GENERAL NOTES:

1. CONTRACTOR SHALL LOCATE ALL EXISTING UTILITIES WITHIN THE CONSTRUCTION LIMITS OF THE PROJECT PRIOR TO COMMENCEMENT OF CONSTRUCTION.

2. CONTRACTOR SHALL FIELD VERIFY EXISTING WATER LINES LOCATION AND DEPTH PRIOR TO CONSTRUCTION AND MAKE ADJUSTMENTS AS NECESSARY FOR CONNECTION OF THE WATER LINES.

3. SEPARATION OF WATER LINES AND SANITARY AND/OR COMBINED SEWERS.
   A. FOLLOW STATE HEALTH DEPARTMENT STANDARDS FOR SEPARATION OF WATER MAINS AND SEWER LINES.

   B. PARALLEL INSTALLATION
      (1) NORMAL CONDITIONS - WATER LINES SHALL BE CONSTRUCTED AT LEAST 10 FEET HORIZONTALLY FROM A SEWER OR SEWER MANHOLE WHENEVER POSSIBLE. THE DISTANCE SHALL BE MEASURED EDGE-TO-EDGE.

      (2) UNUSUAL CONDITIONS - WHEN LOCAL CONDITIONS PREVENT A HORIZONTAL SEPARATION OF AT LEAST 10 FEET, THE WATER LINE MAY BE LAID CLOSER TO A SEWER OR SEWER MANHOLE PROVIDED THAT:
         A. THE BOTTOM OF THE WATER LINE IS AT LEAST 18 INCHES ABOVE THE TOP OF THE SEWER.

         B. WHERE THIS VERTICAL SEPARATION CANNOT BE OBTAINED, THE SEWER SHALL BE CONSTRUCTED OF AWWA APPROVED WATER PIPE PRESSURE-TESTED IN PLACE TO 50 PSI WITHOUT LEAKAGE PRIOR TO BACKFILLING. THE SEWER MANHOLE SHALL BE OF WATERTIGHT CONSTRUCTION AND TESTED IN PLACE.

   C. CROSSING
      (1) NORMAL CONDITIONS - WATER LINES CROSSING OVER SEWERS SHALL BE LAID TO PROVIDE A SEPARATION OF AT LEAST 18 INCHES BETWEEN THE BOTTOM OF THE WATER LINE AND THE TOP OF THE SEWER WHENEVER POSSIBLE.

      (2) UNUSUAL CONDITIONS - WHEN LOCAL CONDITIONS PREVENT A VERTICAL SEPARATION DESCRIBED IN CROSSING, NORMAL CONDITIONS, PARAGRAPH ABOVE, THE FOLLOWING CONSTRUCTION SHALL BE USED.
         A. SEWERS PASSING OVER OR UNDER WATER LINES SHALL BE CONSTRUCTED OF THE MATERIALS DESCRIBED IN PARALLEL INSTALLATION, UNUSUAL CONDITIONS - PARAGRAPH 2. ABOVE.

         B. WATER LINES PASSING UNDER SEWERS SHALL, IN ADDITION, BE PROTECTED BY PROVIDING:
            1. VERTICAL SEPARATION OF AT LEAST 18 INCHES BETWEEN THE BOTTOM OF THE SEWER AND THE TOP OF THE WATER LINE,

            2. ADEQUATE STRUCTURAL SUPPORT FOR THE SEWERS TO PREVENT EXCESSIVE DEFLECTION OF THE JOINTS AND SETTLING ON AND BREAKING WATER LINE,

            3. THAT THE LENGTH OF THE WATER LINE BE CENTERED AT THE POINT OF THE CROSSING SO THAT JOINTS SHALL BE EQUIDISTANT AND AS FAR AS POSSIBLE FROM THE SEWER.

         C. SANITARY AND/OR COMBINED SEWERS OR SEWER MANHOLES - NO WATER PIPES SHALL PASS THROUGH OR COME IN CONTACT WITH ANY PART OF A SEWER OR SEWER MANHOLE.

4. CONTRACTOR SHALL INSTALL DETECTABLE TAPE ACCORDING TO MANUFACTURER'S RECOMMENDATION IN TRENCH ABOVE ALL NONMETALLIC PIPE. THE TAPE SHALL HAVE A METALLIC CORE PROTECTED BY A PLASTIC JACKET AND SHALL BE CONTINUOUSLY MARKED INDICATING THAT A WATER MAIN IS BURIED BENEATH THE TAPE.

