2) - 2 1/2" HOSE NOZZLES NATIONAL STANDARD NUT

BREAKAWAY FLANGE TO BE SET BETWEEN 1" AND 6" ABOVE GRADE

BURY LINE

WATER PROOF SEAL

14 GA. INSULATED COPPER TRACER WIRE

PRECAST CONCRETE BLOCK OR 90LB SACK OF PREMIX CONCRETE

3'L x 2'W x 4" THICK UNREINFORCED CONCRETE SPLASH PAD. INSTALLED DIRECTLY IN FRONT OF THE PUMPER NOZZLE

GROUND LEVEL

SEE GATE VALVE DETAIL

WEDGE ACTION, BOLTED, MECHANICAL JOINT RESTRAINT

INSULATED TRACER WIRE

EXISTING OR PROPOSED WATER MAIN

City of BRENHAM — STANDARD CONSTRUCTION DETAILS — FIRE HYDRANT — DATE: 07/20/21 — REVISED DATE: 07/20/21 — WTR - 6

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# WTR-7 — GATE VALVE

**GENERAL NOTES**

1. ALL MAIN LINE VALVE 18" IN DIAMETER & SMALLER SHALL BE RESILIENT WEDGE GATE VALVES.
2. MAIN LINE VALVE WITH DIAMETERS GREATER THAN 18" MAY BE EITHER RESILIENT WEDGE GATE VALVES OR BUTTERFLY VALVES.
3. RESILIENT WEDGE GATE VALVES SHALL BE AMERICAN FLOW CONTROL.
4. TRACER WIRE SHALL BE CONNECTED TO ALL WATER METER ANGLE STOPS, FIRE HYDRANTS, AND VALVE BOX RISERS.



TWO-PIECE, CAST IRON, ADJUSTABLE VALVE BOX MANUFACTURED BY TYLER. H-20 LOAD RATED REQUIRED IN PAVED AREAS

18" - 24" DIAMETER CONCRETE DISK WITH (1) #4 BAR. CONCRETE SHALL BE CLASS A, 3000 PSI CONCRETE PER TxDOT 421

TRAFFIC RATED COPPERHEAD SNAKEPIT TEST STATION OR APPROVED EQUAL

GROUND LEVEL

BACKFILL IN ACCORDANCE WITH APPLICABLE TRENCH ZONE BACKFILL DETAIL

STANDARD VALVE STEM EXTENSION FASTEN TO OPERATING NUT REQUIRED WHEN DEPTH OF OPERATING NUT EXCEEDS 72"

BELL-END SEGMENT OF 6" C-900 PVC INSTALLED BETWEEN VALVE & VALVE BOX

14 GA. INSULATED COPPER TRACER WIRE

RESILIENT WEDGE GATE VALVE

WEDGE ACTION, BOLTED, MECHANICAL JOINT RESTRAINT ON EACH SIDE OF VALVE

PRECAST CONCRETE BLOCK OR 90LB SACK OF PREMIX CONCRETE

12" AND SMALLER REQUIRE 3.5' OF COVER / 16" AND LARGER REQUIRE 4.5' OF COVER

City of BRENHAM — STANDARD CONSTRUCTION DETAILS — GATE VALVE — DATE: 07/20/21 — REVISED DATE: 07/20/21 — WTR - 7

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# WTR-8 — BUTTERFLY VALVE

**GENERAL NOTES**

1. MAIN LINE VALVES WITH DIAMETERS GREATER THAN 18" MAY BE EITHER RESILIENT WEDGE GATE VALVES OR BUTTERFLY VALVES.
2. BUTTERFLY VALVES SHALL BE PRATT OR APPROVED EQUAL.
3. TRACER WIRE SHALL BE CONNECTED TO ALL WATER METER ANGLE STOPS, FIRE HYDRANTS, AND VALVE BOX RISERS.



TWO-PIECE, CAST IRON, ADJUSTABLE VALVE BOX MANUFACTURED BY TYLER. H-20 LOAD RATED REQUIRED IN PAVED AREAS

18" - 24" DIAMETER CONCRETE DISK WITH (1) #4 BAR. CONCRETE SHALL BE CLASS A, 3000 PSI CONCRETE PER TxDOT 421

TRAFFIC RATED COPPERHEAD SNAKEPIT TEST STATION OR APPROVED EQUAL

GROUND LEVEL

BACKFILL IN ACCORDANCE WITH APPLICABLE TRENCH ZONE BACKFILL DETAIL

STANDARD VALVE STEM EXTENSION FASTEN TO OPERATING NUT REQUIRED WHEN DEPTH OF OPERATING NUT EXCEEDS 72"

14 GA. INSULATED COPPER TRACER WIRE

BELL-END SEGMENT OF 6" C-900 PVC INSTALLED BETWEEN VALVE & VALVE BOX

PRECAST CONCRETE BLOCK OR 90LB SACK OF PREMIX CONCRETE

54" COVER (MIN)

City of BRENHAM — STANDARD CONSTRUCTION DETAILS — BUTTERFLY VALVE — DATE: 07/20/21 — REVISED DATE: 07/20/21 — WTR - 8