

NEENAH FOUNDRY CO.

TRENCH SYSTEMS

MADE IN USA

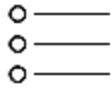
NEENAH **NF**
FOUNDRY
Since 1872



Over the years we have seen premature failure of bolted trench because of poor trench maintenance. A blind hole will fill with debris and prevent the bolt from turning down completely and properly holding the grate to the frame. A worker determined to properly fasten the grate can shear the bolt. Tightening a bolt against debris creates tensile stresses against the bond between the frame and the concrete supporting it.

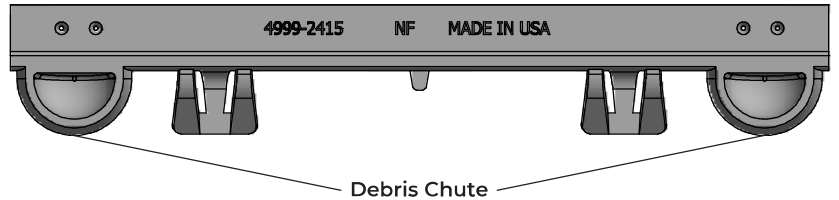
Neenah can solve bolt hole debris problems by eliminating all the maintenance issues altogether.

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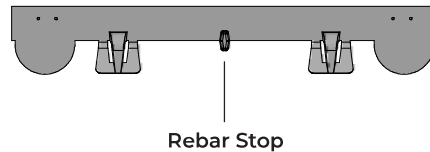
INTRODUCING THE DEBRIS CHUTE FOR BOLTED TRENCH



GENERAL

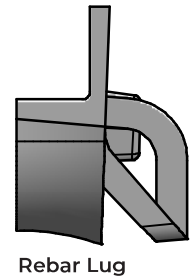
Neenah's debris chutes allow material that falls into the bolt hole of the frame to harmlessly pass through into the trench below.

INNOVATION



The rebar stop prevents a common error for those who do not follow Neenah's recommended forming instructions.

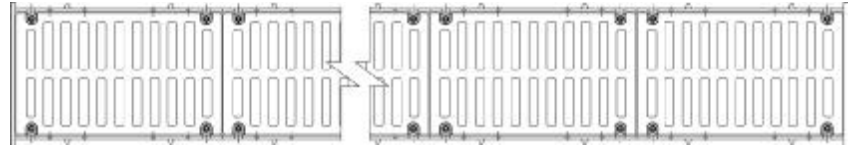
IMPROVEMENT



Easy anchored frame. The rebar lug on Neenah's patented frame is sized for a number 4 rebar. If the rebar is bent 90 degrees or less, it will automatically be positioned at the proper angle to the frame for anchoring in concrete.

R-4990 & R-4999 HEAVY DUTY TRENCH SERIES

Our R-4990 and R-4999 cast iron trench systems offer appealing aesthetics, exceptional longevity and low maintenance. No matter where they're placed, you can be confident Neenah Trench will stand strong



in any climate. Our newly designed frame includes many innovative features making the R-4990 and R-4999 trench series more durable than ever. Please see page 3 for more details. Our R-4990 trench systems are furnished non-bolted. All grates, lids and frames are cast gray iron, meeting ASTM-A48 Class 35-B for heavy-duty use. Typical uses for Neenah R-4990 trench systems include parking lots, loading docks, and warehouse drainage.

Our R-4999 trench systems are furnished bolted. Bolting should be considered for applications where high traffic speeds are

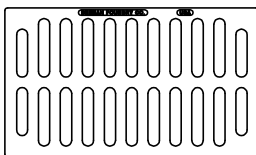
R-4990 & R-4999 HEAVY DUTY

R-4990 HEAVY DUTY TRENCH

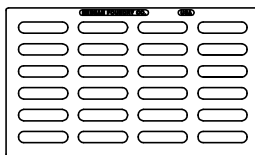
CATALOG NO.		A	B	C	TYPE A	TYPE C	TYPE D	TYPE P	TYPE Q
R-4989*	R-4989-B*	6	1 ½	4	X		X	X	X
R-4990-AX	R-4999-AX	8	1 ½	6	X	X	X	X	
R-4990-BX	R-4999-BX	10	1 ½	8	X	X	X	X	
R-4990-CX*	R-4999-CX*	12	1 ½	10	X	X	X	X	X
R-4990-DX	R-4999-DX	14	1 ½	12	X	X	X	X	X
R-4990-EX	R-4999-EX	17	1 ½	15	X	X	X	X	
R-4990-FX*	R-4999-FX*	20	1 ½	18	X	X	X	X	
R-4990-GX	R-4999-GX	23	1 ½	21	X	X	X		
R-4990-HX	R-4999-HX	26	1 ½	24	X	X	X		X
R-4990-JX	R-4999-JX	30	2	27	X	X	X		
R-4990-KX	R-4999-KX	33	2	30	X	X	X		
R-4990-LX	R-4999-LX	36	2	33	X	X	X		
R-4990-MX	R-4999-MX	39	2	36	X	X	X		
R-4990-NX	R-4999-NX	45	2	42	X	X	X		
R-4990-OX	R-4999-OX	51	2	48	X		X	X	X

* For complete list of Decorative Grates see page 11

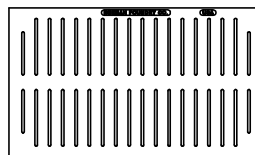
With the exception of certain airport, port and heavy industrial series trench systems cast in ductile iron, all frames, grates and lids are cast in gray iron, ASTM A48 Class 35-B for heavy-duty use.



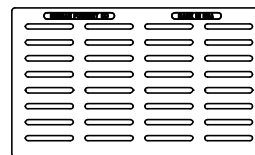
TYPE A
GRATE OPENINGS



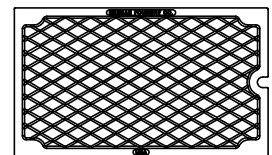
TYPE C
GRATE OPENINGS



TYPE P
GRATE OPENINGS



TYPE Q
GRATE OPENINGS



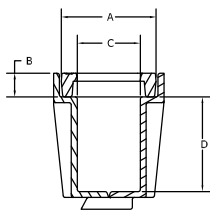
TYPE D LID
SOLID LID

R-4996 TYPE M TRENCH FRAME

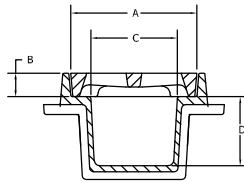
R-4996 TYPE M TRENCH FRAME

CATALOG NO.	COVER DIMENSIONS		FRAME DIMENSIONS		FRAME LENGTH	OUTLET LOCATION/SIZE			AVAILABLE GRATES/COVER								
	A	B	C	D		END	BOTTOM	SIDE	TYPE A	TYPE C	TYPE D	Riverwalk	Tidal Wave	Greek Key	Carriage Walk	TYPE P	TYPE Q
R-4996-A6	6	1 ½	4	6	24	4	4, 6	4	X		X	X	X	X	X	X	X
R-4996-A8	8	1 ½	5 ½	4	24	4	4, 6	4	X	X	X					X	
R-4996-A12	12	1 ½	10	6	24	4, 6	4, 6, 8	4, 6	X	X	X	X	X			X	X

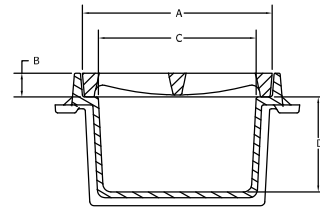
* For Decorative Grates see page 11



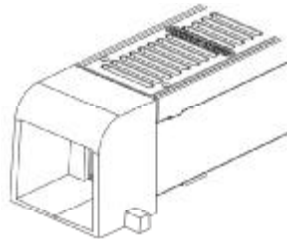
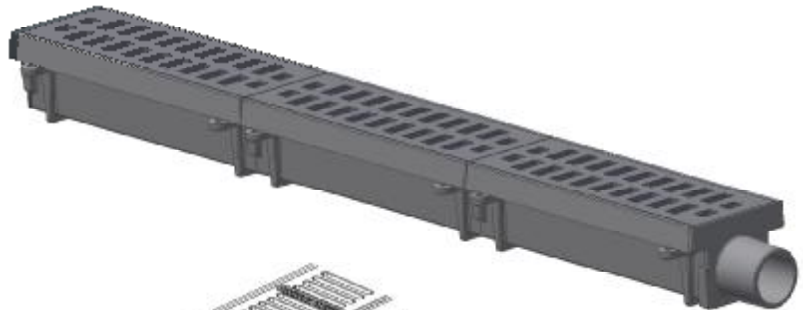
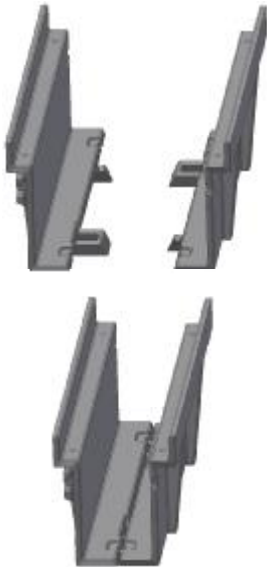
R-4996-A6



