LPP GROUND ABSORPTION SEPTIC SYSTEM DESIGN

DIGH CIRCLE - LOT374

IREDELL COUNTY - NORTH CAROLINA

by

Toney C. Jacobs
168 Broadbill Drive
Mooresville, N. C. 28115

April 8, 1995



To: Mr. David Hinson, R.S.
Iredell County Health Department
412 East Center Avenue
Mooresville, N. C. 28115

Mr. Harry McKee
236 Digh Circle
Mooresville, N. C. 28115



Toney C. Jacobs, CPSS

owner design - full basement

Digh Circle - Lot 374
Low Pressure Pipe (LPP)

Design Considerations: The system has been designed to accommodate a 4 bedroom house with partial basement above field and not impacting design. Field trench design utilize the best soils on the lot closest to Lake Norman and widest aerial loading.

Location: A 0.65 Ac building lot located on the right of Digh Circle, east off McKendree Road and northwest off Brawley School Road.

Reference Material:

1. *Design and Installation of Low Pressure Pipe Wastewater Treatment Systems,* by Craig Cogger; Bobby L. Carlisle, Dennis Osborne, and Ed Holland. UNC Sea Grant UNC-SC-82-03, May 1982.
2. *Laws and Rules for Ground Absorption Sewage Disposal Systems 15A NCAC 18A .1900,* NCDEHNR-DEH.

Recommendations: 480 lineal feet of field lines 2.0 feet wide with 9" of stone in a 13" (low side) deep trench. The application rate and soil suitability were established and agreed upon by Iredell County Health Department (ICHD) field staff and the designer. Five soil pits and numerous auger borings were made on the lot. If required monitoring (management entity) should never indicate a problem with lateral flow, an interceptor drain can be added.

Ownership Responsibility for an LPP System:

It must be kept in mind that this system is designed to accept a moderate amount of wastewater, in a loam and clay loam textured spoil. Conservation measures should be undertaken in plumbing fixture specifications to minimize the volume of wastewater entering the disposal system, including, but not limited to the following precautions:

(a) Provide water conserving plumbing fixtures within the facility.
(b) Develop conservative water use habits.
(c) Do not install a garbage disposal (or use very sparingly if installed)
(d) Monitor and maintain the system as necessary for proper operation. This Type IVa. LPP permit will require a maintenance contract to be filed with the Iredell County Health Department. It is recommended that the owner aggressively use this requirement to extend the life and serviceability of the alternative system.

System must be properly installed by a qualified, experienced, and competent contractor following the requirements of the Iredell County Department of Environmental Health, DEH, the N.C. Building Code, Plumbing Code, and Electrical Code, and the National

Health, DEH, the N.C. Building Code, Plumbing Code, and Electrical Code, and the National Electrical Code. It is strongly suggested that the owner, general contractor, and septic contractor have a pre-clearing and/or pre-construction meeting with the ICHD. This lot is very limited by available space and all provisionally suitable soil on the lot is being utilized to the maximum for the system. With present house siting there is NO flexibility for change in septic. The lot does not have necessary 100% repair, but was platted before such requirements existed. If the septic area is disturbed in an adverse way, the initial Operations Permit cannot be issued; hence, no Certificate of Occupancy. The general contractor [Glenn Parker] should alert every machine operator on the site about this limitation.

Caution:

A mistake in grading or construction could cause the permit to be revoked and render the lot unusable. An important note: when an area is graded it cannot be back filled and be acceptable for septic. Owner, builder, and installer should proceed only after a thorough understanding of plan, permit requirements, and general knowledge of septic systems and their limitations.

Components of System

1. Two compartment septic tank
2. Pumping tank
3. Submersible effluent pump and level controls
4. High water alarm signals
5. Supply pipe
6. Manifold with gate valves in a single valve box
7. Lateral with gravel ground absorption trenches - LPP

Construction Sequence

1. Lines have been flagged as noted on drawing. Actual line length and elevations must conform to measure in specifications and will supersede flags. Flags may vary +/- 0.25', depending on point of measure. Plan specified line length supersedes flags which are on line. Actual plan specified setbacks also supersede flags. Fill the old stump holes, old pits, old roadbed, and other depressions to level surface by hauling to the site. This should be with loam or heavy topsoil only, and then compacted.
2. Clear by grubbing and excavate lateral network trenches 24" wide by approximately 13" deep on downhill side of trenches (see detail). Remove loose soil from bottom of trench. Relating elevations to head calculations are critical at manifold. All lines to be level. There is an

3. Install stone, pipe and sleeve (to specified elevation) and cover stone in bottom of the lateral trench to the proper depth. Sleeve is a 4" corrugated pipe specified in .1955.

4. All joints in lateral manifold piping shall be watertight connections to insure that the only source of the water seepage from the system is through the orifices as designed. Carefully install manifold and lateral network according to the attached designed layout. Protect gate valves with a valve box. These valves should be close enough for one man to simultaneously adjust both valves. A larger diameter protective sleeve with cap or approved box with lid shall be placed over the turned-up lateral and positioned level with the ground surface (so as not to be damaged by mowing machine). This will be backfilled to the surface with washed stone to facilitate maintenance.

5. Carefully backfill manifold trenches to finish grade with clean debris-free earth(no stone). This field shall be of clay or heavy clay loam and securely tamped to prevent bypass in pipe trench. On this slope this is an important and "must do" step.

6. Leave absorption area with a raked surface slightly mounded to accommodate settling and be ready for seeding.

7. The installation contractor shall stabilize the area of construction by liming, fertilizing, and seeding with Kentucky 31 tall Fescue and mulching. The owner shall keep the planted area watered until a hardy stand of grass is established. This will be after the permit is completed, but is no less important.

