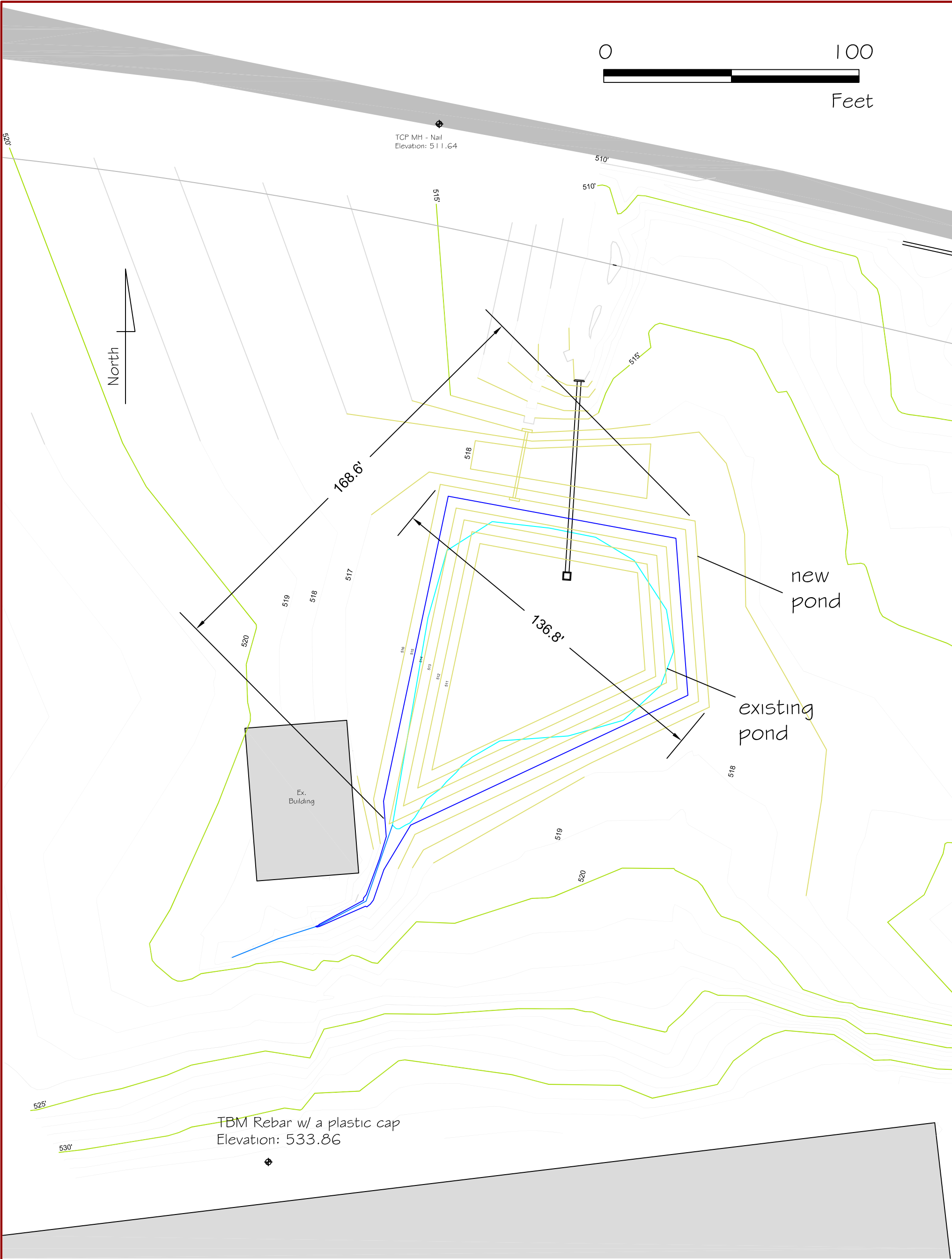




Pure Science for Clean Water®

**BID PACKAGE SENT TO CONTRACTORS
29 NOVEMBER 2018**



base map by Wm Kenneth Wilson, PE



Winchester, Kentucky

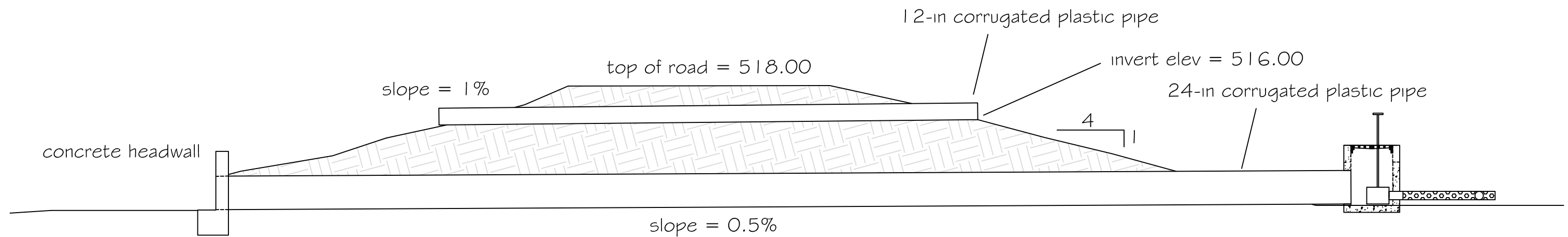
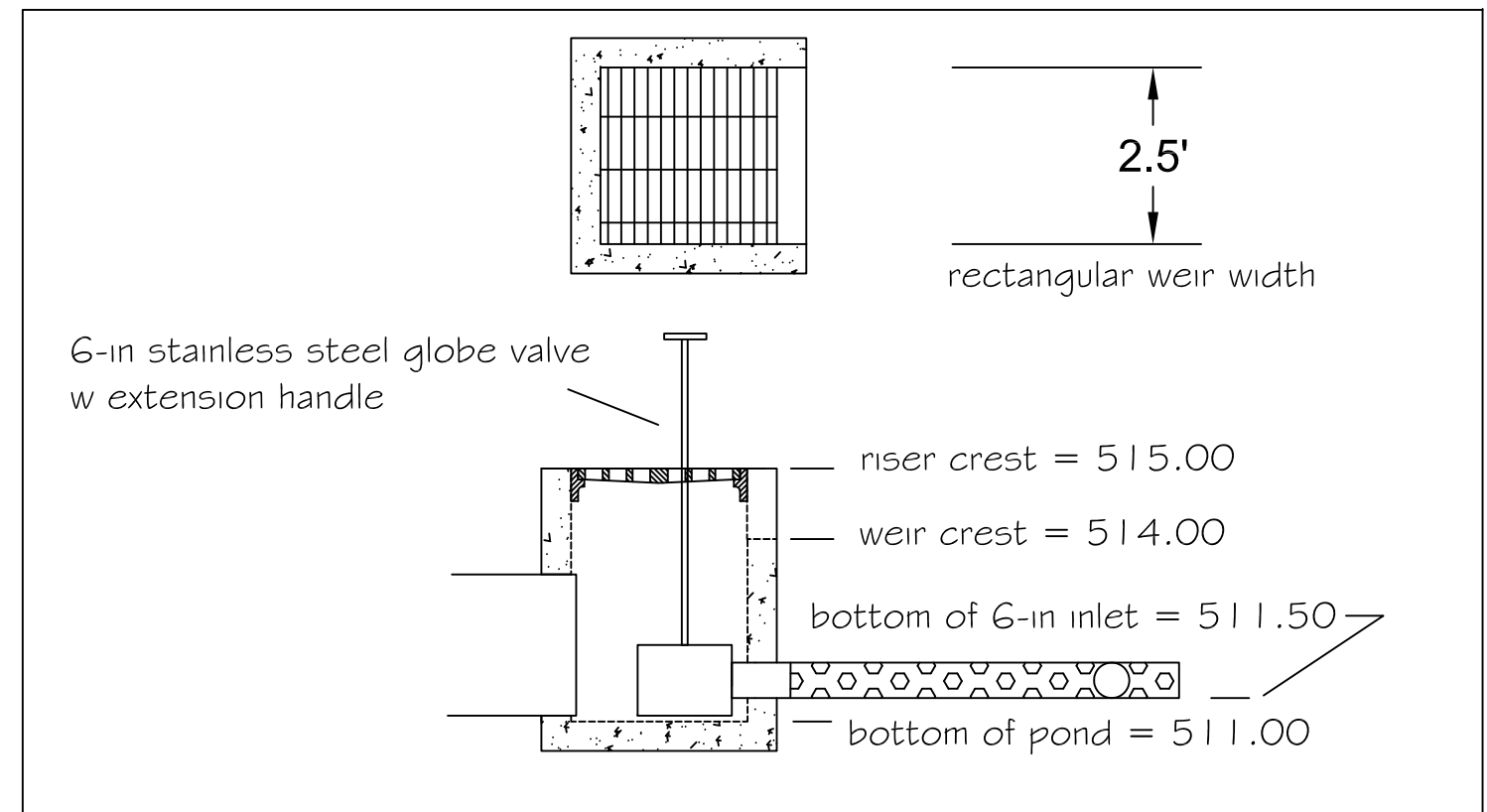
Robinson Stave Company
1812 HWY 3434
East Bernstadt, KY 40729

Pond 2

Drawing Date: 25NOV2018

Drafted by: PR

Figure 1



Winchester, Kentucky

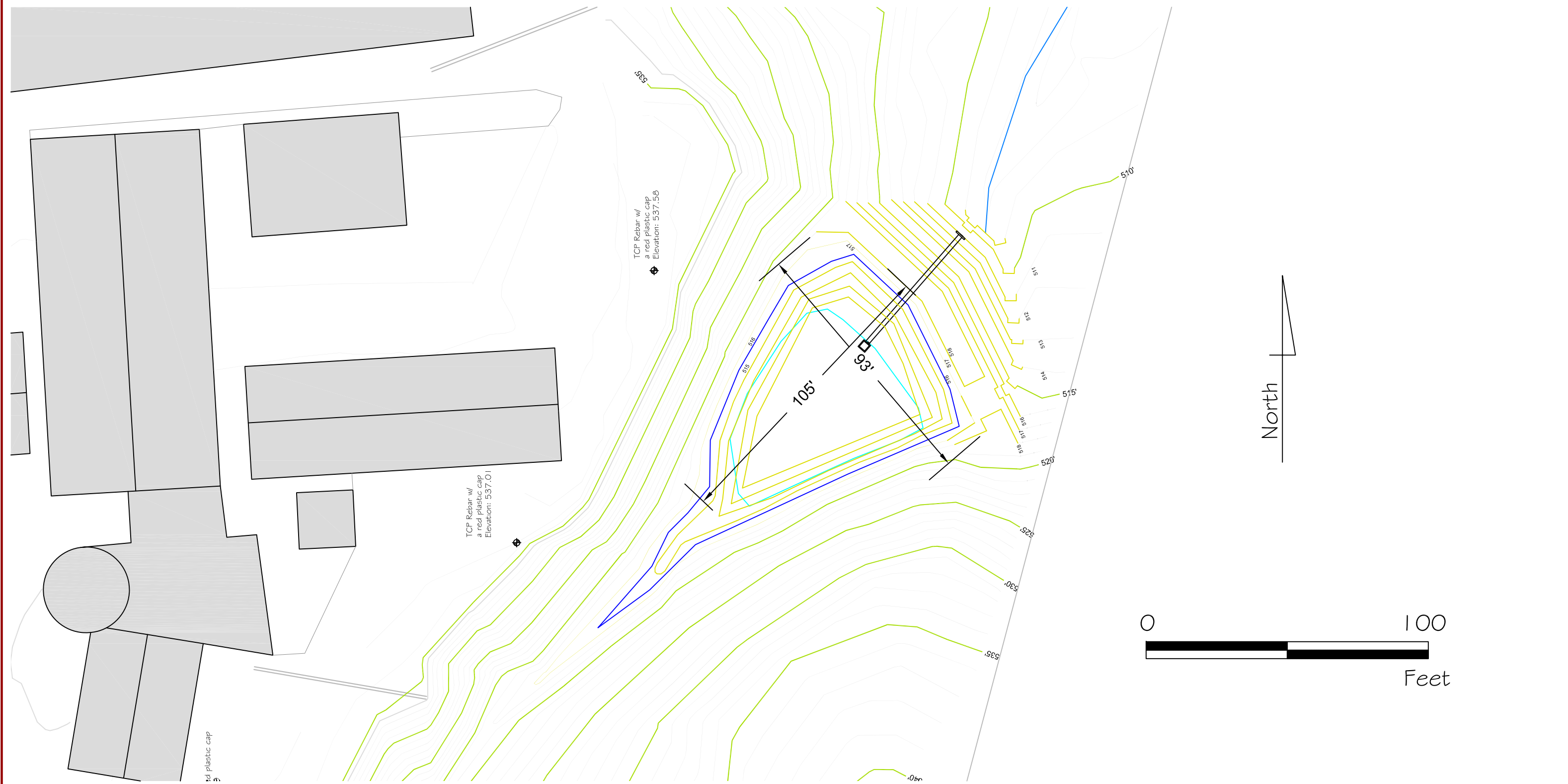
Robinson Stave Company
1812 HWY 3434
East Bernstadt, KY 40729

