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SAFETY AND BUILDINGS DIVISION
Plumbing Product Review
P.O. Box 2658
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Scott Walker, Governor
Paul F. Jadin, Secretary

June 7, 2011

CONINE MANUFACTURING CO., INC.
GREG CONINE / JAY SCHULTZ
10891 FM 346 WEST
FLINT TX 75762

Re: Description: CAST IRON SOVENT SANITARY DRAINAGE, ALTERNATE PLUMBING SYSTEM
Manufacturer: CONINE MANUFACTURING CO., INC.
Product Name: CAST IRON SOVENT SINGLE-STACK DWV SYSTEM
Model Number(s): NONE
Product File No: 20110190

The specifications and/or plans for this plumbing system have been reviewed and determined to be in compliance with chapters Comm 82 through 84, Wisconsin Administrative Code, and Chapters 145 and 160, Wisconsin Statutes.

The Department hereby issues an alternate approval to s. Comm 82.30 & 82.31 based on the Wisconsin Statutes and the Wisconsin Administrative Code. This approval is valid until the end of June 2016.

This alternate approval is contingent upon compliance with the following stipulation(s):

- Any revisions to the 1990 manual require a revision approval prior to use under this approval.
- The entire system must be designed and installed in accordance with the 2004 copyright Sovent Cast Iron Single Stack DWV design manual number 802 requirements and recommendations.
- Written approval for the plumbing plans shall be obtained from the department for each installation of this system. If the project is located within the city of Milwaukee, plans may be submitted to either the department or to the city of Milwaukee.

This approval supersedes the approval issued on July 29, 2005 under product file number 20050653.

This approval letter shall be incorporated with your previously approved plans and/or specifications approved under product file number 20050653.

The department is in no way endorsing this product or any advertising, and is not responsible for any situation which may result from its use.

Sincerely,

Jerry Thompson
Plumbing Product Reviewer
Phone: 608-266-6742
Fax: 608-267-9566
E-mail: jerry.thompson@wi.gov

CAST IRON SOVENT® DESIGN MANUAL #802
Version E802.04

As published by

Conine Manufacturing Co., Inc.
P.O. Box 6561 - Tyler, TX 75711
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www.castironsovent.com

Welcome to the electronic version of the Cast Iron Sovent® Design Manual #802. The information presented herein correlates directly with the complete printed volume catalog currently distributed by our office. In order to maintain page number integrity some blank pages will appear in this document. These pages have been clearly marked and do not alter the technical content or provisions. Contact our office with any questions regarding this manual.

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CAST IRON SOVENT® DESIGN MANUAL #802 – Version E802.04

INTRODUCTION TO CAST IRON SOVENT®

The Cast Iron Sovent® system is an engineered single-stack drainage concept for multi-story buildings typically three stories and taller. Two primary fittings, the Aerator and De-aerator, in conjunction with standard DWV materials render the Sovent® concept unique by accomplishing the function of drainage, waste and venting within one vertical pipe instead of two. This along with the elimination of individual fixture vents results in reduced costs, reduced resource consumption, and reduced space requirements.

The Sovent® system was developed in Switzerland in the 1950's and represented the first time a scientific approach was taken to the protection of trap seals in sanitary systems. The hydraulic and pneumatics characteristics of intermittent flows were studied using a 10-story testing tower complete with measuring instruments. It was found that controlled flow velocities reduced the excessive pressure excursions that can occur in traditional systems. The unique interior geometry of the Sovent® fitting provides this control and maintains these pressures within acceptable limits. Once fully perfected, the Sovent® system was marketed to other industrialized counties around the world. Developed initially in cast iron, Sovent® was introduced to the United States marketplace in the mid-1960s in the form of a copper DWV system. In 1977, Conine Manufacturing Co., Inc. began offering Sovent® in hubless cast iron, which offered superior noise suppression characteristics and ease of assembly. Conine Manufacturing Co., Inc. has since furnished thousands of projects worldwide and continues to be the oldest and most experienced licensed manufacturer/marketer of Cast Iron Sovent in the USA.

Sovent® continues to be the most extensively tested DWV system to date. In addition to laboratory testing and analysis, actual field installations have been subjected to various performance tests. Certified testing by both independent and government agencies is available showing Sovent® meets and exceeds the performance standards required for sanitary systems. Periodic monitoring of Sovent® projects shows no problems attributable to the Sovent® concept.

Code approval procedures for Cast Iron Sovent® systems continue to change as model codes are revised and updated to reflect new and different approaches to plumbing. Most model codes, including various city and state versions, do not specifically address Sovent® systems and the approval process will differ slightly in each jurisdiction. Sovent® approvals are often granted under Alternate Material & Methods or Alternate Engineered Design sections of the prevailing code. In some cases, the approval must be sought for each individual project in a particular jurisdiction. Many areas require the manufacturers review and approval of the design and usually must bear the seal of a Registered Professional Engineer having a license in that jurisdiction. Conine Manufacturing Co, Inc. can assist with the approval process with respect to technical data and plan review services.

In the view of many practitioners of plumbing, systems have traditionally been over-designed. The art of plumbing has evolved through trial and error rather than a truly engineered approach to design. While traditional DWV plumbing systems certainly work well, the inventor and subsequent developers of Sovent® have provided the industry with design criteria and techniques to engineer DWV systems scientifically and professionally. This results in performance and savings that are attractive to the real professionals of the plumbing industry and is evidenced by the fact that they continue to specify, install, and promote the use of Sovent®.

The savings realized with the use of this proven technological advancement in plumbing helps to maintain a healthy construction industry that benefits us all. Innovations such as Sovent® should be encouraged. Sovent® is proven safe, economical, and functional. The performance record is excellent. Contact our office for ways Cast Iron Sovent® can help you with your next multi-story project.

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CAST IRON SOVENT® DESIGN NOTES

The Cast Iron Sovent® system represents advancement in the art and technology of sanitary drainage systems. This manual is intended to address basic plumbing rules that apply when designing, installing, or inspecting a Cast Iron Sovent® system.

The use of *Cast Iron Sovent® Design Manual #802* along with good plumbing practices and techniques will assure a safe and modern plumbing system. Installation requirements such as clean-outs, hydraulic integrity, support systems, slab penetrations and fireproofing do not differ from traditional DWV practices and continue to be the responsibility of the designers, installers and inspectional authorities.

Cast Iron Sovent® Aerators and De-aerators may be used with stacks, branches, and run-outs made from any acceptable DWV material providing proper transition couplings are used. Penetrations of floor/ceiling assemblies, shafts, and fire rated assemblies must be protected in accordance with the Building Code requirements.

The definition of sweeps and bends shall be based on cast iron hubless fittings.

The written rules shall prevail. Illustration drawings are included for interpretation and clarity only.

Designs and conditions not outlined in this manual shall be submitted for approval to Conine Manufacturing Co., Inc.

In accordance with our policy of continual product improvement, we reserve the right to amend specifications without prior notification. Although every effort is made to ensure accuracy, Conine Manufacturing Co., Inc. cannot be held responsible for errors and omissions in the printing of this manual.

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HOW SOVENT® WORKS

The Sovent® system controls the flow within the pipe to keep pressure excursions from exceeding +/- one-inch of water column which is the standard for sanitary drainage systems. The system consists of a vertical stack open to the atmosphere, horizontal branches to each fixture, Sovent® Aerator fittings, and Sovent® De-aerator fittings.

The Sovent® stack conveys waste from the upper levels of the building to the base of each stack. Flow through a vertical stack will cling to the interior wall surface and proceed downward in a swirling motion leaving the center portion as an open airway. As long as this airway exists, pressures are balanced within the stack. Left uncontrolled, the flow will increase in speed to a point known as terminal velocity and can form a complete cross-sectional blockage of the tube. This will result in positive and negative pressures ahead and behind the flow that may cause trap seal failures through induced siphonage and/or blowback. The Sovent® system eliminates the formation of the "hydraulic plug" and maintains a core of air throughout the vertical stack.

The horizontal branches connect to the plumbing fixture and transport wastes to the Sovent® stack. Sovent® branch sizing criteria allocates approximately 75% of the cross-sectional area for venting purposes. Sovent® branch design remains the key to flexibility and the developed length limitations that exclude additional re-vent piping far exceed those of "conventional" systems. The branch size may telescope allowing a possible run-out of fifty-seven feet without a return vent pipe. Developed length is determined by measuring along the centerline of all horizontal piping located in the ceiling and/or wall space. The vertical drop distance is not included in the calculation. A Sovent® system does not use the traditional "S-trap" configuration rather it employs a sizing criteria designed to eliminate self-siphonage and provide proper venting. A typical Sovent® branch connection to a lavatory would consist of a 1-1/4" tailpiece, a 1-1/2" trap-arm, and a 2" vertical drop making it impossible to completely fill the 1-1/2" trap-arm with a 1-1/4" tailpiece – much less the 2" vertical drop.

The third component of a Sovent® system is the Aerator fitting. Aerators are placed in the vertical stack usually at each typical floor level and must remain in a full upright position. They contain no moving parts and require no special tools for maintenance. Their ability to balance the pressure excursions stem from the geometry of the full size waterways through the body of the fitting. Two distinct chambers are found in the body of the Aerator fitting. One is called an offset chamber where flows from the upper floors enter the fitting and actually "offset" around the horizontal branch inlets. This offset is designed to reduce the flow velocity and also break up any "hydraulic plug" formation associated with terminal velocity. Once leaving the offset chamber it will again cling to the interior surface of the pipe leaving the center area open for air. This occurs as the flow reaches Aerator fittings at each floor and also eliminates the need for the "yoke-vents" required in "conventional" systems. Vertical distance between Aerators must not exceed twenty feet. Interior baffles are situated to control the effects of flow through the Aerator. To guard against blocking the cross-sectional area of the stack with a horizontal discharge, a second chamber is provided adjacent to the offset chamber. This mixing chamber is completely separated from the vertical stack flow through the use of a separation baffle. As horizontal flow enters the Aerator fitting, it must transition to a vertical flow before smoothly uniting with any stack flow. These actions take place on an intermittent basis as both stack and branch flows may not be present simultaneously. At the top of the separation baffle, a vent aperture or opening can be found. This provides the venting action between the branches and stack, which balances any pressure fluctuations. A second baffle is located perpendicular to the separation baffle in the mixing chamber to prevent cross-flow from opposing branch inlets.

The final component of the Sovent® system is the De-aerator fitting. It is located at the base of each stack and at any horizontal stack offset. It is designed to effectively deal with the pressure fluctuations that occur when vertical flow transitions to horizontal flow. This phenomenon is referred to as hydraulic jump and in some cases, can cause a complete cross-sectional blockage of the horizontal pipe. The De-aerator fitting has two features designed to overcome these adverse effects. The first feature is an internal nosepiece, which reduces the flow velocity prior to the horizontal transition. It also allows the air and waste to separate thus balancing the internal pressures. The second feature of the De-aerator fitting is the Pressure Relief Line (P.R.L.). The P.R.L. outlet is located on top of the De-aerator and is routed from the De-aerator to the horizontal drain. It connects to the horizontal drain above the centerline at a minimum of distance of ten pipe diameters downstream from the stack. The ten pipe diameters are based on the stack size (i.e. 4" stack = 40" minimum) and this places the P.R.L. connection beyond the hydraulic jump zone. Note that all connections into the horizontal drain must meet this minimum distance requirement. The Sovent system terminates at the P.R.L. connection point to the horizontal drain.

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TABLE A

Fixture Type	Trap Size	D.F.U. Rating
Bar Sink	1-1/2	2
Bath Group (Full) *		6
Bathtub	1-1/2	2
Bidet	1-1/2	2
Clothes Washer	2	4
Dishwasher	1-1/2	2
Disposer	1-1/2	3
Drinking Fountain	1-1/4	1
Floor Drain - 2"	2	2
Floor Drain - 3"	3	5
Kitchen Group ***		5
Lavatory	1-1/4	1
Service Sink	3	5
Shower	2	2
Sink	1-1/2	2
Urinal	2	4
Water Closet	3	6

All Other Fixtures	
Trap Size	D.F.U. Rating
1-1/4	1
1-1/2	2
2	3
2-1/2	4
3	5
4	6

* Bath Group (Full) consists of (1) W.C., (1) Lavatory & (1) Tub/Shower

** Bath Group (Half) consists of (1) W.C. & (1) Lavatory

*** Kitchen Group consists of (1) Sink Trap, with Dishwasher and Disposer

TABLE A-1 - D.F.U. Values For Water Saving Fixtures

Building Type - D.F.U. Rating		Apartments & Condominiums	Office Building & Commercial	Hotels & Motels
Fixture Type	Trap Size			
Bar Sink	1-1/4	0.5	0.5	0.5
Bath Group (Full) *		3.0		4.0
Bath Group (Half) **		2.0		3.0
Bathtub	1-1/2	3.0		3.0
Bidet	1-1/2	1.0		1.0
Clothes Washer	2	4.0		
Dishwasher	1-1/2	2.0	2.0	
Disposer	1-1/2	0.5		
Drinking Fountain	1-1/4		0.5	
Floor Drain (Emergency)	2 thru 4	0.0	0.0	0.0
Kitchen Group ***		3.0		
Lavatory	1-1/4	1.0	1.0	0.5
Service Sink	3	3.0	3.0	3.0
Shower	2	2.0		2.5
Sink	1-1/2	2.0	2.0	2.0
Urinal	2		3.0	
Water Closet	3	3.0		3.0
Water Closet (Public)	3		4.0	

NOTE: Increased W.C. branch sizing as outlined in Cast Iron Sovent Design Manual #802 (Branch Rules - para. H) does not apply when using Table A-1.

CAST IRON SOVENT® STACK LOADING TABLE B

Stack Size	Maximum Drainage Fixture Units
* 3"	64
* 3" over 7 floors	102
4"	504
5"	1,010
6"	2,200
8"	3,900

* No more than twelve (12) W.C.'s are permitted on 3" stacks. The 3" stack will use a 4" De-aerator at the base of the stack.

CAST IRON SOVENT® BUILDING DRAIN LOADING TABLE C

Drain Size	1/4"/ft. (2%) Max. D.F.U.	1/8"/ft. (1%) Max. D.F.U.
4"	120	96
5"	350	280
6"	850	680
8"	2,700	2,160
10"	3,900	3,120
12"	5,800	4,640

Note: This table is also used for sizing horizontal stack offsets.

CAST IRON SOVENT® BRANCH LOADING TABLE D

Branch Size	1/4"/ft. (2%) Max. D.F.U.	1/8"/ft. (1%) Max. D.F.U.
2"	**6	**5
3"	16	13
4"	90	72

** No W.C.'s are permitted on 2" branches. Clothes washer branches 2" insize shall not exceed five feet (5'-0") in developed length.

Cast Iron Sovent systems shall be designed using the load values as shown herein. For loading values and design applications not shown in this manual, please contact our office.

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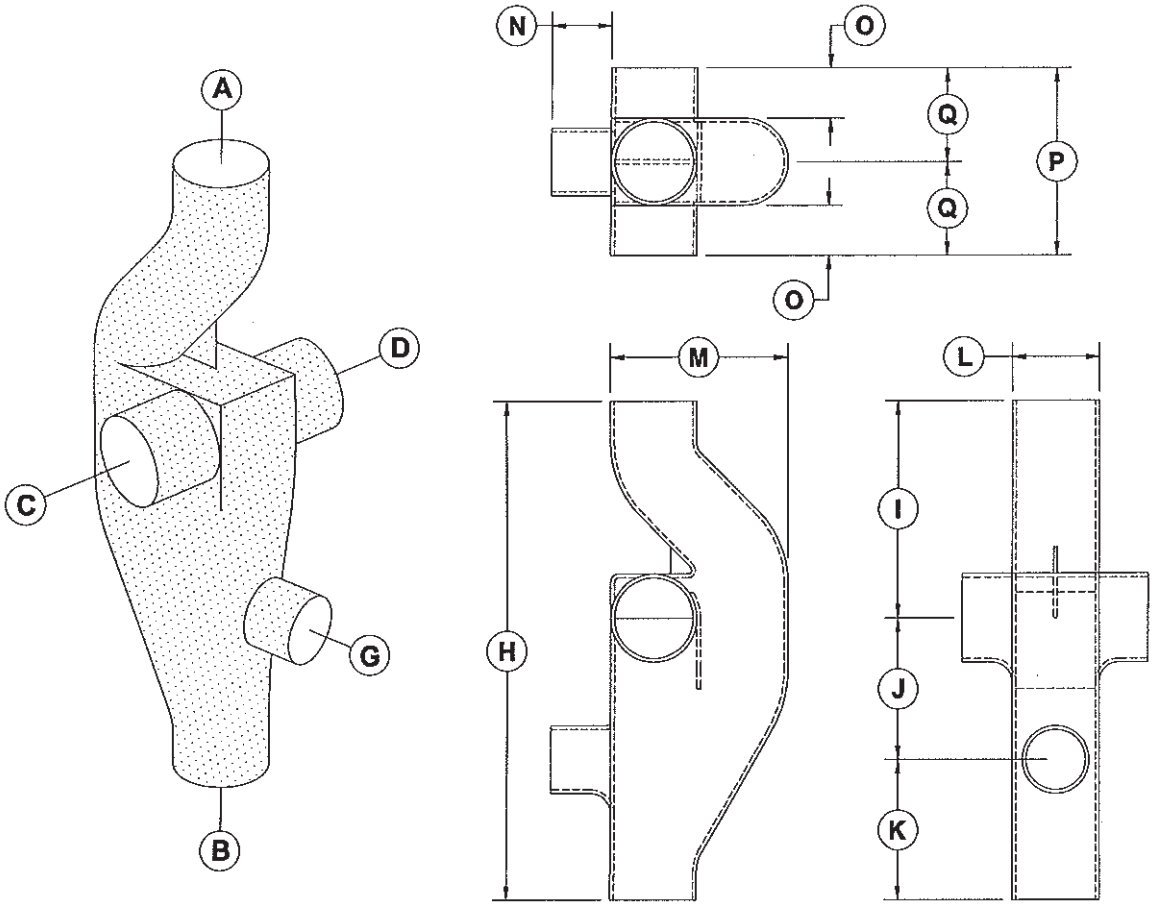
AERATOR DIMENSIONS



Nominal Aerator Size	Nominal Inlet Size (inches)					Fitting Dimensions (inches)									
	A	B	C	D	G	H	I	J	K	L	M	N	O	P	Q
3"	3	3	3	3	2	19.50	8.25	5.00	6.25	3.35	6.75	2.25	2.00	7.25	3.63
4"	4	4	4	4	3	24.75	10.75	7.00	7.00	4.38	9.75	3.00	2.50	9.50	4.75
4" x 3"	4	4	3	3	3	24.75	8.81	7.00	8.94	4.38	8.75	2.50	2.00	8.38	4.19
5"	5	5	4	4	3	30.75	13.75	7.00	10.00	5.30	12.50	2.25	3.50	12.50	6.25
6"	6	6	4	4	3	30.75	13.75	7.00	10.00	6.30	13.25	2.25	3.50	13.25	6.63
8"	8	8	4	4	4	36.00	15.00	10.00	11.00	8.38	15.00	4.50	4.50	17.50	8.75

Nominal inlet dimensions and tolerances are shown in Table E.
Specify nominal Aerator size and all required lettered inlets when ordering.
Inlets not required are blanked off flush with the body of the fitting.
Unused inlets may be capped for future additions and alterations.

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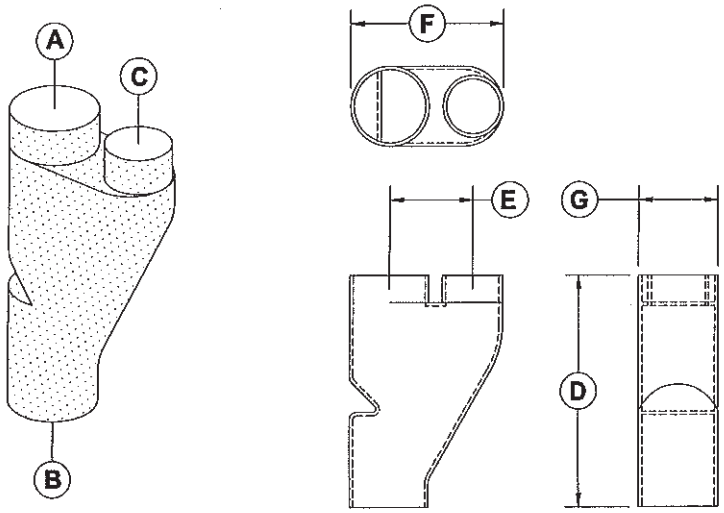
DE-AERATOR DIMENSIONS



Nominal Deaerator Size	Nominal Inlet Size (inches)			Fitting Dimensions (inches)			
	A	B	C	D	E	F	G
4"	4	4	3	12.75	4.63	8.50	4.38
5"	5	5	4	16.00	5.63	10.50	5.30
6"	6	6	4	20.75	6.75	12.25	6.30
8"	8	8	6	21.00	9.00	16.50	8.38

Nominal inlet dimensions and tolerances are shown in Table E.
Specify nominal Deaerator size only when ordering.

TABLE E

Nominal Inlet Size	Inside Diameter (inches)	Outside Diameter (inches)	Nominal Wall Thickness (inches)	Minimum Wall Thickness (inches)
2"	2.00 +.06 / -.06	2.35 +.09 / -.09	.16	.13
3"	3.00 +.06 / -.06	3.35 +.09 / -.09	.16	.13
4"	4.00 +.06 / -.06	4.38 +.09 / -.05	.19	.15
5"	4.94 +.09 / -.09	5.30 +.09 / -.05	.19	.15
6"	5.94 +.09 / -.09	6.30 +.09 / -.05	.19	.15
8"	7.94 +.13 / -.13	8.38 +.13 / -.09	.23	.17

Tolerances and dimensions for stack, soil and waste inlets on Aerators and Deaerators are in accordance with CISPI 301-97 for hubless pipe and fittings as listed by BOCA, IAPMO, IPC, NSPC and SBCCI.

Cast Iron Sovent fittings are gray cast iron of chemical composition in accordance with ASTM-126.

