

**DEKORON METL-COR
INSTALLATION INSTRUCTION**

MC 101

The information and data in this booklet are the result of considerable field experience in installing Dekoron Metl-Cor. If these suggestions are followed in laying out the installation and in installing the tubing, a neat, economical installation of Dekoron Metl-Cor will be obtained. We emphasize, however, that these suggestions are intended to supplement, not replace, procedures developed by experienced field men who make these installations. We realize that no two installations are exactly alike and thus this is a guide from which specific requirements can be evolved for a particular installation.

DEKORON

HANDLING AND STORAGE

To minimize handling and handling costs, Metl-Cor is shipped on disposable, non-returnable reels. Refer to Table No. 1 of the appendix for tables on net weights, shipping weights, standard shipping lengths and reel dimensions.

For storage at the job site provision should be made to keep excessive moisture from the expendable reels. If storage is out of doors, inexpensive polyethylene sheeting may be used to advantage and is recommended.

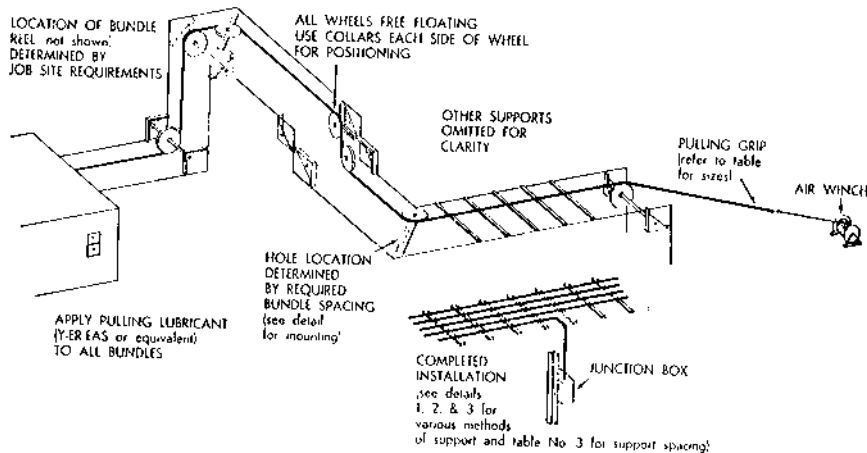
Since full coils of Metl-Cor can weigh up to 1,000 lbs., transporting from the storage area to the point of usage should be done by mechanical equipment.

PLANNING AND PREPARATION

The methods recommended for installing Metl-Cor bundles are adaptations of practices long established in the telephone industry where long cable installations are commonplace. Adequate planning and preparation has always been the general rule for achieving success.

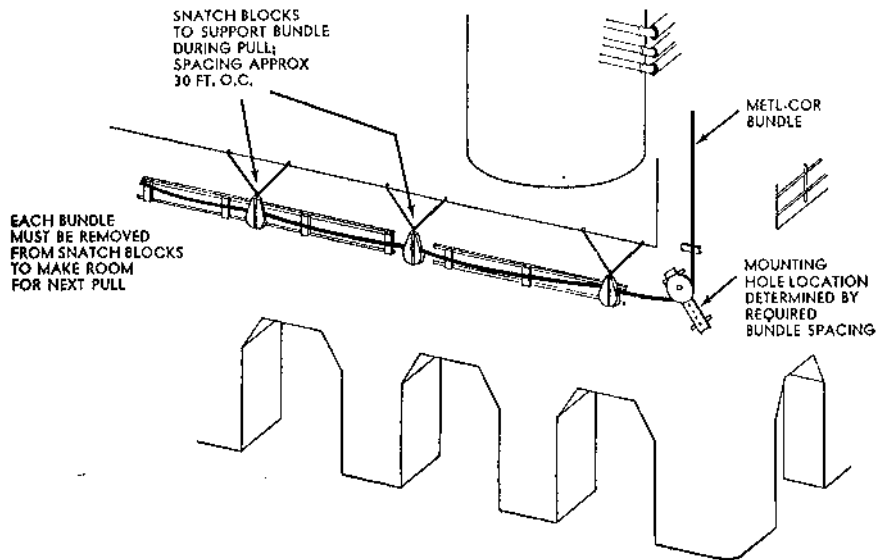
In the case of Metl-Cor, a substantial saving can be realized in the overall installation costs of instrument tubing by establishing definite routes in the early stages of construction planning. Many bends can be eliminated from the course by this preparation, thereby requiring less tubing and improving the signal response of the completed system.

The methods of supporting and fastening the Metl-Cor bundles are usually established early in the plans of the instrument course layout. Some of the several methods of supporting Metl-Cor are shown in sketches 1, 2 and 3. The use of some of the clamping devices available is shown in these sketches and in details 1, 2, 3, 4 and 5. A tabulation of the sizes of several popular makes of clamps for the various sizes of Metl-Cor is shown in Table No. 2 of the appendix. Tabulations of the maximum bundle dimensions and bending radii are found in Table No. 3, and the conduit sizes required to house one or more Metl-Cor bundles in Table No. 4 in the appendix.

