PROJECT : Lot # 22 and portion of lot 21.
COUNTY : Iredell Co.
REFERENCE NO. :
DATE : 04-23-2001

SUMMARY OF DESIGN

DESIGN FLOW	:	480	GPD
APPLICATION RATE	:	0.15	GPD/SQFT
TOTAL AREA REQUIRED	:	3200	SQFT
TOTAL LATERAL LENGTH REQUIRED	:	640	LFT
TOTAL LATERAL LENGTH SPECIFIED	:	640	LFT
NUMBER OF FIELDS	:	2	
LATERAL LENGTH	:	80	FT
NUMBER OF LATERALS	:	8	
NUMBER OF LATERALS PER FIELD	:	4	
SLOPE	:	13	PERCENT, FIELD 1
SLOPE	:	13	PERCENT, FIELD 2

FIELD NO. 1

LAT. NO.	LENGTH	ELEV-ATION	PRESS. HEAD	HOLE SIZE	HOLE SPAC.	NO.OF HOLES	FLOW PER HOLE	FLOW PER LATERAL
1	80	6.00	2.00	0.156	4.00	20	0.41	8.12
2	80	5.35	2.65	0.156	4.71	17	0.47	7.94
3	80	4.70	3.30	0.156	5.71	14	0.52	7.30
4	80	4.05	3.95	0.156	6.67	12	0.57	6.84

TOTAL 320 FEET

FLOW TO FIELD 30.20 GPM
FLOW VARIATION 15.7 %

FIELD NO. 2

LAT. NO.	LENGTH	ELEV-ATION	PRESS. HEAD	HOLE SIZE	HOLE SPAC.	NO.OF HOLES	FLOW PER HOLE	FLOW PER LATERAL
1	80	3.00	2.00	0.156	4.00	20	0.41	8.12
2	80	2.35	2.65	0.156	4.71	17	0.47	7.94
3	80	1.70	3.30	0.156	5.71	14	0.52	7.30
4	80	1.05	3.95	0.156	6.67	12	0.57	6.84

TOTAL 320 FEET

FLOW TO FIELD 30.20 GPM
FLOW VARIATION 15.7 %

LATERAL PIPE SIZE	:	1 1/4	INCHES (SCHEDULE 40)
MANIFOLD PIPE SIZE	:	3	INCHES (SCHEDULE 40)
SUPPLY LINE PIPE SIZE	:	2	INCHES (SCHEDULE 40)
SUPPLY LINE LENGTH	:	80	FEET
TOTAL DYNAMIC HEAD	:	2.07	FEET
DOSING VOLUME	:	175	GALLONS
PUMP TANK INSIDE LENGTH	:	8.00	FEET
PUMP TANK INSIDE WIDTH	:	4.00	FEET
PUMP TANK DRAWDOWN	:	0.73	FEET

MINIMUM DOSING VOLUME:	124.8 GALS	(PUMP RUN TIME : 4.1 MIN.)
MAXIMUM DOSING VOLUME:	249.6 GALS	(PUMP RUN TIME : 8.3 MIN.)
SELECTED DOSING VOLUME:	175.0 GALS	(PUMP RUN TIME : 5.8 MIN.)
VOLUME IS FOR EACH OF 2 FIELDS		PUMP RUN TIME FOR ALL FIELDS