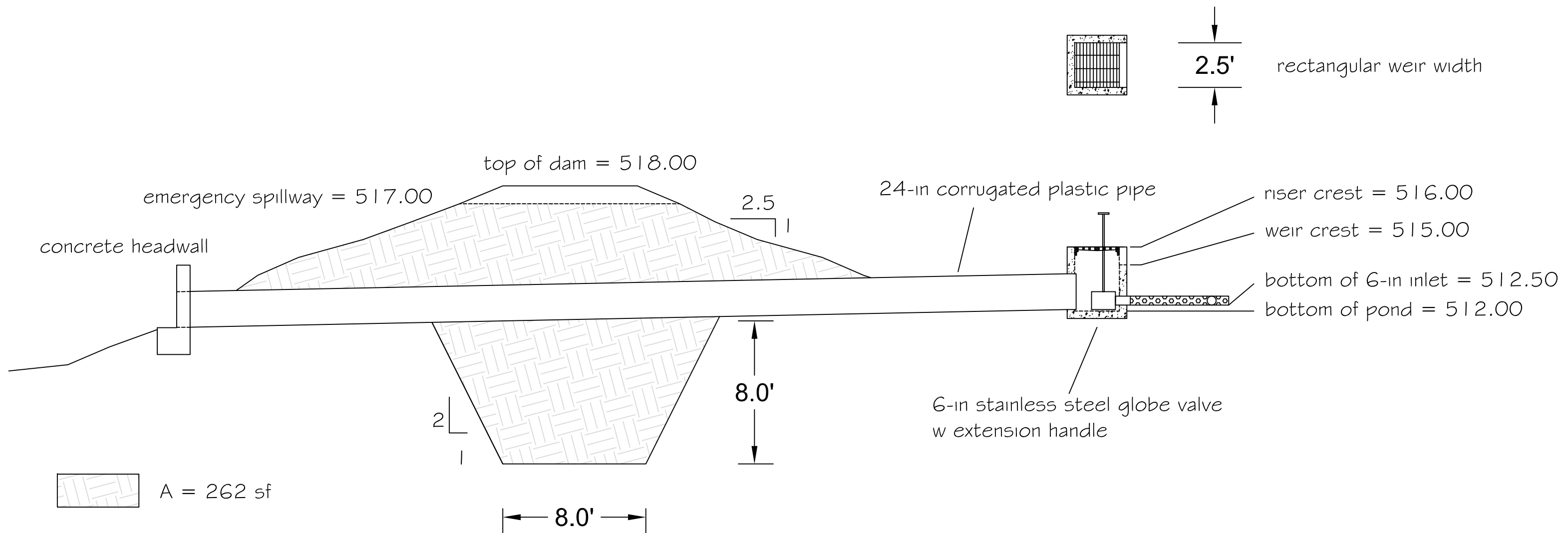
Pond 2

Drawing Date: 24NOV2018

Drafted by: PR

Figure 2





Winchester, Kentucky

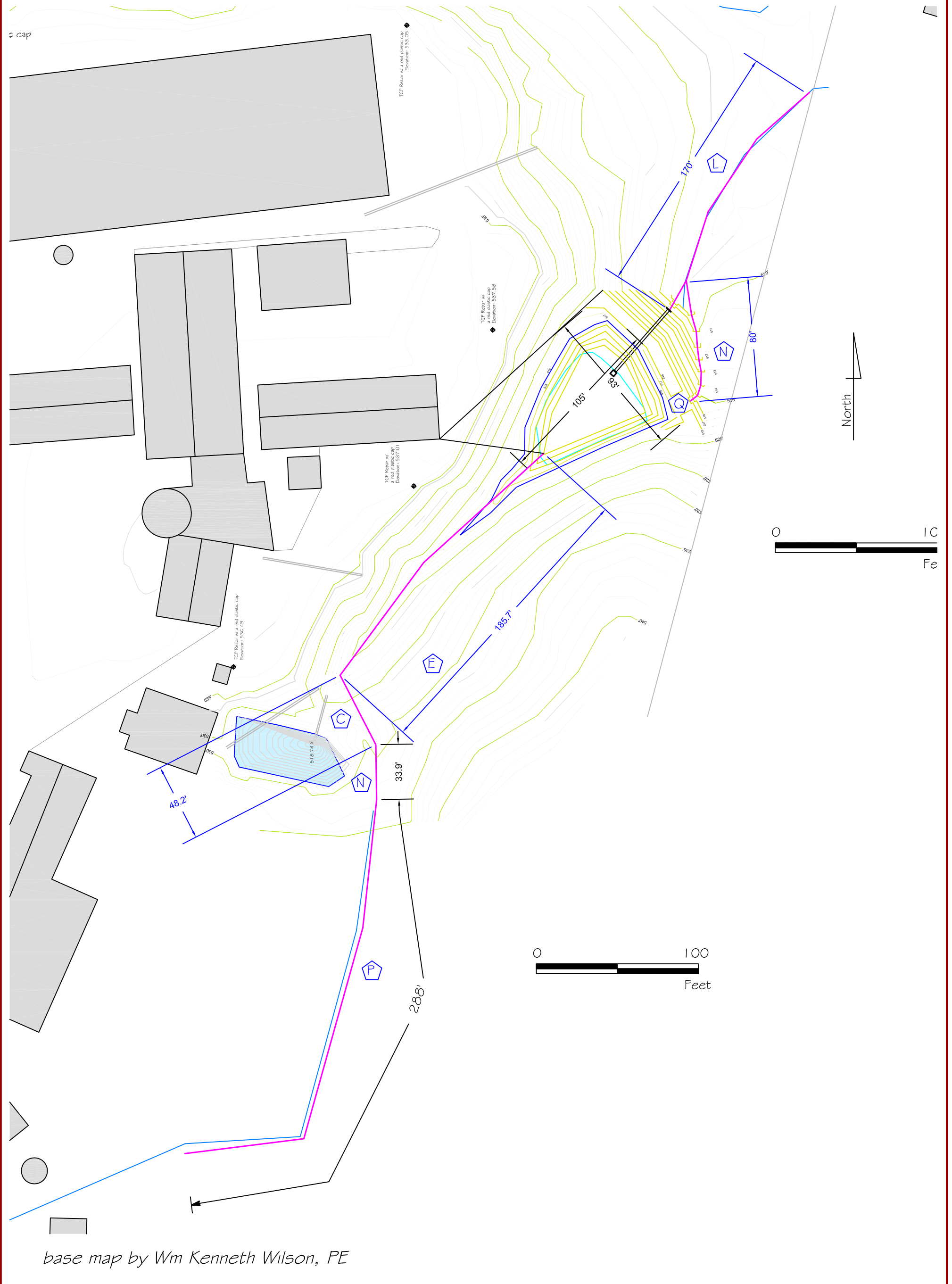
Robinson Stave Company
1812 HWY 3434
East Bernstadt, KY 40729

Pond 3 Dam

Drawing Date: 24NOV2018

Drafted by: PR

Figure 5



Winchester, Kentucky

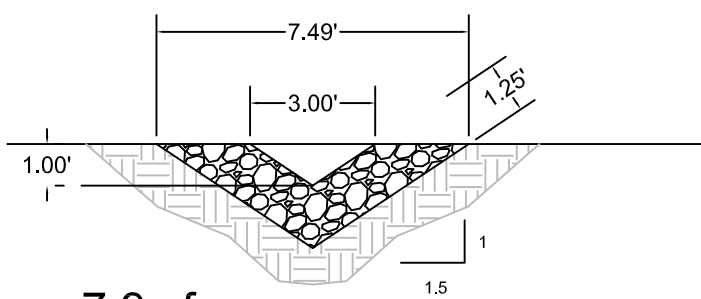
Robinson Stave Company
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East Bernstadt, KY 40729

Pond 3 - Channels

Drawing Date: 25NOV2018

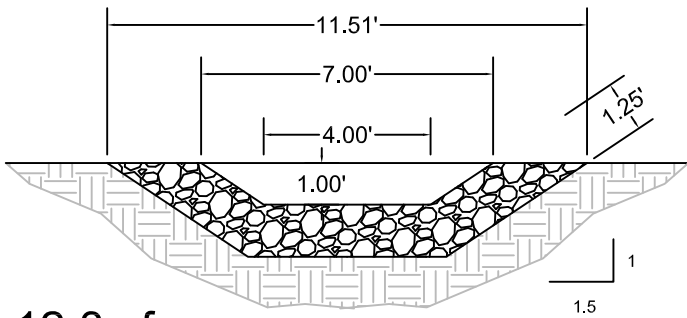
Drafted by: PR

Figure 6



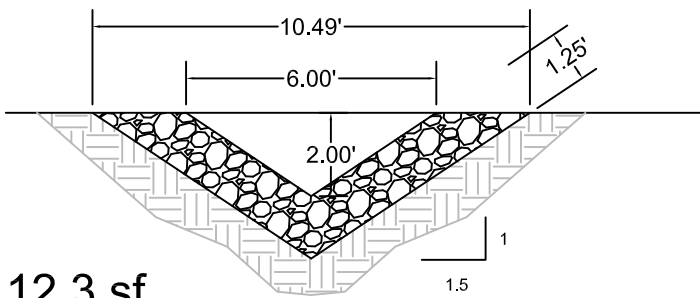
rock x-sec = 7.9 sf

A



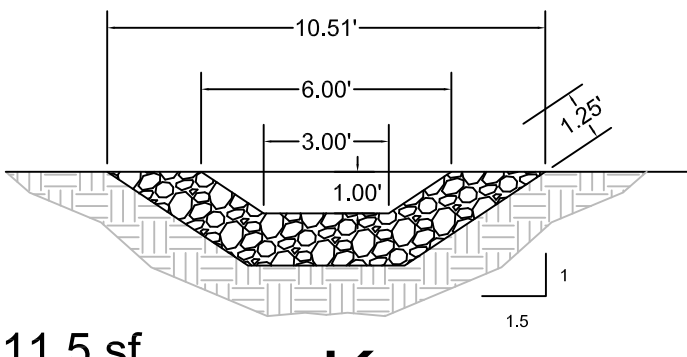
= 12.8 sf

G



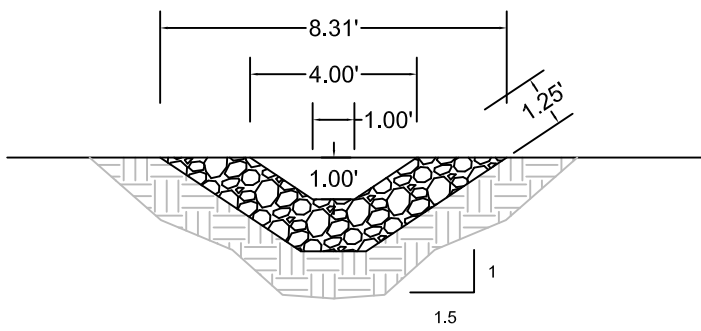
= 12.3 sf

B



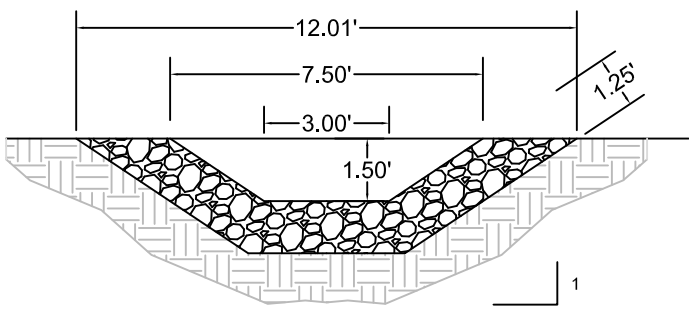
= 11.5 sf

K



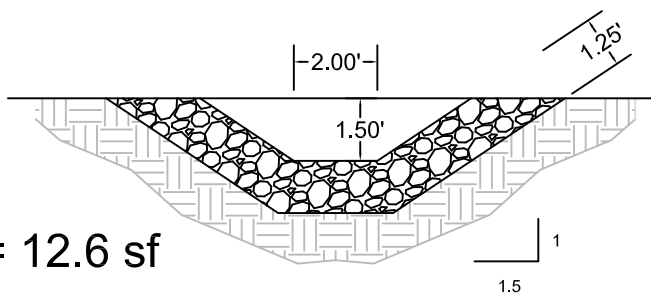
= 8.7 sf

C



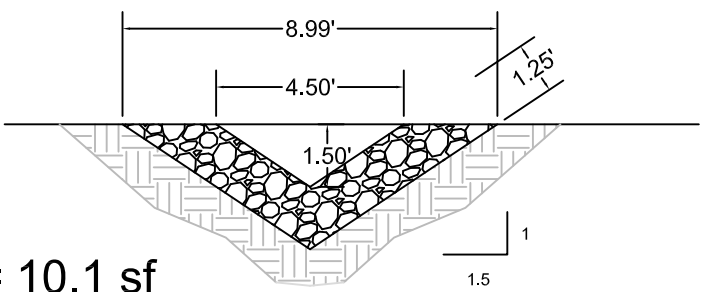
= 13.8 sf

L



= 12.6 sf

E



= 10.1 sf

N

Class II Channel Lining (5- 9 in)



Winchester, Kentucky

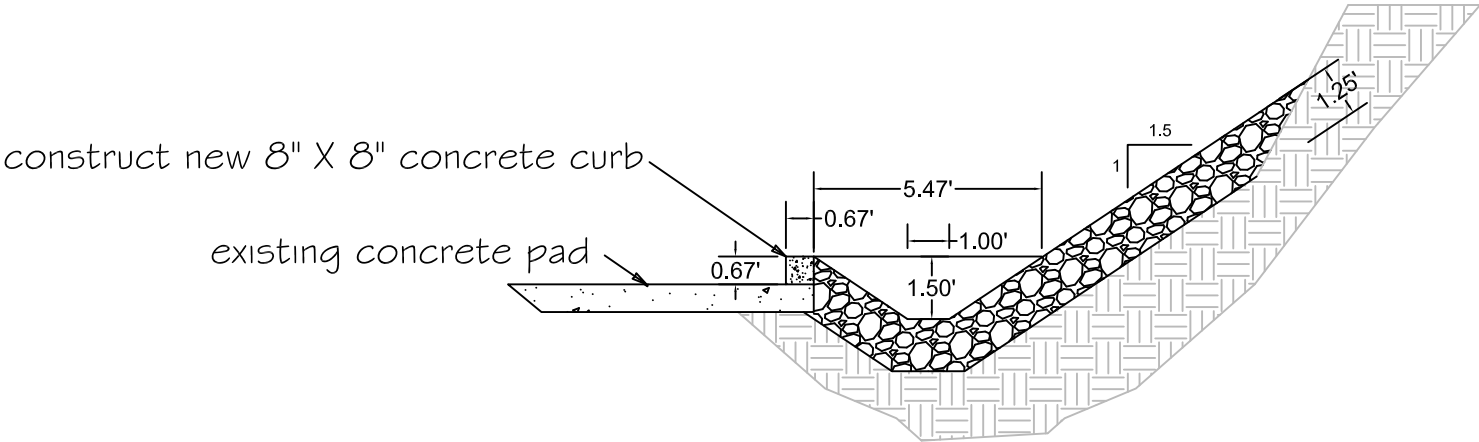
Robinson Stave Company
1812 HWY 3434
East Bernstadt, KY 40729

Channel Cross Sections

Drawing Date: 26NOV2018

Drafted by: PR

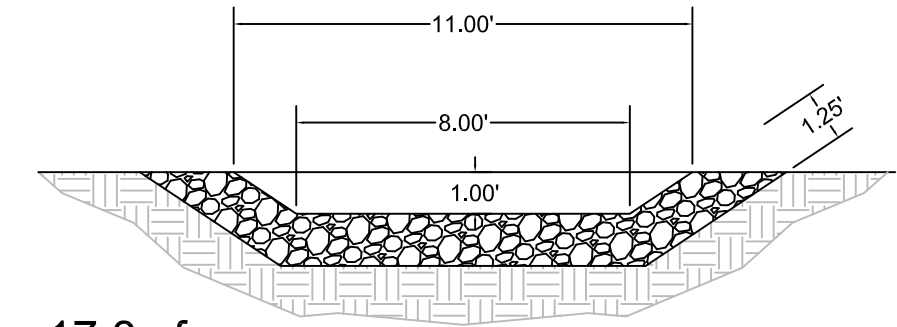
Figure 7a



rock cross section = 16.6 sf

P

Curb and Channel on East Side of Chipping Yard



= 17.8 sf

Q



Pond 3 Emergency Spillway

Class II Channel Lining (5- 9 in)



Winchester, Kentucky

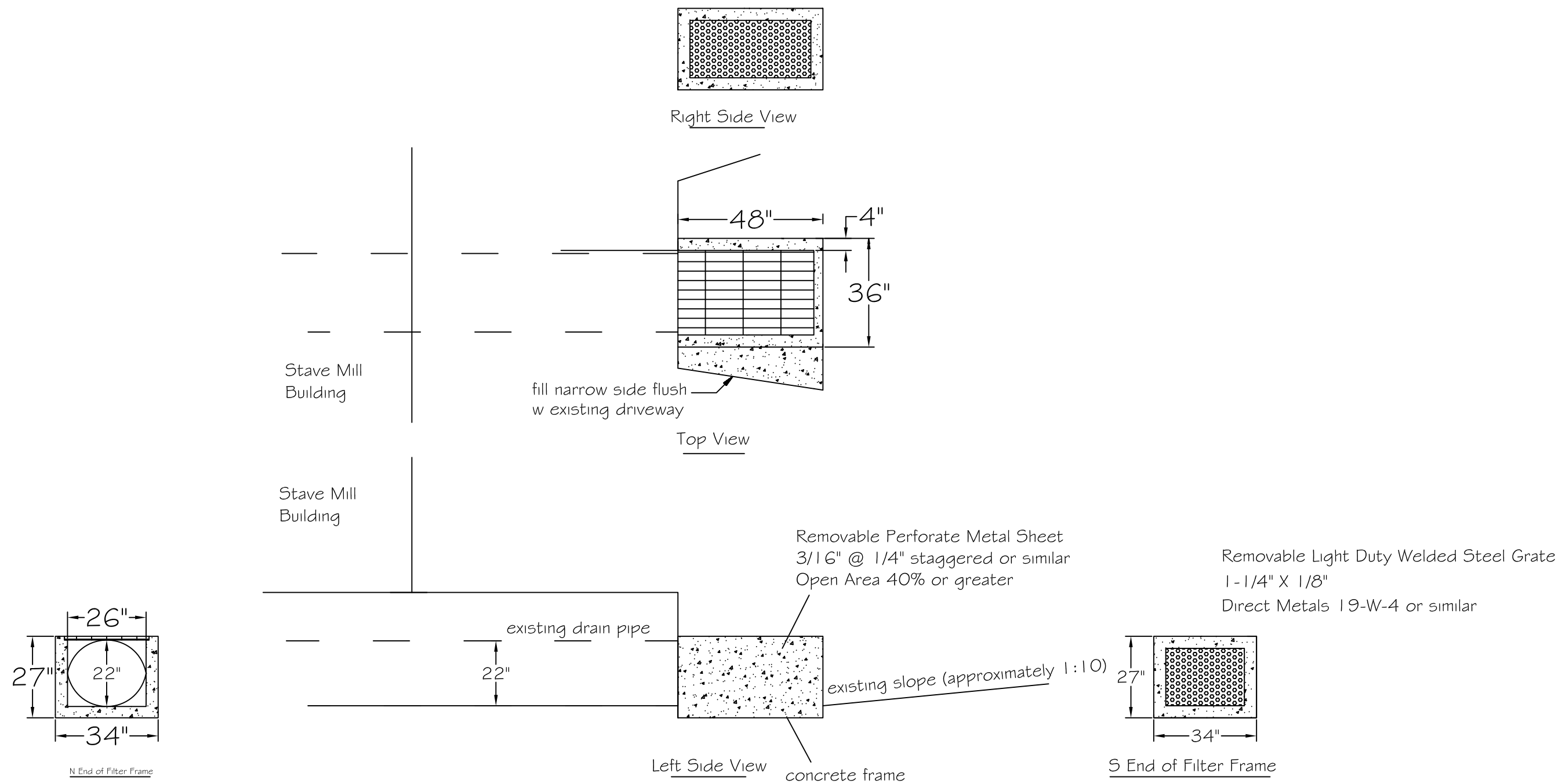
Robinson Stave Company
1812 HWY 3434
East Bernstadt, KY 40729