Manufacturers Standards for Cast Iron Sovent Fittings: CISMA Designation 177-85
National Standard for Cast Iron Sovent Fittings: ASME B16.45-1998
Performance Standard for Cast Iron Sovent System: ASSE No. 1043

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SOVENT® AERATOR AND STACK RULES

(A) The stack size shall be in accordance with Table B based on the total fixture unit load determined by Table A or A-1.

(B) The stack shall not telescope or decrease in size and must be continued full size through the roof.
(Drawing No. 1)

(C) An Aerator fitting is required at each level where the following horizontal branches enter the stack:

(1) Any soil branch
(2) A waste branch the same size as the stack size
(3) A waste branch one pipe size smaller than the stack size
(Drawing No. 2)

(D) The Aerator fitting shall be placed in a vertical plane. Tilting the Aerator to offset the Sovent® stack is not permitted.

(E) At any level where an Aerator is not required, an "in-line" offset consisting of two one-eighth bends and one quarter bend may be used. The vertical distance between Aerators or "in-line" offsets shall not exceed twenty feet (20'-0"). No more than two consecutive "in-line" offsets are permitted.
(Drawing No. 3)

(F) Waste branches two pipe sizes smaller than the stack size may connect directly to the stack through a sanitary fitting.
(Drawing No. 4)

(G) Horizontal stack offsets exceeding sixty degrees (60°) from vertical require a De-aerator fitting and Pressure Relief Line (PRL). The Pressure Relief Line (PRL) shall connect to the vertical portion of the stack downstream of the offset. Soil and waste branches may connect to the horizontal portion of the offset. These connections shall be made BETWEEN the two vertical portions of the stack at a minimum distance of ten pipe diameters (based on stack size) downstream of the higher vertical stack. Branch connections to a horizontal stack offset less than ten pipe diameters in length shall be made as far downstream on the horizontal as possible. Soil and waste branches shall not connect where the offset makes a horizontal change of direction. Waste branches may connect to the horizontal portion of the Pressure Relief Line (PRL), except on office building battery type installations. Waste branches shall be at least one pipe size smaller than the PRL. Waste branch connections shall not be made into any vertical portion of the PRL. Clothes washers shall not connect to the PRL. Horizontal stack offsets shall be sized per Table C based on the total fixture unit load of all fixtures connecting to the offset and fixtures upstream. The entire stack size shall be no smaller than the largest horizontal offset size.
(Drawing No. 5)

(H) Sovent® stacks may be combined before entry into the main sewer drain. The stacks shall combine downstream of each Pressure Relief Line (PRL) termination point. The total fixture unit load of the combined stacks determines collection drain line sizing.
(Drawing No. 6)

(I) Stack vent headers above the highest fixture may offset prior to the vent thru roof penetration (VTR). The horizontal vent header and VTR shall be increased one pipe size when exceeding twenty feet (20'-0") in horizontal length.
(Drawing No. 7)

(J) Stack vent headers above the highest fixture may be combined prior to the vent thru roof penetration (VTR) with one vertical stack extending through the roof. The one combined vertical stack shall be one pipe size larger than the largest of the combined stacks. If the distance between any stack and the VTR exceeds twenty feet (20'-0"), the horizontal offset shall be increased one (1) pipe size larger than the downstream stack.
(Drawing No. 7)

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SOVENT® DE-AERATOR AND BUILDING DRAIN RULES

(A) A De-aerator fitting is required at the base of each stack. The De-aerator fitting shall be installed in the vertical portion of the stack. The distance between the De-aerator fitting and the Sovent® building drain shall not exceed five feet (5'-0"). The Sovent® building drain size shall be in accordance with Table C based on the total fixture unit load determined by Table A or A-1. The transition to a larger Sovent® building drain size shall be made in the vertical stack below the De-aerator fitting, except as noted in paragraph "I".
(Drawing No. 8)

(B) The De-aerator fitting uses a Pressure Relief Line (PRL). The Pressure Relief Line (PRL) connects to the Sovent® building drain a MINIMUM distance of ten pipe diameters (based on stack size) downstream from the centerline of the stack. The PRL connects to the Sovent® building drain above the centerline of the drain. The PRL may be rolled to the side providing the bottom of the PRL is above the centerline of the Sovent® building drain.
(Drawing No. 9)

(C) The installed slope for the Sovent® building drain and PRL is recommended to be one-quarter inch per foot (2%). Installed slopes of one-eighth inch per foot (1%) are permitted however pipe capacity is reduced by a factor of 0.8 as shown in Table C. Installed slopes less than one-eighth inch per foot (1%) are strictly prohibited.

(D) Soil and waste branches may connect to the Sovent® building drain BETWEEN the centerline of the stack and the termination point of the Pressure Relief Line (PRL). All connections shall be made a MINIMUM distance of ten pipe diameters (based on stack size) downstream from the centerline of the stack. Soil and waste branches shall not connect where the Sovent® building drain makes a horizontal change of direction.
(Drawing No. 10)

(E) Waste branches may connect to the horizontal portion of the Pressure Relief Line (PRL), except on battery type installations. Waste branches shall be at least one pipe size smaller than the PRL. Waste branch connections shall not be made into any vertical portion of the PRL. Clothes washers shall not connect to the PRL.
(Drawing No. 11)

(F) Soil and waste branches may connect downstream of the PRL termination point providing conventional plumbing rules are applied. The vent header from these fixtures may connect to the vertical portion of a Sovent® stack below an Aerator fitting through a sanitary tee installed with the flow radius down. The vent load of these fixtures shall be added to the fixture unit load on the Sovent® stack.
(Drawing No. 13)

(G) Soil and waste branches may connect to the vertical stack below the De-aerator fitting. These connections shall be made through a wye-type fitting or through an Aerator fitting. Entry to the Sovent® building drain from the stack shall be made using a short sweep, long sweep, two one-eighth bends, or a combination wye & one-eighth bend fitting.
(Drawing No. 14)

(H) Fixtures considered too remote from the Sovent stack may be plumbed by conventional methods. This waste and vent area shall be sized in accordance with local prevailing ordinances.
(Drawings No. 12 & No. 15)

(I) Office building battery type installations and Sovent® stacks serving clothes washers shall use a De-aerator fitting equal in size to the Sovent® building drain serving that stack. A four-inch (4") De-aerator fitting will be required on three-inch (3") Sovent® stacks.

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SOVENT® BRANCH RULES

(A) The maximum developed length of a three-inch (3") soil branch shall not exceed twelve feet (12'-0"). The maximum developed length of a four-inch (4") soil branch shall not exceed twenty-seven feet (27'-0"). Developed lengths are measured along the centerline of all horizontal branch piping located in ceiling and wall areas. Vertical drops from trap arms or fixtures are not included in the developed length calculations.
(Drawing No. 16)

(B) The maximum developed length of a two-inch (2") waste branch shall not exceed fifteen feet (15'-0"). The maximum developed length of a three-inch (3") waste branch shall not exceed fifteen feet (15'-0"). Developed lengths are measured along the centerline of all horizontal branch piping located in ceiling and wall areas. Vertical drops from trap arms or fixtures are not included in the developed length calculations. Waste branches two pipe sizes smaller than the stack size may connect directly to the stack through a sanitary fitting.
(Drawing No. 17)

(C) Branch sizing shall be in accordance with Table D based on the total fixture unit load determined by Table A or A-1. The installed slope for horizontal branches is recommended to be one-quarter inch per foot (2%). Installed slopes of one-eighth inch per foot (1%) are permitted however pipe capacity is reduced by a factor of 0.8 as shown in Table D. Installed slopes less than one-eighth inch per foot (1%) are strictly prohibited.

(D) Branches having three ninety degree (90°) horizontal changes of direction shall be increased one pipe size at the third ninety degree (90°) change of direction nearest the stack. This increase is not required if one of the directional changes can be made with two one-eighth bends or a short sweep radius bend.
(Drawing No. 18)

(E) The transition from a horizontal or vertical branch to another horizontal branch must be made with a wye-type fitting.
(Drawing No. 18)

(F) Horizontal branch piping at the base of a vertical drop exceeding forty inches (40") in height shall be increased one pipe size. This increase is not required when the lower portion of the drop is made at forty-five degrees (45°) and the upper vertical portion is less than forty inches (40").
(Drawing No. 19)

(G) Branch piping with vertical drops exceeding ten feet (10'-0") shall be increased one pipe size.
(Drawing No. 19)

(H) A three-inch (3") soil branch shall be increased one pipe size at the connection point of other fixtures. This increase is not required when computing fixture unit loads from Table A-1.

(I) Two fixtures using 1-1/4" tailpiece/trap sizes may combine into a single two-inch (2") vertical drop. Fixtures using 1-1/2" tailpiece/trap sizes and larger require separate vertical drops from each trap arm or may combine into a single vertical drop that is increased one pipe size. This increase is not required if the change in elevation is made at forty-five degrees (45°). The fixture trap arm shall be one pipe size larger than the fixture tailpiece and this increase may be made at the wall.
(Drawing No. 20)

(J) Clothes washer branches shall be three-inch (3") in size. Clothes washer branches with no vertical drops and developed lengths five feet (5'-0") or less may be two-inch (2") in size.
(Drawing No. 20)

(K) Pressure Equalizing Lines may be used as an alternate to the rules concerning increased branch sizes. Pressure Equalizing Lines shall rise vertically above the branch and connect to the Sovent stack above the flood rim of the fixtures they serve. Pressure Equalizing Lines may be led directly through the roof.

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ILLUSTRATIONS OF SOVENT® SYSTEM RULES

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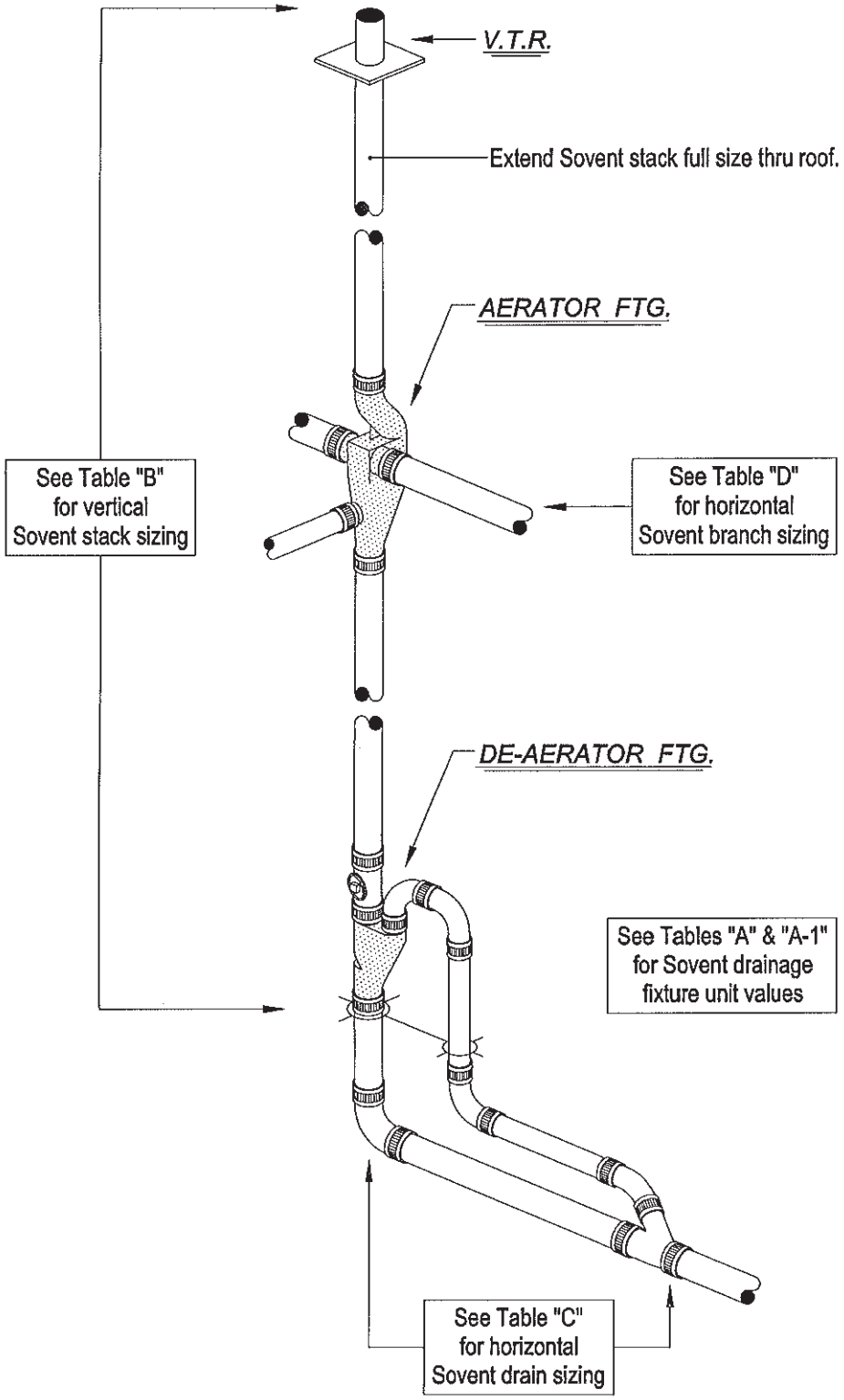

DRAWING NO. 1
Sovent Sizing Requirements

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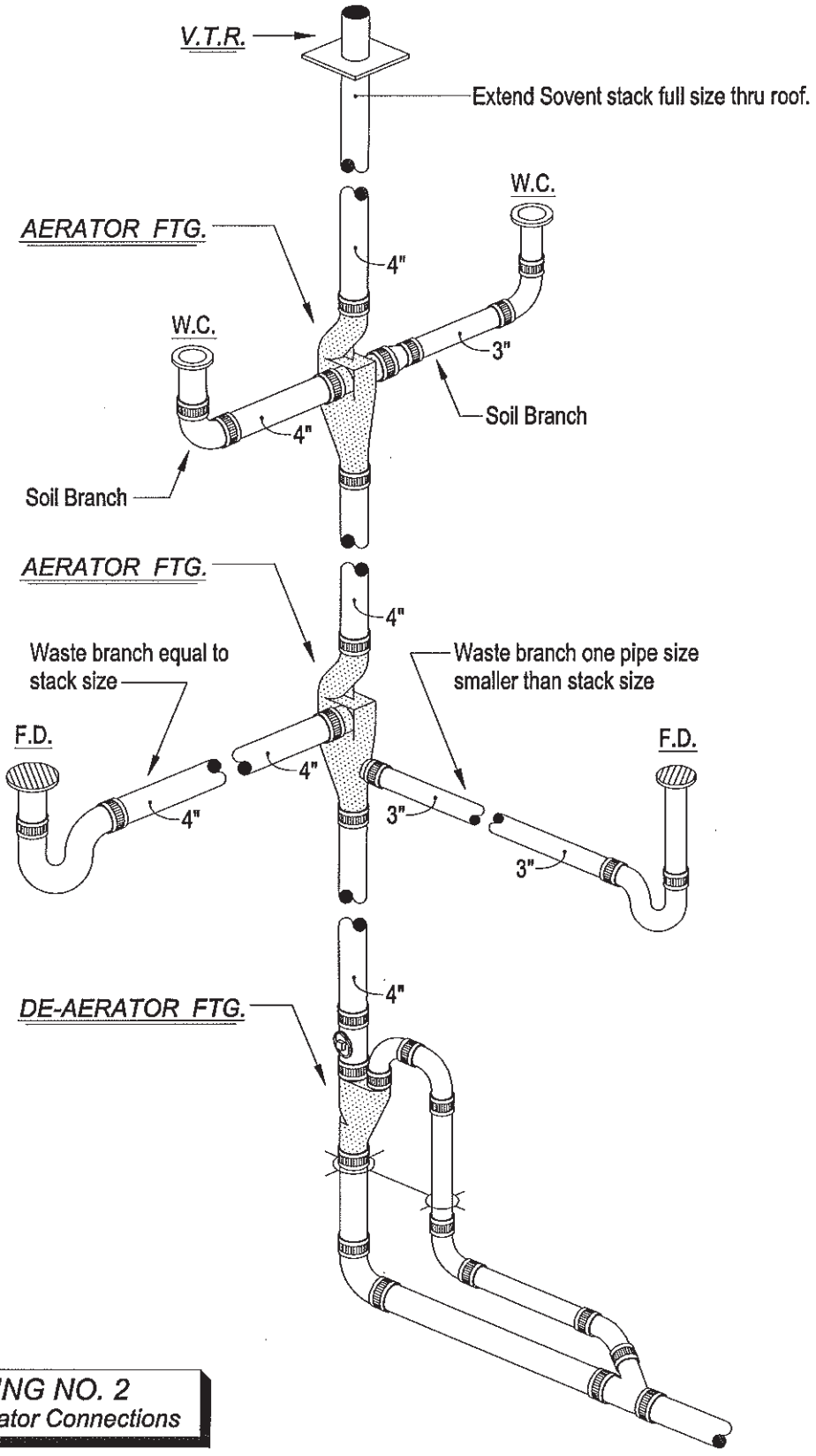

DRAWING NO. 2
Required Aerator Connections

Conine Manufacturing Co., Inc. - P.O. Box 6561 - Tyler, TX 75711 - Phone (903) 894-6150 - Fax (903) 894-6702
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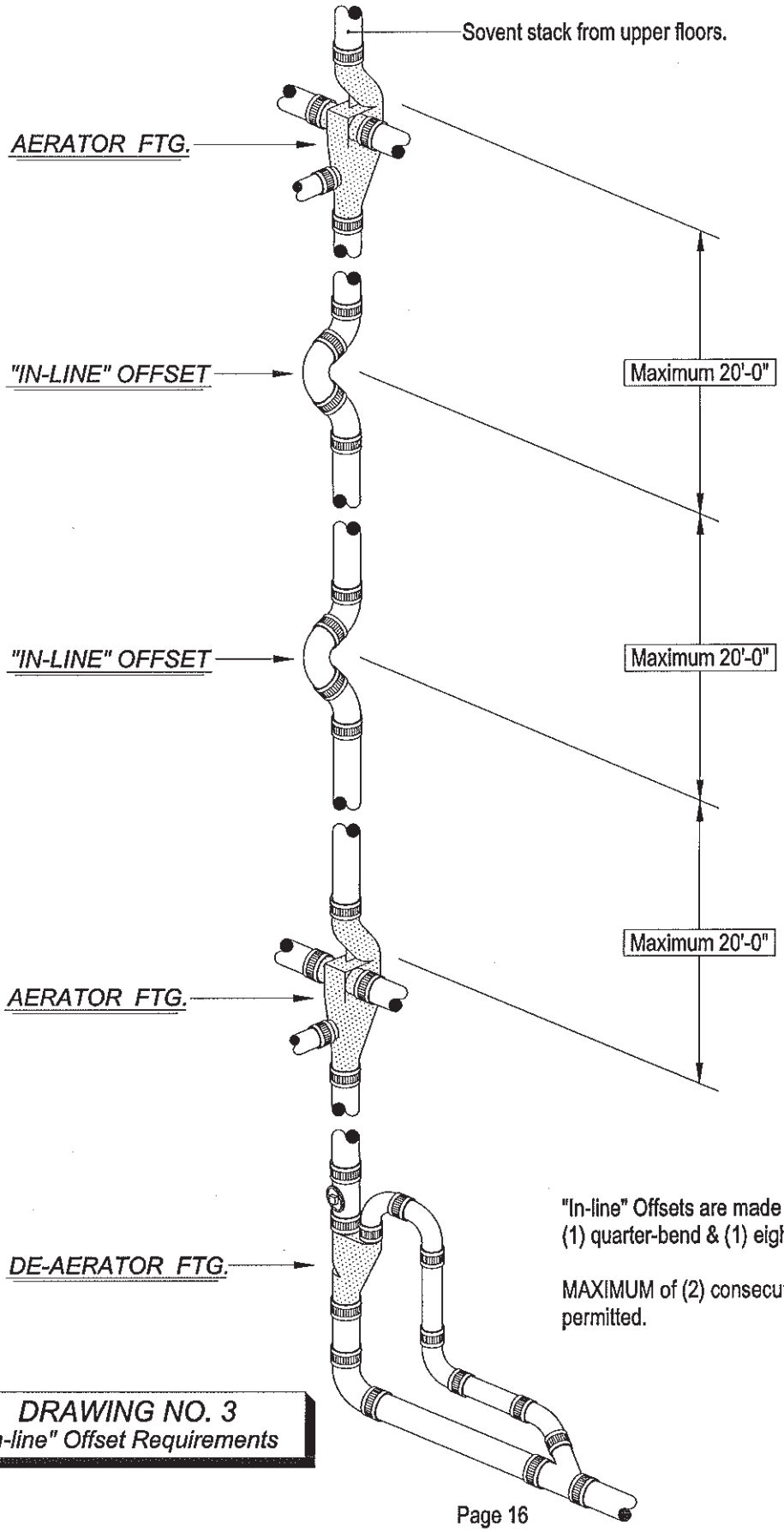

"In-line" Offsets are made by using (1) eighth-bend, (1) quarter-bend & (1) eighth-bend.

MAXIMUM of (2) consecutive "In-line" Offsets are permitted.