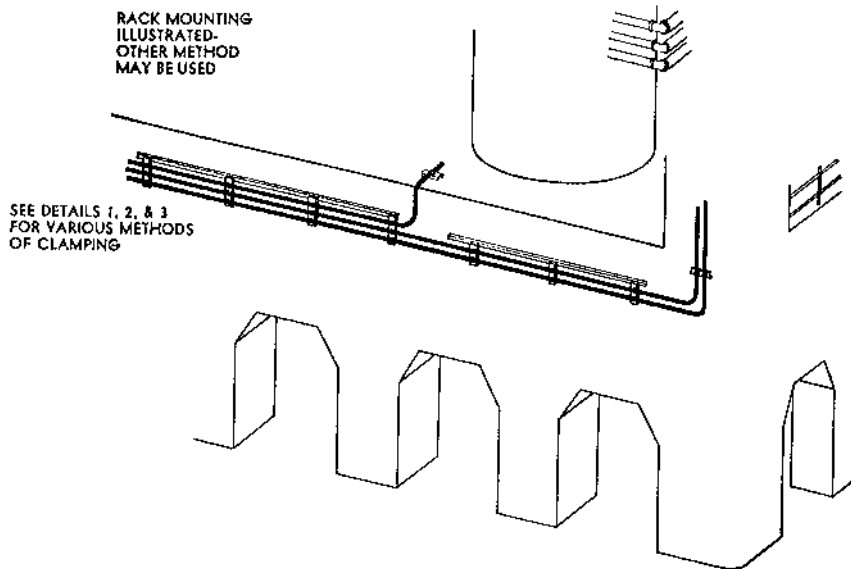


Sketch No. 1

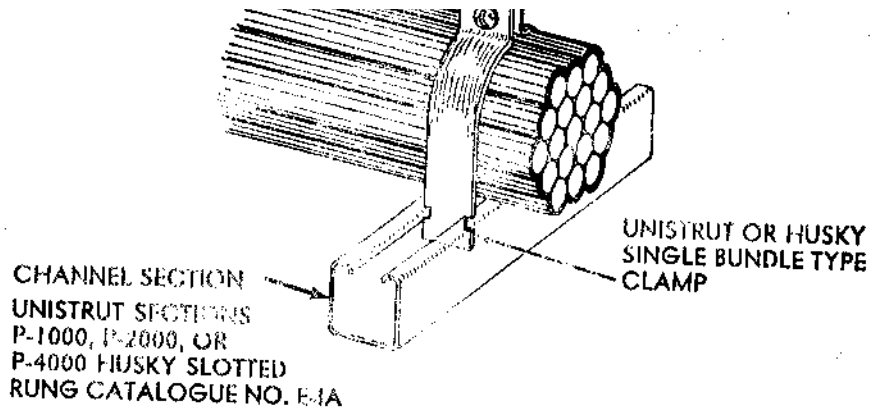
Installation Over Horizontal Racking



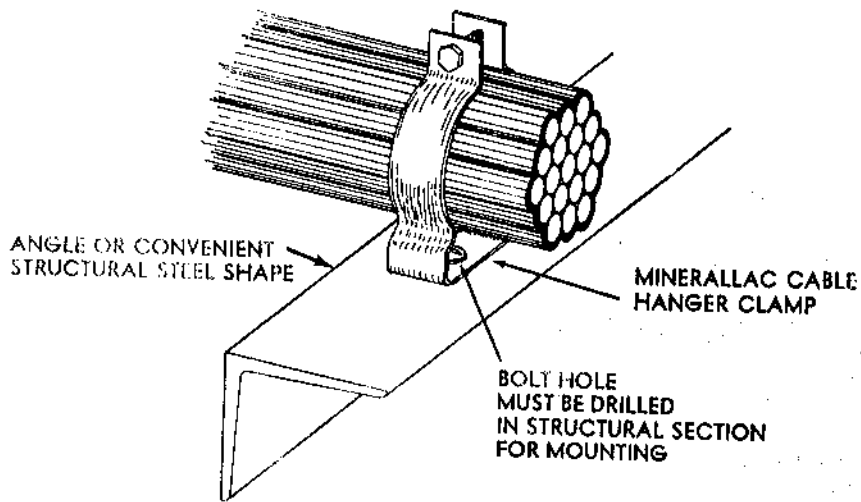
Sketch No. 2 (A)
Method of Installation Along Vertical Surface



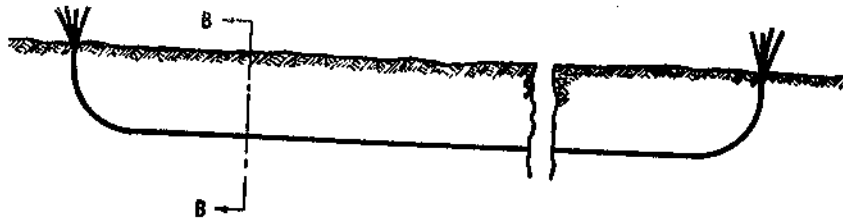
Sketch No. 2 (B)
Completed Installation on Vertical Surface



