

■ Note: When specifying/ordering grates, refer to "Choosing the proper inlet grate" on pages 117-118.  
 For a complete listing of FREE OPEN AREAS and WEIR PERIMETERS of all NEENAH grates, refer to pages 306-311.

## R-4990 and R-4999 Series Heavy Duty Trench

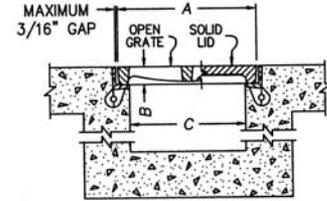
Materials: All frames and grates/lids are furnished standard in Gray Iron, Class 35-B for heavy-duty use. For extra heavy-duty use or superior durability requirements, see our Airport and Port Grating Series on page 198 and our R-4993 & R-4994 Series on page 269.

Neenah recommends project designers avoid the use of light duty trench installations because it is likely that applications will be subjected to heavy delivery vehicle traffic at some time. Furthermore, the use of a site could be changed to heavy duty use patterns at some unanticipated future date.

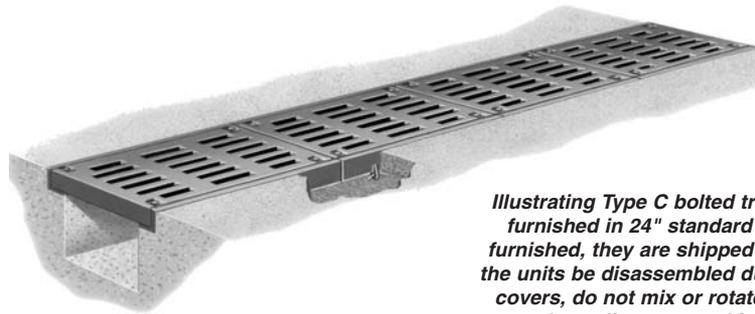
Dimensions in inches

Un-Bolted Catalog No.	Bolted Catalog No.	A	B	C	Type A	Type C	Type D	Type E	Type P	Type Q
R-4990-AX	R-4999-AX	8	1 1/2	6	x	x	x	x	x	
R-4990-BX	R-4999-BX	10	1 1/2	8	x	x	x	x	x	
R-4990-CX	R-4999-CX	12	1 1/2	10	x	x	x	x	x	x
R-4990-DX	R-4999-DX	14	1 1/2	12	x	x	x	x	x	x
R-4990-EX	R-4999-EX	17	1 1/2	15	x	x	x	x	x	
R-4990-FX	R-4999-FX	20	1 1/2	18	x	x	x	x	x	
R-4990-GX	R-4999-GX	23	1 1/2	21	x	x	x			
R-4990-HX	R-4999-HX	26	1 1/2	24	x	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	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 - Indicates availability



General schematic shown may not apply to all designs. Bar and rib depths, plate thicknesses, and seating widths vary on different sizes and styles. If your project has design restrictions, contact your sales representative or product engineering.



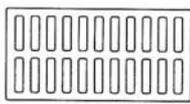
Illustrating Type C bolted trench. Bolted trench sections are furnished in 24" standard lengths. When bolted trench is furnished, they are shipped assembled - AT NO TIME should the units be disassembled during installation. When removing covers, do not mix or rotate 180 degrees as bolt holes may lose alignment and improper bearing may occur.

### Read Carefully Before Ordering

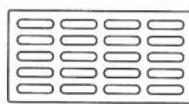
The various standard trench drains are available with a number of alternatives. It is important to examine all of the variables carefully and specify your requirements fully. Your order will be entered correctly and promptly if it includes the following information:

- Complete catalog number
- Frame end pieces, when required
- Type of Lid or Grate: A, C, D, E, P or Q
- Length of trench sections
- Angles and intersections \*
- Load requirements

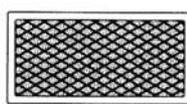
\*Trenches with angles, intersections, size changes, or other special requirements require detail drawings prior to ordering. Contact your sales representative or product engineering for assistance.



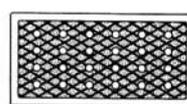
TYPE A  
GRATE OPENINGS



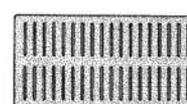
TYPE C  
GRATE OPENINGS



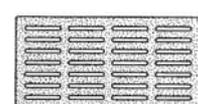
TYPE D  
SOLID LID



TYPE E  
VENTED LID



TYPE P  
GRATE OPENINGS



TYPE Q  
GRATE OPENINGS

■ Note: The suggested forming procedures shown in this catalog are general suggestions to qualified professionals, and may not be appropriate for every installation.