DRAWING NO. 3
"In-line" Offset Requirements

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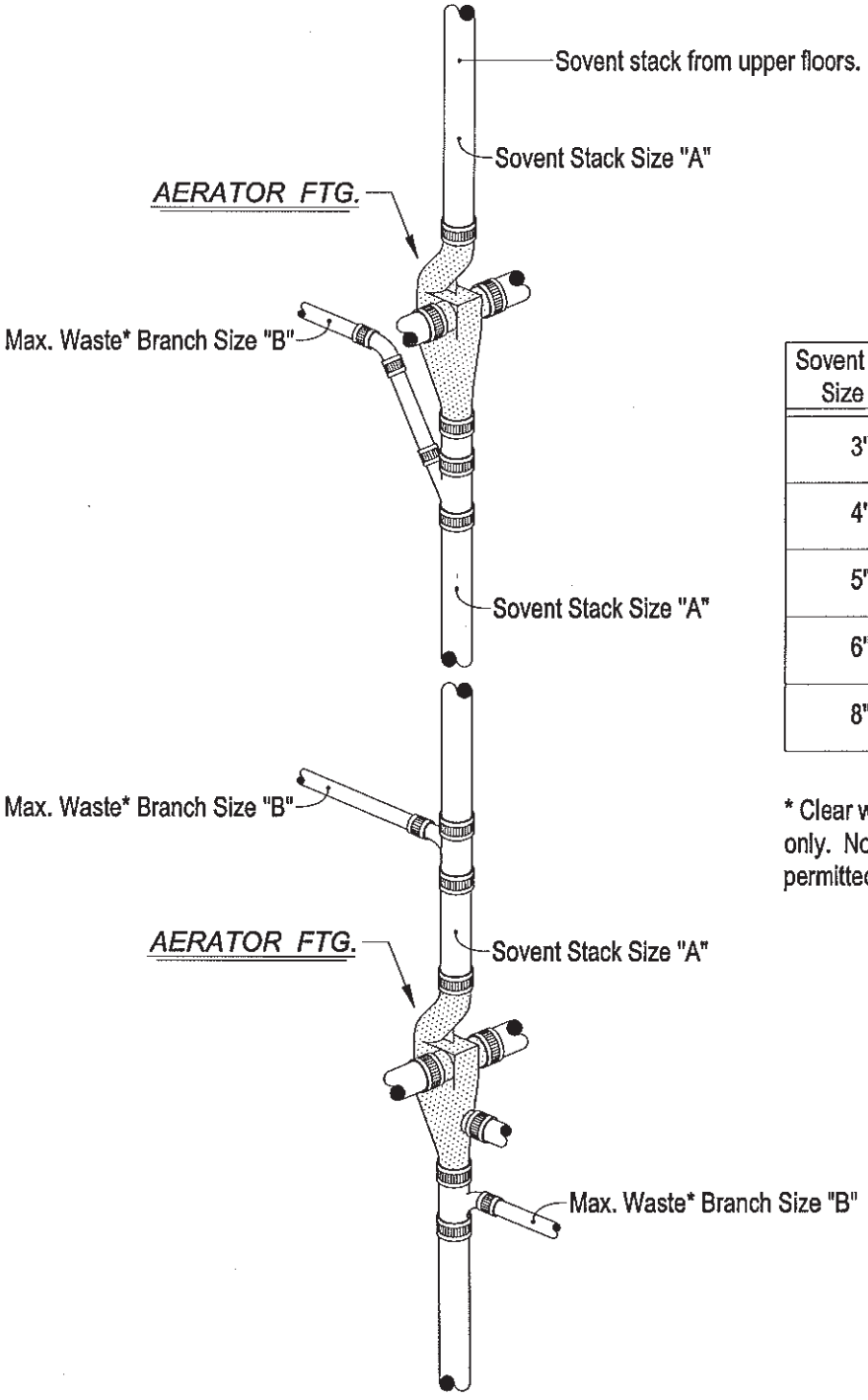

Sovent Stack Size "A"	Max. Waste* Size "B"
3"	2"
4"	2-1/2"
5"	3"
6"	4"
8"	5"

* Clear water waste branches only. No soils from W.C.'s are permitted.

DRAWING NO. 4
Direct Stack Connections

Conine Manufacturing Co., Inc. - P.O. Box 6561 - Tyler, TX 75711 - Phone (903) 894-6150 - Fax (903) 894-6702
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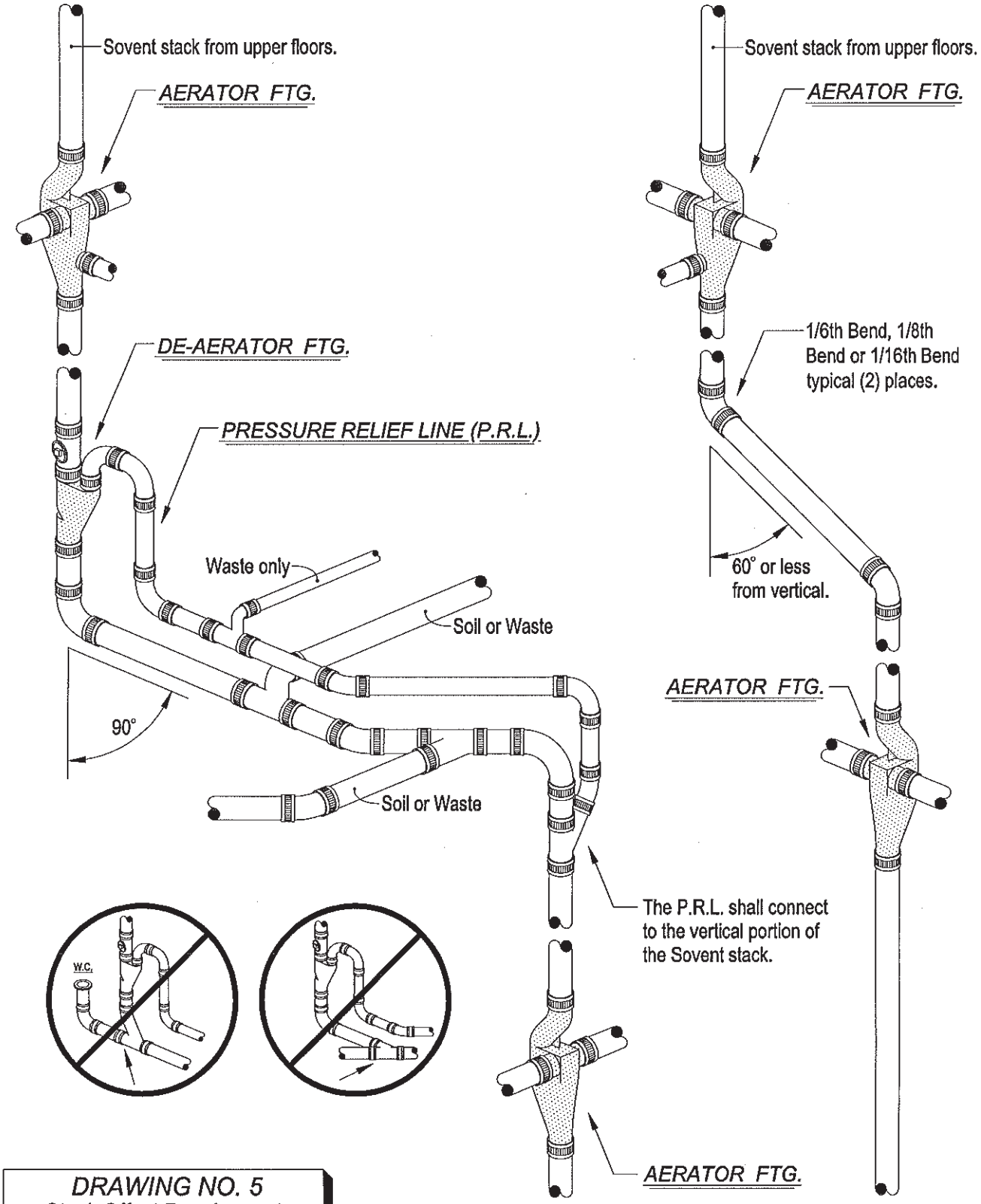

DRAWING NO. 5
Stack Offset Requirements

Conine Manufacturing Co., Inc. - P.O. Box 6561 - Tyler, TX 75711 - Phone (903) 894-6150 - Fax (903) 894-6702
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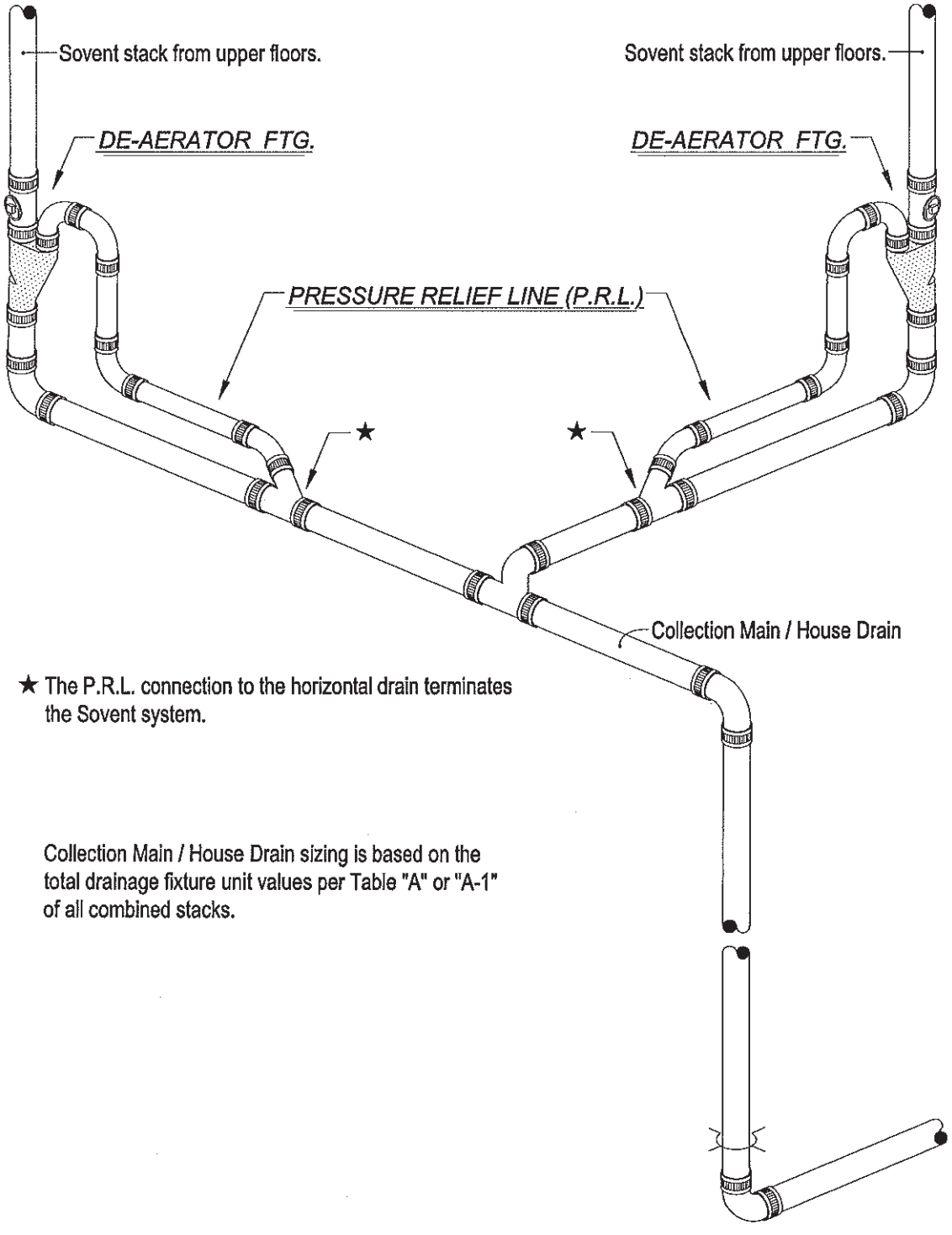

★ The P.R.L. connection to the horizontal drain terminates the Sovent system.

Collection Main / House Drain sizing is based on the total drainage fixture unit values per Table "A" or "A-1" of all combined stacks.

DRAWING NO. 6
Combining Stacks

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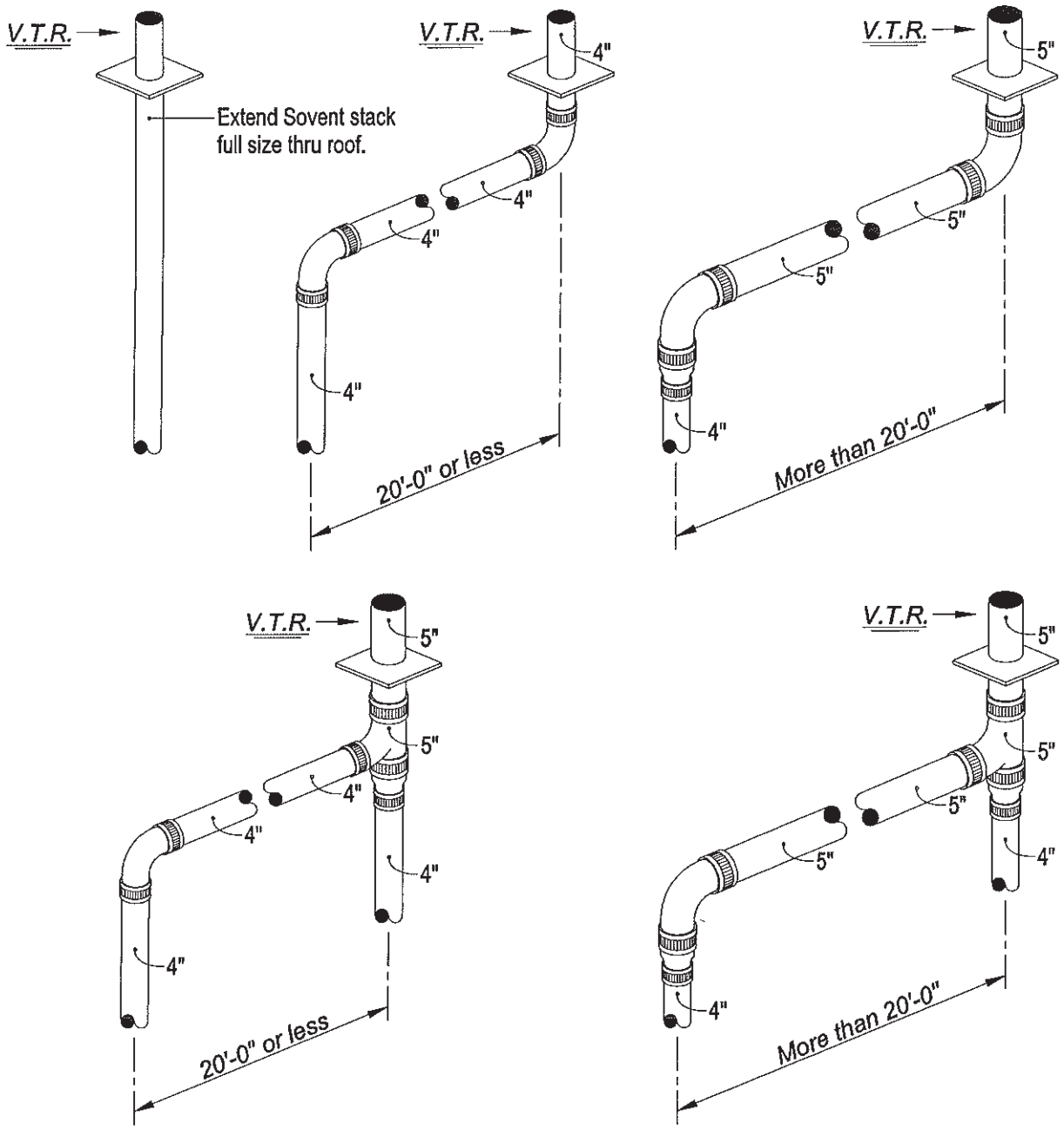

DRAWING NO. 7
Vent Stack Offset Requirements

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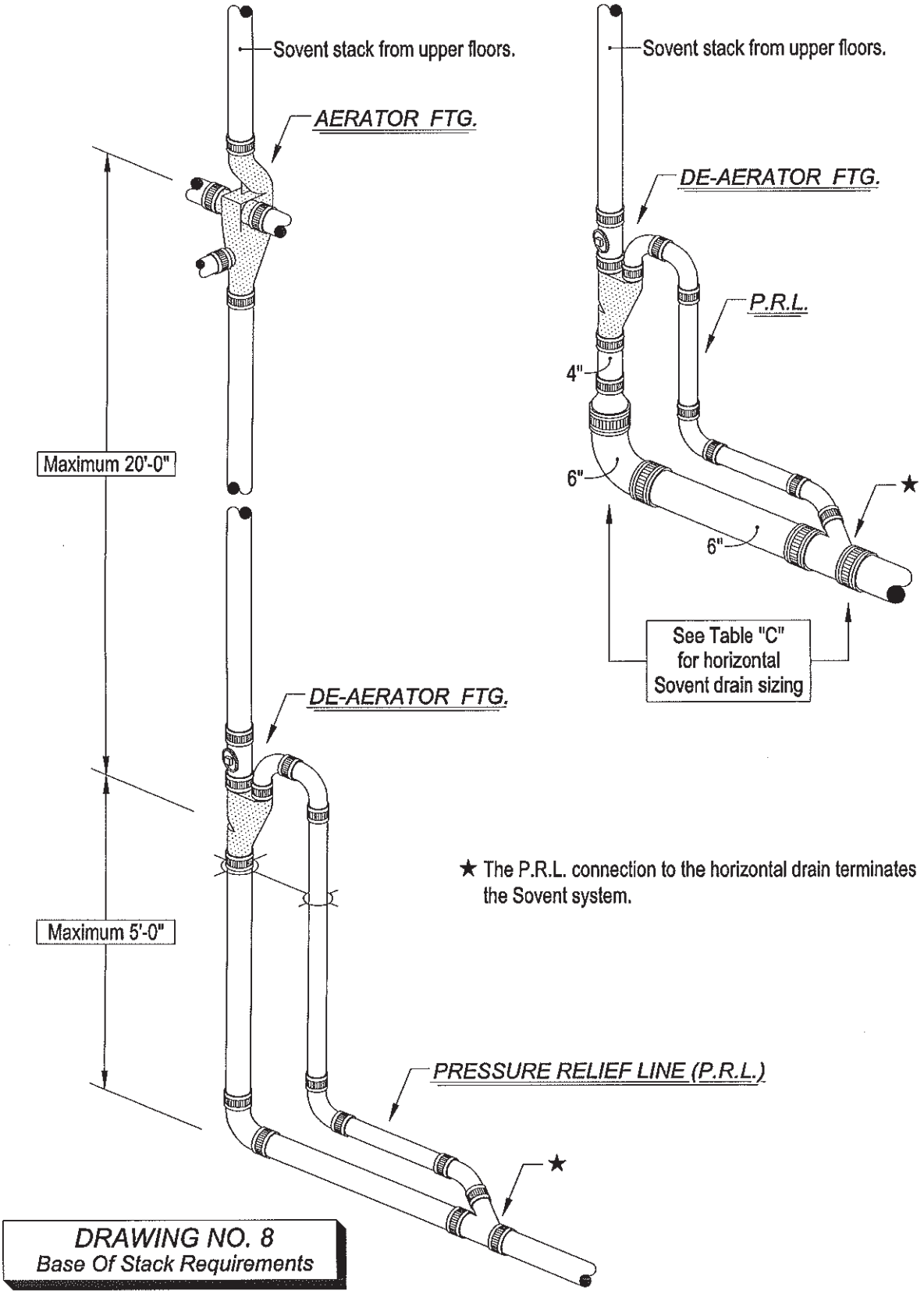

★ The P.R.L. connection to the horizontal drain terminates the Sovent system.