Channel Cross Sections

Drawing Date: 26NOV2018

Drafted by: PR

Figure 7b



Winchester, Kentucky

Robinson Stave Co
1812 Hwy 3434
East Bernstadt, KY 40729

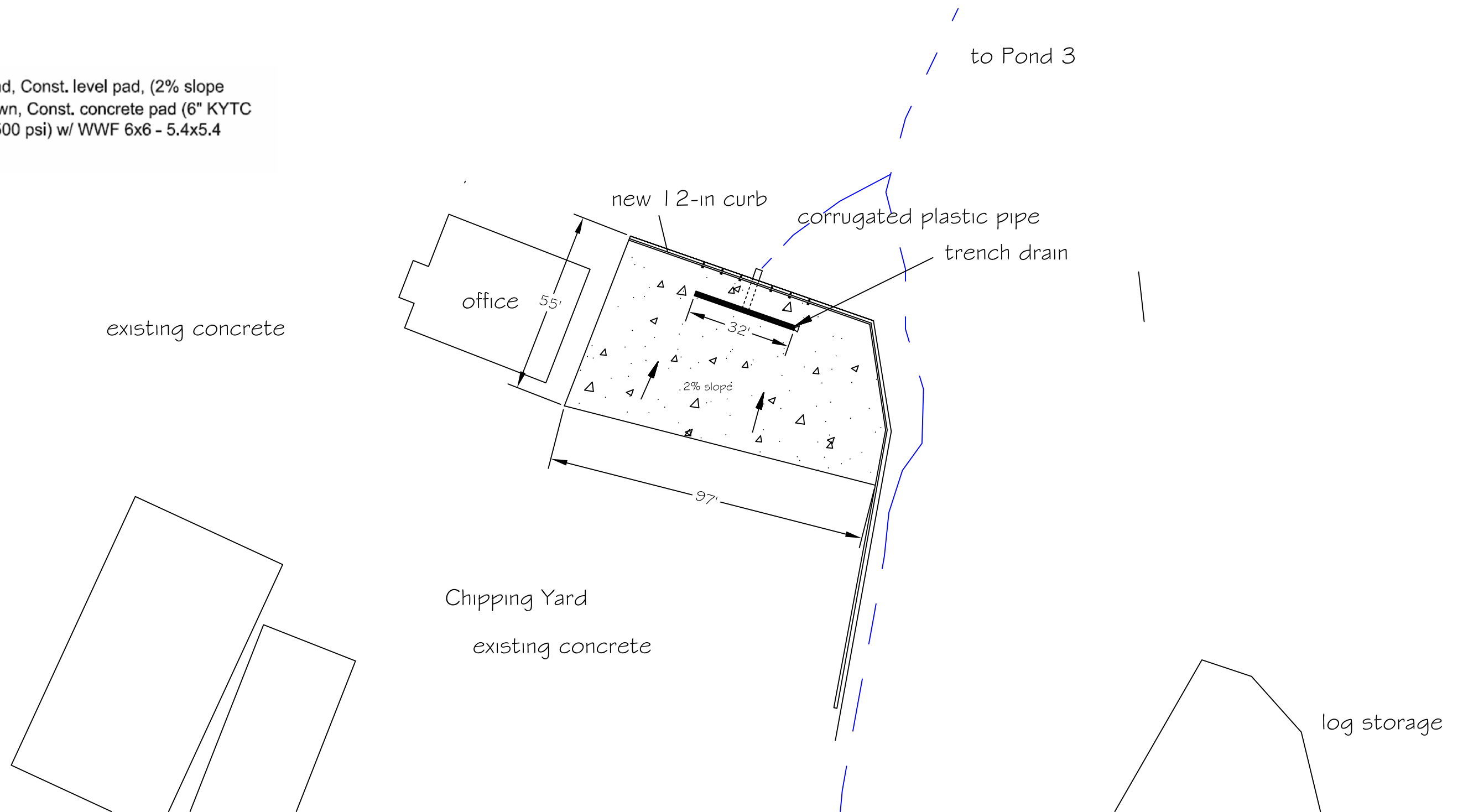
Stave Mill Sediment Trap

Drawing Date: 23SEP2018

Drafted by: PR

Figure 8

Remove existing pond, Const. level pad, (2% slope downstream) as shown, Const. concrete pad (6" KYTC class A concrete (3,500 psi) w/ WWF 6x6 - 5.4x5.4 per Detail



Winchester, Kentucky

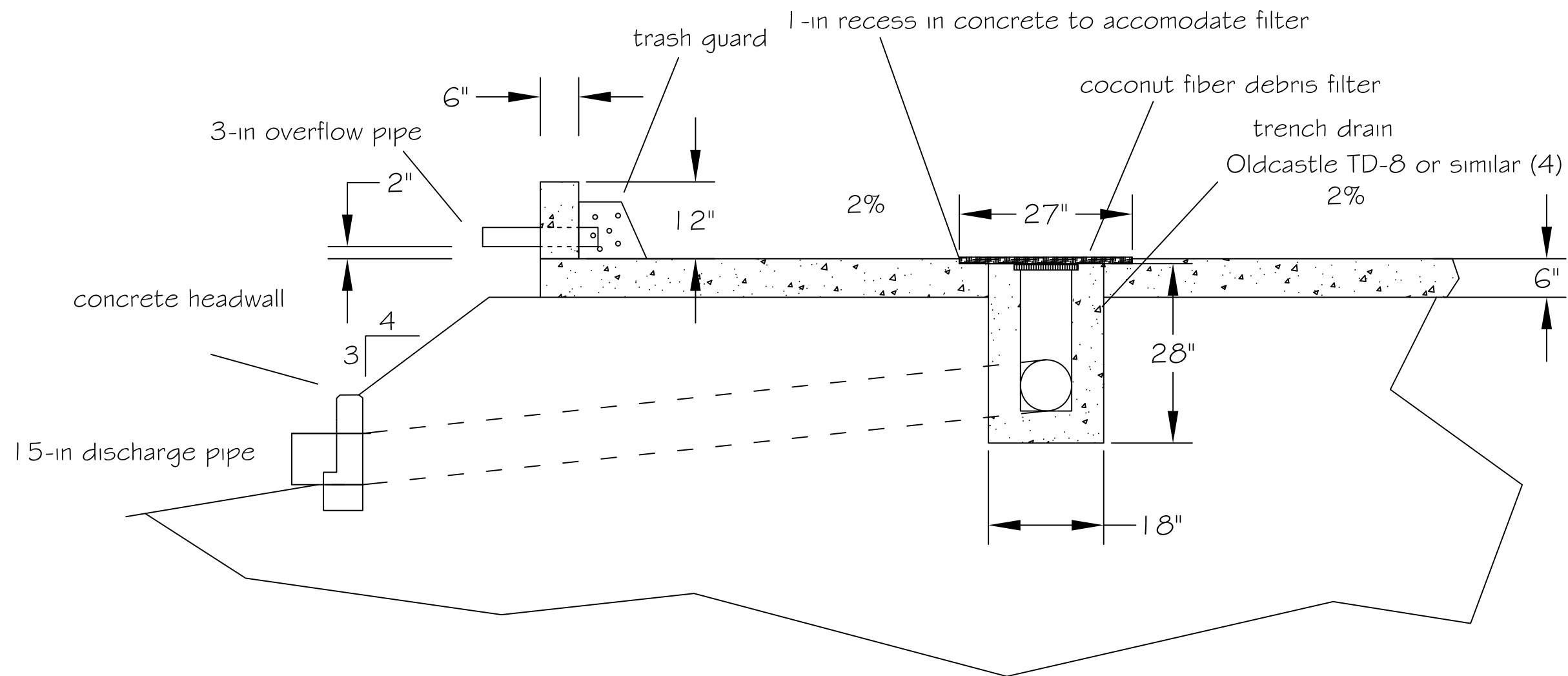
Robinson Stave Co
1812 Hwy 3434
East Bernstadt, KY 40729

Office Sediment Trap

Drawing Date: 15OCT18

Drafted by: PR

Figure 9



Winchester, Kentucky

Robinson Stave Co
1812 Hwy 3434
East Bernstadt, KY 40729

Office Sediment Trap

Drawing Date: 15OCT18

Drafted by: PR

Figure 9b

Scope of Work

Robinson Stave Stormwater Improvements

A. Rehab Channels

see Figures 3, 6, 7a, 7b, and table of Channel Types and Stone Volumes

B. Install Sediment Filters

1. Saw Mill Yard – Fig 8
2. Chipping Yard – Fig 9, 9b
 - Drain old pond, remove sediment
 - Install springbox and culvert
 - Fill old pond
 - Install 6-inch thick 3,500 psi concrete pad w trench drain

C. Rehab Ponds

1. Pond 2 – Fig 1
 - drain/pump existing water
 - remove and dispose of sediment
 - excavate to new dimensions (4:1 H:V side slopes)
 - install solid floor
 - install outlet structure
 - install 24-in culvert at 511.50 (0.5% slope) – Fig 2, 3
 - install 12-in emergency drain at 516.00 (1.0% slope)
 - finish grade (incl access road), seed and straw
2. Pond 3
 - construct access road
 - drain existing water
 - remove dam and sediment
 - excavate to new dimensions – Fig 4
 - install solid floor
 - install outlet structure
 - construct new dam – Fig 5
 - finish grade (incl access road), seed and straw

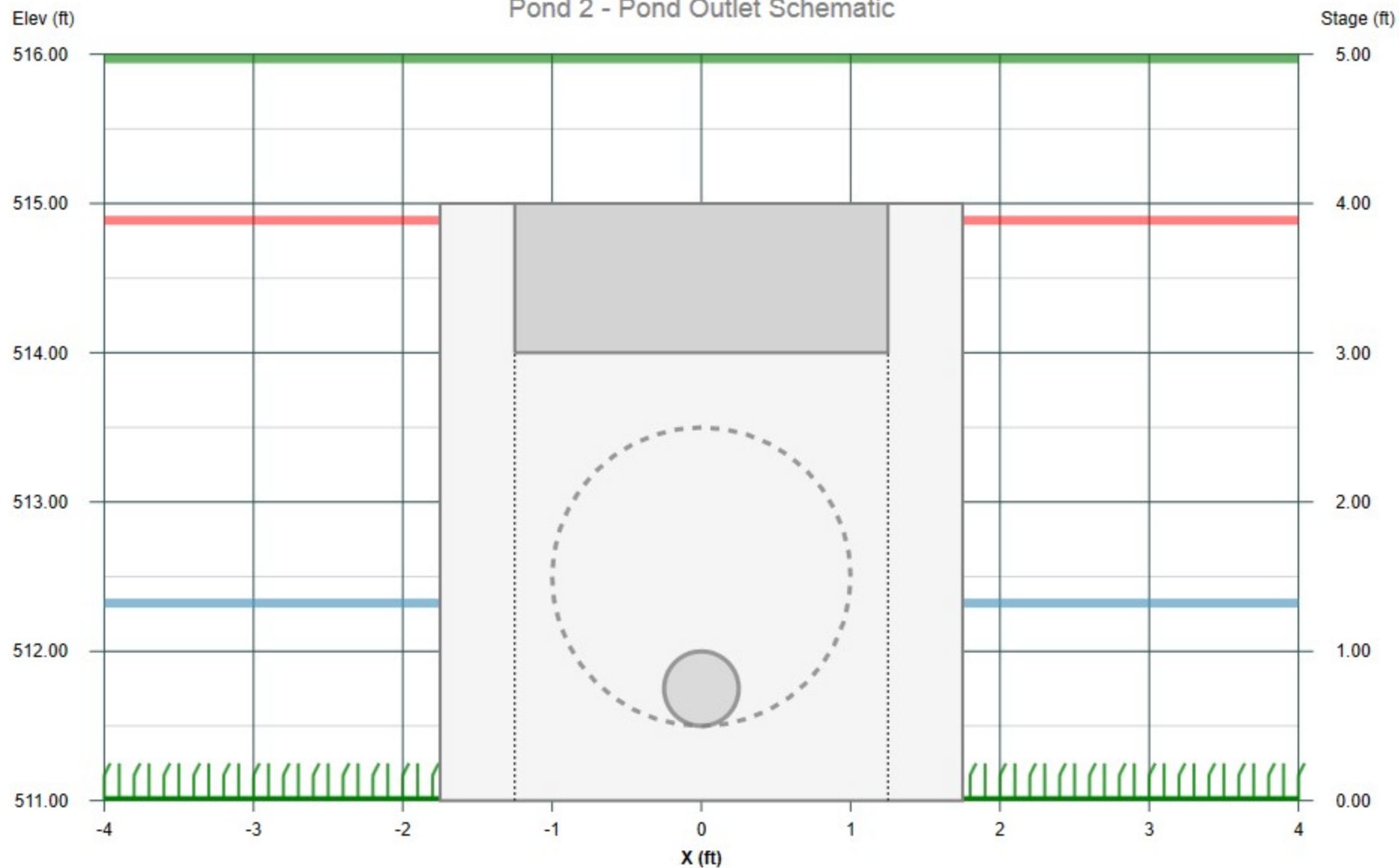
29 NOV 2018

Task	Earth Vol Estimate (cy)	Budget Amount
Rehab Channels		
Pond 2 Channels		
Pond 3 Channels		
Chipping Yard Curb and Channels		
Install Sediment Traps		
Saw Mill Yard Sediment Trap		
Chipping Yard Sediment Trap		
drain old pond, fill and compact		
install concrete pad w trench drain		
Rehab Ponds		
Pond 2		
drain; remove and dispose of sediment	340	
re-contour bottom - cut	368	
install and compact floor at 511.00 - fill	100	
install outlet structure, 24-in culvert, and 12-in emergency drain		
final grade, incl access road w 6-in DGA, seed and straw		
Pond 3		
construct access road		
drain pond		
remove dam and sediment		
remove existing dam and sediment; excavate to new dimensions, incl core below dam - cut	700	
install new core; install floor at 512.00 - fill	342	
install outlet structure		
install new dam	672	
final grade, incl access road w 6-in DGA, seed and straw		

Channel Types and Stone Volumes

Channel Type	Total Length (ft)	Stone Area (sf)	Stone Vol (cy)	Note
G	48	12.8	22.8	base of Pond 2 to road
A	45	7.9	13.2	below emergency spillway Pond 2
K	93	11.5	39.6	entrance to Pond 2 at garage
K	45	11.5	19.2	below parking lot at barrel shop
L	170	13.8	86.9	base of Pond 3 to property line
N	80	10.1	29.9	emergency spillway down face of dam
E	186	12.6	86.8	gully above Pond 3 (flatter portion)
C	48	8.7	15.5	gully above Pond 3 (steeper portion)
N	34	10.1	12.7	gully below old pond (very steep)
P	288	16.6	177.1	channel beside chipping yard
Q	12	17.8	7.9	emergency spillway for Pond 3
511.5				

