430990014

State Design Criteria for Wastewater Treatment Systems

September 1990

U.S. Environmental [illegible] Agency
R[illegible]
[illegible]
Chicago, IL 60604

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Washington, D.C. 20460

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This report was under EPA contract 68-C8-0022. Data were gathered and entered in the data base used for the project by the EPA Small Flows Clearinghouse under a grant.

SECTION 1

INTRODUCTION

Background

This report provides a summary of criteria in use in various states for the design of wastewater treatment plants. It is intended for use by states in reviewing their own design criteria. Consultants may also be able to use the tables to see how states are approaching regulation of certain technologies.

The methodology of preparing this report started out with the compilation of regulations from as many states and counties as possible. The EPA Small Flows Clearinghouse at West Virginia University gathered the regulatory information and condensed it into tabular form with comments. The information was then sent back to the states for review, and any revisions to data or additional comments were incorporated.

In analyzing the data, several states were found that could be combined because they use the same regulatory criteria for their conventional technologies. Nineteen states use the "10-State Standard". A list of these states is shown in Table 1-1.

TABLE 1-1
States Using the 10-State Standard

Alaska	Kentucky	Nebraska
Alabama	Louisiana	New York
Delaware	Michigan	North Carolina
Florida	Mississippi	North Dakota
Georgia	Missouri	Ohio
Hawaii	Montana	South Carolina
Indiana		

In total, 44 states and 1 territory provided regulatory information concerning conventional technologies. For on-site systems, 48 states, 2 territories, and 6 counties provided regulatory guidelines. Due to the large amount of regulatory information that is not key to wastewater treatment plant design, a data reduction step was used to eliminate those parameters that are not of prime importance. The scaling down of information was discussed with experienced professionals in the field of wastewater treatment design. Based upon their years of experience and sound engineering judgment, the list of regulatory parameters was condensed significantly to include only the most relevant parameters.

This report's primary goal is to serve as a ready reference that will allow states to review their own design criteria against those of other states and localities. In no way does this report constitute a total composite of all states' regulations concerning wastewater treatment designs; however, this report does constitute a quick reference summary for some key design parameters.

Updates to these guidelines should be made whenever state's regulations change or other important design technologies have been developed. All such additions or changes should be forwarded to the U.S. EPA Office of Municipal Pollution Control for updates.

How to Use the Tables

The summary tables are divided into two parts:

- Part 1: Conventional Technologies
- Part 2: On-Site Systems

Within Part 1, Conventional Technologies, there are individual tables for pre-treatment, primary treatment, secondary treatment (includes trickling filters, activated sludge processes, and ponds and lagoons), disinfection, and sludge treatment and management. For Part 2, On-Site Systems, there is a single table for all technologies and parameters.

Each of the tables lists the design criteria in the first two columns and then summarize the states'/localities' regulations in the following columns. Before each table, there is an introduction that provides the context for the table and summarizes characteristics common to many states. The introduction also provides any extra information concerning the comments that states might have over what will fit easily within a table.

A comment column is provided to indicate comments. In many cases, there is information in state standards that does not lend itself to portrayal in tabular, numerical format. An asterisk indicates that a particular state has a comment referring to the individual parameter. A summary of comments is provided in the two appendices (Appendix A: Conventional Technologies Comments, Appendix B: On-Site Systems Comments). Note that in many cases, states have complex tables or formulas in their regulations that could not be included here. Where absolute accuracy is necessary, reviewers must obtain copies of state regulations for clarity, additional requirements, and any other possible constraints.

SECTION 2

PART 1. CONVENTIONAL TECHNOLOGIES

This section contains the data summary tables for conventional technologies. Within this general category are the subcategories of pre-treatment, primary treatment, secondary treatment (includes attached growth, activated sludge processes, and ponds and lagoons), disinfection, and sludge treatment and management practices. Each subcategory has its own table.

PRE-TREATMENT

Table 2-1 presents the summary of state regulatory design criteria for pre-treatment in wastewater treatment plants. 24 states plus the 10-State Standard States provided data on regulations that apply to pre-treatment processes; Minnesota and South Dakota reported no regulations. Major categories of pre-treatment processes consist of bar screens, grit removal facilities, and flocculation.

The design criteria for bar screens are based primarily on the flow-through velocity and the spacing of the bars. Flow-through velocity generally ranged from 1 to 3 feet per second depending upon the type of screen. Bar screen spacing requirements vary with the type of cleaning system used. Comments on screens vary, with the most frequent comment being that fine screens should be preceded by a mechanically cleaned coarse screen.

The design criteria for grit removal facilities are limited to a few basic factors depending upon the type of grit removal facility, e.g., detention time and flow-through velocity for horizontal flow grit chambers.

Only five states have specific design criteria for flocculation: Arizona, California, Kansas, Oklahoma, and Pennsylvania. Three states (Connecticut, New Hampshire, and Pennsylvania) have comments pertaining to the use of flocculation.

Table 2-1 PRE-TREATMENT

TECHNOLOGY	PARAMETER	10 ST	AZ	CA	CO	CT	IL	IA	KS	ME	MD	MA	MN	NH	NJ
SCREENS		*			*						*			*	*
	VELOCITY, FT/SEC	1.25 - 3.0						1.25 - 3							≤3
- MECHANICALLY CLEANED SCREENS	VELOCITY, FT/SEC.		1.5 - 2 5 *	2 - 3	MAX.2 5		MAX. 2.5		MAX. 2 5					MAX 2.5	
	BAR SPACING, INCHES	0.625	0.625	0.625 - 3	0.625	0.625	0 625	0.625-1.75	0 625	0 625		0 625		0 625	< 0.625
- MANUALLY CLEANED	VELOCITY, FT/SEC.	1	1(2-4 permitted		1 - 2			MAX 2 5							1
	BAR SPACING, INCHES	1 - 1.75	1 - 3	1 - 2	1 - 1 75	1 25 - 2	1 - 1 75		1 - 2	1.25 - 2		1 25 - 2		1 TO 1.75	1 TO 1.5
- MANUALLY CLEANED COARSE SCREENS	BAR SPACING, INCHES					4				4	1 - 2.5	4			>1.5
- FINE SCREENS	SIZE OPENING, INCH		0.005 - 0 1					0.06							
COMMINUTING DEVICES	WIDTH OF THE SLOTS, INCH	*				NOT< 0.25 *				NOT< 0 25	0.25 - .75 *	NOT< 0.25		MIN. 0.25 *	NOT < 0.25 *
	VELOCITY IN THE SCREEN CHAMBER AT AVERAGE RATE OF FLOW, FT/SEC					2				2	2 - 3	2			NOT < 1
GRIT REMOVAL FACILITIES		*	*		*	*		*							*
- HORIZONTAL FLOW GRIT CHAMBER	NUMBER OF UNITS					1 - 2			MIN 2	1 - 2		1 - 2		MIN. 2	
	INLET (units)														
	FLOW THROUGH VELOCITY, FT/SEC	1	0 8 - 1 3	0.8 - 1 2	1.0	1	1		0 5 - 1	1	1	1		0.8 TO 1 2	0.5 TO 1.0
	DETENTION TIME, SEC		30-60(peak)	45 - 90											
- AERATED GRIT CHAMBER	DEPTH TO WIDTH RATIO			1:1 - 1:5					1 5 - 2 : 1						
	AIR REQUIREMENT, cfm/ft of chamber length		3 - 8	1.62 - 4.86					MIN. 3						
FLOCCULATION						*								*	
	DETENTION PERIOD, MINUTES -		20 - 60												
	-NORMAL DETENTION PERIOD (min)		30	30											
	-NEVER LESS THAN (min)														
	- FOR BOD REDUCTION (min)		MIN 45						MIN. 45						
	- IN THE QUICK MIX CHAMBER		0 6 - 3						3						
	PERIPHERAL SPEED OF PADDLES, fps		1.5	1 2 - 3											

PRE-TREATMENT (continued)

TECHNOLOGY	PARAMETER	NM	OK	PA	SD	TN	TX	UT	VI	VA	WA	WV	W	WY	COMM
SCREENS						*								*	*
	VELOCITY, FT/SEC	1 25 TO 3.5		1 25 TO 3.0			2 TO 3	1.25 TO 3		1 25 TO 3		1 25-3	1.25 TO 3		
- MECHANICALLY CLEANED SCREENS	VELOCITY, FT/SEC.					1.25 TO 3 *			MAX. 2 5		MAX. 3			1.25 TO 3	*
	BAR SPACING, INCHES		0.625	0.625		0 625		0.625 - 1.75	0 625		MIN. 0.5	0 625-1.75	2	0 5 TO 1.75	
- MANUALLY CLEANED	VELOCITY, FT/SEC.						*		1		1 TO 3			1.25 TO 1.5	*
	BAR SPACING, INCHES	1 TO 1.75	1 TO 1 75	1 TO 1.75		1 TO 2	MIN. 0.75	MIN. 1	1 TO 2	1 TO 1.75	1 TO 1.5		1 TO 2	1 TO 1.75	
- MANUALLY CLEANED COARSE SCREENS	BAR SPACING, INCHES										1.75-2.5				
- FINE SCREENS	SIZE OPENING, INCH	*		*		*					*	*			*
COMMINUTING DEVICES	WIDTH OF THE SLOTS, INCH					0 25							*		*
	VELOCITY IN THE SCREEN CHAMBER AT AVERAGE RATE OF FLOW, FT/SEC										MIN. 2				
GRIT REMOVAL FACILITIES				*							*	*	*		*
- HORIZONTAL FLOW GRIT CHAMBER	NUMBER OF UNITS	single acceptable	MIN. 2				MIN. 2		at least 2			MIN. 2	min.1		
	INLET (units)														
	FLOW THROUGH VELOCITY, FT/SEC	1	0.8 to 1.3	1		1		1	1	1	1	1	1	0.8 TO 1 3	
	DETENTION TIME, SEC	30 TO 60	20 to 60												
- AERATED GRIT CHAMBER	DEPTH TO WIDTH RATIO		0.7-1 (dep = = 10-16ft)												
	AIR REQUIREMENT, cfm/ft of chamber length		3 to 5							3 to 5			3 TO 8	0.01 - 0.04	
FLOCCULATION				*											*
	DETENTION PERIOD, MINUTES -														
	-NORMAL DETENTION PERIOD (min)		30	30											
	-NEVER LESS THAN (min)		20	20											
	- FOR BOD REDUCTION (min)		min. 45	MIN.. 45											
	- IN THE QUICK MIX CHAMBER		0.5 to 3	0.5 TO 3											
	PERIPHERAL SPEED OF PADDLES,fps		1 5 to 2 5	1 5 TO 2 5											

PRIMARY TREATMENT

Table 2-2 presents the summary of state regulatory criteria for primary treatment. Major categories of primary treatment consist of primary clarifiers and chemical coagulation (in settling tanks).

All states submitting regulatory information have at least one regulation concerning the design of primary clarifiers. Most states specify the same weir loadings for average flow of 1 MGD or less (maximum 10,000 gallons/day/linear foot), and larger average flows (maximum 15,000 gallons/day/linear foot). The exceptions are most of the west coast states, where higher loadings may be allowed.

Only three states submitted regulatory information about settling tanks with chemicals; Arizona, Washington, and California.

Table 2-2 PRIMARY TREATMENT

TECHNOLOGY	PARAMETER	10 ST	AZ	CA	CO	CT	IL	IA	KS	ME	MD	MA	MN	NH	NJ
CLARIFIERS-PRIMARY		*													*
- MECHANICALLY CLEANED															
	WEIR LOADINGS, GAL/DAY/LINEAL FOOT		MAX. 15000	10k-40k							15000				
	-FOR AV. FLOWS OF 1 MGD OR LESS	MAX. 10000				MAX. 10000		10000		MAX. 10000		MAX 10000	10000	MAX. 10000	
	-FOR LARGER AV. FLOWS	MAX. 15000				MAX 15000		15000		MAX. 15000		MAX. 15000	15000		
	SURFACE OVERFLOW RATE (SOR) gal/sq.ft/d (OR SURFACE SETTLING RATE)	MAX. 1000			800			1000	MAX. 1000		MAX. 800		MAX. 1000		
	- EXCEPT THOSE PRECEDING ACTIVATED SLUDGE (AS)														NOT > 600
	PEAK SOR FOR MAX. FLOW gal/day/sq.ft		700-1000			3000		1500		3000		3000	MAX. 1500		
	MINIMUM DIA OF THE SLUDGE WITHDRAWAL LINE, INCH					6	MIN. 6			6		6			
	SIDE WATER DEPTH, FT.				7	NOT < 7	MIN. 7	MIN. 7	MIN. 8	NOT < 7		NOT < 7	MIN 7		
	LIQUID DEPTH IN FEET-										MIN.1				
	MIN. SLOPE OF SIDE WALLS OF SLUDGE HOPPER						1.7 V : 1 H		1 5 V · 1H				1 7 V : 1 H		
	MAX. DIMENSION OF THE HOPPER BOTTOM, FT		1.7 V: 1 H			1.7 V: 1 H	2		2	1.7 V: 1 H		1.7 V · 1 H	2	1.7: 1	1 7 V TO 1 H
CHEMICAL COAGULATION															
- SETTLING TANKS WITH CHEMICALS	SURFACE LOADING RATE, GPD/SQ FT														
	- - -AVERAGE FLOW		450-1000	625-750											
	- - - PEAK FLOW		500-1600	1250-1500											
	WEIR LOADING RATE, GPD/LIN. FT.		8000-15000												
	DETENTION PERIOD, HOURS		2 - 3												

PRIMARY TREATMENT (continued)

TECHNOLOGY	PARAMETER	NM	OK	PA	SD	TN	TX	UT	VI	VA	WA	WV	WI	WY	COMM
CLARIFIERS-PRIMARY															*
-MECHANICALLY CLEANED															
	WEIR LOADINGS, GAL/DAY/LINEAL FOOT-					MAX. 15000					10,000 To 40,000			80,000 (for rectangular)	
	-FOR AV. FLOWS OF 1 MGD OR LESS	10000	MAX. 10000	MAX. 10000			MAX. 20000	max. 10000	MAX 10000			MAX. 10000	10000		
	-FOR LARGER AVERAGE FLOWS	15000	MAX 15000	MAX. 15000			MAX. 30000	max. 15000	MAX. 15000			MAX. 15000			
	SURFACE OVERFLOW RATE (SOR), gal/sq.ft/d (OR SURFACE SETTLING RATE)	800				800-1200	MAX. 1000			1000	800-1200	1000	1000	1000	
	- EXCEPT THOSE PRECEDING ACTIVATED SLUDGE (AS)														
	PEAK SOR FOR MAX. FLOW gal/day/sq.ft	1500		1500		2000-3000	MAX. 1800			2500	2000-3000	1500	1500	1500	
	MINIMUM DIA OF THE SLUDGE WITHDRAWAL LINE, INCH								6						
	SIDE WATER DEPTH, FT.	MIN. 7	min. 7				min 7 (10 acceptable)		min. 7	MIN. 7		MIN 7	MIN.7	MIN. 7	
	LIQUID DEPTH IN FEET-							MIN. 8							
	MIN. SLOPE OF SIDE WALLS OF SLUDGE HOPPER		1.7 V : 1 H						1 7V:1H			1.7 V 1 H	1.7V · 1H	1.7V : 1H	
	MAX. DIMENSION OF THE HOPPER BOTTOM, FT		2	1.7 H · 1 V		1.7V : 1 H			2			2			
CHEMICAL COAGULATION															
- SETTLING TANKS WITH CHEMICALS	SURFACE LOADING RATE, GPD/SQ.FT										600-1000				
	- - -AVERAGE FLOW														
	- - - PEAK FLOW														
	WEIR LOADING RATE, GPD/LIN. FT.														
	DETENTION PERIOD, HOURS														

SECONDARY TREATMENT

Secondary treatment is divided into three tables:

- Attached Growth
- Activated Sludge
- Ponds and Lagoons

Each table is preceded by a discussion of the contents of that table.

Attached Growth

Table 2-3 presents the summary of state regulatory design criteria for attached growth systems in wastewater treatment plants. 23 states plus the 10-State Standard states provided data on regulations that apply to these types of systems. California, Colorado, and South Dakota reported no regulations. Major categories of attached growth systems consist of trickling filters, low rate trickling filters, intermediate rate trickling filters, high rate trickling filters, roughing filters, rotating biological contactors (RBCs), and activated biofilters (ABFs). Key parameters relating to the regulation of trickling filters are depth of the media, sizing of the media, slope, velocity, hydraulic loading rate, organic loading rate, depth of the filter bed, and BOD removal percentage. Those states reporting regulations for generic trickling filters, low rate trickling filters, intermediate rate trickling filters, and roughing filters all generally have the same range of regulations. In the high rate trickling filters, the states of Iowa, Minnesota, Tennessee, Texas, Washington, and Wisconsin all have hydraulic loading rates that can exceed 900 gpd/sq. foot; whereas Arizona, Connecticut, Kansas, Maine, Massachusetts, New Hampshire, New Jersey, Oklahoma, Virginia, and Wyoming all maintain a level of less than 700 gpd/sq. foot. As expected, the organic loading rates differ for the same groups of states.

Table 2-3 SECONDARY TREATMENT - ATTACHED GROWTH

TECHNOLOGY	PARAMETER	10 ST	AZ	CA	CO	CT	IL	IA	KS	ME	MD	MA	MN	NH	NJ
TRICKLING FILTERS (TF)		*													*
	CAPACITY OF EACH UNIT, MGD										05				
	5-DAY BOD REDUCTION IN PRIMARY TREATMENT, %							30-35	MAX. 30				30-35	MAX. 35	NOT > 35
	ROCK MEDIA :-					*									
	-DEPTH OF THE MEDIA, FT	5 - 10	5 - 7			MIN. 5	7		MIN 6	MIN 5	5 - 8	MIN.5	5 - 10	5 TO 10	5 TO 8
	-DEPTH OF THE MANUFACTURED FILTER, FT		5 - 20						upto 22				10 - 30	MAX. 30	
	-SIZING OF MEDIA														should pass 4"screen
	SIZING OF MEDIA, % BY WEIGHT-														
	-PASSING 4.5 INCHES	100	100			100	100		100	100	YES	100	100	100	
	-RETAINED ON 3 INCHES	95 - 100	95			95-100	95 - 100		95 - 100	95 - 100	95	95 - 100	95 - 100	95 TO 100	
	-PASSING 2 INCHES	0 - 2	0 - 2			0-2	0 - 2		0 - 2	0 - 2		0 - 2	0 - 2	0 TO 2	
	-PASSING 1 INCH	0 - 1	0 - 1			0-1	0 - 1		0 - 1	0 - 1		0 - 1	0 - 1	0 TO 1	
	MINIMUM SIZE OF THE MEDIA, INCH		3								1				
	MAXIMUM SIZE OF THE MEDIA, INCH		5												
	MANUFACTURED MEDIA	✓													be retained on 2.5"screen
	UNDERDRAINAGE SYSTEM:														
	AREA OF INLET OPENING INTO UNDERDRAINS-														
	-WITH RESPECT TO SURFACE AREA OF FILTER, %	15	15			15		15		15	15	15		MIN 15	MIN. 15
	SLOPE, %	MIN. 1	1			1	MIN 1			1	1	1		1	MIN. 1
	VELOCITY, FT/SEC	MIN. 2	MIN. 2			2	MIN. 2			2	MIN. 2	2		MIN. 2	2
	FREE BOARD, FT	MIN. 4							MIN. 2					MIN. 0.25	

SECONDARY TREATMENT - ATTACHED GROWTH (continued)

TECHNOLOGY	PARAMETER	NM	OK	PA	SD	TN	TX	UT	VI	VA	WA	WV	W	WY	COMM
TRICKLING FILTERS (TF)		*		*		*									*
	CAPACITY OF EACH UNIT, MGD														
	5-DAY BOD REDUCTION IN PRIMARY TREATMENT, %			30 TO 35		30 TO 35	35		35		30-35				
	ROCK MEDIA :-													*	*
	-DEPTH OF THE MEDIA, FT	MIN. 5	MIN. 5	5 TO 10				5 to 10		MIN. 5		MIN 5	MIN 5	5 TO 10	
	-DEPTH OF THE MANUFACTURED FILTER, FT		MIN 10	MAX. 30				10 to 30		MIN. 10		MIN. 10			
	-SIZING OF MEDIA														
	SIZING OF MEDIA, % BY WEIGHT-													*	*
	-PASSING 4.5 INCHES		100	100		100	100	100	100	100		100	100		
	-RETAINED ON 3 INCHES		95 TO 100	95-100		90-100	95 to 100	95-100	95-100	95 TO 100		95 TO 100	95 to 100		
	-PASSING 2 INCHES		0 TO 2	0 TO 2		0 TO 2	0.2	0 to 2	0 TO 2	0 TO 2		0 TO 2	0.2		
	-PASSING 1 INCH		0 TO 1	0.1		0	01	0 to 1	0 TO 1	0 TO 1		0 TO 1	01		
	MINIMUM SIZE OF THE MEDIA, INCH					3			5	3					
	MAXIMUM SIZE OF THE MEDIA, INCH					5			3	5					
	MANUFACTURED MEDIA					*									*
	UNDERDRAINAGE SYSTEM:														
	AREA OF INLET OPENING INTO UNDERDRAINS-														
	-WITH RESPECT TO SURFACE AREA OF FILTER, %	MAX. 50		MIN 15		MIN. 15		15	MIN. 15	MIN. 15		15		MIN. 15	
	SLOPE, %	1		MIN. 1		1			1	MIN. 1		1			
	VELOCITY, FT/SEC	MIN. 2		MIN. 2		MIN. 2			MIN 2	MIN 2		2			
	FREE BOARD, FT		MIN. 2	MIN. 4				min. 4		MIN. 4		MIN. 4		4	

SECONDARY TREATMENT - ATTACHED GROWTH (continued)

TECHNOLOGY	PARAMETER	10 ST	AZ	CA	CO	CT	IL	IA	KS	ME	MD	MA	MN	NH	NJ
- LOW RATE TRICKLING FILTER-rock media															
	HYDRAULIC LOADING RATE, (GPD/SQ.FT)		46-115			70		25-90	45-90	70		70	25 - 90	70	14 4
	ORGANIC LOADING RATE lbs. of BOD/day/1000 cft		9.2 (4.6-25.3)			15		5 TO 25	10 TO 20	15		15	5 TO 25	15	15
	DEPTH OF THE FILTER BED, FT		6 (5 - 10)					6 TO 8							
	BOD REMOVAL, %							80							
- INTERMEDIATE RATE TRICKLING FILTER															
	HYDRAULIC LOADING RATE, GPD/SQ.FT/DAY							90-230							
	ORGANIC LOADING RATE lbs. of BOD/day/1000 cft							15 TO 30							
	DEPTH OF THE FILTER BED, FT							6 TO 8							
	BOD REMVOAL, %							50 TO 70							
- HIGH RATE TRICKLING FILTER															
-- SINGLE STAGE	-HYDRAULIC LOADING RATE,(GPD/SQ.FT)		367 (230-690)			275-700		230-900	250-700	275-700	MAX 80.35	275-700	230-900	275-700	230
	ORGANIC LOADING RATE lbs of BOD/day/1000 cft		46 (30 - 90)			45		25 to 300	10 TO 30	45		45	25-300	45	NOT > 67
- ROUGHING FILTER															
	HYDRAULIC LOADING RATE, GPD/SQ.FT							700-4200					1400-4200		
	ORGANIC LOADING RATE, lbs. of BOD/1000 cft/day							100-500					40 - 65		
	DEPTH OF THE FILTER BED, FT							3 to 20							
	BOD REMVOAL, %							40-65							

SECONDARY TREATMENT - ATTACHED GROWTH (continued)

TECHNOLOGY	PARAMETER	NM	OK	PA	SD	TN	TX	UT	VI	VA	WA	WV	WI	WY	COMM
LOW RATE TRICKLING FILTER-rock media															
	HYDRAULIC LOADING RATE (GPD/SQ.FT)		45 TO 90			23-92	25-90			46-92	23-92		92		
	ORGANIC LOADING RATE, lbs. of BOD/day/1000 cft		5 TO 12			5 TO 25	5 to 25			9.2 TO 18.4	5 TO 25		20		
	DEPTH OF THE FILTER BED, FT					5 TO 10									
	BOD REMOVAL, %					80-85									
- INTERMEDIATE RATE TRICKLING FILTER															
	HYDRAULIC LOADING RATE, GPD/SQ.FT/DAY					92 TO 230	90-230				92-230		253		
	ORGANIC LOADING RATE, lbs. of BOD/day/1000 cft					10 to 40	15 to 30				15-40		30		
	DEPTH OF THE FILTER BED, FT					4 TO 8									
	BOD REMVOAL, %					50-70									
- HIGH RATE TRICKLING FILTER															
- - SINGLE STAGE	HYDRAULIC LOADING RATE (GPD/SQ.FT)		230-690			230 to 920	230-900			230-690	230-920		989	144-432	
	ORGANIC LOADING RATE, lbs of BOD/day/1000 cft		30-100			25 TO 300	25 to 300			27.6 - 75.9	MAX 300		60	10 TO 16	
- ROUGHING FILTER						*									*
	HYDRAULIC LOADING RATE, GPD/SQ FT					1380-4140	1400-4200								
	ORGANIC LOADING RATE, lbs. of BOD/1000 cft/day					100 +	40 - 65								
	DEPTH OF THE FILTER BED, FT					15 TO 40									
	BOD REMVOAL, %					40 TO 65									

SECONDARY TREATMENT - ATTACHED GROWTH (continued)

TECHNOLOGY	PARAMETER	10 ST	AZ	CA	CO	CT	IL	IA	KS	ME	MD	MA	MN	NH	NJ
ROTATING BIOLOGICAL CONTACTOR (RBC)	ORGANIC LOADING RATE, IN TERMS OF - -lbs. BOD/day/1000 sq.ft					*									
	- AVERAGE FLOW														
	- -FOR STAGE 1														
	- -FOR TOTAL RBC SYSTEM														
	- PEAK FLOW (Stage 1)														
	ORGANIC LOADING RATE, IN TERMS OF - lbs. BOD/day/1000 sq. ft														
	- AVERAGE FLOW							3							
	- -FOR STAGE 1														
	- -FOR TOTAL RBC SYSTEM														
	- PEAK FLOW (Stage 1)														
- CLARIFIER FOR RBC	OVERFLOW RATE, GPD/SQ.FT -														
	- - AT AVERAGE DESIGN FLOW														
	- - AT PEAK FLOW						MAX. 1000						MAX.1000		
	DEPTH, FT						MIN. 7						MIN. 7		
ACTIVATED BIOFILTER (ABF)	Depth of artificial media in TF portion, FT														
- ABF TOWER	HYDRAULIC LOADING RATE, GPM/SQ.FT														
	ORGANIC LOADING RATE, lb. BOD/1000 cft/day														

SECONDARY TREATMENT - ATTACHED GROWTH (continued)

TECHNOLOGY	PARAMETER	NM	OK	PA	SD	TN	TX	UT	VI	VA	WA	WV	WI	WY	COMM
ROTATING BIOLOGICAL CONTACTOR (RBC)	ORGANIC LOADING RATE,IN TERMS OF -lbs. BOD/day/1000 sq.ft			*		*									*
	- - AVERAGE FLOW					2 5 TO 3 5									
	- -FOR STAGE 1										MAX. 5			140	
	- -FOR TOTAL RBC SYSTEM										MAX. 2			40	
	- PEAK FLOW (Stage 1)										MAX. 6				
	ORGANIC LOADING RATE,IN TERMS OF - -lbs. of sol. BOD/day/1000 sq.ft														
	- AVERAGE FLOW						max. 8								
	- -FOR STAGE 1									3	MAX. 2.5				
	- -FOR TOTAL RBC SYSTEM										MAX. 1.1				
	- PEAK FLOW (Stage 1)										MAX. 4				
- CLARIFIER FOR RBC	OVERFLOW RATE, GPD/SQ.FT -														
	- - AT AVERAGE DESIGN FLOW										MAX. 700			800	
	- - AT PEAK FLOW	1200	max. 1200								1100			1200	
	DEPTH, FT	MIN. 12	min. 7								10 TO 13				
ACTIVATED BIOFILTER (ABF)	Depth of artificial media in TF portion, FT					7 TO 25									
- ABF TOWER	HYDRAULIC LOADING RATE, GPM/SQ.FT					1 5 TO 5 5					1.5 TO 5.5				
	ORGANIC LOADING RATE, lb. BOD/1000 cft/day					350					100-350				

Activated Sludge

Table 2-4 presents the summary of state regulatory design criteria for activated sludge systems. 24 states plus the 10-State Standard states reported regulatory data pertaining to activated sludge systems. California and South Dakota reported no regulations. The two main regulated components of activated sludge are aeration and secondary settling tanks. As indicated by the table, design parameters for activated sludge systems are often dependant upon the specific type of activated sludge system utilized (e.g., high rate, conventional, step aeration, complete mix, pure oxygen, etc.). Key parameters typically regulated include aeration time, space loading, MLSS concentration, loading factor, sludge age, recirculation factor, side water depth, and surface overflow rate.