DRAWING NO. 8
Base Of Stack Requirements

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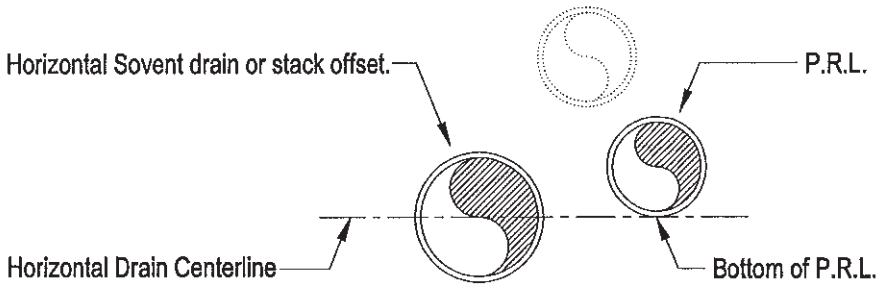
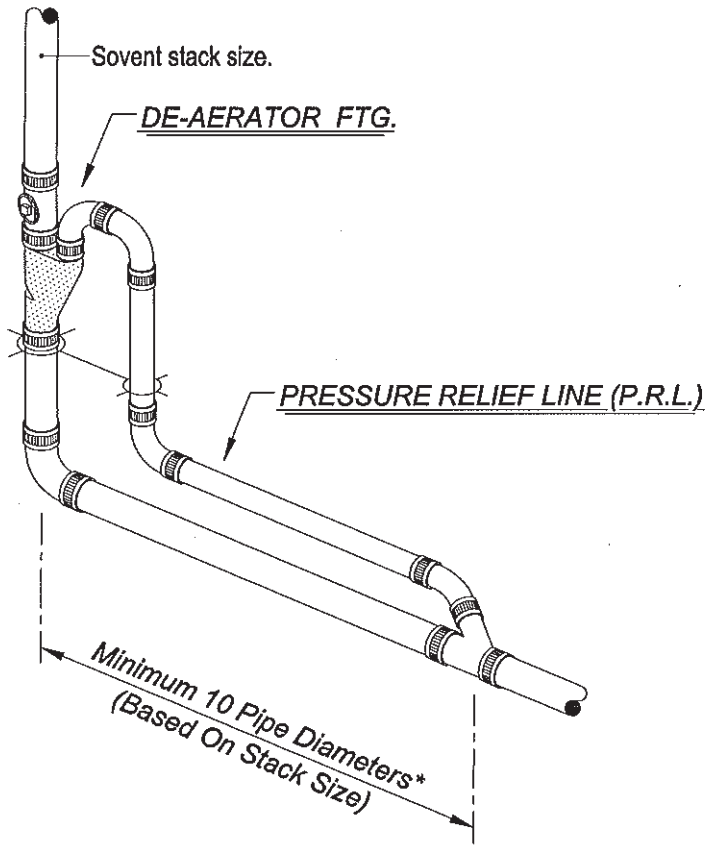


MINIMUM P.R.L. ELEVATION REQUIREMENTS



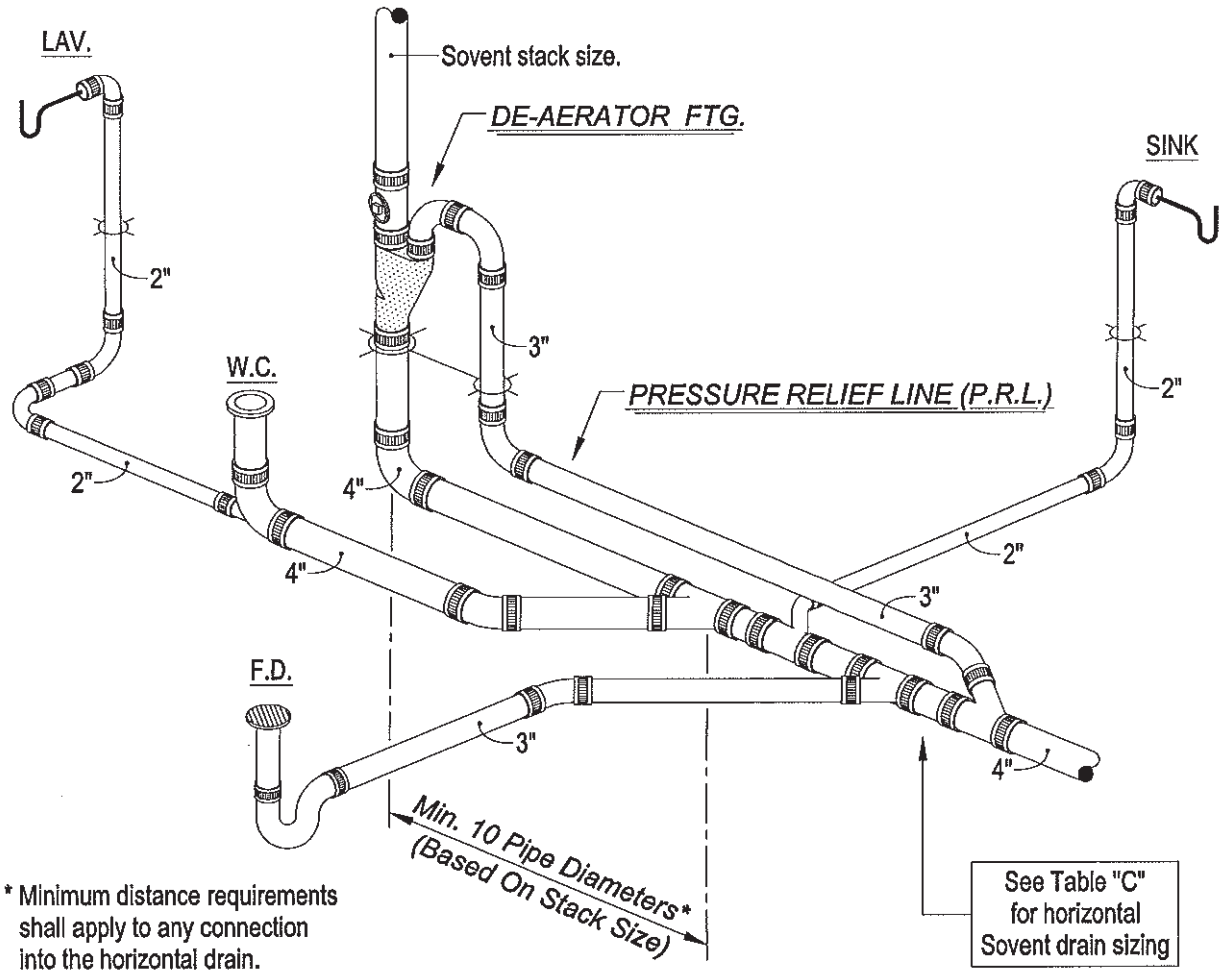
Sovent Stack Size	Minimum Distance*
3"	30"
4"	40"
5"	50"
6"	60"
8"	80"

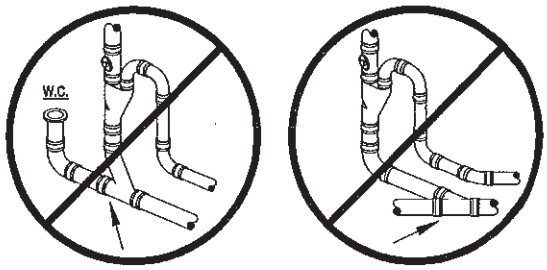
* Minimum distance requirements shall apply to any connection into the horizontal drain.

De-aerator** Size	P.R.L. Size
4"	3"
5"	4"
6"	4"
8"	6"

** 3" Sovent stacks will use a 4" De-aerator at the base of the stack.

DRAWING NO. 9
Pressure Relief Line Details





DRAWING NO. 10
Base Of Stack Connections

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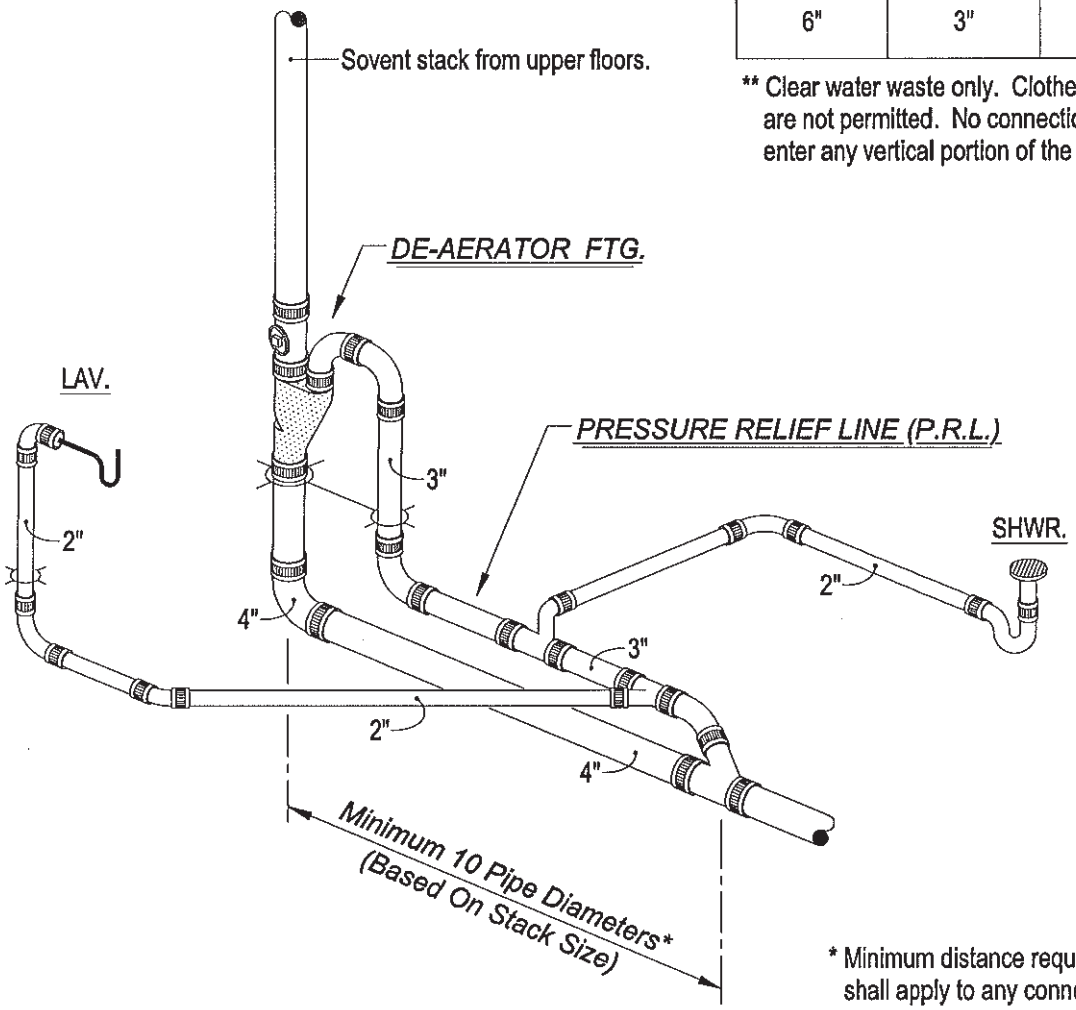
P.R.L. Size	Maximum Branch Size**	Maximum P.R.L. Dfu's
3"	2-1/2"	16
4"	3"	90
6"	3"	90

** Clear water waste only. Clothes washers are not permitted. No connections shall enter any vertical portion of the P.R.L.



* Minimum distance requirements shall apply to any connection into the horizontal drain.

DRAWING NO. 11
Branch Connections To P.R.L.

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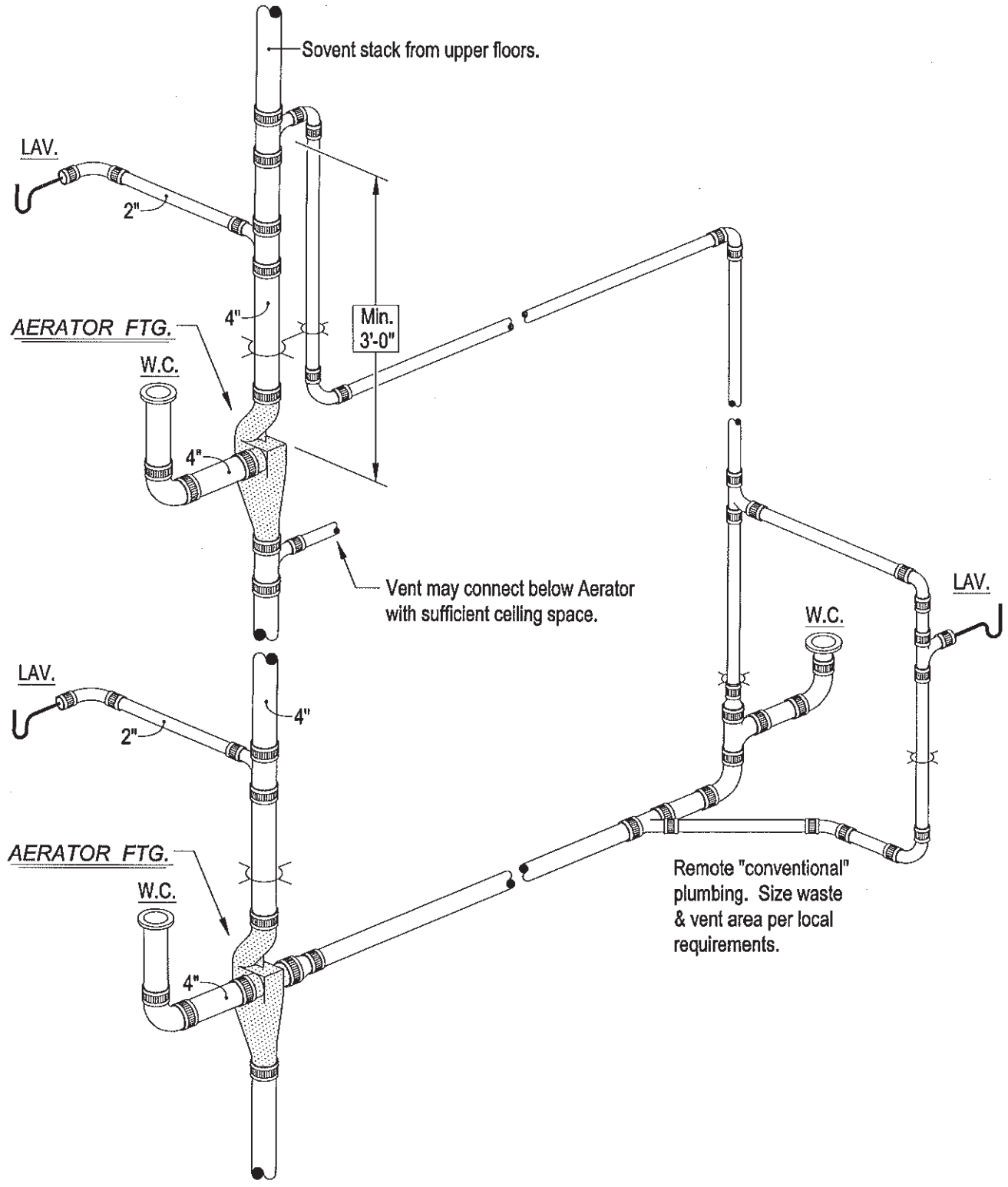

DRAWING NO. 12
Interim Level Remote Plumbing

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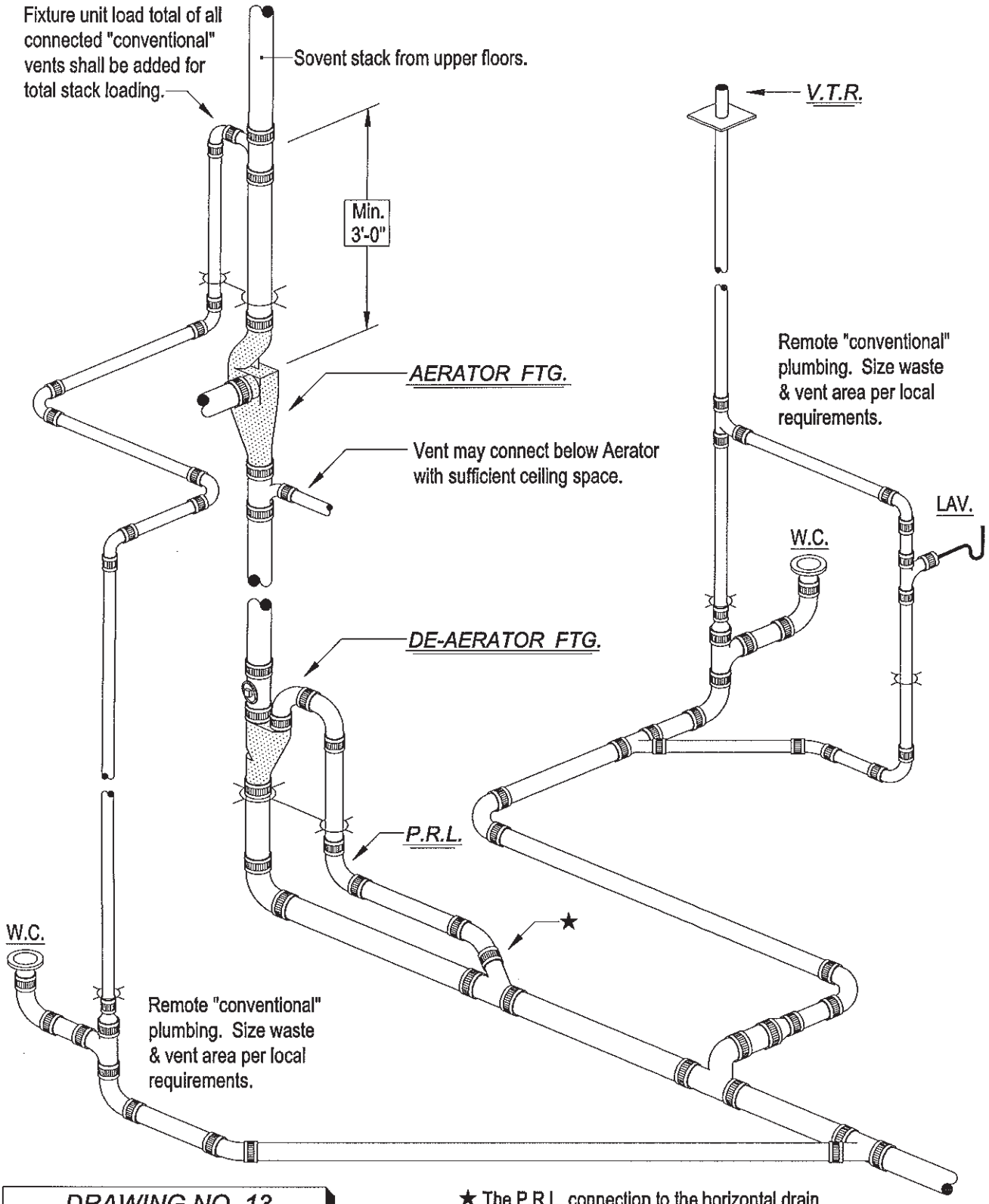
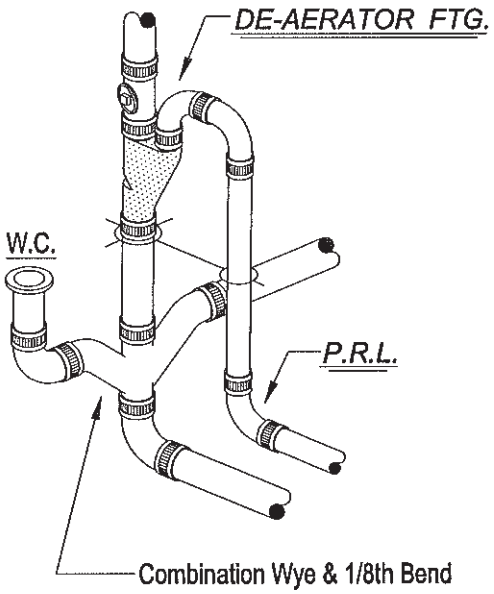
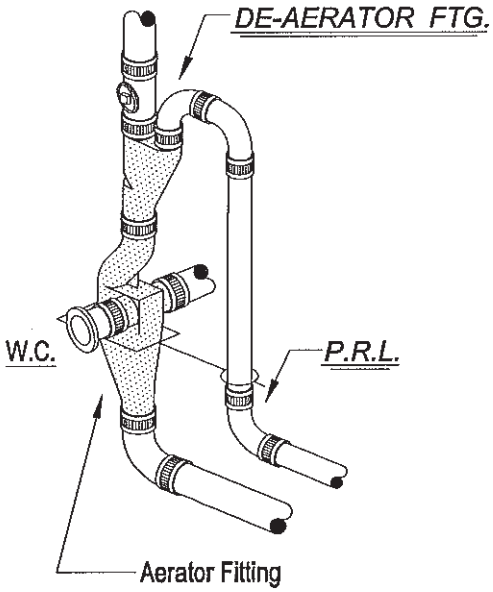
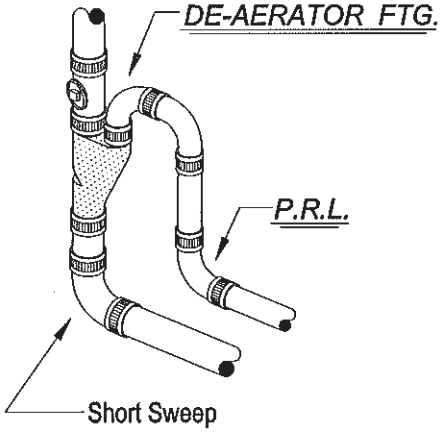


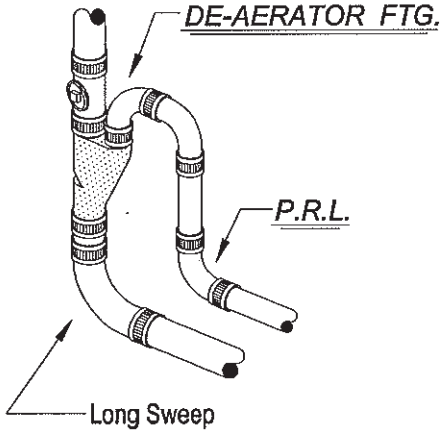
DRAWING NO. 13
"Conventional" Vent Connections

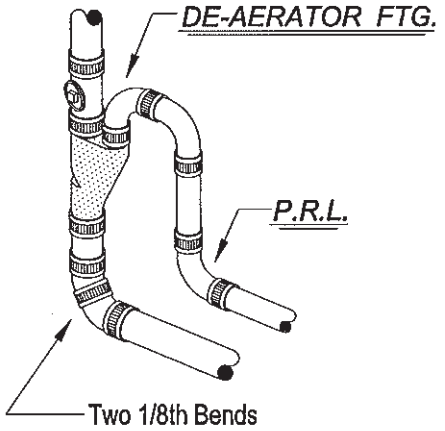
★ The P.R.L. connection to the horizontal drain terminates the Sovent system.