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MANIFOLD PIPE SIZE	:	3	INCHES (SCHEDULE 40)
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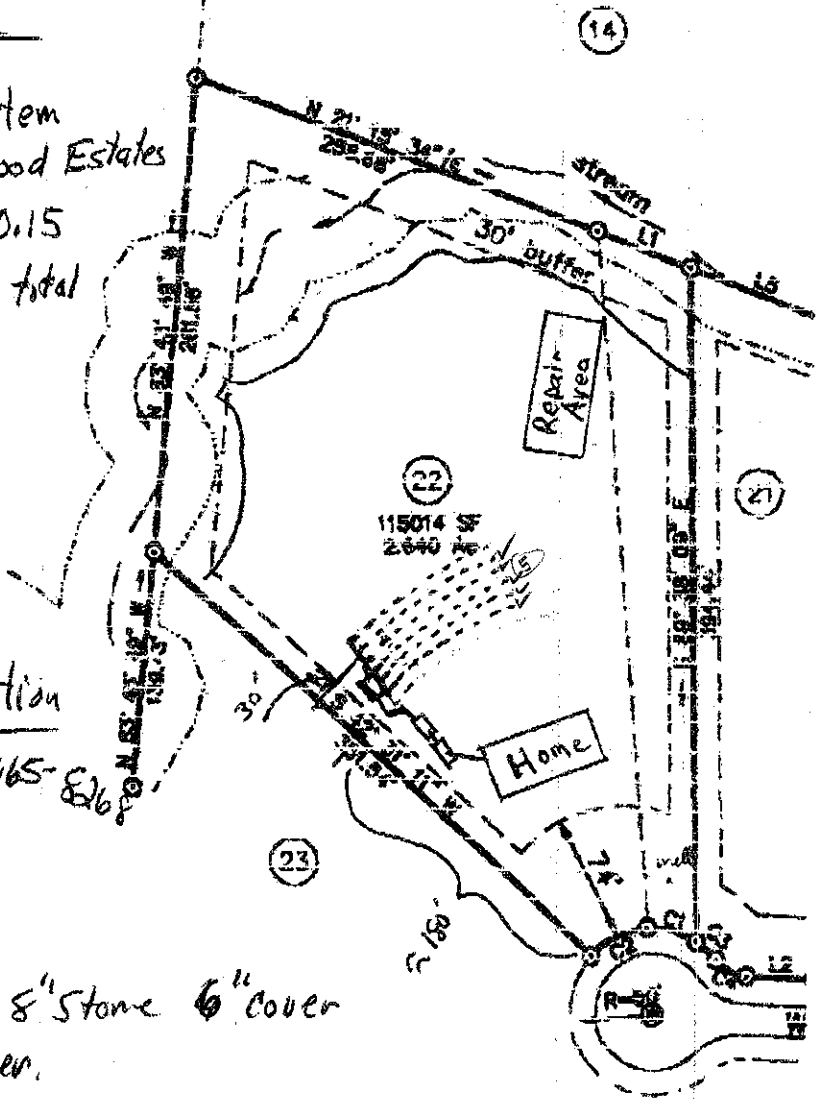
Curve	Radius	Chord Bearing and Distance		Arc Length
C1	80.00'	S 14° 27' 12" W	39.59'	39.99'
C2	50.00'	S 35° 25' 19" E	37.56'	38.50'
C3	50.00'	N 41° 29' 27" E	18.03'	18.10'
C4	25.00'	N 28° 37' 15" E	20.41'	21.03'

NORTH

c/o Realco
Low Pressure Pipe System
for Lot #22 Beechwood Estates
3 Bedroom, LTAR of 0.15
2 - Subfields - 6 lines total
of 80'

Valves at pump tank
& at 3" manifold.