8. The septic tank shall consist of an approved 1500 gallon capacity, reinforced, precast concrete tank with full baffle and shall have easy access to each chamber from ground level for checking and pumping. The first chamber of the septic tank shall consist 2/3 or 3/4 of the volume of the total tank and the baffle shall contain a horizontal opening across the tank at midway its height. Locate the septic tank at such height as to provide approximately 8" of cover soil over top of the tank. It is recommended that a riser be installed on this tank for inspection and maintenance purposes.

9. The dosing tank shall consist of an approved 1000 gallon capacity (one piece), reinforced, precast concrete tank. Within the tank have a concrete mounting pad (concrete blocks) for accommodating the pump. If a two piece tank is used, it must be plastered along the joint as specified and tested with all requirements of .1954(b). This tank must have riser for maintenance.

10. All piping and fittings shall be Sch 40 PVC. Glue for all PVC pipe joints shall be as recommended by the pipe manufacturer.

11. Pump: The submerged pump shall be model ME 33 manufactured by F.E. Myers Company, Ashland, OH, or equal, 1/3 hp, 115 or 230v/1ph; capable of pumping 31 gallons per minute at a 24.2' head. This pump sized for initial system, but will meet repair need should such ever be needed.

12. Pump controls and alarm to meet specification of .1952 all being compatible.

13. A "Warning Sign" shall be located within the house to inform the occupants of action to take in case the "High Water Alarm" is activated. This sign shall contain the name, address, telephone number, and emergency telephone number of the person to contact upon malfunction of the system. This person should be the certified operator

14. Pump and Controls: Details of pump installation are shown on the plan. The pump must be placed on concrete blocks on the bottom of the tank. This prevents the pumping of any solid particles which can clog the LPP system. A piece of nylon and rope or other non-corrodible material should be attached to the pump and to the outlet pipe for lifting the pump in and out of the chamber. Controls are fastened to the outlet pipe with clamps or brackets supplied by the manufacturer. The lower level control or "pump-off" must be positioned above the pump, so that the pump remains submerged at all times. The level control "pump-on" is positioned to pump a specified volume of effluent. The high water control float is then mounted about 5" above the upper pump on control (Note: Care must be taken to insure that floats do not become fouled by other components in the tank such as the electric power cord or the lifting rope.) A tree must be used to hold floats (see detail). The pump outlet pipe should be connected to the supply manifold with a threaded PVC union (or dresser coupling) to allow quick removal.

15. Electrical Connections: The pump and high water alarm must be placed on separate electrical circuits. (If the pump circuit fails, the alarm must still be able to operate.) Follow the manufacturers recommendations for the proper fuses or circuit breakers. All electrical connections must be made outside the pumping chamber. Power cords from the pumps and controls should be plugged into a NEMA 4X approved outdoor receptacle mounted outside of the pumping chamber. The receptacle must not be located inside the pumping chamber due to the corrosive and explosive gasses that may form from the sewage. Electrical connections may be made inside the pumping tank only if wired inside a sealed, watertight box. Some level control switches have a box built into the housing, but are more expensive than the plug-in devices. Wiring between the pumping chamber and the station must meet State and local code requirements. A lightning arrester is recommended to protect the pump and controls from electrical surges.

16. Proper Operation Check: After all components have been installed and connected, the system should be checked for proper operation. With electrical power turned off, fill the pumping chamber with water from a garden hose until the liquid rises to the level of the high-water alarm float. Turn on the electrical power. The alarm light should go off when the liquid falls below the high-water float. The pump should turn off when the liquid reaches the lowest float control. Be sure the pump is still completely submerged.

falls below the high-water float. The pump should turn off when the liquid reaches the lowest float control. Be sure the pump is still completely submerged.

17. Pressure Head Adjustment: The pressure head must be adjusted to match that specified in the design. The pressure head is measured as the height liquid will rise above the turn-up elbow when the pump is running. To adjust the head:

(a) Glue a 4' length of pipe (preferably clear) to a threaded adapter that will screw onto the turn-up adapters. (Call this the "test tube".)

(b) Replace the turn-up cap with the "test tube".

(c) Adjust the gate valves until the effluent reaches the desired height in the "test tube". Remember to include the distance below the ground surface to the lateral line when measuring the height. The pressure head should be as specified for each line. This is the height above the lateral the liquid should be in the temporary "test tube".

18. Final Landscaping: After the system is installed, the following should be checked to insure that the system will not be overloaded with excess rainwater and runoff:

(a) The distribution field is shaped to shed rainwater and is free of low area.

(b) If areas of old pits and stump holes in the drainfield have settled during the installation, fill with clay loam or loam material from off-site.

Concluding Note

This plan was done to facilitate permitting by the Iredell County Health Department by an agent of the property owner. Any additions, or additional requirement(s), or deletions to enhance design or workability which will facilitate a permit are welcomed and may be made by note on this plan without returning entire design. The designer realizes that a plan with as many details as this can be changed and/or improved upon. The installer must realize that this is an exact plan and must be installed with exacting measurements. Should the installer desire a change, it must be approved in writing by note on the plan by the health department. At the discretion of the ICHD (and this will be noted on permit) the designer or other certified or registered professional (soil scientist or professional engineer) may be required to sign-off on installation before trenches are closed. Final inspection by the ICHD will also require more time and detail than a conventional system. If there are questions, please give me a call.