For those states reporting regulations on aeration equipment and secondary settling tanks, the regulated values are usually in the same approximate range. Some values do differ significantly. For instance, under contact stabilization's sludge age, Arizona's regulations say 3.5 to 7 days while Iowa states 6 to 15 days.

Only one state, Tennessee, reported regulations for sequencing batch reactors.

Table 2-4 SECONDARY TREATMENT - ACTIVATED SLUDGE

TECHNOLOGY	PARAMETER	10 ST	AZ	CA	CO	CT	IL	IA	KS	ME	MD	MA	MN	NH	NJ
AERATION TANK		*			*						*				*
	MAXIMUM CAPACITY OF EACH BASIN				0.25 MGD	0.04 MGD		*		0.04 MGD	0 5 MGD	0.04 MGD	100000	40000 gpd	
	FREE BOARD, INCHES	MIN. 18					MIN. 18		min. 18		18		MIN. 18	MIN. 18	
	- AT PEAK FLOWS, INCHES				NOT <18	NOT < 18				NOT < 18		NOT < 18			
	-WITH MECHANICAL AERATORS					MIN. 3 - 5				MIN 3 TO 5		MIN. 3 TO 5			
	NUMBER OF AERATION TANKS	2 or more				MIN. of 4	Multiple			MIN OF 4		MIN. OF 4		Multiple	Multiple
	MINIMUM D.O. IN AERATION TANK, mg/L	2			2	2	2			2	1(2 desirabl)	2		MIN. 2	
	LIQUID DEPTH, FEET	10 - 30	10 - 15			10 - 20	MIN. 10		MIN. 10	10 TO 20		10 TO 20	10 TO 20	10 t0 15	10-15
- HIGH RATE PROCESS	AERATION TIME, HRS. -		0.5 - 2		1 - 3										NOT < 6
	SPACE LOADING, lbs. BOD5/1000 CFT/DAY.	40	100-1000		<100										NOT > 38
	MLSS CONCENTRATION, mg/L	1000-3000	4000-10000		<1000										
	LOADING FACTOR (F/M RATIO), lbs. BOD/lbs.MLVSS.d	0 2 - 0.5			0.5-5 0										
	LOADING FACTOR, lbs. BOD/lbs. of MLSS.d		0.4-1.5												
	SLUDGE AGE, DAYS		0.5 - 2												
	- Maximum RF	2	5											0.5	
- CONVENTIONAL	AERATION TIME, HOURS - - -		4 - 8						6 TO 8				4 TO 8		
	SPACE LOADING, lbs. BOD5/1000 CFT/DAY -		35 (20-40)				35 - 50	MAX 40	30-40				40		
	- FOR PURE OXYGEN SYSTEM														
	- FOR AIR SYSTEM, lbs.BOD5/1000 CFT/DAY	40			< 40						35			30	

SECONDARY TREATMENT - ACTIVATED SLUDGE (continued)

TECHNOLOGY	PARAMETER	NM	OK	PA	SD	TN	TX	UT	VI	VA	WA	WV	W	WY	COMM
AERATION TANK				*											*
	MAXIMUM CAPACITY OF EACH BASIN			50000 gpd. *				5000 CFT					0 1 MGD	*	
	FREE BOARD, INCHES	MIN. 18	18	min. 18		18 to 24		min. 18				MIN. 18	18	18 TO 36	
	- AT PEAK FLOWS, INCHES														
	-WITH MECHANICAL AERATORS														
	NUMBER OF AERATION TANKS					multiple									
	MINIMUM D.O. IN AERATION TANK, mg/L	2		2		2 (1 at peak flow)			2					2	
	LIQUID DEPTH, FEET		10 TO 15	10 TO 30		10 TO 30	min. 8	10 to 30	10 TO 15			MIN. 10	MIN 10		
- HIGH RATE PROCESS	AERATION TIME, HRS. -										1 TO 3				
	SPACE LOADING, lbs. BOD5/1000 CFT/DAY.										100-250				
	MLSS CONCENTRATION, mg/L										6000-8000				
	LOADING FACTOR (F/M RATIO), lbs. BOD/lbs.MLVSS.d										0 4 TO 1.5				
	LOADING FACTOR, lbs. BOD/lbs. of MLSS.d														
	SLUDGE AGE, DAYS										5 TO 10				
	- Maximum RF										0.5				
- CONVENTIONAL	AERATION TIME, HOURS - - -		6 TO 8					4 to 8	7.5	4 TO 8	4 TO 8			6 TO 9	
	SPACE LOADING, lbs. BOD5/1000 CFT/DAY -	20 TO 40	30 TO 40				4 5	20 to 40	35	20 TO 40	20 TO 40		40	MAX. 35	
	- FOR PURE OXYGEN SYSTEM			160											
	- FOR AIR SYSTEM, lbs.BOD5/1000 CFT/DAY.			40								40			

SECONDARY TREATMENT - ACTIVATED SLUDGE (continued)

TECHNOLOGY	PARAMETER	10 ST	AZ	CA	CO	CT	IL	IA	KS	ME	MD	MA	MN	NH	NJ
	MLSS CONCENTRATION, mg/L		1500-3000					1000-3000					1000-3000		
	MLSS CONCENTRATION - PURE OXYGEN SYSTEM, mg/L														
	- AIR SYSTEM, mg/L	1000-3000			1500-4000										
	LOADING FACTOR (F/M RATIO), lbs.BOD/lbs.MLVSS.d							0 2 TO 0 5					0.2 TO 0 5		
	SLUDGE AGE, DAYS		3.7 - 7					6 TO 15							
	Recirc. Factor - Maximum RF	0.75	0 5			1				1		1	0.75	0 75	
- STEP AERATION	AERATION TIME, HOURS - - -		2 - 4						6 TO 8				3 TO 5		
	SPACE LOADING, lbs.BOD5/1000 CFT/DAY	40	50 (40-60)		<50		30 - 50	MAX. 40	30-50				40		
	MLSS CONCENTRATION, mg/L	1000-3000	2000-3500		1500-4000			1000-3000					1000-3000		
	LOADING FACTOR (F/M RATIO), lbs.BOD/lbs.MLVSS.d	0.2 - 0.5			0.2-0.5			0.2 TO 0.5					0.2 TO 0.5	0.2 TO 0.5	
	SLUDGE AGE, DAYS		3.5 - 7					6 TO 15							
	Recirc Factor - Maximum RF	0.75	0 75			1				1		1	0.75	0.75	
- COMPLETE-MIX	AERATION TIME, HOURS - - -		3 - 5						3 TO 24				3 TO 5		
	MLSS CONCENTRATION, mg/L		3000-6000					1000-3000					1000-3000		
	LOADING FACTOR (F/M RATIO), lbs.BOD/lbs.MLVSS d							0.2 TO 0 5					0 2 TO 0 5		
	LOADING FACTOR, lbs.BOD5/100 lbs MLSS		50-75						5 TO 10						
	SLUDGE AGE, DAYS		3.5 - 7					6 TO 15							
	Recirc. Factor - Maximum RF		1												
- PURE OXYGEN SYSTEM	AERATION TIME, HRS.		1 - 3												
	SPACE LOADING, lbs.BOD5/1000 CFT/DAY.		100-250										100-250		
	MLSS CONCENTRATION, mg/L		6000-8000										3000-6000		
	LOADING FACTOR (F/M RATIO), lbs BOD/lbs.MLVSS.d												0 5 TO 1 2		
	SLUDGE AGE, DAYS		1 - 2												
	Recirc. Factor - Maximum RF		0 5												

SECONDARY TREATMENT - ACTIVATED SLUDGE (continued)

TECHNOLOGY	PARAMETER	NM	OK	PA	SD	TN	TX	UT	VI	VA	WA	WV	WI	WY	COMM
	MLSS CONCENTRATION, mg/L	1500-3000	> 5000					1500-4000		1500-4000	1500-3000	1000-3000	1000-3000	1000-3000	
	MLSS CONCENTRATION - PURE OXYGEN SYSTEM, mg/L			3000-5000								0.2 TO 0.5			
	- AIR SYSTEM, mg/L			1000-3000											
	LOADING FACTOR (F/M RATIO), lbs.BOD/lbs.MLVSS.d	0.2 TO 0.5						0 2 to 0.4		0 2 TO 0 5	0.2 TO 0.4		0.2 TO 0 5		
	SLUDGE AGE, DAYS							4 to 8		5 TO 15	5 TO 15				
	Recirc. Factor - Maximum RF		0.75	0.75				0.75		1	0.5	0 75	0.75		
- STEP AERATION	AERATION TIME, HOURS - - -		6 TO 8	2				4 to 8			3 TO 5			6 TO 9	
	SPACE LOADING, lbs.BOD5/1000 CFT/DAY.		30 TO 50					20 to 40			20-60	40	40	MAX. 35	
	MLSS CONCENTRATION, mg/L		> 5000					1500-4000			2000-3500	1000-3000	2000-3500	1000-3000	
	LOADING FACTOR (F/M RATIO), lbs.BOD/lbs.MLVSS.d							0.2 to 0 4			0.2 TO 0.6	0.2 TO 0.5	0 2 TO 0 5		
	SLUDGE AGE, DAYS							4 to 8			5 TO 15				
	Recirc Factor - Maximum RF		0.75	0.75				0 75			0.75	0 75	0.75		
- COMPLETE-MIX	AERATION TIME, HOURS - - -							4 to 8			3 TO 5			6 TO 9	
	MLSS CONCENTRATION, mg/L							1500-4000			2000-5000	1000-3000	3000-5000	1000-3000	
	LOADING FACTOR (F/M RATIO), lbs.BOD/lbs.MLVSS.d							0 2 to 0 4			0 2 - 0 6	0.2 TO 0.5	0.2 TO 0.6		
	LOADING FACTOR, lbs.BOD5/100 lbs.MLSS														
	SLUDGE AGE, DAYS							4 to 8			5 TO 15				
	Recirc. Factor - Maximum RF										1		0.75		
- PURE OXYGEN SYSTEM	AERATION TIME, HRS.									2 TO 5	1 2 TO 5				
	SPACE LOADING, lbs.BOD5/1000 CFT/DAY.									100 TO 250	100-250				
	MLSS CONCENTRATION, mg/L									4000-8000	3000-6000				
	LOADING FACTOR (F/M RATIO), lbs.BOD/lbs MLVSS.d									0 25 TO 1	0.5 TO 1 2				
	SLUDGE AGE, DAYS									5 TO 15	8 TO 20				
	Recirc. Factor - Maximum RF									0 5					

SECONDARY TREATMENT - ACTIVATED SLUDGE (continued)

TECHNOLOGY	PARAMETER	10 ST	AZ	CA	CO	CT	IL	IA	KS	ME	MD	MA	MN	NH	NJ
CONTACT - STABILIZATION	CONTACT AERATION TIME, HOURS. -				0.25 TO 0.5				0.5 TO 1				0 5 TO 1.5		
	REAERATION TIME, HRS				2 TO 6				2 TO 6				3 TO 8		
	SPACE LOADING, lbs. BOD5/1000 CFT/DAY.	50			< 75		30 - 50	MAX 50	30 TO 50				50		
	MLSS CONCENTRATION, mg/L	1000-3000						1000-3000							
	- CONTACT, mg/L		1000-3000		2000-4000										
	- REAERATION, mg/L		4000-10000		4000-6000								1000-3000		
	LOADING FACTOR (F/M RATIO), lbs.BOD/lbs.MLVSS d	0.2 - 0.6			0.2-0 5			0.2 TO 0.6					0 2 TO 0 6		
	SLUDGE AGE, DAYS		3.5 - 7					6 TO 15							
	Recirc. Factor - Maximum RF	1.5	1			1.5				1.5		1.5	1.5	1.5	
- EXTENDED AERATION (Oxidation Ditch)	AERATION TIME, HRS -		24		24	20 - 24	24		24	20 - 24		20 - 24		20 TO 24	
	LIQUID DEPTH, FEET								MIN. 3						
	MLSS CONCENTRATION, mg/L	3000-5000	2000-4000		2000-6000			3000-5000					3000-5000		
	LOADING FACTOR, lbs.BOD5/100 lbs.MLSS		5 - 15			5 - 10			5 to 100	5 TO 10		5 TO 10			
	SLUDGE AGE, DAYS		10 or more					20-30							
	Recirc. Factor - Maximum RF	1.5	1			2				2		2		2	
AERATION EQUIPMENT:	Air supply rate ,lbs.O2/lb. BOD5 fed (all except OD) -	1.1 (except ox ditch)			12		1	11							
	AIR REQUIREMENT, cfm/1000 cft of tank										30		20 TO 30		
- DIFFUSED AIR SYSTEM	AIR REQUIREMENT, cft/lb. of BOD removed					*									1000 *
	-HIGH RATE	1500												400-1500	
	-CONVENTIONAL	1500	700-1000			1500			1000	1500		1500		1200-1500	
	-STEP AERATION	1500	500-700			1500			1000	1500		1500		1200-1500	
	-CONTACT STABILIZATION	2000				1500			1500	1500		1500		1200-1500	
	-EXTENDED AERATION		2100			2000			2000	2000		2000		1500-2000	
	-KRAUS SYSTEM		800												
	-MODIFIED AERATION		400-600												
	-COMPLETE MIX SYSTEM								1500						

SECONDARY TREATMENT - ACTIVATED SLUDGE (continued)

TECHNOLOGY	PARAMETER	NM	OK	PA	SD	TN	TX	UT	VI	VA	WA	WV	WI	WY	COMM
- CONTACT - STABILIZATION	CONTACT AERATION TIME, HOURS. -			5				1 to 3		0.5 TO 1.5	0.5 TO 1.5			0.5 TO 3	
	REAERATION TIME, HRS.							3 to 6		3 TO 6	3 TO 6			MIN. 6	
	SPACE LOADING, lbs. BOD5/1000 CFT/DAY.			60			50	50		30 TO 50	30-75	50	50	50	
	MLSS CONCENTRATION, mg/L			1000-3000				2000-4000				1000-3000			
	- CONTACT, mg/L									1000-3000	1000-4000		1000-3000	1000-3000	
	- REAERATION, mg/L									3000-8000	4000-10000		4000-10000	5000-10000	
	LOADING FACTOR (F/M RATIO), lbs.BOD/lbs.MLVSS.d			0.2 TO 0.6				0.2 to 0.6		0.2 TO 0.6	0.2 TO 0.6	0.2 TO 0.6	0.2 TO 0.6		
	SLUDGE AGE, DAYS							3 to 10		5 TO 15	5 TO 15				
	Recirc. Factor - Maximum RF									1	1	1.5	1.5		
- EXTENDED AERATION (Oxidation Ditch)	AERATION TIME, HRS -		25	24				24		24	10-24			MIN. 16	
	LIQUID DEPTH, FEET			MAX. 10											
	MLSS CONCENTRATION, mg/L	3000-6000	> 5000	3000-5000				2000-6000		2000-6000	2000-6000	3000-5000	3000-5000	1000-3000	
	LOADING FACTOR, lbs.BOD5/100 lbs.MLSS		5 TO 10												
	SLUDGE AGE, DAYS									20 TO 30	10 TO 30				
	Recirc. Factor - Maximum RF		1.5	1.5						1.5	1.5	1.5	0.2		
AERATION EQUIPMENT:	Air supply rate ,lbs.O2/lb. BOD5 fed (all except OD) -		1.1	1.1		1.1		1.2		MIN. 1.1		1.1	1.1		
	AIR REQUIREMENT, cfm/1000 cft of tank									20 TO 30					
- DIFFUSED AIR SYSTEM	AIR REQUIREMENT, cft/lb. of BOD removed		1500												*
	-HIGH RATE					400-1500					400-1500	400-1500			
	-CONVENTIONAL			MIN 1500		1500	1800			1500	MIN. 1500	1500			
	-STEP AERATION			MIN. 1500		1500				1500	MIN 1500	1500			
	-CONTACT STABILIZATION			MIN 1500		1500	1800			1500	MIN 1500	1500			
	-EXTENDED AERATION			MIN. 2000		2100	2850			2100	MIN 2100	2600			
	-KRAUS SYSTEM														
	-MODIFIED AERATION														
	-COMPLETE MIX SYSTEM						1800			1500					

TECHNOLOGY	PARAMETER	10 ST	AZ	CA	CO	CT	IL	IA	KS	ME	MD	MA	MN	NH	NJ
SECONDARY SETTLING TANK (SST)	NUMBER OF UNITS		*		*	*	MULTIPLE	*							
	SCUM REMOVAL														
	WEIR LOADING - for average flows, gal/d/ft.	not > 10000	10000		* not > 20000		20000 for <=1 mgd							10000	
	-for larger average flows, gal/d/ft	not > 15000	8000-15000				30000 for > 1 mgd							15000	
	VELOCITY IN WEIR TROUGH, FT/SEC	MIN. 1													
	FREE BOARD, INCH	MIN. 12													
	SIDE WATER DEPTH, FT.-	MIN. 12			MIN.10		MIN. 12	12 *	MIN. 10					10 TO 12	
	-For rectangular tanks, FT														
	-For circular tanks:					10				10		10			
	-Up to a diameter - 40 feet					11				11		11			
	- 40 to 70 feet					12				12		12			
	- 71 to 100					13				13		13			
	- 101 to 140					14				14		14			
	-Greater than 140 feet					15				15		15			
	-FOR FLOW 2 MGD AND LESS														8 TO 10
	-FOR FLOW OVER 2 MGD														10 TO 12
	SURFACE SETTLING RATE, gpd/sq ft-						1000 (peak hourly)								
	-FOR FLOW 2 MGD AND LESS														800
	-FOR FLOW OVER 2 MGD														1000
	AVERAGE SOLIDS LOADING RATE, lbs. solids/d/sq.ft	50						30							
	PEAK HOURLY SOLIDS LOADING RATE, lbs/d/sq.ft						MAX. 50	50							
- SST FOR CONVENTIONAL,	MINIMUM DETENTION TIME, HRS:														
HIGH RATE, STEP AERATION,	For design flows - UPTO 0.5 MGD		3 - 4		3 - 4				3-3 5					3 - 4	
CONTACT STABILIZATION,	- 0 5 TO 1.5 MGD		2.5-4		2 5 - 3 6				2 5-3					2 5-3.6	
EXTENDED AERATION, +	-1.5 MGD AND UP		2-3.6		2 - 3				2-2 5					2 - 3	
HIGH PURITY O2 SYSTEM	AV. SURFACE OVERFLOW RATE, gal/d/sq.ft.					200-800				200-800		200-800			

SECONDARY TREATMENT - ACTIVATED SLUDGE (continued)

TECHNOLOGY	PARAMETER	NM	OK	PA	SD	TN	TX	UT	VI	VA	WA	WV	W	WY	COMM
SECONDARY SETTLING TANK (SST)	NUMBER OF UNITS														*
	SCUM REMOVAL														
	WEIR LOADING - for average flows, gal/d/ft.	10000								10000			10000		*
	- for larger average flows, gal/d/ft	15000				15000				15000					
	VELOCITY IN WEIR TROUGH, FT/SEC	1				MIN. 1									
	FREE BOARD, INCH					MIN. 12									
	SIDE WATER DEPTH, FT.-	min. 12	min. 12					MIN. 12	MIN. 8	MIN. 12					*
	-For rectangular tanks, FT					MIN. 12									
	-For circular tanks:														
	-Up to a diameter - 40 feet					11					12 TO 13				
	- 40 to 70 feet					12					13 TO 14				
	- 71 to 100					13					15 TO 16				
	- 101 to 140					14					15 TO 20				
	- Greater than 140 feet					15					20				
	-FOR FLOW 2 MGD AND LESS														
	-FOR FLOW OVER 2 MGD														
	SURFACE SETTLING RATE, gpd/sq.ft-					800			MAX. 800					600-1200	
	-FOR FLOW 2 MGD AND LESS														
	-FOR FLOW OVER 2 MGD														
	AVERAGE SOLIDS LOADING RATE, lbs. solids/d/sq.ft						50							28	
	PEAK HOURLY SOLIDS LOADING RATE, lbs/d/sq.ft													50	
- SST FOR CONVENTIONAL,	MINIMUM DETENTION TIME, HRS:	1 - 4					1.3 - 2 2								
HIGH RATE, STEP AERATION,	For design flows - UPTO 0.5 MGD														
CONTACT STABILIZATION,	- 0.5 T0 1.5 MGD														
EXTENDED AERATION, +	-1.5 MGD AND UP														
HIGH PURITY O2 SYSTEM	AV. SURFACE OVERFLOW RATE, gal/d/sq ft.		200-800	500-800		400-800	400-700			1000-1200					

SECONDARY TREATMENT - ACTIVATED SLUDGE (continued)

TECHNOLOGY	PARAMETER	10 ST	AZ	CA	CO	CT	IL	IA	KS	ME	MD	MA	MN	NH	NJ
	For design flows upto - 0.5 MGD		440-600		300-600				600					300-700	
	- 0.5 TO 1.5 MGD		700		600-700				700					600-700	
	- 1.5 MGD AND UP		800		700-800				800					700-800	
	PEAK SOR, gal/d/sq.ft -	MAX. 1200	1000			600-1200		1000-1200		600-1200		600-1200	1000-1200	MAX. 1400	
	For flows - UPTO 0.5 MGD								5000						
	- 0.5 T0 1.5 MGD								10000						
	-1.5 MGD AND UP								15000						
	AV. SOLIDS LOADING RATE, gal/d/sq.ft					1 - 30				1 - 30		1 - 30			
	AV. SOLIDS LOADING RATE, lb. solids/day/sq.ft -														
	PEAK SOLIDS LOADING RATE, gal/d/sq.ft					30 - 50				30 - 50		30 - 50			
	PEAK SOLIDS LOADING RATE, lb. solids/day/sq.ft														
SEQUENCING BATCH REACTOR															

SECONDARY TREATMENT - ACTIVATED SLUDGE (continued)

TECHNOLOGY	PARAMETER	NM	OK	PA	SD	TN	TX	UT	VI	VA	WA	WV	WI	WY	COMM
	For design flows upto - 0.5 MGD					600					200-600				
	- 0.5 TO 1.5 MGD					800					300-700				
	- 1.5 MGD AND UP					800					400-800				
	PEAK SOR, gal/d/sq.ft -	1000-1200	800-1200	1000-1200		1000-1200	800-1400	1000-1200				1000-1200	1000-1200		
	For flows - UPTO 0.5 MGD										800-1000				
	- 0.5 T0 1.5 MGD										1000-1200				
	-1.5 MGD AND UP										1200				
	AV. SOLIDS LOADING RATE, gal/d/sq.ft					25-30							28 8-33 6		
	AV. SOLIDS LOADING RATE, lb. solids/day/sq.ft -		20 - 35	30-40		30-35				4 8-24	25				
	PEAK SOLIDS LOADING RATE, gal/d/sq.ft					50							48		
	PEAK SOLIDS LOADING RATE, lb. solids/day/sq.ft		50	50		50	50			33 6	40				
SEQUENCING BATCH REACTOR						*									*

Ponds and Lagoons

Table 2-5 presents the summary of state regulatory design criteria for pond and lagoon systems. 22 states plus the 10-State Standard states provided data on regulations that apply to pond and lagoon systems. Arizona, California, Minnesota, and New Jersey reported no regulations. Major categories of ponds and lagoons consist of stabilization ponds (subcategorized into primary cells and total pond), aerated ponds systems, and aerated facultative lagoons. Key parameters typically regulated consist of surface loading rate, design loading, water depth, detention time, and the physical dimension of the pond and dike.

For those states reporting regulations concerning stabilization ponds, most states have the same design parameters. The only parameter that varies significantly is the length to width ratio (New Mexico = 3:1, Virginia = 10:1).

For those states reporting regulations concerning aerated ponds systems, most states regulate the minimum dissolved oxygen, total detention time, and water depth. The only major difference between states is between Colorado and other reporting states on the parameter of total detention time. Colorado regulates detention time from 10 to 25 days, whereas other states (e.g., Maine) require 0.5 to 5 days.