* Call Before Installation
Russell Williams (828)465-8268



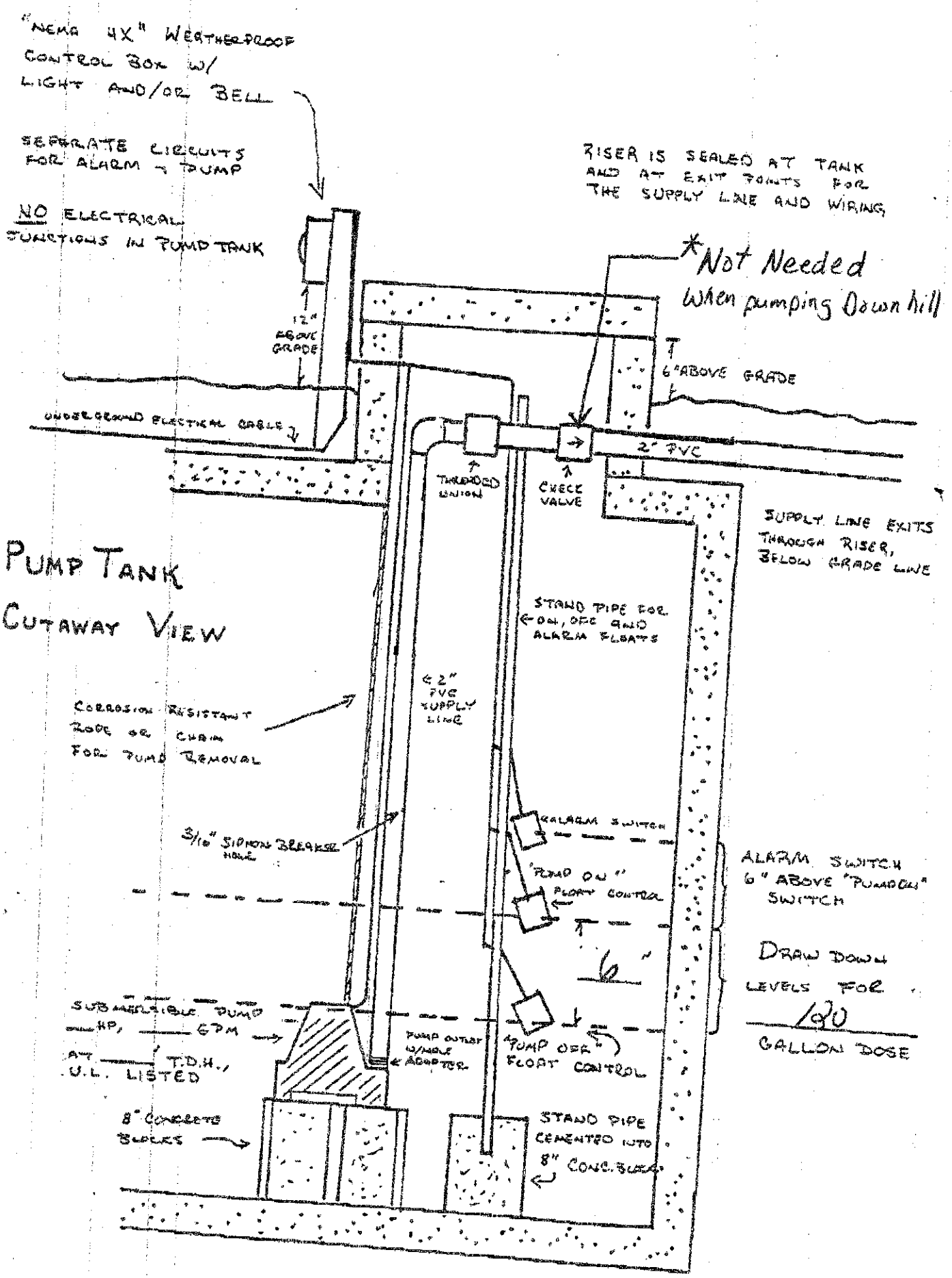
X = CP NOTHING SET
⊕ = EXISTING IRON AS NOTED
○ = 5/8" REBAR SET/RR SPIKE SET
⊕ = UTILITY POLE