Design Specifications for Lot 374 - Digh Circle

Daily design waste flow:	√480 gpd
Septic tank size:	√1500 gal. (2 compartments)
Pumping tank size:	√1000 gal.
Effluent loading rate:	√0.2 gpd/sf LPP system, repair not required
Total linear feet and diameter of laterals:	√480 ft. of 1-1/4" dia. sch 40 in 12" wide trench not less than 5' o.c.
Repair	some available if needed
Special design consideration	√ 24" wide laterals with pipes sleeved in 4" corrugated pipe (see detail)
Total length and diameter of supply manifold:	60 lf - 3" sch 40 PVC (I measured = 85')
Number and length of laterals:	eight 1¼" @ 60 end fed, 4 valves
Hole size:	5/32"
Hole spacing:	5.45-10.0'
Total number of holes:	67
Flow rate through the system	30.95 gpm
Elevation head:	13.55'
Pressure head:	3.0'
Friction head:	3.3' high but OK
20% contingency:	4.97'
Total head:	23.8'
Pump requirements:	31 gpm at 24' head; use Myers 1/3hp ME33 pump or equivalent with compatible electrical ✓
Dosing volume:	180 gal. = 2.6 doses/day ✓
Depth of water pumped per dose:	calculated to specific tank used 1 ft cubed=7.48 gal.
Approximate pump run per dose float control:	approx. 6.0 minutes ✓
Check valve:	No

Lot 374 Digh Cir (McKee)

color	Line #	length	head	hole size	flow/hole	hole spacing	# holes	gpm line	Manifold to 1st hole	Assumed elevation	
orange	1	60'	2.0	5/32	.41	5.45	11	4.51	2.72	97.2	.075
live	2	|	3.0	|	.50	6.66	9	4.50	3.33	96.2	.075
red	3	|	2.0	|	.41	6.0	10	4.1	3.0	94.8	.068
white	4	|	3.75	|	.56	4.57	7	3.92	4.28	93.05	.065
orange	5	|	2.0	|	.41	6.66	9	3.69	3.33	91.70	.062
live	6	|	3.4	|	.53	8.6	7	3.71	4.3	90.3	.062
yellow	7	|	2.0	|	.41	7.5	8	3.28	3.75	89.05	.055
red	8	60	3.45	5/32	.54	10.0	6	3.24	5.0	87.6	.054
		480					67	30.95			

elevational head 97.2 − 83.65 = 13.55 ≈ 15

working 3.0 2

friction 3.3 ≈ 1

19.85

contingency 20% 3.97

23.8' ✓

Dosing Volume = V supply + 5 V lats

.85 .7(36.7) + 5(4.8)(6.4)

25.7 + 153.6 = 179.3 ≈ 185 gal

dose/day at design flow = 2.6 ✓

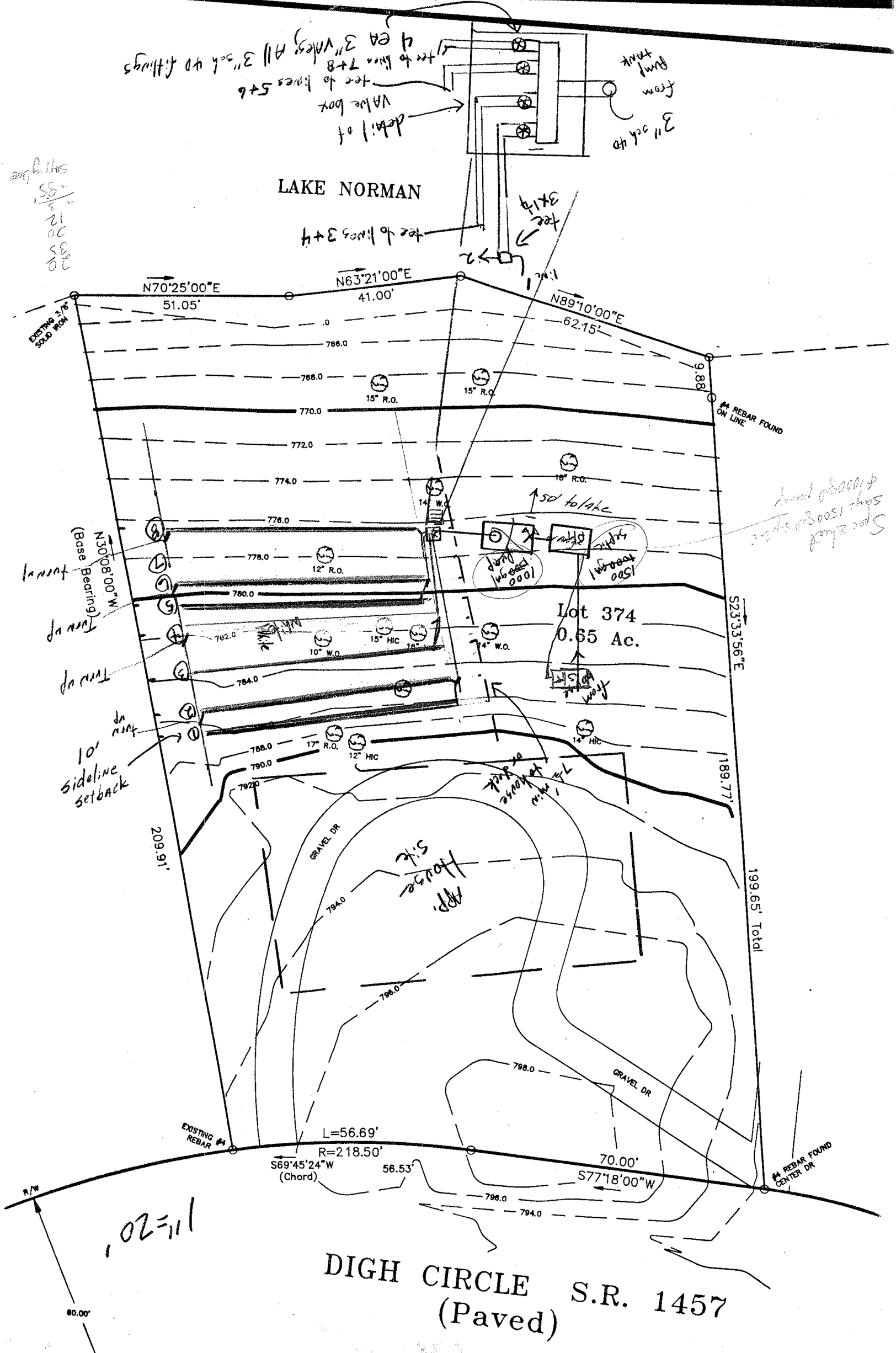
check valve ~~V store~~ = V supply + V lats