Table 2-5 SECONDARY TREATMENT - PONDS AND LAGOONS

TECHNOLOGY	PARAMETER	10 ST	AZ	CA	CO	CT	IL	IA	KS	ME	MD	MA	MN	NH	NJ
- LAGOONS							*								
	NO. OF PONDS						MIN 2								
	DISTNCE FROM HABITATION, MILE	MIN. 0.25													
	DISTANCE BETWEEN BOTTOM OF POND AND MAXIMUM GROUND WATER LEVEL, FEET	MIN. 4													
	FREE BOARD, FEET	3 *					MIN. 3	MIN. 2			-				
- STABILIZATION PONDS (SP)	CAPACITY -				*						1 acre/200 population			*	
	--MIN. AREA, ACRE														
	--MAX. AREA, ACRE														
- SP-PRIMARY CELLS	SURFACE LOADING RATE, lb of BOD5/1000 sq.ft/d	0.34 - 0.8			MAX. 0.5	0.804		0 46 TO 0.56	0.782	0.804	0.184	0.804		0.34 TO 0 8	
	DESIGN LOADING, lbs. BOD/ac-ft/day								68.4-136.8 (anaerobic)						
	DEPTH, FT							MAX. 6	upto 5 (anaerobic= 10 to 20)						
	MINIMUM STORAGE TIME, DAYS							30	120 (> 5 days for anaerobic)						
- SP - TOTAL POND															
	DESIGN LOADING, lbs. BOD/ac-ft/day	*						0 575							
	LENGTH TO WIDTH RATIO,				not > 3		3 01	NOT >3							
	MINIMUM WATER DEPTH, FT.	2				3	2	2		3	3	3		3	
	MAXIMUM WATER DEPTH, FT.	6			5	5	not < 5			5	5	5		5	
	MINIMUM FREE BOARD, FT				3	2		2		2		2		3	
	DETENTION TIME, DAYS				180			180			MIN 60				
	TOP WIDTH OF THE DIKE, FT.	8			MIN. 8	MIN. 12	MIN. 8	MIN. 8		MIN. 12	10	MIN. 12		min. 8	
	DIKE SLOPES-										3.1 TO 4 1				
	-VERTICALLY, NOT STEEPER THAN (inner & outer)	1 V:3 H			3 - 1	3 - 1	1 V .3 H	3 H · 1 V	3 5:1(outer)	3 TO 1		3 TO 1		3 H 1	
	-VERTICALLY, NOT FLATTER THAN (inner)	1 V · 4 H			6 - 1		1 V 4 H	4 H 1 V	25 · 1					4 H 1	
	EXTERIOR SLOPES					MIN 2 - 1				MIN 2 TO 1		MIN 2 TO 1			

SECONDARY TREATMENT - PONDS AND LAGOONS (continued)

TECHNOLOGY	PARAMETER	NM	OK	PA	SD	TN	TX	UT	VI	VA	WA	WV	WI	WY	COMM
- LAGOONS											*				*
	NO. OF PONDS	min. 2	2		multiple	MIN. 3	multiple				MIN. 3		2		
	DISTNCE FROM HABITATION, MILE				0.5(min .25)			1-4	300 FT	1.5				500 FT	
	DISTANCE BETWEEN BOTTOM OF POND AND MAXIMUM GROUND WATER LEVEL, FEET		MIN. 4		min. 4 (10 above rock)					MIN. 2					
	FREE BOARD, FEET		3		min. 3	min. 1	2 to 3			MIN 2					*
- STABILIZATION PONDS (SP)	CAPACITY -			Max 40 acres per pond. Pond sys min 3 cells to facilitate											*
	--MIN. AREA, ACRE					0.5					0.5				
	--MAX. AREA, ACRE					4 0					40				
- SP-PRIMARY CELLS	SURFACE LOADING RATE, lb of BOD5/1000 sq.ft/d			0.34 TO 0.8	MAX. 0 69			0 4 TO 0.8		0.69		0 782	0.46	MAX. 0 92	
	DESIGN LOADING, lbs. BOD/ac-ft/day					MAX. 50					MAX. 50				
	DEPTH, FT				5	MAX. 6 *				4	3 TO 5				*
	MINIMUM STORAGE TIME, DAYS				180										
- SP - TOTAL POND															
	DESIGN LOADING, lbs. BOD/ac-ft/day					MAX. 30	max. 75				MAX. 20				*
	LENGTH TO WIDTH RATIO,	3:01				NOT > 3				10:01				MAX 5 : 1	
	MINIMUM WATER DEPTH, FT.	3		2	2		norm= 3 to 5		2			3.5	2	2	
	MAXIMUM WATER DEPTH, FT.	5	6		6				5			5	6	6	
	MINIMUM FREE BOARD, FT	3		3				3				MIN. 3	3	2	
	DETENTION TIME, DAYS			90 - 120 *				120(summer =60)		MIN. 45			150 (facultative)	MIN. 180	*
	TOP WIDTH OF THE DIKE, FT.		MIN. 8	10	min. 8	MIN. 12	min. 10	MIN 8	MIN. 6	MIN 8	min. 12	MIN. 8	MIN 12	min. 8	
	DIKE SLOPES-														
	-VERTICALLY, NOT STEEPER THAN (inner & outer)		1 V : 3 H	3 H . 1 V	1 V : 3 H	3H.1V-inner	1 V : 3 H	1 04	3 TO 5 : 1	3 H 1 V	3H·1V-inner	1V · 2H	MIN 3 H 1	≥2H:1V	
	-VERTICALLY, NOT FLATTER THAN (inner)		1 V : 4 H	4 H · 1 V	1 V 6 H					3 H 1 V		1V : 4H	MIN 4 H 1		
	EXTERIOR SLOPES							1·03			2H 1 V			≥3 H 1 V	

SECONDARY TREATMENT - PONDS AND LAGOONS (continued)

TECHNOLOGY	PARAMETER	10 ST	AZ	CA	CO	CT	IL	IA	KS	ME	MD	MA	MN	NH	NJ
AERATED POND SYSTEM (APS)				*		*		*					*		
	SURFACE LOADING RATE, lbs. BOD5/acre-foot/day													150	
	VOLUMETRIC LOADING RATE, lbs. BOD5/1000 cft						Max. 0.5 for 1st cell		upto 30					0 75	
	MIN. D.O. TO BE MAINTAINED, mg/L	2			2	2				2		2		2	
	TOTAL DETENTION TIME (HRT), DAYS				10 - 25	0.5 - 5.0			1 to 5	0 5 TO 5 0		0.5 TO 5.0			
	WATER DEPTH, FT-	*				10 - 15				10 TO 15		10 TO 15			
	-MINIMUM WATER DEPTH, FT	2												10	
	-NORMAL WATER DEPTH, FT	10 - 15							10 TO 12					15	
	LENGTH TO WIDTH RATIO														
	MIN. NUMBER OF CELLS REQUIRED	3			3										
	MAX. SIZE OF A POND, ACRES	40													
	MIN. NUMBER OF SETTLING BASINS					2				2		2			
APS-ADDITIONAL POND	DETENTION PERIOD, DAYS				2 - 5										
AERATED FACULTATIVE LAGOON								*							
	DETENTION TIME (HRT), DAYS					20-30			5 to 20	20-30	MIN.30	20-30			
	ORGANIC LOADING, lbs. of BOD5/1000 cft								0 5		0.46				
	VOLUME FOR SLUDGE STORAGE, %					10				10		10			
	WATER DEPTH, FT.							10 TO 15	5 TO 12		MAX 15				
	FREE BOARD, FT							MIN 2			1-4				
	OXYGEN REQUIREMENT, lbs of O2/lb. of BOD5 applied					2 - 3		MIN. 2		2 TO 3		2 TO 3			
	MINIMUM D.O. LEVEL, mg/L					2		2		2		2			

SECONDARY TREATMENT - PONDS AND LAGOONS (continued)

TECHNOLOGY	PARAMETER	NM	OK	PA	SD	TN	TX	UT	VI	VA	WA	WV	WI	WY	COMM
AERATED POND SYSTEM (APS)									min. 2 ponds					*	
	SURFACE LOADING RATE, lbs. BOD5/acre-foot/day														
	VOLUMETRIC LOADING RATE, lbs. BOD5/1000 cft													MAX 10	
	MIN. D.O. TO BE MAINTAINED, mg/L	2		MIN 2	2			2		2		2			
	TOTAL DETENTION TIME (HRT), DAYS														
	WATER DEPTH, FT-									6 TO 15		6 TO 15		4 TO 15	*
	-MINIMUM WATER DEPTH, FT.-					7					7		6		
	-NORMAL WATER DEPTH, FT-												MAX 15		
	LENGTH TO WIDTH RATIO					NOT >3									
	MIN. NUMBER OF CELLS REQUIRED			3											
	MAX. SIZE OF A POND, ACRES														
	MIN. NUMBER OF SETTLING BASINS														
- APS-ADDITIONAL POND	DETENTION PERIOD, DAYS													1 TO 15	
AERATED FACULTATIVE LAGOON															*
	DETENTION TIME (HRT), DAYS														
	ORGANIC LOADING, lbs. of BOD5/1000 cft														
	VOLUME FOR SLUDGE STORAGE, %														
	WATER DEPTH, FT.			10 TO 15											
	FREE BOARD, FT			3											
	OXYGEN REQUIREMENT, lbs of O2/lb. of BOD5 applied						1 6								
	MINIMUM D.O. LEVEL, mg/L														

DISINFECTION

Table 2-6 presents the summary of state regulatory design criteria for disinfection. 22 states reported regulatory data pertaining to disinfection. The 10-State Standard states and California, Minnesota, South Dakota, and West Virginia reported no regulations. The sole disinfection category considered is chlorination. Key parameters typically regulated consist of contact time and dosing capacity for a multitude of conditions (e.g., raw sewage, primary sedimentation effluent, trickling filter plant effluent, etc.). For those states that regulate the same parameters, there is close consensus on values.

Table 2-6 DISINFECTION

TECHNOLOGY	PARAMETER	10 ST	AZ	CA	CO	CT	IL	IA	KS	ME	MD	MA	MN	NH	NJ
CHLORINATION	CONTACT TIME AT DESIGN FLOW, MIN				*	*			MIN. 30						MIN. 30
	CONTACT TIME AT PEAK HOURLY FLOW, MIN				30	15 *	MIN. 15		MIN. 15	15	MIN. 30	15		MIN. 15	NOT < 20
	FREE CHLORINE RESIDUAL IN FINAL EFFLUENT, PPM								MAX 0 5						2
	DOSING CAPACITY (BASED ON DESIGN AV. FLOW), PPM										15				
	- FOR RAW SEWAGE														30
	- FOR PRIMARY SEDIMENTATION EFFLUENT						20	15							20
	- FOR TRICKLING FLITER PLANT EFFLUENT (TFE)		15				10	10							15
	- FOR TFE + STABILIZATION PLANT EFFLUENT														
	- FOR WASTE STABILIZATION POND														
	- FOR ACTIVATED SLUDGE PLANT EFFLUENT		8				6 w/chem=4	8							10
	- FOR ACTIVATED SLUDGE RETURN														
	- FOR SAND FILTER EFFLUENT		6				10								10
	- FOR TERTIARY FILTRATION EFFLUENT							6							
	- FOR NITRIFIED EFFLUENT							6							
	-FOR STABILIZATION POND EFFLUENT						20								
	-FOR PHYSICAL CHEM EFFLUENT		10												
	DOSING CAPACITY (BASED ON PEAK FLOW), PPM														
	- FOR RAW SEWAGE														
	- FOR PRIMARY SEDIMENTATION EFFLUENT														
	- FOR TRICKLING FLITER PLANT EFFLUENT (TFE)														

DISINFECTION (continued)

TECHNOLOGY	PARAMETER	NM	OK	PA	SD	TN	TX	UT	VI	VA	WA	WV	W	WY	COMM
CHLORINATION	CONTACT TIME AT DESIGN FLOW, MIN.			30		min 30		60		30	MIN. 60		60		*
	CONTACT TIME AT PEAK HOURLY FLOW, MIN	MIN. 15		15		min.15	20	30		20	MIN. 20		30	15	
	FREE CHLORINE RESIDUAL IN FINAL EFFLUENT, PPM														
	DOSING CAPACITY (BASED ON DESIGN AV. FLOW), PPM														
	- FOR RAW SEWAGE					20-25									
	- FOR PRIMARY SEDIMENTATION EFFLUENT								20 TO 25						
	- FOR TRICKLING FLITER PLANT EFFLUENT (TFE)		10			3 TO 15			15						
	- FOR TFE + STABILIZATION PLANT EFFLUENT			15											
	- FOR WASTE STABILIZATION POND			15											
	- FOR ACTIVATED SLUDGE PLANT EFFLUENT		8	8		2 TO 8			8						
	- FOR ACTIVATED SLUDGE RETURN					5 TO 10			6						
	- FOR SAND FILTER EFFLUENT														
	- FOR TERTIARY FILTRATION EFFLUENT		6	6		1 TO 6									
	- FOR NITRIFIED EFFLUENT		6	6		2 TO 6									
	- FOR STABILIZATION POND EFFLUENT					upto 35									
	- FOR PHYSICAL CHEM EFFLUENT														
	DOSING CAPACITY (BASED ON PEAK FLOW), PPM														
	- FOR RAW SEWAGE										20-25				
	- FOR PRIMARY SEDIMENTATION EFFLUENT										5 TO 20				
	- FOR TRICKLING FLITER PLANT EFFLUENT (TFE)										6 TO 15				

SLUDGE TREATMENT AND MANAGEMENT

Table 2-7 presents the summary of state regulatory design criteria for sludge treatment and management. 22 states plus the 10-State Standard states provided data on regulations that apply to sludge treatment and management. Major categories consist of Imhoff tanks, anaerobic digestion, aerobic digestion, heat conditioning, composting, sludge thickening (gravity thickening and dissolved air flotation), and sludge dewatering (vacuum filtration, sludge drying and incineration, sludge drying beds, and shallow sludge lagoons). Key parameters typically regulated include solids loading rate, side water depth, and physical dimensions of a specific technology.

For those states reporting regulations concerning anaerobic digestion, most states specify the number of units required (usually multiple), volatile matter in digested sludge (usually 40-50%), loading rate, side water depth, and bottom slopes of the tanks (all reporting states have the same slopes). The only parameter with a slight discrepancy between states is the loading rates associated with completely mixed and moderately mixed systems.

For those states with regulations concerning aerobic digestion, most states report on the number of units required (usually multiple), volatile solids loading (usually the maximum being 100 pounds/1000 cft/day), solids retention time, the minimum dissolved oxygen to be maintained, and an oxygen requirement (usually minimum of 30 cfm of O_2/1000 cft of tank). The major discrepancies between states are located in the volatile solids loading rate. Tennessee and Virginia both range the loading rate from 100 to 200 lbs/1000 cft/day, while the rest of the states reporting regulations limit the rate to 100 lbs/1000 cft/day.

Only four states reported regulations on heat conditioning: Arizona, Connecticut, Maine, and Massachusetts. Connecticut, Maine, and Massachusetts all report the same regulations for the temperature of the liquid sludge (300-500°F), and pressure (150-400 psi). Arizona limits the temperature to 65-350°F and the pressure to 120-350 psi.

For those states reporting regulations concerning gravity thickening, most states limit the solids loading rate for the different types of sludge, the hydraulic loading, and the side water depth. All reporting states are in close agreement.

For those states reporting regulations concerning dissolved air flotation, most states specify the solids loading rate, the hydraulic loading, and the percentage of floatable solids. All reporting states are in close agreement.

The subtopic of sludge dewatering is broken down further into four groups: vacuum filtration, sludge drying and incineration, sludge drying beds, and shallow (sludge) lagoons.

Six states report regulations concerning vacuum filtration (Connecticut, Maine, Massachusetts, New Hampshire, Pennsylvania, and Virginia). Connecticut, Maine, Massachusetts, Pennsylvania, and Virginia all report regulations concerning the rate of filtration. Connecticut, Maine, and Massachusetts all list the same requirements for the same parameters within fresh solids and digested solids (from primary treatment, primary

& trickling filter, and primary & activated sludge). Virginia only reported on regulations for fresh solids from the same three parameters as the previous states. New Hampshire's only reported regulation concerning vacuum filtration is the capacity of sludge holding tanks.

For those states reporting regulations on sludge drying beds, most states specify the area consideration, and the specific dimensions and components of the bed. The parameter of area consideration (or area requirements) is broken down further into many types of beds and sludges that are regulated usually by only one or two states for a specific sludge or bed type. Concerning the specific dimensions and components of the beds, most reporting states agree with each other in their individual regulations.

Three states reported regulations concerning shallow (sludge) lagoons, Iowa, Maryland, and Oklahoma. All regulations are printed in the comment section of the table. Each state regulates a different aspect of shallow lagoons.

Table 2-7 SLUDGE TREATMENT AND MANAGEMENT

TECHNOLOGY	PARAMETER	10 ST	AZ	CA	CO	CT	IL	IA	KS	ME	MD	MA	MN	NH	NJ
IMHOFF TANKS															*
ANAEROBIC DIGESTION							*								
	MINIMUM NO. OF UNITS	*					Multiple	Multiple	Multiple		1/1 MGD			Multiple	2 OR MORE *
	VOLATILE MATTER IN DIGESTED SLUDGE, %	40 - 50				40 - 50	40 - 50	40-50		40-50		40-50			
	CAPACITY, MIN. CFT/CAPITA -FOR PRIMARY + STANDARD FILTER													4	2.5 TO 3
	- MODERATELY MIXED SYSTEM								4 TO 5						
	- COMPLETELY MIXED SYSTEM								2.7 TO 3.3						
	- FOR PRIMARY+HIGH RATE FILTER													5	3 TO 4
	- FOR CHEMICAL COAGULATION													6	4 TO 6
	- FOR ACTIVATED SLUDGE													6	4 TO 6
	- FOR ACTIVATED SLUDGE, HEATED										5 TO 6				
	- FOR ACTIVATED SLUDGE, UNHEATED										8 TO 12				
	- FOR PRIMARY + ACT. SLUDGE														
	- - MODERATELY MIXED SYSTEM								4 TO 6						
	- - COMPLETELY MIXED SYSTEM								2.7 TO 4						
	LOADING RATE, lbs of volatile solids/1000 cft/day:													max. 30	
	-FOR COMPLETELY MIXED SYSTEM	80	MAX. 80			120	MAX. 80	max. 80	100-400	120	80	120		400	
	-FOR MODERATELY MIXED SYSTEM	40	MAX. 40			40	MAX. 40	max 40	40-100	40	MAX 40	40			
	LOADING RATE, lbs VS destroyed/cft/day														
	- completely mixed		0 1 - 0 2												
	- unmixed		0.02 - 0 05												
	SIDE WATER DEPTH, FT	MIN 20				MIN. 20	MIN 20	min. 20	min 6	MIN 20	15	MIN. 20			
	side water depth for 60 ft dia. digester														
	side water depth for 100 ft dia. digester														
	FREE BOARD, FT										1 TO 2				

SLUDGE TREATMENT AND MANAGEMENT (continued)

TECHNOLOGY	PARAMETER	NM	OK	PA	SD	TN	TX	UT	VI	VA	WA	WV	W	WY	COMM
IMHOFF TANKS															*
ANAEROBIC DIGESTION															*
	MINIMUM NO. OF UNITS	multiple	multiple	*		multiple		multiple	multiple	multiple		multiple		2 or more	*
	VOLATILE MATTER IN DIGESTED SLUDGE, %			40 TO 50											
	CAPACITY, MIN. CFT/CAPITA -FOR PRIMARY + STANDARD FILTER		5(heated=4)												
	- MODERATELY MIXED SYSTEM					4 TO 5									
	- COMPLETELY MIXED SYSTEM					2.7-3.3									
	- FOR PRIMARY+HIGH RATE FILTER		5.5 (heated = 4)												
	- FOR CHEMICAL COAGULATION														
	- FOR ACTIVATED SLUDGE								4 TO 6						
	- FOR ACTIVATED SLUDGE, HEATED		4				29.5 cft/lb BOD/day								
	- FOR ACTIVATED SLUDGE, UNHEATED		6				44 0 cft/lb BOD/day								
	- FOR PRIMARY + ACT. SLUDGE														
	- - MODERATELY MIXED SYSTEM					4 TO 6									
	- - COMPLETELY MIXED SYSTEM					2.7 TO 4									
	LOADING RATE, lbs of volatile solids/1000 cft/day:														
	- FOR COMPLETELY MIXED SYSTEM		max. 80	MAX 100		150-400		120		MAX 200		max 80	80	300(heated)	
	- FOR MODERATELY MIXED SYSTEM		max. 40	MAX. 50		UPTO 40		40		MAX 40		max 40	40	100(heated)	
	LOADING RATE, lbs VS destroyed/cft/day														
	- completely mixed														
	- unmixed														
	SIDE WATER DEPTH, FT	min. 20	min. 20	MIN 20				min. 20		min. 6		min. 10	MIN. 20		
	side water depth for 60 ft dia. digester					1/2 the dia									
	side water depth for 100 ft dia. digester					1/3 the dia									
	FREE BOARD, FT														

SLUDGE TREATMENT AND MANAGEMENT (continued)

TECHNOLOGY	PARAMETER	10 ST	AZ	CA	CO	CT	IL	IA	KS	ME	MD	MA	MN	NH	NJ
	BOTTOM SLOPES OF THE TANKS:														
	-w/suction mechanism for withdrawal of sludge	MIN. 1:12				MIN. 1 TO 12	MIN. 1:12	1:12	min. 1V : 12H	MIN. 1 TO 12	1V TO 12 H	MIN. 1 TO 12			
	-where sludge is removed by gravity alone	1·04				1 - 4	1 - 4	1:04	min. 1V : 4H	1 TO 4	1V TO 4H	1 TO 4		1·04	
	DETENTION TIME, DAYS-														
	- FOR HIGH RATE DIGESTER		10 - 15								MIN. 20				
	- FOR STANDARD-RATE DIGESTER		30-90								MIN. 30				
	VOLATILE SOLIDS REDUCTION, %														
	- FOR HIGH RATE DIGESTER		50												
	- FOR STANDARD RATE DIGESTER		50-70												
	SOLIDS RETENTION TIME, DAYS-														
	- FOR COMPLETELY MIXED SYSTEM								10 TO 20						
	- FOR MODERATELY MIXED SYSTEM								30 TO 60						
	- FOR MULTISTAGE SYSTEM														
AEROBIC DIGESTION	NUMBER OF UNITS	*	Multiple				Multiple	Multiple						*	
	VOLATILE SOLIDS LOADING, lbs/1000 cft/day	MAX. 100				100		max. 100		100		100			
	SOLIDS RETENTION TIME, DAYS:	*									MIN. 15				
	- FOR PRIMARY SLUDGE	MIN. 20				20				20		20			
	- FOR PRIMARY SLUDGE + WASTE ACTIVATED SLUDGE	MIN. 20				20		20		20		20			
	- FOR WASTE ACTIVATED SLUDGE	MIN. 15				15		15		15		15			
	MINIMUM D.O. TO BE MAINTAINED, mg/L					1 - 2	2	1		1 TO 2	>1	1 TO 2			
	OXYGEN REQUIREMENT, cfm of O2/1000 cft of tank					30	MIN. 30	30		30	MIN 30	30			
HEAT CONDITIONING	TEMP. OF LIQUID SLUDGE, °F		65-350			300-500				300-500		300-500			
	PRESSURE, PSI		120-350			150-400				150-400		150-400			
COMPOSTING															
SLUDGE THICKENING		*													

SLUDGE TREATMENT AND MANAGEMENT (continued)

TECHNOLOGY	PARAMETER	NM	OK	PA	SD	TN	TX	UT	VI	VA	WA	WV	WI	WY	COMM
	BOTTOM SLOPES OF THE TANKS:					1/12 - 1/4									
	-w/suction mechanism for withdrawal of sludge		MIN. 1:12	1:12											
	-where sludge is removed by gravity alone		1 to 4	1:04											
	DETENTION TIME, DAYS-									min. 15			MIN. 15		
	- FOR HIGH RATE DIGESTER														
	- FOR STANDARD-RATE DIGESTER														
	VOLATILE SOLIDS REDUCTION, %														
	- FOR HIGH RATE DIGESTER														
	- FOR STANDARD RATE DIGESTER														
	SOLIDS RETENTION TIME, DAYS-						MIN. 30								
	- FOR COMPLETELY MIXED SYSTEM			MIN. 15										10 (heated)	
	- FOR MODERATELYMIXED SYSTEM			MIN. 30										30 (heated)	
	- FOR MULTISTAGE SYSTEM														
AEROBIC DIGESTION	NUMBER OF UNITS	multiple ★		★		★	★			multiple					★
	VOLATILE SOLIDS LOADING, lbs/1000 cft/day		MAX. 100	MAX. 100 ★		100 - 200				100-200		max. 100	MAX. 100		★
	SOLIDS RETENTION TIME, DAYS:		MIN. 40 ★	★			MIN. 15 ★								★
	- FOR PRIMARY SLUDGE												min. 20	30	
	- FOR PRIMARY SLUDGE + WASTE ACTIVATED SLUDGE			MIN. 20								min. 20	min. 20		
	- FOR WASTE ACTIVATED SLUDGE			MIN. 15								min. 15	min 15	20	
	MINIMUM D.O. TO BE MAINTAINED, mg/L	1 TO 2	1 to 2	1 TO 2		1(2 desired)				2			1	2	
	OXYGEN REQUIREMENT, cfm of O2/1000 cft of tank		min. 30	MIN. 25			min. 30 ★					min. 30	★		★
HEAT CONDITIONING	TEMP. OF LIQUID SLUDGE, °F														
	PRESSURE, PSI														
COMPOSTING						★									★
SLUDGE THICKENING				★											★

SLUDGE TREATMENT AND MANAGEMENT (continued)