Pond 2 - Pond Outlet Schematic



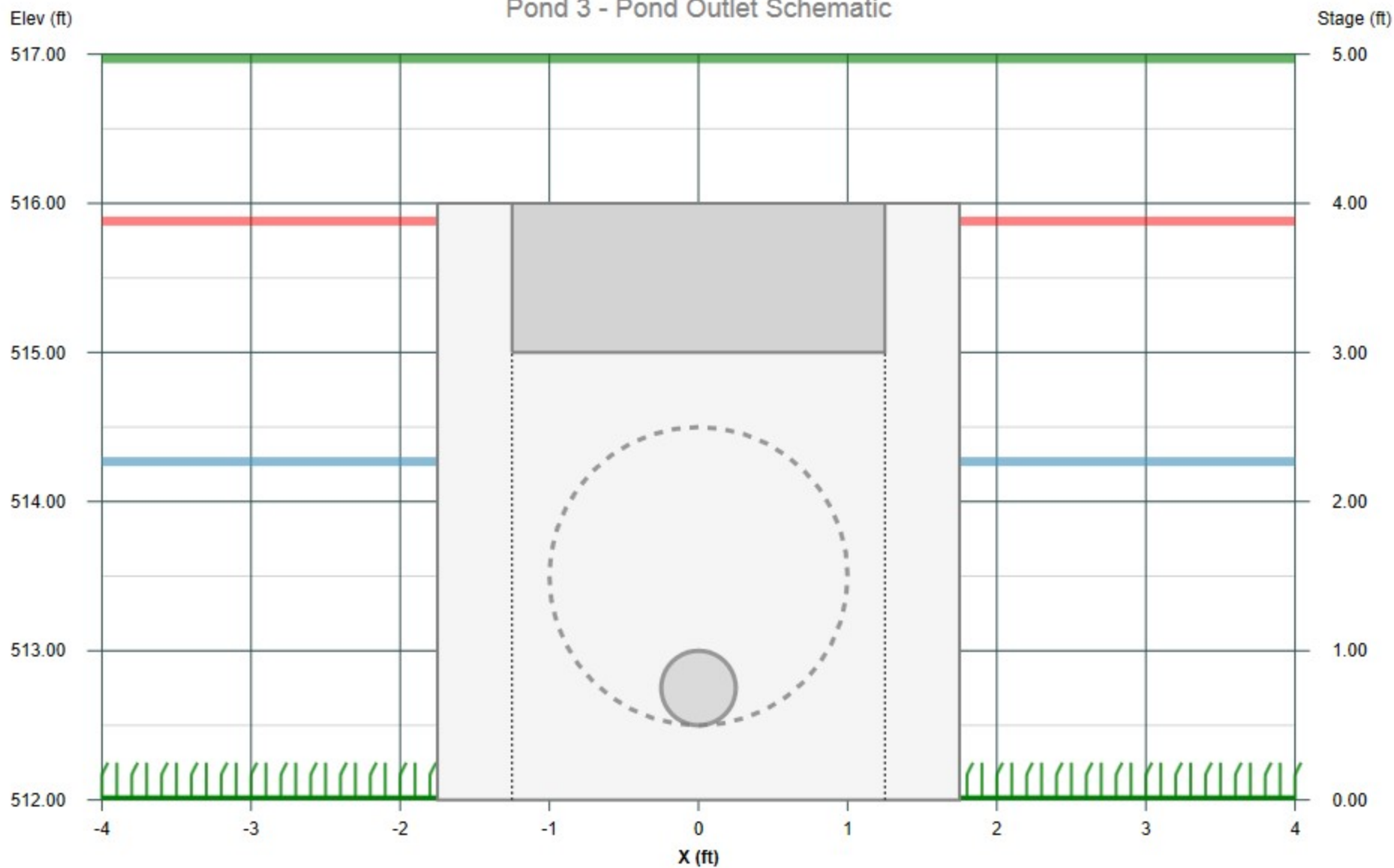
— 2-yr Actual

— 2-yr Target

Front Side Plan

Click on a structure to select. Double-click to resize.

Pond 3 - Pond Outlet Schematic



— 2-yr Actual

— 2-yr Target

Front Side Plan

Click on a structure to select. Double-click to resize.



3'-5" x 3'-5" x 12'-2" MAX O.D.
CURB BOX INLET TYPE F KDOT - LFUCG
MODEL #: CBI F - LFUCG-KY

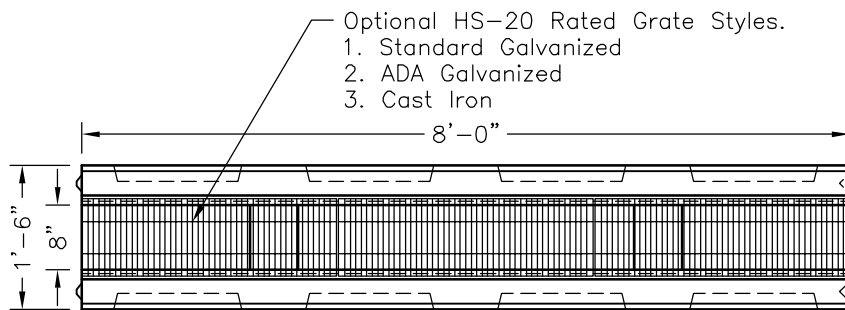


1. Concrete minimum compression strength: $F'_c=5,000$ PSI @ 28 days.
2. Reinforcing steel: ASTM A615, $F_y=60,000$ PSI

Oldcastle Precast Tri-State Region

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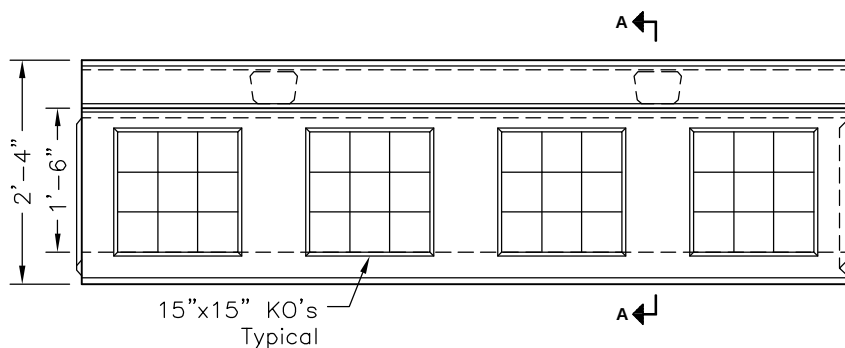
Lexington, KY
859-259-1484



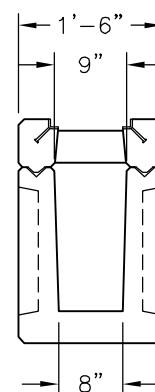
PLAN VIEW

GENERAL NOTES:

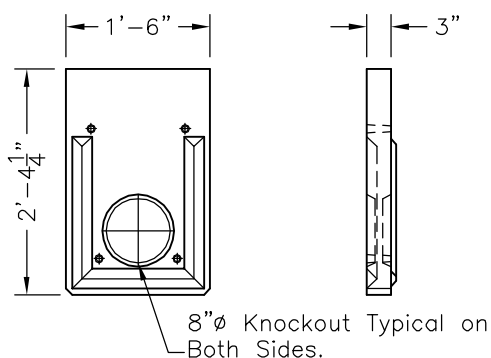
1. Concrete: 28 Day Compressive Strength $f'_c = 5,000$ psi.
2. Reinforcing Steel, ASTM A-615 Grade 60
3. Design Live Load = HS-20
4. Earth Cover = 0'-0" Min. to 0'-0" Max.
5. Invert of Structure must be level, Grout Slope as Needed (Refer to Example Trench Layouts).



ELEVATION VIEW

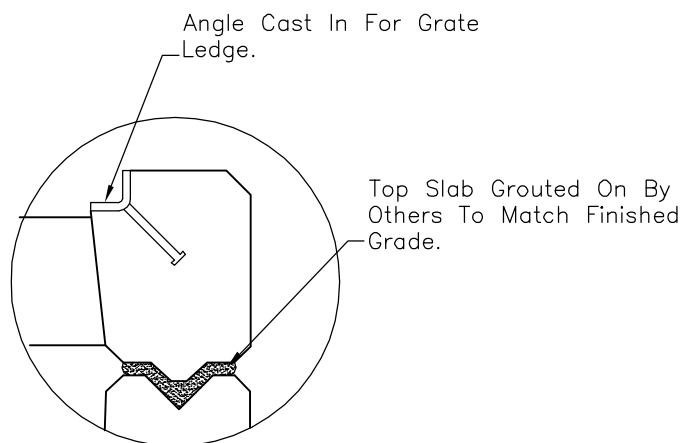


SECTION A-A



BOLT ON END CAP DETAIL

(Attachable To Both Ends As Needed.)



DETAIL A

SCALE: $1/2" = 1'-0"$



Oldcastle Precast®
Rotondo

5115 Massaponax Church Road, Fredericksburg, Virginia
Phone: 540.898.6300 Fax: 540.898.2389

TD-8

FILE NAME: 365DISTD8.DWG

ISSUE DATE: March, 2003

0'-8"x1'-6"x8'-0" I.D.
Trench Drain

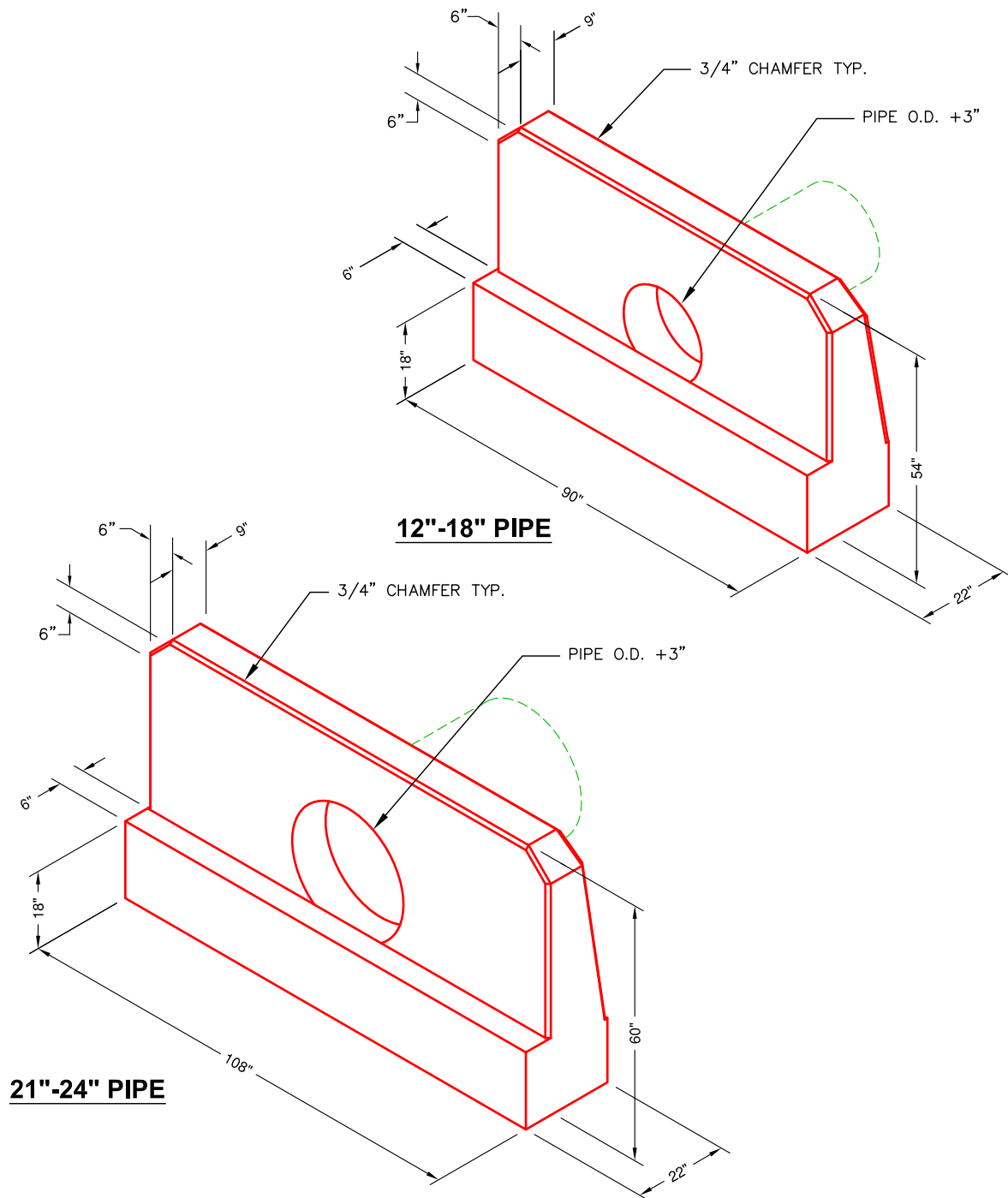
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Oldcastle Precast®

WATER

9'-0" x 1'-10" x 5'-0" MAX O.D.
STRAIGHT HEADWALL KDOT
MODEL #: S HW-KY



SPECIFICATIONS:

1. Concrete minimum compression strength:
F'c=5,000 PSI @ 28 days.
2. Reinforcing steel: ASTM A615, Fy=60,000 PSI

ITEMS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

**Oldcastle Precast
Tri-State Region**

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: 6" Globe Valve, Stainless Steel 150# Flanged TCI # TC-GBF

6" Globe Valve, Stainless Steel 150# Flanged TCI # TC-GBF

TCI Valves

\$2,242.20

★ ★ ★ ★ ★ (No reviews yet) Write a Review

SKU:
02-GBF-060

Weight:
132.30 LBS



Quantity:

▼

1

▲

0.0 ★★★★★

No rating available

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Description

6" Globe Valve, 316 Stainless Steel 150# Flanged TCI # TC-GBF

- Rising Stem
- OS&Y, Flexible Wedge
- Body: ASTM A351 Gr. CF8M
- Disc: ASTM A351 Gr. CF8M
- Stem: SS316
- Packing: PTFE
- Face to Face: ANSI B16.10
- Flange Dimensions: ANSI B16.5 150
- Test Standard: API 598
- NACE MR-0175 Full Compliance

Cut sheets are available on our [Downloads page](#).



STOP

104 376

Maximum load: 500 lbs / 227kg.
Maximum occupants: 2.
Occupants and equipment must
not exceed 500 lbs / 227kg.

TiteWeld™ 7-TW-4 Welded Steel

TiteWeld™ super narrow welded grating - ideal for those very tight spacing requirements when you need maximum “roll-a-bility.”

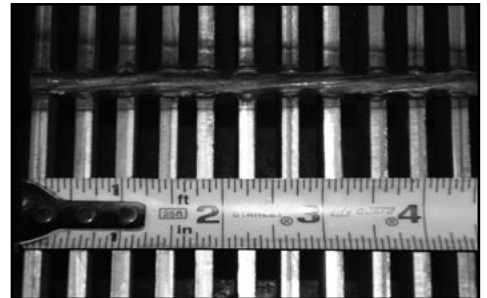
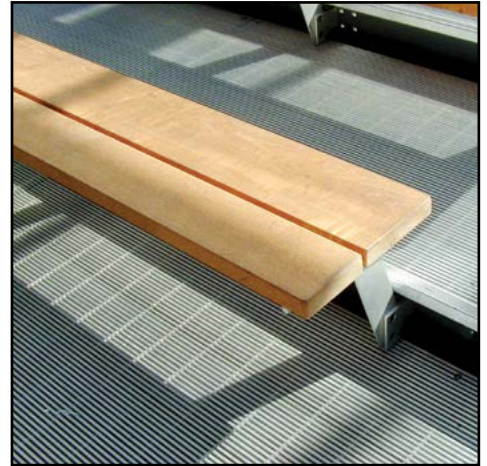
TiteWeld™ satisfies both ADA comfort requirements for wheel chairs and walking pedestrians.

TiteWeld™ is **IN STOCK** and ready to ship.

IN STOCK!!