25.7 + 30.7 = 56.42

480 × .25 = 120

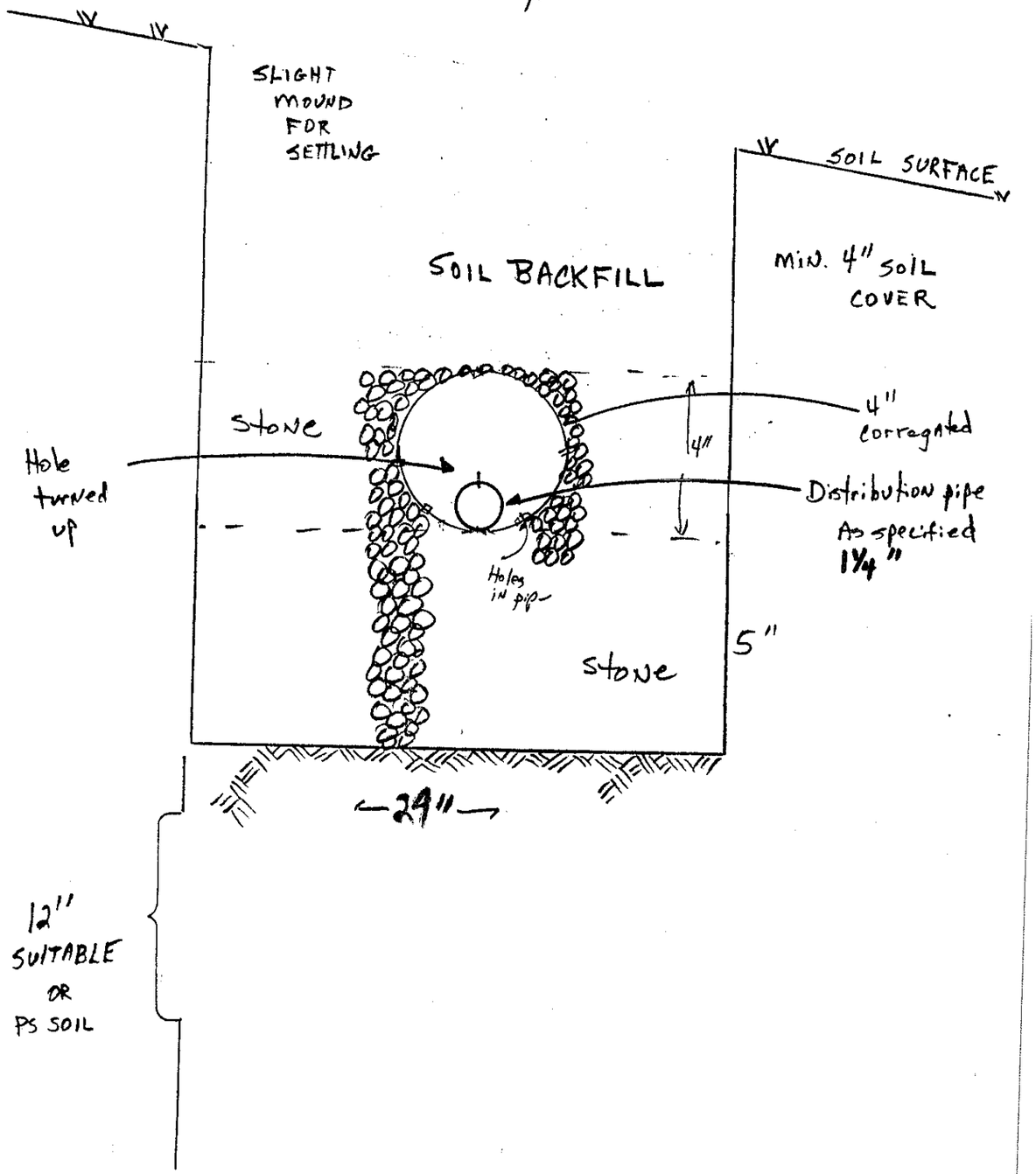
56 < 120 ∴ No check needed

62 < 120 ✓


LAKE NORMAN
N70°25'00"E
51.05'
N63°21'00"E
41.00'
N89°10'00"E
62.15'
9.88
#4 REBAR FOUND ON LINE
EXISTING 3/4" SOLID IRON
N30°08'00"W
(Base Bearing)
S23°33'56"E
189.77'
199.65' Total
209.91'
Lot 374
0.65 Ac.
10' Sideline Setback
GRAVEL DR
GRAVEL DR
EXISTING #4 REBAR
L=56.69'
R=218.50'
S69°45'24"W
(Chord)
56.53'
70.00'
S77°18'00"W
#4 REBAR FOUND CENTER DR
R/W
80.00'
DIGH CIRCLE S.R. 1457
(Paved)