5. STEEL CASING PIPE SHALL MEET THE REQUIREMENTS OF ASTM A 139, GRADE B AND HAVE SPIRAL WELDED SEAMS. JOINING OF STEEL CASING PIPE SHALL MEET REQUIREMENTS OF AWWA C206 "STANDARD FOR FIELD WELDING OF STEEL WATER PIPE". INSTALLATION SHALL MEET REQUIREMENTS OF HIGHWAY PERMIT. PRIOR TO BEGINNING WORK, NOTIFY HIGHWAY DEPARTMENT.

6. CONCRETE FOR REACTION ANCHORS SHALL HAVE 3,500 PSI STRENGTH AT 28 DAYS AND SHALL MEET REQUIREMENTS OF ASTM C 94. CONCRETE REACTION ANCHORS SHALL BEAR AGAINST UNDISTURBED EARTH. ANCHORS SHALL BE OF THE SIZE AND SHAPE INDICATED ON THE DRAWINGS.

7. VALVE BOXES SHALL BE ADJUSTABLE CAST IRON VALVE BOXES OF THE THREE-PIECE TYPE, CONSISTING OF LID, TWO PIECE SLIDING EXTENSION, AND BASE. BASE SHALL BE PROPER TYPE AND SIZE FOR THE VALVE WITH WHICH IT IS USED. THE WORD "WATER" SHALL BE CAST OR EMBOSSED ON THE VALVE BOX LID IN LETTERS NOT LESS THAN 1 INCH HIGH. VALVE BOX SHALL BE MANUFACTURED BY MUELLER COMPANY OR EQUAL. SET THE BOX COVER FLUSH WITH THE FINISHED GROUND SURFACE OR PAVEMENT.

8. PVC PIPE SHALL BE SDR 21, 200 PSI RATED WITH RUBBER RING GASKETS IN EITHER BELL ENDS OR COUPLINGS. PIPE AND JOINTS SHALL BE NSF APPROVED AND MEET ASTM D2241 AND ASTM D1784 STANDARDS.

9. GALVANIZED STEEL PIPING SHALL BE SCHEDULE 40 THREADED PIPE AND SHALL MEET THE FOLLOWING REQUIREMENTS: DIMENSIONS, ANSI B36.10; MATERIAL ASSTM A 53, AND GALVANIZING ASTM A 153. SCREWED FITTINGS FOR GALVANIZED PIPING SHALL BE 150-POUND STANDARD, MALLEABLE IRON MEETING THE FOLLOWING REQUIREMENTS: DIMENSIONS, ANSI B16.3; THREADS, ANSI B2.1; MATERIAL ASTM A 47; AND GALVANIZING, ASTM A 153.

10. TAPPING SLEEVES SHALL MEET REQUIREMENTS OF ANSI/AWWA C110 FOR PRESSURE RATINGS OF THE PIPING. SLEEVES SHALL BE BUILT IN TWO SECTIONS AND SHALL BE MECHANICAL JOINT TYPE WITH FLANGED OUTLET. THE TAPPING SLEEVE SHALL BE FOR THE SIZE AND TYPE OF PIPE SHOWN ON THE DRAWINGS.

    A. ALL TAPPING SLEEVES SHALL BE SET TO AVOID INTERFERENCE WITH EXISTING PIPE JOINTS.

    B. AFTER ALL TAPPING SLEEVES AND VALVES HAVE BEEN SET IN PLACE, A PRESSURE TEST OF 150 PSI SHALL BE MADE TO INSURE THAT THERE ARE NO LEAKS AROUND THE SLEEVE OR THROUGH THE VALVE PRIOR TO TAPPING. ALL LEAKAGE SHALL BE CORRECTED.

11. PIPE LAYING - EXERCISE CARE TO KEEP FOREIGN MATERIAL AND DIRT FROM ENTERING PIPE DURING STORAGE, HANDLING, AND PLACING IN TRENCH. CLOSE ENDS OF IN-PLACE PIPE AT THE END OF ANY WORK PERIOD TO PRECLUDE THE ENTRY OF ANIMALS AND FOREIGN MATERIAL. DO NOT LAY PIPE WHEN TRENCH BOTTOM IS MUDDY OR FROZEN, OR HAS STANDING WATER. STONES AND ROCKS FOUND IN THE TRENCH SHALL BE REMOVED THE FOLLOWING TABLE SHOWS THE NUMBER OF 5-GRAIN HTH TABLETS NECESSARY PER JOINT OF PIPE TO OBTAIN 50 PPM CHLORINE.