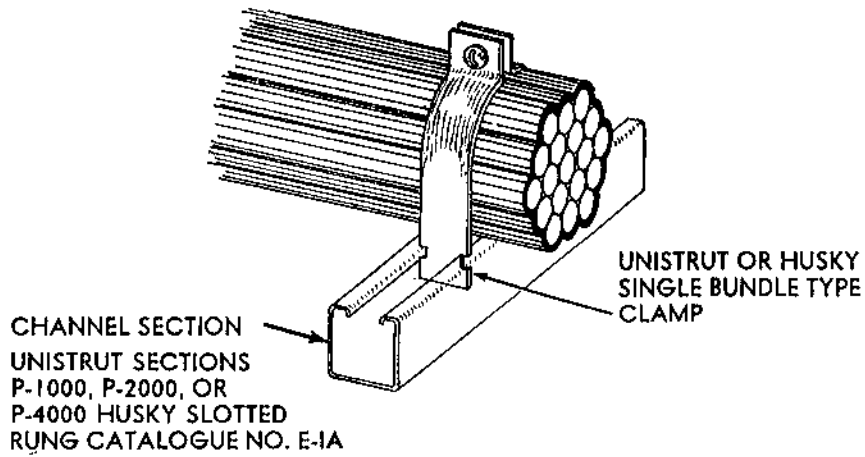
Detail No. 2



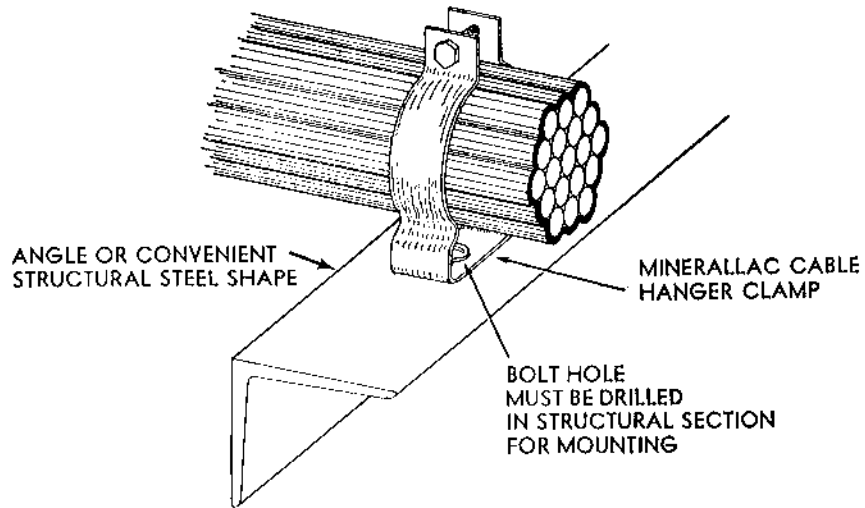
Detail No. 3



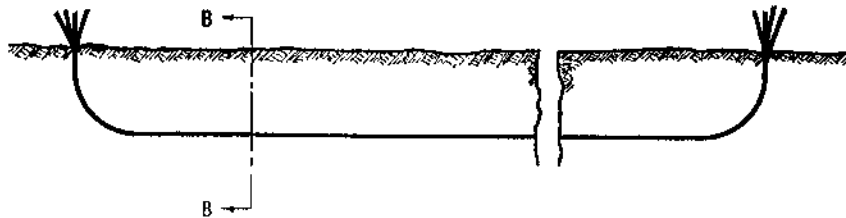
Detail No. 4



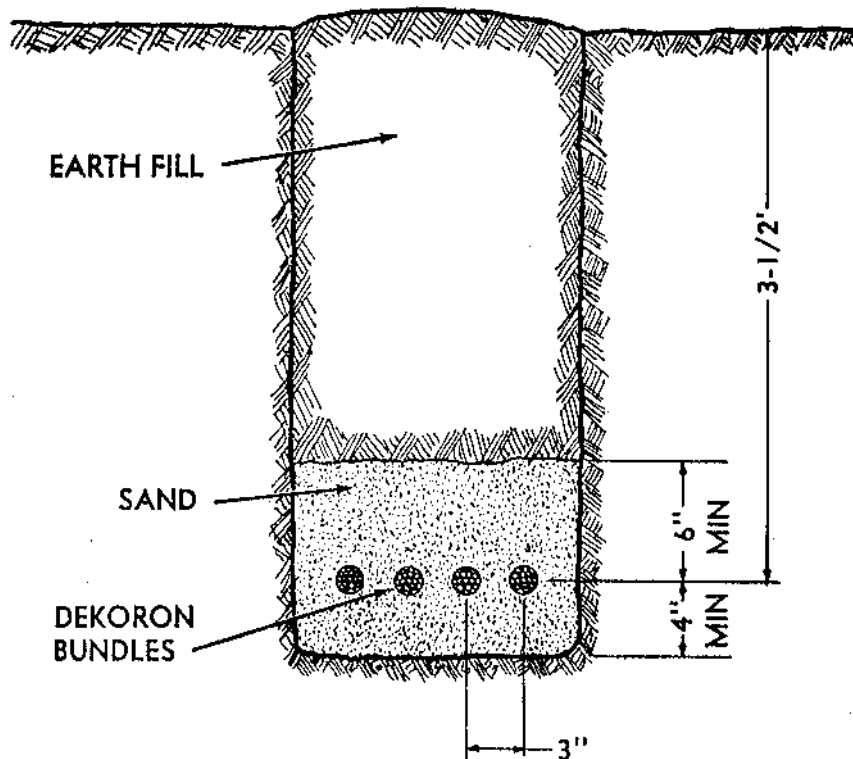
Detail No. 2



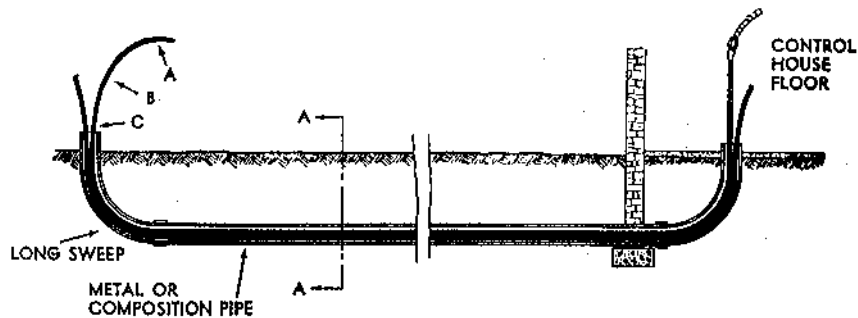
Detail No. 3



Detail No. 4
Direct Burial Installation (Sand Fill)



Detail No. 4 (Sec. B-B)
Recommendations for Underground Burial Installation

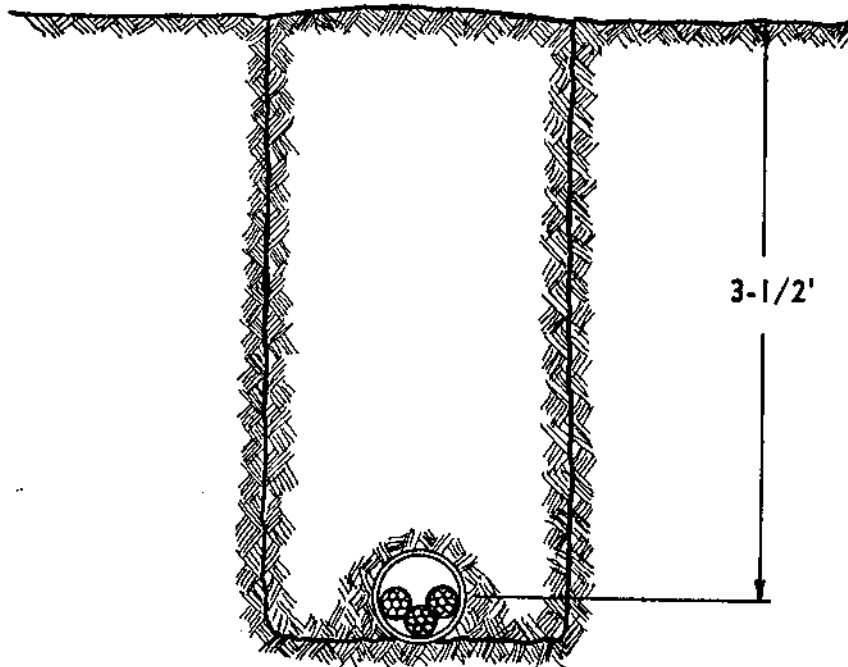


Detail No. 5

NOTE: During pulling operation, use cable lubricant.

NOTE: While pulling bundles through pipe, one man maintains large radius at point A (about 4 feet). One man feeds bundle into pipe at point B and one man applies lubricant at point C.

NOTE: If more than one Dekoron bundle is to be placed in pipe, the installation will be simplified by pulling multiple bundles simultaneously.



Detail No. 5 (Sec. A-A)

METHODS OF INSTALLATION

A decision will have to be made in the planning stage as to the amount of mechanization required to obtain the lowest installation cost. A study of the fundamental requirements of the particular job will generally aid the project engineer to determine the best procedure. A few of the important ones are: length of course, total degrees of bend through which Metl-Cor bundles must be pulled, number of bundles being installed over a single course, and the size of the Metl-Cor involved.

OUR RECOMMENDATIONS ARE AS FOLLOWS:

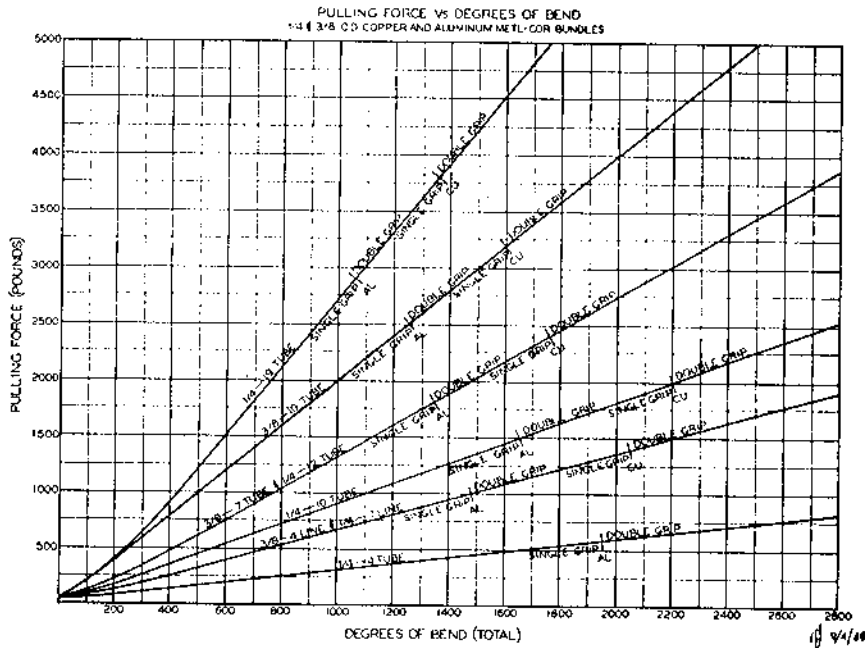
A. If the pulling force required to install the Metl-Cor bundle is expected to exceed two or three hundred pounds, use mechanical power. See detail graph No. 6 for approximate pulling force required to pull various size bundles through various total degrees of bend.