LPP Trench Design

typical



ME SERIES

1/3 through 1-1/2 HP
Effluent Pumps



Double Seal



Single Seal

THE MYERS ME SERIES EFFLUENT PUMPS ARE DESIGNED SPECIFICALLY FOR TODAY'S EFFLUENT PRESSURE DISTRIBUTION MOUNDS, TRENCHES AND HIGH FLOW DRAINAGE APPLICATIONS. The ME Series effluent pumps with their efficient two vane, enclosed impellers, provide the ideal performance for optimum dosing. ME Series pumps are constructed of only corrosion resistant materials like cast iron, stainless steel and thermoplastics to assure that they will perform for years to come in the harsh effluent environment and drainage applications. For more information, call your Myers distributor today or the Myers Ashland, Ohio sales office at 419/289-1144.

ADVANTAGES BY DESIGN

IDEAL FOR USE IN MOUND AND TRENCH PRESSURE DISTRIBUTION SYSTEMS

- High efficiency, two vane, enclosed impeller provides ideal performance for most efficient dosing.
- Impeller passes full ¾ inch solids.
- Enclosed impeller design eliminates possibility of jamming or corrosion between impeller and volute.

DURABLE MOTOR WILL DELIVER MANY YEARS OF RELIABLE SERVICE

- Oil-filled motor for maximum heat dissipation and constant bearing lubrication.
- High torque, permanent split capacitor (PSC), single phase motors. No starting switches or relays to wear out.
- Optional seal leak probe warns of seal leak condition. (Dual seal motors only.) Helps prevent costly motor damage.
- Motors have on winding current and temperature sensitive overload. (Single phase only.)

THE ME SERIES EFFLUENT PUMPS ARE DESIGNED FOR YEARS OF MAINTENANCE FREE OPERATION

- Volute seal ring is replaceable. Restores pump to original performance if wear should occur.
- Motor is held in place by 4 screws. Easily removed if service is ever needed.

PRODUCT CAPABILITIES

Capacities To	120 GPM	454 LPM
Heads To	98 ft.	29.8 m
Max. Spherical Solids	¾ in.	19 mm
Liquids Handling	domestic effluent & drain water	
Intermittent Liquid Temp.	up to 140° F	up to 60° C
Motor Electrical Data	1/3 & 1/2 HP, 115 volts, 1 ph 1/3 to 1-1/2 HP, 230 volts, 1 ph 208, 230, 460, 575 volts, 3 ph oil-filled, permanent split capacitor type, 1 ph, 3450 rpm, 60 Hz	
Motor Insulation	Class B (130°C)	
Third Party Approvals	Pending	
Acceptable pH Range	6-9	
Specific Gravity	.9-1.1	
Viscosity	28-35 SSU	
Discharge, NPT	2 in.	50.8 mm
Min. Sump Dia. Simplex Duplex	24 in. 36 in.	61 cm 91.4 cm

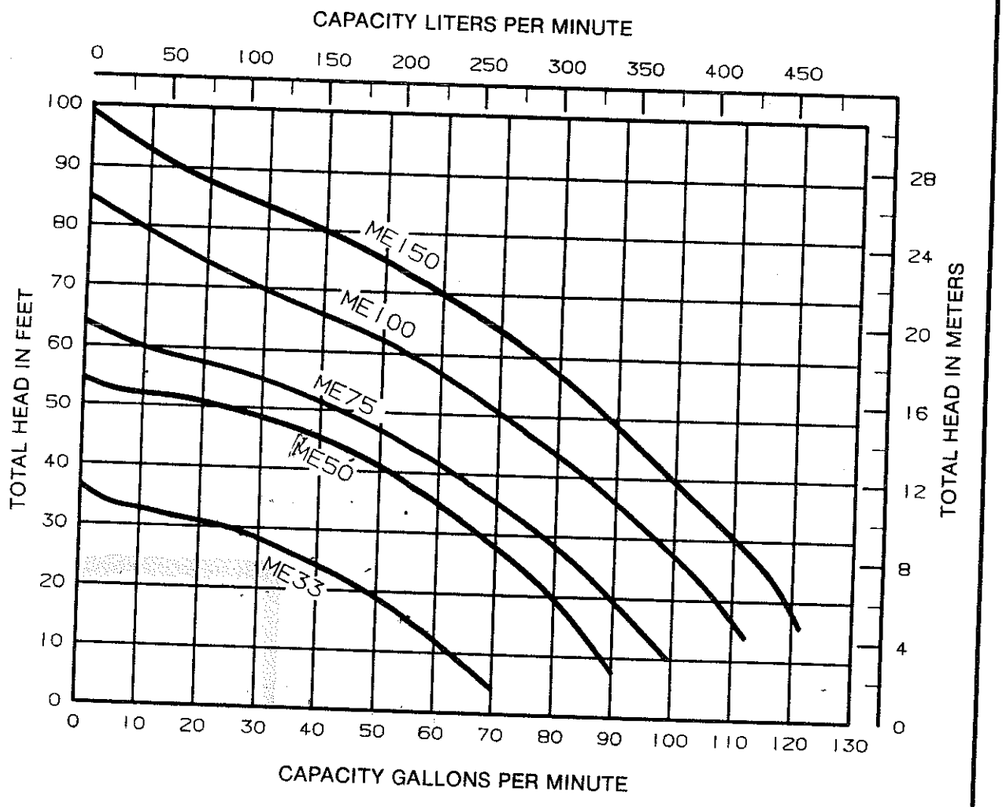
Construction Materials	
Motor Housing, Volute	cast iron, Class 30, ASTM A48-76
Enclosed Two Vane Impeller Standard Optional	engineered thermoplastic bronze
Impeller Wear Ring	304 SST
Volute Sealing Ring	Buna-N
Shaft	416 SST
Power Cord 1/3 & 1/2 HP, 1 Ph 3/4 - 1-1/2 HP, 1 Ph All 3 Ph	 20 ft. 16/3 SJOW/SJOW-A 20 ft. 14/3 SJOW/SJOW-A 20 ft. 14/4 SOW/SOW-A
Shaft Seals Standard Optional Opt. Lower	single carbon & ceramic tandem carbon & ceramic tungsten carbide
Fasteners	300 Series SST