## Suggested Forming Procedures for R-4990 and R-4999 Series With Type X Frame

For those who are not experienced in the installation of Neenah drainage structures (R-4990 or R-4999 Series), the following procedures are one method of achieving desirable results.

### Forming Procedures, Non-Bolted 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 1a. Details and suggestions are based on using the Neenah Foundry Type "X" frame.

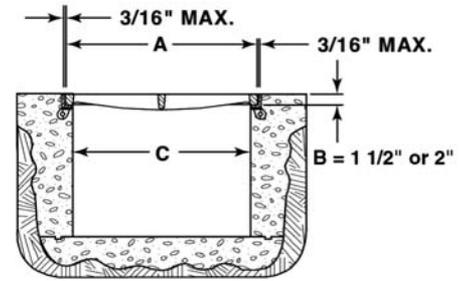


FIGURE 1a

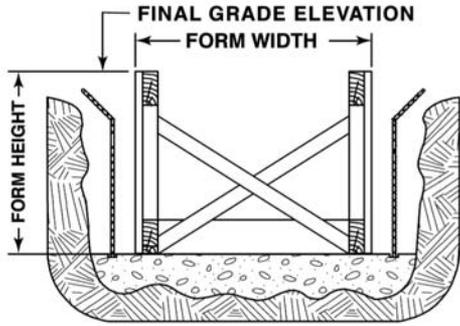


FIGURE 1b

Pour the trench bottom to the proper depth and slope and allow curing time. Construct the forms. For properly fitting covers, the forms must be PLUMB, STRAIGHT, LEVEL and SOLID. The width of the forms (see Figure 1b) establishes the trench wall. This dimension must correspond with the "C" dimension on Figure 1a. The top of the form (see Figure 1b) corresponds to the final grade elevation when installing non-bolted frame and grates/lids. Spreaders are installed, extending them beyond the edge of the form, to provide a stop for the wood seat forms. (see Figure 2 and 3)

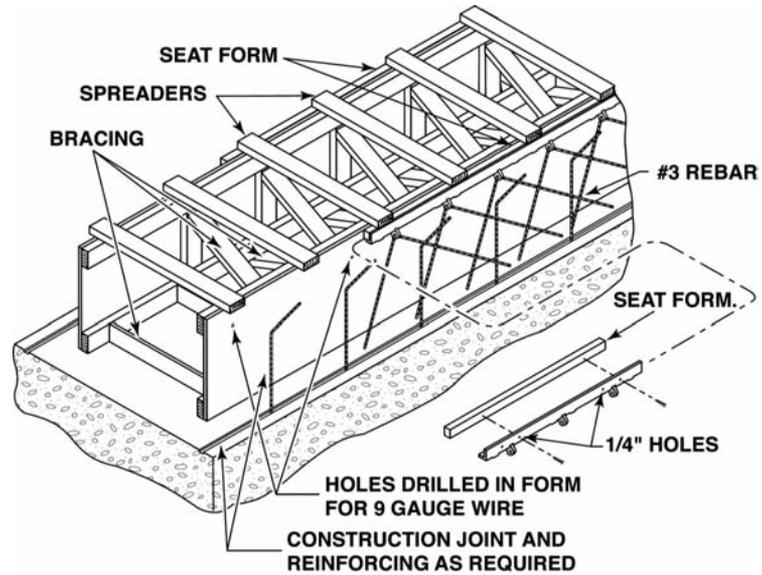


FIGURE 2

Cut the wood seat forms to the exact inside horizontal and vertical dimension of the iron frame seat. (Note: all Neenah frames have a slight radius at the corner of the seat and vertical face of the iron frame sections so the wood seat form pieces should be beveled to accommodate this radius.) The wood seat form is nailed flush to the top of the form walls, and the iron frame pieces are nailed to the wood seat forms through the holes provided in the side wall of the iron frame sections. In proper orientation, the anchor lugs on the iron frame pieces are positioned downward. Iron frame sections should be butted together snugly, leaving as little gap as possible. The iron frame seat form and plywood sides of the form are then secured with 9 gauge tie wire tied through a drilled hole in the plywood side wall. (see Figure 3) Number 3 rebar can be installed through the anchor holes provided on the iron frames.