TECHNOLOGY	PARAMETER	10 ST	AZ	CA	CO	CT	IL	IA	KS	ME	MD	MA	MN	NH	NJ
- GRAVITY THICKENING	SOLIDS LOADING RATE, lbs/day/sq.ft:														
	- FOR PRIMARY SLUDGE		22 (20-30)			20-30 (8-10)				20-30 (8-10)	20	20-30 (8-10)			
	- FOR TF SLUDGE		9 (8-10)			8-10 (7-9)				8-10 (7-9)		8-10 (7-9)			
	- FOR ACTIVATED SLUDGE					4-8 (2 5-3)				4-8 (2.5-3)	4	4-8 (2 5-3)			
	- - for air system		4 (4-12)												
	- -for pure Oxygen system		5												
	- FOR ACTIVATED SLUDGE Physical & Chemical W/Lime, Alum, or Iron		5 - 30												
	- FOR PRIMARY AND TF SLUDGE		15 (12-20)			10-12 (7-9)				10-12 (7-9)		10-12 (7-9)			
	- FOR PRIMARY & ACT. SLUDGE		10 (6-16)			6-10 (3-6)				6-10 (3-6)	8	6-10 (3-6)			
	HYDRAULIC LOADING, gpd/sq.ft					400-800				400-800	MAX. 900	400-800			
	DIAMETER OF THE THICKENER, FT														
	SIDE WATER DEPTH, FT					10 - 14				10 TO 14		10 TO 14			
	FREE BOARD, FT														
- DISSOLVED AIR FLOTATION	SOLIDS CONCENTRATION, PPM		MAX. 15000												
	SOLIDS LOADING RATE (SLR), lb/sq.ft/day										72 TO 96				
	SLR WITH and WITHOUT POLYMER, lb./sq.ft/day					20-50				20-50		20-50			
	- PRIMARY SLUDGE ONLY		upto 156												
	- WASTE ACTIVATED SLUDGE - - WITH AIR		36 (29-60)												
	- WASTE ACTIVATED SLUDGE - - WITH OXYGEN														
	- TRICKLING FILTER SLUDGE														
	- PRIMARY + WASTE ACTIVATED SLUDGE (AIR)		84 (60-108)												
	- PRIMARY + TRICKLING FILTER SLUDGE														
	HYDRAULIC LOADING, gpm/sq.ft	2 (1.25-1.75)			UP TO 0 8				UP TO 0 8	1	UP TO 0 8				
	HYDRAULIC LOADING WITH POLYMER, GPM/SQ.FT														

SLUDGE TREATMENT AND MANAGEMENT (continued)

TECHNOLOGY	PARAMETER	NM	OK	PA	SD	TN	TX	UT	VI	VA	WA	WV	W	WY	COMM
- GRAVITY THICKENING	SOLIDS LOADING RATE, lbs/day/sq.ft			5 to 12											
	- FOR PRIMARY SLUDGE		20 TO 30			20-30		20 to 30						24(digested (prim. = 20)	
	- FOR TF SLUDGE		8 TO 10			8 TO 10		8 to 10							
	- FOR ACTIVATED SLUDGE					5 TO 6		4 to 8							
	- - for air system		4 TO 8												
	- - for pure Oxygen system		5 TO 10												
	- FOR ACTIVATED SLUDGE Physical & Chemical W/Lime, Alum, or Iron													60(prim.+ lime=20)	
	- FOR PRIMARY AND TF SLUDGE		12 TO 20			10 TO 12		10 to 12							
	- FOR PRIMARY AND ACT. SLUDGE		8 TO 16			6 TO 10		6 to 12							
	HYDRAULIC LOADING, gpd/sq.ft		600-800 (MIN. 400)	400-800		500-800 ★				400-800				400-800	★
	DIAMETER OF THE THICKENER, FT					MAX. 80 ★									★
	SIDE WATER DEPTH, FT.							10 to 14		min. 10					
	FREE BOARD, FT					MIN. 2									
- DISSOLVED AIR FLOTATION	SOLIDS CONCENTRATION, PPM														
	SOLIDS LOADING RATE (SLR), lb/sq.ft/day:							20-30 (no polymer)							
	SLR WITH and WITHOUT POLYMER, lb./sq.ft/day			20 - 40				0 8						(w/alum=12)	
	- PRIMARY SLUDGE ONLY		UPTO 53			w/19.92-30 w/o 60									
	- WASTE ACTIVATED SLUDGE - - WITH AIR		5-15 (mixed liquor)			w/10.08 w/o 48								w/48 w/o 12	
	- WASTE ACTIVATED SLUDGE - - WITH OXYGEN		12 - 30			w/14.4-19 2 w/o 52.8									
	- TRICKLING FILTER SLUDGE					w/14.4-19.2 w/o 48									
	- PRIMARY + WASTE ACTIVATED SLUDGE (AIR)		20 - 40			w/14.4-30 w/o 48									
	- PRIMARY + TRICKLING FILTER SLUDGE					w/19.92-30 w/o 60									
	HYDRAULIC LOADING, gpm/sq.ft			0 8											
	HYDRAULIC LOADING WITH POLYMER, GPM/SQ.FT					2 5									

TECHNOLOGY	PARAMETER	10 ST	AZ	CA	CO	CT	IL	IA	KS	ME	MD	MA	MN	NH	NJ
	% FLOAT SOLIDS					3.5 - 5.0				3 5 TO 5 0		3.5 TO 5 0			
	AIR/SOLIDS RATIO		0 02								0 005 - 0 06				
	RECIRCULATION RATIO, %		200-250								200				
SLUDGE DEWATERING															
- VACUUM FILTRATION															*
	RATE OF FILTRATION, lbs of dry solids/sq.ft/year														
	FOR FRESH SOLIDS FROM-														
	- PRIMARY TREATMENT					4 - 8				4 TO 8		4 TO 8			
	- PRIMARY & TRICKLING FILTER					3 - 6				3 TO 6		3 TO 6			
	- PRIMARY & ACTIVATED SLUDGE					3 - 4				3 TO 4		3 TO 4			
	FOR DIGESTED SOLIDS FROM-														
	- PRIMARY TREATMENT					4 - 6				4 TO 6		4 TO 6			
	- PRIMARY & TRICKLING FILTER					3 - 5				3 TO 5		3 TO 5			
	- PRIMARY & ACTIVATED SLUDGE					3 - 4				3 TO 4		3 TO 4			
	- ACTIVATED SLUDGE														
	-CHEMICALLY PRECIPITATED														
	CAPACITY SLUDGE HOLDING TANKS, CFT/CAPITA													2	
- SLUDGE DRYING AND INCINERATION			*												
- SLUDGE DRYING BEDS															*
	AREA REQUIREMENTS, sq ft/capita	2 *				1 - 2 *			*	1 TO 2		1 TO 2			
	- PRIMARY TREATMENT							2						1	1.5
	- PRIMARY DIGESTED SLUDGE (PDS), OPEN BEDS										1 0 TO 1 5				
	- PDS, OPEN BEDS, solids,lb /sqft/yr														
	- - ALL TYPES OF SLUDGE		2.2 - 2 4												
	- PRIMARY DIGESTED SLUDGE, COVERED BEDS										0 75 TO 1 0				*

SLUDGE TREATMENT AND MANAGEMENT (continued)

TECHNOLOGY	PARAMETER	NM	OK	PA	SD	TN	TX	UT	VI	VA	WA	WV	W	WY	COMM
	% FLOAT SOLIDS														
	AIR/SOLIDS RATIO									0.02 - 0.04					
	RECIRCULATION RATIO, %														
SLUDGE DEWATERING															
- VACUUM FILTRATION				*											*
	RATE OF FILTRATION, lbs of dry solids/sq.ft/year			3 TO 5											
	FOR FRESH SOLIDS FROM-														
	- PRIMARY TREATMENT									4 TO 6					
	- PRIMARY & TRICKLING FILTER									3 TO 5					
	- PRIMARY & ACTIVATED SLUDGE									3 TO 4					
	FOR DIGESTED SOLIDS FROM-														
	- PRIMARY TREATMENT														
	- PRIMARY & TRICKLING FILTER														
	- PRIMARY & ACTIVATED SLUDGE														
	- ACTIVATED SLUDGE														
	-CHEMICALLY PRECIPITATED														
	CAPACITY SLUDGE HOLDING TANKS, CFT/CAPITA														
- SLUDGE DRYING AND INCINERATION															*
- SLUDGE DRYING BEDS															*
	AREA REQUIREMENTS, sq.ft/capita		*	1.5 TO 2 *											*
	- PRIMARY TREATMENT								0.5 TO 0.75			2	MIN. 2		
	- PRIMARY DIGESTED SLUDGE (PDS), OPEN BEDS		1 TO 1.5			1 TO 1.5									
	- PDS, OPEN BEDS, solids, lb./sq/ft/yr		25 TO 40			27 5				15					
	- - ALL TYPES OF SLUDGE												MIN 1		
	- PRIMARY DIGESTED SLUDGE, COVERED BEDS					0 75 to 1									*

SLUDGE TREATMENT AND MANAGEMENT (continued)

TECHNOLOGY	PARAMETER	10 ST	AZ	CA	CO	CT	IL	IA	KS	ME	MD	MA	MN	NH	NJ
	- DIGESTED PRIMARY (DP)+ HUMUS SLUDGE, OPEN BEDS										1.25 TO 1.75				
	- DIGESTED PRIMARY + HUMUS SLUDGE, COVERED BEDS										1.0 TO 1 25				
	- STANDARD RATE FILTER													1.25	1 75
	- HIGH RATE FILTER														1.75
	- ATTACHED GROWTH, open beds														
	- ATTACHED GROWTH, covered beds														
	- Attached growth, open beds, solids, lb/sq.ft/year														
	- SUSPENDED GROWTH, open beds														
	- Suspended growth, open beds solids, lb/sq.ft/year														
	- Suspended growth, covered beds														
	- ACTIVATED SLUDGE													1.5	2
	- DP + ACTIVATED SLUDGE, OPEN BEDS										1 75 TO 2 5				
	- DP + ACTIVATED SLUDGE, COVERED BEDS										1 25 TO 1 5				
	- DP + CHEMICALLY PPT SLUDGE, OPEN BEDS										2 0 TO 2 5				
	- DP + CHEM. PPT SLUDGE, COVERED BEDS										1 25 TO 1.5				
	-CHEMICAL PRECIPITATION														2 25
	SIZE OF THE GRAVEL, INCH	1/8 - 1/4				1/8 - 1/4				1/8 TO 1/4	1/8 TO 1/4	1/8 TO 1/4		1/8 TO 1/4	1/8 TO 1/4
	DEPTH OF GRAVEL BED AROUND UNDERDRAIN, INCH	12				12				12	12	12		12	12
	DEPTH OF THE SAND BED, INCH	6 - 9				6 - 9				6 TO 9	9 TO 18	6 TO 9		9 TO 12	6
	EFFECTIVE SIZE OF SAND, MM													0 3 TO 0.6	
	- FOR TRICKLING FILTER SLUDGE														
	- FOR WASTE ACTIVATED SLUDGE														
	UNIFORMITY COEFFICIENT OF SAND													NOT > 3.5	
	DIAMETER OF THE UNDERDRAIN, INCH													MIN 4	
	SPACING OF THE UNDERDRAIN, FT													MAX. 10	

SLUDGE TREATMENT AND MANAGEMENT (continued)

TECHNOLOGY	PARAMETER	NM	OK	PA	SD	TN	TX	UT	VI	VA	WA	WV	WI	WY	COMM
	- DIGESTED PRIMARY (DP) + HUMUS SLUDGE, OPEN BEDS		1 2 TO 1 7												
	- DIGESTED PRIMARY + HUMUS SLUDGE, COVERED BEDS														
	- STANDARD RATE FILTER								0.75 TO 1.2						
	- HIGH RATE FILTER														
	- ATTACHED GROWTH, open beds					1 TO 1.5									
	- ATTACHED GROWTH, covered beds					1 to 1.25									
	- Attached growth, open beds, solids, lb/sq.ft/year					22									
	- SUSPENDED GROWTH, open beds					2 5									
	- Suspended growth, open beds solids, lb/sq ft/year					15									
	- Suspended growth, covered beds					2									
	- ACTIVATED SLUDGE								1 5 TO 2 5						
	- DP + ACTIVATED SLUDGE, OPEN BEDS		1.7 TO 3												
	- DP + ACTIVATED SLUDGE, COVERED BEDS														
	- DP + CHEMICALLY PPT SLUDGE, OPEN BEDS		2 TO 2 5												
	- DP + CHEM. PPT SLUDGE, COVERED BEDS														
	- CHEMICAL PRECIPITATION								1 TO 1.35						
	SIZE OF THE GRAVEL, INCH		1/8 TO 1/4	1/8 TO 1/4		1/8 to 1/4						1/8 TO 1/4			
	DEPTH OF GRAVEL BED AROUND UNDERDRAIN, INCH		12	12		12				12		12			
	DEPTH OF THE SAND BED, INCH		MIN. 9	6 TO 9		min. 9				12					
	EFFECTIVE SIZE OF SAND, MM		0.3 TO 1 2	0.3 TO 1.2						0 3 TO 0.75					
	- FOR TRICKLING FILTER SLUDGE					0 8 TO 3									
	- FOR WASTE ACTIVATED SLUDGE					0.5 TO 0 8									
	UNIFORMITY COEFFICIENT OF SAND		MAX 5	NOT < 5		NOT < 3.5				4					
	DIAMETER OF THE UNDERDRAIN, INCH		MIN 6	MIN. 4		MIN 4									
	SPACING OF THE UNDERDRAIN, FT		MAX. 10	MAX 20											

SLUDGE TREATMENT AND MANAGEMENT (continued)

TECHNOLOGY	PARAMETER	10 ST	AZ	CA	CO	CT	IL	IA	KS	ME	MD	MA	MN	NH	NJ
- SHALLOW (SLUDGE) LAGOONS								*			*				

SLUDGE TREATMENT AND MANAGEMENT (continued)

TECHNOLOGY	PARAMETER	NM	OK	PA	SD	TN	TX	UT	VI	VA	WA	WV	WI	WY	COMM
- SHALLOW (SLUDGE) LAGOONS			*												*

PART 2. ON-SITE SYSTEMS

This section contains the state summary tables for on-site systems. Within this general category are the subcategories of: septic tanks, distribution boxes, aerobic biological systems, subsurface trench or bed, low pressure distribution systems, syphons, absorption or seepage pits, sand filters, elevated sand mounds, wastewater ponds, and vault privy.

Table 2-8 presents the summary of regulatory design criteria for on-site systems. Forty-nine states, one territory, and six counties reported regulatory design criteria for on-site systems.

All reporting agencies reported at least one regulation concerning septic tanks. Key parameters concerning septic tanks are the physical tank dimensions and construction of the tanks. Individual agencies do vary from other agencies on some regulations, yet, no one agency strays far from any other agency.

Twenty-eight agencies report regulations concerning distribution boxes. Iowa, Alabama, and Kansas do not require distribution boxes, and Idaho does not use distribution boxes. The remaining agencies mostly regulate the inlet and outlet locations. All reporting agencies have similar regulations concerning these parameters.

Twenty-six agencies report regulations concerning aerobic biological systems. Access, NSF schedule, grease trap, and aeration compartment capacity are regulated by the various reporting agencies. There are variances among the different agencies especially in the regulation of grease traps.

All states, territories, and counties reporting regulations have regulations concerning subsurface trenches or beds. Parameters regulated concern the characteristics of the trenches, beds, and the location of the beds and trenches. No single agency radically differs from the other agencies; however, there are differences on many parameters among agencies.

Thirty-three states, two counties and Puerto Rico have regulations concerning low-pressure distribution systems. Key parameters regulated are the dosing cycle, the construction of the dosing chamber, and the construction of the percolation line. There are slight variances among the agencies reporting regulations for the individual parameters; however, the differences among the agencies' criteria are not great.

Three states have regulations concerning syphoning. All regulations are short comments with varied concerns.

Sixteen states, three counties, and Puerto Rico have regulations concerning absorption or seepage pits. Key parameter regulated are the depth to groundwater table, capacity, percolation tests, separation of pits, and access. For each parameter there is significant differences between most reporting agencies.

Seven states have regulations concerning sand filters. Key parameters regulated are loading rate, and depth to groundwater table. For each parameter there is usually close agreement between states.

Seven states and Marin County, California have regulations concerning elevated sand mounds. The two key parameters of elevated sand mounds are depth to groundwater table, and the maximum height in inches. Five agencies require the depth to groundwater table to be ≥ 2 feet (Florida ≥30"). Idaho qualifies its requirements by stating that the depth depends upon the type of soil, and Wyoming species a separate regulation. For the parameter of the maximum height, only Florida specifies that the maximum height should be 96 inches.

Seven states report regulations concerning wastewater ponds. Key parameters concerning wastewater ponds are loading, maximum water depth, capacity, depth, and length to width ratio. The range and specific regulations covered for the various states is very broad, and cannot be easily summarized.

Eight states list regulations concerning vault privies. Key parameters concern the effective capacity, the depth to groundwater, and the location of vault privies. Four states specify the effective capacity of vault privies. Colorado limits the capacity to ≥400 gallons, whereas Maine, Ohio, and Wyoming require ≥500 gallons. Colorado and Illinois both regulate the depth to groundwater table at ≥4 feet. Only Virginia specifically regulates the location of vault privies. Vault privies are prohibited in the state of South Dakota.

Table 2-8 ON-SITE SYSTEMS

TECHNOLOGY	PARAMETER	AK	AL	AR	AZ	MARIN CO CA	MENDICINO CO., CA	N. COAST REG., CA	SAN DIEGO CO., CA	CO	CT	DE	FL	GA	HI
SEPTIC TANKS	DETENTION PERIOD (hours)		48 min							30		24 @ Peak flow			
	TANK SIZE (gallons)			≥750	1 6xdesign daily flow	min. 1200		uniform plumb. cd ★				120 gal/bd/day		★	
	TANK SIZE (gallons) Based on bedrooms				max 20,000										
	1 to 2	1000	750 min	750	9 6 0	1200	810		1000	750	1000	1000	750 min	750	
	3	1000	1000	1000	9 6 0	1200	1200		1000	1000	1250	1000		900	
	4	1250	1000	1250	1200	1200	1600		1200	1250	1500	1000		1000	
	5	1500	1250	1500	1500	1500			1500	1500	1750	1250			
	each additional	250	250	250	★	250			6-1500	250	250	250		250	
	SEWAGE FLOW (gpd/bdrm)		150			150									
	SEPTAGE REMOVAL (years)		3 - 5						★						
	COMPARTMENTS			≥250 gal each ★	★						By 1/90, 2 chambers				
	Number		min 2		min 2	min 2	2 min		2 min liq	≥2		2 min	multiple		
	Other Characteristics		1st 2/3 eff. vol.	★	1st d ≥ 2/3 tot. vol	vol1=2 x vol2 ★	precast		1st: 2/3 vol			1st 2/3 tot. vol	★		
	LIQUID DEPTH (feet)		3 - 6	3 - 6	4 - 6				4	4 - 8	3 min		≥ 3 1/2 ★		
	FREEBOARD (feet)		0.75	≥0.583 ★	1 min				1	1			≥ 15% of volume		
	INLET-OUTLET STRUCTURES														
	TOP ACCESS	12" deep	watertight	inlet & outlet	airtight ★	★			1/comp min	1/comp	watertight	★			18" min
	MANHOLE DIAMETER (in)		to finished grade		min 16				22 min			18" ★	225 sq in		
	WATERTIGHTNESS		yes		required	required			required		required	required			
	SEPARATION DISTANCE (feet)		★	100from well							★				
	well or suction line											50		50	
	water supply/property line											10		10	
	surface water course											25		25	50

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	IA	ID	IL	IN	KS	KY	LA	MA	MD	ME	CHARLEVOIX CO., MI	KENT CO. MI	MN	MO
SEPTIC TANKS	DETENTION PERIOD (hours)							60 hours						36 hours ★	
	TANK SIZE (gallons)		2 x ADF				w/o garbage disposal	2 5 x ADF	150 times design flow					★	
	TANK SIZE (gallons) Based on bedrooms			w/grinder							★				
	1 to 2		750	250 - 1250	750	750	750	500 - 750	≤1000 gal	760	750 working capacity	1000	1500	750	1000
	3		900	1000- 1500	1000	900	1000	1000		1000	1000	1000	1500	1000	1000
	4		1000	1250 - 2000	1250	1000	1250	1250		1250	1000	1250	1750	1000	1250
	5			250 - 400	1500	1250	1500	1500		1500		1500	2000	1500	1500
	each additional		250		150	250	250	250 gal/bdrm		250	250	250	250		V=0.75Q+ 1125
	SEWAGE FLOW (gpd/bdrm)		no regulation					100							
	SEPTAGE REMOVAL (years)							Inspect 2-5	1						★
	COMPARTMENTS			0>1350gpd											reqd if >1500 gal
	Number		1					3 max			2			★	
	Other Characteristics		1st - 1/2 - 2/3 capacity	1st: 1/2 - 2/3 tot capacity				250 gpm			★			★	1st is 1/2 - 2/3 totl. vol. ★
	LIQUID DEPTH (feet)		25-50	3.5 - 6	2.5 - 6.5	2 1/2 - 5	2.8 - 4 5	2.5 - 6	4					≥ 2.5 ★	2.5 - 6.5
	FREEBOARD (feet)		15% tank capacity		≥15% liquid depth	★	10" - 1'	1 25'					10% of liq. capac ≥0.75	★	
	INLET-OUTLET STRUCTURES														
	TOP ACCESS	≥8" dia	1/comp ★	Inspect. of inlet/outlet ★	1/comp ★	Watertight		inlet, outlet 1/comp	access to inlet & outlet		YES ★		at outlet if only one		w/in 6' of walls ★
	MANHOLE DIAMETER (in)	24, 1/comp ★	20 min	12 min	≥8" ★	20", 1/comp	≥10" ≤24"	24 min (20x20 min)	24, 1/comp		≥18, 1/comp		≥20	≥20 ★	≥20
	WATERTIGHTNESS	required	required	required		required		required			YES				
	SEPARATION DISTANCE (feet)					50 from ★ water source		min 50 ft. ★ from water			SETBACK DISTANCES				
	well or suction line			50	50						100	50	50		50
	water supply pr line		10-25	10	10						10	10	10		10
	surface water course		50-100	25	25						25-100	50	50		50

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	MS	MT	NC	ND	NE	NH	NJ	NM	NV	NY	OH	OK	OR	PA
SEPTIC TANKS	DETENTION PERIOD (hours)	Follows EPA manual													
	TANK SIZE (gallons) Based on bedrooms						min.≤10,000	★				>1000 g	≥1000; Flow+50%	★	based on design flow
	Bedrooms										Min recmded				
	1 to 2		900, 1000	900	1000		750	250 - 500	750	1000	750 750	for 2 tanks		1000	
	3		1000	900	1000		900	750	1000	1000	900 1000	≥ 2 5 x east		1000	
	4		1000	1000	1200		1000	1000	1200	1000	1000 1200	daily flow		1000	
	5		1250	1250	1500		1250	1250	1500	1250	1250 1250			1450	
	each additional			V= 1.17 Q + 500			250	250	150			total 2500		> 51500	
	SEWAGE FLOW (gpd/bdrm)														
	SEPTAGE REMOVAL (years)		≤1.3 liq dep.			★									
	COMPARTMENTS							if garbage grinder							
	Number			2 min				septic vol. + 50% capac.	2			≥2			
	Other Characteristics		1st ≥1/2 tot volume	1st: 2/3-3/4 tot capac		1st with 1/2-2/3 tot vol ★		min 1000 gal		1st 1/2-2/3 tot volume			1st 1/2-2/3 tot volume		★
	LIQUID DEPTH (feet)		2.5 - 5			3.5 - 6.5	≤5 for ≥ 3000 gal ★	3 - 6	≥2 1/2 ≤ 6	2.5 - 5	≥4	≥4 ' ≤10'	5		★
	FREEBOARD (feet)		1			≥ 1/comp	★					≥1/4 liq dep	1		
	INLET-OUTLET STRUCTURES														
	TOP ACCESS	Manhole or part	to inlet and outlet	watertight; w/in 6" of ground ★			1/comp ★	flush w/grd ★	★	at inlet & outlet	≥20 inches ★	watertight	1/comp	★	
	MANHOLE DIAMETER (in)		≥20	24	24		≥20	20 min	≥20	24	★	≥18	≥24		20 in
	WATERTIGHTNESS	required	required		required		must be watertight	required		required		required			
	SEPARATION DISTANCE (feet)	★					≥75frm well					≥10 ★	★		
	well or suction line		50		50	50	50	50	50		50				50
	water supply pr line					10	10	10	10						10
	surface water course		50			50	75	25	50		50				25

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	PR	RI	SC	SD	TN	TX	UT	VA	VI	VT	WA	W	WV	WY	Comm
SEPTIC TANKS	DETENTION PERIOD (hours)								≥48				24			★
	TANK SIZE (gallons)		★					★								★
	TANK SIZE (gallons)) Based on bedrooms															★
	1 to 2		1000	890	1000	750	750	(1 bdrm)750	750	500		750	750	750	1000	
	3		1000	1000	1000	900	1000	(2-3 bdrm) 1000	900	600		900	975	1000	1000	
	4		1250	1000	1250	1000	1250	1250	1200	750		1000	1200	1000	1000	
	5		1500		1500		1500		1500	900		1250	1425		1250	
	each additional		250	250	250	250	250	250		200		250	225	250	250	★
	SEWAGE FLOW (gpd/bdrm)					150							150		150	
	SEPTAGE REMOVAL (years)					3 - 5							@ 1/3 liquid capacity			★
	COMPARTMENTS				>3000 gal required											★
	Number					2	≥2 req'd	≤3				≥2				★
	Other Characteristics	★			1/2 - 2/3 capacity	★	1st w/1/2 = 2/3 tot vol	★						★	1st ≥1/2 tot vol.	★
	LIQUID DEPTH (feet)	4	> 4, < 8		2.5 - 6	2 1/2 - 5 ★		≥ 2.5		4 - 6.5			>.3≤ave. 6	≥2 1/2 ★	4 - 6	★
	FREEBOARD (feet)				1	20%			1	0 83			>0 67	9 inches	scum storage = 20% of liquid depth	★
	INLET-OUTLET STRUCTURES		6" below flow line ★													★
	TOP ACCESS		★		1/comp	1/comp.	10" dia/sq to ea flow line		★			watertight	above inlet or outlet		1/comp	★
	MANHOLE DIAMETER (in)	23			20 min	20" dia. 18 x 18 min		≥ 18	18 x 18 min	≥24			24" square , >24" dia		≥20	★
	WATERTIGHTNESS				required	★	required			required			yes		required	★
	SEPARATION DISTANCE (feet)	★								★			★			★
	well or suction line						50	50	50		50	100				
	water supply pr. line						10	10			25	10				
	surface water course						50	25			25	100				