Bar Size, Inches	Wt.* Lbs. Sq. Ft.	ClearSpan											
		2'- 0"	2'- 6"	3'- 0"	3'- 6"	4'- 0"	4'- 6"	5'- 0"	5'- 6"	6'- 0"	6'- 6"	7'- 0"	8'- 0"
3/4 x 3/16	13.73	U	1446	926	643	472	362	286	231	U - Safe uniform load in pounds/sq. ft. C - Safe concentrated load in pounds/ft. grating width D - Deflection in inches			
		D	.099	.155	.223	.304	.398	.503	.620				
		C	1446	1157	964	827	723	643	579				
		D	.079	.124	.179	.243	.318	.402	.497				
1 x 3/16	18.09	U	2571	1646	1143	840	643	508	411	340	286	Loads and deflections given in this table are theoretical, and are based on a unit stress of 18,000 psi.	
		D	.074	.116	.168	.228	.298	.377	.465	.563	.671		
		C	2571	2057	1714	1469	1286	1143	1029	935	857		
		D	.060	.093	.134	.182	.238	.302	.373	.451	.536		
1-1/4 x 3/16	22.45	U	4018	2571	1786	1312	1004	794	643	531	446	380	328
		D	.060	.093	.134	.182	.238	.302	.372	.450	.536	.629	.730
		C	4018	3214	2679	2296	2009	1786	1607	1461	1339	1236	1148
		D	.048	.074	.107	.146	.191	.241	.298	.360	.429	.503	.584
1-1/2 x 3/16	26.81	U	5786	3703	2571	1889	1446	1143	926	765	643	548	472
		D	.050	.078	.112	.152	.199	.251	.310	.375	.447	.525	.608
		C	5786	4629	3857	3306	2893	2571	2314	2104	1929	1780	1653
		D	.040	.062	.089	.122	.159	.201	.248	.300	.358	.420	.487
1-3/4 x 3/16	31.20	U	7875	5040	3500	2571	1969	1556	1260	1041	875	746	643
		D	.043	.067	.096	.130	.170	.216	.266	.322	.383	.450	.521
		C	7875	6300	5250	4500	3938	3500	3150	2864	2625	2423	2250
		D	.034	.053	.077	.104	.136	.172	.213	.258	.306	.360	.417
2 x 3/16	35.59	U	10286	6583	4572	3359	2571	2032	1646	1360	1143	974	840
		D	.037	.058	.084	.114	.149	.189	.233	.282	.335	.393	.456
		C	10286	8229	6857	5878	5143	4572	4114	3740	3429	3165	2939
		D	.030	.047	.067	.091	.119	.151	.186	.225	.268	.315	.365
2-1/4 x 3/16	39.92	U	13018	8332	5786	4251	3255	2571	2083	1721	1446	1232	1063
		D	.033	.052	.074	.101	.132	.168	.210	.250	.298	.350	.406
		C	13018	10414	8679	7439	6509	5786	5207	4734	4339	4006	3719
		D	.026	.041	.060	.081	.106	.134	.166	.200	.238	.280	.324
2-1/2 x 3/16	44.31	U	16072	10286	7143	5248	4018	3175	2571	2125	1786	1522	1312
		D	.030	.047	.067	.091	.119	.151	.186	.225	.268	.315	.365
		C	16072	12857	10714	9184	8036	7143	6429	5844	5357	4945	4592
		D	.030	.037	.054	.073	.095	.121	.149	.180	.215	.252	.292



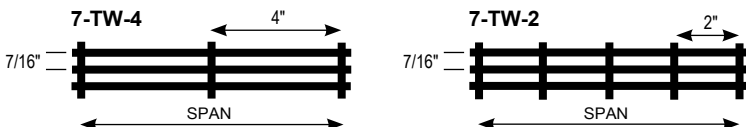
*Based on 27.429 bars/ft. of grating width. Bearing bars 7/16" c.c. Add .6 lbs./sq. ft. for 7-TW-2. 1/8" bearing bars available upon inquiry. Note: Grating for spans to the left of the heavy line have a deflection less than 1/4" for uniform loads of 100 lbs./sq. ft. This is the maximum deflection to afford pedestrian comfort and can be exceeded for other types of load at the discretion of the engineer. The actual "Ped (pedestrian) Span" under this condition is shown above for each size of grating. When serrated grating is specified, the depth of grating required for a specific load will be 1/4" greater than that shown in these tables. 3/4" x 3/16" serrated grating is NOT available.

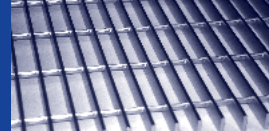
Panel Width Chart (in.) 7-TW-4 TiteWeld

Dimensions Are Out-to-Out of Bearing Bars**

No. of Bars	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
3/16" Bars	5/8	1-1/16	1-1/2	1-15/16	2-3/8	2-13/16	3-1/4	3-11/16	4-1/8	4-9/16	5	5-7/16	5-7/8	6-5/16	6-3/4
No. of Bars	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
3/16" Bars	7-3/16	7-5/8	8-1/16	8-1/2	8-15/16	9-3/8	9-13/16	10-1/4	10-11/16	11-1/8	11-9/16	12	12-7/16	12-7/8	13-5/16
No. of Bars	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
3/16" Bars	13-3/4	14-3/16	14-5/8	15-1/16	15-1/2	15-15/16	16-3/8	16-13/16	17-1/4	17-11/16	18-1/8	18-9/16	19	19-7/16	19-7/8
No. of Bars	47	48	49	50	51	52	53	54	55						
3/16" Bars	20-5/16	20-3/4	21-3/16	21-5/8	22-1/16	22-1/2	22-15/16	23-3/8	23-13/16						

**Add 1/4" for extended cross bars. Deduct 1/16" for 1/8" bearing bars. Standard panel widths indicated in bold.





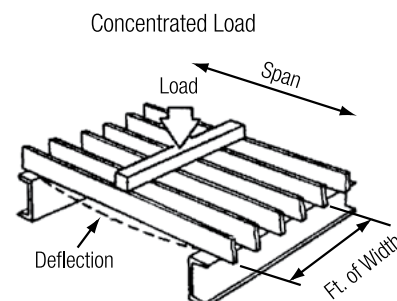
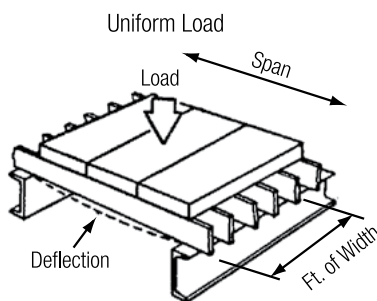
Light Duty Steel Design Criteria

The tables of safe loads which follow have been computed using the following design parameters:

- U** = Uniform Load - lbs/ft²
- C** = Concentrated Load - lbs/ft of grating width
- S** = Section Modulus - in³/ft of grating width
- I** = Moment of Inertia - in⁴/ft of grating width
- L** = Simple Clear Span - feet
- D** = Deflection - inches
- E** = Modulus of Elasticity (30,000,000 psi)
- F** = Allowable Bending Stress (18,000 psi)
- M** = Bending Moment

	Uniform Load	Concentrated Load
Step 1. Determine M:	$M = \frac{FS}{12}$	$M = \frac{FS}{12}$
Step 2. Determine U or C:	$U = \frac{8M}{L^2}$	$C = \frac{4M}{L}$
Step 3. Check D*	$D = \frac{5UL(L \times 12)^3}{384 EI}$	$D = \frac{C(L \times 12)^3}{48 EI}$

*Deflection should be limited to 1/4" under 100# uniform load to afford pedestrian comfort.

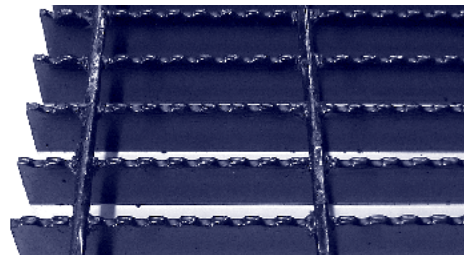


Light Duty Welded Steel (W Series)

HOW TO SPECIFY:

- Grating:** Light Duty Welded Steel W Series.
- Bearing Bars:** Rectangular Bar on 1-3/16" centers maximum. (**Note:** Other spacings may be specified at the discretion of the architect/engineer.)
- Cross Bars:** Electroforge welded at right angles to bearing bars at 4" centers maximum. (**Note:** 2" cross bar centers may be specified at the discretion of the architect/engineer.)
- Surface:** Plain. (**Note:** A serrated surface may be specified for maximum skid resistance.)
- Loading:** Grating to carry a pedestrian loading equal to 100# per square foot over the required clear span with deflection not to exceed 1/4". (**Note:** Alternate loading requirements may be specified at the discretion of the architect/engineer.)
- Finish:** Galvanized or manufacturer's standard black paint at the discretion of the architect/engineer.
- Fabrication and Tolerances:** In accordance with the NAAMM Metal Bar Grating Manual.

For those areas requiring the corrosion resistance of stainless steel, Direct Metals stocks 1" x 3/16", 1-1/4" x 3/16" and 1-1/2" x 3/16" 19-W-4 Type 304 stainless steel electroforge welded grating. Since the welding process discolors the stainless surface, this grating is best suited for industrial applications only and should not be specified where cosmetic appearance is important.



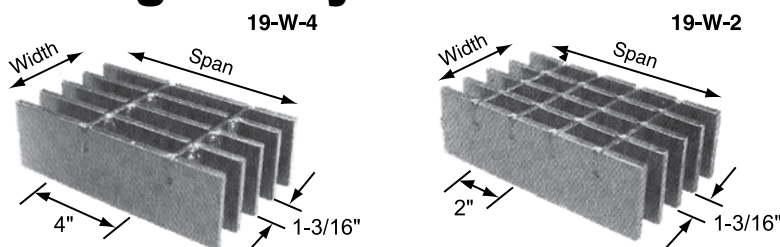
Serrated Surface

GRATING TYPES - LIGHT DUTY WELDED STEEL W SERIES

19-W-4 1-3/16"	4"	19-W-2 1-3/16"	2"
SPAN		SPAN	
15-W-4 15/16"	4"	15-W-2 15/16"	2"
SPAN		SPAN	
11-W-4 11/16"	4"	11-W-2 11/16"	2"
SPAN		SPAN	
7-TW-4 7/16"	4"		
SPAN			

NOTE: 2" cross bar spacing not available in 7-W spacing.

Light Duty Welded Steel



Bar Size, Inches	Ped Span Inches	Wt.* Lbs. Sq. Ft.	Sec. Prop S _x *, in ³ I _x *, in ⁴	Clear Span														
				2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	8'-0"			
			U	D	C	D	U	D	C	D	U	D	C	D	U	D	C	D
3/4 x 3/16	46	5.43	0.178	U	533	341	237	174	133									
				D	0.099	0.155	0.224	0.304	0.397									
			0.067	C	533	426	355	305	266									
				D	0.079	0.124	0.179	0.244	0.317									
1 x 1/8	51	4.88	0.211	U	632	404	281	206	158	125								
				D	0.075	0.116	0.168	0.228	0.298	0.378								
			0.105	C	632	505	421	361	316	281								
				D	0.060	0.093	0.134	0.183	0.239	0.302								
1 x 3/16	57	7.04	0.316	U	947	606	421	309	237	187	152							
				D	0.074	0.116	0.168	0.228	0.298	0.377	0.467							
			0.158	C	947	758	632	541	474	421	379							
				D	0.060	0.093	0.134	0.182	0.239	0.302	0.372							
1-1/4 x 1/8	61	5.96	0.329	U	987	632	439	322	247	195	158	130						
				D	0.060	0.093	0.134	0.182	0.239	0.302	0.373	0.449						
			0.206	C	987	789	658	564	493	439	395	359						
				D	0.048	0.074	0.107	0.146	0.191	0.242	0.298	0.361						
1-1/4 x 3/16	67	8.64	0.493	U	1480	947	658	483	370	292	237	196	164					
				D	0.060	0.093	0.134	0.182	0.238	0.301	0.373	0.451	0.535					
			0.308	C	1480	1184	987	846	740	658	592	538	493					
				D	0.048	0.074	0.107	0.146	0.191	0.241	0.298	0.360	0.429					
1-1/2 x 1/8	70	7.04	0.474	U	1421	909	632	464	355	281	227	188	158					
				D	0.050	0.078	0.112	0.152	0.198	0.252	0.310	0.376	0.447					
			0.355	C	1421	1137	947	812	711	632	568	517	474					
				D	0.040	0.062	0.089	0.122	0.159	0.201	0.248	0.300	0.358					
1-1/2 x 3/16	77	10.25	0.711	U	2132	1364	947	696	533	421	341	282	237	202				
				D	0.050	0.078	0.112	0.152	0.199	0.251	0.310	0.376	0.447	0.525				
			0.533	C	2132	1705	1421	1218	1066	947	853	775	711	656				
				D	0.040	0.062	0.089	0.122	0.159	0.201	0.248	0.301	0.358	0.420				
1-3/4 x 3/16	87	11.87	0.967	U	2901	1857	1289	947	725	573	464	384	322	275	237	181		
				D	0.043	0.067	0.096	0.130	0.170	0.215	0.266	0.322	0.383	0.450	0.522	0.680		
			0.846	C	2901	2321	1934	1658	1451	1289	1160	1055	967	893	829	725		
				D	0.034	0.053	0.077	0.104	0.136	0.172	0.213	0.257	0.306	0.360	0.417	0.545		
2 x 3/16	96	13.48	1.263	U	3789	2425	1684	1237	947	749	606	501	421	359	309	237		
				D	0.037	0.058	0.084	0.114	0.149	0.189	0.233	0.282	0.335	0.394	0.456	0.596		
			1.263	C	3789	3032	2526	2165	1895	1684	1516	1378	1263	1166	1083	947		
				D	0.030	0.047	0.067	0.091	0.119	0.151	0.186	0.225	0.268	0.315	0.365	0.477		
2-1/4 x 3/16	105	15.08	1.599	U	4796	3069	2132	1566	1199	947	767	634	533	454	392	300		
				D	0.033	0.052	0.074	0.101	0.132	0.168	0.207	0.250	0.298	0.350	0.406	0.530		
			1.798	C	4796	3837	3197	2741	2398	2132	1918	1744	1599	1476	1370	1199		
				D	0.026	0.041	0.060	0.081	0.106	0.134	0.165	0.200	0.238	0.280	0.324	0.424		
2-1/2 x 3/16	113	16.70	1.974	U	5921	3789	2632	1933	1480	1170	947	783	658	561	483	370		
				D	0.030	0.047	0.067	0.091	0.119	0.151	0.186	0.225	0.268	0.315	0.365	0.477		
			2.467	C	5921	4737	3947	3383	2960	2632	2368	2153	1974	1822	1692	1480		
				D	0.024	0.037	0.054	0.073	0.095	0.121	0.149	0.180	0.215	0.252	0.292	0.381		

U - Safe uniform load in pounds sq. ft.
C - Safe concentrated load in pounds/ft. grating width
D - Deflection in inches

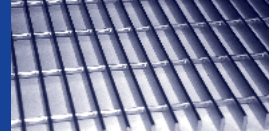
Loads and deflections given in this table are theoretical, and based on a unit stress of 18,000 psi.

*Based on 10.105 bars/ft. of grating width. Bearing bars 1-3/16" c.c. Add .6 lbs./sq. ft. for 19-SGCS-2. Note: Grating for spans to the left of the heavy line have a deflection less than 1/4" for uniform loads of 100 lbs./sq. ft. This is the maximum deflection to afford pedestrian comfort and can be exceeded for other types of load at the discretion of the engineer. The actual Ped (pedestrian) Span under this condition is shown above for each size of grating. When serrated grating is specified, the depth of grating required for a specific load will be 1/4" greater than that shown in these tables. 3/4" x 3/16" serrated grating is not available.