WHERE INNOVATION MEETS TRADITION

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1/3 through 1-1/2 HP
Effluent Pumps
Performance Curve

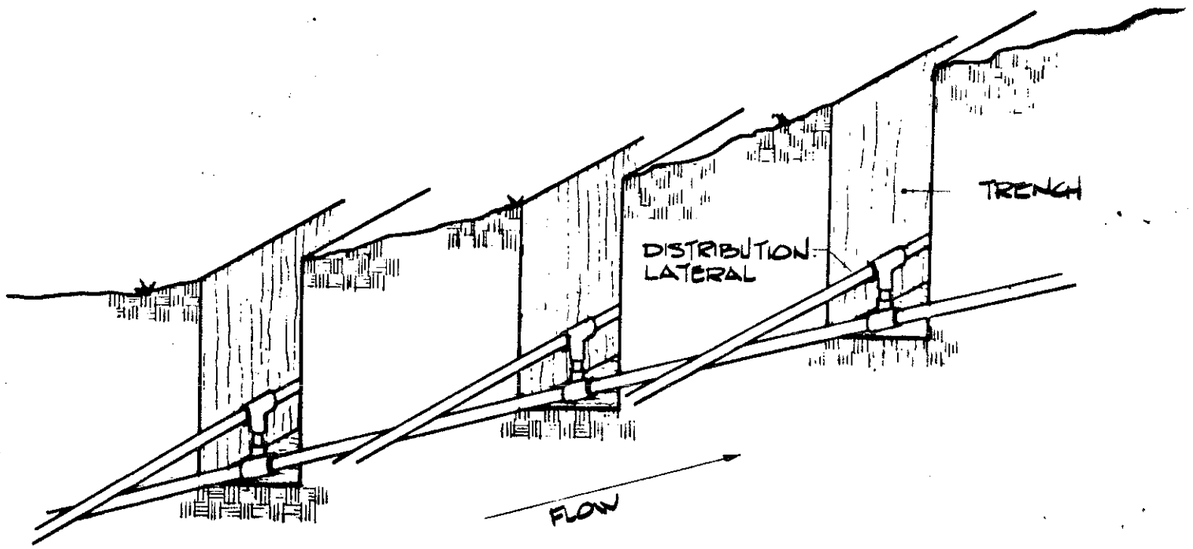
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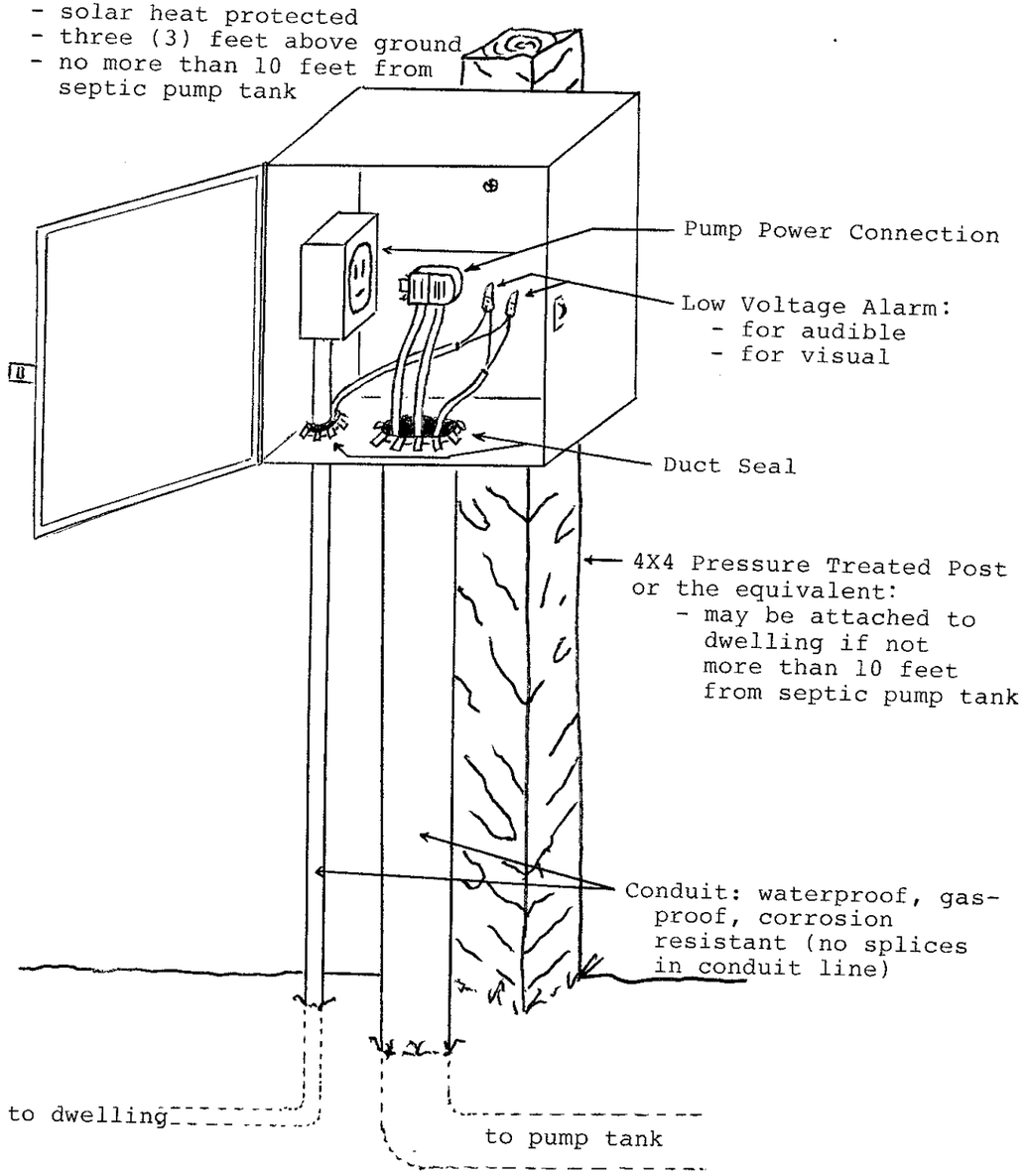


