

SECTION IV

DISPERSAL AREA SIZING:

The size of the required dispersal area will be determined by the daily design flow and the soils application rate provided by a qualified soils scientist and / or hydrogeologist. Typically systems greater than 10,000 gpd may be required to undergo in-depth groundwater mounding analysis and / or mass nutrient loading calculations as well as additional infiltration testing.

An effort should be made to avoid concentration of the absorption fields in one area. Stretching the system along contour as much as possible (avoid zone stacking) to reduce landscape linear loading as well as placement of “pods” of zones in differing landforms will enhance the hydraulic dispersal of the effluent on the landscape.

Please note that the American “Perc-Rite®” system claims no effluent treatment and suggests that any effluent quality requirements be addressed prior to final dispersal or in the soil after dispersal. The micron disc filtration on our hydraulic unit is for the sole purpose of protecting the drip tubing emitters and network.

Typical designs call for drip tubing to be spaced 1.5 feet to 3.0 feet on center (2.0' o.c. is most common) although site conditions and applications may dictate closer or farther apart spacing. It is very important to keep the drip tubing along contour so spacing may change as contours change from manifolds to distal ends. When designing on sloping sites and treed sites 2.0 - 3.0 feet on center is more realistic so the system installer has adequate room to make field adjustments (i.e. maneuvering around rocks, trees, etc.). Flatter sites may lend itself to closer spacing but the area requirement should not be compromised.

The typical design methodology for an single family home or other small flow system provides that the minimum amount of tubing required as being determined by the square footage of the absorption area divided by two, indicating a two foot spacing.

This criterion is a good starting point. However, in the case of larger flows, as a fluid handling system applied as a subsurface or slow rate land application system, the amount of tubing maybe further determined by a variety of factors. These considerations include the actual flows, the loading rate, pump run times, instantaneous dose to the soil, the zone dosing regime, and other variables.

An example would be a large flow system installed in a soil with a very low loading rate. Tubing separations of 3' or more maybe indicated based on project analysis and considerations of the above outline factors. Conversely, a system in a deep, coarse soil material may indicate an increased amount of tubing.

COMPONENT SIZING:

Standard American “Perc-Rite®” skid mounted filtration units range from 25 gpm (ASD25) to 250 gpm (ASD250) with 25, 40, 60, 90, 120, 150, 200 and 250 gpm units readily available. This does not mean that for example the 250 gpm unit actually runs at 250 gpm continually, rather a total daily pump run time of 20-50% is targeted when utilizing “dual zone” dosing. This enables rest times for the soil, and maintenance time for pumps controls, etc. plus will allow the system to catch up in the event more than the normal flow has been stored for dispersal.

Example: 50,000 gpd daily peak flow. Check run time for 40 gpm unit (ASD40):

$$50,000 \text{ gpd} / 40 \text{ gpm} / 1440 \text{ min/day} = 86\% \text{ RUN TIME AT PEAK CAPACITY}$$

This leaves little time for routine disc filter backwashing or general maintenance events. This flow rate relates to dosing from 2% to 13% of the total dispersal area at a time.

Check run time for 90 gpm unit (ASD90):

$$50,000 \text{ gpd} / 90 \text{ gpm} / 1440 \text{ min/day} = 39\% \text{ RUN TIME AT CAPACITY}$$

This falls within the desired range of 20-50% run time and allows ample time for zone resting, routine disc filter backwashing and/or general maintenance events. This flow rate relates to dosing from 5% to 17% of the total dispersal area at a time. Please note that the ASD120 (29% run time) and the ASD150 (23% run time) also fall within the desired range and are options to be considered. This does require siting larger zones.

Most designs will have more than one appropriate ASD model filtration unit. Choosing between multiple options involves examining site layout, costs of each option and future expansion requirements (if applicable). American Manufacturing Company can assist in evaluating these many options.