Panel Width Chart (in.) - 19-W-4, 19-W-2, 19-DT-4, 19-DT-2, 19-SGCS-4 & 19-SGCS-2 Dimensions Are Out-to-Out of Bearing Bars**

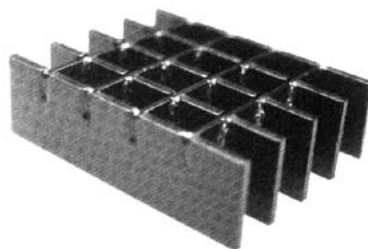
No. of Bars	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
3/16" Bars	1-3/8	2-9/16	3-3/4	4-15/16	6-1/8	7-5/16	8-1/2	9-11/16	10-7/8	12-1/16	13-1/4	14-7/16	15-5/8	16-13/16	18
No. of Bars	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
3/16" Bars	19-3/16	20-3/8	21-9/16	22-3/4	23-15/16	25-1/8	26-5/16	27-1/2	28-11/16	29-7/8	31-1/16	32-1/4	33-7/16	34-5/8	35-13/16

**Add 1/4" for extended cross bars. Deduct 1/16" for 1/8" bearing bars. Standard panel widths indicated in blue.

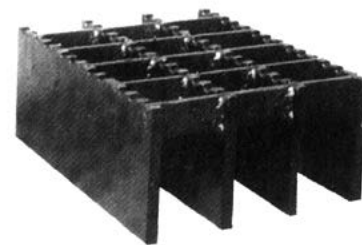


Heavy Duty Welded Steel (W Series)

Heavy duty welded grating ranges in size from 1-1/4" X 1/4" bearing bars through 6" x 1/2" (7" bearing bars available by inquiry). Standard bearing bar spacings are 15/16", 13/16", 1-3/8", 1-7/8" and 2-3/8" center-to-center. See pages 25 and 27 for standard cross bar design. Rectangular cross bars are also available. Standard cross bar spacings are 4" or 2" center-to-center.



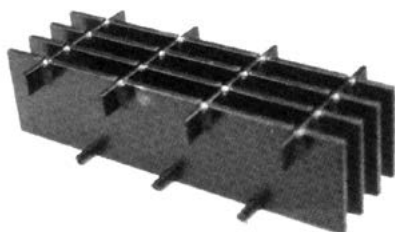
Plain Surface



Serrated Surface

HOW TO SPECIFY:

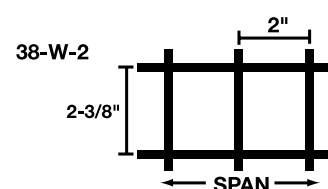
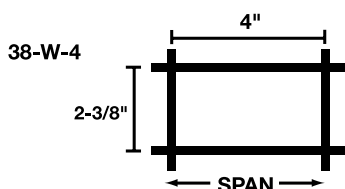
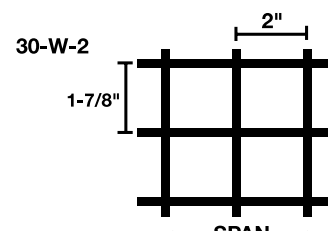
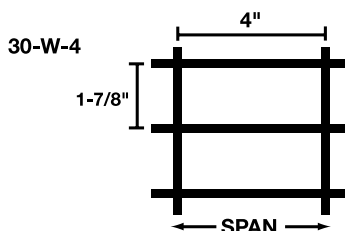
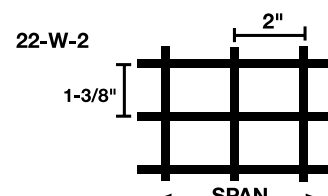
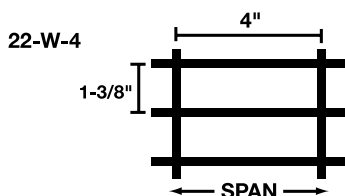
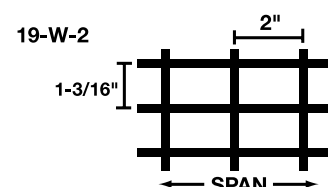
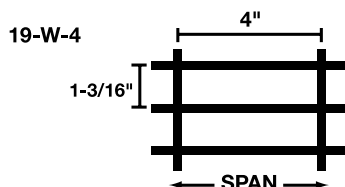
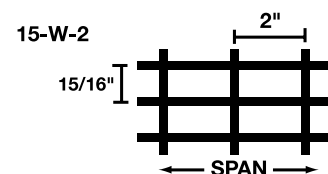
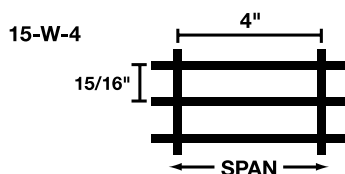
- Grating:** Heavy Duty Welded Steel W Series by Direct Metals or approved equal.
- Bearing Bars:** To be (size) rectangular bar spaced (as specified) inches center-to-center. (**Note:** Bearing bar size selection and spacing must be coordinated with the load and span conditions.)
- Cross Bars:** To be (size) spaced 4" center-to-center and welded at right angles to bearing bars with one fillet at each bearing bar/cross bar intersection. (**Note:** 2" cross bar spacing may be specified for maximum lateral stability.)
- Surface:** Plain. (**Note:** A serrated surface may be specified for maximum skid resistance.)
- Loading:** Shall be specified by the architect/engineer in terms of uniform load/sq. ft., concentrated load/ft. of grating width or by AASHTO wheel load designation. Loading, bearing bar size, bearing bar spacing and span conditions must be coordinated.
- Finish:** Galvanized or manufacturer's standard black paint at the discretion of the architect/engineer.
- Fabrication and Tolerances:** In accordance with the NAAMM Heavy Duty Metal Bar Grating Manual.



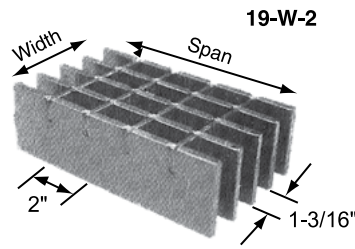
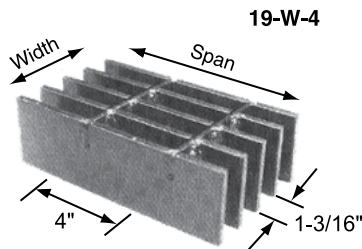
For traffic areas running perpendicular to the span direction, supplementary bottom cross bars may be specified to provide added lateral stability and impact resistance.

SLIP-NOT Grip Grate Safety Surface Available

GRATING TYPES HEAVY DUTY WELDED STEEL W SERIES



Heavy Duty Welded Steel 19-W-4/19-W-2



		%Open Area*				
BB Size	CB Ctrs	Bearing Bar Thickness				
		1/4"	5/16"	3/8"	1/2"	
Thru 2 - 1/2"	4"cc	72%	67%	62%	—	
	2"cc	65%	61%	56%	—	
3" to 6"	4"cc	74%	69%	64%	54%	
	2"cc	70%	65%	60%	51%	

Bar Size, Inches	Wt.** Lbs. Sq. Ft	Section Properties		Maximum Safe Clear Span, Inches- Partially Distributed Load			
		Sx**, in ³ Ft. Width	Ix**, in ⁴ Ft. Width				
				1 Ton	3 Ton	5 Ton	H15/H20
1 x 1/4	9.71	0.421	0.211	7	6	7	9
1 x 3/8	14.01	0.632	0.316	9	8	9	11
1 - 1/4 x 1/4	11.87	0.658	0.411	10	8	9	12
1 - 1/4 x 3/8	17.23	0.987	0.617	14	10	12	14
1 - 1/2 x 1/4	14.01	0.947	0.711	13	10	11	14
1 - 1/2 x 5/16	17.23	1.184	0.888	16	11	13	16
1 - 1/2 x 3/8	20.46	1.421	1.066	19	13	14	18
1 - 3/4 x 1/4	16.16	1.289	1.128	17	12	14	17
1 - 3/4 x 3/8	23.67	1.934	1.692	25	17	18	21
2 x 1/4	18.30	1.684	1.684	22	15	16	20
2 x 5/16	22.60	2.105	2.105	28	18	19	23
2 x 3/8	26.89	2.526	2.526	33	21	22	26
2 - 1/4 x 1/4	20.46	2.132	2.398	28	18	19	23
2 - 1/4 x 3/8	30.12	3.197	3.597	41	26	26	31
2 - 1/2 x 1/4	22.60	2.632	3.289	34	22	22	27
2 - 1/2 x 5/16	27.96	3.289	4.112	42	27	27	31
2 - 1/2 x 3/8	33.34	3.947	4.934	50	31	31	36
3 x 1/4	28.32	3.789	5.684	49	30	30	35
3 x 5/16	34.76	4.737	7.105	60	37	36	42
3 x 3/8	41.20	5.684	8.526	67*	44	43	49
3 x 1/2	54.09	7.579	11.368	78*	57	55	61*
3 - 1/2 x 1/4	32.61	5.158	9.026	66	40	39	45
3 - 1/2 x 3/8	47.65	7.737	13.539	85*	58	56	64
3 - 1/2 x 1/2	62.67	10.316	18.052	96	75*	72*	76*
4 x 1/4	36.91	6.737	13.473	85*	51	50	57
4 x 5/16	45.50	8.421	16.842	95*	63	61	70
4 x 3/8	54.09	10.105	20.210	96	75	72	80*
4 x 1/2	71.26	13.473	26.947	96	91*	88*	92*
4 - 1/2 x 1/4	41.20	8.526	19.184	96	64	61	70
4 - 1/2 x 3/8	60.53	12.789	28.776	96	94*	90	95*
4 - 1/2 x 1/2	79.85	17.052	38.367	96	96	96	96
5 x 1/4	45.50	10.526	26.315	96	78	75	85
5 x 5/16	56.24	13.158	32.894	96	96	92	96
5 x 3/8	66.97	15.789	39.473	96	96	96	96
5 x 1/2	88.44	21.052	52.630	96	96	96	96
5 - 1/2 x 1/4	49.79	12.737	35.025	96	94	89	96
5 - 1/2 x 3/8	73.42	19.105	52.538	96	96	96	96
5 - 1/2 x 1/2	97.03	25.473	70.051	96	96	96	96
6 x 1/4	54.09	15.158	45.473	96	96	96	96
6 x 5/16	66.97	18.947	56.841	96	96	96	96
6 x 3/8	79.85	22.736	68.209	96	96	96	96
6 x 1/2	105.62	30.315	90.945	96	96	96	96

*Span limited to 1/400 of span = Deflection. **Based on 10.105 bars/ft of grating width. Bearing bars 1-3/16" c.c.

When serrated grating is specified, the depth of grating required for a specified load will be 1/4" greater than that shown in these tables. Weights shown are for 4" cross bar centers. Add 1.13 lbs./sq. ft. (3/8" Dia.) or 2.55 lbs./sq. ft. (1" x 1/4") for 2" cross bar centers. Cross bars are determined based on project applications and bearing bar height.

Heavy Duty Welded Steel - 19 Space

Bar Size Inches	Maximum Safe Concentrated Load*, Lbs. - Clear Span																																													
	1'- 0"	1'- 6"	2'- 0"	2'- 6"	3'- 0"	3'- 6"	4'- 0"	4'- 6"	5'- 0"	5'- 6"	6'- 0"	7'- 0"	8'- 0"																																	
1 x 1/4	2807	1871	1403	1123	936	802	% Open Area* <table><tr><th rowspan="2">BB Size</th><th rowspan="2">CB Ctrs</th><th colspan="4">Bearing Bar Thickness</th></tr><tr><th>1/4"</th><th>5/16"</th><th>3/8"</th><th>1/2"</th></tr><tr><td>Thru 2-1/2"</td><td>4" cc</td><td>72%</td><td>67%</td><td>62%</td><td>—</td></tr><tr><td rowspan="2">3" to 6"</td><td>2" cc</td><td>65%</td><td>61%</td><td>56%</td><td>—</td></tr><tr><td>4" cc</td><td>74%</td><td>69%</td><td>64%</td><td>54%</td></tr><tr><td></td><td>2" cc</td><td>70%</td><td>65%</td><td>60%</td><td>51%</td></tr></table>	BB Size	CB Ctrs	Bearing Bar Thickness				1/4"	5/16"	3/8"	1/2"	Thru 2-1/2"	4" cc	72%	67%	62%	—	3" to 6"	2" cc	65%	61%	56%	—	4" cc	74%	69%	64%	54%		2" cc	70%	65%	60%	51%	Loads are theoretical, and are based on a unit stress of 20,000 psi.					
BB Size	CB Ctrs	Bearing Bar Thickness																																												
		1/4"	5/16"	3/8"	1/2"																																									
Thru 2-1/2"	4" cc	72%	67%	62%	—																																									
3" to 6"	2" cc	65%	61%	56%	—																																									
	4" cc	74%	69%	64%	54%																																									
	2" cc	70%	65%	60%	51%																																									
1 x 3/8	4213	2809	2107	1685	1404	1204																																								
1-1/4 x 1/4	4387	2924	2193	1755	1462	1253		1097																																						
1-1/4 x 3/8	6580	4387	3290	2632	2193	1880		1645																																						
1-1/2 x 1/4	6313	4209	3157	2525	2104	1804	1578	1403																																						
1-1/2 x 5/16	7893	5262	3947	3157	2631	2255	1973	1754																																						
1-1/2 x 3/8	9473	6316	4737	3789	3158	2707	2368	2105																																						
1-3/4 x 1/4	8593	5729	4297	3437	2864	2455	2148	1910	1719																																					
1-3/4 x 3/8	12893	8596	6447	5157	4298	3684	3223	2865	2579																																					
2 x 1/4	11227	7484	5613	4491	3742	3208	2807	2495	2245																																					
2 x 5/16	14033	9356	7017	5613	4678	4010	3508	3119	2807																																					
2 x 3/8	16840	11227	8420	6736	5613	4811	4210	3742	3368																																					
2-1/4 x 1/4	14213	9476	7107	5685	4738	4061	3553	3159	2843					2584																																
2-1/4 x 3/8	21313	14209	10657	8525	7104	6090	5328	4736	4263					3875																																
2-1/2 x 1/4	17547	11698	8773	7019	5849	5013	4387	3899	3509					3190	2924																															
2-1/2 x 5/16	21927	14618	10963	8771	7309	6265	5482	4873	4385					3987	3654																															
2-1/2 x 3/8	26313	17542	13157	10525	8771	7518	6578	5847	5263					4784	4386																															
3 x 1/4	25260	16840	12630	10104	8420	7217	6315	5613	5052					4593	4210																															
3 x 5/16	31580	21053	15790	12632	10527	9023	7895	7018	6316					5742	5263																															
3 x 3/8	37893	25262	18947	15157	12631	10827	9473	8421	7579	6890	6316																																			
3 x 1/2	50527	33684	25263	20211	16842	14436	12632	11228	10105	9187	8421																																			
3-1/2 x 1/4	34387	22924	17193	13755	11462	9825	8597	7641	6877	6252	5731	4912																																		
3-1/2 x 3/8	51580	34387	25790	20632	17193	14737	12895	11462	10316	9378	8597	7369																																		
3-1/2 x 1/2		45849	34387	27509	22924	19650	17193	15283	13755	12504	11462	9825																																		
4 x 1/4		29942	22457	17965	14971	12832	11228	9981	8983	8166	7486	6416																																		
4 x 5/16		37427	28070	22456	18713	16040	14035	12476	11228	10207	9357	8020																																		
4 x 3/8		44911	33683	26947	22456	19248	16842	14970	13473	12248	11228	9624																																		
4 x 1/2		59880	44910	35928	29940	25663	22455	19960	17964	16331	14970	12831																																		
4-1/2 x 1/4		37893	28420	22736	18947	16240	14210	12631	11368	10335	9473	8120	7105																																	
4-1/2 x 3/8		56840	42630	34104	28420	24360	21315	18947	17052	15502	14210	12180	10658																																	
4-1/2 x 1/2			56840	45472	37893	32480	28420	25262	22736	20669	18947	16240	14210																																	
5 x 1/4			35087	28069	23391	20050	17543	15594	14035	12759	11696	10025	8772																																	
5 x 5/16			43860	35088	29240	25063	21930	19493	17544	15949	14620	12531	10965																																	
5 x 3/8			52630	42104	35087	30074	26315	23391	21052	19138	17543	15037	13158																																	
5 x 1/2				56139	46782	40099	35087	31188	28069	25518	23391	20050	17543																																	
5-1/2 x 1/4				33965	28304	24261	21228	18870	16983	15439	14152	12130	10614																																	
5-1/2 x 3/8				50947	42456	36390	31842	28304	25473	23158	21228	18195	15921																																	
5-1/2 x 1/2					56607	48520	42455	37738	33964	30876	28303	24260	21228																																	
6 x 1/4					33684	28872	25263	22456	20211	18373	16842	14436	12632																																	
6 x 5/16					42104	36090	31578	28070	25263	22966	21052	18045	15789																																	
6 x 3/8					50524	43307	37893	33683	30315	27559	25262	21653	18947																																	
6 x 1/2						57743	50525	44911	40420	36745	33683	28871	25263																																	

% Open Area*					
BB Size	CB Ctrs	Bearing Bar Thickness			
		1/4"	5/16"	3/8"	1/2"
Thru 2-1/2"	4" cc	72%	67%	62%	—
	2" cc	65%	61%	56%	—
3" to 6"	4" cc	74%	69%	64%	54%
	2" cc	70%	65%	60%	51%

Loads are theoretical, and are based on a unit stress of 20,000 psi.