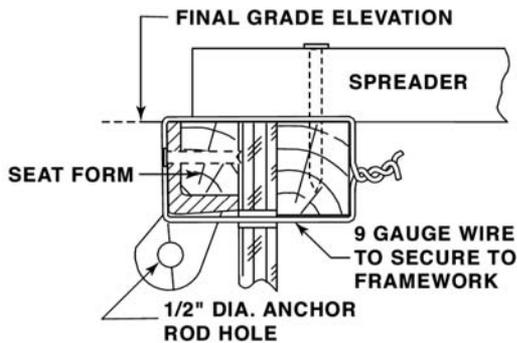


FIGURE 3

Check measurements. The grate/lid opening dimension must correspond to the "A" dimension plus 3/16" maximum per side. (see Figure 1a and 3)

Pour concrete using the top edge of the iron frame pieces as a final elevation guide. Strip forms after concrete is properly cured. Install grates/lids. The completed installation should resemble Figure 1a.

■ **Note:** The suggested forming procedures shown in this catalog are general suggestions to qualified professionals, and may not be appropriate for every installation.

## Forming Procedures, Bolted Trench

### 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 1a. Details and suggestions are based on using the Neenah Foundry Type "X" frame.

Bolted frames and grates/lids are furnished assembled (see Figure 4a) and therefore require appropriate forming procedures. AT NO TIME SHOULD THE UNITS BE DISASSEMBLED DURING INSTALLATION! VERIFY THAT THE 3/16" PER SIDE MAXIMUM GAP BETWEEN FRAME AND LID HAS NOT CHANGED DURING TRANSPORT. WHEN SATISFIED THE GAP IS CORRECT, TORQUE BOLTS TO ASSURE THE PIECES REMAIN IN THAT ORIENTATION.

Pour the trench bottom to the proper depth and slope and allow curing time. Construct the forms per Figure 4a. For properly fitting covers, the forms must be PLUMB, STRAIGHT, LEVEL and SOLID. The width of the forms establishes the trench wall. This dimension must correspond with the "C" dimension on Figure 1a.

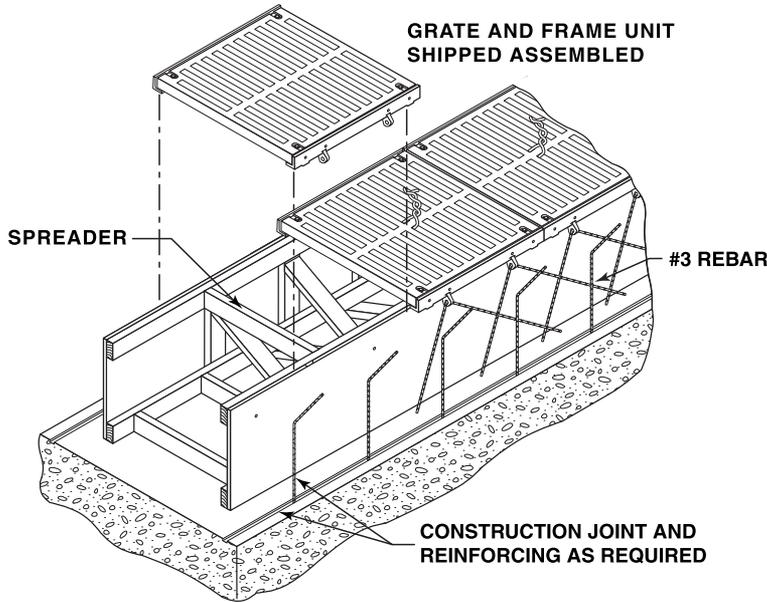


FIGURE 4a

Construct the forms. (see Figure 4a) The grate/lid top surface establishes the final grade elevation when the assembled iron casting unit is set on the form. (See Figure 4b) Accordingly, form side wall elevation is set at final grade elevation less the seat depth "B" dimension. (Note: "B" dimensions vary per catalog number. Neenah recommends checking dimensions on the catalog line item of page 266 If unsure, contact product engineering or your Neenah representative).

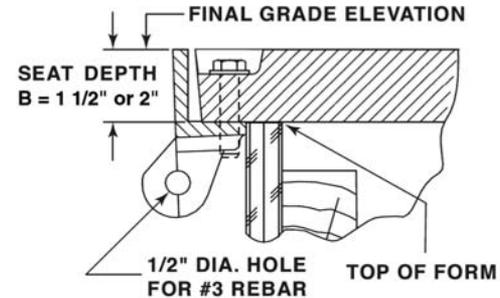


FIGURE 4b

Set frame and grate/lid assembled sections on the forms, taking care to keep the sections tight to one another to eliminate creep. When the sections are in the proper position, wire them to the bracing as show. (See Figure 5) Number 3 rebar can be installed through the anchor holes provided on the iron frames.