B. Always use a cornering aid wherever bundles are required to change direction on those installations using mechanical power. See detail series No. 7 for data on construction of cornering aids.

C. Cornering wheels of the correct diameter provide the least resistance to the pulling force and should always be used where space permits. Use roll corner troughs only in locations where it is impossible to use the wheel.

D. Manual installation is usually economical on short runs of 100 ft. or less with a maximum of 3 or 4 bends. Long runs of a single bundle having no more than 2 bends can usually be made without the need of mechanical power; particularly the smaller bundles.

E. All installations in conduit should be made by mechanical pulling devices.



Detail Graph No. 6

EQUIPMENT REQUIRED:

Pulling Grips:

Kellems Company, Stonington, Connecticut
See table No. 5 in appendix

Graybar Electric (Reliable Pulling Grips)
See table No. 5 in appendix

Cornering aids:

See detail series No. 7 for details of construction.

Cable Reel Jacks:

Graybar Electric

Tugger and Pulling Cable:

Usually at job site or equipment rental agency.

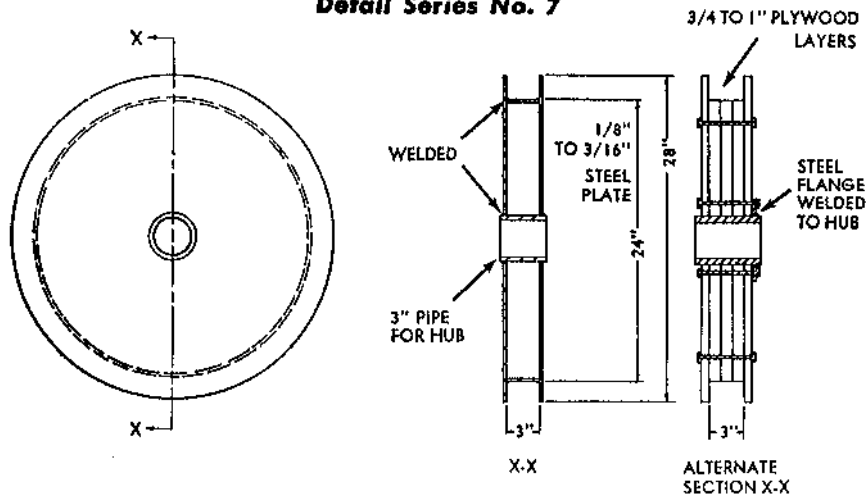
Pulling Lubricant:

Y-ER-EAS
Electro Compound Co., Cleveland, Ohio

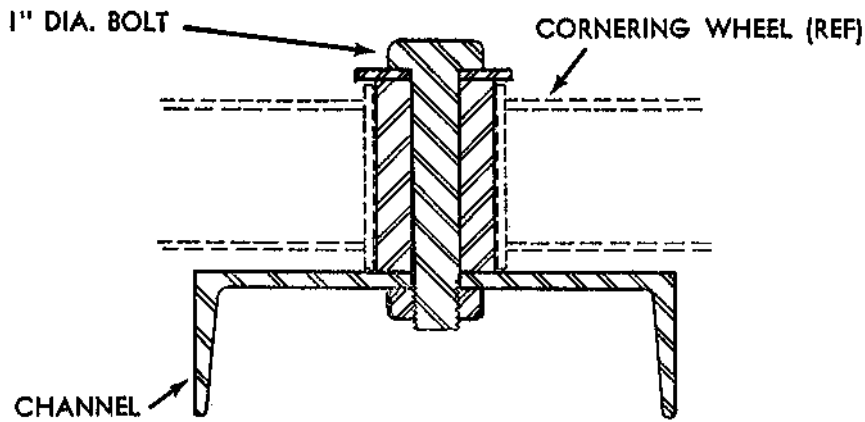
Wirelube
Ideal Industries, Inc., Sycamore, Ill.

Pull-In-Compound
Minerallac Electric Co., Chicago, Ill.

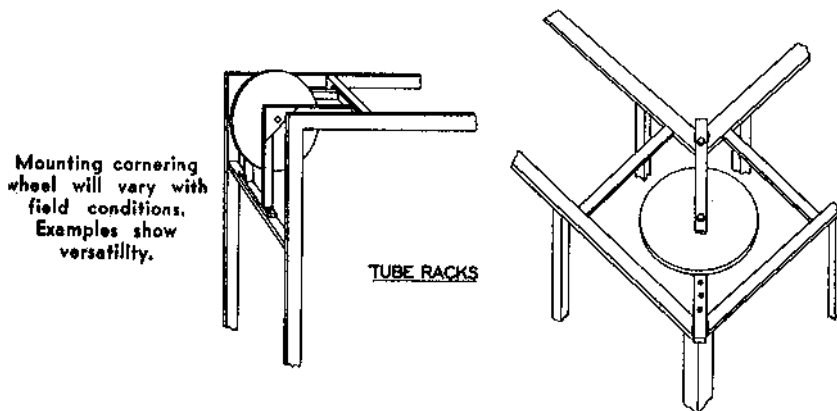
Detail Series No. 7



Cornering Wheel

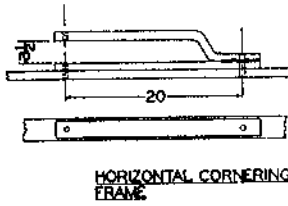
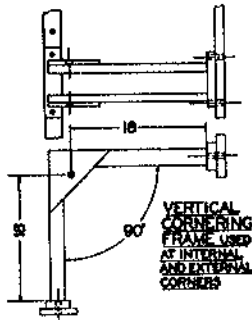