The model number indicators for the ASD units also represent the filtering volume capacity of each filter battery. From this flow volume the amount of tubing and the number of laterals is calculated that can be properly flushed at a minimum of 2 ft/sec at the distal end of each lateral. Typical zone details for each ASD model along with typical component quantities are provided in a later section. A quick summary reference is as follows:

TYPICAL ZONE DYNAMICS (assuming 300' laterals)

<u>ASD Model No.</u>	<u>Linear Feet of Drip Tubing</u>	<u>Dose Flow (gpm)</u>	<u>No. of Lateral Connections</u>	<u>Flushing Flow (gpm)</u>	<u>Total Flow Required (gpm)</u>
ASD25 - 25 gpm	2400	12.2	8	12.8	25.0
ASD40 - 40 gpm	3600	18.3	12	19.2	37.5
ASD60 - 60 gpm	5400	27.5	18	28.8	56.3
ASD90 - 90 gpm	8400	42.7	28	44.8	87.5
ASD120 - 120 gpm	11100	56.4	37	59.2	115.6
ASD150 - 150 gpm	13800	70.2	46	73.6	143.8
ASD200 - 200 gpm	18600	94.6	62	99.2	193.8
ASD250 - 250 gpm	23100	117.4	77	123.2	240.6

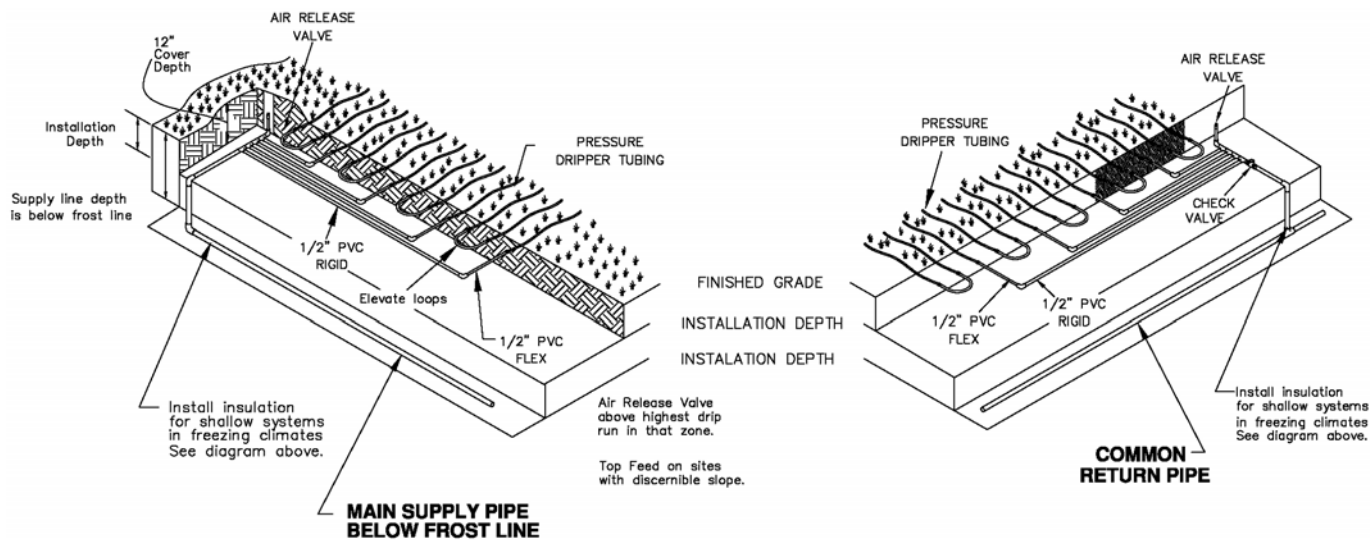
Larger models are available upon request. Please note that zones of all shapes and sizes are common and can be incorporated into each model provided it can be flushed properly with the specified ASD unit.

A length of drip tubing across the contour is identified as a "run". A series of connected runs that start at the supply manifold and terminate into the return manifold is identified as a "lateral". Lateral lengths of 300' are common. Longer laterals can be accommodated but should be discussed with American Manufacturing as head loss through the laterals during flushing increase exponentially. A group of laterals dosed at the same time are a "Zone". It is encouraged that lateral lengths within a zone remain as close to each other in size as possible to ensure equal flushing. Zones within a system may be of different sizes but zones too large or with too many lateral connections may not be able to be flushed properly. Over pressurizing a zone too small must also be considered.