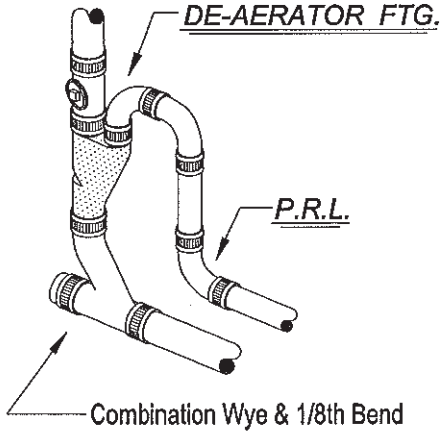












DRAWING NO. 14
De-aerator Transition Details

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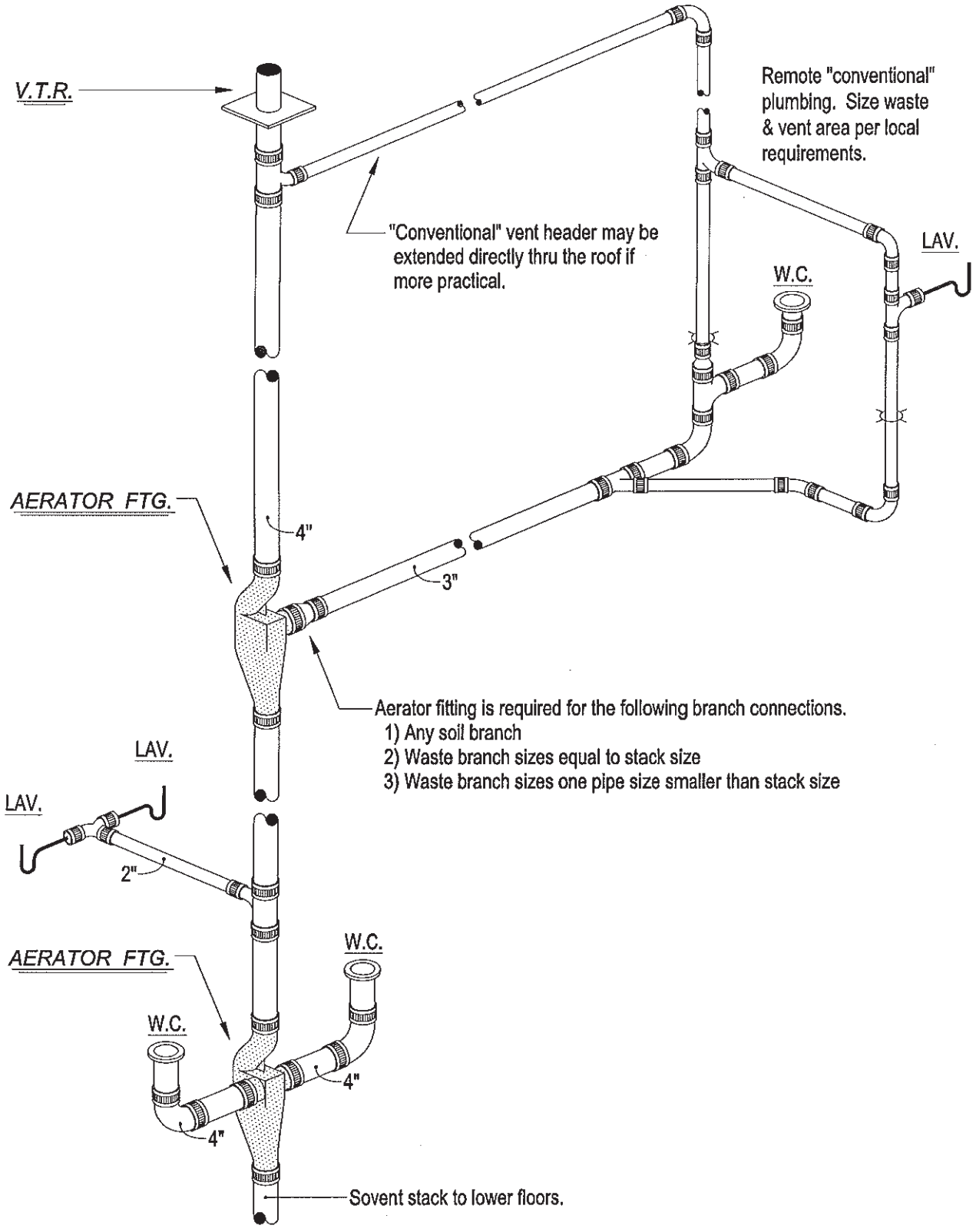

DRAWING NO. 15
Remote Penthouse Connections

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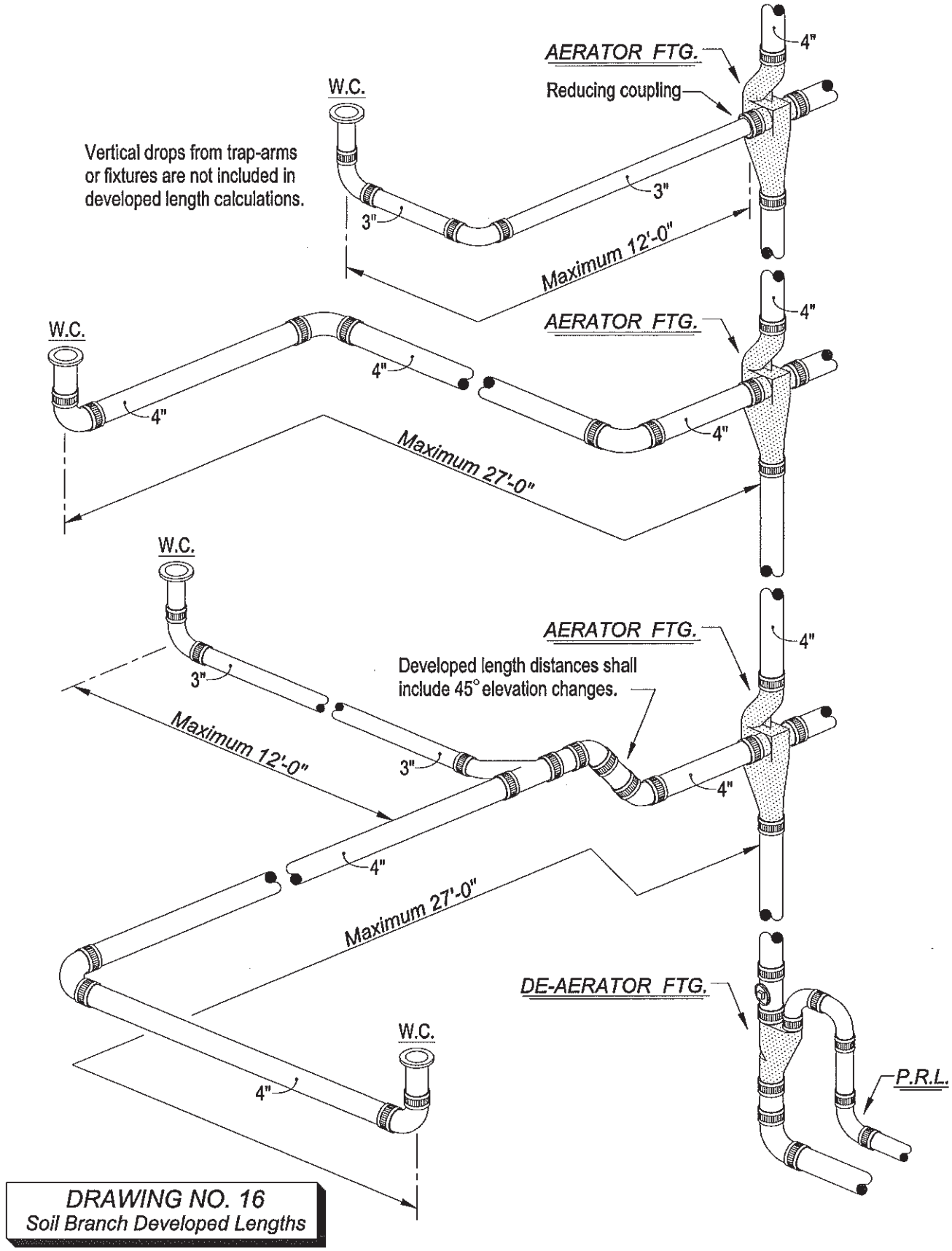

DRAWING NO. 16
Soil Branch Developed Lengths

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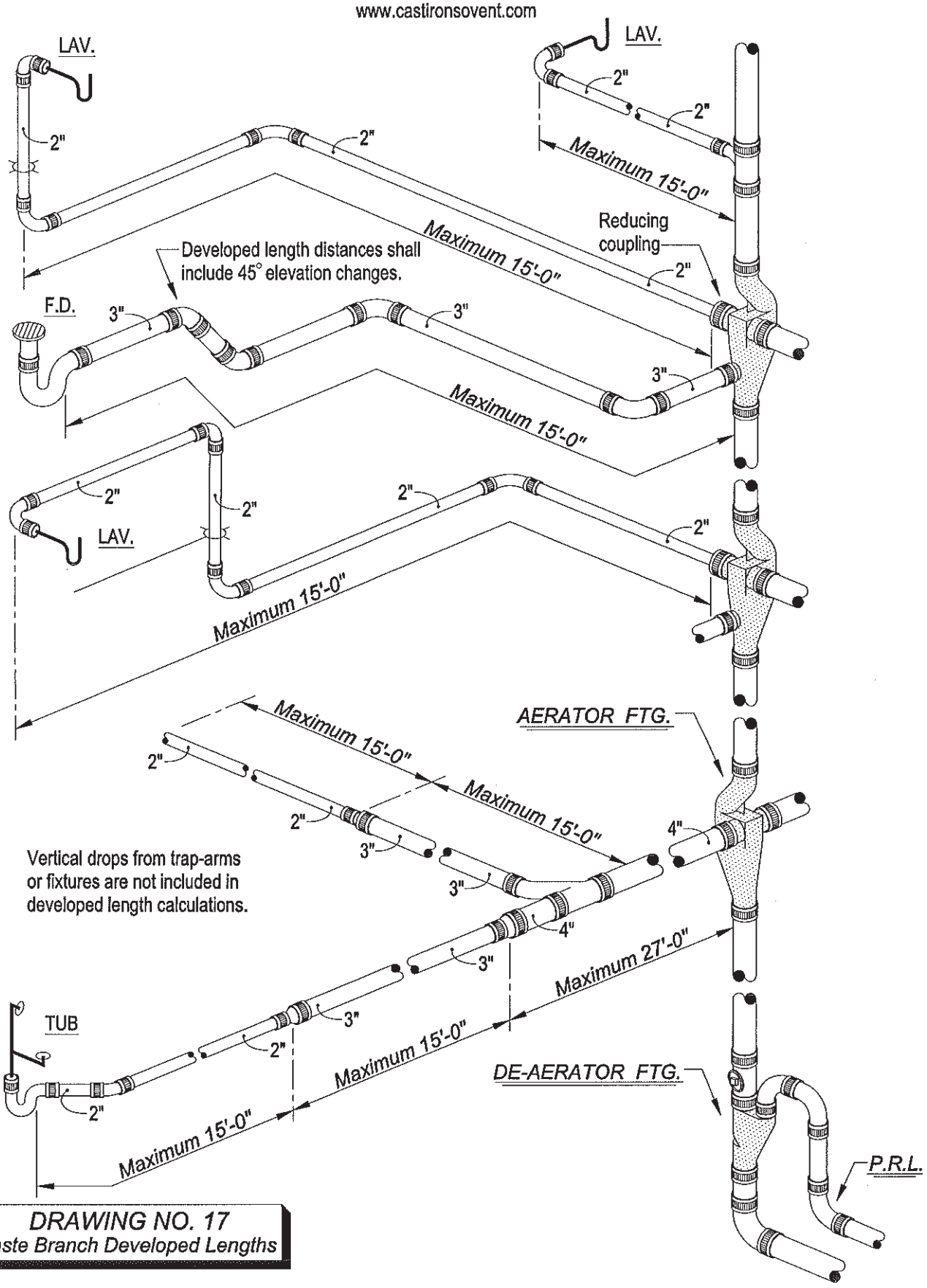

DRAWING NO. 17
Waste Branch Developed Lengths

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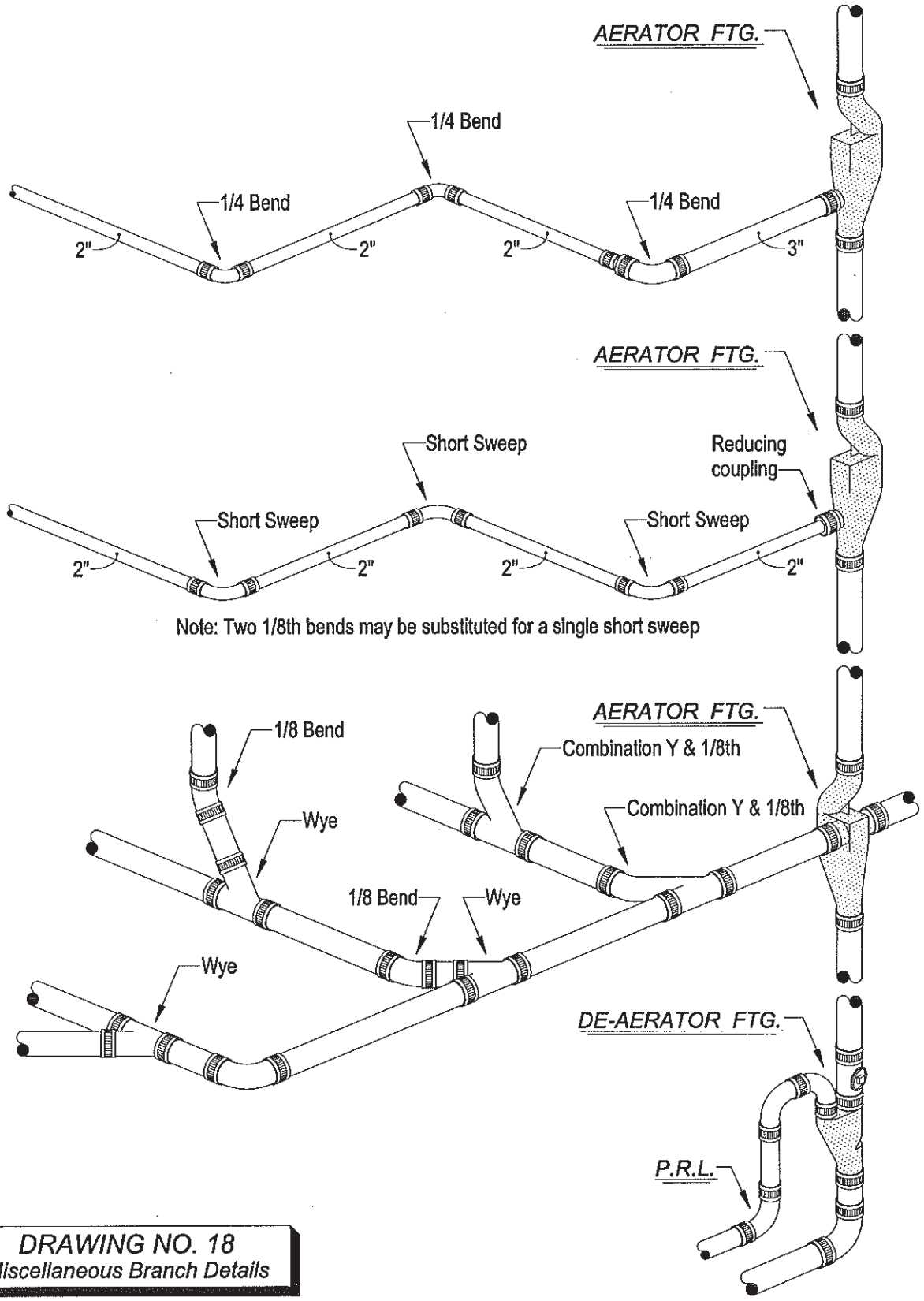
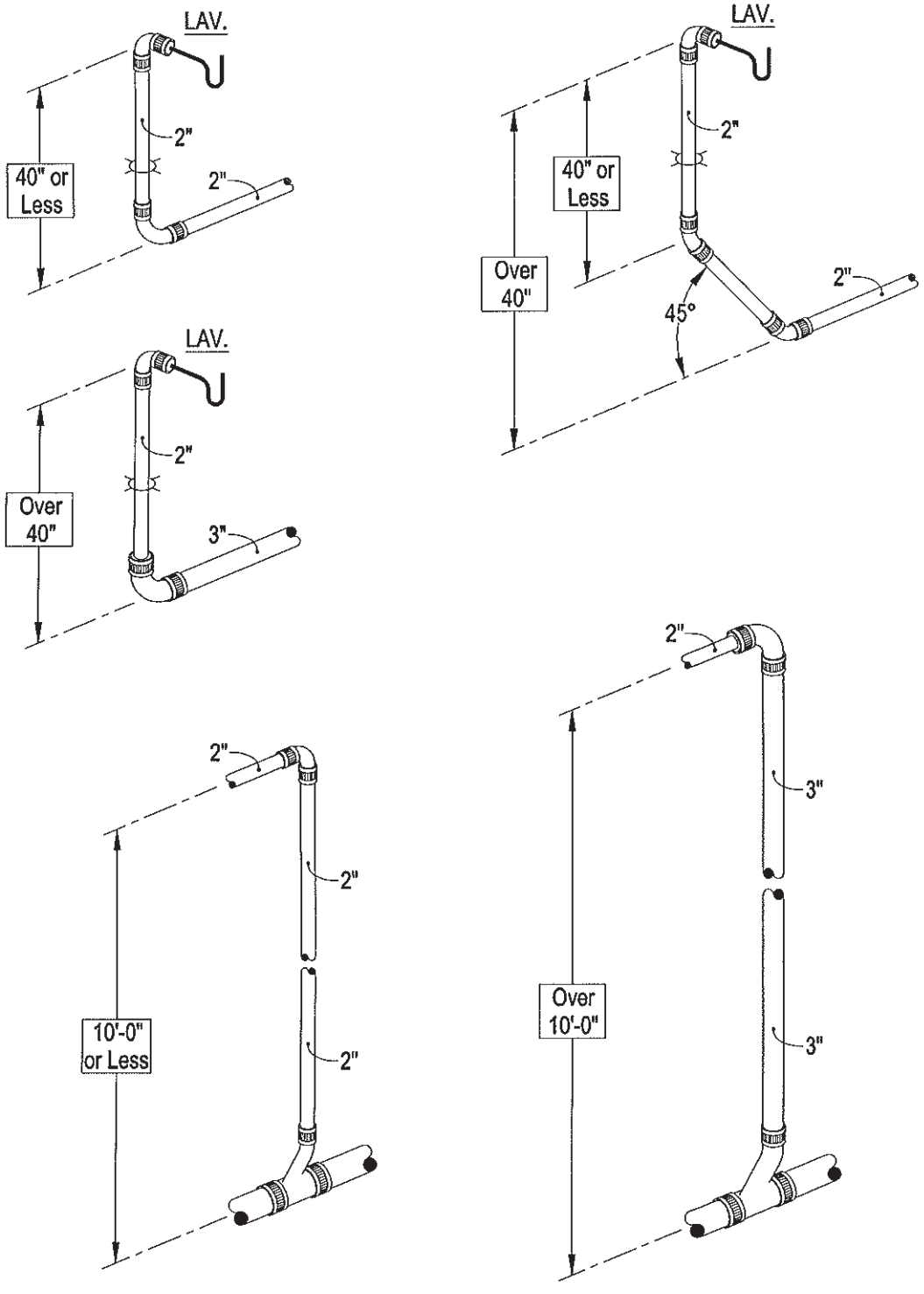
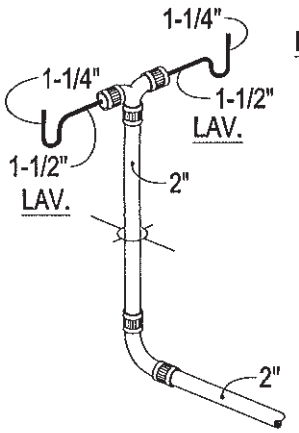


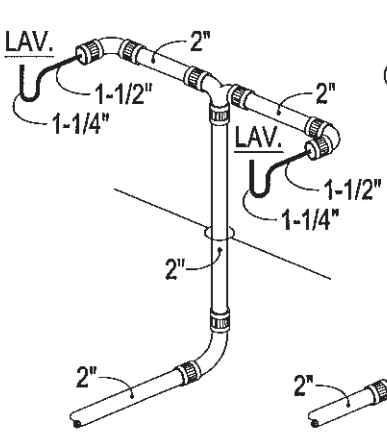
DRAWING NO. 18
Miscellaneous Branch Details



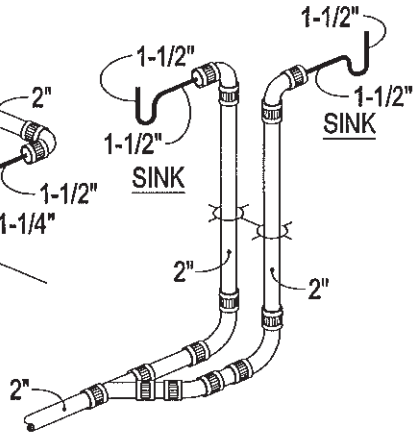
DRAWING NO. 19
Branch Sizing - Vertical Drops



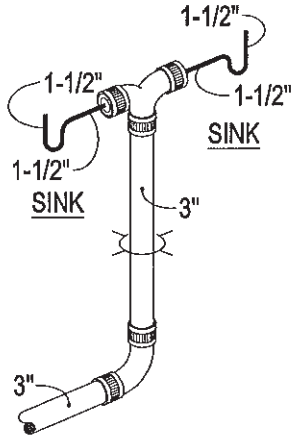
Back-To-Back
1-1/4" Tailpiece Fixtures



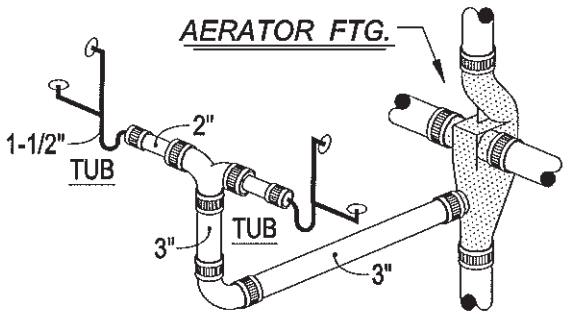
Side-By-Side
1-1/4" Tailpiece Fixtures



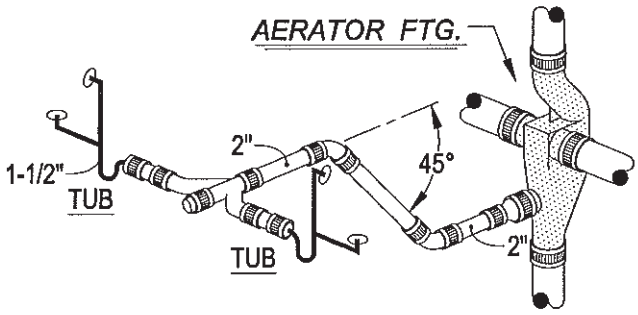
Back-To-Back
1-1/2" Tailpiece Fixtures



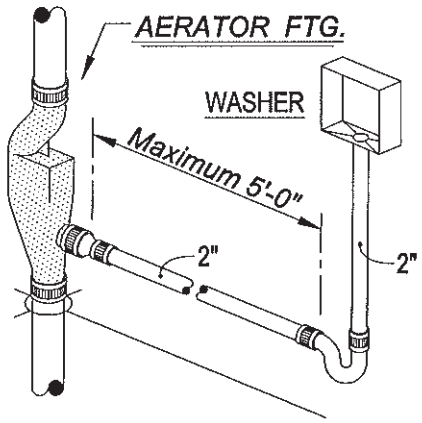
Back-To-Back
1-1/2" Tailpiece Fixtures

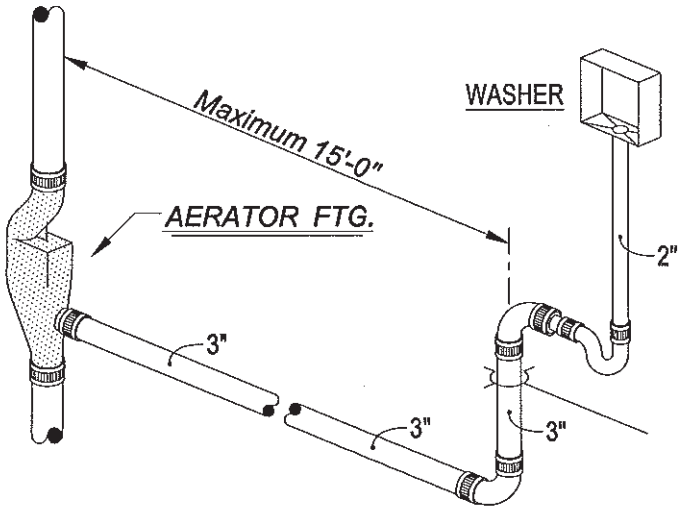


Back-To-Back
1-1/2" Tailpiece Fixtures



Back-To-Back
1-1/2" Tailpiece Fixtures





DRAWING NO. 20
Miscellaneous Branch Details

SUPPLEMENTAL ILLUSTRATIONS OF CAST IRON SOVENT® SYSTEM RULES

The following pages are to be used for interpretation and clarity of the written rules listed on the preceding pages. The written rules shall take precedence over all illustrations. All possible scenarios are not covered by these illustrations. Designs and conditions not shown may require approval by the manufacturer.