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	AK	AL	AR	AZ	MARIN CO CA	MENDICINO CO., CA	N. COAST REG., CA	SAN DIEGO CO., CA	CO	CT	DE	FL	GA	HI
	dwelling, property line											10		10	5
	BAFFLES/TEES		3 types	*							*	*			
	Inlet		local or STD code or well	6" below L	required,; L>, 1" from top				4" clay; 19" below liq		12-18 below liq level; > 6" above LL	3 in. diam	extend≤33% of liq dept *		
	Outlet		6" above 18" below	≥4" diam *	18 in below, 8 in above				4" clay; 18 below, 6" above		≥18 below ig level, >6" above liq lev	3 in diam *	extend ≥30% ≤40% of liq depth *		
	MATERIALS		Concrete, Fiberglass, Plastic	not excessive decay *	non corrosive no cinder-block	no metal or wood	fiberglass	w/permit				non corrosive; masonry	sound		
	INLET INVERT OVER OUTLET INV. (in)		3	≥3	2				2		3	2			
DISTRIBUTION BOXES	DISTRIBUTION BOX		not required	reqd, watertight*	*								*		
	Minimum Width (inches)								24*						
	Freeboard (inches above invert)														
	Inlet Elev. Above Outlet (inch)		1		1		slightly		1			1 min	1 min		
	Outlet Elev. Above Floor (inch)				4 - 6				2						
	Separation Dist. (ft)				min 2'										
AEROBIC BIOLOGICAL SYSTEMS															
	ACCESS		NSF STD 40	appd by NSF											
	NSF		NSF STD 33					*					10D.054 (2) (e) in regs		
	GREASE TRAP		Per mfg		*						*		*	*	

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	IA	ID	IL	IN	KS	KY	LA	MA	MD	ME	CHARLEVOIX CO., MI	KENT CO. MI	MN	MO
	dwelling property line		5	5	10						10	10	10		10
	BAFFLES/TEES			1" to top of tank				★	6" above flow line		6-12" above/ below liq depth ★	★	★	★	≥4" dia ★
	Inlet		★	6" below liq. level min. ★	6" below liquid level	≥6" below liquid level ★	extend 8-10" below liq lev	6' above liquid level			33% below liq level			★	★
	Outlet		★	40% of liq depth below	0.4 x liq ★ depth down	★	35-40% of liquid depth	★						★	★
	MATERIALS	No Metal Tanks	No steel	sound durable ★		★		concrete, ★ steel app'd		approved	Noncorrosive ★		Durable, ★ carry lead		
	INLET INVERT OVER OUTLET INV. (in)			2 min			3	2" min	2		3 ★				3
DISTRIBUTION BOXES	DISTRIBUTION BOX	No required	Not Used			optional		★			watertight			★	watertight
	Minimum Width (inches)				12										
	Freeboard (inches above invert)				>8 of effint										
	Inlet Elev. Above Outlet (inch)				1						2"			≥1	
	Outlet Elev. Above Floor (inch)	>4			>4				6					>= 4	
	Separation Dist. (ft)														
AEROBIC BIOLOGICAL SYSTEMS			Lagoons used												
	ACCESS			to service all parts	NSF 40									★	
	NSF										NSF 40				
	GREASE TRAP					★					★				

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	MS	MT	NC	ND	NE	NH	NJ	NM	NV	NY	OH	OK	OR	PA
	dwelling, property line		10		10	10	10	5	5		10				10
	BAFFLES/TEES					★		min 4" dia	★				w/in 2" of top		
	Inlet		up 2"			≥6" below liquid depth	invert ≥1" above liq lev ★	below - 25% liquid depth	4" above, 12 below liq lev	4 in below ld.			6" below liq level ★		6" below liq. level ★
	Outlet		≥ 2", down 16 - 18"			below by 40% liq. dep	below by 40% liq dep		4" above ,12" below liq lev	40% of l.d. below liq surf			★		40% of liquid depth ★
	MATERIALS	steel, concrt, app'd	★	not excessive corrosion		★	no excessive decay ★	no metal ★		struct sound, durable	★		concrete, steel, app'd ★		
	INLET INVERT OVER OUTLET INV. (in)	2	1			2		2	≥2	3	≥2	≥2 above LL			≥3"
DISTRIBUTION BOXES	DISTRIBUTION BOX			watertight		dir conn.	1/each field						★	watertight	
	Minimum Width (inches)													≥8 ★	
	Freeboard (inches above invert)														
	Inlet Elev. Above Outlet (inch)					1				1				≥2	
	Outlet Elev. Above Floor (inch)					4				4 - 6	≥1			≥2	
	Separation Dist. (ft)														
AEROBIC BIOLOGICAL SYSTEMS															
	ACCESS														
	NSF														standard #40
	GREASE TRAP					★	restaruants & dining halls ★								

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	PR	RI	SC	SD	TN	TX	UT	VA	VI	VT	WA	W	WV	WY	Comm
	dwelling, property line						10	5	5		10	5				
	BAFFLES/TEES	★													required	★
	Inlet	6" below water line	1' below flow line ★			extend 12" below liq lev ★	2-4" to top of tank	extend 6" below liq lev ★		≥ crown of inlet			>6"above, 9" below liq lev	extend ≥ 6" ≤20% liquid depth		★
	Outlet	down to 40% of liq dep	★			extend 18" below liq lev ★	2-4" to top of tank	extend to 40% liq dep ★	★	6" below liq limit				≥35%≤40% liq depth	inlet & outlet shall be acess for inspect	★
	MATERIALS		★	★			no metal tanks ★	★	concrete preferred ★	durable, not decay		concrete	steel, conc. approved ★			★
	INLET INVERT OVER OUTLET INV. (in)	3" min	2"		3		3	≥2		3	3		2		≥3	
DISTRIBUTION BOXES	DISTRIBUTION BOX				watertight			★		1/field						★
	Minimum Width (Inches)								≥ 12							★
	Freeboard (Inches above invert)								≥ 12							
	Inlet Elev. Above Outlet (inch)		≥2		1 min			2		1						
	Outlet Elev. Above Floor (inch)		≥4		4 min					4 - 6						
	Separation Dist. (ft)															
AEROBIC BIOLOGICAL SYSTEMS																
	ACCESS						≤1500 gpd								NSF std No. 4-1978- refer to sect 39(b) for aerobic units	★
	NSF															★
	GREASE TRAP	★		★			≥100 gal ★									★

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	AK	AL	AR	AZ	MARIN CO CA	MENDICINO CO., CA	N. COAST REG., CA	SAN DIEGO CO., CA	CO	CT	DE	FL	GA	H
	AERATION COMPARTMENT Capacity (gallons)				★										★
SUBSURFACE TRENCH OR BED	SIZE		area & repl area	★	w/100% resv area available	dual req'd		+ = repl area	+ resv area	★	resv area available ★	+ 100% replacement	★		
(Gravity Distribution)	Trench Bottom Area (sq. ft.)		min 125	★								33 Q *t**0 5			
	Bed Bottom Area (sq. ft.)									=Q*SQRT(perc rt)/5 ★	★	.42 Qt**0.5	1000 max		
	DEPTH TO GWT (feet) surface	4 ★	3.3												
	LOCATION														
	SOIL CONDITIONS			★											
	Dist. to imperv. material (ft)	6 min	1.5	≥4			5 min	3 min ★			4 min	3 min	★		
	Depth to high ground water level(ft)	4 min	1.5	≥4'	min 5		5 min	≥5, 2' for alternative		4'	1.5 min	3 min	10D6.047 (2) in regs		
	Percolation Rate (minutes / inch)	60 max	5 - 60 conven sys	10 - 75	1-60 trench 1-30 bed pit	1 - 120		60 max		≤ 60, ≥5"		6 - 60 ★			
	SLOPE - Surface (deg.)		≤11 25				max 30 %	30 max		≤ 30					
	Trench Bottoms (in /100 ft.)		0	1-4 uniform	0						2 - 4 ★				

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	IA	ID	IL	IN	KS	KY	LA	MA	MD	ME	CHARLEVOIX CO., MI	KENT CO. MI	MN	MO
	AERATION COMPARTMENT Capacity (gallons)			500(4bdrm max)	≥500; 150 gal/bdrm									≥500 ★	≥120 gal/bdrm/day
SUBSURFACE TRENCH OR BED	SIZE		reserve area required	★	A=[(150g)x (#bd)]/ loading rate					★		min Q for 2 bedrooms			
(Gravity Distribution)	Trench Bottom Area (sq. ft.)								<60 trench	bottom only					≥400
	Bed Bottom Area (sq. ft.)			1.5 x trench area											
	DEPTH TO GWT (feet) surface		3 min								≥1	★		3 from bttm	
	LOCATION														
	SOIL CONDITIONS												from bottom of trench		
	Dist. to Imperv. material (ft)	≥3'		4 min if limestone	≥20		≥2'	4 min	4	4 min		≥4	≥4		
	Depth to high ground water level(ft)	≥3'		4 ft min	≥2 ft			2 min	4	4 min		≥4	≥4		3 ★
	Percolation Rate (minutes / inch)	≥60 ≤1	1 - 120			1 - 60			2 - 30 , 20 for beds	>2; ★ 30 max		≥45	≥60 trench ≥ beds		≥60
	SLOPE - Surface (deg.)		20max trnch 8 max bed		≤6 75		≤30	6" across area	≥ 2	25 max	6-67degrees	≤5.4	≤20	★	≤6.75
	Trench Bottoms (in /100 ft.)		0									0	0 - 4		2.5

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	MS	MT	NC	ND	NE	NH	NJ	NM	NV	NY	OH	OK	OR	PA
	AERATION COMPARTMENT Capacity (gallons)											120/d/bdrm	≥1000		*
SUBSURFACE TRENCH OR BED	SIZE	Follows EPA Manual	replacement field reqd									1"ft./gal/d	10 sq.ft/ 1 ft dist pipe		
(Gravity Distribution)	Trench Bottom Area (sq. ft.)						sidewall inc.								based on perc. rate
	Bed Bottom Area (sq. ft.)						no sidewall								based on perc rate
	DEPTH TO GWT (feet) surface	4							5	2		≥4			
	LOCATION														
	SOIL CONDITIONS					from bottom of bed/trnch									
	Dist. to Imperv. material (ft)		4			4	8	4 min	4 ft from Infiltr surf	4				≥6 *	4' from Infiltr surf
	Depth to high ground water level(ft)	3.3 min	4	≥4		4	4	4 min	4ft from Infiltr surf	4		≥4		4' to perm gwt *	
	Percolation Rate (minutes / inch)		1 - 60			≤60	≥60 *	3 - 60		min 60	≤60		≤60		
	SLOPE - Surface (deg.)	15% max	≤11.25			≤5.625	*	75 max						30 degres	≤25% (trench) 8%(bed)
	Trench Bottoms (in /100 ft.)		0	2.5	2 - 4	0					6 25				

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	PR	RI	SC	SD	TN	TX	UT	VA	VI	VT	WA	WI	WV	WY	Comm
	AERATION COMPARTMENT Capacity (gallons)				2 vol/gpm of flow 750gpm											★
SUBSURFACE TRENCH OR BED	SIZE								max. pipe len 1800 ft ★				★		replacement reqd	★
(Gravity Distribution)	Trench Bottom Area (sq. ft.)				A= Q(t) 1/2/s		A= 1.25 Q/Ra		≥400 ★		Q=3/A**.5		bottom area only			★
	Bed Bottom Area (sq. ft.)						A=[150 (1+B)]/Ra				Q=.8/3t** 5		bottom area only	★		★
	DEPTH TO GWT (feet) surface	≥4						≥4 ★			≥3 below inf surf	≥3 can be reduced to 1' under spec circumst if desgnd by PE reg, sanit or certif desgnr	4.7		Depth to seasonal high gw≥4' from bottom of abs field & 2' from natural grnd. surf.	★
	LOCATION														location rqmts. are inch in sect 36, site suitability & sect 35 isolation	
	SOIL CONDITIONS															★
	Dist. to imperv. material (ft)		5'	1	4 min	4			1 (v. & h)		≥3, ≥4 bdrk below inf surf		3	3	4	★
	Depth to high ground water level(ft)	4	3'	0.5	4'	★					≥3 below inf surf	≥3	3	3	4	★
	Percolation Rate (minutes / inch)	≥1, ≤60	≤40		5 - 60	10 - 105		≥1 ≤60 trench, ≤30 bed			>1, <60		≥60		≥1	★
	SLOPE - Surface (deg.)					≤30% ★	★	≤ 25% ★			20% trench; 10% bed	24	≤20	≤25%	11.25	★
	Trench Bottoms (in /100 ft.)					≤4	0		≥2 ≤4				0		0	

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	AK	AL	AR	AZ	MARIN CO CA	MENDICINO CO., CA	N. COAST REG., CA	SAN DIEGO CO., CA	CO	CT	DE	FL	GA	HI
	TRENCH CHARACTERISTICS					★		Septic Tank Manual							
	Length (ft.)		100 max		max 100	max 100			200 tot. min		≤75			100	
	Depth (inches)		22 - 42	approx 24 ★		12 - 96	30 min		36 min 60 max ★		≤48	24 min		≥25	
	Width (inches)		18 - 36	≤24	min 12	18 - 36	24 min		18 min		max 36		≤36"	≤36"	
	Dist. b/w trenches (ft)		5	6	2 x depth	min 6					4 x width o/c		≥6' ★	8 ★	
	Slope of bottom (in/100 ft)		0 (level)		0		0 - 33		★						
	BED CHARACTERISTICS		w/alternate systems												
	Depth (in)											24 min			
	Length (ft)														
	Dist. b/w pipes (ft)														
	Slope (%)														
	GRAVEL		1/4 - 2 1/2 6 below top	1.4 - 1 1/2; ★	w/min 30% 6" under 2" above	voids					pipe 12	below	★		
	Size (inches, diam.)				3/4 - 2,	3/4 - 1 1/2	3/4 - 2 1/2				1"	3/4 - 2 1/2	1/4 - 2		
	Depth (inches)				4 above		12 under, 2 above				18"	6 below, 2 above	6 below 12" total		
	COVER (inch, above gravel)		12 min		12 soil ★	12 - 30 ★	★		12 min	≥10 ★	6 ★	12 min		12"	
	SEPARATION DISTANCE										★				
	well or suction line											100			
	water supply pr. line											10			
	surface water course											100			50
	dwelling, property line											10			5

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	IA	ID	IL	IN	KS	KY	LA	MA	MD	ME	CHARLEVOIX CO., MI	KENT CO. MI	MN	MO
	TRENCH CHARACTERISTICS											≥ 2 trenches	≥2 required		
	Length (ft.)		100 max, 500 total max			60-100		100 max	≤100*		100 Max	≤100	≤100	≤100 (and beds)	≤100
	Depth (inches)	depth ≥36 6" cover over ateals	24-48		10 - 36	≥18	≥6" ≤ 24"	18 - 36			24-30	18 - 30	≤36		18 - 30
	Width (inches)	18-36	36 max		18 - 36	12 - 36		12 min	>12 at bottm	24-36	24	18 - 36	18 - 36	18-36	18 - 36
	Dist. b/w trenches (ft)		6		7.5	6-7.5'	≥8'			6-9 ★	5' or 50% of width				
	Slope of bottom (in/100 ft)										1"				
	BED CHARACTERISTICS														
	Depth (in)														
	Length (ft)										100' MAX				
	Dist. b/w pipes (ft)										5' or 50% of width	6.5 - 7.5			
	Slope (%)										1"/100ft				
	GRAVEL	6 below enough to cover 3/4-2 1/2			6" below 2" above	1/2 - 2 1/2" 6 below, 2 above ★			3/4 - 1 1/2 no iron			2" above, 6" below, 12" test	1/2 - 1 1/2 washed. 6" below 2" above		3/4 - 2 1/2", 6" below, 2" above
	Size (inches, diam.)		1/2 - 2 1/2	3/4 - 4			3/4 - 2 1/2	1/2 - 2 1/2	≥6 below; 2 above		1 above (min)	1/2 - 1 1/2"			
	Depth (inches)		6 below, 2 above	6 below, 2 above		12 below		6 below, 2 2 above	1/8-1/2 no iron		7 below		6-24		
	COVER (inch, above gravel)		12 min ★			4-6" earth		6 - 12 pervious	12" backfill		2" hay, 8-12 backfill	hay or straw ≥2"	biodegradble		
	SEPARATION DISTANCE										Setbacks				
	well or suction line		100	100							100	50			100
	water supply pr. line		25	25							10	10			10
	surface water course		50	25							100	100			25
	dwelling, property line		5	10							10	10			10

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	MS	MT	NC	ND	NE	NH	NJ	NM	NV	NY	OH	OK	OR	PA
	TRENCH CHARACTERISTICS														
	Length (ft.)		≤100		≤100; per 100gpd	≤100	all equal			<100				≤125	
	Depth (inches)	24 - 36	24 - 36	36 max	18 - 36		≤36	12 - 36		18 min		24 - 30	18 - 36	≥18, ≥2" top <3.5	12 - 36"
	Width (inches)			36 max	18 - 36	≤36	12 - 36	18 - 36	≥18 ≤36"	12-24		≥12	≥24	2 1 at bttm	12 - 72
	Dist. b/w trenches (ft)	10		5 min				6 min	6	2xdepth	4 min				5 min
	Slope of bottom (in/100 ft)	2 max								0					level +- 2"/100ft
	BED CHARACTERISTICS							min 2 lines							
	Depth (in)														
	Length (ft)					≤100									
	Dist. b/w pipes (ft)	3	≥6												
	Slope (%)							10 max							
	GRAVEL		6" below; 2" above	6 below 2" above			3/4"-2 1/2 ★						★		
	Size (inches, diam)				6"below ★				3/4 - 2 1/2 ★	3/4 - 1 1/2	0.75 - 1.5	≥12			
	Depth (inches)	6 under, 2 over			1/2 - 2 1/2"	6 - 24 below	12 below	12-18 below, 2 above	≥2" above ≥12" bel line	2 above, 6 below		3/4 - 1 1/2"	3" below 2" above	12 total ≥6 bottom; ≥2" above	≥6"below, ≥2"above line
	COVER (inch, above gravel)	12 - 24 ★	12 - 20 ★	6		8 - 36	<18"	9 - 18	≥12	4 - 6 ★	≥12	2"		≥6	≥12" ★
	SEPARATION DISTANCE	★										≥0 ★	★		
	well or suction line		100	100	100			100	100					100	100
	water supply pr. line		10	10				10	10					10	10
	surface water course		100	50				50	50					50-100	50
	dwelling, property line		10	10	10			10	5					10	10

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	PR	RI	SC	SD	TN	TX	UT	VA	VI	VT	WA	WI	WV	WY	Comm
	TRENCH CHARACTERISTICS															★
	Length (ft.)	100	≤77		100' may be gravity no limit if press dist.	100 max	≥75	≤ 100	≤100				<100'	≤100 ★		★
	Depth (inches)	18 - 36		≥23"	48" max	≤48" ≥24"	18 - 36	>12	≥18 ★	18 - 36	≤36		≥18	≥18" ≤36"		★
	Width (inches)	18 - 36	≤3	≥18 ≤36	36" max		≤36	≥12 ≤36	18 - 36	18 - 36	≤48		12 - 60	12 - 36"	min sep of 3' or distance = 1.25 vert dep dep of trench whichever is greater	
	Dist. b/w trenches (ft)		5'	7	6' min	6	≤3 x width	3 x depth; 12'	3 x width min ★		≥4		6'	6 ★	0 "/100 ft.	★
	Slope of bottom (in/100 ft)			4	4"/100 ft	≤4					1-2 max		0			
	BED CHARACTERISTICS				36" max											
	Depth (in)	18 - 36			36 " max						≥18, ≤36		8 - 42			
	Length (ft)				100 max								≤100		Dist piping spaced ≤ 10' apart	
	Dist. b/w pipes (ft)				5'								3 - 6		Slope = zero	
	Slope (%)				level			≤4 in/ft					2-4 per 100'			
	GRAVEL					★	★	★		★			★	★		★
	Size (inches, diam.)		1/2 - 2	1/2 - 2 1/2 ★	1/2 - 2 1/2	1/2 - 2 1/2	3/4 - 2	3/4 - 2 1/2	1/2 - 1 1/2	1/2 - 2 1/2	3/4-1 1/2		1/2 - 2 1/2	1/2 - 2	1/2 - 2 1/2	★
	Depth (inches)	6" below, 4" above line	6" below, 2" above ★	6" below 3" above line	6"min	≥2" above ≥6" below	6 below, 12 total ★	6"below 2" above line	13		≥12(trench), 6 (bed) below pipe		6 below pipe, 2" above	≥6" below ≥2 above	6" below	★
	COVER (inch, above gravel)	2 ★	2	9 ★		≥12 ★		★			6-12 fill, 2-4 topsoil		18	≥ 6"	≥12	★
	SEPARATION DISTANCE			★						★			★			★
	well or suction line		100					100			100			100		
	water supply pr. line		25					10			25					
	surface water course		100					100			50			20		
	dwelling, property line		10					5			25					

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	AK	AL	AR	AZ	MARIN CO CA	MENDICINO CO., CA	N. COAST REG., CA	SAN DIEGO CO., CA	CO	CT	DE	FL	GA	HI
	LEAD LINE CHARACTERISTICS		(header)	≥2 req'd					★			★			
	Size (diameter, inches)		4 min		min 4						★	4 min			
	Length (feet)		varies	all the same	max 100							100 max			
	Slope (inch / 100 feet)		0 (level)		0							0.25 min			
	Other Characteristics			★	4" from soil					unperforated					
	Material	Plastic		min crush 2000 psi ★	★						sch 40 PVC, ANSI22 ★				
	PERCOLATION LINE									≥ 3" dia					
	Size (diameter, inch)		4 min		min 4	3,4 inside dia	3,4				3 perforated	4 min	≥4		
	Length (feet)		100 max	≤100	max 100		100 max			≤100			≤100	100	
	Slope (inch / 100 feet)		0 - 2	2 - 4	0	max 3						2 max	2 5-5 ★		
	Dist b/w lines (ft)										3 x width				
	Material		ASTM	★	sch 40 min ★	durable plastic	min 1500 no crush		clay, bitum, ★ biver, app'd		Sch 40 PVC				
	Other Characteristics		★		4" from soil				★	perforated ★	★		★		
Low Pressure Distribution Systems	DOSING CYCLE		convtl-use								★	1 / 2			
	DOSING		design	≥ 500' pipe	★					3 - 4 times/day ★					
	depth of system area														
	DOSING CHAMBER												★		
	Alarm			recomm											
	Capacity (gal / min / 100 sq.ft.)				2 days flow										
	PERCOLATION LINE														
	Size (diameter, inches)				★							1 - 3			
	Hole Size (diameter, inch)											1/4 - 1/2			
	Hole Placement (feet)											30 min			

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	IA	D	IL	IN	KS	KY	LA	MA	MD	ME	CHARLEVOIX CO., MI	KENT CO. MI	MN	MO
	LEAD LINE CHARACTERISTICS				1/perc line			min 2 lines							
	Size (diameter, inches)			4 min of limestone	≥4		4								
	Length (feet)				5										
	Slope (inch / 100 feet)			12 min	level				≥6						
	Other Characteristics				backfill no gravel										
	Material			*	unperforated										
	PERCOLATION LINE			connected											
	Size (diameter, inch)				≥4	4	≥2 ≤4	4 min				≥4	4 min	≥4 *	≥4"
	Length (feet)		100 max tot 500 max		≤100	≥60, ≤100	≤ 100								
	Slope (inch / 100 feet)	≤6			≤4	2-4, ≤6		2 - 3			d w/+-1	2 - 6	0 - 4		
	Dist b/w lines (ft)														
	Material			*		agrig. tile, vit. clay						sound/ durable			
	Other Characteristics			*											*
Low Pressure Distribution Systems	DOSING CYCLE	≥2/day	(Depends on soil type) *		daily design flow								app'd	*	≤4 times/day
	DOSING												for Q≥2000 gpd	≥75 gallons *	recommend *
	DOSING CHAMBER								watertight if below gwt						
	Alarm			visible, audible	above high water mark				circuit seprte form pump		audible high level	req'd			
	Capacity (gal / min / 100 sq.ft.)											overcame static heat & friction		≥7.5 *	
	PERCOLATION LINE			connected	*										
	Size (diameter, inches)				1 - 4							≥1		1 to 1-1/2	
	Hole Size (diameter, inch)		1/4"	1/2 - 3/4	1 / 4		5/32 - 1/4					≥0.75			
	Hole Placement (feet)		1 1/2 - 3	1/4 - 5/12, 2 rows			3 - 8								

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	MS	MT	NC	ND	NE	NH	NJ	NM	NV	NY	OH	OK	OR	PA
	LEAD LINE CHARACTERISTICS					1/percol-line	not allowed			not allowed					
	Size (diameter, inches)			4		≥4		3 min						≥4"	≥3"
	Length (feet)													≥4'	
	Slope (inch / 100 feet)			12.5		0		25 min						*	≥1/4"/FT
	Other Characteristics					watertight connections		*					8' b/w dist pipe	watertight	
	Material			pvc, pe, abs								field tile			
	PERCOLATION LINE									directly to dist box					
	Size (diameter, inch)		≥4"	3	4	≥4 *	4	3 min			≥ 4	≥4			≥3
	Length (feet)			not tot 750			≤100		≤ 100	5-100	≤ 60	≤150	≤150		
	Slope (inch / 100 feet)					≤4	0	2 max	≤ 3"	2 - 4/1000'	6 25 - 3 125	6	≤2"/pipe len	*	≥ 1/4"/FT
	Dist b/w lines (ft)														
	Material			sched 40 PVC, PE ABS, equiv.	durable					*	*	field tile	*		
	Other Characteristics					*	*	tight joints		12 24 in below surf					
Low Pressure Distribution Systems	DOSING CYCLE					≤4 times/day	6-8 times/ day/field		every 3 - 4 hours *						
	DOSING													< 2500 gpd	
	DOSING CHAMBER														
	Alarm			audible or visual											
	Capacity (gal / min / 100 sq ft.)			2/3 septic tank capac											*
	PERCOLATION LINE							min 2 lines							
	Size (diameter, inches)			1 - 2				1 - 3							1 1/2
	Hole Size (diameter, inch)			5/32 in for 2/3 lat len				1/4 - 1/2							3/16
	Hole Placement (feet)							along inlet 2 5 - 5						on top	*