Fixture for Horizontal Mounting of Cornering Wheel

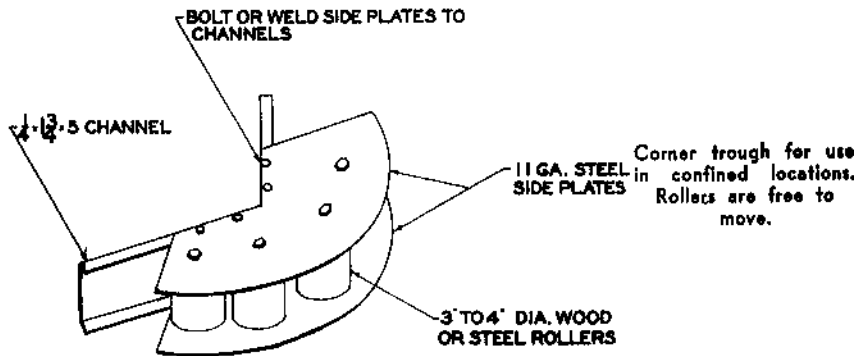
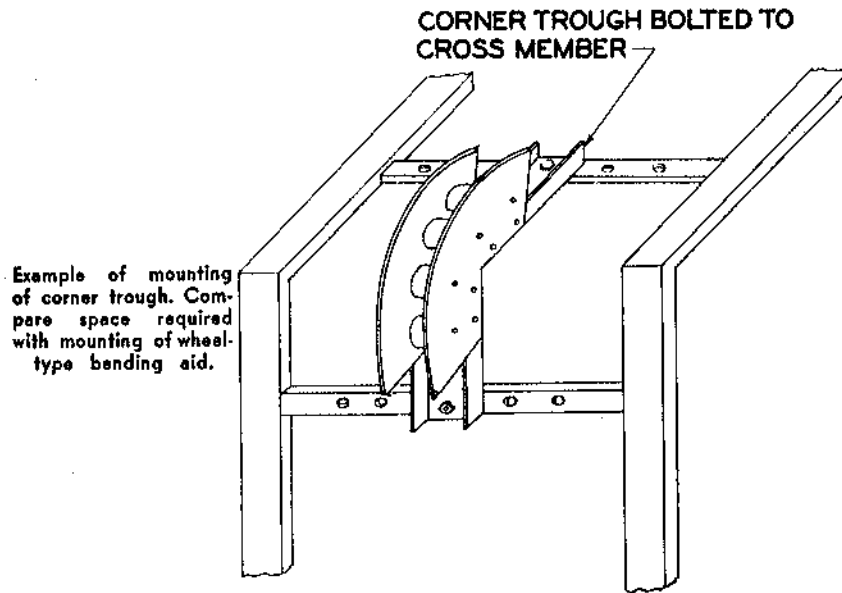


Mounting cornering wheel will vary with field conditions. Examples show versatility.

(Detail Series No. 7)

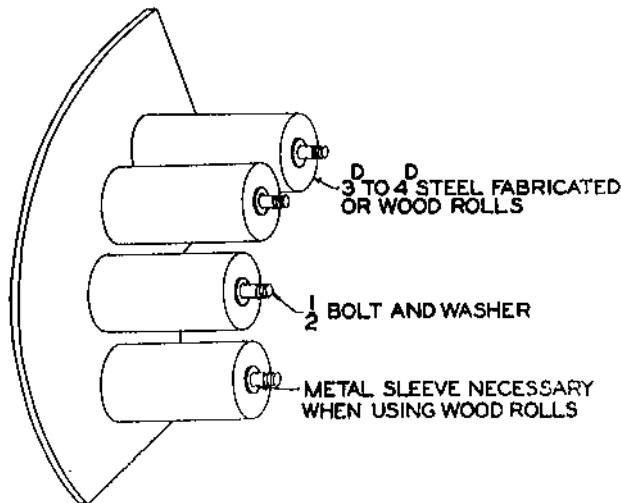
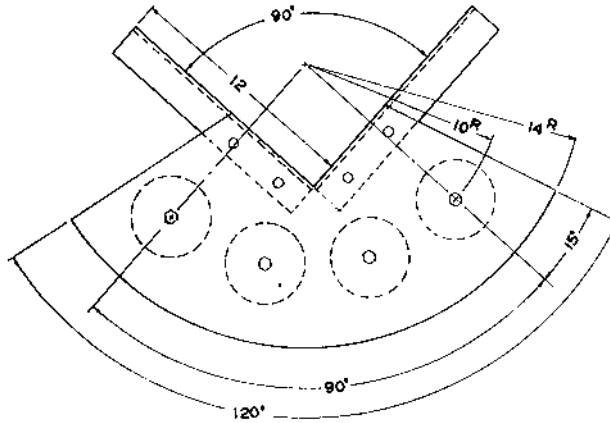


Cornering wheel offers least resistance to pull and is recommended where space permits.



(Detail Series No. 7)

Slight modifications in the corner through design can be made to suit existing conditions. Avoid reducing the radius of curvature since this will increase pulling force required to pull bundle into place.



Another sketch of corner trough.

GENERALLY GOOD PRACTICES:

(1) Wheels, troughs and special guides must be mounted in such a manner as to prevent their binding during the pulling operation. Wheel axle loadings can be computed by reference to the detail graph No. 6 on pulling force vs. degrees of bend. Total the degrees of bend on the load side, through which the bundle must pass, up to and including the bend at the axle in question.

The axle loading is then computed by the formula: $L=2 (F \cos 1/2 \phi)$

where L =Axle loading in pounds

F =Pulling force indicated on graph

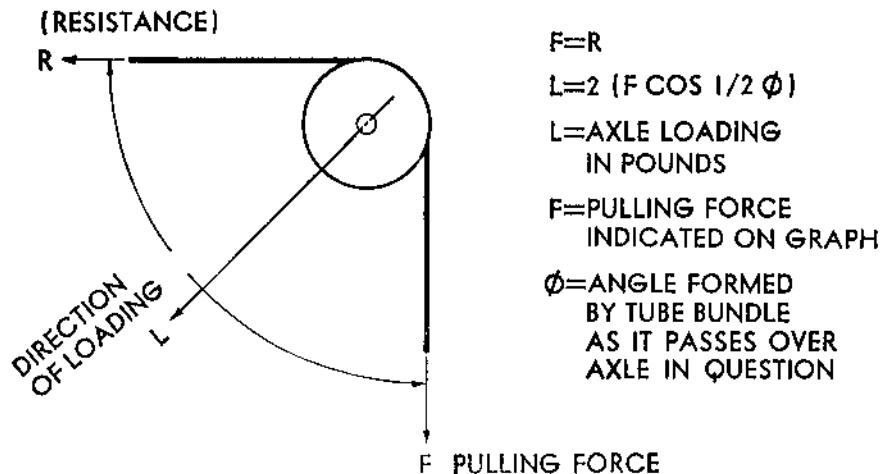
ϕ =Angle formed by tube bundle as it passes over axle in question. See detail No. 8.

(2) Axles and axle mountings must be strong enough to support loadings required during the pulling operation.

(3) The pulling grip should be permanently fastened to the pulling cable by means of clamps or ring splice and thimble.

(4) The cornering wheels or troughs should be placed so that the bundle, when pulled, will be as near its final fastening location as possible. When more than one bundle is being installed and a parallel layout is desired, the cornering aids should be mounted so as to be easily relocated.

(5) If the estimated pulling force as determined on the aforementioned graph exceeds 200 lbs. per tube, the bundle must be pulled by two or more separate pulling grips. When it has been pulled as far as practical with an end grip alone, a second grip, called a split slack grip (see Table No. 5 in appendix) is attached to the bundle at the beginning of a straight section near the reel end, and used to eliminate all drag on the end pulling grip originating from points behind the slack grip. See detail No. 9. For example, if more than a total of 1350° (ten 90° and one 45°) is required to install a 19-tube bundle, a second grip should be used. In the case of a 12-tube bundle, more than nineteen 90° bends requires the second grip.



Detail No. 8

INSTALLATION

The actual installation of Dekoron Metl-Cor is simple and fast when adequate planning and preparation have preceded it. Sketches 1, 2 and 3 show Metl-Cor being installed over different courses. Each is self explanatory. The pulling procedure is as follows:

(1) Mount bundle reel on reel jacks and prepare bundle end for insertion into pulling grip (Table No. 5 appendix).