R-4996-A8



R-4996-A12

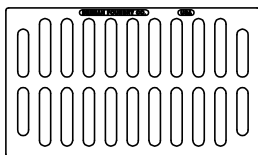


curb opening end cap

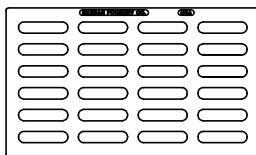
* For R-4996-A6 Frame only

R-4996 Type M HEAVY DUTY

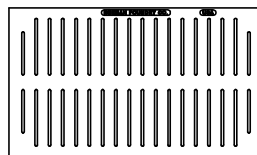
Designed for exceptional durability, the New R-4996 Type M trench system virtually eliminates maintenance problems associated with the cracking and delaminating of non-iron trench pan materials. The R-4996 trench system installs quickly and inexpensively and withstands rough jobsite conditions. Typical uses for Neenah R-4996 Type M trench systems includes parking lots, loading docks, and sidewalk chase drain applications.



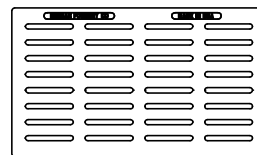
TYPE A
GRATE OPENINGS



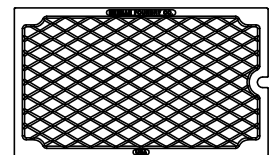
TYPE C
GRATE OPENINGS



TYPE P
GRATE OPENINGS



TYPE Q
GRATE OPENINGS



TYPE D LID
SOLID LID

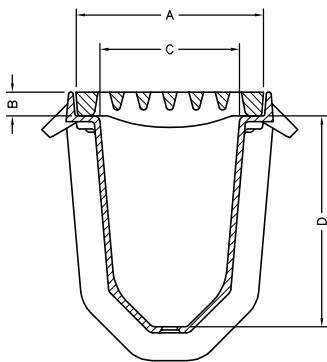
R-4996 SELF FORMING TRENCH PAN

R-4996 SELF FORMING TRENCH PAN

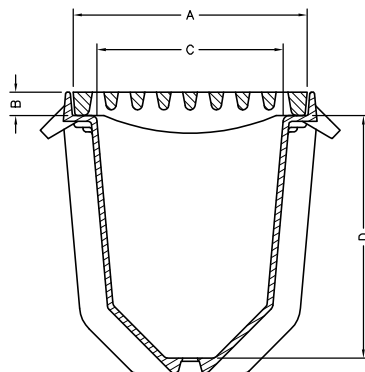
CATALOG NO.	STANDARD COVER DIMENSIONS				FRAME LENGTH	OUTLET LOCATION/SIZE			AVAILABLE GRATES/COVER
	A	B	C	D		END	BOTTOM	SIDE	
R-4996-A	8	1	6	9	30	4	4	4, 6	Q**
R-4996-B	10	1	8	10 3/8	30	4, 6	4, 6	4, 6, 8	P, Q**
R-4996-C	12	1 1/2	10	10	36	4, 6, 8	4, 6, 8	4, 6, 8	A, C, D, L, P, Q
R-4996-CA*	12	1 1/2	10	10	36	4, 6, 8	4, 6, 8	4, 6, 8	A

Type L grates furnished standard bolted
 * Aircraft Rated Standard Bolted
 ** Can be incorporated into plans for ADA Compliance
 For Decorative Grate Information, See Page II

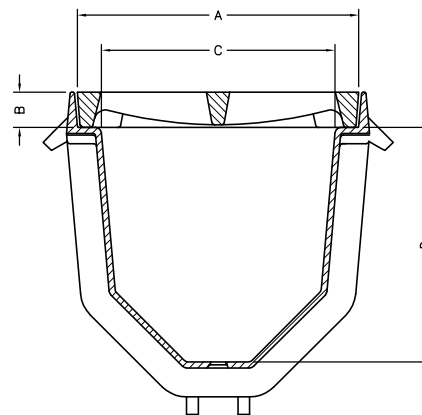
R-4996 SELF FORMING TRENCH PAN



R-4996-A

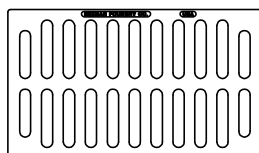


R-4996-B

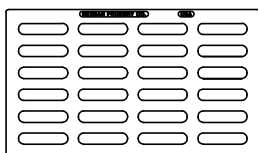


R-4996-C & CA

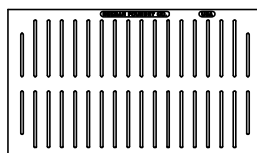
Every Neenah Foundry trench system is built with lasting form and function, the R-4996 Self-Forming trench pan is no exception. Installation is made easy utilizing reusable inexpensive forms. Specifiers can be assured of hydraulic performance utilizing Neenah Foundry's hydraulic data collected from full scale testing of our products.



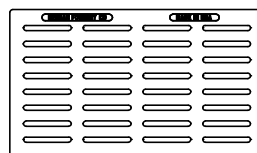
TYPE A
GRATE OPENINGS



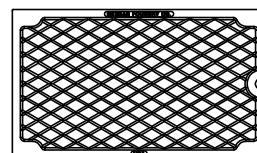
TYPE C
GRATE OPENINGS



TYPE P
GRATE OPENINGS



TYPE Q
GRATE OPENINGS



TYPE D LID
SOLID LID

R-3599 SLOTTED VANE DRAIN

R-3599 SLOTTED VANE DRAIN

CATALOG NO.	GRATE TYPE	SQUARE FEET OPEN	WEIR PERIMETER LINEAL FEET	TYPE
R-3599-A	L	0.2 per ft.	2 per ft.	Heavy Duty
R-3599-B	L	0.2 per ft.	2 per ft.	Extra Heavy Duty

Neenah's Cast Iron Slotted Vane Drain offers ease of installation along with the superior vaned configuration to capture previously unexpected quantities of water when placed perpendicular to the flow. This product is typically installed across driveway entrances, highway shoulders, loading docks or wherever sheet flow capture is required.

The R-3599 Slotted Vane Drain offers the superior performance of the vaned configuration as well as the strength, durability, and economy of gray iron. When the Slotted Vane Drain is installed perpendicular to the flow, the unique shape provides a capacity of 0.5 cfs per lineal foot of drain for longitudinal slopes from 0% to 6%.



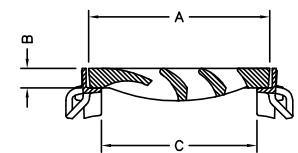
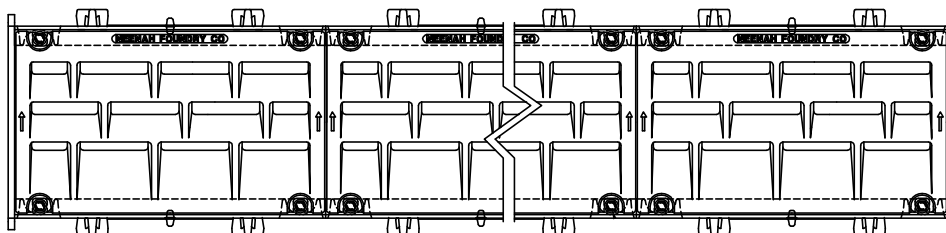
R-4999 VANED TYPE L SERIES

R-4999 VANED TYPE L SERIES

CATALOG NO.	A	B	C
R-4999-L2***	12	1/1/02	10
R-4999-L3*	14	1/1/02	12
R-4999-L6**	23 7/8	2	21 7/8
R-4999-L7*	26 5/8	2	24 5/8
R-4999-L9***	29 3/4	2/1/02	26 3/4

* Furnished in 24" sections
 ** Furnished in 12" or 24" sections
 *** Furnished in 18" or 36" sections

The growing popularity of Type "L" Vane Style Gates is not only because of their unbeatable capacity under virtually all flow conditions, but also because they're safer for bicycles than other grate styles. For these reasons, increasing numbers of states, counties and municipalities are adopting the Vane Style Gate as standard. Specifiers trust Type "L" vane shaped grates for the ability to remove significant amounts of sheet flow from streets, parking lots and industrial lots.