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	PR	RI	SC	SD	TN	TX	UT	VA	VI	VT	WA	WI	WV	WY	Comm
	LEAD LINE CHARACTERISTICS		★							not allowed					4 inch	★
	Size (diameter, inches)					3		4	≥ 4 i.d.				4			★
	Length (feet)		≤75						≥ 2 into abs trench							
	Slope (inch / 100 feet)							1 / 4"/ft	≥2							★
	Other Characteristics								1500 lbs crush				solid pipe		ASTM 27 29	★
	Material					sch 40 PVC			★				approved			★
	PERCOLATION LINE															
	Size (diameter, inch)	≥4	≥4			4	4	4	≥4 i d.	≥4	4		4	≥4 ★	≥4	★
	Length (feet)		≤75		100 max; 750 tot	≤ 100 ★		≤100	≤100		≤100 unless closed		<100'			★
	Slope (inch / 100 feet)	>1/16"/ft min	2 - 4			4 max	≥4	4	≥2, ≤4		2		2 - 4		3 ft min	★
	Dist b/w lines (ft)														ASTM 2729	
	Material						PE equiv						approved			★
	Other Characteristics	★				★		perforated		1/3" oper joints ★			8 -42"below surface ★		ASTM D2729	★
Low Pressure Distribution Systems	DOSING CYCLE				1 time/ 3-4 hours		3 times/day		★		≤4/day					★
	DOSING										min 1 psi		min 2.5 psi			★
	DOSING CHAMBER		★		30" dia min	1 compartmen	+ 500 gal						watertight ★			★
	Alarm		rqd.		required		3,14									
	Capacity (gal / min / 100 sq.ft.)					2 x daily flow							min 2.5 psi		refer to sect 40(a)(ni)	★
	PERCOLATION LINE														S.F. =2	★
	Size (diameter, inches)	≥1.5							1-1/4 i d		>l		1 - 3			★
	Hole Size (diameter, inch)					5/32-7/32			3/16 - 1/4		> 1/4		1/4-3/8			
	Hole Placement (feet)								3 - 5				varies			★

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	AK	AL	AR	AZ	MARIN CO CA	MENDICINO CO., CA	N. COAST REG., CA	SAN DIEGO CO., CA	CO	CT	DE	FL	GA	HI
	Materials					schedule 40 PVC						Sch 40, SDR 26 PVC			
SYPHON			Not with conv syst												
ABSORP. OR SEEPAGE PITS	NUMBER AND SIZING														
	DEPTH TO GWT (ft)														
	LEACHING CHAMBER														
	material														
	construction/dimensions														
	CAPACITY (min/in)				+ 100 % reserve area					*	*				
	PERCOLATION TESTS				1 - 30			30 max		≤2					
	SEPARATION OF PITS (ft)				min 12				20 min	*	4x diam. of conc struct				
	ACCESS														
SAND FILTER	DEPTH (feet)		or experimntl to the State Board							≥2					
	GRAVEL									< 2 -1/2"					
	Loading Rate (gal/sq.ft./d)				max 1.2					≤ 3 from sidewall					
	Slope of Distributor Lines (in/100 ft)									0 40%					
	SLOPE OF UNDERDRAINS									0 5 - 1.0%					
	GROUND WATER TABLE (ft) depth				5 (1' to imperm)					≥ 4					
	MINIMUM AREA														
ELEVATED SAND MOUND	Depth to GWT (ft)		Alternative Use			2'							≤30"		
	Max height (inches)												96		
WASTEWATER POND	LOADING					case-by-case				≤0 46#BOD 5 / k sq ft					
	MAX. WATER DEPTH (feet)		not under							≤3					

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	IA	D	L	N	KS	KY	LA	MA	MD	ME	CHARLEVOIX CO., MI	KENT CO. M	MN	MO
	Materials			*	If plastic-26									*	
SYPHON														*	
ABSORP. OR SEEPAGE PITS	NUMBER AND SIZING														
	DEPTH TO GWT (ft)														
	LEACHING CHAMBER														
	material														
	construction/dimensions														
	CAPACITY (min/in)	pits are not allowed													
	PERCOLATION TESTS												≤10		
	SEPARATION OF PITS (ft)			3 x largest diameter					2x effect width or depth	3 x largest diameter	Setback Distances				
	ACCESS														
SAND FILTER	DEPTH (feet)							2							
	GRAVEL														
	Loading Rate (gal/sq.ft./d)		1.2												
	Slope of Distributor Lines (in/100 ft)							2 - 3							
	SLOPE OF UNDERDRAINS							4 min							
	GROUND WATER TABLE (ft) depth														
	MINIMUM AREA							12 ft wide, 25 ft long							
ELEVATED SAND MOUND	Depth to GWT (ft)		(depends on soil type)												
WASTEWATER POND	LOADING							400 gpd							
	MAX. WATER DEPTH (feet)							5 ft							

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	MS	MT	NC	ND	NE	NH	NJ	NM	NV	NY	OH	OK	OR	PA
	Materials			160 psi PVC				solvent weld joints							watertight
SYPHON															*
ABSORP. OR SEEPAGE PITS	NUMBER AND SIZING														
	DEPTH TO GWT (ft)											≥10'			
	LEACHING CHAMBER														
	material														
	construction/dimensions														
	CAPACITY (min/in)														
	PERCOLATION TESTS							40 min							
	SEPARATION OF PITS (ft)														
	ACCESS														
SAND FILTER	DEPTH (feet)											≥1 5			
	GRAVEL											≥12" deep 3/4 - 1 1/2			
	Loading Rate (gal/sq.ft./d)														
	Slope of Distributor Lines (in/100 ft)											≤3" / 100'			
	SLOPE OF UNDERDRAINS											dia. ≥ 4" ≤12"/100'			
	GROUND WATER TABLE (ft) depth														
	MINIMUM AREA											240 ft/bdrm			
ELEVATED SAND MOUND	Depth to GWT (ft)														
WASTEWATER POND	LOADING														
	MAX. WATER DEPTH (feet)														

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	PR	RI	SC	SD	TN	TX	UT	VA	VI	VT	WA	W	WV	WY	Comm
	Materials	watertight				sched 40 PVC			*				plastic		4 ft	*
SYPHON															refer to sect 40	*
ABSORP. OR SEEPAGE PITS	NUMBER AND SIZING														refer sect40	
	DEPTH TO GWT (ft)	≥4' above			4 max						≥3		min 3' below bottom		refer to sect 41(b)	
	LEACHING CHAMBER														refer to sect 41(b)	
	material		*												refer to sect 41(b)	*
	construction/dimensions		*												refer to sect 41(b)	*
	CAPACITY (min/in)		*												4 inch	*
	PERCOLATION TESTS												≥30 min/in		3	
	SEPARATION OF PITS (ft)		≥20'					≥15 *					6		ASTM 2729	*
	ACCESS	≥23" dia	*					18 " dia			w/in 12" of final grade				3' min. 1.25x vert trnch depth	*
SAND FILTER	DEPTH (feet)															
	GRAVEL															
	Loading Rate (gal/sq.ft./d)															
	Slope of Distributor Lines (in/100 ft)														refer to sect 41(c)	
	SLOPE OF UNDERDRAINS														refer to sect 41(c)	
	GROUND WATER TABLE (ft) depth														refer to sect 46	
	MINIMUM AREA														refer to sect 46	
ELEVATED SAND MOUND	Depth to GWT (ft)					2'					≥2		2MIN		refer to sect 46	
WASTEWATER POND	LOADING					*									refer to sect 46	*
	MAX WATER DEPTH (feet)					4 *									refer to sect 37	*

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	AK	AL	AR	AZ	MARIN CO CA	MENDICINO CO., CA	N. COAST REG., CA	SAN DIEGO CO., CA	CO	CT	DE	FL	GA	HI
	CAPACITY		Jurisdiction AL Dept of Public Health												
	DEPTH (FT)		AL Dept. of Env. Mgmt												
	LENGTH:WIDTH														
VAULT PRIVY															
	Effective Capacity (gallons)									≥ 400					
	Depth to Ground Water Table (ft)									≥ 4					
	Location														

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	IA	D	L	N	KS	KY	LA	MA	MD	ME	CHARLEVOIX CO., MI	KENT CO. MI	MN	MO
	CAPACITY			90 X ADF ★											
	DEPTH (FT)			3 - 5 uniform				4-5 ft							
	LENGTH:WIDTH		★	13 max				25' x 25'							
VAULT PRIVY				watertight							★				
	Effective Capacity (gallons)										≥500				
	Depth to Ground Water Table (ft)			max 4											
	Location														

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	MS	MT	NC	ND	NE	NH	NJ	NM	NV	NY	OH	OK	OR	PA
	CAPACITY														
	DEPTH (FT)														
	LENGTH:WIDTH														
VAULT PRIVY															
	Effective Capacity (gallons)						vert wall area below inlet					≥500			
	Depth to Ground Water Table (ft)														
	Location														

ON-SITE SYSTEMS (continued)

TECHNOLOGY	PARAMETER	PR	RI	SC	SD	TN	TX	UT	VA	VI	VT	WA	WI	WV	WY	Comm
	CAPACITY					*										*
	DEPTH (FT)					6										
	LENGTH:WIDTH					variable										*
VAULT PRIVY					prohibited				*							*
	Effective Capacity (gallons)														≥500/riser	
	Depth to Ground Water Table (ft)															
	Location								*							*

Appendix A

Conventional Technologies Comments

COMMENTS ON THE CONVENTIONAL TREATMENT SYSTEMS

I. PRE-TREATMENT

A. Screens and Comminutors

10-State Std	Screens may be used in lieu of primary sedimentation providing that subsequent treatment units are designed on the basis of anticipated screen performance. Fine screens shall be preceded by a mechanically cleaned bar screen or other protective device. Comminuting device shall not be used ahead of fine screens.
10-State Std	Comminutor capacity shall be adequate to handle peak flow. Each comminutor that is not preceded by grit removal equipment should be protected by a 6" deep gravel trap.
AZ	Mechanically cleaned bar screens should be placed on a slope of 60 to 90 degrees with the horizontal.
CO	Screens or shredding devices shall be provided for all mechanical wastewater treatment plants.
CO	Bars are placed at a slope of 30 to 45 degrees with the horizontal.
CT	An elevated drive motor for the comminutor should be provided where flooding is expected. Removable baffle plates should be used above the comminutor to prevent passage of unscreened flows during periods of high liquid levels. Gravel traps should precede comminutors that are not preceded by grit removal.
MD	Fine screens should be evaluated on an individual basis. Coarse screens including bar screens and comminutors shall be installed ahead of units to be protected.
MD	Mechanically cleaned bar screens normally have slopes ranging from 45 to 90 degrees with the horizontal. Manually cleaned bar screens normally have slopes from 30 to 75 degrees with the horizontal.
NH	All sewage treatment plants shall be provided with mechanical means for comminuting or screening coarse materials in the sewage. Operation of such mechanically-cleaned devices shall be continuous or automatically controlled. In designing comminuting or screening chambers, consideration shall be given to protection from the weather; adequate lighting and ventilation.
NH	The use of fine screens in lieu of sedimentation alone shall not be approved. For treatment plant with capacities up to 5.0 mgd, a minimum of one (1) mechanically cleaned bar screen or comminutor shall be provided.

NJ	All treatment plants shall be provided with means for screening or comminuting coarse material in the sewage. Screening equipment in very small plants should be of the mechanical type. Fine screens will not be approved as the sole method of treatment.
NJ	A bypass screen shall be provided except where there are multiple screens.
NM	The use of fine screen systems should be supported by full scale studies or by pilot studies concerning effectiveness and reliability.
PA	Fine screens may be used in lieu of primary sedimentation providing that subsequent treatment units are designed on the basis of anticipated screen performance. Fine screens shall be preceded by a mechanically-cleaned bar screen or other protective device.
PA	Comminutors shall be used in plants that do not have primary sedimentation or fine screens and should be provided in cases where mechanically-cleaned screens will not be used.
TN	Slope of the bars shall be 30 to 60 degrees from the vertical. A perforated drain plate shall be installed at the top of the bar screen for temporary storage and drainage.
TN	Mechanically cleaned bar screens are recommended for all plants greater than 1 mgd.
TN	Fine screens shall be preceded by a trash rack or coarse bar screen. Comminution shall not be used ahead of fine screens. A minimum of two fine screens shall be provided, each capable of independent operation at peak design flow.
TX	Manually cleaned bar screens shall be constructed having a 30 to 60 degree slope to a horizontal platform which will provide for drainage of the screenings.
W A	Fine screens are sometimes used to replace primary clarification. The units should normally be installed following the raw sewage pumps. They can be installed before or after grit removal facilities.
W A	Manually cleaned screens, except those for emergency use, should be placed on a slope of 30 to 60 degrees with the horizontal.
WI	Inlets shall be designed to distribute flow evenly across the tank. Tanks shall be deep enough to prevent turbulent flow. An additional depth of 15 to 25 cm shall be provided for raking mechanisms. Surface area of the sedimentation tank shall be designed not to exceed a surface settling rate of 1,900 cubic meters/day/sq. meter.

W V	The use of fine screens in lieu of sedimentation is not permitted.
W V	Comminutors may be required at sewage treatment plants 40,000 gallons or greater in size
W Y	Bars shall be between 45 and 90 degrees measured from the horizontal.

B. Grit Removal facilities

10-State Std	Plants treating wastes from combined sewers should have at least two mechanically cleaned grit removal units.
AZ	Grit chambers shall have duplicate manually cleaned units or a single mechanically cleaned unit with a bypass.
AZ	The velocity control shall be based upon retaining a 0.2 mm diameter particle of assumed specific gravity of 2.65.
AZ	Aerated grit chambers are preferred over conventional grit chambers.
CO	Grit removal facilities should be provided for all wastewater treatment plants. If a plant is designed without grit facilities, the design shall include provisions for future installations.
CO	Parallel units are encouraged. Grit chambers with a bypass may be acceptable for small wastewater treatment plants.
CO	The design should take into consideration undesirable turbulence and velocities at inlets and outlets.
CO	Channel-type chambers shall be designed to provide controlled velocities, applied over the entire flow range, as close as possible to 1 ft/sec.
CO	The detention period shall depend on the size of the particle removed.
CT/PA	Plants serving combined sewer systems should have at least one mechanically-cleaned grit chamber. Single, manually-cleaned chambers with a by-pass are acceptable for small wastewater treatment plants.
IA	Design of grit chambers shall be based on the size and specific gravity of the grit particle to be removed.
NH	Inlet turbulence shall be minimized.
NJ	Detention shall be adequate to deposit grit coarser than 0.2 mm. Provisions for dewatering shall be made.
W A	Length of the channels depend on the size of grit desired for removal and the maximum depth of flow.

W A	On the basis of a grit specific gravity of 2.65, settling velocities are 3.7 feet/min for 65-mesh and 2.5 feet/min for 100-mesh.
W A	Mechanically cleaned grit chambers are recommended for plants greater than 2.0 mgd average design flow.
WI	Design of grit chambers shall be based on the size and the specific gravity of the grit particle to be removed. If the information is not available, then the design shall assume removal of all particles retained on a 65 mesh sieve and having a minimum specific gravity of 2.65.
W V	The detention time shall be based on the size of particles (0.21) to be removed. Undesirable turbulence and velocities at inlets and outlets shall be taken into consideration in the design.

C. Flocculation

CT	Flocculation of wastewater by air or mechanical agitation, with or without chemicals, may be desirable in certain instances.
NH/PA	Flocculation of sewage shall be provided when it is desired to reduce the strength of sewage prior to subsequent treatment or to pretreat sewage containing specific industrial wastes.

II. PRIMARY TREATMENT

A. Primary Clarifiers

10-State Std	Multiple units capable of independent operation are desirable and shall be provided in all plants where design flows exceed 100,000 gallons per day. Plants not having multiple units shall include other provisions to assure continuity of treatment.
NJ	Channels shall be designed to maintain a velocity of 1 foot/second at 50 percent of design flow.
NJ	This method of sewage treatment shall be considered as a degree of treatment intermediate between sedimentation and sedimentation plus oxidation.

III. SECONDARY TREATMENT

A. Attached Growth

1. Trickling filters and roughing filters

10-State Std/ PA	Pilot testing is recommended to verify performance predictions based upon the various design equations, particularly when sufficient amounts of industrial wastes are present.
CT	The media should be crushed igneous rock. The media shall be durable, resistant to spilling and flaking, and be relatively insoluble in wastewater.
CT	The media shall conform to the size and grading when mechanically graded over vibrating screens with square openings.
CT	The figures are based on average rate of flow and BOD_5 of waste after settling except the hydraulic loading for high rate filters which is the allowable range of rates of instantaneous applications of settled waste plus recirculation.
NJ	When the average BOD_5 of the raw sewage exceeds 325 ppm, two stages of trickling filter treatment are recommended, with or without intermediate sedimentation.
NJ	The average rate of application during dosing periods shall not exceed 22 gallons/1000 cubic feet of media/minute. The time intervals between dosing cycles to the filter should generally not exceed five minutes at design flow.
NJ	Under conditions where treatment of unusually strong sewage is necessary and two-stage filtration is adopted, intermediate settling tanks may be required, with suitable sludge and scum removing devices to provide a detention period of one hour based upon design flow.
NM	Rock and stone filter media shall have a minimum depth of 5 feet above the underdrains. Manufactured media shall have a depth in accordance with the manufacturer's recommendations and design conditions.
NM	Filter media shall be free from thin, elongated and flat pieces, dust, clay, sand and fine material. The size of the filter media shall be such that 100 percent by weight shall be retained on a 3 inch screen.
NM	Unit sizing should be based on experience at similar full-scale installations or on thoroughly documented pilot testing with the particular wastewater.
TN	Roughing filters shall be followed by additional treatment and will be equipped with manufactured media.
TN	The recirculation ratio should be in the range of 0.5 to 4.0.

TN Application of manufactured media should be evaluated on a case-by-case basis. Suitability should be evaluated on the basis of experience with installations handling similar wastes and loadings.

WY Rocks shall be durable and free from thin, elongated, flat pieces and should have the following size distribution:

Passing 6" screen -	100% by weight
Retained on 4" screen -	95 - 100% by weight

2. Rotating biological contactors

CT All RBC installations must be preceded by units capable of providing acceptable primary treatment including scum and grease collection.

PA Design standards, operating data and experience for this process are not well established. Therefore, expected performance of RBCs shall be based upon full-scale experience or thoroughly documented pilot testing with a particular wastewater.

TN Primary clarifiers or fine screens should be placed ahead of the RBC process to minimize solids settling in the RBC tanks.

B. Activated Sludge

1. Aeration tank

10-State Std Mixed liquor suspended solid levels greater than 5000 mg/l may be allowed provided adequate data are submitted showing the aeration and clarification system capable of supporting such levels. MLSS values are dependent upon the surface area provided for sedimentation, rate of sludge return, and the aeration process.

10-State Std These values apply to plants receiving peak to average diurnal load ratios ranging from about 2:1 to 4:1.

10-State Std Total aeration capacity includes both contact and reaeration capacities. Normally, the contact zone equals 30 to 35% of the total aeration capacity.

CO It is intended that these design parameters be met over the entire flow range expected for the design life of the plant. Deviations from the above criteria must be justified.

CO Aeration basin detention times shown do not include recirculation.

IA Total aeration capacity includes both contact and reaeration capacities.

MD In the event the activated sludge process is designed for rough treatment as an intermediate process, the volumetric loading should not exceed 50 pounds of BOD_5/day/1000 cubic foot of aeration tank.

NJ Total required detention period of aeration tanks, based upon 125 percent of design flow.

PA Where primary settling tanks are not used, effective removal or exclusion of grit, debris, excessive oil or grease, and communition or screening of solids shall be accomplished prior to the activated sludge process.

PA Total aeration capacity includes both contact and reaeration capacities. Normally the contact zone equals 30 to 35% of the total aeration capacity.

2. Aeration equipment - Diffused air

CT The requirements assume equipment capable of transferring at least 1.0 lb. oxygen to the mixed liquor per pound of BOD_5 aeration tank loading.

NJ The air diffuser system shall be capable of delivering 150% of normal requirements.

3. Secondary settling tank

AZ Under no circumstance shall the surface loading rate exceed 1000 gallons/day/sq. ft for the secondary sedimentation.

CO Scum from the final settling tanks should not be discharged back to the aeration basins, but rather should be discharged to facilities that allow for ultimate removal from the plant.

CO Weir loading is specified for maximum hourly flow per linear foot of weir length.

CO The allowable maximum clarifier overflow rate should be 1.75 times the allowable overflow based on average daily flow.

CT Multiple units capable of independent operation are desirable and shall be provided in all plants where design flows exceed 40,000 gallons per day unless other provisions are made to assure adequate treatment. A minimum of 4 independent settling tanks shall be provided in all plants where design flow exceeds 20 mgd.

IA Settling tanks following the activated sludge process may have 10 foot sidewater depths provided that less than 340 lbs/day of BOD_5 is treated and the clarifier is followed by a 5-day pond.

4. Sequencing batch reactors

TN A pre-aeration, flow equalization basin is to be provided for when the SBR is in the settle and/or draw phases. If multiple SBR basins are provided, a pre-aeration basin will not be needed if each SBR basin is capable of handling all the influent peak flow while another basin is in the settle and/or draw phase.

C. Ponds and Lagoons

10-State Std For very small systems, 2 feet may be acceptable.

IL Lagoons as a means of disposing of or dewatering digested sludge will be permitted upon proof that the character of the digested sludge and the design mode of operation are such that offensive odors will not result.

W A An approved system of groundwater monitoring wells may be required around the perimeter of the pond site to facilitate groundwater monitoring. The use of wells will be determined on a case-by-case basis.

1. Stabilization ponds

10-State Std Pond design for BOD_5 loading may range from 15 to 35 pounds/acre/day at the mean operating depth in the primary cells.

CO Ponds must consist of a minimum of 3 cells and be designed to be operated both in series and in parallel.

CO With one cell out of operation, the system must be able to operate with primary cell(s) not loaded more than 1 lb of BOD_5/1000 sq. ft. of water surface area/day.

CO Interior corners of the ponds are rounded.

NH Stabilization ponds used as a method of treatment shall be limited to smaller communities and shall be used only with specific approval of the commission.

PA A detention time of 90-120 days for the entire pond system should be provided; however, this must be properly related to other design considerations. It should be noted that the major factor in the design is the duration of the cold weather period (water temperature less than 5°C).

TN The primary pond depth should not exceed 6 feet. Greater depths will be considered for polishing ponds and the last ponds in a series of 4 or more.

2. Aerated pond system

10-State Std This depth limitation may be altered depending on the aeration equipment, waste strength and climatic conditions.

CO A separate pond or a quiescent area shall be provided to settle out suspended solids which are kept in suspension by the aeration system.

CO The first pond shall be aerated with oxygen to be dispersed throughout the pond. The second pond shall be aerated and should have oxygen dispersion in the first 2/3 of the pond. The third pond shall be for settling.

IL Aeration systems shall be designed to provide a minimum of 1,500 cu. ft. of air/lb of BOD_5 in the raw waste. Floating type aerators will not be permitted.

KS The minimum air requirement is 3 cubic feet per minute per foot of chamber length when the total depth of the basin is approximately 10 to 12 feet. Higher air rates per foot are required for wider and deeper installations.

NH Aerated lagoons shall be designed so as to accomplish a minimum of 85% removal of BOD_5 under winter conditions and 90% removal under summer conditions.

3. Aerated facultative lagoon

IA The design minimum detention times of aerated cells treating domestic waste of greater strength than 200 mg/l BOD_5 should be determined utilizing an equation [given in the regulation] on a per-cell basis.

IV. DISINFECTION

CO Disinfection systems, other than those using chlorine, will be reviewed on a case-by-case basis. The same is true for dechlorination systems other than those utilizing sulfur dioxide.

CT Chlorine is the most commonly used chemical method for wastewater disinfection. The forms most often used are liquid or gaseous chlorine and sodium and calcium hypochlorite. Other disinfectant methods including chlorine dioxide, ozone, ultraviolet light radiation, bromine, iodine, silver oxide and gamma radiation may be accepted by the approving authority in individual cases.

CT The contact period required for effluent discharging to shellfish areas shall be 30 minutes unless otherwise indicated by the regulatory agency.

V. SLUDGE TREATMENT AND MANAGEMENT

1. Imhoff tanks

NJ The use of Imhoff tanks will not be approved except by special permission of the Department.

2. Anaerobic digestion

10-State Std Multiple tanks are recommended.

IL Sludge production for a two-stage anaerobic digestion process is estimated as at least 0.12 lbs/P.E./day of dry solids with a maximum solids concentration of 5% without additional thickening. A production value of 0.09 lbs/P.E./day shall be used for primary and fixed film reactor plants.

NJ In cases of very small installations where a lagoon or open tank is available for emergency use without creating local nuisance and where pumps are piping are available for such emergency, a single digestion tank may be approved if the plan and the report show emergency provisions.

PA Multiple units are desirable. A single digestion tank may be used only where other means for disposal of sludge are available so that the tank may be taken out of service without unduly interrupting plant operations.

3. Aerobic digestion

10-State Std Multiple tanks are recommended.

10-State Std Where sludge temperature is lower than 50°F, additional detention time should be considered.

NH/TN The size and the number of aerobic sludge digestion tank(s) shall be determined by factors such as volume of sludge added, percent solids and character, degree of volatile solids reduction required, the size of installation with appropriate allowance for sludge and supernatant storage aeration time.

NM The determination of tank capacity shall be based on factors such as quantity of sludge produced, sludge characteristics, time of aeration and mixing to be provided and sludge temperature.

OK The process is conducted by agitating sludge with air or oxygen to maintain aerobic conditions, at residence times ranging from 60 days at 15°C to 40 days at 20°C.

PA Multiple tanks are recommended. A single sludge digestion tank may be used in the case of small treatment plants or where adequate provision is made for sludge handling and where a single unit will not adversely affect normal plant operations.

PA Lower loading rates, between 25 to 100 pounds/1000 cu. ft/day, may be necessary depending on temperature, type of sludge, and other factors.

PA Where sludge temperature is lower than 59°F, additional detention time should be considered.

TX If a separate system of air compressors or blowers will supply air to the digester, then the compressor or blower system shall be designed so that the air requirements can be met with the largest single unit out of service. Surface aerators with an oxygen transfer capability equivalent to 0.02 pounds of oxygen/ minute/1,000 cubic feet.

TX A digester shall provide a minimum sludge retention time of 15 days. The design volume of the aerobic digesters may be calculated using 20 cubic feet per lb BOD_5 per day.

TX It is recommended that this volume be provided in two cells capable of operating as a single or two-step unit.

WI In the absence of experimentally determined values, the design oxygen requirements for aerobic digesters shall be 2.0 kilograms oxygen per kilogram anticipated volatile suspended solids reduction. An additional 1.8 kilograms oxygen per kilogram of BOD_5 applied to the digester by primary sludge shall be supplied.