(1-a) Dekoron bundles of less than 100 ft. length are shipped in coils, not on reels. This bundle is most easily handled by first uncoiling it into a relatively straight length on the ground and then pulling it into position.

(2) String pulling rope or cable through system if mechanical pulling power is to be used and attach to bundle end using recommended size of pulling grip.

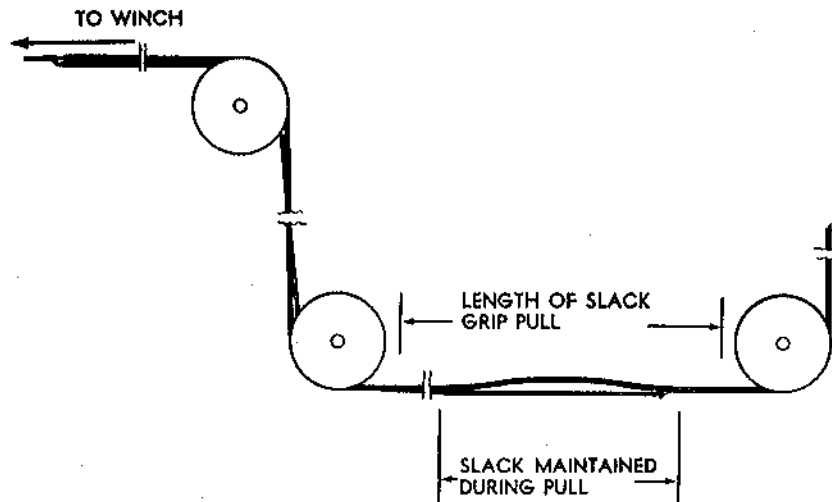
(2-a) Pulling by hand does not generally require the pulling rope.

(3) Start pulling Metl-Cor into position. One man should be applying liberal quantities of pulling lubricant; another should be slowing the rotation of the reel to prevent over run.

(4) If the use of a split slack grip is required, it should be attached as near as possible to the reel end of the run at the beginning of a long straight section (see Detail No. 9). *The slack grip should not be pulled around bending devices.* The pulling coordination is most easily accomplished if done by one tugger. However, regardless of the number of tuggers used, the split grip must always keep a small quantity of slack ahead of it from which the lead grip pulls. See Detail No. 9.

(5) Care should be exercised during the pulling operation to insure the bundle tracking properly over the various guides and supporting devices.

Note: Pulling grips will not slip off bundles if trailing one or two inches of grip is taped to bundle.



Detail No. 9

METHODS OF BENDING

Most of the bends required in a Metl-Cor bundle to make it conform to the course will be made by the cornering wheels as the bundle is pulled. An "Appleton style 1" conduit bender may be used when extra bends are required. A list of the minimum recommended bending radii is included in Table No. 3 in the appendix.

METHODS OF STRAIGHTENING

As a rule, the Dekoron Metl-Cor bundle will require very little straightening after being pulled into position. If, however, its position needs adjustment, a 2 x 4, or an equivalent tool with a broad surface may be used as a lever.

FINAL ASSEMBLY

The field engineer in charge of the installations can best decide when to fasten down the Metl-Cor bundles. Many times it will be easier to pull all of the bundles over a horizontal course before fastening any. In other cases, such as shown in sketch 2, pulls along vertical surfaces must be fastened immediately to make room for the next pull on the supporting equipment.

UNDERGROUND INSTALLATIONS

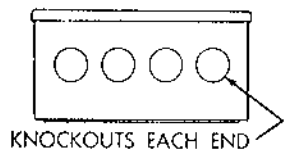
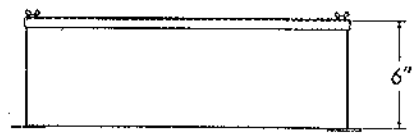
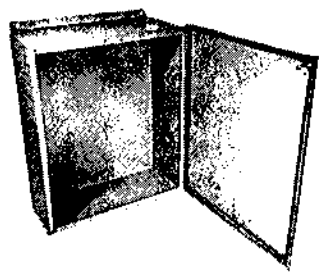
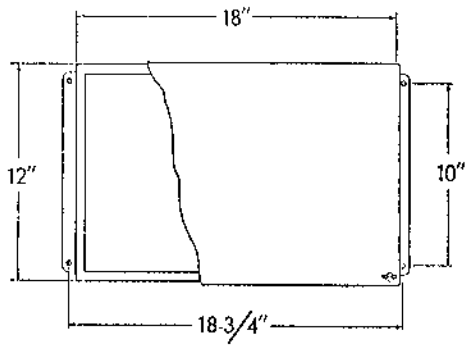
Underground installations either in conduit or direct burial are generally lower in cost than other methods. Savings are realized in material by the elimination of many bends, thereby reducing the bundle footage, and in labor by eliminating the necessity to fasten down the underground portion of the instrument tube runs.

Sketch 3 illustrates this type of installation.

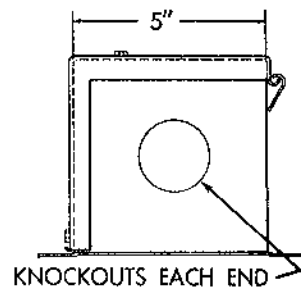
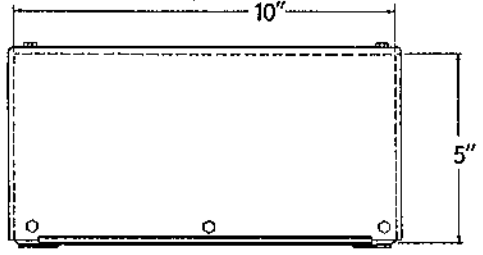
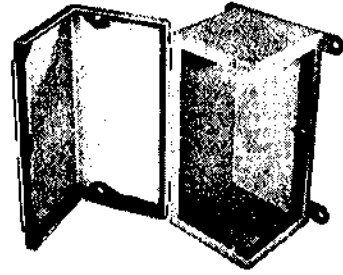
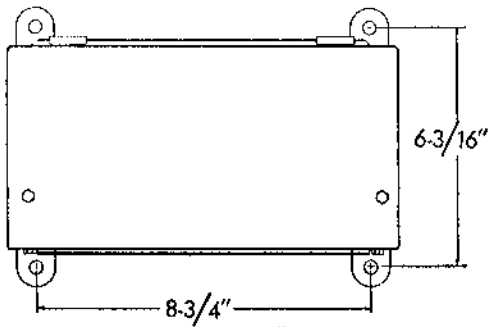
Methods of installation in conduit are outlined in detail 5. The procedure for direct burial is shown in sketch form, in detail 4.

RULES ON PREPARATION FOR JUNCTIONS:

One of the outstanding features of Dekoron Metl-Cor is its corrosion resistance. If the sheath is removed at any point, some auxiliary means of protection must be provided to fully realize the value. Any one of several protective mediums may be used, including junction boxes, tape, and corrosion resistant coatings. Junction boxes or union boxes usually provide the neatest installation and are much easier to work on particularly at a later date in the event of circuit changes. See details 10 and 11.