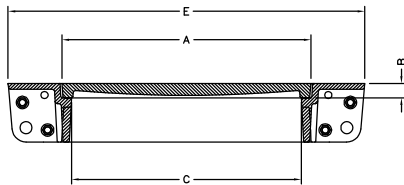


R-3599 SLOTTED VANE DRAIN & R-4999 VANED TYPE L HEAVY DUTY SERIES

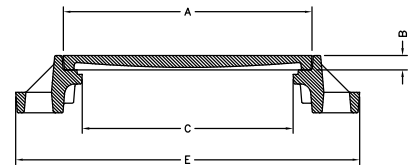
R-4993 & R-4994 SUPERIOR DURABILITY FRAMES

R-4993 & R-4994 HEAVY DUTY GRATE

TYPE T	TYPE S	TYPE T				TYPE S		TYPE	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE
CATALOG NO.	CATALOG NO.	A	B	C	E	C	E	A	C	D	E	L	P	Q
R-4993-AB	R-4994-AB	8	1 ½	6	19 ¼	4	18	X	X	X	X		X	
R-4993-BB	R-4994-BB	10	1 ½	8	21 ¼	6	20	X	X	X	X		X	
R-4993-CB	R-4994-CB	12	1 ½	10	23 ¼	8	22	X	X	X	X		X	X
R-4993-DB	R-4994-DB	14	1 ½	12	25 ¼	10	24	X	X	X	X	X	X	X
R-4993-EB	R-4994-EB	17	1 ½	15	28 ¼	13	27	X	X	X	X		X	
R-4993-FB	R-4994-FB	20	1 ½	18	31 ¼	16	30	X	X	X	X		X	
R-4993-GB	R-4994-GB	23	1 ½	21	34 ¼	19	33	X	X	X				
R-4993-HB	R-4994-HB	26	1 ½	24	37 ¼	22	36	X	X	X	X			X
R-4993-JB	R-4994-JB	30	2	28	41 ¼	26	40	X	X	X				
R-4993-KB	R-4994-KB	33	2	31	44 ¼	29	43	X	X	X	X			
R-4993-LB	R-4994-LB	36	2	34	47 ¼	32	46	X	X	X				
R-4993-MB	R-4994-MB	39	2	37	50 ¼	35	49	X	X	X				
R-4993-NB	R-4994-NB	45	2	43	56 ¼	41	55	X	X	X				
R-4993-OB	R-4994-OB	51	2	49	62 ¼	47	61	X		X			X	X

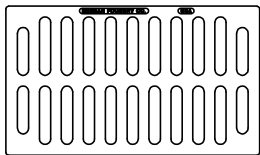


TYPE 'T' FRAME

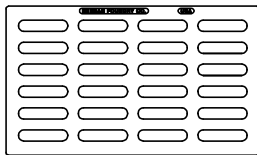


TYPE 'S' FRAME

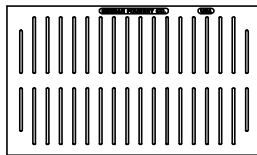
- 254 square inches of masonry contact surface per foot.
- 150 square inches of masonry bearing surface per foot.
- Frame top section provides transition platform onto and off grating surface.
- Provision for bolting successive frame sections together
- Provides significant reinforcing bar opportunity
- Bolt holes are drilled clear through cantilever seat and will not trap debris.
- 350 square inches of masonry contact surface per foot.
- 65 square inches of masonry bearing surface per foot.
- Unique frame shape allows the clear opening to be wider than typical.
- Bolt holes are drilled clear through cantilever seat and will not trap debris.
- Provision for bolting successive frame sections together
- Provides significant reinforcing bar opportunity
- Frame is integrated within the concrete slab.
- Available with LiftMate ball and socket connector.



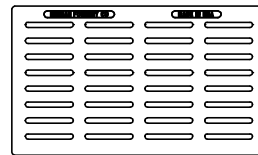
TYPE A
GRATE OPENINGS



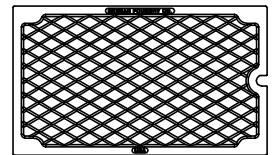
TYPE C
GRATE OPENINGS



TYPE P
GRATE OPENINGS



TYPE Q
GRATE OPENINGS



TYPE D LID
SOLID LID

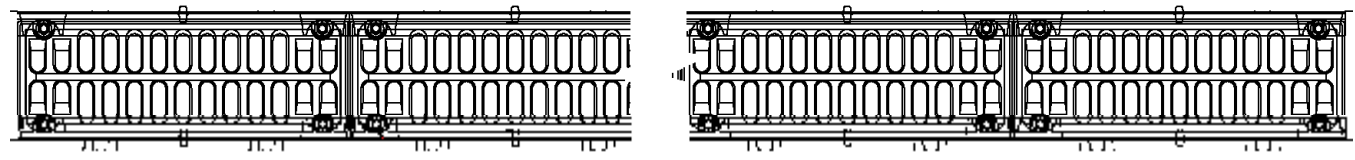
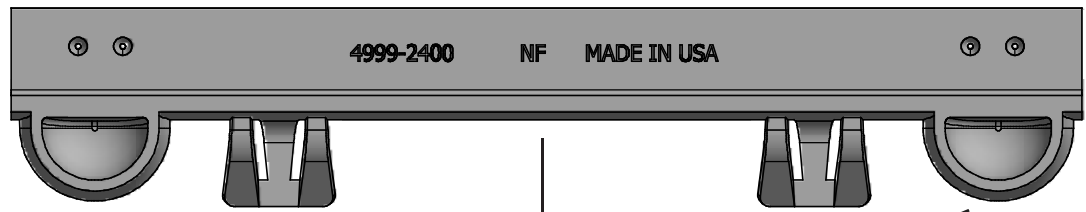
R-4990 AIRPORT, PORT, & HEAVY INDUSTRIAL SERIES

R-4990 AIRPORT

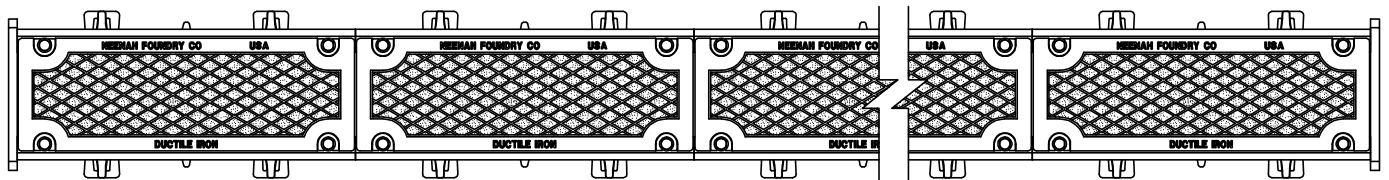
CATALOG NO.	A	B	C	GRATE MATERIAL
R-4990-AA	8	2	6	Gray Iron
R-4990-BA	10	2	8	Gray Iron
R-4990-CA	12	2	10	Ductile Iron
R-4990-DA* **	14	2	12	Ductile Iron
R-4990-EA*	17	2	15	Ductile Iron
R-4990-FA*	20	2	18	Ductile Iron
R-4990-HA*	26	2	24	Ductile Iron
R-4990-KA2*	34	2	31	Ductile Iron
R-4990-OA*	51	2	48	Ductile Iron

Furnished standard with Type A Grate
 * Type D solid cover available.
 ** Type C grate available

Neenah Foundry's extra heavy-duty airport and port trench castings are exclusively manufactured to support the loadings imposed by all commercial and military aircraft. Proven to withstand time and rigors of repeated heavy wheel loads, Neenah trench systems provide continuous performance. Additional products are routinely being developed for our extra heavy-duty trench casting line, so if you don't find what you need in this brochure, please contact Neenah Foundry at 800-558-5075. We'll work with you and your application to provide an effective solution.