Pressure Relief Line – Length and Sizing ..... Drawing A-1
Soil Branch Developed Length ..... Drawing A-2
Waste Branch Developed Length ..... Drawing A-3
Base of Stack Information ..... Drawing A-4
Base of Stack Minimum Elevations ..... Drawing A-5
Base of Stack Branch Connections ..... Drawing A-6
Branch Details ..... Drawing A-7
Stack Offset Method "A" ..... Drawing A-8
Stack Offset Method "B" ..... Drawing A-9
Stack Offset Method "C" ..... Drawing A-10
Stack Detail – General Branch Connections ..... Drawing A-11
Stack Detail – Floor Mount Bottom Outlet W.C. ..... Drawing A-12
Stack Detail – Floor Mount Back Outlet W.C. ..... Drawing A-13
Stack Detail – Wall Hung W.C ..... Drawing A-14
Stack Detail – Miscellaneous W.C. Connections ..... Drawing A-15
Stack Detail – Wall Hung W.C. Office Battery ..... Drawing A-16
Stack Detail – Floor Mount W.C. Office Battery ..... Drawing A-17
Stack Detail – Lavatory Connections ..... Drawing A-18
Stack Detail – Hotel/Apartment Bathroom Connections ..... Drawings A-19 thru A-28
Stack Detail – Miscellaneous Fixture Connections ..... Drawing A-29
Branch Sizing – Trap Arm & Tailpiece Assemblies ..... Drawing A-30
Stack Sizing – Multiple Horizontal Stack Offsets ..... Drawing A-31
Vent Sizing – Multiple Vent Header Collection Method ..... Drawing A-32

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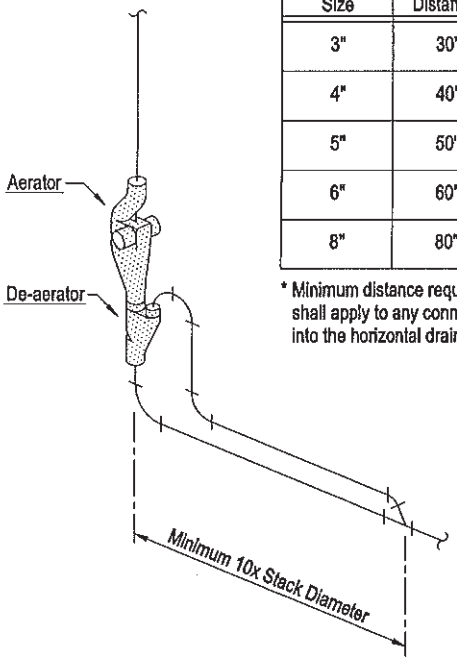
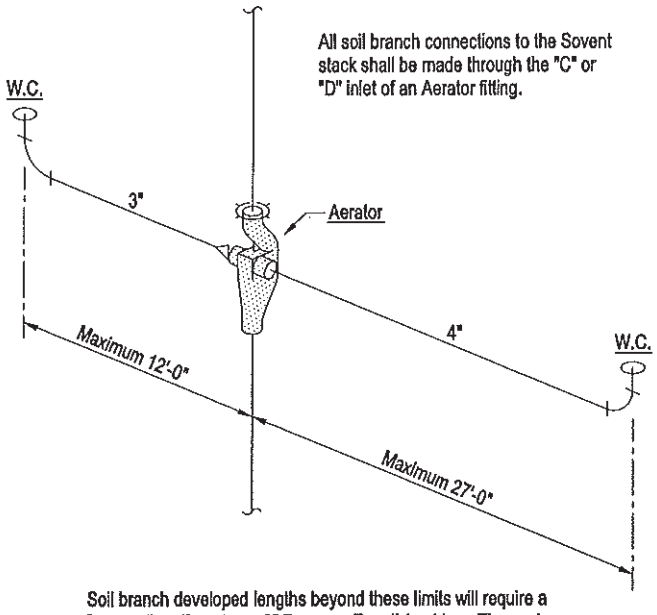
Sovent Stack Size	Minimum Distance*
3"	30"
4"	40"
5"	50"
6"	60"
8"	80"

* Minimum distance requirements shall apply to any connection into the horizontal drain.



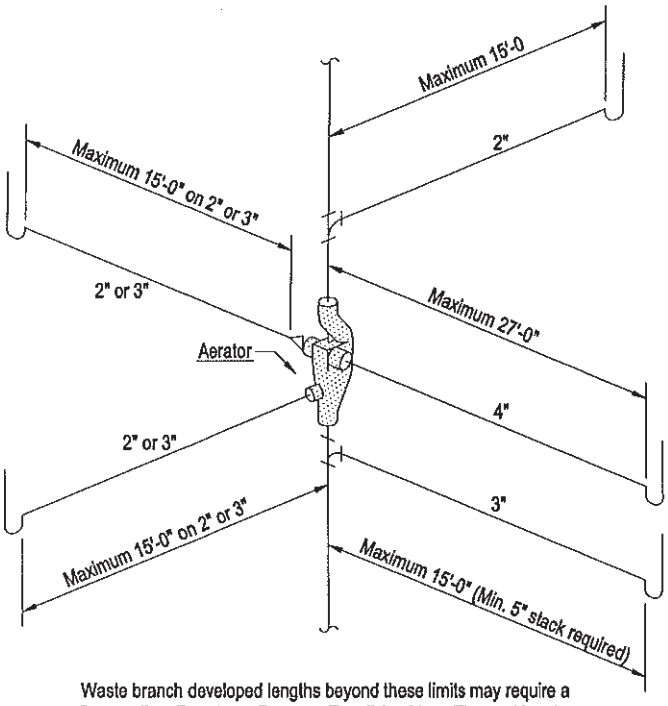
A-1
MINIMUM P.R.L. DISTANCES

All soil branch connections to the Sovent stack shall be made through the "C" or "D" inlet of an Aerator fitting.



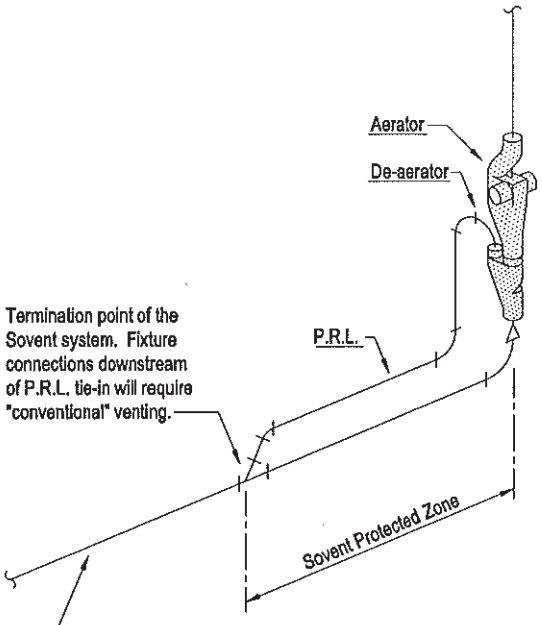
Soil branch developed lengths beyond these limits will require a "conventional" vent or a 2" Pressure Equalizing Line. The vent header or P.E.L. may connect to the Sovent stack a minimum of 3'-0" above the Aerator fitting.

A-2
SOIL BRANCH DEVELOPED LENGTH



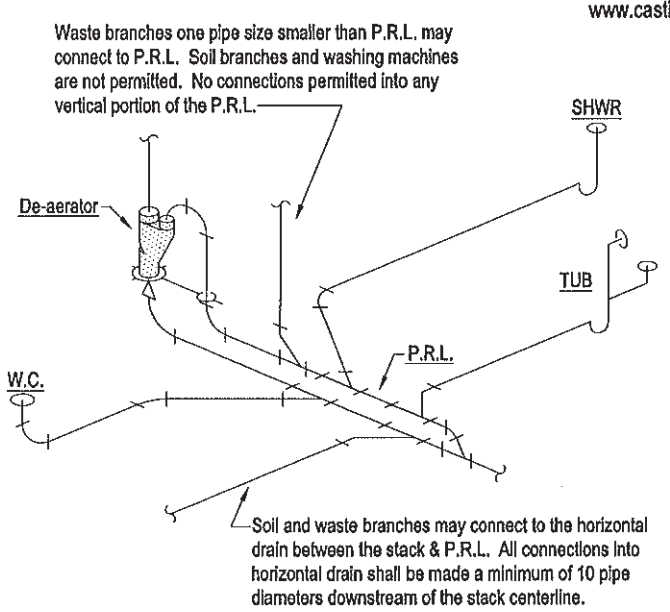
Waste branch developed lengths beyond these limits may require a "conventional" vent or a Pressure Equalizing Line. The vent header or P.E.L. may connect to the Sovent stack a minimum of 3'-0" above the Aerator fitting. P.E.L. Sizing - 4" waste / 2" P.E.L. 3" waste / 1-1/2" P.E.L. - 2" waste / 1-1/4" P.E.L.

A-3
WASTE BRANCH DEVELOPED LENGTH



This portion of piping is considered to be "conventional" plumbing and shall be sized by the prevailing Local Plumbing Code or CISDM #802 - Table "C", whichever is applicable. Fixture unit values shall be based on data found in CISDM #802 - Table "A" or "A-1".

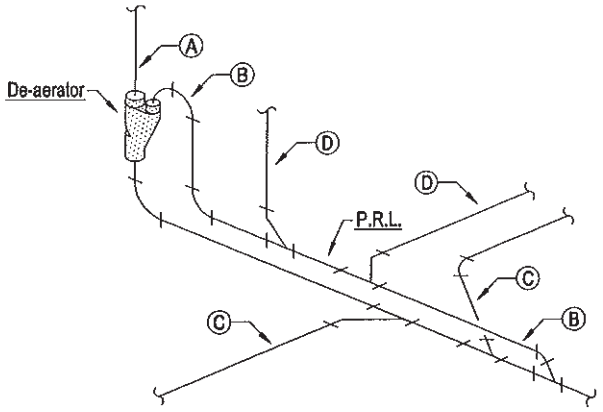
A-4
BASE OF SOVENT STACK INFORMATION



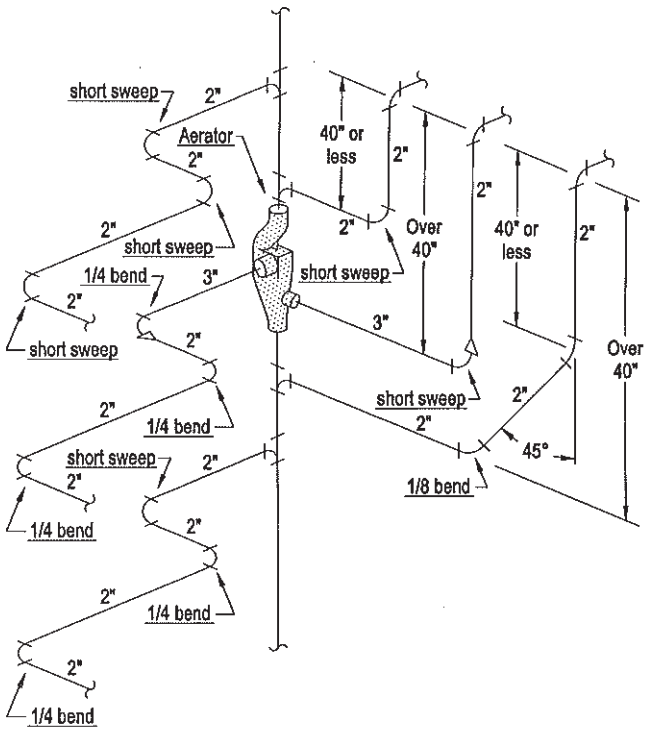
Rough-in height limitations can be reduced by eliminating the Aerator fitting and connecting the lower level fixtures into the horizontal portion of the Sovent system as shown. The De-aerator fitting may be installed above the finish floor providing it remains within 5'-0" of the horizontal drain.

A-5
BASE OF STACK MINIMUM ELEVATION PRACTICES

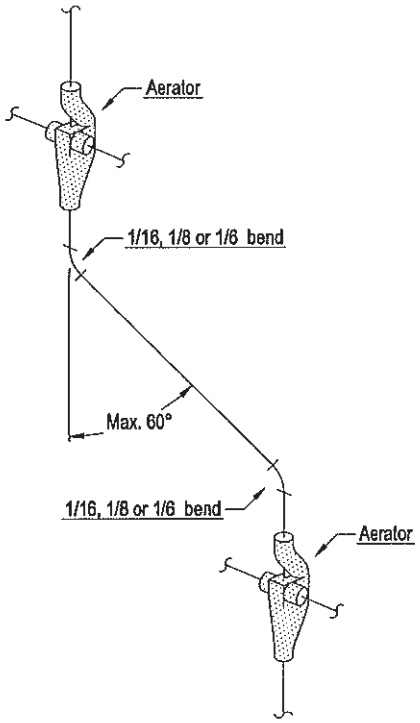
Sovent Stack Size - "A"	P.R.L. Size "B"	Soil or Waste Max. Size - "C"	Waste Size Max. - "D"
3"	3"	4"	2-1/2"
4"	3"	4"	2-1/2"
5"	4"	4"	3"
6"	4"	4"	3"
8"	6"	4"	3"



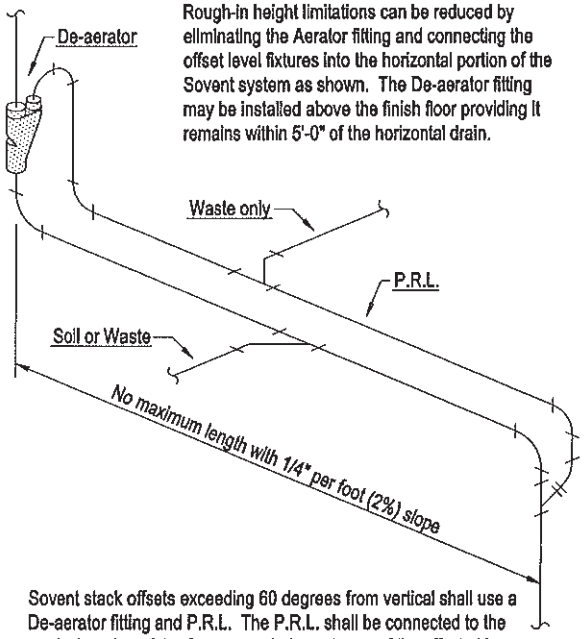
A-6
BASE OF STACK BRANCH CONNECTIONS



A-7
BRANCH DIRECTION / DISTANCE SIZING CHANGES



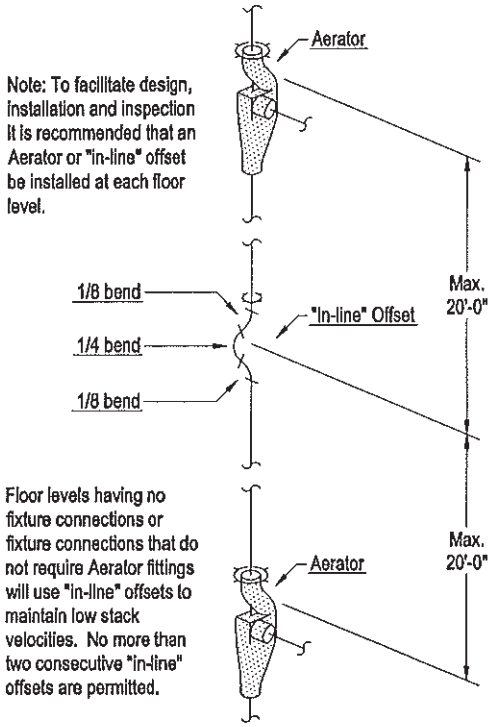
A-8
SOVENT STACK OFFSET - METHOD "A"



Rough-in height limitations can be reduced by eliminating the Aerator fitting and connecting the offset level fixtures into the horizontal portion of the Sovent system as shown. The De-aerator fitting may be installed above the finish floor providing it remains within 5'-0" of the horizontal drain.

Sovent stack offsets exceeding 60 degrees from vertical shall use a De-aerator fitting and P.R.L. The P.R.L. shall be connected to the vertical portion of the Sovent stack downstream of the offset. No connections are permitted into any vertical portion of the P.R.L.

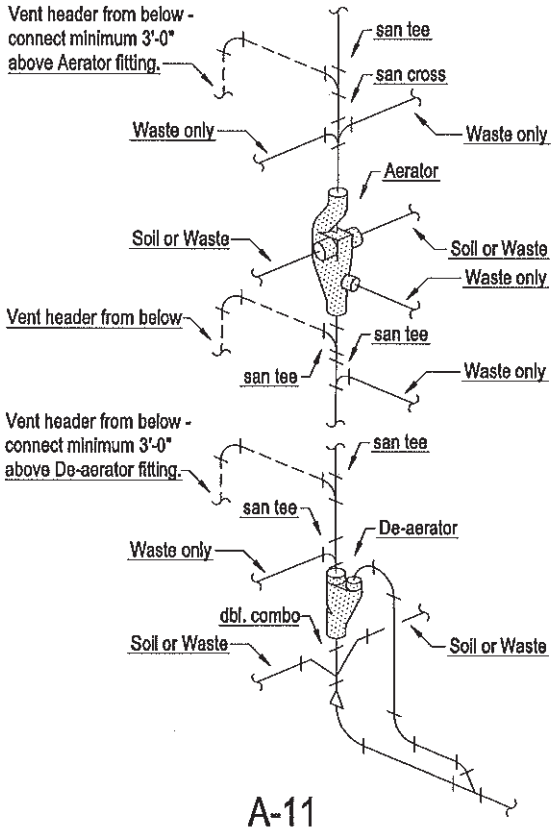
A-9
SOVENT STACK OFFSET - METHOD "B"



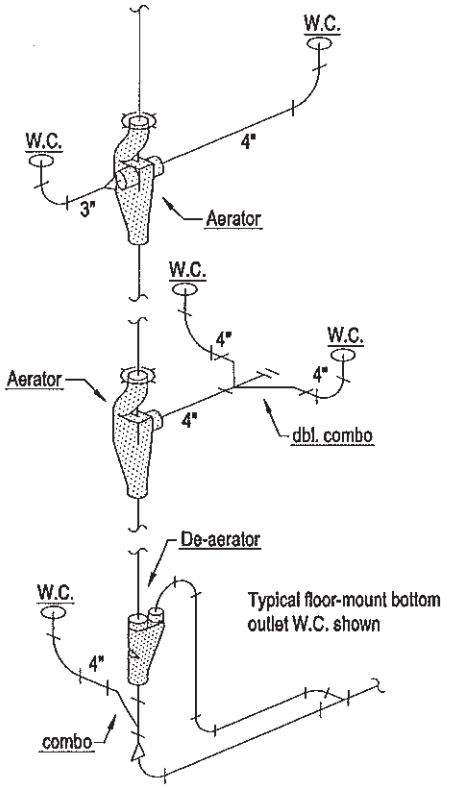
Note: To facilitate design, installation and inspection it is recommended that an Aerator or "in-line" offset be installed at each floor level.

Floor levels having no fixture connections or fixture connections that do not require Aerator fittings will use "in-line" offsets to maintain low stack velocities. No more than two consecutive "in-line" offsets are permitted.