Detail No. 10



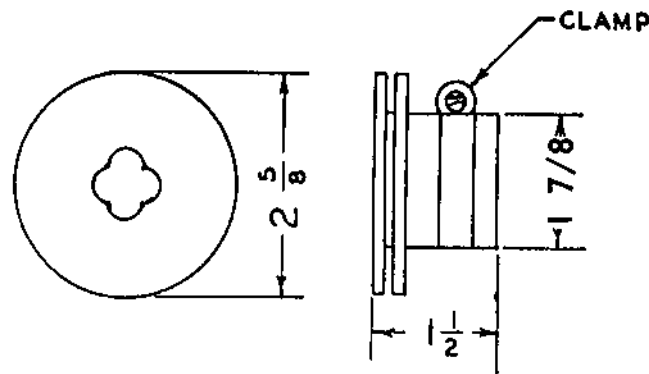
Detail No. 11

To prepare the bundle for installation in a junction or union box:

- (1) Install the grommet (see detail No. 12) in the preferred knockout hole. The grommet is installed from the inside of the box with the aid of a screw driver.
- (2) Lubricate the Metl-Cor bundle end with Y-ER-EAS or other cable pulling lubricant suitable for synthetic sheathed cables, to reduce friction and facilitate pushing the bundle through the grommet.
- (3) Push the bundle into the box a distance of 1-1/2 times the box length. This will provide enough tubing to reach any location in the box.
- (4) Tighten the clamp on the grommet so that it tightly grips the bundle to seal and to keep the bundle from being inadvertently pulled out.
- (5) Strip the plastic sheath from the bundle starting at a point approximately 2" inside box by the method described.
- (6) Make the necessary hook-ups in the box, cutting the tubing to the desired lengths, applying the fittings, etc.

To continue from the junction or union box with individual tubes:

- (1) Drill the proper size hole in the box wall for the particular bulk-head fitting you plan to use.
- (2) Install the fitting.
- (3) Attach the proper tube in the bundle to the fitting end inside the box.
- (4) Attach the individual tube to the fitting end outside the box.
- (5) If corrosion is a danger, use Dekoron plastic coated metal tube for single runs.
- (6) Protect the fittings outside the box with plastic tape or good corrosion resistant paint.

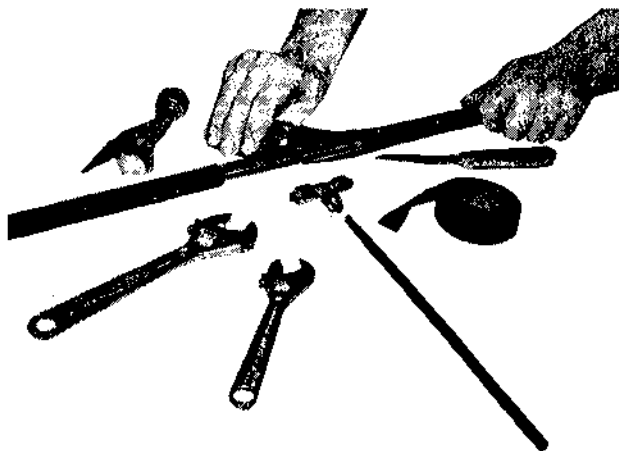


GROMMET ASSY (2IT2)
NEOPRENE RUBBER

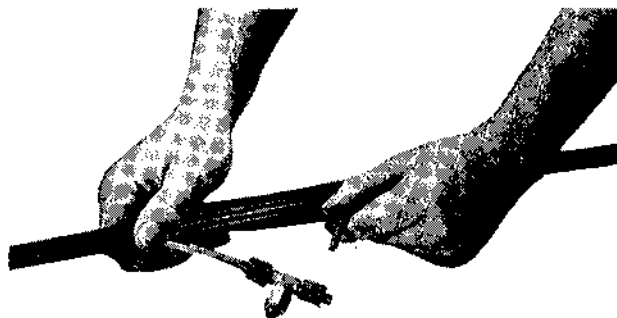
Detail No. 12

TAPPING ONE TUBE IN A BUNDLE

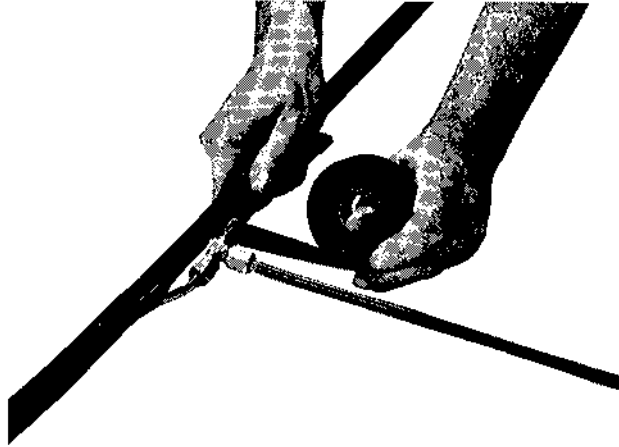
The following photographs and data apply specifically to 7-tube Metl-Cor. However, identical methods are used for making taps on tubes in Metl-Cor having a lesser or greater number of core tubes.



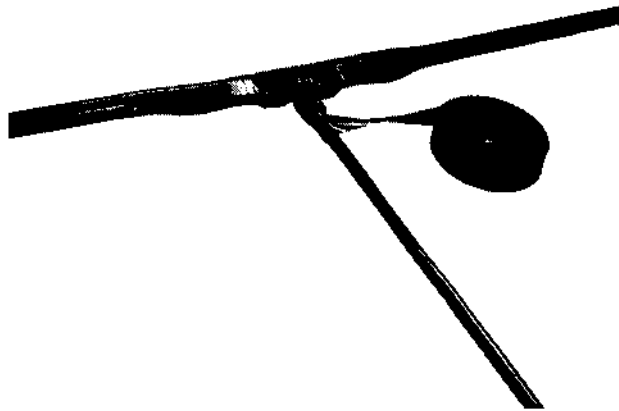
The plastic armor is slit with a sharp knife and turned back. Make the opening 10 to 12 inches long. Cut around the bundle at one end of the opening only. All the tools needed for making tap are shown.



The fitting is applied to the tube ends after the desired tube is severed with a cable cutter and then cut to proper length with the tube cutter. A tee is shown, but unions, elbows, or other fittings may be used.



After the desired joint is made, put the plastic armor back into place and tape the joint with plastic electrical tape. To assure a chemically resistant tape wrap, two or three layers should be applied. A 1/4" lap should be used in taping.



Criss-cross the layers to eliminate leakage. Tension should be applied to the tape to assure tight seams and good conformity to joint. The last two or three turns should be applied without tension to lessen chance of tape creep.

TABLE NO. 1

NET AND SHIPPING WEIGHTS, SHIPPING LENGTHS ETC.