R-4990 Airport Type A Grate



R-4990 Airport Type D Solid Lid

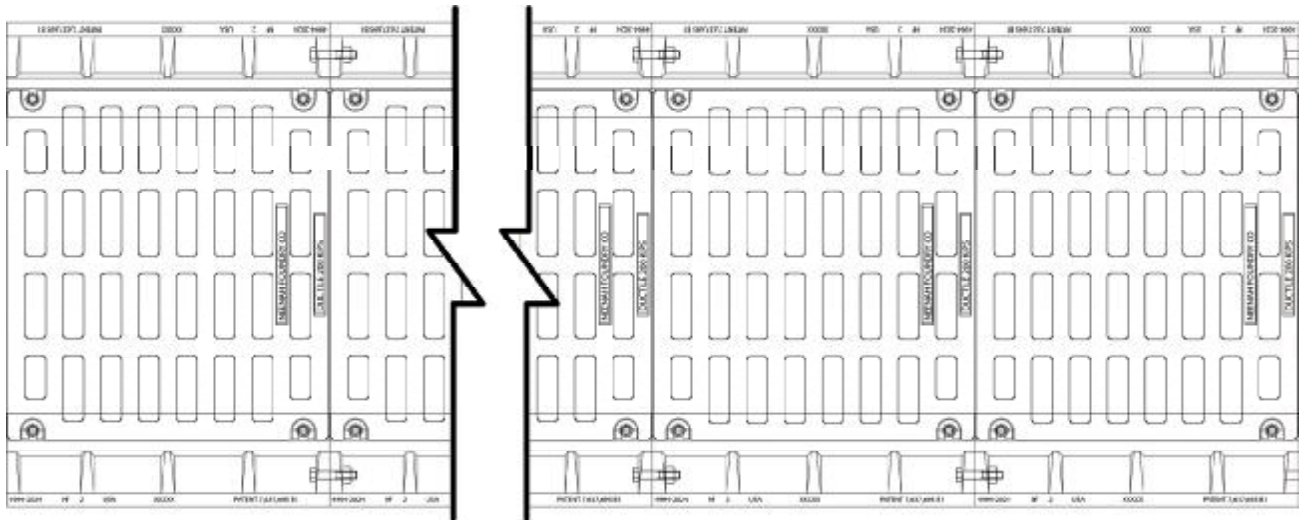
Suitable for aircraft loading per FAA Advisory Circular AC No: 150-15320-6F.

R-4990 AIRPORT SERIES

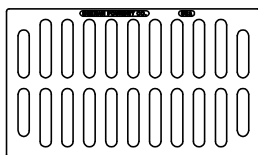
R-4993 & R-4994 SUPERIOR DURABILITY FRAMES FOR AIRPORT & PORT APPLICATION

R-4993 & R-4994 SUPERIOR DURABILITY AIRPORT & PORT APPLICATION FRAMES

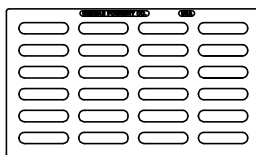
TYPE T	TYPE S	TYPE T				TYPE S		*Available Grates and Lids		
CATALOG NO.	CATALOG NO.	A	B	C	E	C	E	TYPE A	TYPE C	TYPE D
R-4993-AAB	R-4994-AAB	8	2	6	19 ¼	4	18	X		
R-4993-BAB	R-4994-BAB	10	2	8	21 ¼	6	20	X		
R-4993-CAB	R-4994-CAB	12	2	10	23 ¼	8	22	X		
R-4993-DAB	R-4994-DAB	14	2	12	25 ¼	10	24	X	X	X
R-4993-EAB	R-4994-EAB	17	2	15	28 ¼	13	27	X		X
R-4993-FAB	R-4994-FAB	20	2	18	31 ¼	16	30	X		X
R-4993-HAB	R-4994-HAB	26	2	24	37 ¼	22	36	X		X
R-4993-KAB	R-4994-KAB	34	2	32	45 ¼	30	44	X		X
R-4993-OAB	R-4994-OAB	51	2	49	62 ¼	47	61	X		X



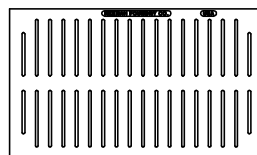
Designers have the option to utilize either of these new frames in locations where it is deemed that traditional angle frames could break loose from concrete due to extraordinary conditions. A few examples of such conditions are braking forces of ultra-heavy vehicles; torsional forces due to turning aircraft and container port vehicles; heavy airfield and industrial applications; highway tunnels; certain highway applications.



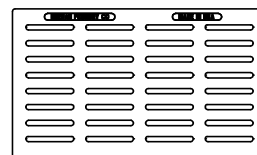
TYPE A
GRATE OPENINGS



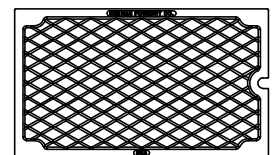
TYPE C
GRATE OPENINGS



TYPE P
GRATE OPENINGS



TYPE Q
GRATE OPENINGS



TYPE D LID
SOLID LID

DECORATIVE TRENCH GRATES

DECORATIVE GRATES

R-4990 Series	River Walk	Tidal Wave	Greek Key	Carriage Walk
R-4989	X	X	X	X
R-4990-CX		X		
R-4999-CX		X		
R-4990-FX	X			
R-4999-FX	X			
R-4996 Type M Trench Frame				
R-4996-A6	X	X	X	X
R-4996-A12		X		
R-4996-A	X			

Neenah Foundry's line of decorative trench grates combine stylish designs with the durability and quality you have come to expect from a Neenah Foundry product. Available in four equally captivating designs, these grates will add that extra touch to your special project. Neenah Foundry offers these grates in the R-4990 & R-4996 series. For more information on custom grates, please contact your local Neenah representatives by going to www.nfco.com.



River Walk



Tidal Wave



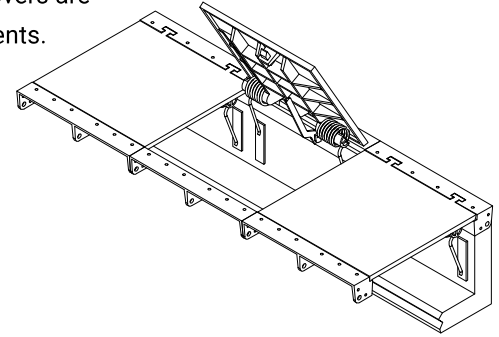
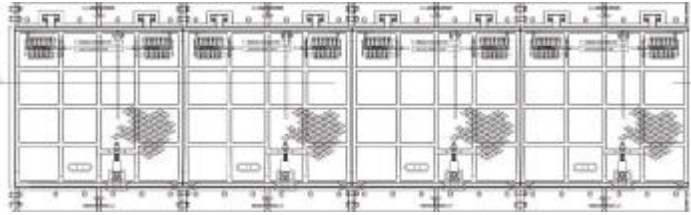
Greek Key



Carriage Walk

R-4993 SPRING ASSIST TRENCH SERIES

Neenah's Spring Trench System is now being applied to our R-4993 Type T Frame trench series. With Neenah's Spring Assist system, a single maintenance worker can quickly open the lid, secure it in the upright position with Neenah's hold-open device and perform the necessary work. In addition, these trench covers are capable of supporting the heavy wheel loads of today's commercial environments.



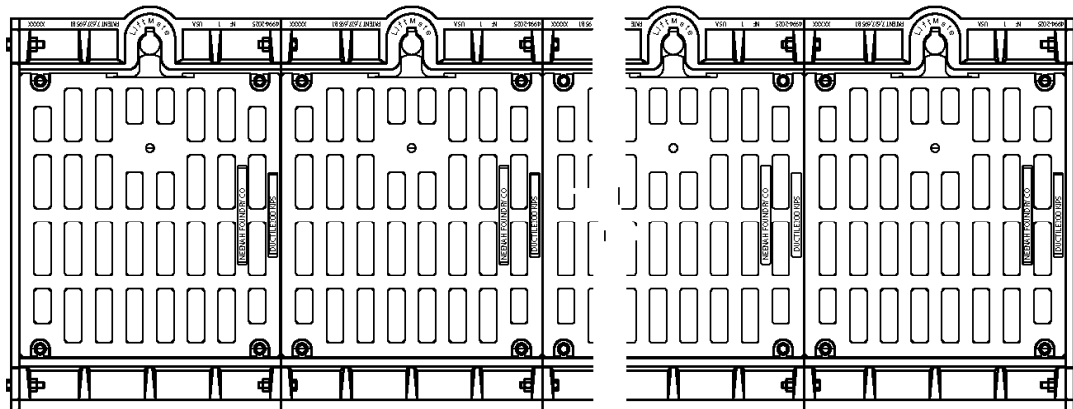
R-4994 LIFTMATE TRENCH

R-4994 LIFTMATE TRENCH SYSTEMS

CATALOG NO.	A	B	C	FRAME LENGTH	GRATE LENGTH	GRATE MATERIAL	GRATE TYPE
R-4994-FALM	20"	2"	18"	24"	23 7/8"	Ductile Iron	A
R-4994-HALM	26"	2"	24"	24"	23 7/8"	Ductile Iron	A, D

Neenah's new LiftMate Hinge System is now being applied to our R-4994 Type S Frame trench series. The LiftMate Hinge System has advanced municipal castings to a whole new level of function and safety. Our patented LiftMate Hinge System eases operation and access while virtually eliminating many traditional hazards of working with covers for manholes, grates and trenches.