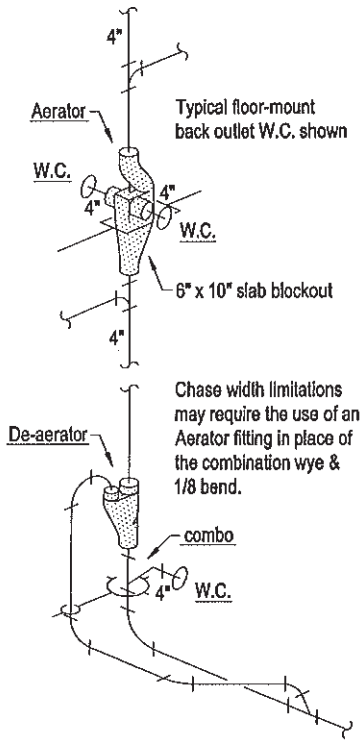
A-10
SOVENT STACK OFFSET - METHOD "C"



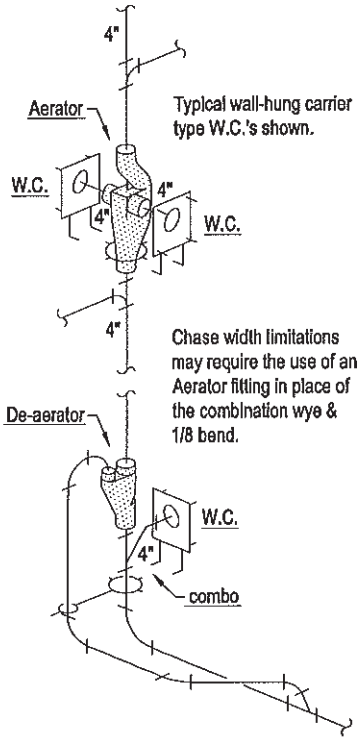
A-11
PERMITTED SOVENT STACK CONNECTIONS



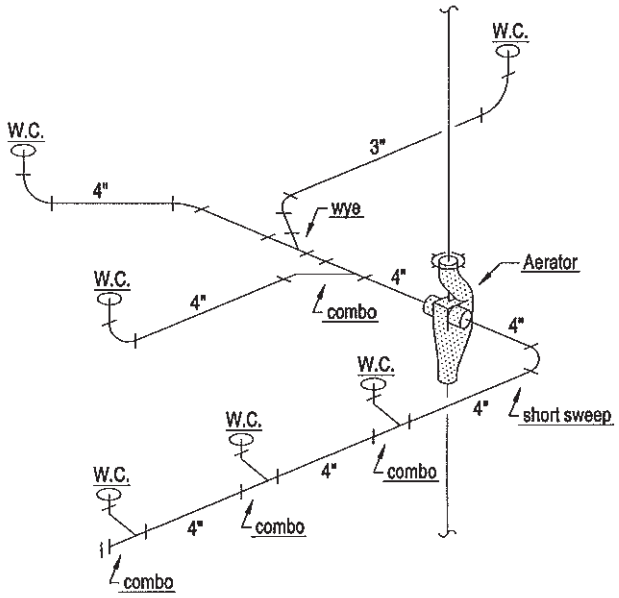
A-12
SOVENT STACK W.C. CONNECTIONS - METHOD "A"



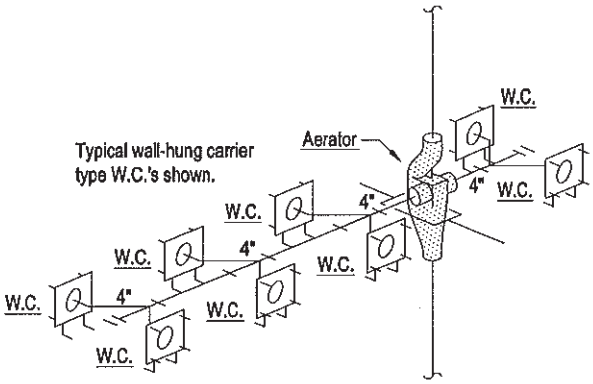
A-13
SOVENT STACK W.C. CONNECTIONS - METHOD "B"



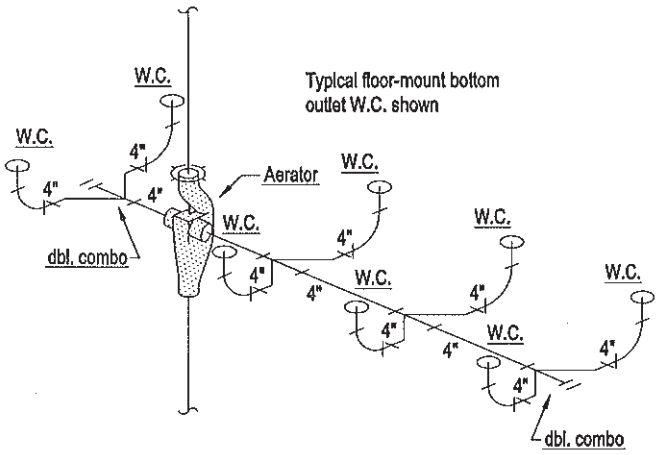
A-14
SOVENT STACK W.C. CONNECTIONS - METHOD "C"



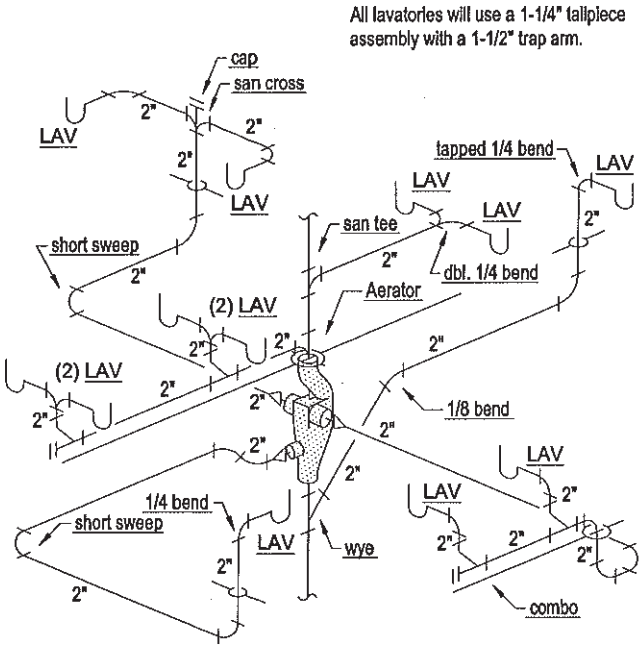
A-15
SOVENT STACK W.C. CONNECTIONS - MISCELLANEOUS



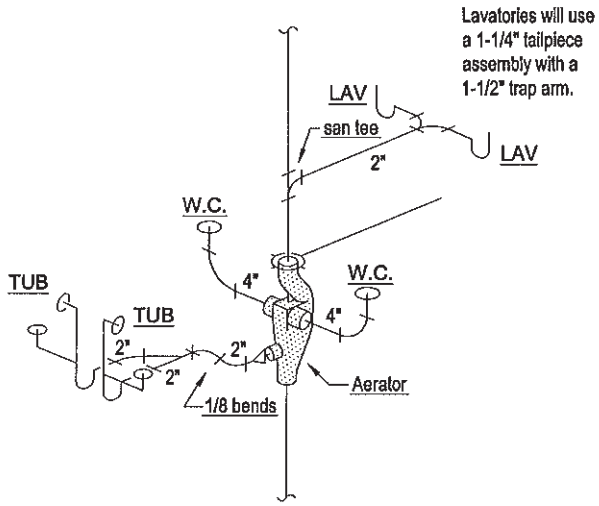
A-16
SOVENT STACK W.C. CONNECTIONS - OFFICE BLDG.



A-17
SOVENT STACK W.C. CONNECTIONS - OFFICE BLDG.

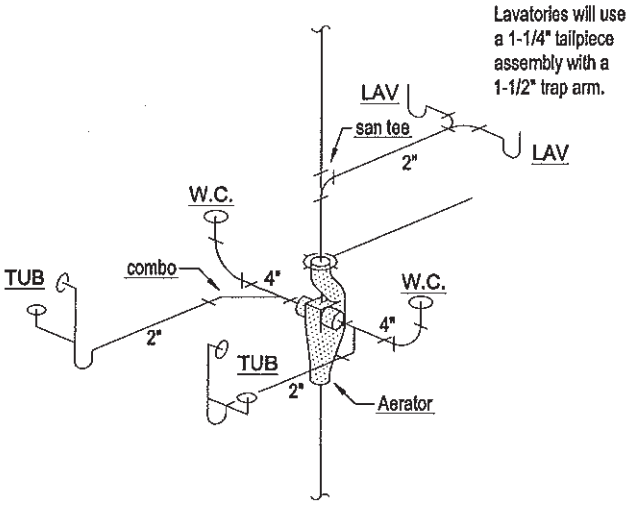


A-18
SOVENT STACK LAVATORY CONNECTIONS



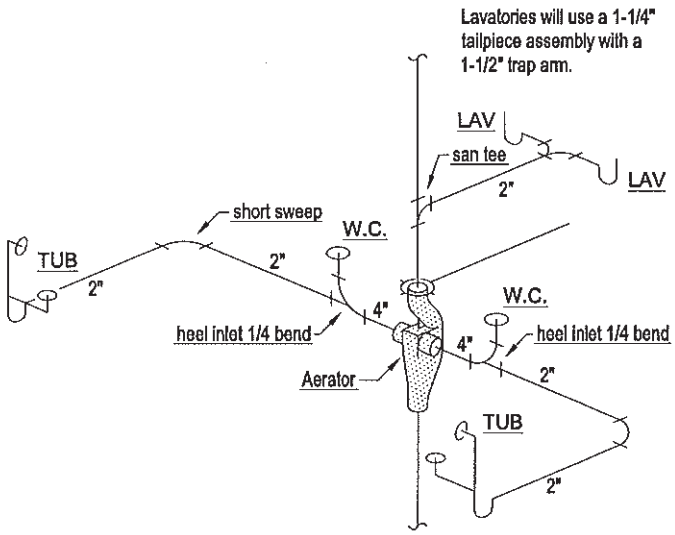
Back-to-back installation shown. Single bath unit is similar.

A-19
SOVENT STACK BATHROOM CONNECTIONS



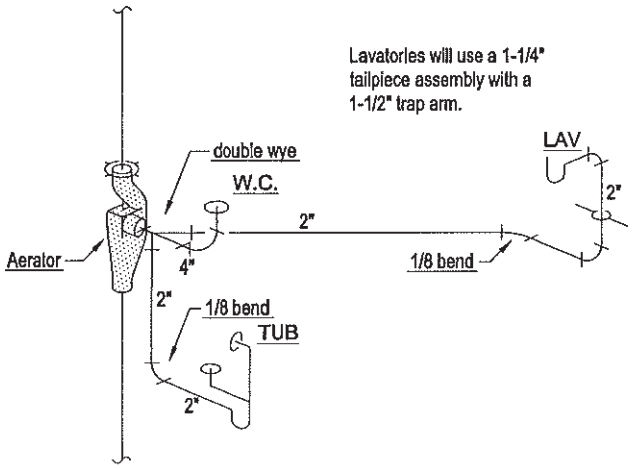
Back-to-back installation shown. Single bath unit is similar.

A-20
SOVENT STACK BATHROOM CONNECTIONS



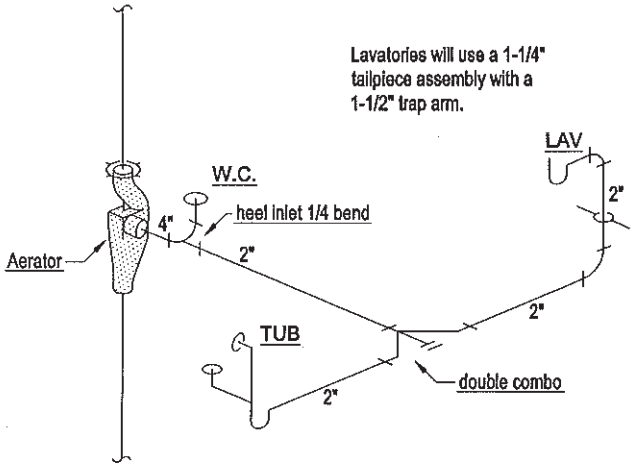
Back-to-back installation shown. Single bath unit is similar.

A-21
SOVENT STACK BATHROOM CONNECTIONS



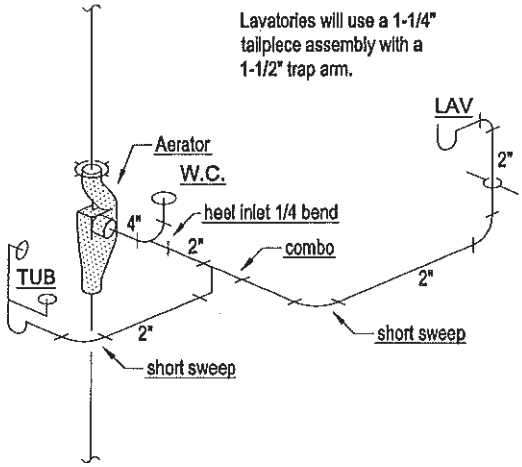
Single bath installation shown. Back-to-back unit is similar.

A-22
SOVENT STACK BATHROOM CONNECTIONS



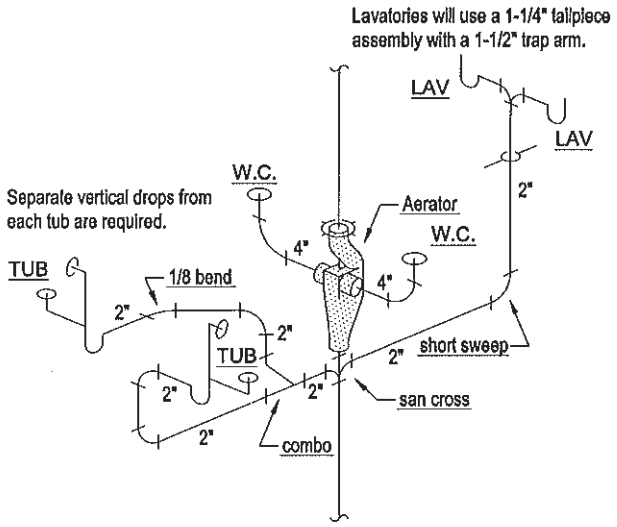
Single bath installation shown. Back-to-back unit is similar.

A-23
SOVENT STACK BATHROOM CONNECTIONS



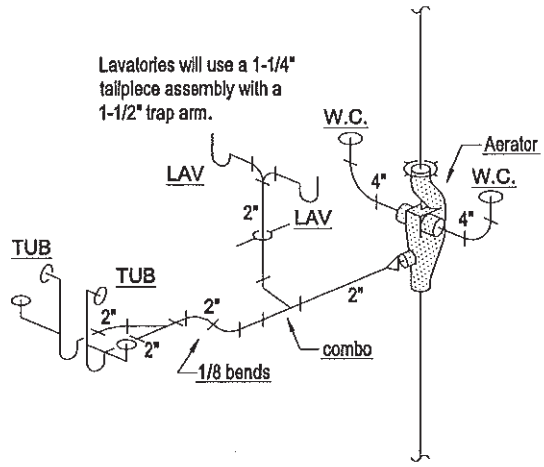
Single bath installation shown. Back-to-back unit is similar.

A-24
SOVENT STACK BATHROOM CONNECTIONS



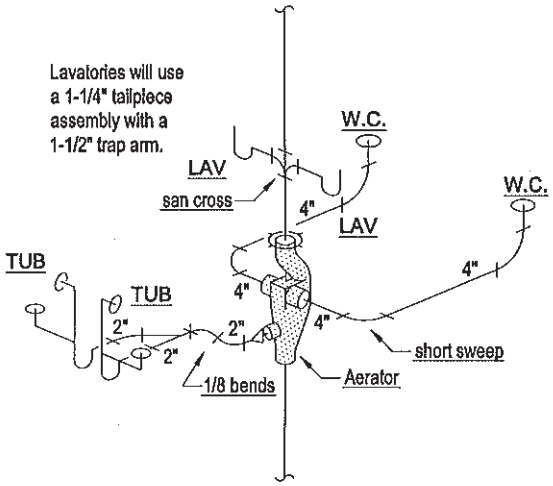
Back-to-back installation shown. Single bath unit is similar.

A-25
SOVENT STACK BATHROOM CONNECTIONS



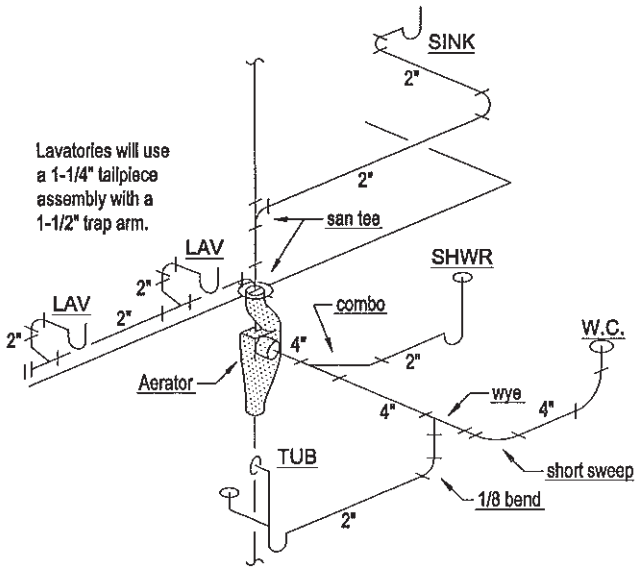
Back-to-back installation shown. Single bath unit is similar.

A-26
SOVENT STACK BATHROOM CONNECTIONS



Back-to-back installation shown. Single bath unit is similar.

A-27
SOVENT STACK BATHROOM CONNECTIONS



Single bath installation shown. Back-to-back unit is similar.

A-28
SOVENT STACK BATHROOM CONNECTIONS

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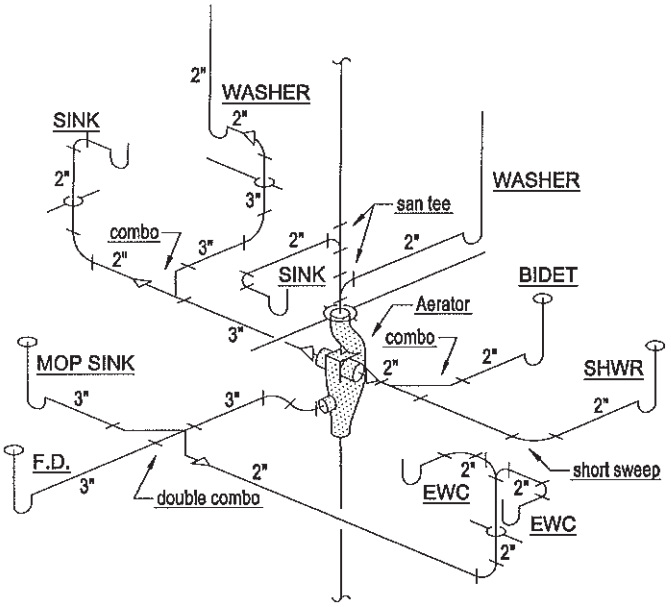
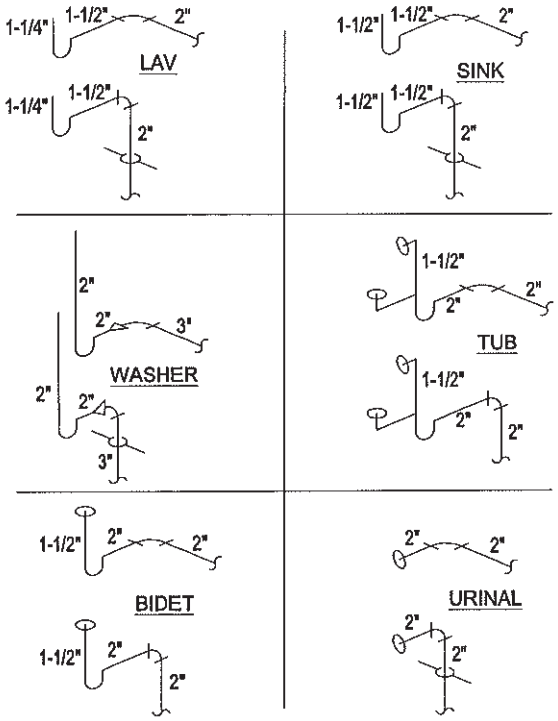
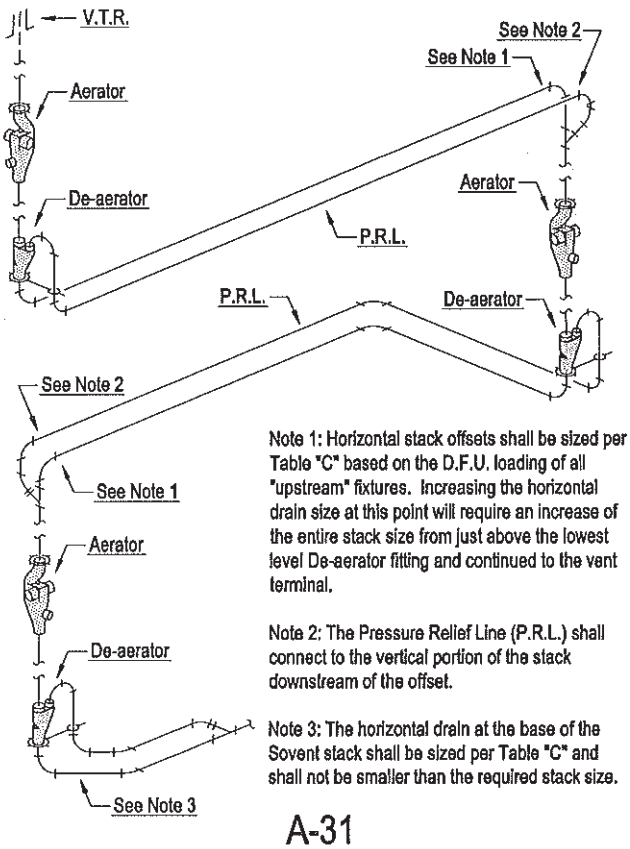


A-29
MISCELLANEOUS FIXTURE CONNECTIONS



Note: All branch piping located in ceiling or wall areas will be a minium of 2" in size.

A-30
BRANCH, TRAP-ARM & TAILPIECE SIZES

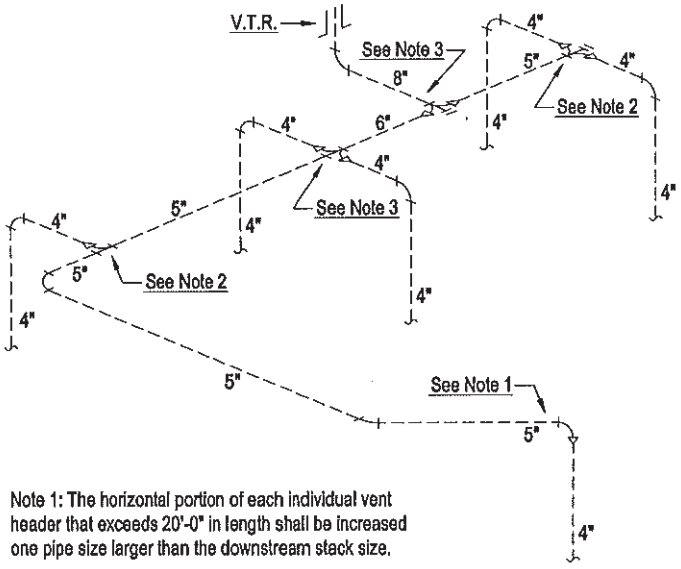


Note 1: Horizontal stack offsets shall be sized per Table "C" based on the D.F.U. loading of all "upstream" fixtures. Increasing the horizontal drain size at this point will require an increase of the entire stack size from just above the lowest level De-aerator fitting and continued to the vent terminal.