PIPE SIZE	TABLETS PER JOINT
3 INCH	1
4 INCH	1

WHEN INSTALLATION IS COMPLETED, FILL THE MAIN WITH WATER AT A VELOCITY OF LESS THAN 1-FOOT PER SECOND. THE WATER SHALL REMAIN IN THE PIPE FOR AT LEAST 24 HOURS. OPERATE VALVES SO THAT THE STRONG CHLORINE SOLUTION WILL NOT FLOW BACK INTO THE LINE SUPPLYING THE WATER.

D. FINAL FLUSHING: AFTER THE APPLICABLE RETENTION PERIOD, THE HEAVILY CHLORINATED WATER SHALL BE FLUSHED FROM THE MAIN UNTIL THE CHLORINE CONCENTRATION IN THE WATER LEAVING THE MAIN IS NO HIGHER THAN THAT GENERALLY PREVAILING IN THE SYSTEM OR LESS THAN 1 MG/L. CHLORINE RESIDUAL DETERMINATION SHALL BE MADE TO ASCERTAIN THAT THE HEAVILY CHLORINATED WATER HAS BEEN REMOVED FROM THE PIPELINE.

E. BACTERIOLOGIC TESTS
   (1) AFTER FINAL FLUSHING AND BEFORE THE WATER MAIN IS PLACED IN SERVICE, SAMPLES SHALL BE COLLECTED AND TESTED FOR BACTERIOLOGIC QUALITY AND SHALL SHOW THE ABSENCE OF COLIFORM ORGANISMS. AT LEAST TWO SAMPLES SHALL BE COLLECTED AT LEAST 24 HOURS APART AT INTERVALS NOT EXCEEDING 2,000 FEET, AND TESTED BY A STATE HEALTH DEPARTMENT APPROVED LABORATORY AND RESULTS SUBMITTED TO BERKLEY-HOWELL.

   (2) SAMPLES FOR BACTERIOLOGICAL ANALYSIS SHALL BE COLLECTED IN STERILE BOTTLES TREATED WITH SODIUM THIOSULFATE. IF LABORATORY RESULTS INDICATE THE PRESENCE OF COLIFORM BACTERIA, THE SAMPLES ARE UNSATISFACTORY AND DISINFECTION SHALL BE REPEATED UNTIL THE SAMPLES ARE SATISFACTORY.

   (3) A SAMPLING TAP CONSISTING OF A CORPORATION COCK WITH METAL PIPE SHALL BE INSTALLED WITHIN 2 FEET OF VALVES. THE CORPORATION STOP INLET SHALL BE MALE, 1 INCH IN SIZE, AND THE OUTLET SHALL HAVE 1 INCH I.P. THREADS AND A CAP.

F. CLEANING, DISINFECTION, AND TESTING WILL BE THE RESPONSIBILITY OF THE CONTRACTOR. WATER FOR THESE OPERATIONS WILL BE FURNISHED BY THE OWNER, BUT THE CONTRACTOR SHALL INCLUDE IN HIS BID THE COST OF LOADING, HAULING, AND DISCHARGING THE WATER.

G. TESTING AND DISINFECTION OF THE COMPLETED SECTIONS SHALL NOT RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITY TO REPAIR OR REPLACE ANY CRACKED OR DEFECTIVE PIPE. ALL WORK NECESSARY TO SECURE A TIGHT LINE SHALL BE DONE AT THE CONTRACTOR'S EXPENSE.

FOR A DEPTH OF AT LEAST 6 INCHES BELOW THE BOTTOM OF THE PIPE AND SELECTED FILL BEDDING PROVIDED.

12. ACCEPTANCE TESTS
   A. AFTER THE LINE HAS BEEN BACKFILLED AND AT LEAST 7 DAYS AFTER THE LAST CONCRETE REACTION ANCHOR HAS BEEN POURED, SUBJECT THE LINE OR ANY VALVED SECTION OF THE LINE TO A HYDROSTATIC PRESSURE TEST. FILL THE SYSTEM WITH WATER AT A VELOCITY OF APPROXIMATELY 1-FOOT PER SECOND WHILE NECESSARY MEASURES ARE TAKEN TO ELIMINATE ALL AIR. AFTER THE SYSTEM HAS BEEN FILLED, RAISE THE PRESSURE BY PUMP TO 1.25 TIMES THE WORKING PRESSURE. MEASURE PRESSURE AT THE LOW POINT ON THE SYSTEM COMPENSATING FOR GAGE ELEVATION. MAINTAIN THIS PRESSURE FOR 2 HOURS. IF PRESSURE CANNOT BE MAINTAINED, DETERMINE CAUSE, REPAIR, AND REPEAT THE TEST UNTIL SUCCESSFUL.