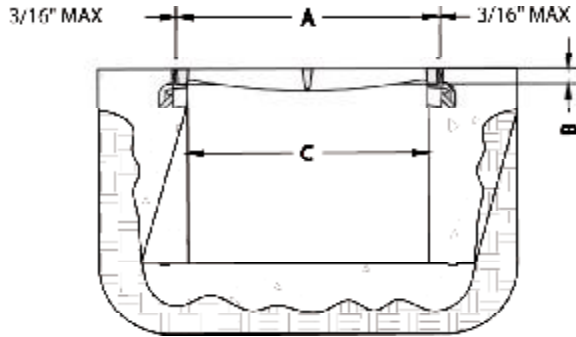
The LiftMate Hinge System provides a controlled motion pivot that helps protect workers from excess strain or off-balance maneuvering. That helps prevent on-the-job accidents as well as reduces lost-time injuries.



R-4993 SPRING ASSIST & R-4994 LIFTMATE TRENCH SERIES

FORMING PROCEDURES

R-4990 FRAME & GRATE/LID



Section view of completed trench installation
Figure 1

Unbolted Units

Materials

Under normal situations, use 3/4 inch plywood for forming walls. 2x4's are suitable for studs, plates, bracing and spreaders. A typical installation is shown in Figure 2. Details and suggestions are based on using the Neenah Foundry Type "B" Frame.

Forming Procedures

Pour the floor slab of the trench according to the plans and specifications. The width of the form, (see Figure 1) measured from the outside edges of the forms, corresponds to the "C" dimension on Figure 1. During the entire forming procedure, verify that the forms are plumb, straight, solid and level.

The height of the form corresponds to the final grade elevation when installing the non-bolted frames and grates/lids. Extend the spreaders beyond the edge of the forms (see figure 3 and 4) to provide a stop for the frame and seat form.

To attach the cast iron frame to the form, the use of a "seat form" is recommended to assure that the frame is at the proper elevation and true. The seat form has the same dimensions as the frame, with the height corresponding to the frame height (the "b" dimension), and the width the same as the seat width of the frame. The seat width should be field measured to assure a proper fit. All Neenah frames have a slight radius at the corner of the seat and vertical face so the seat form should be beveled to accommodate the radius. Most 2x4's have this radius.

Nail the seat form to the form shown in figure 2. Then nail the frame to the seat form using the holes in the frame. (figure 3)

Note: Frames should butt together snugly, leaving as little gap as possible.

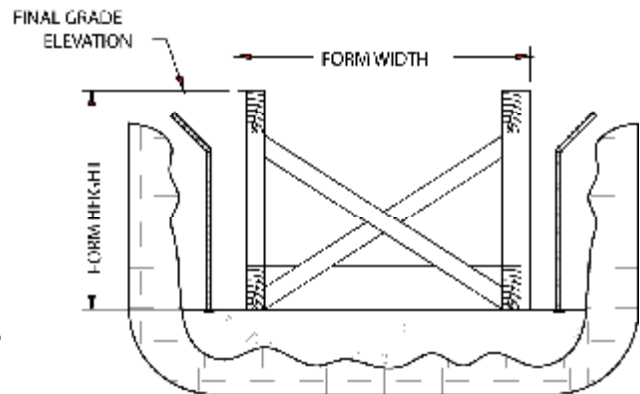
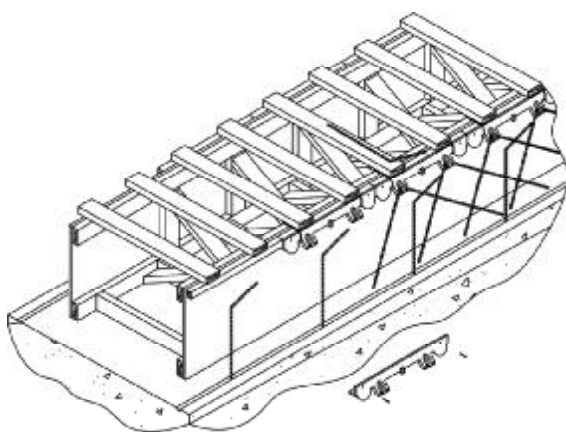


FIGURE 2



The rebar shown in the vertical walls of the trench is for illustrative purposes only. Proper sizing and placement is the responsibility of the engineering firm providing the project design.

Place a 90 degree bent #4 rebar through the holes in the anchor lugs to provide anchorage in the concrete. Verify the space between the edge of the grate and frame so grates will fit properly. This should be no greater than 3/16" (see figure 1).

Pour concrete and use the top edge of the frame as a screed point.

FORMING PROCEDURES

R-4999 FRAME & GRATE/LID

Bolted Units

Bolted frames and grates are furnished assembled and therefore require different forming procedures. At no time should the units be disassembled prior to or during installation! Do check that 3/16" maximum gap has not changed in transport

When installing the frame and grate units on the forms, keep the sections tight to one another to eliminate creep. When the sections are in the proper position, wire them to the bracing as shown in figure 5. Place a #4 rebar bent at 90A through the holes in the anchor lugs to provide proper anchorage in the concrete.

When the concrete has sufficiently cured, remove the grates, noting their position and orientation. The grates need to be put back in the exact way they came out. Debris chutes are provided to allow debris to pass through the bolt holes in frame. Strip the forms. Replace the grates in the same location and with the same orientation as they came out. Bolts should be tightened to 15 foot-pounds. The completed installation should resemble figure 8.

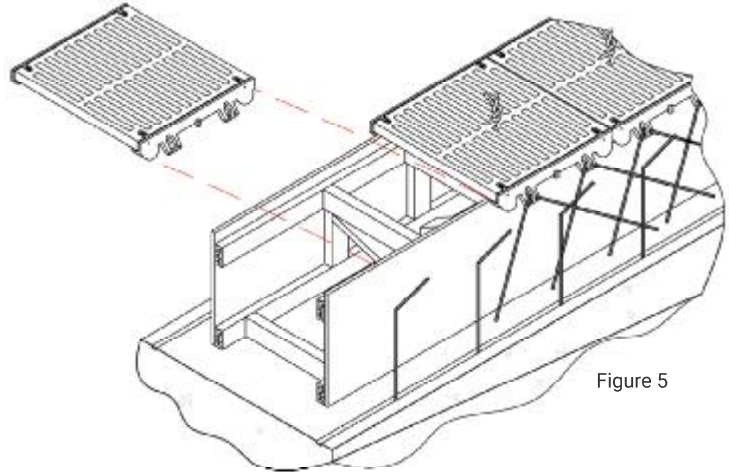


Figure 5

General Comments

All frame sections are manufactured and furnished in standard lengths. It is the responsibility of the installer to cut frame pcs. to the proper length and miter corners where applicable. In cases where trench direction must change, special drawings will be furnished by our engineering services department. These prints will show special lengths and cuts of grates/lids, and other essential information.

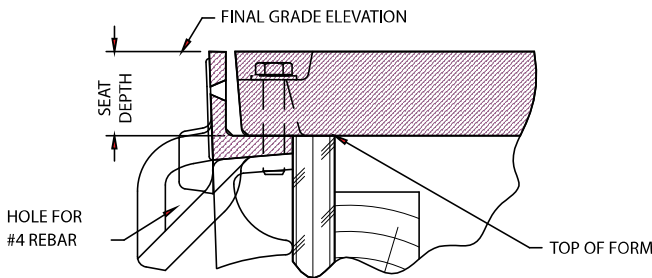


FIGURE 6

(The rebar shown in the vertical walls of the trench is for illustrative purposes only. Proper sizing and placement is the responsibility of the engineering firm providing the project design.)

Place a 90A bent #4 rebar through the holes in the anchor lugs to provide anchorage in the concrete. Verify the space between the edge of the grate and frame so grates will fit properly. This should be no greater than 3/16" (see figure 1).

Pour concrete and use the top edge of the frame as a screed point.

The bolted grate and frame should be at the finished elevation when the assembled unit is set on the forms.