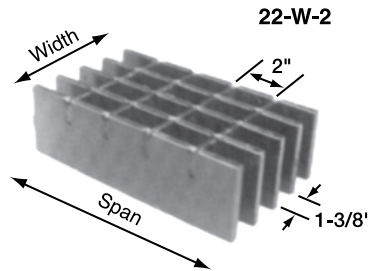
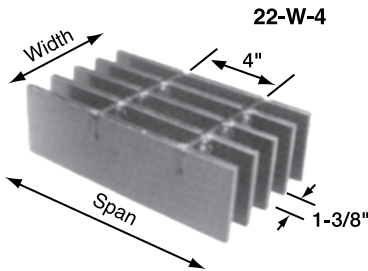
*Based on 10.105 bars / ft. of grating width. Bearing bars 1-3/16" c.c. Note: When serrated grating is specified, the depth of grating required for a specific load will be 1/4" greater than that shown in these tables.

Panel Width Chart (in.) - 19-W-4 & 19-W-2 Dimensions Are Out-to-Out of Bearing Bars**

No. of Bars	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1/4" Bars	1-7/16	2-5/8	3-13/16	5	6-3/16	7-3/8	8-9/16	9-3/4	10-15/16	12-1/8	13-5/16	14-1/2	15-11/16	16-7/8	18-1/16
5/16" Bars	1-1/2	2-11/16	3-7/8	5-1/16	6-1/4	7-7/16	8-5/8	9-13/16	11	12-3/16	13-3/8	14-9/16	15-3/4	16-15/16	18-1/8
3/8" Bars	1-9/16	2-3/4	3-15/16	5-1/8	6-5/16	7-1/2	8-11/16	9-7/8	11-1/16	12-1/4	13-7/16	14-5/8	15-13/16	17	18-3/16
1/2" Bars	1-11/16	2-7/8	4-1/16	5-1/4	6-7/16	7-5/8	8-13/16	10	11-3/16	12-3/8	13-9/16	14-3/4	15-15/16	17-1/8	18-5/16

No. of Bars	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1/4" Bars	19-1/4	20-7/16	21-5/8	22-13/16	24	25-3/16	26-3/8	27-9/16	28-3/4	29-15/16	31-1/8	32-5/16	33-1/2	34-11/16	35-7/8
5/16" Bars	19-5/16	20-1/2	21-11/16	22-7/8	24-1/16	25-1/4	26-7/16	27-5/8	28-13/16	30	31-3/16	32-3/8	33-9/16	34-3/4	35-15/16
3/8" Bars	19-3/8	20-9/16	21-3/4	22-15/16	24-1/8	25-5/16	26-1/2	27-11/16	28-7/8	30-1/16	31-1/4	32-7/16	33-5/8	34-13/16	36
1/2" Bars	19-1/2	20-11/16	21-7/8	23-1/16	24-1/4	25-7/16	26-5/8	27-13/16	29	30-3/16	31-3/8	32-9/16	33-3/4	34-15/16	36-1/8

Heavy Duty Welded Steel 22-W-4/22-W-2



%Open Area*					
BB Size	CB Ctrs	Bearing Bar Thickness			
		1/4"	5/16"	3/8"	1/2"
Thru	4"cc	75%	70%	66%	—
2 - 1/2"	2"cc	68%	64%	60%	—
3" to 6"	4"cc	77%	72%	68%	60%
	2"cc	72%	68%	64%	56%

Bar Size, Inches	Wt.** Lbs. Sq. Ft	Section Properties		Maximum Safe Clear Span, Inches- Partially Distributed Load			
		Sx**, in ³ Ft. Width	Ix**, in ⁴ Ft. Width	1 Ton	3 Ton	5 Ton	H15/H20
1 x 1/4	8.54	0.364	0.182	6	6	7	9
1 x 3/8	12.25	0.545	0.273	9	7	9	11
1 - 1/4 x 1/4	10.40	0.568	0.355	9	7	9	11
1 - 1/4 x 3/8	15.04	0.852	0.533	13	9	11	13
1 - 1/2 x 1/4	12.25	0.818	0.614	12	9	11	13
1 - 1/2 x 5/16	15.04	1.023	0.767	15	11	12	15
1 - 1/2 x 3/8	17.82	1.227	0.920	18	12	13	16
1 - 3/4 x 1/4	14.11	1.114	0.974	16	11	13	15
1 - 3/4 x 3/8	20.59	1.670	1.462	23	15	16	20
2 x 1/4	15.96	1.455	1.455	21	14	15	18
2 x 5/16	19.67	1.818	1.818	25	17	17	21
2 x 3/8	23.38	2.182	2.182	30	19	20	24
2 - 1/4 x 1/4	17.82	1.841	2.071	26	17	18	21
2 - 1/4 x 3/8	26.16	2.761	3.106	38	24	24	28
2 - 1/2 x 1/4	19.67	2.273	2.841	31	20	20	24
2 - 1/2 x 5/16	24.30	2.841	3.551	39	24	24	29
2 - 1/2 x 3/8	28.95	3.409	4.261	46	28	28	33
3 x 1/4	24.80	3.273	4.909	45	27	27	32
3 x 5/16	30.37	4.091	6.136	55	33	33	38
3 x 3/8	35.93	4.909	7.363	64*	40	38	44
3 x 1/2	47.06	6.545	9.818	74*	52	50	57*
3 - 1/2 x 1/4	28.51	4.454	7.795	60	36	35	41
3 - 1/2 x 3/8	41.50	6.682	11.693	81*	53	50	58
3 - 1/2 x 1/2	54.48	8.909	15.590	94*	69	66	71*
4 x 1/4	32.22	5.818	11.636	78	46	45	51
4 x 5/16	39.64	7.273	14.545	91*	57	54	62
4 x 3/8	47.06	8.727	17.454	96	68	64	73
4 x 1/2	61.89	11.636	23.272	96	86*	83*	87*
4 - 1/2 x 1/4	35.93	7.363	16.568	96	58	55	63
4 - 1/2 x 3/8	52.63	11.045	24.851	96	85	80	89*
4 - 1/2 x 1/2	69.31	14.727	33.135	96	96	96	96
5 x 1/4	39.64	9.091	22.727	96	71	67	76
5 x 5/16	48.92	11.363	28.408	96	88	82	92
5 x 3/8	58.18	13.636	34.090	96	96	96	96
5 x 1/2	76.73	18.181	45.453	96	96	96	96
5 - 1/2 x 1/4	43.35	11.000	30.249	96	85	80	90
5 - 1/2 x 3/8	63.75	16.499	45.374	96	96	96	96
5 - 1/2 x 1/2	84.15	21.999	60.498	96	96	96	96
6 x 1/4	47.06	13.091	39.272	96	96	94	96
6 x 5/16	58.18	16.363	49.089	96	96	96	96
6 x 3/8	69.31	19.636	58.907	96	96	96	96
6 x 1/2	91.57	26.181	78.543	96	96	96	96

*Span limited to 1/400 of span = Deflection. **Based on 8.727 bars/ft of grating width. Bearing bars 1-3/8" c.c.

When serrated grating is specified, the depth of grating required for a specified load will be 1/4" greater than that shown in these tables. Weights shown are for 4" cross bar centers. Add 1.13 lbs./sq. ft. (3/8" Dia.) or 2.55 lbs./sq. ft. (1" x 1/4") for 2" cross bar centers. Cross bars are determined based on project applications and bearing bar height.

Heavy Duty Welded Steel - 22 Space

Bar Size, Inches	Maximum Safe Concentrated Load*, Lbs. - Clear Span												
	1'-0"	1'-6"	2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	7'-0"	8'-0"
1 x 1/4	2427	1618	1213	971	809	693							
1 x 3/8	3633	2422	1817	1453	1211	1038							
1 - 1/4 x 1/4	3787	2524	1893	1515	1262	1082	947						
1 - 1/4 x 3/8	5680	3787	2840	2272	1893	1623	1420						
1 - 1/2 x 1/4	5453	3636	2727	2181	1818	1558	1363	1212					
1 - 1/2 x 5/16	6820	4547	3410	2728	2273	1949	1705	1516					
1 - 1/2 x 3/8	8180	5453	4090	3272	2727	2337	2045	1818					
1 - 3/4 x 1/4	7427	4951	3713	2971	2476	2122	1857	1650	1485				
1 - 3/4 x 3/8	11133	7422	5567	4453	3711	3181	2783	2474	2227				
2 x 1/4	9700	6467	4850	3880	3233	2771	2425	2156	1940				
2 x 5/16	12120	8080	6060	4848	4040	3463	3030	2693	2424				
2 x 3/8	14547	9698	7273	5819	4849	4156	3637	3233	2909				
2 - 1/4 x 1/4	12273	8182	6137	4909	4091	3507	3068	2727	2455	2232			
2 - 1/4 x 3/8	18407	12271	9203	7363	6136	5259	4602	4090	3681	3347			
2 - 1/2 x 1/4	15153	10102	7577	6061	5051	4330	3788	3367	3031	2755	2526		
2 - 1/2 x 5/16	18940	12627	9470	7576	6313	5411	4735	4209	3788	3444	3157		
2 - 1/2 x 3/8	22727	15151	11363	9091	7576	6493	5682	5050	4545	4132	3788		
3 x 1/4	21820	14547	10910	8728	7273	6234	5455	4849	4364	3967	3637		
3 x 5/16	27273	18182	13637	10909	9091	7792	6818	6061	5455	4959	4546		
3 x 3/8	32727	21818	16363	13091	10909	9350	8182	7273	6545	5950	5454		
3 x 1/2	43633	29089	21817	17453	14544	12467	10908	9696	8727	7933	7272		
3 - 1/2 x 1/4	29693	19796	14847	11877	9898	8484	7423	6599	5939	5399	4949	4242	
3 - 1/2 x 3/8	44547	29698	22273	17819	14849	12728	11137	9899	8909	8099	7424	6364	
3 - 1/2 x 1/2	59393	39596	29697	23757	19798	16970	14848	13199	11879	10799	9899	8485	
4 x 1/4	38787	25858	19393	15515	12929	11082	9697	8619	7757	7052	6464	5541	
4 x 5/16	48487	32324	24243	19395	16162	13853	12122	10775	9697	8816	8081	6927	
4 x 3/8	58180	38787	29090	23272	19393	16623	14545	12929	11636	10578	9697	8311	
4 x 1/2		51716	38787	31029	25858	22164	19393	17239	15515	14104	12929	11082	
4 - 1/2 x 1/4		32724	24543	19635	16362	14025	12272	10908	9817	8925	8181	7012	6136
4 - 1/2 x 3/8		49089	36817	29453	24544	21038	18404	16363	14727	13388	12272	10519	9204
4 - 1/2 x 1/2			49090	39272	32727	28051	24545	21818	19636	17851	16363	14026	12273
5 x 1/4			30303	24243	20202	17316	15152	13468	12121	11019	10101	8658	7576
5 x 5/16			37877	30301	25251	21644	18938	16834	15151	13773	12626	10822	9469
5 x 3/8			45453	36363	30302	25973	22727	20201	18181	16528	15151	12987	11363
5 x 1/2				48483	40402	34630	30302	26935	24241	22038	20201	17315	15151
5 - 1/2 x 1/4				29333	24444	20952	18333	16296	14667	13333	12222	10476	9167
5 - 1/2 x 3/8				43997	36664	31427	27498	24443	21999	19999	18332	15713	13749
5 - 1/2 x 1/2				58664	48887	41903	36665	32591	29332	26665	24443	20951	18333
6 x 1/4				34909	29091	24935	21818	19394	17455	15868	14546	12468	10909
6 x 5/16				43635	36362	31168	27272	24241	21817	19834	18181	15584	13636
6 x 3/8				52363	43636	37402	32727	29090	26181	23801	21818	18701	16363
6 x 1/2					58180	49869	43635	38787	34908	31735	29090	24934	21818

%Open Area*					
BB Size	CB Chs	Bearing Bar Thickness			
		1/4"	5/16"	3/8"	1/2"
Thru 2 - 1/2"	4"cc	75%	70%	66%	—
	2"cc	68%	64%	60%	—
3" to 6"	4"cc	77%	72%	68%	60%
	2"cc	72%	68%	64%	56%

Loads are theoretical, and are based on a unit stress of 20,000 psi.

%Open Area*					
BB Size	CB Chs	Bearing Bar Thickness			
		1/4"	5/16"	3/8"	1/2"
Thru	4"cc	75%	70%	66%	—
2 - 1/2"	2"cc	68%	64%	60%	—
3" to 6"	4"cc	77%	72%	68%	60%
	2"cc	72%	68%	64%	56%