Top Feed Manifolds and Run Length:

Top feed manifolds are used whenever any discernable slope is encountered in any zone. The alternative is side feed manifolds which on sloping sites enable "draindown" which will overload the lower most laterals in a zone after the pump shuts off. Draindown in the draining of manifolds and upper zone laterals into the lower laterals after each dose.

TOP FEED MANIFOLD



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The maximum number of laterals within a sub-zone may also be affected by the tubing spacing in that sub-zone. There are top-feed manifolds placed at the high point of each sub-zone that are connected to 3/4" lateral feeds or 1/2" lateral returns. The 3/4" dia. and 1/2" dia. SCH40 PVC lateral feeds and returns are positioned to drain into the drip tubing upon the completion of each dose (pump shut off) and to prevent the drain down of upper to lower laterals. It is recommended that the 3/4" and 1/2" lateral feeds and returns **not exceed 50 feet** length down the slope. Longer lengths may begin to defeat their original purpose.

Sub-Zones: Zones may be split into sub-zones. However, they are still part of the same zone and controlled by a single 24v zone Control Valve. Sub-zones within a zone are designed to minimize construction cost and have the ability to be manually isolated from the remainder of the zone for repair or maintenance without taking the entire zone out of service. Sub-zones within a zone may consist of various amounts of drip tubing, number of laterals, and number of runs. However, they still must maintain nearly the same run lengths and lateral constraints listed above.

SUPPLY & RETURN MANIFOLD LENGTHS (ft) For tubing spacing 2' O.C.							
MODELS	Maximum Zone (ft.)	<u>150'</u>	<u>Contour</u>	<u>100'</u>	<u>Contour</u>	<u>75'</u>	<u>Contour</u>
		Full Zone Manifold	1/2 Zone Manifold	Full Zone Manifold	1/2 Zone Manifold	Full Zone Manifold	1/2 Zone Manifold
ASD-25	2,400	32	16	48	24	64	32
ASD-40	3,600	48	24	72	36	96	48
ASD-60	5,400	72	36	108	54	144	72
ASD-90	8,400	112	56	168	84	224	112
ASD-120	11,100	148	74	222	111	296	148
ASD-150	13,800	184	92	276	138	368	184
ASD-200	18,600	248	124	372	186	496	248
ASD-250	23,100	308	154	462	231	616	308

DOSING & FORWARD FLUSH FLOW RATES:

Zone sizing and layout are critical design factors since pump sizing is based on dosing, flushing, and filter cleaning. The following example shows how to calculate zone flushing. The example illustrates how in large systems most designs provide for dosing two zones at a time and flushing one zone at a time.

Example: ASD60 - 60 gpm. Typical Zone has approximately 5400 l.f. and 18 - 300' laterals.

Dose Flow: (5400 l.f. / 2.0' o.c. emitter spacing) x (0.61 gph / 60 min/hr) = 27.5 gpm

Flush Flow: 18 lateral connections x 1.6 gpm/connection = 28.8 gpm

Total Flow Required: 27.5 gpm + 28.8 gpm = 56.3 gpm

** 1.6 gpm equals 2.0 ft/sec inside ½ drip tubing (0.57 actual inside dia.)*

ZONE LAYOUT TECHNIQUES:

The results of the site and soil evaluation should be information to delineate suitable soil areas on contour for the project. Experienced site evaluators will layout areas on contour showing the width across contour, typically from 75' up to 300'. Long runs of 300 feet are not common but are possible in some landscapes. The available distance down slope will also be provided.

Based on the preliminary evaluation of the Perc-Rite system sizing, zone details need to be developed to fit into the landscape. For example, if it has been determined to use a 60 gallon per minute system, then zones must be developed for the landscape that do not exceed 5,400 linear feet. Reference the "Supply & Return manifold lengths" Table. This table shows the manifold lengths for 2 foot run spacing for the various typical contours and the available systems sizes. For a 60 gpm unit and 150 feet across contour, with two sub zones the manifold lengths are 36 Feet.