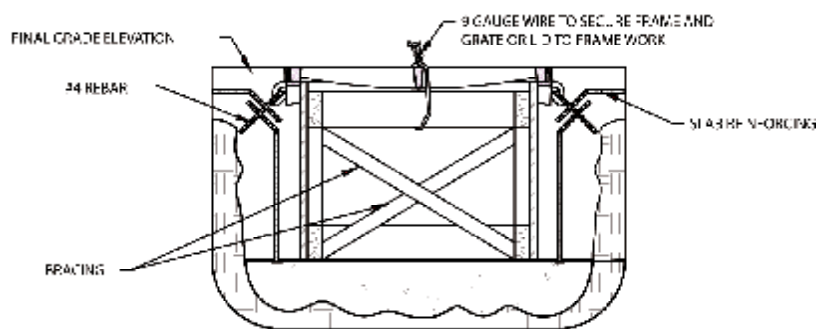


FIGURE 7

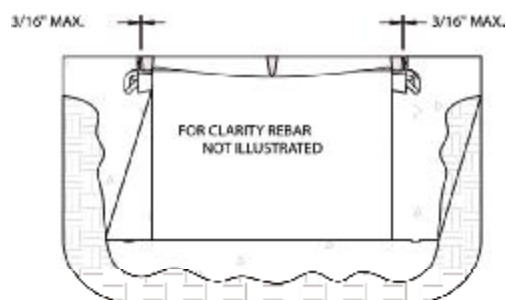


FIGURE 8

FORMING PROCEDURES

R-4996 SERIES

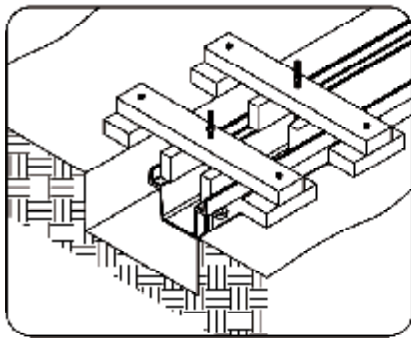
Step 1:

Excavate trench placement area to provide room for trench pan and concrete

Concrete depth and thickness determined by others

Step 2:

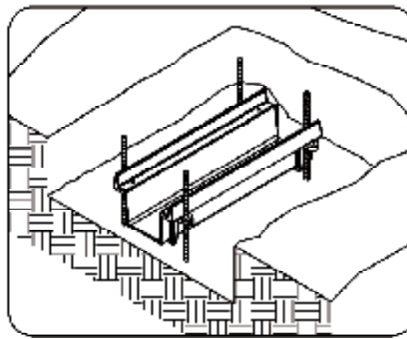
These methods are available for installation as detailed below



"A"

Threaded rod support

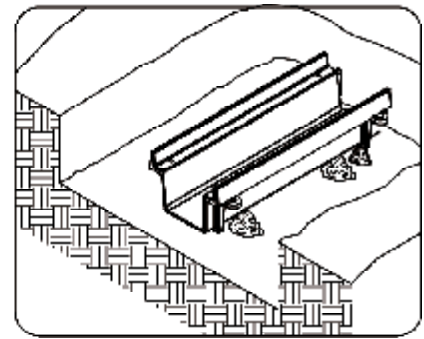
* For use with Type M & Self Forming



"B"

Rebar support

* For use with Type M



"C"

Concrete Support

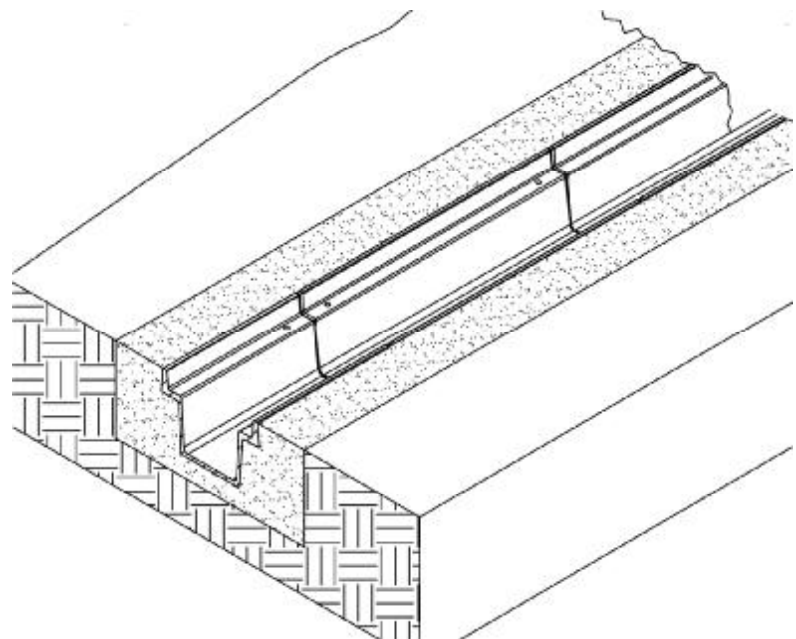
* For use with all 4996 Series Trench

Step 3:

Pour concrete around and below trench pan. For methods A & B, two separate pours are recommended to allow the removal of supports or cutting of rebar below grade.

*4996 - A6 is a two piece frame, assembly is required prior to installation.

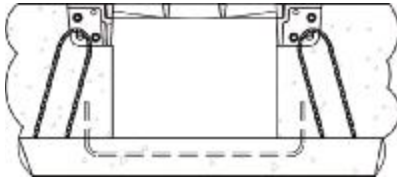
Note: For detailed installation instructions, please contact Neenah Foundry Company.



FORMING PROCEDURES

R-4993 TYPE T FRAME

IMPORTANT DO NOT DISASSEMBLE THE COVERS FROM THE FRAMES UNTIL FORMING IS COMPLETE.



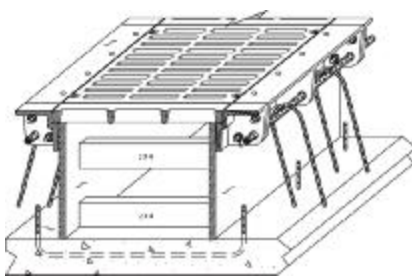
Instructions

1. First pour the bottom slab of the trench
2. Create forms for the inside walls of the

trench, the out to out of the forms matches the 'C' dimension provided in the catalog. When done correctly, the bolted frame and cover will neatly rest on the forms.

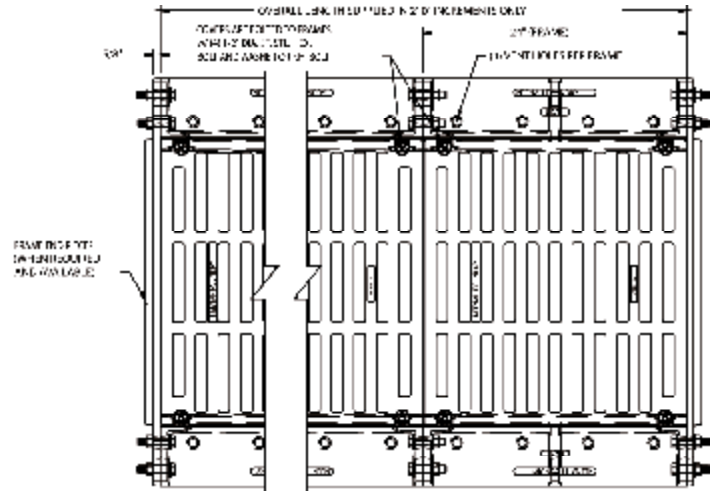
3. Add additional sections of trench by placing them on the forms with all sections butted together. There are 4 holes on the ends of the trench frame. The largest hole will accept as large as #8 rebar. The two matching diagonal holes will accept 1/2" dia. steel bolts. Add washers and nut, finger tighten.

4. The longitudinal #8 rebar must be used with additional rebar bends to anchor the frame into the concrete. It is not acceptable to use only the #8 rebar as this will be counter-productive. The remaining hole on the frame end will not require bolts but can be used as an alignment hole for the two butted frames when needed.



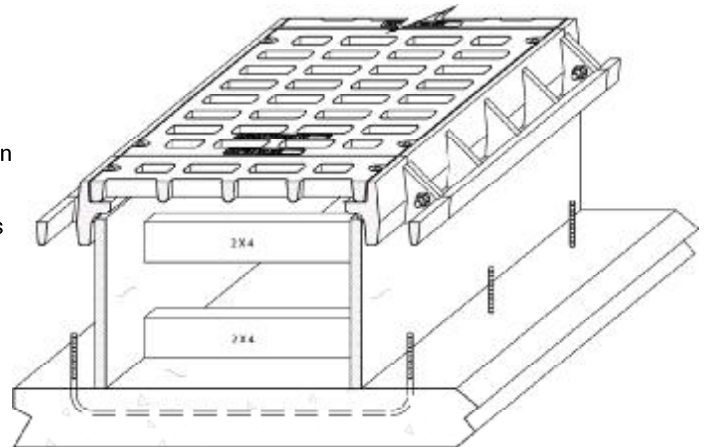
5. Pour concrete and vibrate assuring that concrete is completely under the frame and there are no voids.