Check measurements. The grate/lid opening dimension must correspond to the "A" dimension plus 3/16" maximum per side. (see Figure 1a)

Pour concrete using the top edge of the iron frame pieces as a final elevation guide. When concrete is properly cured, unbolt and remove grates/lids, retaining their position and orientation. GRATES/LIDS MUST BE REINSTALLED IN THE EXACT WAY THEY CAME OUT TO ASSURE PROPER BOLTHOLE ALIGNMENT. DO NOT ALLOW DEBRIS TO FALL INTO THE FRAME BOLTHOLES AS IT MAY PROHIBIT PROPER TIGHTENING OF BOLTS. Strip forms and replace grates/lids in the same location and orientation as they came out. Reinstall bolts, tightening them to the specifiers desired torque. The completed installation should resemble Figure 1a.

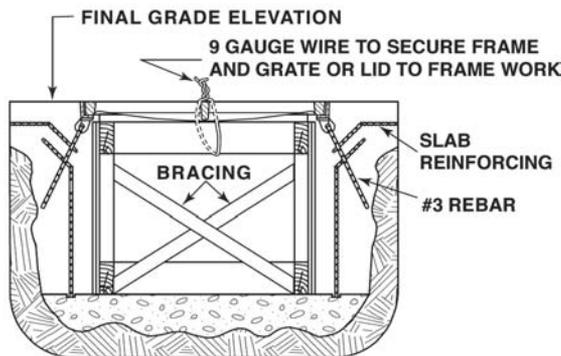


FIGURE 5

### General Comments for Non-bolted and Bolted Applications

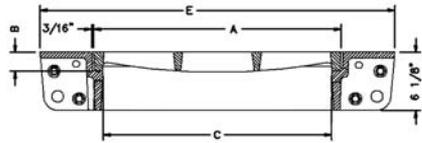
All frame sections are manufactured and furnished in standard lengths. It is the responsibility of the installer to cut frame pieces to the proper length and miter corners where applicable. In cases where trench direction must change, special drawings can be furnished by our Product Engineering Department.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

■ Note: The suggested forming procedures shown in this catalog are general suggestions to qualified professionals, and may not be appropriate for every installation.

## R-4993 & R-4994 Superior Durability Frame Series for Airports, Ports, Industrial Sites and Roads

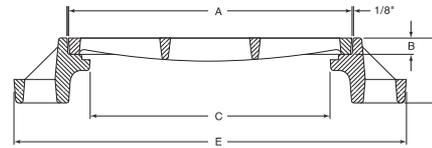
### Superior Duty Frames

Designers have the option to utilize either of these new frames in locations where it is deemed that traditional angle frames could break lose 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. Neenah offers two frame choices each with its own unique benefits.



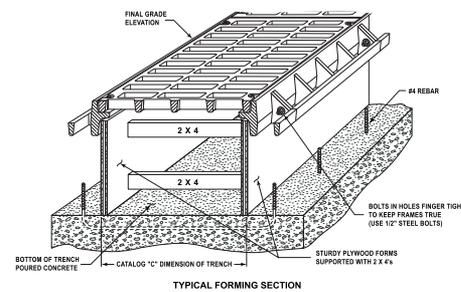
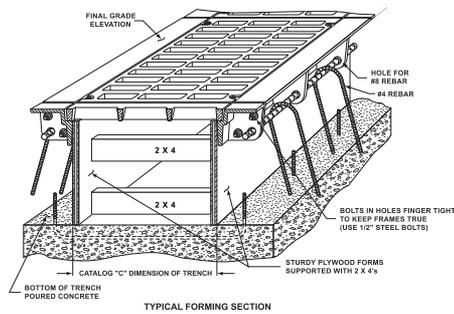
Illustrating R-4993 w/ Type T Frame

- 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.



Illustrating R-4994 w/ Type S Frame

- 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. See R-4999-HALM on Page 199



Note: Typical "L" shaped angle frame has about 120 inches of masonry contact surface per foot and about 54 inches of masonry bearing surface per foot.