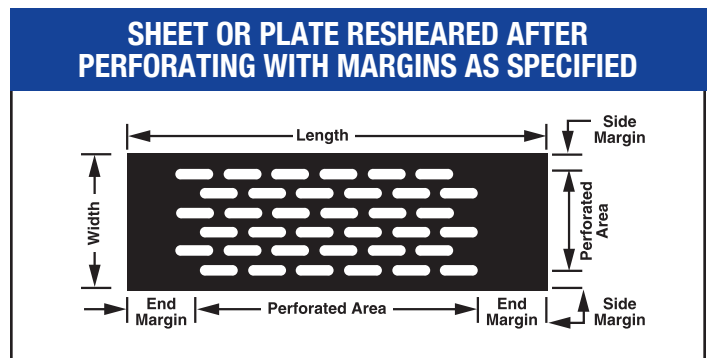
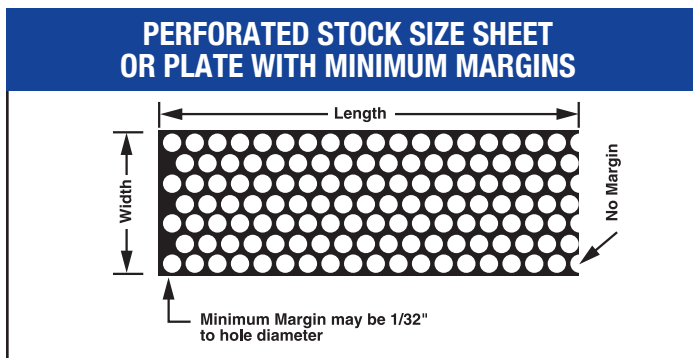
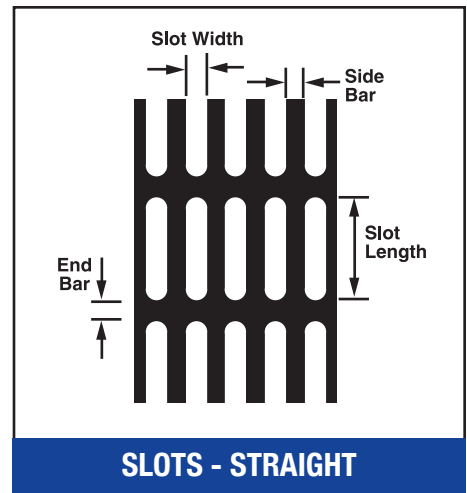
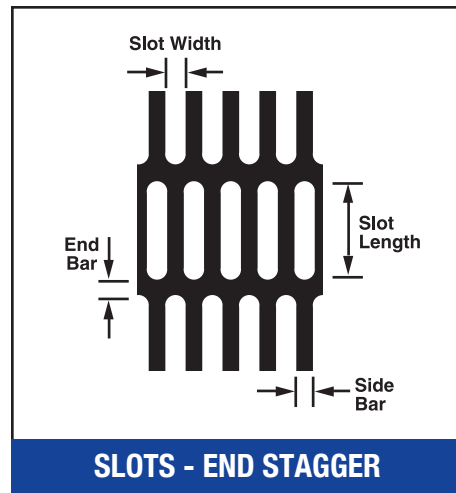
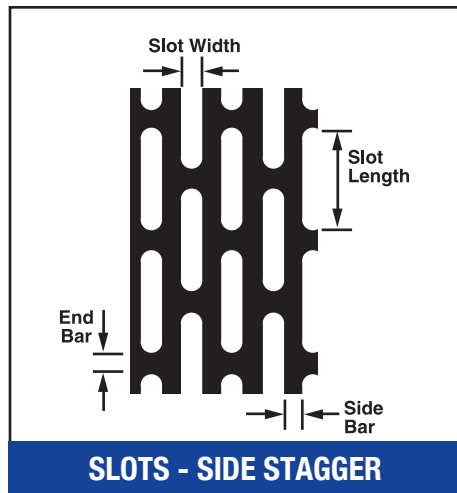
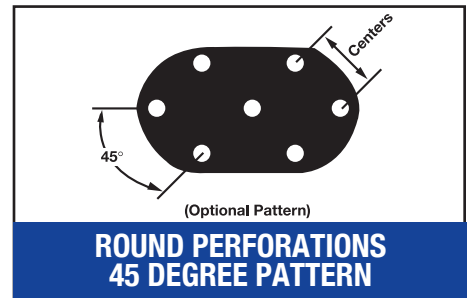
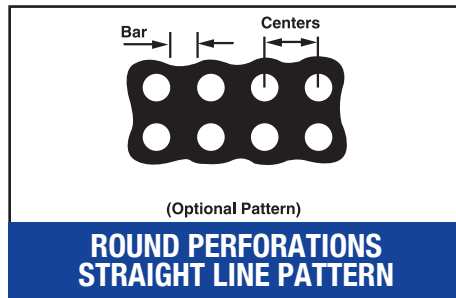
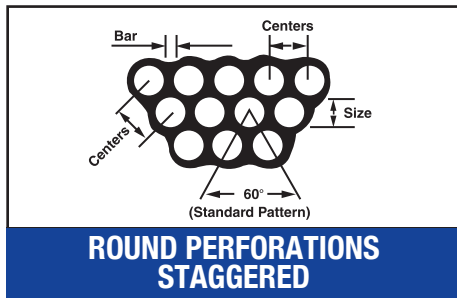
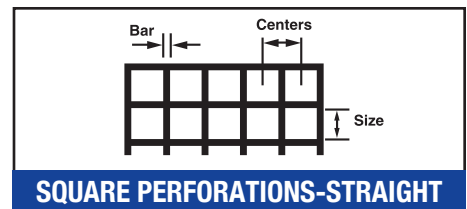
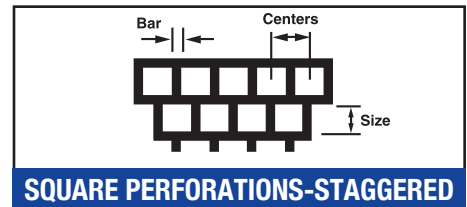
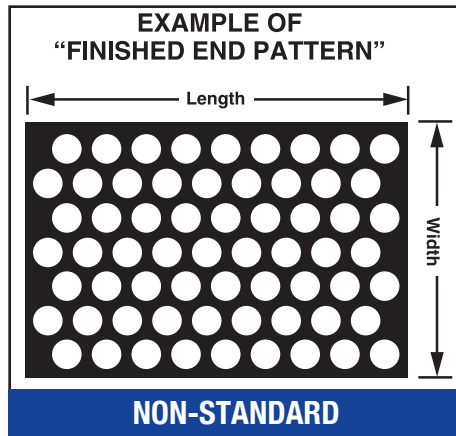
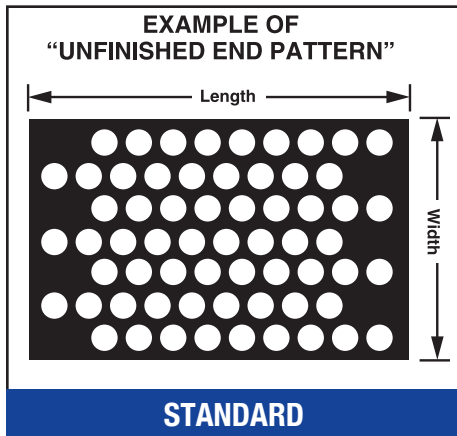
Limits are theoretical, and are based on a unit stress of 20,000 psi.

*Based on 8,727 bars / ft. of grating width. Bearing bars 1-3/8" c.c. Note: When serrated grating is specified, the depth of grating required for a specific load will be 1/4" greater than that shown in these tables.

Panel Width Chart (in.) - 22-W-4 & 22-W-2 Dimensions Are Out-to-Out of Bearing Bars**															
No. of Bars	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1/4" Bars	1-5/8	3	4-3/8	5-3/4	7-1/8	8-1/2	9-7/8	11-1/4	12-5/8	14	15-3/8	16-3/4	18-1/8	19-1/2	20-7/8
5/16" Bars	1-11/16	3-1/16	4-7/16	5-13/16	7-3/16	8-9/16	9-15/16	11-5/16	12-11/16	14-1/16	15-7/16	16-13/16	18-3/16	19-9/16	20-15/16
3/8" Bars	1-3/4	3-1/8	4-1/2	5-7/8	7-1/4	8-5/8	10	11-3/8	12-3/4	14-1/8	15-1/2	16-7/8	18-1/4	19-5/8	21
1/2" Bars	1-7/8	3-1/4	4-5/8	6	7-3/8	8-3/4	10-1/8	11-1/2	12-7/8	14-1/4	15-5/8	17	18-3/8	19-3/4	21-1/8

No. of Bars	17	18	19	20	21	22	23	24	25	26	27				
1/4" Bars	22-1/4	23-5/8	25	26-3/8	27-3/4	29-1/8	30-1/2	31-7/8	33-1/4	34-5/8	36				
5/16" Bars	22-5/16	23-11/16	25-1/16	26-7/16	27-13/16	29-3/16	30-9/16	31-15/16	33-5/16	34-11/16	36-1/16				
3/8" Bars	22-3/8	23-3/4	25-1/8	26-1/2	27-7/8	29-1/4	30-5/8	32	33-3/8	34-3/4	36-1/8				
1/2" Bars	22-1/2	23-7/8	25-1/4	26-5/8	28	29-3/8	30-3/4	32-1/8	33-1/2	34-7/8	36-1/4				

Types of Perforations



Tool List

Perforations (inches)	Type Centers	Holes PSI	Open Area
.020	Straight	825	30%
.020	Staggered	625	23%
.023	Straight	576	24%
.023	Staggered	400	18%
.027	Straight	400	23%
.027	Staggered	320	18%
.033	Staggered	225	19%
.033	Straight	330	29%
.040	Straight	225	30%
.040	Staggered	186	23%
.041	Staggered	—	32%
.043	Staggered	—	35%
.045	Straight	225	37%
.045	Staggered	169	28%
.050	Straight	144	33%
.050	Staggered	115	26%
.055	Straight	144	33%
.055	Staggered	135	30%
.058	Straight	144	38%
.058	Staggered	115	35%

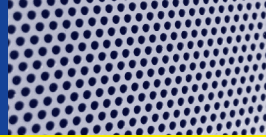
Perforations (inches)	Type Centers	Holes PSI	Open Area
.063	3/32"	Staggered	40%
.063	1/10"	Straight	30%
.063	7/64"	Staggered	30%
.063	1/8"	Staggered	23%
.067	1/8"	Staggered	28%
.071	1/8"	Staggered	30%
.077	7/64"	Staggered	45%
.078	1/8"	Staggered	36%
.079	7/64"	Straight	45%
.083	1/8"	Staggered	37%
.083	5/32"	Staggered	26%
.093	9/64"	Staggered	40%
.093	5/32"	Staggered	33%
.093	11/64"	Staggered	26%
.093	3/16"	Staggered	23%
.093	3/16"	SL	20%
.093	17/64" (45°)	Staggered	11%
.093	1/4"	Staggered	13%

Perforations (inches)	Type Centers	Holes PSI	Open Area
.100	5/32"	Staggered	36%
.100	9/64"	SL	45%
.109	3/16"	Staggered	29%
.109	7/32"	Staggered	23%
.109	5/32"	Staggered	45%
.113	7/32"	Staggered	25%
.117	3/16"	Staggered	33%
.117	7/32"	Staggered	27%
.117	5/32"	Staggered	50%
.125	3/16"	Staggered	40%
.125	3/16"	SL	28%
.125	7/32"	Staggered	29%
.125	1/4"	Staggered	23%
.125	1/4"	SL	20%
.125	5/16"	SL	11%
.141	3/16"	Staggered	51%
.141	7/32"	Staggered	38%
.141	1/4"	Staggered	28%
.148	1/4"	Staggered	30%
.148	7/32"	Staggered	30%
.156	3/16"	Staggered	62%
.156	7/32"	Staggered	46%
.156	1/4"	Staggered	36%
.156	9/32"	Staggered	28%
.156	17/64"	SL	26%
.156	3/8"	Staggered	15%
.172	1/4"	Staggered	43%
.172	3/8"	Staggered	19%
.172	9/32"	Staggered	33%
.180	9/32"	Staggered	35%
.188	7/32"	Staggered	66%
.188	1/4"	Staggered	51%
.188	9/32"	Staggered	41%
.188	5/16"	Staggered	33%
.188	1/4"	SL	55%
.188	9/16"	SL	12%
.203	9/32"	Staggered	47%
.219	5/16"	Staggered	45%
.219	11/32"	Staggered	36%

Tool List

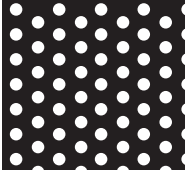
Perforations (inches)	Type Centers	Holes PSI	Open Area
.219	9/16"	Staggered	15%
.219	7/16"	SL	23%
.223	11/32"	Staggered	39%
.234	5/64"	Staggered	52%
.234	11/32"	Staggered	42%
.234	3/8"	Staggered	35%
.242	3/8"	Staggered	37%
.250	5/16"	Staggered	58%
.250	11/32"	Staggered	48%
.250	3/8"	Staggered	40%
.250	1/2"	Staggered	22%
.250	1/2"	SL	20%
.250	1"	SL	5%
.258	7/16"	Staggered	30%
.258	3/8"	Staggered	45%
.266	3/8"	Staggered	46%
.281	3/8"	Staggered	50%
.281	13/32"	Staggered	44%
.297	7/16"	Staggered	42%
.305	7/16"	Staggered	45%
.313	3/8"	Staggered	62%
.313	7/16"	Staggered	47%
.316	7/16"	Staggered	49%
.320	1/2"	Staggered	45%
.328	7/16"	Staggered	50%
.328	1/2"	Staggered	45%
.336	1/2"	Staggered	47%
.344	15/32"	Staggered	48%
.344	1/2"	Staggered	43%
.352	1/2"	Staggered	45%
.359	15/32"	Staggered	50%
.359	17/32"	Staggered	41%
.359	3/4"	Staggered	21%
.367	9/16"	Staggered	36%
.375	1/2"	Staggered	51%
.375	17/32"	Staggered	45%
.375	9/16"	Staggered	40%
.375	5/8"	Staggered	33%
.375	11/16"	Staggered	27%
.383	9/16"	Staggered	42%

Perforations (inches)	Type Centers	Holes PSI	Open Area
.391	9/16"	Staggered	45%
.406	9/16"	Staggered	47%
.406	5/8"	Staggered	42%
.422	13/16"	Staggered	25%
.422	5/8"	Staggered	27%
.430	5/8"	Staggered	30%
.438	9/16"	Staggered	54%
.438	5/8"	Staggered	45%
.438	3/4"	Staggered	30%
.445	5/8"	Staggered	47%
.453	11/16"	Staggered	47%
.469	5/8"	Staggered	47%
.469	3/4"	Staggered	38%
.484	11/16"	Staggered	42%
.500	11/16"	Staggered	47%
.500	3/4"	Staggered	40%
.500	7/8"	Staggered	30%
.500	1"	SL	20%
.531	3/4"	Staggered	45%
.531	3/16"	Staggered	40%
.547	3/4"	Staggered	42%
.547	3/4"	Staggered	45%
.563	3/4"	Staggered	51%
.578	3/4"	Staggered	55%
.594	13/16"	Staggered	48%
.625	13/16"	Staggered	53%
.625	7/8"	Staggered	47%
.641	7/8"	Staggered	50%
.656	7/8"	Staggered	50%
.688	15/16"	Staggered	50%
.750	1"	Staggered	51%
.750	15/16"	Staggered	55%
.750	1-1/8"	Staggered	40%
.781	1"	Staggered	53%
.813	1-1/16"	Staggered	50%
.875	1-1/8"	Staggered	54%
1.00	1-1/4"	Staggered	58%
1.00	1-3/8"	Staggered	48%

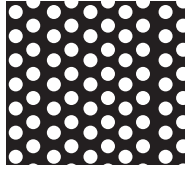


Round Holes

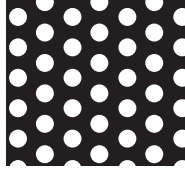
A FEW OF OUR PERFORATIONS - (holes at actual size)



1/16" @ 1/8"
STAGGERED
Open area . . . 22.5%



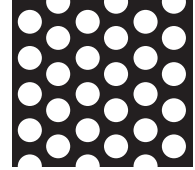
.078 @ 1/8"
STAGGERED
Open area . . . 36%



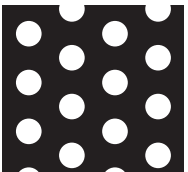
3/32" @ 5/32"
STAGGERED
Open area . . . 32%



3/32" @ 3/16"
STAGGERED
Open area . . . 23%



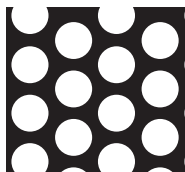
1/8" @ 3/16"
STAGGERED
Open area . . . 40%



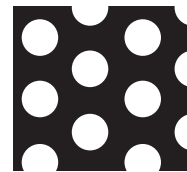
1/8" @ 1/4"
STAGGERED
Open area . . . 23%



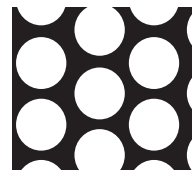
5/32" @ 7/32"
STAGGERED
Open area . . . 46%



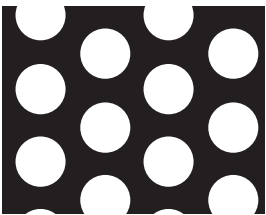
3/16" @ 1/4"
STAGGERED
Open area . . . 51%



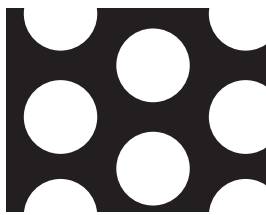
3/16" @ 5/16"
STAGGERED
Open area . . . 33%



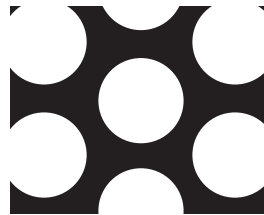
1/4" @ 5/16"
STAGGERED
Open area . . . 58%



1/4" @ 3/8"
STAGGERED
Open area . . . 40%



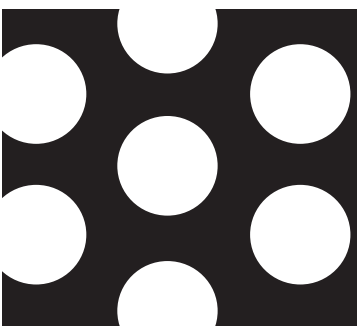
3/8" @ 9/16"
STAGGERED
Open area . . . 40%



7/16" @ 9/16"
STAGGERED
Open area . . . 51%



1/2" @ 11/16"
STAGGERED
Open area . . . 47%



1/2" @ 3/4"
STAGGERED
Open area . . . 40%



3/4" @ 1"
STAGGERED
Open area . . . 51%



1" @ 1-1/4"
STAGGERED
Open area . . . 58%

**MANY ADDITIONAL PERFORATIONS AVAILABLE . . . ASK YOUR DIRECT METALS SALESPERSON
WE CAN PERFORATE MOST ANY METAL, PLASTIC OR RUBBER.**