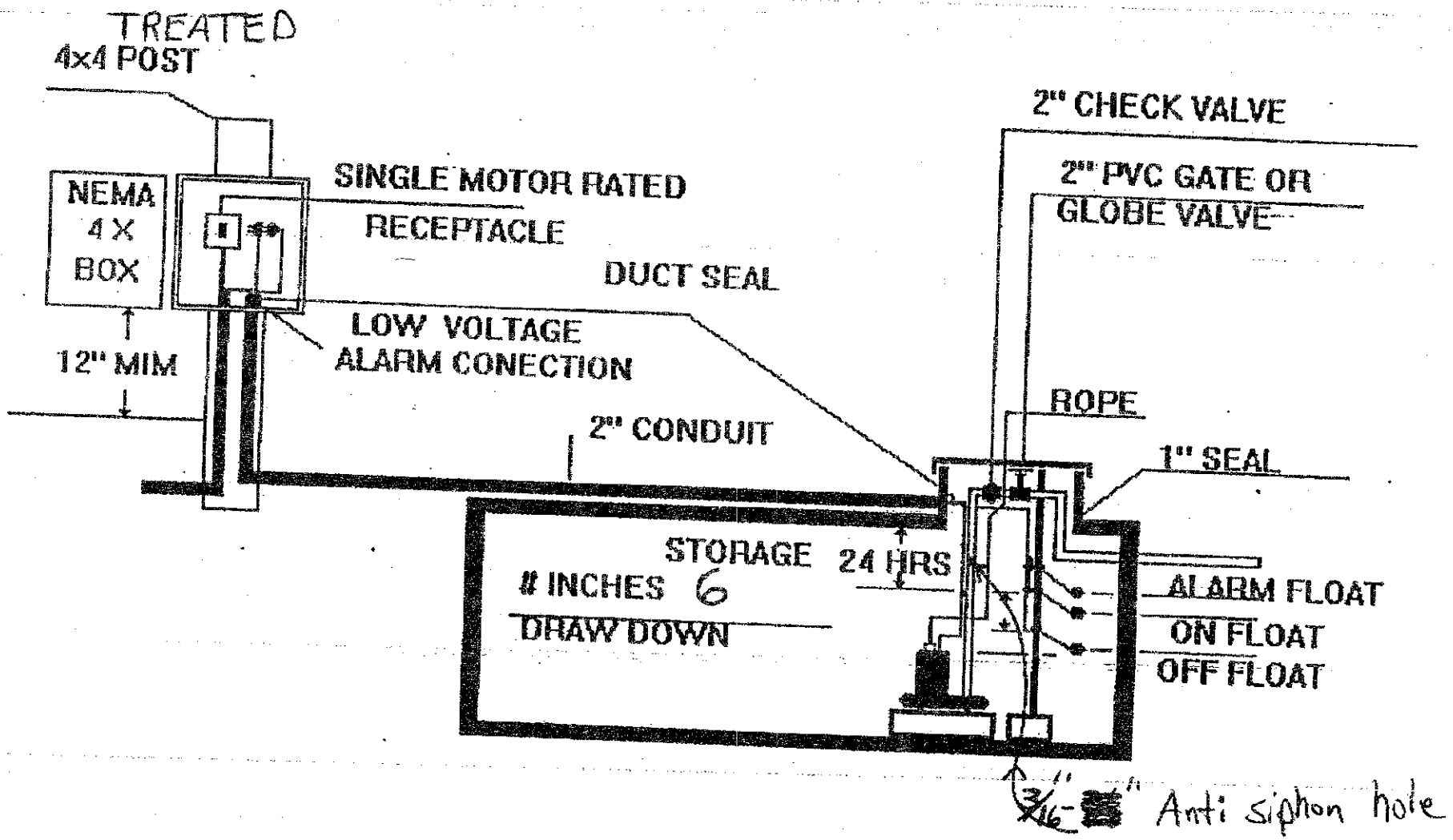
* trenches 18" wide · 8" stone 6" cover
18" wide
5' on center.

NOTES:

1. TRAVERSE ADJUSTED BY COMPASS RULE ADJUSTMENT METHOD.
2. AREAS DETERMINED BY COORDINATE COMPUTATIONS.
3. ALL DISTANCES ARE HORIZONTAL GROUND DISTANCES.
4. SUBJECT PROPERTY IS LOCATED IN ZONE "C" (AREAS OF MINIMAL FLOODING AS PER F.I.R.M. COMMUNITY PANEL NO. 370148-0103 EFFECTIVE DATE: 12/1/81