   B. A LEAKAGE TEST SHALL BE CONDUCTED CONCURRENTLY WITH THE PRESSURE TEST. LEAKAGE SHALL BE DETERMINED WITH A CALIBRATED TEST METER FURNISHED BY THE CONTRACTOR. LEAKAGE WILL BE DEFINED AS THE QUANTITY OF WATER REQUIRED TO MAINTAIN A PRESSURE WITHIN 5 PSI OF THE SPECIFIED TEST PRESSURE, AFTER AIR HAS BEEN EXPELLED, AND THE PIPE FILLED WITH WATER. LEAKAGE, IN GALLONS PER HOUR, SHALL NOT EXCEED THAT QUANTITY DETERMINED BY L= 0.00225 (SQ ROOT OF AVG TEST PRESSURE IN PSIG). IF LEAKAGE EXCEEDS THAT AMOUNT, FIND AND REPAIR THE LEAKS AND REPEAT THE TEST UNTIL SUCCESSFUL. ALL VISIBLE LEAKS SHALL BE REPAIRED REGARDLESS OF THE AMOUNT OF LEAKAGE.

13. DISINFECT AND TEST WATER MAINS AND ACCESSORIES IN ACCORDANCE WITH THE PROCEDURES LISTED BELOW AND MEET REQUIREMENTS OF VDH.

   A. PRELIMINARY FLUSHING: THE MAIN SHALL BE FLUSHED PRIOR TO DISINFECTION, EXCEPT WHEN THE TABLET METHOD IS USED. FLUSHING SHALL BE AT A VELOCITY OF NOT LESS THAN 2.5 FEET PER SECOND. ADEQUATE PROVISIONS SHALL BE MADE FOR DRAINAGE OF FLUSHING WATER.

   B. FORM OF CHLORINE FOR DISINFECTION
      (1) CALCIUM HYPOCHLORITE CONTAINS 70 PERCENT AVAILABLE CHLORINE BY WEIGHT. IT SHALL BE EITHER GRANULAR OR TABULAR IN FORM. THE TABLETS, SIX TO EIGHT TO THE OUNCE, ARE DESIGNED TO DISSOLVE SLOWLY IN WATER. A CHLORINE-WATER SOLUTION SHALL BE PREPARED BY DISSOLVING THE GRANULES OR TABLETS IN WATER IN THE PROPORTION REQUISITE FOR THE DESIRED CONCENTRATION.

      (2) SODIUM HYPOCHLORITE IS SUPPLIED IN STRENGTHS FROM 5.25 TO 16 PERCENT AVAILABLE CHLORINE. THE CHLORINE-WATER SOLUTION SHALL BE PREPARED BY ADDING HYPOCHLORITE TO WATER. PRODUCT DETERIORATION SHALL BE RECKONED WITH IN COMPUTING THE QUANTITY OF SODIUM HYPOCHLORITE REQUIRED FOR THE DESIRED CONCENTRATION.

      (3) APPLICATION: THE HYPOCHLORITE SOLUTIONS SHALL BE APPLIED TO THE WATER MAIN WITH A GASOLINE OR ELECTRICALLY-POWERED CHEMICAL FEED PUMP DESIGNED FOR FEEDING CHLORINE SOLUTIONS. FOR SMALL APPLICATIONS, THE SOLUTIONS MAY BE FED WITH A HAND PUMP. FOR EXAMPLE, A HYDRAULIC TEST PUMP. FEED LINES SHALL BE OF SUCH MATERIAL AND STRENGTH AS TO WITHSTAND SAFELY THE MAXIMUM PRESSURES THAT MAY BE CREATED BY THE PUMPS. ALL CONNECTIONS SHALL BE CHECKED FOR TIGHTNESS BEFORE THE HYPOCHLORITE SOLUTION IS APPLIED TO THE MAIN.