4. Composting

TN Composting operations will be considered on a case-by-case basis, provided that the basis for design and a cost-effective analysis are submitted by the engineer.

5. Sludge thickening

10-State Std The design of thickeners should consider the type and concentration of sludge, the sludge stabilization processes, the method of ultimate sludge disposal, chemical needs, and the cost of operation.

PA Air flotation thickening is best applied to thickening waste activated sludge and it is possible to thicken the sludge to 6 percent solids.

TN For very thin mixtures, hydraulic loading rates of 100-200 gpd/sq ft are appropriate. The diameter of a gravity thickener should not exceed 80 feet.

6. Sludge dewatering

10-State Std 2 sq. ft/capita is the basis of estimation when the drying bed is the primary method of dewatering; whereas 1 sq. ft/capita is the basis when it is to be used as a back-up dewatering unit. An increase of bed area by 25% is recommended for paved beds.

AZ Incineration is employed as a method of sludge volume reduction. Heat drying by the flash drying or rotary kiln method is employed for the purpose of removing sludge moisture so that it can be incinerated efficiently or processed into fertilizer.

CT In determining the area of sludge drying beds, consideration shall be given to climatic conditions, the character and volume of the sludge to be dewatered, the method and schedule of sludge removal, and other methods of sludge disposal.

IA Sludge lagoons shall not be substituted for adequate sludge digestion and shall not be approved for use as a sludge volume reduction process.

KS	The climatic conditions, character and volume of the sludge to be dewatered shall be used to determine the area needed for sludge drying beds. Unless calculations are submitted to justify the design, the minimum size bed for digested sludge shall not be less than 1 square foot per capita for percolation type and 1.5 square feet per capita for impervious type beds. Smaller area may be used if alternative methods of sludge dewatering are provided.
MD	The volume of a sludge lagoon depends on the local climatic conditions and the characteristics of the sludge to be disposed of. The volume should be adequate to provide a storage capacity for at least 2 months operation.
NJ	Area required for glass covered beds is 60% of open beds.
NJ	For installations where undigested or partially digested sludge is to be filtered, vacuum filters shall be provided in duplicate unless nuisance-free storage of sludge is provided in a manner approved by the Department.
OK	Anaerobically digested sludge may be stored temporarily in facultative sludge lagoons. Organic loadings shall not exceed 20 pounds volatile solids per 1000 sq. ft surface area per day. Aeration equipment must be provided to maintain a minimum dissolved oxygen of 0.5 mg/l throughout a lagoon receiving solids from aerobic treatment units. It is recommended that aeration equipment be provided on all lagoons receiving sludge to maintain an aerobic surface layer.
OK	The use of effluent liquid recirculation is strongly recommended to maintain an active biological growth at all times and to increase overall efficiency.
OK	Corresponding area requirements for covered beds vary from 70 to 75 percent of those for open beds.
PA	The sizing of the drying bed may be estimated on the basis of 1.5 to 2.0 sq. ft/capita when the drying bed is the primary method of dewatering, and 1.0 sq. ft/capita if it is to be used as a back-up dewatering unit. An increase of bed area by 25% is recommended for paved type beds. Sand drying beds may be reduced in size by 25% when covered.
PA	Chemical conditioning of the sludge should precede vacuum filtration.

Appendix B

On-Site Systems Comments

COMMENTS ON THE ON-SITE TREATMENT SYSTEMS

I. SEPTIC TANKS

A. Detention Period

MN	The liquid capacity of a septic tank shall be sufficient to provide sewage detention period of not less than 36 hours in the tank for sewage flows less than 1,500 gallons/day, but in no instance shall the liquid capacity be less than 750 gallons.

B. Tank Size

AZ	Dens, garages, family rooms and similar areas that can be converted to bedrooms may be included at the discretion of the county health department. For more than 6 bedrooms use 1.6 * 200 * # of bedrooms for minimum tank capacity in gallons.
N. Coast, CA	At a minimum, septic tank size requirements shall be based upon the current edition of the Uniform Plumbing Code, the United States Public Health Service Manual of Septic Tank Practice, or other local agency regulations approved by the Regional Board.
GA	Septic tanks shall be increased by 50% where garbage grinders are to be used.
ME	For 2-4 units the minimum liquid working capacity shall be 500 gallons per unit or 1.5 times the design flow, whichever is greater. For 5 units or more the minimum liquid working capacity shall be 1.5 times the design flow.
MN	For sewage flows greater than 1,500 gallons/day the minimum liquid capacity shall equal 1,125 gallons plus 75% of the daily sewage flow.
NJ	When serving installations other than single family dwellings, the minimum capacity shall be 1.5 times the volume of sanitary sewage. In no case shall the capacity be less than 1,000 gallons.
OR	For sewage flows less than 1,500 gallons/day, septic tanks shall have a liquid capacity equal to 1.5 times the sewage flow for a day. For sewage flows greater than 1,500 gallons/day, the septic tanks shall have a liquid capacity equal to 1,125 gallons plus 75% of the projected daily sewage flow.
RI	For sewage flows up to 500 gallons/day the capacity shall be 1,000 gallons. For sewage flows between 500 and 1,500 gallons/day, the capacity of the tank shall be equal to at least 2 times the day's flow. For flows greater than 1,500 gallons/day, the capacity of the tank shall equal 1,500 gallons plus 100% of the maximum daily flow.

UT	For wastewater flows up to 500 gallons/day the capacity of the tank should be 750 gallons. For wastewater flows between 500 and 1500 gallons per day, the liquid capacity of the tank shall be at least 1.5 times the 24-hour estimated sewage flow. For wastewater flows between 1,500 and 5,000 gallons per day, the liquid capacity of the tank shall equal at least 1,125 gallons plus 75% of the daily wastewater flow.

B. Septage Removal

San Diego,CA	Openings between tank compartments must serve to retain all possible sludge and scum in the first compartment. The bottom of the 4" opening shall be 28" from the bottom of the tank.
MO	Septage from the tank should be removed whenever the top of the sludge layer is less than 12" below the bottom of the outlet baffle or whenever the bottom of the scum layer is less than 3" above the bottom of the outlet baffle.
NE	Septage from the tank should be removed whenever the top of the sludge layer is less than 12" below the bottom of the outlet baffle or whenever the bottom of the scum layer is less than 3" above the bottom of the outlet baffle.

C. Compartments

AR	The minimum capacity of any compartment of a multi-compartment tank shall not be less than 250 gallons, and the inlet end compartment capacity shall not be less than 350 gallons.
AZ	Inlet and outlet connections of each compartment of a septic tank shall be designed and installed to retain sewage solids, scum and sludge effectively.
MARIN CO, CA	The first compartment shall be twice the capacity of the second and separated by a baffle.
FL	Septic tanks shall be watertight and may have single or multiple compartments, or tanks placed in series, to achieve required liquid capacity.
ME	Two compartment tanks shall have an inlet compartment capacity of not less than 0.5 but not more than 2/3 of the total tank capacity.
MN	Septic tanks larger than 3,000 gallons and fabricated as a single unit shall be divided into two or more compartments.

MN	Connections between compartments shall be baffled so as to obtain effective retention of scum and sludge. Adequate venting shall be provided between compartments by an opening of at least 50 square inches near the top of the compartment wall.
MO	Connections between compartments shall be baffled so as to obtain effective retention of scum and sludge.
NE	When a septic tank is divided into three or more compartments, one-half of the total volume shall be in the first compartment and the other half equally divided in the other compartments.
PA	If the tank has more than one compartment, the first compartment shall have at least the same capacity as the second but shall not exceed twice the capacity of the second. Tanks or compartments shall be connected in series and shall not exceed 4 in number in one installation.
PR	The inlet compartment of tanks having two compartments shall have the capacity of the inlet compartment not less than half and not more than two-thirds of the total tank capacity.
TN	Septic tanks installed after January 1, 1991 shall be of two-compartment design. The inlet compartment of a two-compartment tank shall be between 2/3 and 3/4 of the total tank capacity.
UT	Septic tanks may be divided into compartments provided the volume of the first compartment must equal or exceed the volume of any other compartment and no compartment shall have an inside horizontal distance less than 24".
W V	It is recommended that dual compartment tanks or dual tanks be used. If a dual compartment tank or dual tank are used, the volume ratio of the first compartment or tank to the second compartment or tank shall be 2 to 1. In a dual compartment tank, the connection between compartments shall be an elbow with a minimum diameter of 4", placed so that the invert at the partition is approximately 16" below the liquid level.

D. Liquid Depth

FL	Liquid depths greater than 72" shall not be considered in determining the effective liquid capacity.
MN	A liquid depth greater than 6.5' shall not be considered in determining tank capacity.
NH	The liquid depth shall not exceed 5' for septic tanks of less than 3,000 gallons capacity and shall not exceed 6' for larger tanks.

PA	The depth of liquid in a tank should be 2.5 to 5 feet for a tank with a capacity less than 600 gallons and 3 to 7 feet for a tank with a capacity of more than 600 gallons.
TN	The liquid depth may range from 30 to 60" with the preferred liquid depth being 48".
W V	Minimum liquid depth should be 30". Liquid depth should not exceed 5' for tanks less than 3,000 gallons and should not exceed 6' for larger tanks.

E. Freeboard

AR	In horizontal; cylindrical tanks; this distance should be equal to 20% of the tank diameter.
KS/NH	For tanks having straight, vertical sides, the distances between the top of the tank and the liquid line should be equal to 20% of the liquid depth. In horizontal, cylindrical tanks an area equal to 15% of the total circle should be provided above the liquid level.
MN	The space between the liquid surface and the top of the inlet and outlet baffles shall not be less than 20% of the total required liquid capacity, except in horizontal cylindrical tanks this space shall not be less than 15% of the total required capacity.

F. Inlet-Outlet Structures

RI	Tops of tees or baffles shall be left open to provide ventilation. There shall be an air space of at least 3" between tops of the tees or baffles and the top interior of the tank.

G. Top Access/Manhole Diameter

AZ	Septic tank covers shall be sufficiently strong to support static and dynamic loads.
MARIN CO,CA	Septic tanks should be installed so that manhole opening(s) are within 12" of ground surface.
DE	A 4" diameter inspection port shall be located over each intercompartment connection and shall be extended no more than 6" below the grade level. Access opening shall be at least 18" square or in diameter and extended to no more than 12" below grade level with appropriate manhole extension.

IA	In the event the tank is covered by 24" or more backfill, a manhole with a suitable cover shall be extended to within 6" of the ground surface, such manhole to be at least 30" in diameter and placed over an access opening in the top of the tank.
ID	If the top of the septic tank is to be located more than 24" below the finished grade, manholes will be extended to within 18" of the finished grade.
ID	An inspection port measuring at least 8" in its minimum dimension will be placed above each inlet and outlet. Manholes may be substituted for inspection ports.
IL	A manhole or access port extension collar or riser with a minimum dimension of 12" shall be provided to bring access to the tank to within 12" of the ground surface.
IN	Access manholes at least 8" in diameter extending to the ground surface and fitted with safely secured, gas-tight covers, shall be provided for each septic tank or compartment. Access for inspection shall be provided in the top of the septic tank above the inlet and outlet baffles of each tank and compartment.
ME	A cleanout opening shall be provided over each baffle or sanitary tee with a recommended area of least 100 sq. inches with the smallest dimension being at least 8 sq. inches.
MN	There shall be one or more manholes with a minimum dimension of 20" and located within 6' of all walls of the tank. There shall be an inspection pipe of at least 4" diameter.
MO	A manhole shall extend through the cover to a point within 12" but no closer than 6" below finished grade. All manhole covers should be covered with at least 6" of earth. There shall be an inspection pipe of at least 4" diameter or a manhole over both the inlet and outlet devices.
NC	Any system with a design sewage flow greater than 3,000 gallons/day shall have access manholes over each compartment.
NH	Adequate access shall be provided to each compartment of the tank for inspection and cleaning. Both the inlet and the outlet devices shall be accessible. Access shall be provided to each compartment by means of either a removable cover or a 20" manhole in the least dimension.

NJ An inspection port extending to finished grade shall be provided over each tank or compartment inlet and outlet which is directly below a manhole. Inspection ports shall extend to finished grade, shall be constructed of 4" cast iron or PVC and shall have a locked or bolted cap.

NM Access to each septic tank shall be provided by at least 2 manholes 20" in minimum dimension or by an equivalent removable cover slab. Wherever a first compartment exceeds 12' in length, an additional manhole shall be provided over the baffle wall.

NY The top of the tank shall be no more than 12" below the finished grade and should be provided with 2 openings: one large enough for entering and inspection; the other large enough for cleanout purposes. The larger opening or manhole shall be a minimum of 20" in the shorter dimension.

OR All septic tanks installed with the manhole access deeper than 18" shall be provided with a watertight manhole riser extending to the ground surface or above.

RI At least one manhole with a removable cover of concrete, iron or other durable material shall be provided for each septic tank compartment.

VA Watertight access manholes over inlet and outlet structures (at minimum) with an open space of 18" by 18" (minimum). If tank has more than 30" of soil cover, manhole must be within 18" of the ground surface and have tight fitting covers.

H. Watertightness

TN A septic tank shall be watertight, structurally sound, and not subject to excessive corrosion or decay.

I. Separation Distance

AL Easements or right-of-way areas for underground utilities, or subsurface drainage shall not be used in computing lot sizes or as location for individual water supplies or on-site sewage disposal system

CT Normally 50' with a minimum distance of 25'.

KS The tank should not be located within 5' of any building. The tank should not be located in swampy areas, nor in areas subject to flooding.

LA The location of a septic tank shall be at least 50' and downgrade from a well or suction line supplying potable water.

MS	A septic tank must be located at least 50' away and downgrade from any well or other source of water supply.
OH	Septic tanks must be located at least 10' from buildings, at least 100' from any private water supply source, and at least 300' from any public water supply well.
OK	Septic tank shall be at least 50' from any water well, 5' from dwellings. A 15' separation distance shall be maintained between the septic tank and the top bank of any stream.
PR	Septic tanks shall be located at a minimum distance of 3' from a property line, 100' from a potable water supply source, and 3' from any building structure.
VI	Septic tanks shall be located at a minimum distance of 5' from a property line, 50' from a potable water supply source, and 5' from any dwelling.
WI	Septic and other treatment tanks shall not be located within 5' of any building or its appendage, water service, 2' of any lot line, 10' of any cistern, 15' of any pool, 25' of any well, reservoir or high water mark of any lake, stream, pond or flowage, within the interior foundation walls of a building; nor shall a new building or addition to an existing building be constructed or located over or within 5' of a tank.

J. Baffles/Tees

AR	Inlet and outlet tees shall be 4" or larger schedule 40 PVC or other approved non-corrosive material.
CT	Both the inlet and the outlet baffles will encompass not more than 48 sq. inches of liquid surface area.
DE	All inlet and outlet connections shall be sanitary tees or baffles constructed of cast-in-place concrete, vitrified clay or PVC.
DE	The inlet and the outlet baffles or sanitary tees shall extend at least 12" below the liquid level, but to a level no deeper than 40% of the liquid depth.
LA	The inlet tee or baffle shall extend downward to at least 6" below the liquid level, but it shall not extend below the level of the lower end of the outlet and shall extend at least 6" above the liquid level.
MN/MO	Inlet and outlet baffles shall be constructed of acid resistant concrete, acid resistant fiberglass, or plastic.

MN/MO	Sanitary tees shall be affixed to the inlet or the outlet pipes with a permanent waterproof adhesive.
MN	There shall be at least 1" between the underside of the top of the tank and the highest point of the inlet and the outlet devices. The horizontal distance between the nearest points of the inlet and the outlet devices shall be at least 4'.
NE	The space in the tank between the liquid surface and the top of the inlet and outlet baffles shall not be less than 20% of the total required liquid capacity.
NM	The vertical leg of a round inlet and outlet fittings shall not be less in size than the connecting sewer pipe nor less than 4". A baffle type fitting shall have the cross-sectional area of the connecting sewer pipe and not less than a 4" horizontal dimension when measured at the inlet and the outlet pipe inverts.
NM	The inlet and outlet pipe or baffle shall extend 4" above and at least 12" below the water surface. The invert of the inlet pipe shall be at a level not less than 2" above the invert of the outlet pipe.
PR	Baffles shall be located 6 to 8" from the walls and shall extend at least 6" above the flow line and have a 1" vent space between the top of the baffle and the treatment tanks.

1. Inlet

FL	The inlet invert shall enter the tank 1-3" above the liquid level of the tank. The inlet device shall have a minimum diameter of 4" and shall not extend below the liquid surface more than 33% of the liquid depth.
ID	Vented tees or baffles will extend above the liquid level 7" or more but not closer than 1" to the top of the tank. Tees should not extend horizontally into the tank beyond 2 times the diameter of the inlet.
IL	Inlet baffles shall be provided and shall extend at least 6" below the surface of the liquid and to within at least 3" of the tank lid.
KS	The inlet invert should be located at least 1" above the liquid level in the tank.
MN	The inlet baffle shall extend at least 6" but no more than 20% of the total liquid depth below the liquid surface and at least 1" above the crown of the inlet sewer. Inlet baffles shall be no less than 6" and no more than 12" measured from the end of the inlet pipe to the nearest point on the baffle.

MO	Inlet baffles shall be no less than 6" or no more than 12" measured from the end of the inlet pipe to the nearest point on the baffle.
NH	A vented inlet tee or baffle shall be provided to divert the incoming sewage downward. It shall penetrate at least 6" below the liquid level.
OK	The inlet baffle or the tee shall extend a minimum of 6" below the liquid depth in the septic tank.
PA	Inlet baffles or vented tees shall extend below the liquid level at least 6".
RI	The inlet shall be provided with a tee or baffle which must extend downward at least 1' below the flow line but not below the outlet tee.
TN	An inlet tee or baffle shall be provided to divert the incoming sewage downward and extend at least 12" below the liquid level.
UT	An inlet baffle or sanitary tee of wide sweep design shall be provided to divert the incoming sewage downward. This baffle or tee is to penetrate at least 6" below the liquid level, but the penetration is not to be greater than that allowed for the outlet devices.

2. Outlet

AR	The outlet tee shall extend to a distance below the surface to 40% of the liquid depth. For horizontal, cylindrical tanks, this should be reduced to 35%.
FL	A minimum 4" diameter vented outlet tee, swamp or baffle shall extend below the liquid level of the tank a distance not less than 30% nor greater than 40% of the liquid depth, and shall extend at least 5" above the liquid level.
ID	Vented tees or baffles will extend above the liquid level 7" or more but not closer than 1" to the top of the tank. Tees and baffles will extend below the liquid level to a depth where 40% of the tank's liquid volume is above the bottom of the tee or baffle. For vertical walled rectangular tanks, this point is at 40% of the liquid depth. In horizontal cylindrical tanks this point is about 35% of the liquid depth.
ID	All concrete outlet baffles must be finished with an asphalt or other protective coating.
IN	The septic tank outlet baffle or sanitary tee and baffles or submerged pipes between compartments shall extend below the liquid level a distance of 1/10 times the tank liquid depth.

KS	The outlet device should extend below the liquid surface a distance equal to 40% of the liquid depth. For horizontal, cylindrical tanks, this distance should be reduced to 35%.
LA	On the outlet side of the tee, the baffle shall extend downward to a distance below the water surface equal to 40% of the liquid depth of tanks with vertical sides and 35% of liquid depth of tanks of other shapes.
MN	The outlet baffles and the baffles between the compartments shall extend below the liquid surface a distance equal to 40% of the liquid depth except that the penetration of the indicated baffles or sanitary tees for horizontal cylindrical tanks shall be 35%. Outlet baffles shall be 6" from the beginning of the outlet pipe to the nearest point on the baffle.
MO	Outlet baffles shall be 6" measured from beginning of the outlet pipe to the nearest point on the baffle.
OK	Outlet baffles or tees and the passage in the common wall of two compartments tanks shall be located below 20 to 40% of the total liquid depth.
PA	The outlet baffles or vented tees shall extend below the liquid surface to a distance equal to 40% of the liquid depth. Penetration of outlet baffles or tees in horizontal cylindrical tanks shall be equal to 35% of the liquid depth.
RI	The outlet shall be provided with a tee either precast or installed of other acceptable material. The outlet tee shall extend downward one-third of the depth below the flow line. Multiple outlets shall be provided on tanks wider than 7'.
TN	A tee or baffle shall be provided on the first compartment sides of the partition at the same elevation as the outlet tee or baffle.
UT	For tanks with vertical sides, outlet baffles or sanitary tees shall extend below the liquid surface a distance equal to approximately 40% of the liquid depth. For horizontal cylindrical tanks and tanks of other sludge shapes, that distance shall be reduced to approximately 35% of the liquid depth.
VA	Outlet shall extend below normal liquid surface to a distance 35 to 40% of the liquid depth and 8 to 10 inches above normal liquid level.

K. Materials

AR	Pre-cast septic tanks may be constructed with high strength concrete or other materials as approved by the Department.

IL	Septic tanks shall be constructed of the following materials: poured-in-place reinforced concrete, precast reinforced concrete, concrete block, reinforced plastic, reinforced fiberglass, and thermoplastic.
KS	Septic tanks shall be water tight and constructed of material not subject to excessive corrosion or decay such as concrete, coated metal, vitrified clay, concrete blocks, fiberglass, and hard-burned bricks.
LA	The tank shall be constructed of materials which are corrosion resistant and provide a watertight permanent structure.
ME	Reinforced concrete, fiberglass, polyethylene, and other materials as approved by the National Sanitation Foundation.
KENT CO, MI	Septic tanks will be constructed of materials which will not permit the flow of water from surrounding soils into the septic tanks. Acceptable materials may include reinforced concrete, cement blocks, or bricks, or other materials approved by the Director.
MT	Watertight, corrosion resistant materials should be used. These include concrete, reinforced fiberglass, vitrified clay or plastic.
NE	Concrete, coated metal, concrete blocks, and fiberglass are acceptable.
NH	Septic tanks should be watertight and constructed of materials not subject to excessive corrosion or decay, such as concrete, coated metal or fiberglass.
NJ	Metal septic tanks are prohibited. Septic tanks may be made of poured-in-place concrete, precast reinforced concrete, fiberglass, and polyethylene.
NY	The tank must be watertight, constructed of durable material and not subject to excessive corrosion, decay, frost damage, or cracking.
OK	Fiberglass, steel, and plastic septic tanks must be approved by the State Health Department.
RI	Septic tanks shall be watertight. They shall be constructed of sound and durable materials not subject to excessive corrosion, decay, or frost damage, or to cracking or buckling due to settlement or soil pressures.
TX	The septic tank shall be of sturdy, watertight construction. Materials used may be steel-reinforced poured-in-place concrete, steel reinforced pre-cast concrete, reinforced fiberglass, polyethylene or other materials approved by the regulatory authority. Metal septic tanks are prohibited because they are subject to corrosion.

UT	Septic tanks may be constructed of the following: precast reinforced concrete, prefabricated metal, fiberglass, polyethylene, poured-in-place concrete, concrete block, cinder block, or brick and other material approved by the Department.
VA	Concrete is preferred. The structure should be resistant to chemical and electrolytic corrosion and structural strength to resist lateral, compressive and bearing loads.
WI	Septic tanks shall be fabricated or constructed of welded steel, monolithic concrete, fiberglass or other materials approved by the department. All tanks shall be watertight and fabricated so as to constitute an individual structure. The design of a prefabricated septic tanks shall be approved by the department.

II. DISTRIBUTION BOXES

A. Distribution Box

AR	All distribution boxes utilized on dosed systems must be baffled in order to insure flow equalization.
AZ	The distribution box is to be constructed of sound, durable material such as to assure watertightness.
SAN DIEGO,CA	A pre-cast distribution box having at least an inside diameter of 13" will be acceptable for a maximum of three tile line openings to seepage pits.
FL	Distribution boxes shall be watertight, constructed of durable materials, have adequate structural strength, and be of sufficient size to accommodate the required number of drain pipe lines.
LA	A distribution box is not required for flat areas.
MN	When sewage tank effluent is delivered to the distribution box by pump, either a baffle wall shall be installed in the distribution box or the pump discharge shall be directed against the wall or side of the box on which there is no outlet.
OK	Retention boxes shall be used on sloping sites. The outlet weir in the retention box shall be 10" above the bottom of the trench. The inlet may be at the bottom of the retention box.
OR	The minimum inside horizontal dimension measured at the bottom shall be 8", with a minimum bottom inside surface area of 160 square inches.

UT	Distribution boxes may be used on level or nearly level ground. They shall be watertight and constructed of concrete or other durable material approved by the Department.

III. Aerobic Biological Systems

A. Access

MN	Treatment system including each individual unit or compartment shall be easily accessible for inspection and maintenance and shall be provided with secured covers.

B. NSF

N. COAST, CA	Individual treatment units other than septic tanks shall require certification by the National Sanitation Foundation (NSF) or the International Association of Plumbing and Mechanical Officials (IAMPO) prior to approval for use.

C. Grease Trap

AZ	Pretreatment tanks are recommended to remove grease, floating solids, and large debris. The capacity of the pretreatment tank shall be equal to at least 150 gpd/bedroom.
CT	All new grease traps shall be provided with manhole covers which have been placarded with notification as to the danger of entering the chamber due to noxious gases.
FL	The inlet invert of grease interceptors shall discharge a minimum of 2.5" above the liquid level line and the outlet pipe shall be taken off the outer wall of the grease interceptor basin at a 45° angle in such a manner as to provide a trap seal of approximately 18".
GA	Grease traps shall be designed to provide a liquid capacity of not less than 125 gallons.
KS	Discharge from a garbage grinder should never be passed through grease traps.
ME	An external grease trap shall be installed for all new or expanded restaurants with 30 or more seats or other establishments.
NE	If an external grease trap is used it shall be watertight, durable, and constructed of the same materials as septic tanks. The grease trap shall be provided with an inspection or cleanout cover over the inlet and the outlet.

NH The grease trap size shall be based on 2.5 gallons for each patron served at one meal, but the minimum size shall be 125 gallons.

PR Grease trap is required before the septic tank if the raw wastewater contains oil or grease.

SC Commercial food preparation establishments shall be required to have a grease trap on the kitchen wasteline preceding the individual sewage treatment and disposal system.

TX Grease traps shall be used on kitchen wastelines. The grease interceptors are required to have two compartments. The primary compartment shall hold seven times the maximum gallons-per-minute flow rate and the secondary shall hold five times the flow rate.