REFERENCES: DEEDS AND MAPS ARE SHOWN HEREON

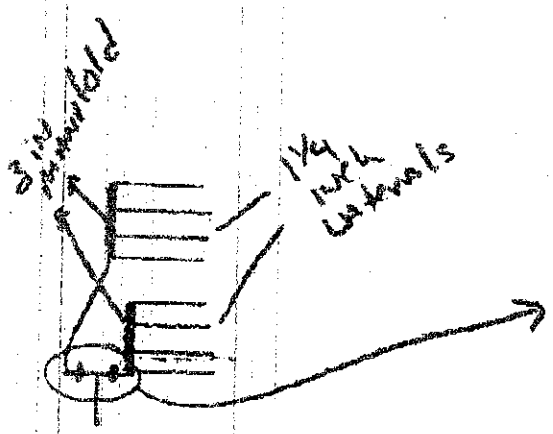

"NEMA 4X" WEATHERPROOF CONTROL BOX W/ LIGHT AND/OR BELL
SEPERATE CIRCUITS FOR ALARM & PUMP
NO ELECTRICAL JUNCTIONS IN PUMP TANK
RISER IS SEALED AT TANK AND AT EXIT POINTS FOR THE SUPPLY LINE AND WIRING
*Not Needed When pumping Down hill
12" ABOVE GRADE
6" ABOVE GRADE
UNDERGROUND ELECTRICAL CABLE
2" PVC
THREADED UNION
CHECK VALVE
SUPPLY LINE EXITS THROUGH RISER, BELOW GRADE LINE
PUMP TANK
CUTAWAY VIEW
STAND PIPE FOR ON, OFF AND ALARM FLOATS
2" PVC SUPPLY LINE
CORROSION RESISTANT ROPE OR CHAIN FOR PUMP REMOVAL
3/16" SIPHON BREAKER HOLE
ALARM SWITCH
"PUMP ON" FLOAT CONTROL
ALARM SWITCH 6" ABOVE "PUMP ON" SWITCH
DRAW DOWN LEVELS FOR 420 GALLON DOSE
SUBMERSIBLE PUMP ___HP, ___GPM AT ___ T.D.H., U.L. LISTED
PUMP OUTLET W/HOSE ADAPTER
"PUMP OFF" FLOAT CONTROL
8" CONCRETE BLOCKS
STAND PIPE CEMENTED INTO 8" CONC. BLOCK

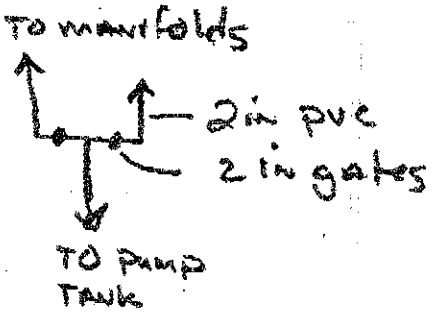


03-30-2001 11:06AM FROM CATAWBA COUNTY EHD TO 9704654737 P.03

* Example of Manifold Design

CHANGE LPP DESIGN
(MANIFOLD AREA)





1¼ in. Laterals should come from manifold directly

RECOMMENDED DESIGN CONSIDERATIONS FOR PREVENTING COMMON LPP PROBLEMS

(addendum to "Design of Large Low-Pressure Pipe Distribution Systems in North Carolina", Marinshaw, 1988)

DESIGN COMPONENT	REQUIRED	RECOMMENDED
Lateral Line Diameter	1-inch, minimum.	1-1/4-inch. 1-1/2-inch, maximum.
Trench Width	8 inches, minimum.	12 inches, minimum. 18 inches, recommended when site conditions allow. Protect trench with geotextile fabric (see below).
Orifice Size	5/32-inch for 2/3 of holes, minimum. 1/8-inch, absolute min. for 1/3 of holes.	5/32-inch, minimum. 3/16-inch, minimum, for food services. Protect orifices by sleeving or shielding (see below).

OTHER RECOMMENDATIONS:

1. *Sleeve laterals in 3- or 4-inch conventional nitrification line perforated tubing.* Reduces the effects of rock shadowing and root intrusion and enables easy removal or replacement of the LPP laterals, if necessary. (See Figures 1 and 3)

2. *Following item 1, drill all orifices facing upwards, except for a hole at the beginning and end of each line which should face down.* Having the orifices face up: helps bleed air out of the system better during pressurization; ensures no shadowing of these orifices by rock, roots, or perforated pipe corrugations; helps breaks the air block better after pump shut off, reducing siphonage from laterals to the supply manifold, which, in turn, may reduce the overloading of the lower laterals; and allows less opportunity for hole clogging by solids and bioslime. Having the two holes on each line face down allows effluent to drain after pumps shut off which: prevents anaerobic conditions inside the laterals; prevents standing water inside the laterals which could possibly attract plant, grass, and tree roots; and prevents freezing of the laterals (though typically not a problem in southeastern climates). (See Figure 3)