Note 2: The Pressure Relief Line (P.R.L.) shall connect to the vertical portion of the stack downstream of the offset.

Note 3: The horizontal drain at the base of the Sovent stack shall be sized per Table "C" and shall not be smaller than the required stack size.

A-31
MULTIPLE OFFSET STACK SIZING REQUIREMENTS



Note 1: The horizontal portion of each individual vent header that exceeds 20'-0" in length shall be increased one pipe size larger than the downstream stack size.

Note 2: The vent header from two combined vent headers shall be increased one pipe size larger than the largest individual vent. This increased sizing does not apply if previously made as noted above.

Note 3: Sizing for three or more combined vent headers is based on the cumulative D.F.U. total from each stack and capacities shown in the table at the right.

Vent Header Size	Maximum D.F.U. Load
5"	600
6"	1380
8"	3600

A-32
MULTIPLE VENT HEADER SIZING REQUIREMENTS

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Phone: (903) 894-6150 - Fax: (903) 894-6702
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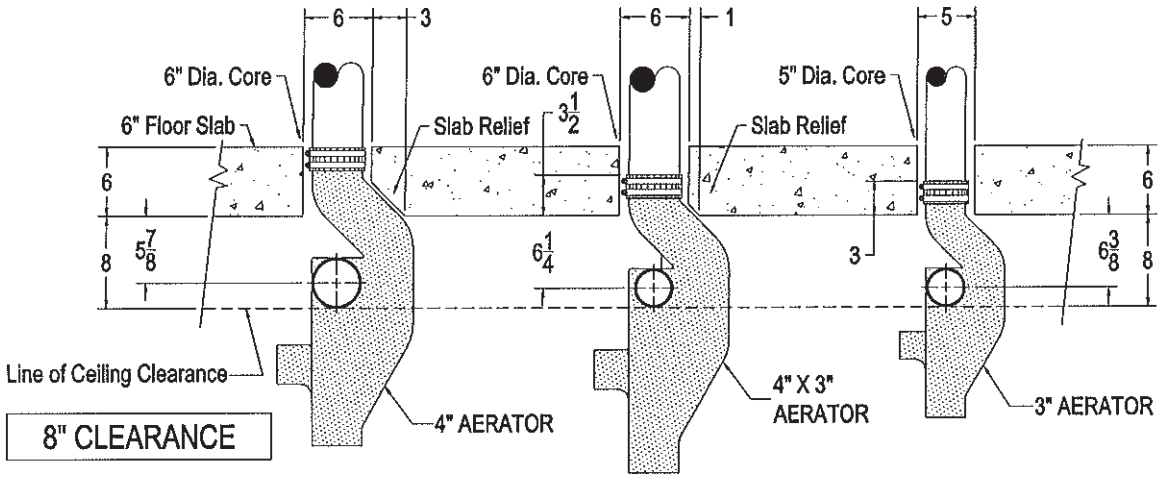
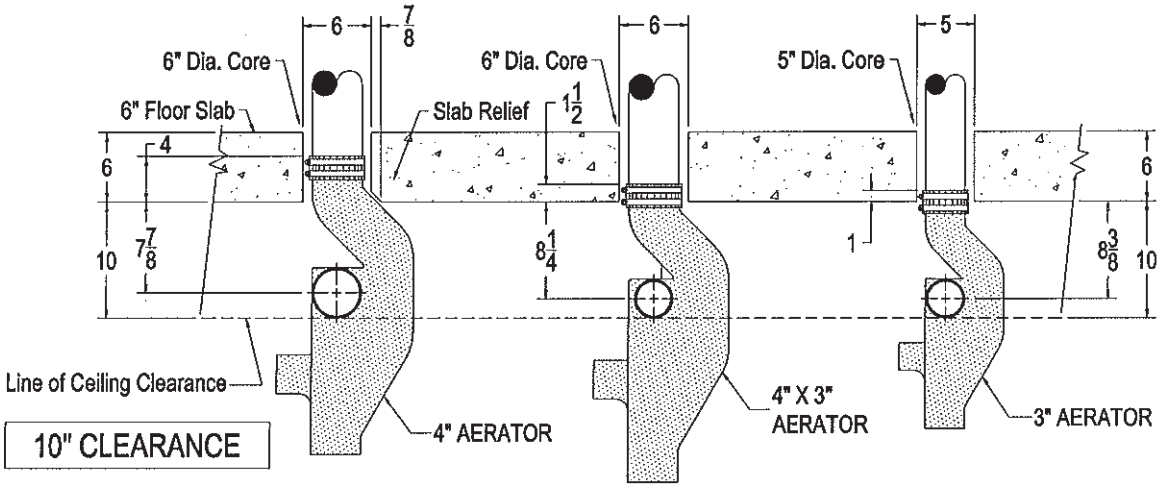
CAST IRON SOVENT® AERATOR ROUGH-IN / CEILING SPACE & SLEEVING

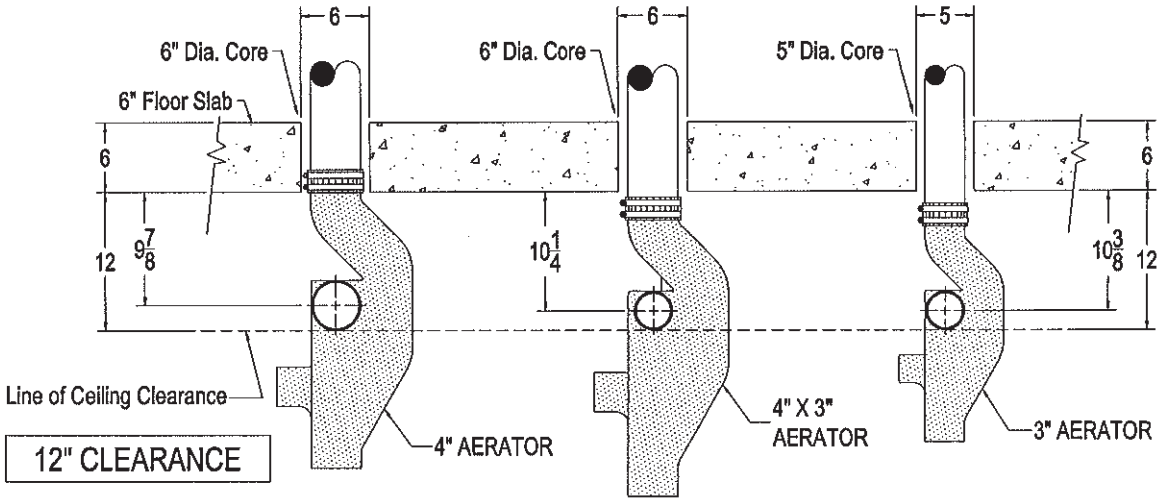
Cast Iron Sovent® can be adapted to most multi-story projects with a minimal amount of structural impact while reducing the space requirements for DWV systems. The available space created by dropped ceiling areas will alter the Aerator fitting location and resulting slab penetration. The following illustrations show various dimensional requirements for conditions commonly found in the construction market. Contact our office for assistance with conditions not shown.



8" CLEARANCE



10" CLEARANCE



12" CLEARANCE

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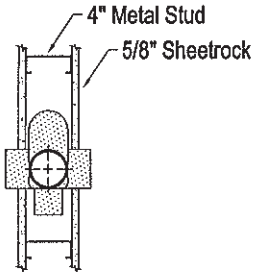
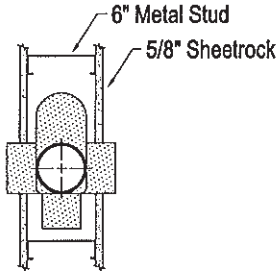
CAST IRON SOVENT® FITTING ROUGH-IN / WALL SPACE & SLAB BLOCK-OUTS

Cast Iron Sovent® can be adapted to most multi-story projects with a minimal amount of structural impact while reducing the space requirements for DWV systems. The partition space required for a properly orientated Aerator or De-aerator fitting is equal to that of a nominal size drainage pipe. Rectangular slab block-outs allow for recessing the Aerator fitting to accommodate back-outlet and wall-hung fixtures. The following illustrations show various dimensional requirements for conditions commonly found in the construction market. Contact our office for assistance with conditions not shown.

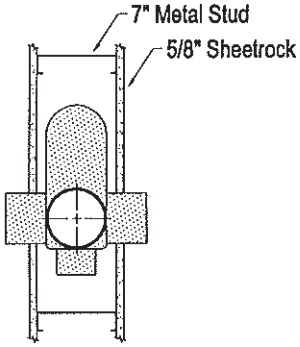
SUGGESTED PARTITION WALL DIMENSIONS



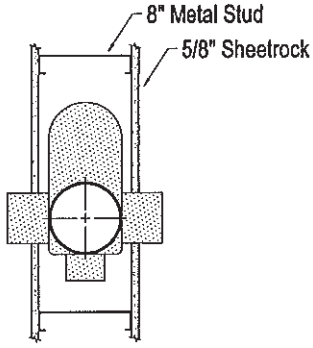
3" AERATOR



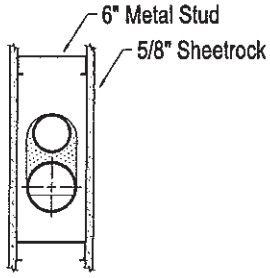
4" AERATOR



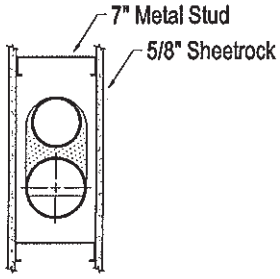
5" AERATOR



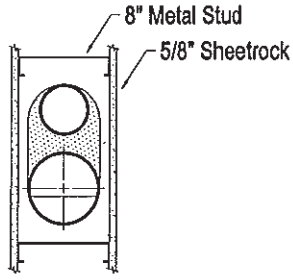
6" AERATOR



4" DE-AERATOR



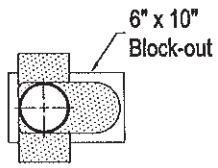
5" DE-AERATOR



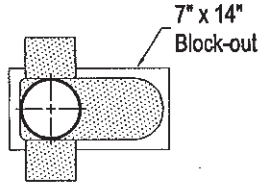
6" DE-AERATOR

Aerator inlets shown beyond partition walls are located above the finish ceiling line. Dimensions shown account for coupling diameter. Couplings not shown for clarity.

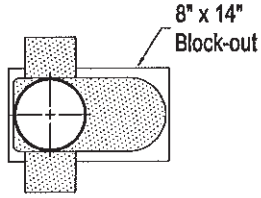
SUGGESTED BLOCK-OUT DIMENSIONS / ABOVE FLOOR ROUGH-IN



4" DE-AERATOR



5" DE-AERATOR



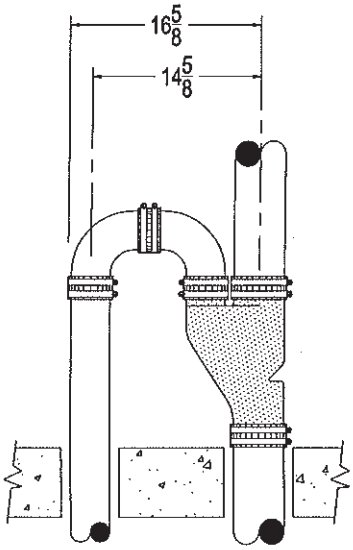
6" DE-AERATOR

Conine Manufacturing Co., Inc. - P.O. Box 6561 - Tyler, TX 75711 - Phone (903) 894-6150 - Fax (903) 894-6702
www.castironsovent.com

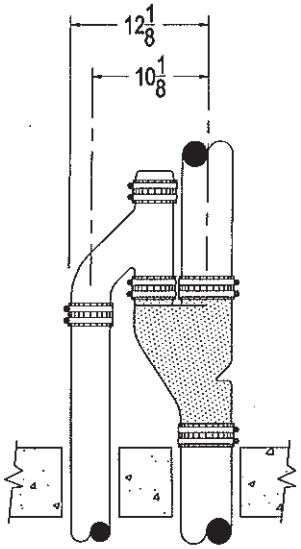
CAST IRON SOVENT® DE-AERATOR ROUGH-IN / P.R.L. & CEILING SPACE

Cast Iron Sovent® can be adapted to most multi-story projects with a minimal amount of structural impact while reducing the space requirements for DWV systems. The P.R.L. connection method to the De-aerator fitting can be made with a variety of standard sanitary fittings to adapt to chase space conditions. The De-aerator fitting is often located above the finish floor to reduce the ceiling space requirements. The following illustrations show various dimensional requirements for conditions commonly found in the construction market. Contact our office for assistance with conditions not shown.

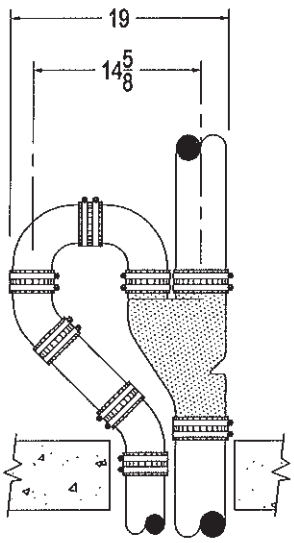
SUGGESTED P.R.L. ROUGH-IN DIMENSIONS



4" DE-AERATOR WITH 3" QUARTER BENDS



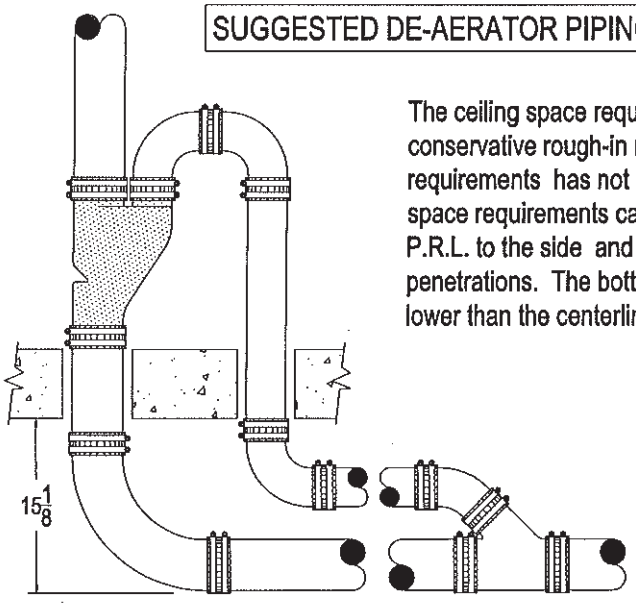
4" DE-AERATOR WITH 3" UPRIGHT WYE & CAP



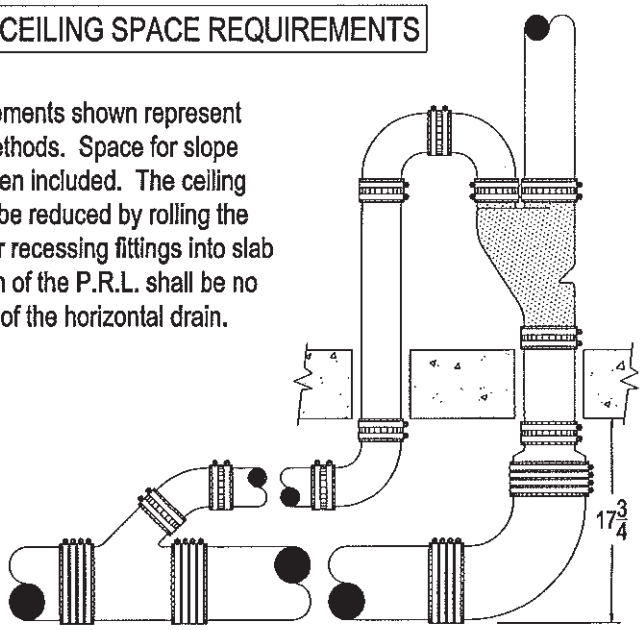
4" DE-AERATOR WITH 3" EIGHTH & QUARTER BENDS

SUGGESTED DE-AERATOR PIPING CEILING SPACE REQUIREMENTS

The ceiling space requirements shown represent conservative rough-in methods. Space for slope requirements has not been included. The ceiling space requirements can be reduced by rolling the P.R.L. to the side and /or recessing fittings into slab penetrations. The bottom of the P.R.L. shall be no lower than the centerline of the horizontal drain.



4" DE-AERATOR WITH 4" HORZONTAL DRAIN LINE



4" DE-AERATOR WITH 6" HORIZONTAL DRAIN LINE

CAST IRON SOVENT® SAMPLE SPECIFICATION

We suggest the following specification.

The Cast Iron Sovent® DWV system shall be installed in accordance with approved construction plans and specifications, and in compliance with criteria set forth by *Cast Iron Sovent® Design Manual #802* as published by Conine Manufacturing Co., Inc. The cast iron Sovent® Aerator and De-aerator fittings shall be manufactured and distributed by Conine Manufacturing Co., Inc. The Aerator and De-aerator fittings shall be in compliance with ASME Standard B16.45-1998 as published by the American Society of Mechanical Engineers. Contact Conine Manufacturing Co., Inc. by phone at 903/894-6150 or fax at 903/894-6702 for additional information.

MANUFACTURER SERVICES

In addition to normal business services, Conine Manufacturing Co., Inc. will:

1) Furnish complete technical assistance and information on the latest techniques of design, installation and inspection of the Cast Iron Sovent® system.
2) Provide design/drawing assistance, plans check, and drawing review.
3) Provide Value Engineering assistance.
4) Provide field inspection service with written reports furnished to all designated parties. Inspections and reports will be subject to a negotiated, equitable fee.
5) Provide assistance in training of designers, installers and inspectors on an as needed, invitational basis. Seminars will be subject to a negotiated, equitable fee.

These pledges assume the obvious. Conine Manufacturing Co., Inc. shall furnish all Cast Iron Sovent® products and the design shall comply with all appropriate criteria set forth by *Cast Iron Sovent® Design Manual #802.*

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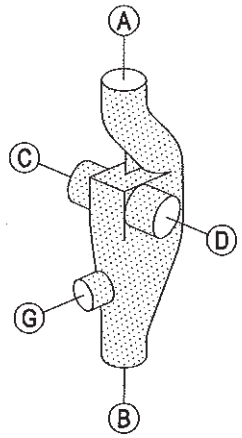
ILLUSTRATED ORDERING GUIDE

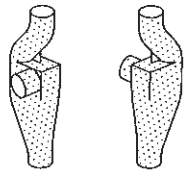
Aerator fittings are available in several nominal sizes and configurations. The illustration below shows the letter designation assigned to each inlet for ordering purposes. Fittings will be furnished with the inlet sizes shown in the table at the right. Ordering information shall include quantity, the nominal fitting size(s) and the required inlet(s) by letter designation.

De-aerator fittings are available in several nominal sizes. Inlet options are not available. Ordering information shall include quantity and nominal size(s) only.

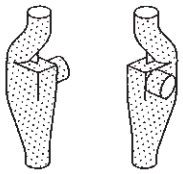
All orders and requests for quotations shall include project name and location.



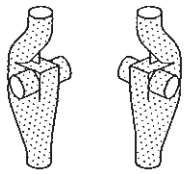
Nominal Fitting Size	Inlet Sizes By Letter				
	"A"	"B"	"C"	"D"	"G"
3" Aerator	3	3	3	3	2
4" Aerator	4	4	4	4	3
4" x 3" Aerator	4	4	3	3	3
5" Aerator	5	5	4	4	3
6" Aerator	6	6	4	4	3
8" Aerator	8	8	4	4	-



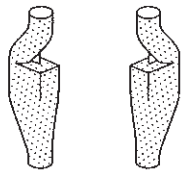
Qty. ____ 3" ABC Aerator
Qty. ____ 4" ABC Aerator
Qty. ____ 4" x 3" ABC Aerator
Qty. ____ 5" ABC Aerator
Qty. ____ 6" ABC Aerator
Qty. ____ 8" ABC Aerator



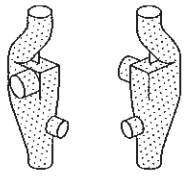
Qty. ____ 3" ABD Aerator
Qty. ____ 4" ABD Aerator
Qty. ____ 4" x 3" ABD Aerator
Qty. ____ 5" ABD Aerator
Qty. ____ 6" ABD Aerator
Qty. ____ 8" ABD Aerator



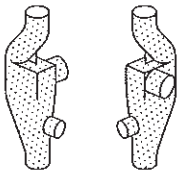
Qty. ____ 3" ABCD Aerator
Qty. ____ 4" ABCD Aerator
Qty. ____ 4" x 3" ABCD Aerator
Qty. ____ 5" ABCD Aerator
Qty. ____ 6" ABCD Aerator
Qty. ____ 8" ABCD Aerator



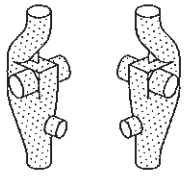
Qty. ____ 3" AB Aerator
Qty. ____ 4" AB Aerator



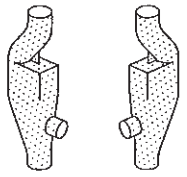
Qty. ____ 3" ABCG Aerator
Qty. ____ 4" ABCG Aerator
Qty. ____ 4" x 3" ABCG Aerator
Qty. ____ 5" ABCG Aerator
Qty. ____ 6" ABCG Aerator



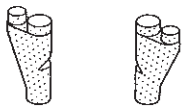
Qty. ____ 3" ABDG Aerator
Qty. ____ 4" ABDG Aerator
Qty. ____ 4" x 3" ABDG Aerator
Qty. ____ 5" ABDG Aerator
Qty. ____ 6" ABDG Aerator



Qty. ____ 3" ABCDG Aerator
Qty. ____ 4" ABCDG Aerator
Qty. ____ 4" x 3" ABCDG Aerator
Qty. ____ 5" ABCDG Aerator
Qty. ____ 6" ABCDG Aerator



Qty. ____ 3" ABG Aerator
Qty. ____ 4" ABG Aerator



Qty. ____ 4" De-aerator
Qty. ____ 5" De-aerator
Qty. ____ 6" De-aerator
Qty. ____ 8" De-aerator

Contact: _____ Phone: _____

Company Name: _____

Project Name: _____

Project Location: _____