Dimensions in inches

Type T Catalog No.	Type S Catalog No.	A	B	Type T C	Type T E	Type S C	Type S E	Type A	Type C	Type D	Type E	Type L	Type P	Type Q
<b>Heavy Duty</b>														
R-4993-AB	R-4994-AB	8	1 1/2	6	19 1/4	4	18	x	x	x	x		x	
R-4993-BB	R-4994-BB	10	1 1/2	8	21 1/4	6	20	x	x	x	x		x	
R-4993-CB	R-4994-CB	12	1 1/2	10	23 1/4	8	22	x	x	x	x		x	
R-4993-DB	R-4994-DB	14	1 1/2	12	25 1/4	10	24	x	x	x	x	x	x	x
R-4993-EB	R-4994-EB	17	1 1/2	15	28 1/4	13	27	x	x	x	x		x	
R-4993-FB	R-4994-FB	20	1 1/2	18	31 1/4	16	30	x	x	x	x		x	
R-4993-GB	R-4994-GB	23	1 1/2	21	34 1/4	19	33	x	x	x				
R-4993-HB	R-4994-HB	26	1 1/2	24	37 1/4	22	36	x	x	x	x			x
R-4993-JB	R-4994-JB	30	2	28	41 1/4	26	40	x	x	x				
R-4993-KB	R-4994-KB	33	2	31	44 1/4	29	43	x	x	x	x			
R-4993-LB	R-4994-LB	36	2	34	47 1/4	32	46	x	x	x				
R-4993-MB	R-4994-MB	39	2	37	50 1/4	35	49	x	x	x				
R-4993-NB	R-4994-NB	45	2	43	56 1/4	41	55	x	x	x				
R-4993-OB	R-4994-OB	51	2	49	62 1/4	47	61	x		x				
<b>Airport, Port, Industrial Loads</b>														
R-4993-AAB	R-4994-AAB	8	2	6	19 1/4	4	18	x						
R-4993-BAB	R-4994-BAB	10	2	8	21 1/4	6	20	x						
R-4993-CAB	R-4994-CAB	12	2	10	23 1/4	8	22	x						
R-4993-DAB	R-4994-DAB	14	2	12	25 1/4	10	24	x	x	x				
R-4993-EAB	R-4994-EAB	17	2	15	28 1/4	13	27	x		x				
R-4993-FAB	R-4994-FAB	20	2	18	31 1/4	16	30	x		x				
R-4993-HAB	R-4994-HAB	26	2	24	37 1/4	22	36	x		x				
R-4993-KAB	R-4994-KAB	34	2	32	45 1/4	30	44	x		x				
R-4993-OAB	R-4994-OAB	51	2	49	62 1/4	47	61	x		x				

x - Indicates availability

- Note: The suggested forming procedures shown in this catalog are general suggestions to qualified professionals, and may not be appropriate for every installation.

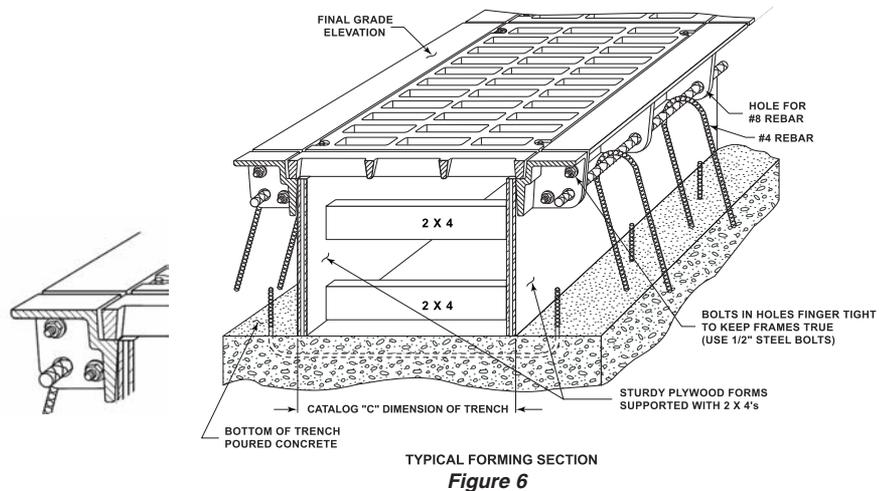
## Forming Procedures R-4993 & R-4994 Bolted Trench Series

Bolted frames and grates/lids are furnished assembled and therefore require different forming procedures than unbolted trenches. AT NO TIME SHOULD THE UNITS BE DISASSEMBLED DURING INSTALLATION! VERIFY THAT THE 3/16" PER SIDE MAXIMUM GAP BETWEEN FRAME AND LID HAS NOT CHANGED DURING TRANSPORT. WHEN SATISFIED THE GAP IS CORRECT, TORQUE BOLTS TO ASSURE THE PIECES REMAIN IN THAT ORIENTATION.

### R-4993 Forming Procedures

Follow forming procedures for bolted trench on page 268. The following exceptions apply.