3. *Use one 90-degree bend for lateral turn-ups, not one or two 45-degree bends.* This will facilitate accurate measurement of operating pressure head in the laterals. Using one or two 45-degree bends for constructing the manifold cleanouts, however, would be warranted. (See Figure 3)

6. *Elbow the manifold-to-lateral connection over the earthen dam, particularly on sloping sites.* This reduces effluent drain-back through the manifold or along the manifold trench. (See Figure 3)

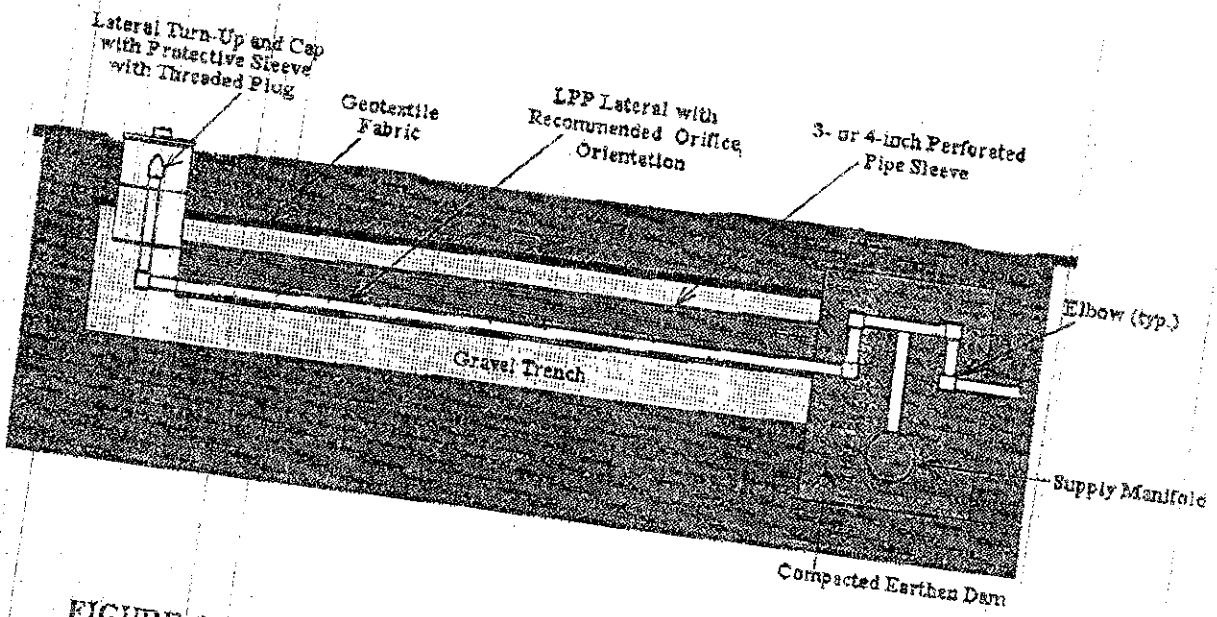


FIGURE 3: Side, Profile Detail of Recommended LPP Trench, including Cross-Section of Recommended Manifold-to-Lateral Connection.

7. *Provide two cleanouts on each supply manifold for LPP systems on sloping sites; one at the beginning (typically, the bottom) and one at the end (typically, the top) of the line.* Facilitates cleaning out the manifold after blowing out the LPP laterals, without reintroducing solids into the LPP laterals.

8. *Use the smallest pressure-adjustment gate valves which do not cause the total dynamic head of the system to exceed that which can be adequately handled by a reasonably-sized pump. This is typically achieved using gate valves which are one nominal size smaller than the effluent supply line or manifold (whichever is smaller).* The use of smaller valves allows for more precise pressure head adjustment. There will typically also be a net cost savings associated with the use of a smaller valve.

In fields served by multiple manifolds, place all pressure-adjustment gate valves in a common area for easy adjustment by one individual.