6. After the concrete is set, the forms can be removed. The mated frames and covers need to be marked in matching sets so when they are removed to expose the formwork, they can be replaced in the exact location and orientation that they were originally in. Relocating the covers is unacceptable.



R-4994 TYPE S FRAME

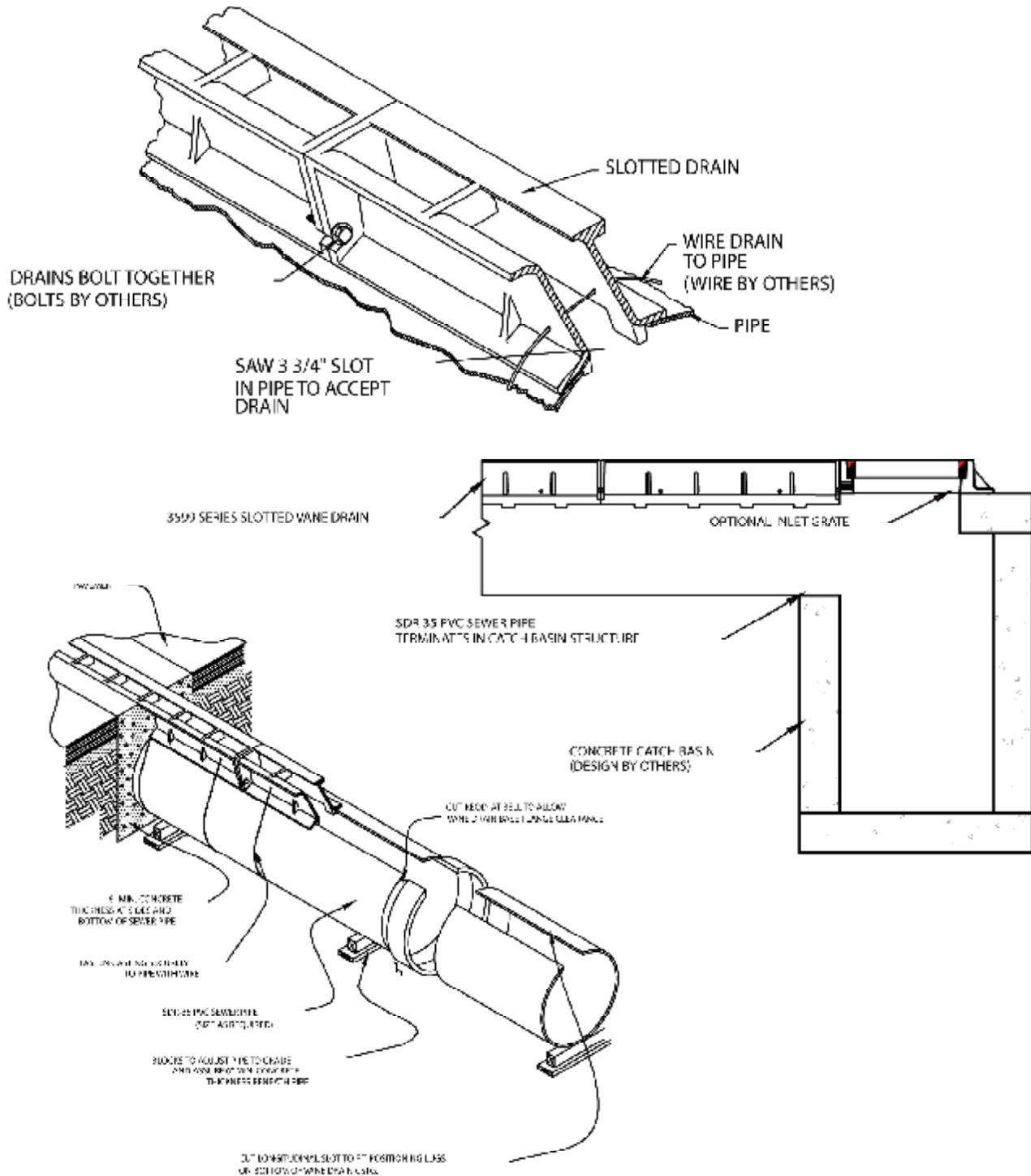
1. First pour the bottom slab of the trench
2. Create forms for the inside walls of the trench. The out to out of the forms matches the 'C' dimension provided in the catalog. When done correctly, the bolted frame and cover will neatly rest on the forms.
3. Add additional sections of trench by placing them on the forms with all sections butted together. There is 1 hole on the ends of the trench frame. This hole will accept 1/2" dia. Steel bolts. Add washers and nut, finger tighten.
4. Pour concrete and vibrate assuring that concrete is completely under the frame and there are no voids.
5. After the concrete is set, the forms can be removed, the mated frames and covers need to be marked in matching sets so when they are removed, to expose the formwork, they can be replaced in the exact location and orientation that they were originally in. Relocating or rotating the covers is unacceptable.



FORMING PROCEDURES

R-3599 A & R-3599-B SLOTTED VANE DRAIN

1. Inlet Grate Shown is for reference purposes only. Inlet Grate is not required for installation.
2. Concrete Manhole structure is for reference purposes only. Actual design to be provided by owner.
3. Structural Calculations to be provided by owner.