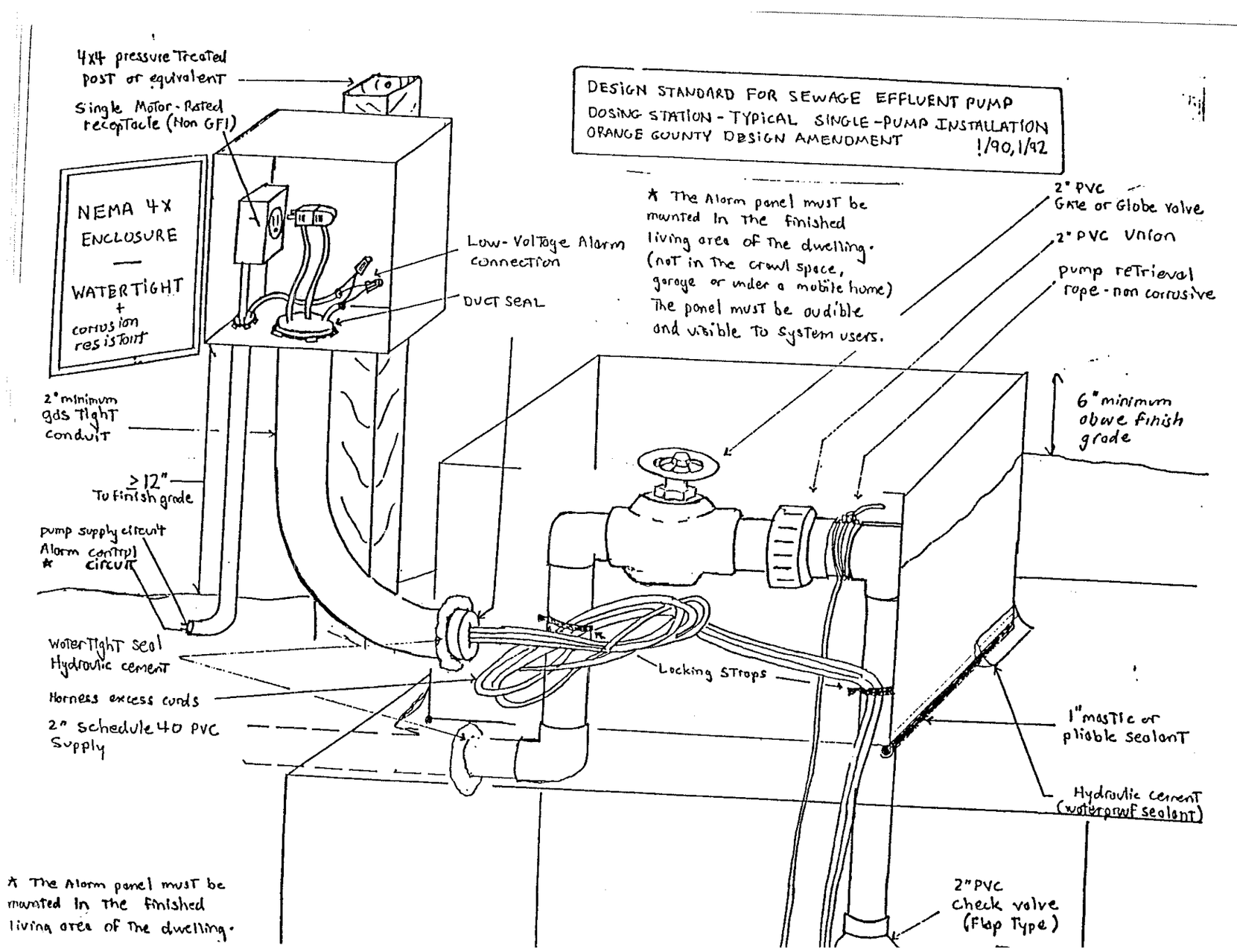
A PUMPING UPHILL

from Cogger et. al, 1982)