   C. METHODS OF CHLORINE APPLICATION

(1) CONTINUOUS FEED METHOD: WATER FROM THE EXISTING DISTRIBUTION SYSTEM OR OTHER APPROVED SOURCES OF SUPPLY SHALL BE MADE TO FLOW AT A CONSTANT, MEASURED RATE INTO THE NEWLY-LAID PIPELINE. THE WATER SHALL RECEIVE A DOSE OF CHLORINE, ALSO FED AT A CONSTANT, MEASURED RATE. THE TWO RATES SHALL BE PROPORTIONED SO THAT THE CHLORINE CONCENTRATION IN THE WATER IN THE PIPE IS MAINTAINED AT A MINIMUM OF 50 MG/L AVAILABLE CHLORINE. TO ASSURE THAT THIS CONCENTRATION IS MAINTAINED, THE CHLORINE SHALL BE MEASURED AT INTERVALS NOT EXCEEDING 2,000 FEET IN ACCORDANCE WITH THE PROCEDURES DESCRIBED IN THE CURRENT EDITION OF "STANDARD METHODS" AND AWWA M12 - "SIMPLIFIED PROCEDURES FOR WATER EXAMINATION." IN THE ABSENCE OF A METER, THE RATE MAY BE DETERMINED EITHER BY PLACING A PITOT GAGE AT THE DISCHARGE OR BY MEASURING THE TIME TO FILL A CONTAINER OF KNOWN VOLUME. TABLE 1 GIVES THE AMOUNT OF CHLORINE REQUIRED FOR EACH 100 FEET OF PIPE OF VARIOUS DIAMETERS. SOLUTIONS OF 1 PERCENT CHLORINE MAY BE PREPARED WITH SODIUM HYPOCHLORITE OR CALCIUM HYPOCHLORITE. THE LATTER SOLUTION REQUIRES APPROXIMATELY 1 POUND OF CALCIUM HYPOCHLORITE IN 8.5 GALLONS OF WATER.

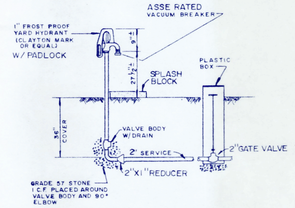
TABLE 1
CHLORINE REQUIRED TO PRODUCE 50 MG/L CONCENTRATION
IN 100 FEET OF PIPE - BY DIAMETER

PIPE SIZE INCHES	100 PERCENT CHLORINE POUNDS	1 PERCENT CHLORINE SOLUTIONS GALLONS
4	0.027	0.33

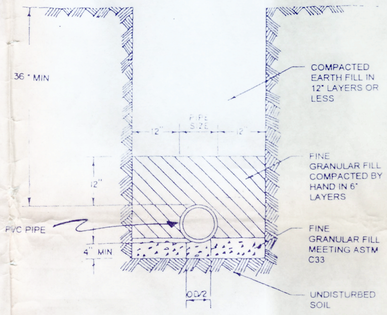
DURING THE APPLICATION OF THE CHLORINE, VALVES SHALL BE MANIPULATED TO PREVENT THE TREATMENT DOSAGE FROM FLOWING BACK INTO THE LINE SUPPLYING THE WATER. CHLORINE APPLICATION SHALL NOT CEASE UNTIL THE ENTIRE MAIN IS FILLED WITH THE CHLORINE SOLUTION. THE CHLORINATED WATER SHALL BE RETAINED IN THE MAIN FOR AT LEAST 24 HOURS, DURING WHICH TIME ALL VALVES IN THE SECTION TREATED SHALL BE OPERATED IN ORDER TO DISINFECT THE APPURTENANCES. AT THE END OF THIS 24-HOUR PERIOD, THE TREATED WATER SHALL CONTAIN NO LESS THAN 25 MG/L CHLORINE THROUGHOUT THE LENGTH OF THE MAIN.

(2) TABLET METHOD: USE ONLY WHEN SCRUPULOUS CLEANLINESS HAS BEEN EXERCISED BECAUSE PRELIMINARY FLUSHING CANNOT BE USED. DO NOT USE THIS METHOD IF TRENCH WATER OR FOREIGN MATERIAL HAS ENTERED THE MAIN OR IF THE WATER IS BELOW 41 DEGREES F (5 DEGREES C). THIS METHOD MAY BE USED FOR MAINS UP TO 12 INCHES IN DIAMETER AND WHERE THE TOTAL LENGTH OF THE MAIN IS LESS THAN 2,500 FEET.