1/4" x .030" WALL COPPER AND 1/4" x .032" WALL ALUMINUM

No.	Net Wt. Per 100' in lbs.		Standard Shipping Length in feet		Shipping Reel Dimensions		Shipping Wt. Incl. Reel in lbs. per Std. Shipping Length	
	CU Tubes	Al. Tubes	CU Tubes	Al. Tubes	(inches) Diam. Width		CU Tubes	Al. Tubes
2	18.9	7.8	500	500	48	16	155	99
			1000		48	16	249	
3	28.4	11.7	500	500	48	16	202	118
			1000		48	16	344	
4	37.8	15.6	500	500	48	16	249	138
			1000		48	16	438	
5	47.3	19.5	500	500	48	16	296	157
			1000		48	32	580	
7	63.9	24.1	500	500	48	16	379	167
			1000		48	32	746	
8	73.0	27.5	500	500	60	24	475	247
			1000		60	48	950	
10	89.1	33.7	500	500	48	16	505	228
			1000		48	32	1014	
12	108.4	41.9	500	500	60	24	652	310
			1000		60	48	1300	
14	139.6	47.67	500	500	74	24	843	383
			1000		74	48	1680	
19	172.8	67.54	500	500	74	24	1009	483
			1000		74	48	2012	

3/8" x .032" WALL COPPER AND 3/8" x .035" WALL ALUMINUM

2	30.7	15.7	500	500	48	16	213	138
3	45.9	23.5	500	500	48	16	289	177
4	61.3	31.3	500	500	48	16	366	216
7	103.5	40.5	500	500	60	24	627	312
10	154.7	64.7	500	500	74	32	1043	593

TABLE NO. 2**RECOMMENDED CLAMPS FOR DEKORON METL-COR**

Tube Size	No. of Tubes in bundle	Unistrut* (Detail 2)	Husky** (Detail 2)	Minerallac Cable*** Hanger Clamps- Everdur (Detail 3)	Minerallac Jiffy*** Clips - Everdur (Detail 1)
1/4"	2	P-2026		No. 0	No. 125
1/4"	3	P-2027		No. 0	No. 125
1/4"	4	P-2027		No. 1 Use with 3/16 Neoprene Rubber Bushing	No. 130 (3/8 Conduit)
1/4"	7	P-2028		No. 0	No. 140 (1/2 Conduit)
1/4"	8	P-2028		No. 1	No. 150
1/4"	10	P-2029		No. 1	No. 150 (3/4 Conduit)
1/4"	12	P-2030	SCR-10	No. 1	No. 155 (1 EMT)
1/4"	14	P-2031	SCR-11	No. 2	No. 155 (1 EMT)
1/4"	19	P-2033	SCR-13	No. 2-1/2	No. 160 (1 Conduit)
3/8"	2	P-2028		No. 0	No. 140
3/8"	3	P-2028		No. 0	No. 140
3/8"	4	P-2029		No. 0	No. 150 (3/4 Conduit)
3/8"	7	P-2031	SCR-11	No. 2	No. 155 (1 EMT) (Must be bent)
3/8"	10	P-2033	SCR-13	No. 2-1/2	No. 165 (1-1/4 EMT) (Must be bent)

Clamps may be obtained from the following sources:

*Unistrut Products Company, 1013 Washington Blvd., Chicago 7, Illinois

**Husky Products, Inc., 5300 Vine Street, Cincinnati 17, Ohio

***Graybar Electric Company

TABLE NO. 3**BUNDLE DIMENSIONS, CENTERS OF SUPPORT AND BENDING RADII**

Tube Size	No. of Tubes in bundle	Dimensions	Support Centers	Bending Radii
1/4"	2	3/8 x 5/8	3	2"
1/4"	3	19/32 x 5/8	3	4"
1/4"	4	13/16 x 5/8	3	4"
1/4"	7	7/8 x 13/16	5	6"
1/4"	8	1-1/16 x 7/8	5	7"
1/4"	10	13/16 x 1-1/8	5	8"
1/4"	12	1 x 1-1/8	5	10"
1/4"	14	1-13/64 x 1-21/64	5	12"
1/4"	19	1-5/16 x 1-7/16	5	12"
3/8"	2	7/8 x 1/2	3	3"
3/8"	3	7/8 x 3/4	3	5"
3/8"	4	1-3/16 x 7/8	3	5"
3/8"	7	1-3/16 x 1-1/4	5	8"
3/8"	10	1-3/16 x 1-5/8	5	10"

TABLE NO. 5**PULLING GRIPS**

Tube Size	No. of Tubes in bundle	KELLEMS*		RELIABLE**	
		Plain	Split	Plain	Split
1/4"	2	J50	UB075-A	821	1862
1/4"	3	J50	UB075-A	821	1862
1/4"	4	J62	UB075-A	822	1862
1/4"	7	J75	UB075-A	823	1862
1/4"	8	K075-P	UB075-A	823	1862
1/4"	10	K075-P	UB100-A	823	1862
1/4"	12	K100-P	UB100-A	823	1862
1/4"	14	K100-P	UB125-A	823	1862
1/4"	19	K100-P	UB125-A	824	1974
3/8"	2	J62	UB075-A	821	1862
3/8"	3	J75	UB075-A	822	1862
3/8"	4	J75	UB075	823	1862
3/8"	7	K100-P	UB100-A	823	1862
3/8"	10	K100-P	UB125-A	824	1862

* Kellems Company, Stonington, Connecticut

**Graybar Electric Company

TABLE NO. 4
NUMBERS OF BUNDLES VS. CONDUIT SIZE
25% OF AREA – NOT EXCEEDING 30%

Nom. Size	Inside Diam. Size	1/4" O.D. Tubes									3/8" O.D. Tubes					
		2	3	4	7	8	10	12	14	19	2	3	4	7	10	
Tubes Per Bundle																
1-1/2	1.610	3	2	1	1	..	..	..	..	..	..	1	..	..	..	..
2	2.067	4	4	2	1	1	1	1	..	..	..	2	1	1	..	..
2-1/2	2.469	6	5	3	2	2	2	1	1	..	..	3	2	1	1	..
3	3.068	9	8	5	4	2	3	2	1	1	..	4	3	2	1	1
3-1/2	3.548	13	10	6	5	3	4	3	2	1	..	6	4	3	2	1
4	4.026	16	13	8	6	4	5	4	2	2	..	7	5	3	3	2
5	5.047	26	21	12	9	6	8	6	4	4	..	11	8	6	5	3
6	6.065	37	30	18	13	9	11	9	6	5	..	17	12	9	7	5
2	2.0	4	3	2	1	1	1	1	..	..	..	2	1	1	..	..
3	3.0	9	8	5	3	2	3	2	1	1	..	4	3	2	1	1
3-1/2	3.5	14	12	7	5	4	4	3	2	2	..	6	5	3	2	1
4	4.0	16	13	8	6	4	5	4	2	2	..	7	5	4	3	2
5	5.0	25	21	12	9	6	8	6	4	3	..	11	8	6	5	3
6	6.0	36	30	18	13	9	11	8	6	5	..	16	12	9	6	5

DEKORON

SPECIALITY PRODUCTS DIVISION



www.wirexcontrols.com 

9446 McLaughlin Rd. N.
wirex@wirexcontrols.com
#27 Brampton, Ontario
L6X 4H9
Local Phone: (905) 459-0742
Toll Free Phone: (877) 620-6500
Local Fax: (905) 450-8216