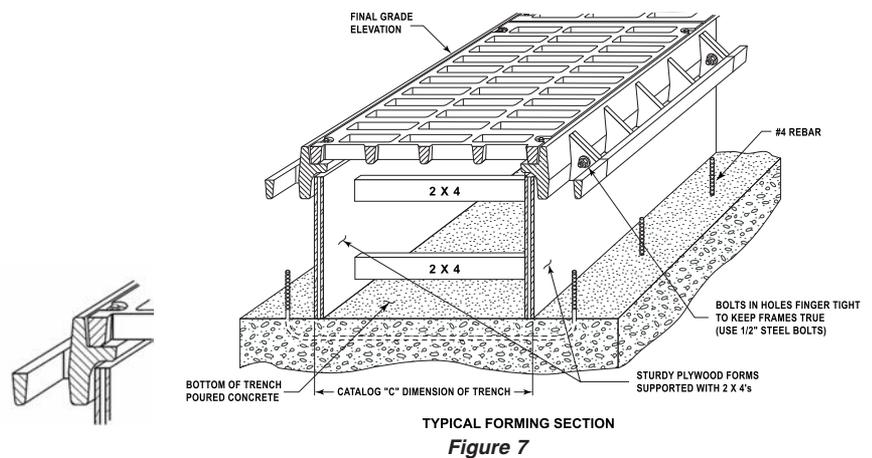
- Use Figure 6 as a guide.
- Frame pieces can be bolted together making sure that bolts are only finger tight.
- Reinforcing bar can be installed per Figure 6.



### R-4994 Forming Procedures

Follow forming procedures for bolted trench on page 268. The following exceptions apply.

- Use Figure 7 as a guide.
- The frame seat for the R-4994 series cantilevers over the trench opening. This requires the distance between sidewalls to be set accordingly. In this case, bolted assemblies are set upon the side wall forms with the contact area being the top of the form and the underside of the cantilever seat. (See Figure 6a on previous page)
- The inside distance between concrete sidewalls correspond with the CS dimension shown on page 268 of the catalog.
- Frame pieces can be bolted together making sure that bolts are only finger tight.
- Reinforcing bar can be installed per Figure 7.



■ Note: The suggested forming procedures shown in this catalog are general suggestions to qualified professionals, and may not be appropriate for every installation.

## R-4995 - R-4996 Type M Trench Frame with Solid or Grated Cover Flap and Flush Valve Frame, Lid

### Heavy Duty

Cast Iron Trench Assemblies—Light or Heavy Duty—For Use in Sidewalks, Driveways, Garages, Loading Docks, etc.

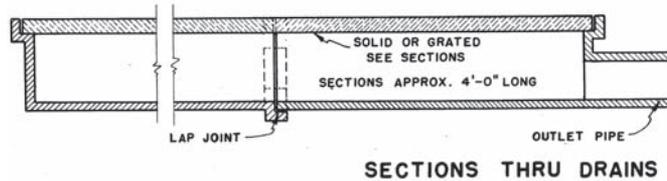
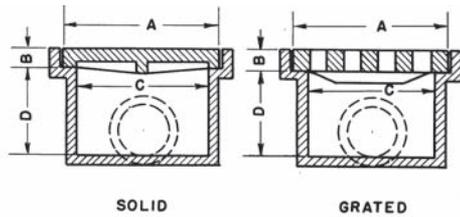
#### Read Carefully Before Ordering

##### Specify:

1. Complete catalog number.
2. Light or heavy duty.
3. Overall length of cover required.
4. Lid solid, flat grated, or diagonally barred convex grate.
5. Location of outlet, side, bottom or end (give dimensional location and pipe size).
6. Whether one end or both ends are to be open or closed.



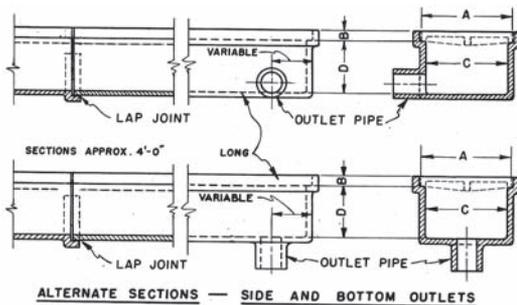
Illustrating Type M frame with grated cover. Standard with 4-inch outside caulk outlet. Can be equipped for inside caulk if specified.



Trench covers are used over areas requiring long drainage assemblies. Can be supplied in a variety of sizes and lengths to meet special needs. For trenches of irregular pattern, arrangements can be made to furnish cover to fit.

Standard 4-inch outlet at end of drain. Special size outlets are available on special order. Side and bottom outlets optional and furnished only when specified.