PLACE TABLETS IN EACH SECTION OF PIPE AND OTHER APPURTENANCES. ENOUGH TABLETS SHALL BE USED TO ENSURE THAT A CHLORINE CONCENTRATION OF 25 MG/L IS PROVIDED IN THE WATER. ATTACH TABLETS USING PERMATEX NO. 1 ADHESIVE OR APPROVED EQUAL, EXCEPT FOR THE TABLETS PLACED IN HYDRANTS AND IN THE JOINTS BETWEEN TUBE PIPE SECTIONS. TABLETS SHALL BE FREE OF ADHESIVE EXCEPT ON THE ONE BROAD SIDE TO BE ATTACHED. PLACE ALL TABLETS AT THE TOP OF THE MAIN. IF THE TABLETS ARE ATTACHED BEFORE THE PIPE SECTION IS PLACED IN THE TRENCH, MARK THE POSITION OF THE TABLET IN THE PIPE AND ASSURE THAT THE PIPE IS PLACED WITH THE TABLET AT THE TOP.



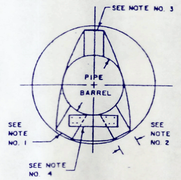
DETAIL
INSTALLATION FOR FREEZEPROOF YARD HYDRANT
SCALE NTS



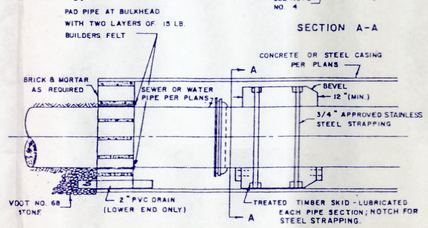
WATER LINE TRENCH DETAIL
NTS

NOTES:

1. Dimension as necessary to center pipe in casing.
2. Minimum of four (4) inches for six (6) inch pipe and over.
3. Dimension as necessary to provide minimum clearance needed to slide pipe through casing.
4. Brace as needed to prevent skids rotating around pipe.
5. PVC Pipe requires skid midway between bell and spigot end. Top block not required at this location. Provide shim to protect pipe against strap.
6. This standard applicable for four (4) inch diameter and larger pipe installed under primary and secondary highways. For lines smaller than four (4) inches, use ductile iron pipe for casing and modify installation accordingly.
7. Use restrained joint pipe in casings.
8. With PVC pipe, do not use petroleum products (oil or grease) or creosote treated wood.

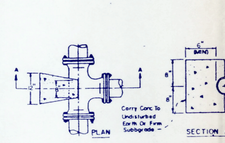


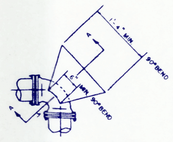
SECTION A-A

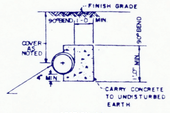


BORE & JACK DETAIL

NTS







WELL HEAD AND WATER LINE SPECIFICATIONS

ITEM	DESCRIPTION
PUMP	GOULDS MODEL 18GS20412
CHECK VALVES	MUELLER, WATTS, OR EQUAL
GATE VALVES	MUELLER, WATTS OR EQUAL
METER	BADGER MODEL 25 W/ RCDL TOTALIZER, ¾-INCH CONNECTIONS, BRONZE HOUSING, W/ IDLER PIPE
AIR RELEASE VALVE	HOFFMAN MODEL 79 OR EQUAL
WELL CAP	CAMPBELL MODEL # WTC6
PITLESS ADAPTER	CAMPBELL MODEL #B-20
PUMP CONTROLS SUSPENSION WIRE ELECTRODES	 B-W TYPE S-W SUSPENSION WIRE B-W TYPE E-15 SHIELDED ELECTRODES (#316 STAINLESS STEEL) 2 REQUIRED
WELL DISCHARGE PIPING	SEE GENERAL NOTES FOR SPECIFICATIONS
WATER DISTRIBUTION SYSTEM PIPING	SEE GENERAL NOTES FOR SPECIFICATIONS
YARD HYDRANT	WOODFORD FROST PROOF OR EQUAL

BERKLEY HOWELL & ASSOC., P.C.
ENGINEERS • SURVEYORS • PLANNERS
LYNCHBURG, VA. SMITH MT. LAKE

COMMONWEALTH OF VIRGINIA
DANNA B. CONNER
027978
REGISTERED PROFESSIONAL ENGINEER

SURVEY DATUM USED:

WOODBROOK / TWIN COVES
WATER SYSTEM INTERFACE

FRANKLIN COUNTY, VIRGINIA

FIELDBOOK IDENTIFICATION:

DETAILS & NOTES

DATE: 10-31-97
TECHNICIAN: TWM
CHECKED BY:

REVISIONS

NO.	DATE
	5-8-98

SCALES AS SHOWN

PROJ. NO. | DIV.

SHEET NO. 4 OF 4

DRAWING NO. C-4

MANUSCRIPT DRAWING NUMBER:

VIEWS TO CREATE THIS DRAWING: