Property of Duncan Hatch

Highway Department Time Book

#1693

Compliments of

WHEAT CULVERT CO., Inc.

Newport, Ky.

MANUFACTURERS OF

REG. U.S. PAT. OFF.

TONCAN

COPPER

Mo-lyb-den-um

IRON

CULVERTS

Highway Department Time Book

Property of

Name _____

Address _____

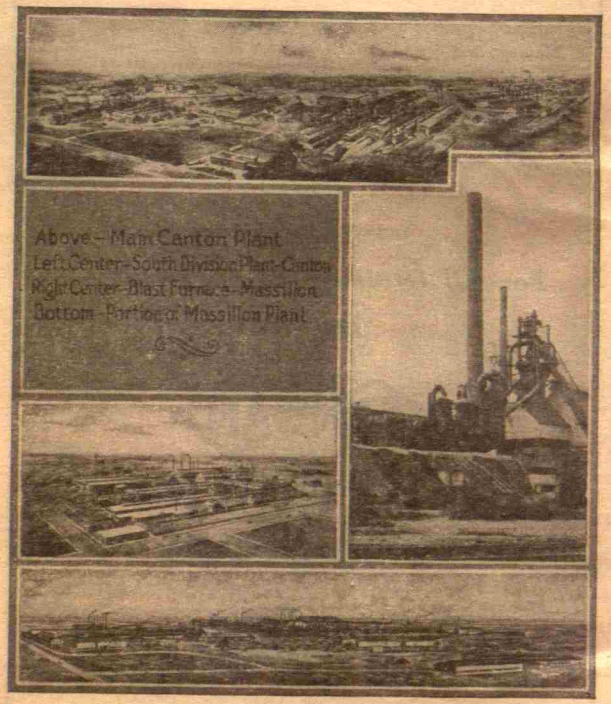
_____

For All Drainage Requirements—
Demand

REG. U.S. PAT. OFF.
TONCAN
COPPER
Mo-lyb-den-um
IRON

Corrugated Culverts
and
Perforated Corrugated Drains

Where TONCAN Copper Mo-lyb-den-um Iron Is Produced



Toncan—The Modern Iron

TONCAN has been manufactured for more than twenty years. During that span of years that product has been accorded every advantage developed by the constant research to evolve an analysis which would be practically non-rusting.

The original Toncan was of commercially pure iron analysis without alloys, and was the first step toward the perfected Toncan of today. Shortly after the introduction of Toncan as a pure iron, scientific research was begun to determine whether any alloy, or combination of alloys, might be added to pure iron which would increase its rust and corrosion-resistance.

Some years later Toncan Iron of Copper content analysis was successfully produced. The carefully processed pure iron base was retained and a small content of Copper added which greatly increased its service life. This development stimulated increased research with the result that several combinations of alloys were discovered, each lowering the natural rate of rust and corrosion. One combination of alloys greatly surpassed all the others, that of molybdenum and copper in combination with Toncan pure iron.

Today Toncan Copper Mo-lyb-den-um Iron is the remarkable commercial result of these discoveries through scientific research. Thousands of comparative tests have proven conclusively that the Toncan of today will far outlast any other metal used for culverts.

TONCAN
COPPER
Mo-lyb-den-um
IRON

Lasts Longer and Serves Better

CORRUGATED CULVERT

PERFORATED DRAIN

DOUBLE ROLLED
REINFORCED END

TONCAN JOINING
BAND

TYTON DRAINAGE GATE

Standard Sizes and Recommended Gauges

Diameter	Gauge	Approx. Weight Lbs. per Lin. Ft.	Area in Sq. Ft.
8	16	7.8	.349
10	16	9.2	.545
12	16	10.7	.785
15	16	13.2	1.227
18	16	15.7	1.767
21	14	22.7	2.405
24	14	25.9	3.142
30	14	32.4	4.909
36	12	53.0	7.068
42	12	61.0	9.621
48	12	70.7	12.566
54	10	100.6	15.904
60	10	112.0	19.635
66	10	122.0	23.758
72	10	132.0	28.274
78	10	145.0	33.183
84	10	156.0	38.485

How to Specify Toncan

"The sheets used in the fabrication of corrugated culverts or underdrains shall be full U. S. Standard Black Gauge and shall contain a two-ounce coating of prime western spelter per square foot of double exposed surface, applied by the hot process. The sheet analysis shall conform to the following chemical requirements—

The total amount of Sulphur, Carbon, Phosphorus, Manganese, and Silicon shall not exceed 0.25%. The Sulphur content shall not exceed .04% and Phosphorus .015%. It shall contain not less than .40% of Copper and .05% of Molybdenum."

Perforated Drain Specifications

"The culverts shall be perforated in the valley of each corrugation with ¼" holes on 1½" centers for a sector of approximately 140° of the circumference. There shall be the following number of rows of holes in the 140° sector:

8" Diameter— 8 rows
10" Diameter—10 rows
12" Diameter—11 rows
15" Diameter—13 rows
18" Diameter—15 rows
24" Diameter—20 rows

Middle Twp.

Casserly-Dugan Ditch

Week Ending

NAMES	S	M	T	W	T	F	S	TOT'L TIME	RATE	AMOUNT
Stg BS		HI				FS			Elev	
BM 4.95	1	0	4	9	5				100.	
0+00								8.92	96.03	
1+00								Tile	95.28	
2+00										
3+00										
⊙								4.33	100.62	
⊼ 4.94	1	0	5	5	6					
4+00										
5+00										
6+00										
7+00										
8+00										
⊙								3.34	102.22	
⊼ 7.54	1	0	9	7	6					
9+00										
10+00										
11+00										
12+00										
13+00										

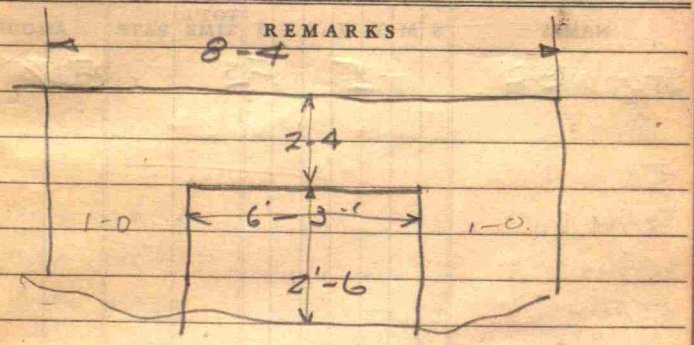
REMARKS					
℄Road	Ditch	Top Stake			
Tops. Horiz.					
4.63	100.32				
4.3	100.65	6.75	98.20	4.56	99.39
4.26	100.69	6.25	98.70	4.15	100.80
4.05	100.90	6.1	98.85	4.33	100.62
4.84	100.72	6.50	98.86	4.34	101.22
4.50	101.06	6.45	99.11	4.38	101.18
4.10	101.46	5.82	99.74	4.06	101.50
3.71	101.85	5.15	100.41	3.31	102.25
2.57	102.99	4.00	101.56	2.15	103.41
5.55	104.21	9.80	101.96	5.65	104.11
5.20	104.56	7.30	102.46	5.67	104.09
4.98	104.98	7.00	102.76	5.76	104.00
5.04	104.72	6.95	102.81	5.19	104.57
5.03	104.73	6.92	103.04	5.29	104.47

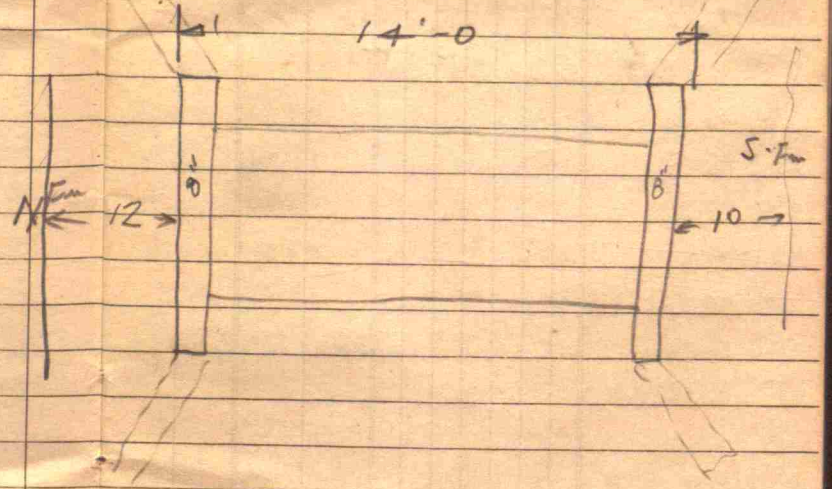
Week Ending

NAMES	S	M	T	W	T	F	S	TOT'L TIME	RATE	AMOUNT
10										
10										
12										
36										

New Mayfield Road

REMARKS





Week Ending

NAMES	S	M	T	W	T	F	S	TOT'L TIME	RATE	AMOUNT
Sta BS		H	I			F	S			Flat
D		10	9	7	6		5	29	104	47
T 5.56		1	1	0	0	3				
14+00										
15+00										
16+00										
17+00										
18+00										
D							3	55	106	48
T 5.48		1	1	1	9	6				
19+00										
20+00										
21+00										
22+00										
23+00										
D							3	36	108	60
T 6.47		1	1	5	0	7				
24+00										
25+00										
26+00										
26+40										

REMARKS				
℄ Road	Ditch	Top Stake		
5.14	104.89	7.15	102.88	5.44 104.59
4.60	105.43	6.93	103.10	4.56 105.47
4.54	105.49	6.20	103.83	4.53 105.50
4.30	105.73	6.83	103.90	4.37 105.66
3.42	106.61	5.40	104.63	3.55 106.48
5.24	106.72	7.06	104.90	5.06 106.90
4.90	107.06	6.83	105.13	5.16 106.80
4.45	107.51	5.90	106.01	4.13 107.83
3.56	108.40	5.35	106.61	3.51 108.45
2.76	109.20	4.70	107.26	3.36 108.60
5.49	109.58	7.18	107.89 ✓	5.96 109.11
4.10	110.37	5.96	109.11 ✓	3.57 111.48
3.55	111.52	4.71	110.36	2.71 112.36
3.03	112.04	4.0	111.07	

Week Ending

NAMES	S	M	T	W	T	F	S	TOT'L TIME	RATE	AMOUNT
BS		AT					FS			
⊙							5.66			105.11
Π 3.05										
⊙							5.97			105.52
Π 3.92										
⊙							5.34			104.10
Π 2.34										
⊙							5.26			101.18
Π 4.05										
⊙							5.18			100.08

REMARKS

103.41 ⁺8

5.95 109.36

5.24 104.12 ⁺9
5.24 [illegible] ⁺10
9.16
3.68

103.41 ⁺8

5.8 109.21

5.24 104.12 ⁺9
5.09 [illegible] 10
5.19 104.02 ⁺11
4.62 105.9 ⁺12

Week Ending

NAMES	S	M	T	W	T	F	S	TOT'L TIME	RATE	AMOUNT	REMARKS
BM										100	
	5.22			105.22							
1+00											4.90
2+00											4.51
3+00											4.65
4+00											4.18
5+00											4.09
0								4.49	100.73		
6+00	7.22			107.95							5.52 102.43
7+00											5.78 102.17
8+00											4.63 103.32 ✓
9+00											3.92 104.03 ✓
10+00											3.91 104.04 ✓
11+00											3.99 103.98 ✓
0								3.06			

NAMES	S	M	T	W	T	F	S	TOT'L TIME	RATE	AMOUNT
9 — 1.25										
10 — 10.82								.43		
11 — 9.91								.71	.23	
12 — 9.46								.45		
13 — 9.41								.05		
14 —										
1-4 — 1.84										
								1.10		

Week Ending

REMARKS

104.11
11.25
11.5 3.6
5.64
109.72

5.52
109.84

97.85
11.25
109.10
5.64
104.46
99.17
5.29

109.10
5.52
104.58
99.83
3.75

Week Ending ____________________

NAMES	S	M	T	W	T	F	S	TOT'L TIME	RATE	AMOUNT	REMARKS
											Hawkins
											Brow + avon
											Sort Wall on
											S. Side Road
											N. Solen.

GOOD PRACTICE IN INSTALLING

INSTALLING a culvert consists of three operations—preparing the trench, placing the culvert and backfilling. The trench need only be wide enough to allow for proper backfilling. The bed should be prepared by cutting and removing all uneven places in the trench floor so that the culvert will have a firm bearing on solid earth throughout its entire length.

In placing the culvert the joints should be laid so that the stream will flow with and over the laps and have a uniform grade in the direction of the flow.

After the culvert is in place, the trench should be backfilled and carefully tamped or flushed, or both, around the culvert and to a depth of at least one foot over the top. The trench or embankment can then be brought to the desired grade, care being taken that no rock or heavy material be dropped directly on the culvert.

Toncan Corrugated Iron Culverts are more economical to haul, handle and install than any other type of culvert. Manufactured of Toncan Copper Mo-lyb-den-um Iron and well constructed, they assure permanency and give a sturdy, flexible installation. Corrugated culverts are especially constructed to withstand the weight of fill and the constant impact of traffic. Their light weight eliminates the necessity of special equipment for installing and the long lengths greatly reduce the instalation cost. No other type of culvert can compare in these salient points which combined make for drainage economy.

DETERMINATION OF CULVERT LENGTH

THE length of a culvert depends upon the total width of the road including earth shoulders, the height of the fill, the slope of the embankment and the grade of the culvert. It should be sufficiently long so that there will be no danger of the embankment slumping into the exposed culvert openings. In many instances, particularly in mountainous country with heavy fills, the corrugated culvert can be extended to carry the water well away from the embankment.

Common practice in determining the length of a culvert where "cross sections" of the road are not available is to add to the width of the road four times the height of the fill. This is based on an embankment slope of two to one. In case of a one and one-half to one slope, add three times the height of the fill and proportionately for other slopes.

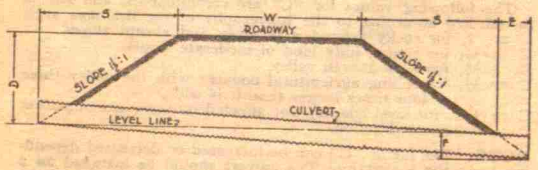


DIAGRAM SHOWING HOW CULVERT LENGTHS ARE COMPUTED

EXAMPLE:

W = WIDTH OF ROADWAY — ASSUME W = 24 FT

D = DEPTH OF FILL AT INLET — " D = 12 FT

S = SIDE SLOPE = D — = 1½ × 12 FT = 18 FT

F = ¼ CULVERT GRADE = (W ÷ 25) — ASSUME F = .83 × (24 + 36) = 2 FT ± = 3 FT ±

E = 1½ F (APPROX)

RESULT: LENGTH OF CULVERT = W + 2S + E = 24 + 36 + 3 = 63 FT. (USE 64 FT LENGTH)

CULVERT SIZE AS DETERMINED BY DRAINAGE AREA

Computed by Talbot Formula

AREA OF WATERWAY = $C \sqrt[4]{(\text{ACREAGE DRAINED})^3}$

Area in Acres Drained by Various Diameter Culverts

Diam. of Culvert in Inches	Waterway Opening in sq. ft.	C=1	C=½	C=⅓	C=⅛
12″	.785	¾	2	3	6
15″	1.227	1	3	5	11
18″	1.767	2	5	9	18
21″	2.405	3	8	14	27
24″	3.142	4½	12	20	39
30″	4.909	8	21	36	71
36″	7.068	13	32	59	116
42″	9.621	20	52	88	175
48″	12.566	29	74	126	250
54″	15.904	40	100	173	342
60″	19.635	53	133	229	453
66″	23.758	68	172	295	584
72″	28.274	86	217	373	736
84″	38.485	130	327	562	1110

The following values for "C" are recommended and should be selected according to the topography of the drainage area.

C = 1, for rocky ground with steep and abrupt slopes.
C = ⅔, for rough, hilly land of moderate slopes.
C = ½, for wide uneven valley.
C = ⅓, for rolling agricultural country with the valley three or four times longer than it is wide.
C = 1/5, for level country not affected by snow accumulation or flood action.

NOTE: The factor "C" can be increased or decreased depending upon the topograhy. The culvert should be installed on a slope corresponding with the average per cent grade of the country served by it.

TALBOT FORMULA—EXAMPLE

Required—the proper diameter of a culvert to properly drain fifty-five acres of rolling agricultural country with the valley three or four times its width in length. In this problem it is only necessary to read down the column C=⅓ till the corresponding nearest acreage is found. Following over to the extreme left-hand column it is found that a 36-inch diameter culvert is suitable. If the upper part of the valley should have considerably steeper slopes than the culvert channel, a culvert of slightly larger diameter should be installed.

Areas and Weights of Toncan Corrugated Culverts

Diameter in Inches	Area in Square Feet	Approximate Weight in Pounds per Foot				
		16 Ga.	14 Ga.	12 Ga.	10 Ga.	8 Ga.
8	.349	7.8				
10	.545	9.2				
12	.785	10.7	13.3			
15	1.227	13.2	16.4			
18	1.767	15.7	19.4	26.5		
21	2.405	18.3	22.7	30.9		
24	3.142	21.0	25.9	35.3	44.7	
30	4.909		32.4	44.2	55.9	
36	7.068		38.9	53.0	67.0	81.6
42	9.621		44.8	61.0	77.1	93.9
48	12.566		51.9	70.7	89.4	108.9
54	15.904			79.5	100.6	122.5
60	19.635			88.4	112.0	136.1
66	23.758				122.0	148.3
72	28.274				132.0	160.6
78	33.183				145.0	176.0
84	38.485				156.0	190.5

Cubic Yards of Excavation per Lineal Foot of Trench

Wd. in Feet	DEPTH IN FEET									
	2	4	6	8	10	12	14	16	18	20
1	0.07	0.15	0.22	0.30	0.37	0.44	0.52	0.59	0.67	0.74
1.5	0.11	0.22	0.33	0.44	0.56	0.67	0.78	0.89	1.00	1.11
2	0.15	0.30	0.44	0.59	0.74	0.89	1.04	1.18	1.33	1.48
2.5	0.18	0.37	0.56	0.74	0.93	1.11	1.30	1.48	1.67	1.85
3	0.22	0.44	0.67	0.89	1.11	1.33	1.56	1.78	2.00	2.22
3.5	0.26	0.52	0.78	1.04	1.30	1.56	1.82	2.07	2.33	2.59
4	0.30	0.59	0.89	1.18	1.48	1.78	2.07	2.37	2.67	2.96
4.5	0.33	0.67	1.00	1.33	1.67	2.00	2.33	2.67	3.00	3.33
5	0.37	0.74	1.11	1.48	1.85	2.22	2.59	2.96	3.33	3.70
5.5	0.41	0.82	1.22	1.63	2.03	2.44	2.85	3.26	3.67	4.07
6	0.44	0.89	1.33	1.78	2.21	2.66	3.11	3.55	4.00	4.44
6.5	0.48	0.96	1.44	1.93	2.40	2.89	3.37	3.85	4.33	4.81
7	0.52	1.04	1.55	2.07	2.59	3.11	3.63	4.15	4.67	5.19
7.5	0.56	1.10	1.66	2.22	2.77	3.33	3.89	4.44	5.00	5.55
8	0.59	1.18	1.78	2.37	2.96	3.55	4.15	4.74	5.33	5.92
8.5	0.63	1.26	1.89	2.52	3.15	3.78	4.41	5.04	5.67	6.29
9	0.67	1.33	2.00	2.67	3.33	4.00	4.67	5.33	6.00	6.67
9.5	0.70	1.41	2.11	2.81	3.52	4.22	4.93	5.63	6.33	7.04
10	0.74	1.48	2.22	2.96	3.70	4.44	5.18	5.93	6.67	7.41

USEFUL INFORMATION

LENGTH EQUIVALENTS

12 inches = one foot
3 feet = one yard
16½ feet = one ród
66 feet = one chain
5280 feet = one mile

AREA EQUIVALENTS

144 square inches = one square foot
9 square feet = one square yard
43560 square feet = one acre
640 acres = one square mile

VOLUME EQUIVALENTS

1728 cubic inches = one cubic foot
27 cubic feet = one cubic yard
231 cubic inches = one gallon
7.48 gallons = one cubic foot

To find circumference of a circle multiply diameter by 3.1416.

To find diameter of a circle multiply circumference by .31831.

To find area of a circle multiply square of diameter by .7854.

To find area of a triangle multiply base by half perpendicular height.

To find surface of a sphere multiply square of diameter by 3.1416.

A cubic foot of water weighs 62½ lbs.

To find the pressure in pounds per square inch of a column of water, multiply the height of the column in feet by .434.

To find the capacity of tanks, any size: Given dimensions of a cylinder in inches, to find its capacity in U. S. gallons, square the diameter, multiply by the length, and by .0034.