#### Sections: Thru Drains, Type M



Dimensions in inches						
Catalog No.	Description	A	B	C	D	Length
<b>Standard Sizes—Light Duty</b>						
R-4995-A1**	with grated cover	11½	¾	10	6¾	as ordered
R-4995-A2*	with grated cover	7	¾	5	4¾	as ordered
R-4995-B1	with solid cover	11½	¾	10	6¾	as ordered
R-4995-B2	with solid cover	7	¾	5	4¾	as ordered
<b>Standard Sizes—Heavy Duty</b>						
Catalog No.	Description	A	B	C	D	Length
R-4996-A1**	with grated cover	11½	1½	10	6	as ordered
R-4996-A2*	with grated cover	7	1¼	5	4¾	as ordered
R-4996-B1	with solid cover	11½	1½	10	6	as ordered
R-4996-B2	with solid cover	7	1¼	5	4¾	as ordered

Above Standard Frames made in 4 ft. sections, covers in 2 ft. lengths.

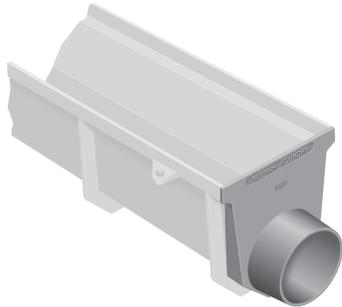
\*Available with Type B grate only.

\*\*Also available with type P grate.

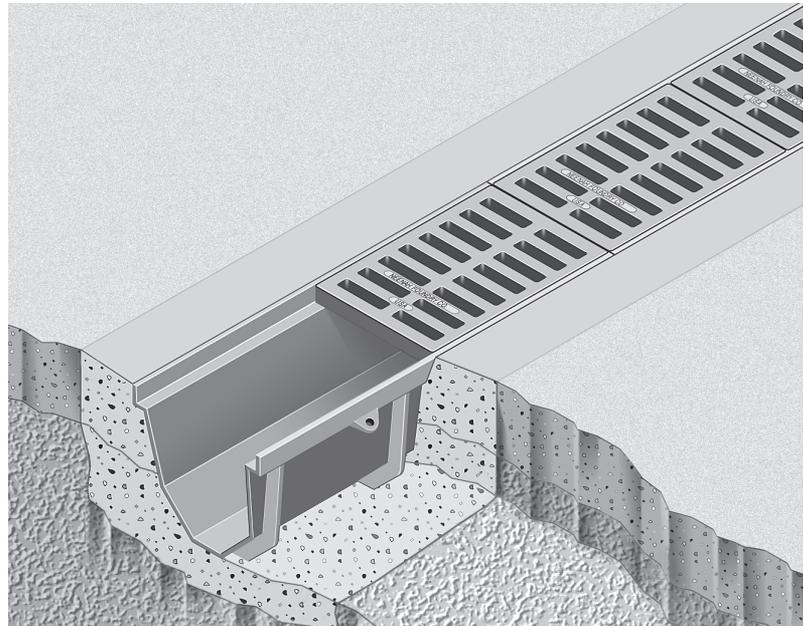
■ Note: The suggested forming procedures shown in this catalog are general suggestions to qualified professionals, and may not be appropriate for every installation.

## R-4996 Series Self-Forming Trench Pan

Heavy Duty



Illustrating R-4996-B frame with 6" outlet



Illustrating R-4996-C w/ Type A grate

All grates/covers and frames can be bolted if required.

Catalog No.	Standard Cover Dimensions				Frame Length	Outlet Location/Sizes			Available Grate/Cover
	A	B	C	D		Side	Bottom	End	
R-4996-A	8	1	6	9	30	4,6	4	4	Q **
R-4996-B	10	1	8	10 3/8	30	4,6,8	4,6	4,6	Q **
R-4996-C	12	1 1/2	10	10	36	4,6,8	4,6,8	4,6,8	A, C, D, L, Q
R-4996-CA *	12	1 1/2	10	10	36	4,6,8	4,6,8	4,6,8	A

\* Aircraft Rated - Standard Bolted

\*\* Can be incorporated into plans for ADA compliance

### FORMING PROCEDURES - SELF FORMING TRENCH PAN SERIES

Assumes existing slabs are at final elevation on either side of the excavation.

#### Materials

Under normal situations, use 2 x 4's and 18-inch lengths of fi inch all-thread rod with 2 nuts and 1 washer per cross bar support. (2 cross bar supports per frame section)

Excavate trench to appropriate depth per design engineers specification. That depth must be the total of the "A" dimension and the "D" dimension plus the depth of additional masonry material specified. (see Figure 7 and Figure 8a)

Attach installation materials onto frame sections. (2 cross bar supports per section.)