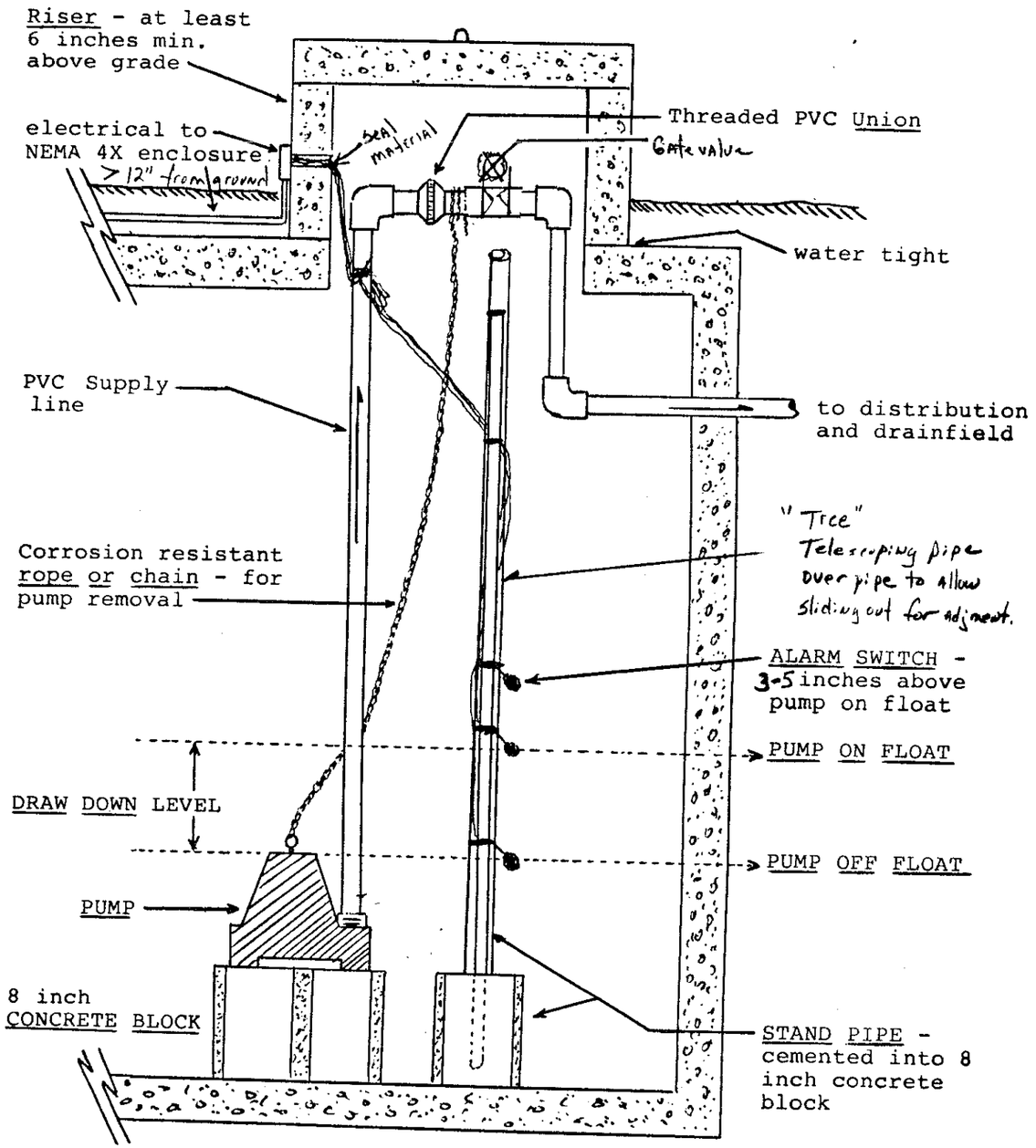
NEMA 4X ENCLOSURE must be:

- water tight
- corrosion resistant
- solar heat protected
- three (3) feet above ground
- no more than 10 feet from septic pump tank




DESIGN STANDARD FOR SEWAGE EFFLUENT PUMP
DOSING STATION - TYPICAL SINGLE-PUMP INSTALLATION
ORANGE COUNTY DESIGN AMENDMENT 1/90, 1/92
4x4 pressure Treated post or equivalent
Single Motor-Rated receptacle (Non GFI)
NEMA 4X ENCLOSURE
WATERTIGHT + corrosion resistant
Low-Voltage Alarm connection
DUCT SEAL
* The Alarm panel must be mounted in the finished living area of the dwelling. (not in the crawl space, garage or under a mobile home) The panel must be audible and visible to system users.
2" PVC Gate or Globe valve
2" PVC Union
pump retrieval rope - non corrosive
2" minimum gas tight conduit
≥ 12" To Finish grade
6" minimum above finish grade
pump supply circuit
Alarm control * circuit
Watertight seal Hydraulic cement
Locking Straps
Harness excess cords
2" schedule 40 PVC Supply
1" mastic or pliable sealant
Hydraulic cement (waterproof sealant)
* The Alarm panel must be mounted in the finished living area of the dwelling.
2" PVC check valve (Flap Type)

PUMP DIAGRAM



Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	
RP	0.15	100.15		100.0	Nail in hickory
1			2.95	97.2	orange
2			3.95	96.2	
3			5.35	94.8	
4			7.1	93.05	
5			8.45	91.7	
6			9.85	90.3	
7			11.1	89.05	
8			12.55	87.6	
ground surface tank			11.5	88.65	X org
bot tank				83.65	

SCS-29 (3-60)

GPO : 1960 OF—550816