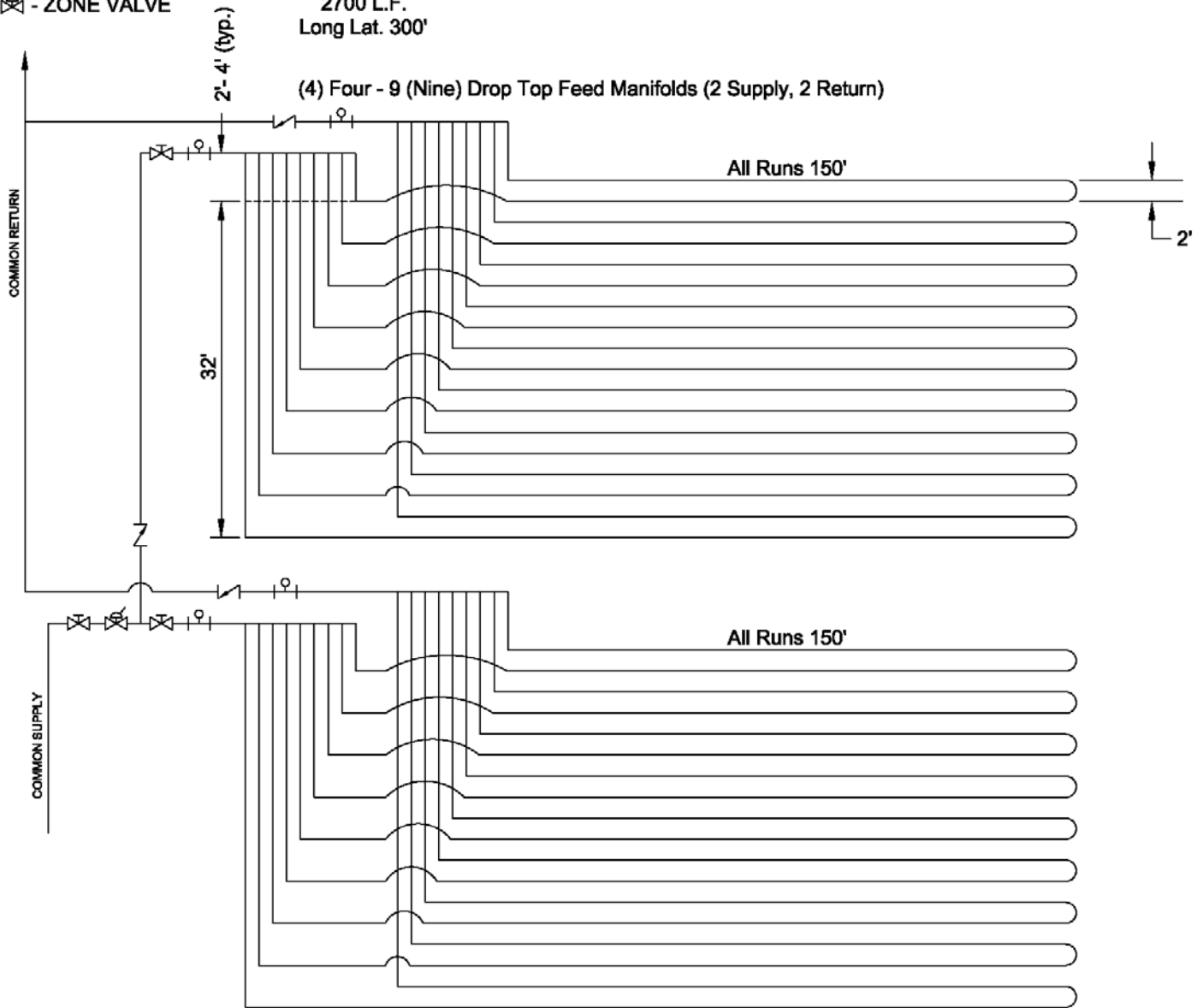
ASD 60 - 5400 Linear Feet

- Legend**
-  - AIR RELEASE VALVE
 -  - CHECK VALVE
 -  - SHUTOFF VALVE
 -  - ZONE VALVE

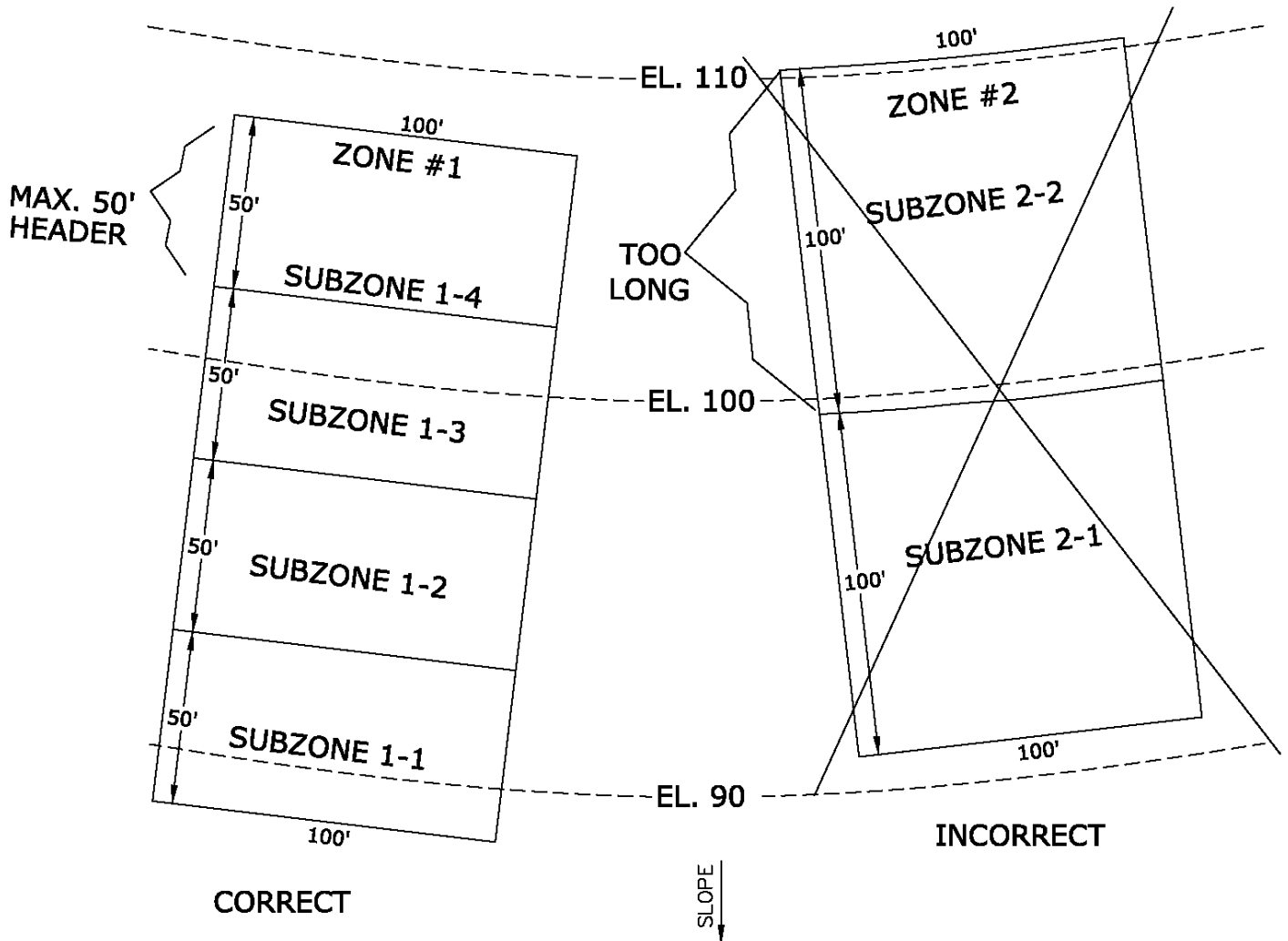
Each Subzone	Total
36 Runs	56 Runs
9 Laterals	18 Lats
2 Runs/Lateral	5400 L.F.
2700 L.F.	
Long Lat. 300'	

Dosing
27 GPM

Field Flush
56 GPM
35' Flushing
Head Loss Tubing



SUBZONES



“Top Feed Manifolds” should be utilized on all sites with discernable slope. When using “Top Feed Manifolds”, zones should be broken into subzones with no subzone header being longer than 50’. The above schematics show zone #1 correctly being broken into multiple subzones with headers no longer than 50’. The schematic also shows zone #2 incorrectly being broken into subzones with 100’ header.

SCALE: 1' = 50' ±