D. Aeration Compartment

1. Capacity

AZ Pretreatment tanks are recommended to remove grease, floating solids, and large debris. The capacity of the pretreatment tank shall be equal to at least 150 gpd/bedroom.

HI The design of a household aerobic unit shall be based on 200 gallons per bedroom per day.

MN The aeration compartment shall have a minimum holding capacity of 500 gallons or 120 gallons per bedroom, whichever is greater.

PA The minimum capacity of an aerobic treatment tank shall be 400 gallons/day. For single family dwelling units a minimum of 400 gpd shall be used to determine required aerobic capacity. This figure shall be increased by 100 gallons for each additional bedroom over three.

IV. SUBSURFACE TRENCH OR BED

A. Size

AR Where dosing tanks are provided, a reduction of 10% in the leaching field size shall be permitted. Where an approved curtain drain is installed, a reduction in leaching field size of 5% will be permitted for septic tank systems on sloping terrain.

CT If the representative percolation rate in the reserve area is slower than that of the primary area, then the reserve area shall be sized according to the slower rate.

DE All systems requiring a total if more than 1.250 sq. ft of disposal area shall have a pressurized distribution system.

FL	The minimum drain field absorption area shall be 75 square feet for a 1/2 bedroom residence with an additional 25 sq. ft. for each additional bedroom.
IL	A subsurface seepage field designed and constructed to be at least 2/3 the size determined necessary by the percolation tests.
MD	The disposal and two recovery areas for an individual lot may not be less than 10,000 sq. ft and shall meet all physical and distance requirements.
VA	If a system has more than 1800 feet of percolation piping, it shall be split into multiple systems, each with a maximum of 1,200 linear feet of percolation piping.
WI	A filled area must be large enough to accommodate a shallow trench system and a replacement system. The size of the area that must be filled is determined by the percolation rate of the natural soil and use of the building. When any portion of the trench system or its replacement is in the fill, the fill shall extend 20' beyond all sides of both systems before the slope begins.

1. Trench bottom area

AR	Trench depths other than 24" must be approved by the authorized agent. The absorption area in square feet is two times the total length of the trenches.
VA	The total trench bottom area required shall be based on the average estimated percolation rate for the soil horizon(s) into which the absorption trench is to be placed. If more than one soil horizon is utilized to meet the sidewall infiltrative surface required, the absorption trench bottom area shall be based on the average estimated or measured percolation rate of the "slowest" horizon.
VA	The required area can be reduced when using low pressure distribution but no reduction is allowed when flow diversion is used with low pressure distribution.

2. Bed bottom area

CO	The area cannot be increased by more than 20% with garbage grinders and not more than 40% with automatic clothes washers.
CT	The effective area of leaching beds shall consist of 1/3 of the total bottom area of the leaching bed.
W V	Absorption beds shall be sized to provide an area 30% greater than that calculated for a standard absorption field to make up for sidewall loss.

B. Depth To Ground Water Table

CHARLEVOIX, CO, MI	The natural ground surface should be not less than 6' above maximum groundwater level, known high water mark of adjoining lake or stream, impervious rock or impervious soil stratum, and fractured rock.
UT	In areas where absorption systems are to be constructed, the maximum elevation of the seasonal ground water table or perched ground water table shall be at least 2' below the bottom of the absorption system excavation and at least 4' below finished grade.

C. Soil Conditions

AR	Soils capable of absorbing and adequately renovating septic tank effluent may be utilized with certain restrictions.

1. Dist. to imperv. material

N. COAST, CA	Where the ground slope is 20 to 30%, minimum soil depth immediately below the bottom of the leaching trench shall be 5'. Where ground slope is less than 20%, a minimum soil depth of 3' immediately below the leaching trench shall be permitted.
FL	The resulting soil profile must be satisfactory to a minimum depth of 54" beneath the bottom surface of the proposed drain field.
OR	Soil with rapid or very rapid permeability shall be 36" or more below the ground surface. A minimum of 18" separation shall be maintained between the soil with rapid permeability and the bottom of disposal trenches.

2. Depth to high ground water level

MO	Greater vertical separation may be required where water-bearing formations are in danger of contamination.
OR	A permanent water table shall be 4' or more from the bottom of the absorption facility. A temporary water table shall be 24" or more below the ground surface.
TN	A lesser depth may be permitted were soil conditions provide adequate protection for groundwater.

3. Percolation rate

DE	Systems placed on slopes between 10-15% shall provide for serial distribution.

MD	A percolation rate faster than 2 mins/inch, after prewatering may not be approved west of the fall line and may also be disapproved east of the fall line.
NH	The size of the leaching area shall be based on the percolation rate taken in the least permeable subsoil.

D. Slope-surface

MN	Where the elevation difference of the ground surface does not exceed 28" in any direction within the soil treatment system, the sewage tank effluent may be directed to the soil treatment system through a system of interconnected distribution pipes of trenches in a continuous system. With slightly sloping ground, the sewage tank effluent may be distributed by a distribution box provided the final ground elevation of the lowest trench is at least 1' higher than the inverts of the distribution box.
NH	For leaching fields built on a sloping site, the bottom elevation shall be calculated from the uphill side.
TN	Slopes of more than 30% shall be considered unsuitable unless soil conditions will prevent lateral movement of sewage effluent to the ground surface.
TX	Where the topography or ground slope is too steep for feasible construction of a closed-looped trench system, the following alternate layout may be used. There shall be a minimum of 16" drop from the bottom of the outlet pipe to the bottom of the first trench when trenches are installed in this configuration.
UT	Construction of absorption systems on slopes in excess of 15% but not greater than 25% may be allowed providing that subsoil profiles indicate no restrictive layers of soil and appropriate engineering design is provided.

E. Trench Characteristics

MARIN CO, CA	Drain field trenches shall be arranged to achieve serial distribution.

1. Length

W V	If distribution lines of greater than 100' are necessary, the solid sewer pipe from the septic tank shall be connected to the center of the distribution line so that the lengths on either side of the connection will be equal and not exceed 100' each.

2. Depth

AR	The trench depth may vary in those instances where the soil absorption field was designed to overcome limiting soil characteristics.
SAN DIEGO, CA	Where the percolation of the soil is not satisfactory, disposal trenches may be designed to a maximum depth of 5'. In addition, there shall be at least 5' of soil below the bottom of the 5' trench.
VA	In a mineral soil with the landscape having a slope less than 10%, the minimum trench depth shall be increased by at least 5" for every 10% increase in slope. Sidewall depth is measured from the ground surface on the downhill side of the trench.

3. Dist b/w trenches

FL	There shall be a minimum separation distance of 6' between centers of the trenches to be installed.
GA	Laterals shall be equal in length and spaced not less than 8' apart, center to center.
MD	When a standard trench is used, there shall be at least 6' of undisturbed soil between 2' wide trenches and 9' between 3' wide trenches.
VA	Where trench bottoms are 2' or more above rock, pans and impervious strata, the absorption trenches shall be separated by a center-to-center distance no less than 3 times the width of the trench for slopes up to 20%. The minimum horizontal separation distance shall be increased by one foot for every 10% increase in slope.
WV	Additional separation may be required in areas of severe topography and poor soil characteristics to avoid interaction between the trenches.

4. Slope of bottom

SAN DIEGO, CA	Disposal trenches containing open joint or perforated tile line shall be graded level.

F. Gravel

AR	The distribution line shall be surrounded by clean, graded gravel, washed rock, or similar aggregate.
FL	Filter material may vary in size from 0.25-2.0" and shall be free of excessive fines which could clog the soil.

KS/NH	Trenches constructed within 10' of large trees or dense shrubbery should have at least 12" of gravel or crushed stone beneath the tile.
OK	Rocks and gravel used shall be clean, durable, decay resistant, and reasonably free of dust, sand, silt, and clay.
TN	Media for the disposal fields shall consist of crushed rock, gravel or other suitable material as approved by the department, and shall be size number 2, 3, 4 or 24 coarse aggregate as defined by ASTM D-448-86. The material must be free from dust, sand, clay or excessive fines. At least 90% of the material must pass a 2.5" screen and not more than 5% may pass a 0.5" screen. Media for the disposal fields shall extend from at least 2" above the top of the perforated field line pipe to at least 6" below the bottom of the perforated field line pipe.
TX	The trench media must be clean graded gravel, broken vitrified brick, washed rock, crushed stone or similar aggregate that is one uniform size (0.75" to 2.0").
TX	In areas of the State where rock media is difficult to obtain, the total amount of rock media may be reduced by filling the initial 12" of the bed with coarse sand and placing rock media only around the top, bottom and sides of the distribution pipe to form an 18" enclosure.
UT	The stone or "gravel" fill used in absorption field trenches shall consist of crushed stone, gravel, or similar material, ranging from 3/4 to 2.5" in diameter. It shall be free from fines, dust, sand, or organic material and shall be durable, and resistant to slaking and dissolution. It shall extend the full width of the trench, shall not be less than 6" deep beneath the bottom of the distribution pipes, and shall completely encase and extend at least 2" above the top of the distribution pipe.
VI	Filter material shall be crushed stone, gravel, slag, clean cinder, or similar material having sufficient voids.
WI	A minimum of 6" of aggregate ranging in size from 0.5" to 2.5" shall be laid into the trench or bed below the distribution pipe elevation. The aggregate shall be evenly distributed a minimum of 2" over the top of the distribution pipe. The aggregate shall be covered with synthetic materials approved by the department or with 9" of uncompacted marsh hay or straw. Building paper shall not be used to cover the aggregate. A minimum of 18" of soil backfill shall be provided above the covering.
W V	Aggregate utilized in the construction of a soil absorption field shall be washed gravel, crushed stone, or slag, 0.5 to 2" in size, with a hardness of 3 on the Moh scale of hardness. Crushed limestone shall be dolomitic.

1. Size

ND	The filter material may be washed gravel, crushed stone, slag, or clean bank-run gravel ranging in size from 0.5" to 2.5".
NM	Clean stone, gravel, slag or similar filter media varying in size from 0.75 to 2.5" shall be placed in the trench.
SC	The coarse aggregate shall range in size from 0.5 to 2.5". Fines are prohibited.

2. Depth

RI	The stones should be placed to a depth not less than 6" and 12" below the distribution lines in a disposal trench and bed respectively. The stones shall extend to 2" above the top of the pipes. The stones shall be covered with at least 2" layer of washed pea stone or a 2" layer of straw or hay, or untreated building paper.

G. Cover

AZ	Backfill shall be at least 12" of native soil over a protective layer of untreated building paper, filter fabric or other pervious biodegradable material.
MARIN CO, CA	Filter fabric, straw, graded aggregate or other suitable filter material shall be placed immediately above the drain rock.
MENDICINO, CA	Roofing felt, heavy brown paper or 4 ml plastic must be placed over the drain rock and leach pipe prior to backfill with earth to prevent infiltration of soil into leach pipe.
CO	A cover of straw, hay or similar impervious material may be used.
CO	It should be hand tamped and made suitable for vegetation.
CT	A layer of non-woven filter fabric shall be paved over all stone used in leaching system construction before backfilling.
ID	The aggregate will be covered throughout with untreated building paper, a synthetic filter fabric, a 3" layer of straw or other permeable material.
MS	After the gravel is in place, it should be covered with untreated building paper, fiberglass, or 2" of hay or pine straw.
MT	Untreated building paper or straw.

NV	The aggregate must be covered with untreated building paper, and the top of the trench must be overfilled with 4-6" of earth.
PA	The top of aggregate material shall be covered with untreated building paper or a two-inch layer of hay, straw or similar material. Minimum depth of earth cover over the aggregate in all installations shall be 12".
PR	The crushed stone shall be covered with at least a 2" layer of compressed hay or straw.
SC	The coarse aggregate over the distribution pipe shall be covered with a strong, untreated pervious material to prevent infiltration of backfill material.
TN	The media for the disposal fields shall be covered with untreated building paper, a layer of straw at least 2" thick or other material determined to be equivalent by the commissioner.
TX	Covering of several layers of newspaper, a layer of butcher paper or geotextile filter fabric material over the top of the gravel is required to prevent the sandy loam or sand backfill from invading the gravel.
UT	The top of the filter media shall be covered with an effective, pervious, material such as an acceptable synthetic filter fabric, unbacked fiberglass building insulation, a 2" layer of compacted straw, or similar material before being covered with earth backfill. Absorption systems shall be backfilled with earth that is free from stones 10" or more in diameter. The first 4 to 6" of soil backfill should be hand-filled. Distribution pipes shall not be crushed or disaligned during backfilling. When backfilling, the earth should be mounded slightly above the surface of the ground to allow for settlement and prevent depressions for surface ponding of water.

H. Separation Distance

CT	Normally 50' with a minimum distance of 25'.
MS	All sections of the disposal field must be located at least 100' from any well or source of water supply.
OH	Tile fields should be located at least 100' from any water supply well, 20' from any occupied building, and 10' to 15' from a property line.
OK	House sewer and other solid pipe should be located 50' from any water well or surface water supply. A minimum of 10' must be maintained. Perforated pipes shall be located at least 50' from any water well or surface water supply.

SC	The system should be at least 5' away from property lines, at least 50' from wells and surface water bodies, at least 25' of a drainage ditch, at least 15' from the top of the slope of embankments, and at least 10' of upslope and 25' of interceptor drains.
VI	The system shall be 50' from any source of domestic water supply, 25' from a stream, 10' from dwellings, trees, and property lines.
WI	The soil absorption system shall be located not less than 5' from any lot line, 10' from a water service, or an uninhabited slab constructed building measured from the slab; 25' from the below grade foundation of any occupied or habitable building or dwelling, public water main or cistern, 50' from any water well. Private sewage systems in compacted areas such as parking lots and driveways are prohibited.

I. Lead Line Characteristics

SAN DIEGO, CA	The line from the septic tank to the distribution box, leach line, or seepage pit must be constructed of watertight, cast iron, clay, approved plastic or other approved material properly joined and sealed.
DE	All distribution laterals shall be connected in closed loop systems except when serial distribution is utilized.
RI	All distribution pipes for minimum of 2' from the distribution box to the first section in the laterals shall be level and unperforated and shall be laid with tight joints.

1. Size

CT	3" diameter of PVC, meeting ASTM D2729 specs or 4" diameter PVC, meeting ASTM D3034 SDR 35 or equal, is required for all solid distribution piping.

2. Slope

OR	The equal distribution system shall be used on generally level ground. All trenches and piping shall be level within a tolerance of plus or minus 1". All lateral piping shall be at the same elevation.

3. Other characteristics

AR	In systems utilizing a distribution box, all lateral lines must be of the same length. In systems utilizing serial distribution, lateral lines must be of an appropriate design and adequate length.

NJ Connecting pipes shall be laid in a continuous grade and in a straight line. Drop manholes may be installed if found necessary. Horizontal bends shall not be sharper than 45°. The inside angle between adjacent sections of pipe shall be no less than 135°.

4. Material

AR All non-perforated pipes and the distribution box must be bedded on undisturbed earth to prevent settling. Pipes shall be constructed of Schedule 40 PVC, cast iron, or with a steel sleeve in areas where traffic will pass over, or in instances where less than 6" of cover is used.

AZ All types of piping materials used in construction shall have established ASTM, ANSI or NSF standards.

CT 3" diameter PVC, meeting ASTM D2729 specs or 4" diameter PVC, meeting ASTM D3034 SDR 35 or equal, is required for all solid distribution piping.

IL All piping located from a point 5' from the building foundation to a point 6' beyond the septic tank shall be ductile iron, vitrified clay, asbestos cement, or plastic.

VA If a system has more than 1800 feet of percolation piping, it shall be split into multiple systems, each with a maximum of 1,200 linear feet of percolation piping.

J. Percolation Line

1. Size

MN Distribution pipe used in trenches or beds for gravity flow distribution shall be at least 4" in diameter, and for pressure flow shall be 1" in diameter, and constructed of sound and durable material.

NE Distribution pipe used in trenches or beds for gravity flow distribution shall be at least 4" in diameter, and for pressure flow shall be 1" in diameter, and constructed of sound and durable material.

WV Pipe for gravity distribution systems shall have a minimum diameter of 4". Smaller size pipes may be utilized for pressure distribution systems.

2. Length

TN The maximum length of a single line should not exceed 100 feet unless conditions require a longer line.

3. Slope

FL	Drainlines may be placed level or with a downward slope not exceeding 0.5" per 10'. For standard gravity gravel drain field systems, drainlines shall be graded with a downward slope of 0.25-0.5" per 10 ft.
OR	The equal distribution system shall be used on generally level ground. All trenches and piping shall be level within a tolerance of plus or minus 1". All lateral piping shall be at the same elevation.

4. Material

AR	All non-perforated pipes and the distribution box must be bedded on undisturbed earth to prevent settling. Pipes shall be constructed of Schedule 40 PVC, cast iron, or with a steel sleeve in areas where traffic will pass over, or in instances where less than 6" of cover is used.
AZ	All types of piping materials used in construction shall have established ASTM, ANSI or NSF standards.
SAN DIEGO,CA	Open joint 4" tile lines must be 0.25" apart. All tile leaching lines must be of clay, bituminous fibre, 4" diameter, or other material approved by the Director of Public Health.
IL	All piping located from a point 5' from the building foundation to a point 6' beyond the septic tank shall be ductile iron, vitrified clay, asbestos cement, or plastic.
NV	Distribution piping must be made of perforated clay tile, plastic, bituminous fiber, cement asbestos or short lengths of clay or concrete drain pipe. The bottom of the distribution piping must be laid 12-24" below the ground surface. A slope of 2-4" per 1000 feet must be maintained. Drain pipes must be spaced approximately 0.25" apart.
NY	4" diameter agricultural drain tile, clay tile, bituminous fiber and rigid or corrugated plastic are acceptable materials for use as open joint or perforated distribution lines.
OK	Perforated pipe shall be polyethylene (PE) ASTM F405, ASTM F810 or ASTM D3350 or polyvinyl chloride (PVC) plastic pipe ASTM D2729, ASTM D3034 or ASTM D3350.

5. Other characteristics

AL	Effluent distribution lines shall be, but not limited to, rigid or semirigid perforated plastic pipe with minimum exfiltration area of 2.2 sq. inches/foot of pipe.

SAN DIEGO,CA	No more than one crossover will be permitted between two leach lines.
CT	When leaching trenches are at the same elevation, ends of trenches shall be connected wherever feasible.
CO	Must be perforated.
FL	Perforated pipe shall have a minimum perforated area of 1 and 1.5 square inches per linear foot. Perforations shall be located in the bottom half of the pipe. All plastic pipes shall conform to the standards of ASTM F 405-82a.
IL	The ends of the lines shall be looped except in serial distribution.
MO	The ends of the distribution lines should be capped or plugged, or when they are at equal elevations, they should be connected.
NE	Distribution pipes shall have a load bearing capacity of more than 1,000 pounds per linear foot.
NH	The holes in the leach lines shall be positioned at 5 and 7 o'clock positions. The leach lines shall be sealed into the distribution box. All leach lines shall be either interconnected or plugged at the far end of the system.
PR	Perforated pipes used in a distribution system shall be installed and aligned so that the holes are located in the lower half of the pipe. Solid pipe shall be installed between the treatment tank and the disposal area.
TN	The pipe used in the disposal field trenches shall have a minimum diameter of 4", be perforated with 0.5" holes and conform to the standards of ASTM F-405-82A.
VI	All open joints shall be protected, on top, by strips of asphalt-treated building paper at least 10" long and 3 to 6" wide.
WI	Fresh air observation inlets of cast iron shall be provided and connected to the perforated distribution pipe with an approved fitting or junction box and be placed so as to assure a free flow of air throughout the whole installation.

V. LOW PRESSURE DISTRIBUTION SYSTEMS

A. Dosing Cycle

CT	Systems located on different elevations may be dosed by pump, siphon or a dosing distribution box to promote uniform application of effluent.
ID	Medium & fine sand shall receive 4 doses/day, loamy sand shall receive 1-2 doses/day, and loam and finer soils 1 dose/day.
MN	The quantity of effluent delivered for each pump cycle shall be no greater than 25% of one day's sewage flow.
NM	Dosing tanks shall be equipped with an automatic siphon or pump which discharges the tank once every 3 to 4 hours. The tank shall have a capacity equal to 60 to 75% of the interior capacity of the pipe to be dosed at one time.
VA	The effluent applied to the absorption area per dosing cycle is from 7 to 10 times the volume of the distribution piping, however the volume per dosing should not result in a liquid depth in the absorption trench greater than 2".

B. Dosing

AZ	The daily dose volume ratio should be at least 7 times the volume of the manifold and lateral piping which drains between doses plus one time the interior volume of the transport line.
CO	Dosing chamber to dose 3-4 times daily. Reduction of field size by 25% with local Board of Health approval.
MN	The size of the effluent dose shall be determined by design of the soil treatment unit but in no case shall the dosing chamber be sized to provide a dose of less than 75 gallons.
MO	Dosing is recommended for all systems except serial distribution systems and shall be provided when the design sewage flow requires more than 500' of distribution line.

C. Dosing Chamber

FL	Systems having less than 2,000 square feet of drain field shall consist of a dosing tank that is at least 24" in diameter, or equivalent rectangular size.

RI A dosing tank equipped with a siphon or two alternating pumps shall be provided where the total length of the distribution lines exceed 500'. The dosing tank shall be provided with at least two alternating siphons or two alternating pumps delivering to separate seepage systems if the total length of the distribution lines exceeds 1,000 feet.

RI All pumps shall be equipped with a high water level visible and audible alarm powered by a circuit separate from the pump power.

WI The alarm system shall consist of a bell or light mounted in the structure and shall be located so it can be easily seen or heard. The high water warning device shall be installed 2" above the depth set for the on-pump control. Alarm systems shall be installed on a separate circuit from the electrical service.

1. Capacity

MN The pump discharge head shall be at least 5' greater than the head required to overcome pipe friction losses and the elevation difference between the pump and the distribution device.

PA The minimum pump capacity shall be calculated shall be calculated by multiplying the total number of discharge holes contained in the laterals of a proposed distribution layout by a factor of 0.75 gpm.

D. Percolation Line

IN The distal end of the delivery pipe from the pumping chamber must be fitted with an elbow turned down, or else the distribution box must be baffled.

1. Size

AZ The orifice diameter will be 0.25". A residual head of 2.5' is used for calculating flows and pump size.

2. Hole Placement

PA The first hole in the lateral shall be 3' from the manifold. Additional holes shall be placed 6' on the center with the last hole placed directly in the end cap. The maximum spacing between discharge holes shall be 10' and 8' for an equilateral triangle and square pattern respectively.

3. Materials

IL All piping located from a point 5' from the building foundation to a point 6' beyond the septic tank shall be ductile iron, vitrified clay, asbestos cement, or plastic pipes.

MN The distribution pipes shall be constructed of sound and durable material not subject to corrosion or decay or to loss of strength under continuously wet conditions.

VA Plastic is preferred, either PVC or ABS is also acceptable. Lines shall have countersink holes placed on a straight line along the longitudinal axis of the pipe. Joining shall be accomplished with manufactured pressure type joints.

VI. SYPHON

MN For a siphon a maintenance inspection shall be made every 6 months.

PA A siphon may be substituted for a pump where site conditions permit the use of gravity flow device.

VII. Absorption or Seepage Pits

A. Leaching Chamber

1. Material

RI The chamber shall be constructed of concrete, stone, brick, or cement block, laid dry with open joints. The cover should be removable and constructed of reinforced concrete.

2. Construction/dimensions

RI The space between the excavation and the lining shall be backfilled with washed stone, 0.5 to 2" in size for a distance of at least 12" from the lining. The stone outside the chamber shall extend to within 2" of the top of the chamber and be covered with a 2" layer of washed pea stone or a 2" layer of straw or hay, or by a layer of untreated building paper. Washed stone 0.5 to 2" in size shall be placed on the bottom of the excavation to a depth of at least 12".

B. Capacity

CO Capacity should be based on weighted average of percolation tests done on each vertical stratum penetrated.

CT Leaching pits or galleries greater than 30" in depth shall only be used when at least 50% of the effective depth of the structure can be installed below original natural grade level.

RI — The sidewall area below the invert of the inlet and the bottom of the excavation, not to exceed 2' around and below the liner, shall be used to determine the effective leaching area. Sidewall or bottom area having a percolation rate exceeding the design percolation rate shall not be used to determine the effective leaching area.

C. Separation of Pits

CO — Equals or greater than 3 times the diameter of the largest pit. If the pit depth is greater than 20 ft, minimum distance is 20 feet.

UT — Seepage pits shall meet the same separation distances specified for seepage trenches, except that seepage pits shall be separated from one another by at least a distance equal to 3 times the greatest diameter of either pit, with a minimum separation of 15'.

D. Access

RI — The top of the seepage pit shall be provided with an access manhole with a removable cover of concrete, iron, or other durable material.

VIII. WASTEWATER POND

A. Loading

TN — The capacity of a two-cell lagoon shall be equivalent to a 60-day minimum retention time based upon the average daily sewage flow of 150 gallons per bedroom for residence.

B. Max. Water Depth

TN — Freeboard shall be at least 2' after settling.

C. Capacity

IL — When domestic sewage is to be discharged to the waste stabilization pond, the capacity shall be equivalent to 90 times the average daily flow. When preceded by a septic tank, the capacity shall be equivalent to 60 times the average daily flow. When preceded by an aerobic treatment plant, the capacity shall be equivalent to 18 times the average daily flow.

TN — The capacity of a two-cell lagoon shall be equivalent to a 60 day minimum retention time based upon the average daily sewage flow of 150 gallons per bedroom for residence.

D. Length:Width

ID — Excavation must provide the following dike and embankment details: inner slope 3:1; outer slope 2:1 or flatter; embankment width 4' minimum.

IX. VAULT PRIVY

ME — A vault privy is designed to handle only human wastes. A vault privy shall have a minimum capacity of 500 gallons and shall be installed to prevent flotation and entrance of surface water.

VA — The Uniform Statewide Building Code of VA normally prohibits the installation of pit privies at new homes. Pit privies utilized at existing dwellings should be abandoned within one year of the availability of sanitary sewers. Proper abandonment consists of removing the structure and covering the pit with at least 2 feet of soil. Pit privies are an acceptable means of sewage disposal at isolated areas.

VA — Vault privies are an acceptable method of holding human wastes where groundwater, surface water or other conditions prohibit the installation of other approved sewerage facilities.

A. Location

VA — The elevation of the top of the vault or access port shall be placed 2 feet above the annual flood elevation. Separation distances from structured and topographic features are determined on a case by case basis.