Cut 2 x 4 lengths 8 inches to 10 inches longer than the "A" dimension shown in the table above. Drill a hole in the center of each 2 x 4 length. Insert all-thread rod through hole in the bottom of the trench pan and twist on a keeper nut being careful that the threads are not exposed past the bottom of the nut. Slide 2 x 4 section over all-thread rod and tighten snugly. Set trench pan sections into the excavation making sure the trench pans are set at proper elevation and that pan sections are mated tight together. (see Figure 8b)

Pour 1st lift of concrete to sufficient depth to hold trench pan sections into position and allow to harden. (see Figure 8c)

Remove assembly materials to be reused to set additional trench.

Pour second lift of concrete to final grade. (See Figure 8d)

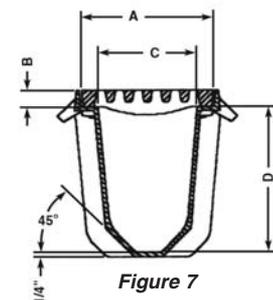


Figure 7

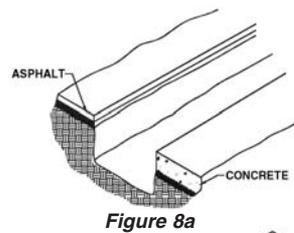


Figure 8a

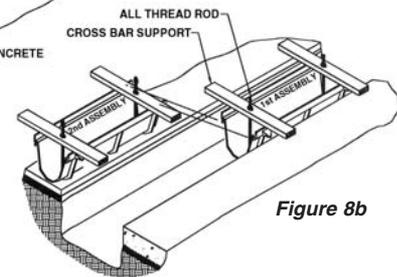


Figure 8b

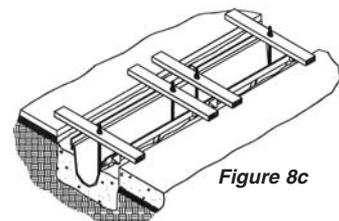


Figure 8c

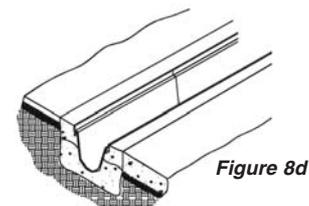


Figure 8d

■ **Note:** When specifying/ordering grates, refer to “Choosing the proper inlet grate” on pages 117-118.  
 For a complete listing of FREE OPEN AREAS and WEIR PERIMETERS of all NEENAH grates, refer to pages 306-311.

## R-4990 Airport, Port & Heavy Industrial Series Bolted Trench for Extra Heavy Duty Applications

These trench drains are capable of supporting the heavy wheel loads of today's commercial environments. For larger trench widths or greater loading requirements, please contact our Product Engineering Department.

Grates are bolted to gray iron frames.

For Alternate Frame options, please see the R-4993 and R-4994 Series Trench found on pages 269.

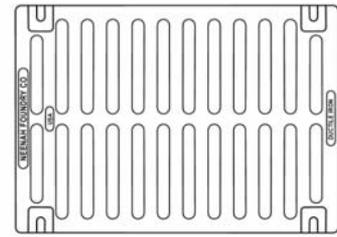
Suitable for aircraft loading per AC150/5320-6D.

Catalog No.	A	B	C	Grate Matl.
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

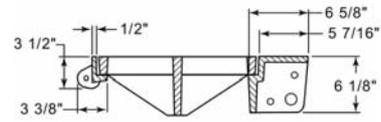
\* Type D solid cover available.

\*\* Type C grate available.

Ductile Iron furnished in Grade 80-55-06.



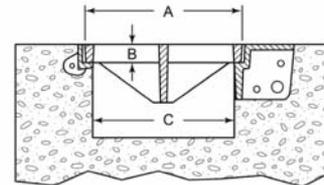
TYPE "A"  
 GRATE OPENINGS



STANDARD  
 TYPE X  
 FRAME

ALTERNATE  
 R-4993 TYPE T  
 FRAME SHOWN

R-4994 TYPE S FRAME  
 ALSO AVAILABLE



## R-4999 Vaned Type L Series Bolted Transverse Drainage Structure

Heavy Duty

This trench grate series represents Neenah's best hydraulic performance.

Catalog No.	A	B	C
R-4999-L2 ***	12	1 1/2	10
R-4999-L3 *	14	1 1/2	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 1/2	26 3/4

\* Furnished in 24" sections

\*\* Furnished in 12" or 24" sections

\*\*\* Furnished in 18" or 36" sections

Type "L" vane shaped grates have the ability to remove significant amounts of sheet flow from streets, parking lots and industrial lots.

For detailed hydraulic information, visit our website at [www.neenahfoundry.com](http://www.neenahfoundry.com) and select "Hydraulic Calculator" or contact Neenah Product Engineering.