R-3599 SLOTTED VANE DRAIN FORMING PROCEDURES

REFERENCE GUIDES

CAT#	GRATE WIDTH	TRENCH WIDTH	GRATE LENGTH	SEAT DEPTH	FRAME LENGTH	FRAME TYPE	TYPE A GRATE	TYPE C GRATE	TYPE P GRATE	TYPE Q GRATE	TYPE L GRATE	TYPE D SOLID I/D	RiverWalk Grate	Tidal Wave Grate	Carriage Walk Grate	Greek Key Grate
HEAVY DUTY TRENCH GRATES																
R-4996-A6	6"	4"	23 7/8"	1 1/2"	24"	M	X		X	X		X	X	X	X	X
R-4989	6"	4"	23 7/8"	1 1/2"	24"	B	X		X	X		X	X	X	X	X
R-4990-AX	8"	6"	23 7/8"	1 1/2"	24"	B	X	X	X			X				
R-4999-AX-BOLTED	8"	6"	23 7/8"	1 1/2"	24"	B	X	X	X			X				
R-4993-AB	8"	6"	23 7/8"	1 1/2"	24"	T	X	X	X			X				
R-4994-AB	8"	4"	23 7/8"	1 1/2"	24"	S	X	X	X			X				
R-4996-A8	8"	6"	23 7/8"	1 1/2"	24"	M	X	X								
R-4996-A	8"	6"	29 7/8"	1"	30"	N				X		X				
R-4990-BX	10"	8"	23 7/8"	1 1/2"	24"	B	X	X	X			X				
R-4999-BX-BOLTED	10"	8"	23 7/8"	1 1/2"	24"	B	X	X	X			X				
R-4993-BB	10"	8"	23 7/8"	1 1/2"	24"	T	X	X	X			X				
R-4994-BB	10"	6"	23 7/8"	1 1/2"	24"	S	X	X	X			X				
R-4996-B	10"	8"	29 7/8"	1"	30"	N			X	X						
R-4990-CX	12"	10"	23 7/8"	1 1/2"	24"	B	X	X	X	X		X		X		
R-4999-CX-BOLTED	12"	10"	23 7/8"	1 1/2"	24"	B	X	X	X	X		X		X		
R-4993-CB	12"	10"	23 7/8"	1 1/2"	24"	T	X	X	X	X		X		X		
R-4994-CB	12"	8"	23 7/8"	1 1/2"	24"	S	X	X	X	X		X		X		
R-4996-AI2	12"	10"	23 7/8"	1 1/2"	24"	M	X	X	X	X		X				
R-4996-C	12"	10"	18"	1 1/2"	36"	N	X	X	X	X	X	X				
R-4999-L2-BOLTED	12"	10"	23 7/8"	1 1/2"	24"	B					X					
R-4990-DX	14"	12"	23 7/8"	1 1/2"	24"	B	X	X	X	X		X				
R-4999-DX-BOLTED	14"	12"	23 7/8"	1 1/2"	24"	B	X	X	X	X		X				
R-4993-DB	14"	12"	23 7/8"	1 1/2"	24"	T	X	X	X	X	X	X				
R-4994-DB	14"	10"	23 7/8"	1 1/2"	24"	S	X	X	X	X	X	X				
R-4999-L3-BOLTED	14"	10"	23 7/8"	1 1/2"	24"	B					X					
R-4990-EX	17"	15"	23 7/8"	1 1/2"	24"	B	X	X	X			X				
R-4999-EX-BOLTED	17"	15"	23 7/8"	1 1/2"	24"	B	X	X	X			X				
R-4993-EB	17"	15"	23 7/8"	1 1/2"	24"	T	X	X	X			X				
R-4994-EB	17"	13"	23 7/8"	1 1/2"	24"	S	X	X	X			X				
R-4990-FX	20"	18"	23 7/8"	1 1/2"	24"	B	X	X	X			X	X			
R-4999-FX-BOLTED	20"	18"	23 7/8"	1 1/2"	24"	B	X	X	X			X	X			
R-4993-FB	20"	18"	23 7/8"	1 1/2"	24"	T	X	X	X			X	X			
R-4994-FB	20"	16"	23 7/8"	1 1/2"	24"	S	X	X	X			X	X			
R-4990-GX	23"	21"	23 7/8"	1 1/2"	24"	B	X	X				X				
R-4999-GX-BOLTED	23"	21"	23 7/8"	1 1/2"	24"	B	X	X				X				
R-4993-GB	23"	21"	23 7/8"	1 1/2"	24"	T	X	X				X				
R-4994-GB	23"	19"	23 7/8"	1 1/2"	24"	S	X	X				X				
R-4999-L6-BOLTED	23 7/8"	21 7/8"	23 7/8"	2"	24"	B					X					
R-4990-HX	26"	24"	23 7/8"	1 1/2"	24"	B	X	X		X		X				
R-4999-HX-BOLTED	26"	24"	23 7/8"	1 1/2"	24"	B	X	X		X		X				
R-4993-HB	26"	24"	23 7/8"	1 1/2"	24"	T	X	X		X		X				
R-4994-HB	26"	22"	23 7/8"	1 1/2"	24"	S	X	X		X		X				
R-4999-L7	26 5/8"	24 5/8"	23 7/8"	2"	24"	B					X					
R-4999-L9	29 3/4"	26 3/4"	17 3/4"	2 1/2"	30"	B					X					
R-4990-JX	30"	27"	23 7/8"	2"	24"	B	X	X				X				
R-4999-JX-BOLTED	30"	27"	23 7/8"	2"	24"	B	X	X				X				
R-4993-JB	30"	28"	23 7/8"	2"	24"	T	X	X				X				
R-4994-JB	30"	26"	23 7/8"	2"	24"	S	X	X				X				

REFERENCE GUIDES

REFERENCE GUIDES

R-4990-KX	33"	30"	23 7/8"	2"	24"	B	X	X									X
R-4999-KX-BOLTED	33"	30"	23 7/8"	2"	24"	B	X	X									X
R-4993-KB	33"	31"	23 7/8"	2"	24"	T	X	X									X
R-4994-KB	33"	29"	23 7/8"	2"	24"	S	X	X									X
R-4990-LX	36"	33"	23 7/8"	2"	24"	B	X	X									X
R-4999-LX-BOLTED	36"	33"	23 7/8"	2"	24"	B	X	X									X
R-4993-LB	36"	34"	23 7/8"	2"	24"	T	X	X									X
R-4994-LB	36"	32"	23 7/8"	2"	24"	S	X	X									X
R-4990-MX	39"	36"	23 7/8"	2"	24"	B	X	X									X
R-4999-MX-BOLTED	39"	36"	23 7/8"	2"	24"	B	X	X									X
R-4993-MB	39"	37"	23 7/8"	2"	24"	T	X	X									X
R-4994-MB	39"	35"	23 7/8"	2"	24"	S	X	X									X
R-4990-NX	45"	42"	23 7/8"	2"	24"	B	X	X									X
R-4999-NX-BOLTED	45"	42"	23 7/8"	2"	24"	B	X	X									X
R-4993-NB	45"	43"	23 7/8"	2"	24"	T	X	X									X
R-4994-NB	45"	41"	23 7/8"	2"	24"	S	X	X				X					X
R-4990-OX	51"	48"	23 7/8"	2"	24"	B	X			X		X					X
R-4999-OX-BOLTED	51"	48"	23 7/8"	2"	24"	B	X			X		X					X
R-4993-OB	51"	49"	23 7/8"	2"	24"	T	X			X		X					X
R-4994-OB	51"	47"	23 7/8"	2"	24"	S	X			X							X

CAT# GRATE WIDTH TRENCH WIDTH GRATE LENGTH SEAT DEPTH FRAME LENGTH FRAME TYPE TYPE A GRATE TYPE C GRATE TYPE P GRATE TYPE Q GRATE TYPE L GRATE TYPE D SOLID LID RiverWalk Grate Tidal Wave Grate Carriage Walk Grate Greek Key Grate

AIRPORT, PORT & INDUSTRIAL SIZES | ALL AIRPORT TRENCH FURNISHED STANDARD BOLTED

R-4990-AA	8"	6"	23 1/8"	2"	24"	B	X										
R-4993-AAB	8"	6"	23 1/8"	2"	24"	T	X										
R-4994-AAB	8"	4"	23 1/8"	2"	24"	S	X										
R-4990-BA	10"	8"	23 1/8"	2"	24"	B	X										
R-4993-BAB	10"	8"	23 1/8"	2"	24"	T	X										
R-4994-BAB	10"	6"	23 1/8"	2"	24"	S	X										
R-4990-CA	12"	10"	23 1/8"	2"	24"	B	X										
R-4993-CAB	12"	10"	23 1/8"	2"	24"	T	X										
R-4994-CAB	12"	8"	23 1/8"	2"	24"	S	X										
R-4996-CA	12"	10"	17 1/8"	1 1/2"	36"	N	X										
R-4990-DA	14"	12"	23 1/8"	2"	24"	B	X	X									X
R-4993-DAB	14"	12"	23 1/8"	2"	24"	T	X	X									X
R-4994-DAB	14"	10"	23 1/8"	2"	24"	S	X	X									X
R-4990-EA	17"	15"	23 1/8"	2"	24"	B	X										X
R-4993-EAB	17"	15"	23 1/8"	2"	24"	T	X										X
R-4994-EAB	17"	13"	23 1/8"	2"	24"	S	X										X
R-4990-FA	20"	18"	23 1/8"	2"	24"	B	X										X
R-4993-FAB	20"	18"	23 1/8"	2"	24"	T	X										X
R-4994-FAB	20"	16"	23 1/8"	2"	24"	S	X										X
R-4994-FALM	20"	18"	23 1/8"	2"	24"	T	X										
R-4990-HA	26"	24"	23 1/8"	2"	24"	B	X										X
R-4993-HAB	26"	24"	23 1/8"	2"	24"	T	X										X
R-4994-HAB	26"	22"	23 1/8"	2"	24"	S	X										X
R-4994-HALM	26"	24"	23 1/8"	2"	24"	T	X										X
R-4990-KA2	34"	31"	23 1/8"	2"	24"	B	X										X
R-4993-KAB	34"	32"	23 1/8"	2"	24"	T	X										X
R-4994-KAB	34"	30"	23 1/8"	2"	24"	S	X										X
R-4990-OA	51"	48"	23 1/8"	2"	24"	B	X										X
R-4993-OAB	51"	49"	23 1/8"	2"	24"	T	X										X
R-4994-OAB	51"	47"	23 1/8"	2"	24"	S	X										X

REFERENCE GUIDES

BUY AMERICAN



The American Recovery and Reinvestment Act (ARRA) of 2009 was enacted to stimulate the economy by incentivizing the use of American-made products. By choosing Neenah cast iron products, not only are you getting the quality and durability you need while supporting American jobs, you could also qualify for federal funding on your project.

GO GREEN



In support of the Green Initiative, Neenah Foundry is pleased to report that our products contain a minimum of 85% recycled content in the form of a minimum of 35% consumer-generated scrap metal and minimum of 50% industrial-generated scrap metal.

Neenah Foundry Company
Box 729, Neenah, Wisconsin 54957-0729

Phone: 800-558-5075 // 920-725-7000
Fax: 920-729-3661
Web: www.neenahfoundry.com

These products are to be specified and used under the guidance of qualified design professionals.

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