9. *Design/configure system to prevent or offset the hydraulic overloading of the lower laterals.* Overloading of lower LPP laterals is anticipated because: the lowest laterals fill up with effluent first and drain last, and they will receive effluent stored in the manifold and, perhaps, upper LPP laterals after dosing. Additionally, lateral, subsurface movement of water through the drainfield may occur, potentially contributing to the overloading of the lower laterals. There are several ways to alleviate these problems, including item number 6, listed above, as well as the following:

   A. *Design the system to "overload" the upper laterals during dosing. This can be accomplished by varying the orifice spacing and/or orifice size among the LPP laterals.*

   B. *Incorporate a drainback mechanism to return effluent to the pump tank between doses.*

   C. *Configure fields to make maximum use of slope width (along contour), thereby reducing the number of lines installed at different elevations.*

   D. *Use check valves to keep effluent dosed to the upper subfields from draining to the lower subfield laterals.*

   E. *Split flow to the subfields or laterals using a pressure manifold above the highest lateral, to prevent redistribution of effluent to the lower subfields or laterals.*

OSWS/DEH - 2/95

4. *Use geotextile fabric over the trench, at the gravel - backfill interface.* Prevents the infiltration of small soil particles into the trench voids. (See Figures 1 and 3)

* May not be required

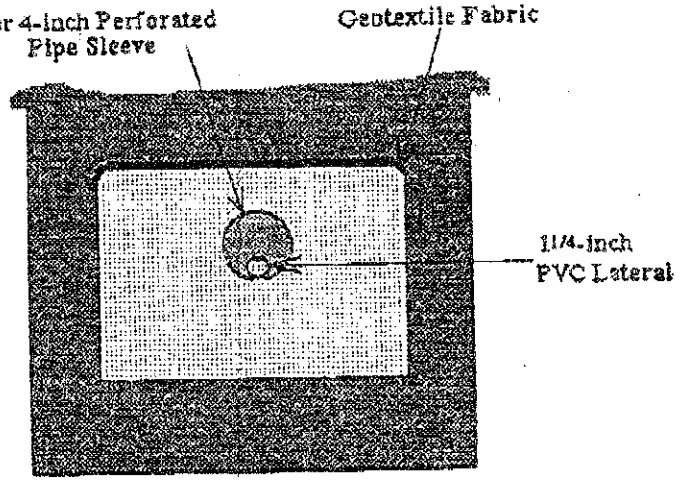


FIGURE 1: Cross-Sectional, Profile Detail of Recommended LPP Trench.

5. *For LPP laterals, tee off of the manifold directly using, for example, a 3" x 3" x 1-1/4" tee, rather than "bushing-down", (ie. using a 3" x 3" x 3" tee with reducing fittings to 1-1/4").* This results in a hydraulically smoother transition and allows less opportunity for irreversible solids accumulation. (See Figure 2)

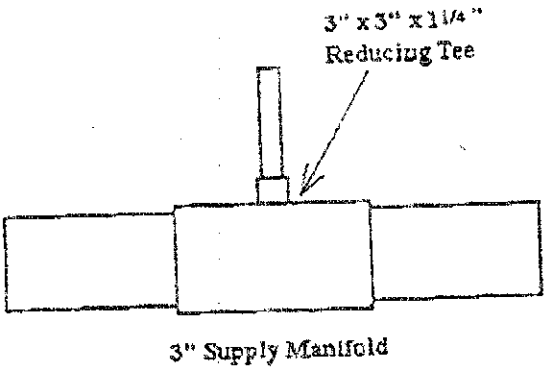


FIGURE 2: Side, Profile Detail of Recommended Supply Manifold-to-Lateral Connection.

ELECTRICAL CONTROL CONFIGURATIONS FOR ON-SITE SEWAGE SYSTEMS

1. Piggyback Switch System

a. Single-outlet motor-rated receptacle shall be used, mounted inside a NEMA 4X (watertight and corrosion resistant) enclosure or equivalent.

b. Enclosure shall be securely mounted adjacent to the pump tank at least 12 inches above finished grade. The enclosure door shall be easy to open without special tools by the system user and maintenance personnel, such as with thumb screws or quick release latches.

c. Wires from the pump and control floats shall be conveyed from the manhole riser to the enclosure through sealed electrical conduit such as with a 2-inch sweep elbow fitting. The original plug caps shall be used to connect the pump and piggyback control float wires to the receptacle, with no splices made in the wire cables. Both ends of the conduit (where leaving the riser and entering the enclosure) shall be rendered watertight and gastight with duct-seal or equivalent pliable sealant.

d. The High Water Alarm:

i. Shall be supplied by an electrical circuit from the facility electrical panel separate from the circuit supplying power to the pump.

ii. Shall be audible and visible by system users

iii. Shall be securely mounted adjacent to the pump tank, on the side of the facility in view of the pump tank, or inside the finished occupied space of the facility. If mounted outside, the alarm shall meet NEMA 4X standards, or equivalent.

iv. If the alarm panel is not located directly adjacent to the pump tank, a junction box rated NEMA 4X, or equivalent, shall be securely mounted adjacent to the pump tank at least 12 inches above finished grade, containing a disconnection means for the alarm float. This may be the same enclosure as the piggyback switch, or an adjacent enclosure. A wire nut connection or covered terminal block is acceptable as the disconnection means for a low-voltage alarm circuit (24 volts or less). The alarm float rating must be compatible with the power circuit provided.

e. The piggyback switch system should <u>not</u> be used when the pump power rating exceeds one horsepower or when the voltage desired exceeds 120 volts.

2. Simplex Control Panel System

a. This system generally consists of the pump controller and high water alarm in a common enclosure. However, these functions can be provided separately. The pump controller shall consist of a means of manually operating the pump, such as a hand-off automatic (H-O-A) switch. Pump run light and alarm test switch should also be provided.

b. The panel shall be listed by Underwriter's Laboratory or equivalent third party electrical testing and listing agency.

c. The panel as designed and installed shall be rated NEMA 4X or equivalent and shall be securely mounted adjacent to the pump tank, or on the side of the facility readily visible from the tank. If not installed directly adjacent to the pump tank, a junction box rated NEMA 4X, or equivalent, shall be securely mounted adjacent to the pump tank at least 12 inches above finished grade.

d. The panel shall be located above the 100-year storm elevation, unless designed and installed in accordance with NEMA 6P criteria, which provides for watertight conditions during periods of up to six feet of submersion.

e. All power circuits to the panel must be provided with adjacent, external disconnects, such as are commonly required for outdoor heating and air conditioning units, unless the following conditions are met:

i. The enclosure door shall be easy to open without special tools by the system user and maintenance personnel, such as with thumb screws or quick release latches.

ii. Internal panel components are behind a dead front (inner door) with main disconnect(s) clearly labeled and accessible through the inner door.

iii. Panel is confirmed to be in accordance with the National Electrical Code disconnect requirements by the local electrical inspector. It is our understanding that such panels are now available from major control equipment manufacturers.

f. The high water alarm shall be supplied ahead of any pump overload and short circuit protective devices. Generally, an independent circuit shall be provided from the facility electrical panel separate from the circuit supplying power to the pump.

However, if the pump overload and short circuit protection device is provided in the control panel, the alarm circuit can be supplied by the same power supply ahead of the pump protection device, provided it is properly protected by a separate breaker or fuse. The amperage rating of the circuit breaker serving the system in the facility electrical panel must be adequate for both the pump and alarm circuits and the acceptability of all components must be specifically confirmed by the local electrical inspector.

g. Wires from the pump and control floats shall be conveyed from the manhole riser to the panel or junction box through sealed electrical conduit, with no splices made in the wire cables. Both ends of the conduit (where leaving the riser and entering the panel or junction box) shall be rendered watertight and gastight with duct-seal or equivalent pliable sealant.

h. Panels serving pumps with voltage exceeding 120 volts should include disconnects which break all ungrounded conductors.

3. Duplex and Multiplex Control Panels:

These must meet the same requirements as simplex panels and all the additional requirements of .1952(c) (6), including short circuit protection for each pump and the control system, automatic pump sequencer, hand-on-automatic (H-O-A) switches, run lights and elapsed time counters for each pump.

SB/dh

1/15/91