

RUNNING CABLE AND WIRE
BULK CABLE

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1. GENERAL

1.1 Scope of Section

1.11 This section covers the requirements and methods for placing wire and switchboard cable on cable rack.

1.2 General Information Pertaining to Arrangement of Tools, Precautions, Verification, Specs and Drawings and Figures

1.21 Refer to Section 1 of this handbook for information pertaining to these items.

2. INSTALLING EQUIPMENT

2.1 The tools and supplies normally required for racks designed for cabling are listed in Section 200 of this handbook.

3. REQUIREMENTS AND METHODS

3.1 Running Cable

3.11 Run several cables together at one time where space permits setting up more than one support for cable reels, or coil dispensers when running coil cable.

NOTE: Before running switchboard cable from a coil of bulk cable, remove the identification tag which lists the code, length, specification and run number from the

outer end of the coil. To prevent loss it may be placed on the cable tag retaining ring, described in Section 150, where this method of storing cable tag is used.

3.111 Pull the cables through the cable guides or sheaves to prevent their dragging over other cables and wires. This prevents damaging the sheathing of cables and the insulation of wires. Placement of the cable guides is covered in Section 131 of this handbook. The use of the R-4145 Cable Puller and Sheaves can be found in Section 213 of this handbook.

3.1111 Take particular care where cables are pulled in over loosely run type AM or BH wires or on cable racks containing power wire.

3.112 Prevent the cables from twisting as they are being run to avoid the necessity of untwisting them later.

3.12 When pulling in a large group of cables on a long straight section of cable rack, use two pulleys with heavy sash cord. Fasten the pulleys to the superstructure or support them by details clamped to the rack as shown in Figure 1. Purchase parts locally.

NOTE: Keep the sash cord taut at all times to prevent the cables which are being pulled from snagging.

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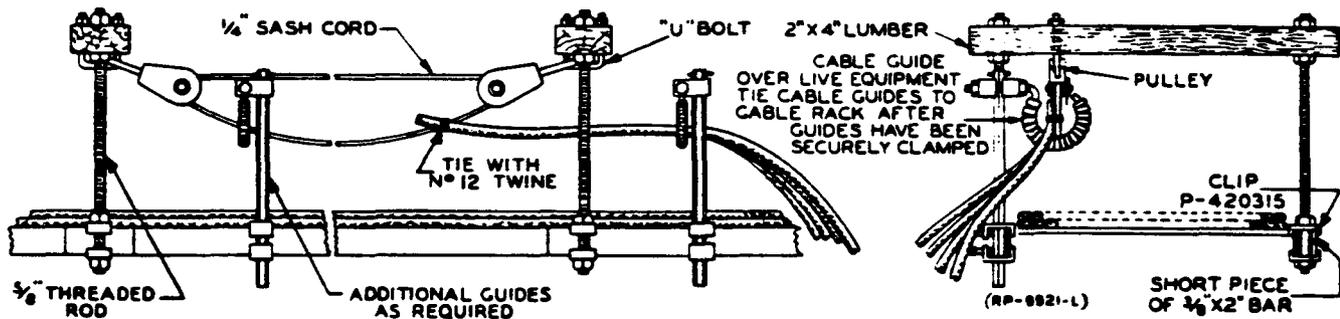


FIG. 1 METHOD OF PULLING CABLE WITH ROPE
(PAR. 3.12)

3.121 Multiple Cables within a lineup should be run from the cable reel setup at one end of the lineup and the cable pulled to the last assigned termination at the other end of the lineup. The end of the cable should then be tied in place. Moving to the next bay or frame towards the cable reel pull sufficient cable from the reel to reach this assigned location, loop and cut the cable, then tie the cable in place at this point. Repeat this operation at each assigned bay or frame in the lineup working towards the cable reel.

3.122 Mult thru cables within a lineup can be run in the same manner as multiple cables in Paragraph 3.121 but the loop should not be cut at each bay or frame location.

3.13 During the running of round and oval cables do not bend them at a radius of less than 6". Do not bend flat type cable on edge at a radius of less than 12". This will prevent altering the shape and thickness of the cable.

3.14 When running flat cable make edge-wise bends with the Cable Template, R-62729, shown in Figure 2. Start the bend by holding the cable firmly in the template at the start of the bend with one hand and work the cable slowly around and into the template with the other hand. Continue moving the template and working the cable into it around the bend.



FIG. 2 R-62729 TEMPLATE FOR BENDING FLAT CABLES (PAR. 3.14)

3.15 After running in a group of cables, secure them temporarily at the head end, leaving 12" of excess cable beyond the length required to reach the equipment which they serve.

NOTE: When a drop length is provided on a printed cable tag, use this length to cut the cable. The drop length represents the length of the cable required from the bottom of the cable rack stringer to the termination. This length includes an allowance for a normal bend off the rack and connecting increment.

3.16 Remove the cables from the cable guides or sheaves and work any slack in them back along the run toward the cable reels. Cables which are to be secured should be placed in their permanent locations and secured temporarily at turns or other intervals as required to sufficiently hold them in place.

3.161 Tie the cable ends temporarily at the cable brackets on frames, bays and racks to prevent them from damaging wiring and apparatus, from being an accident hazard and from causing service interruptions at working equipment.

3.1611 Use twine or nylon ties for making temporary ties. To avoid cuts and bruises when tightening twine, use a steady pull.

3.17 Preferred bending radii to be observed when securing cable temporarily are shown in Table A. Minimum bending radii to be observed when securing cable permanently are given in Section 100 of this handbook.

TABLE A		
Type of Cable	Diameter	Bending Radii (See Note)
<u>Round</u>	Up to 1/2"	3"
	Over 1/2" to 1"	4"
	Over 1"	8"
<u>Oval</u> Bend on flat of cable Bend on edge of cable		2"
		3"
<u>Flat</u> Bend on flat of cable Bend on edge of cable	Less than 1" 1" to 1-1/2" 1-1/2 and over	3"
		6"
		8"
		12"
<p>NOTE: If necessary to use smaller radii, reference to Section 100 of this handbook may indicate some leeway on some codes of cable.</p>		

3.18 When running switchboard power wires where they have been processed on the floor (stripped, butted, etc.) use care so that the strippers do not become kinked, twisted or damaged. If necessary, secure the wires temporarily to keep them in place.

3.2 Arrangement of Secured Cables on Ladder Type Cable Rack

3.21 Place the cables on cable racks in accordance with the following:

3.211 In "regular" runs, place cables as shown in the cross-section views on the job cabling plan drawings.

3.212 In "miscellaneous" runs, place cables in complete layers across the full width of cable rack.

3.213 In "regular" or "miscellaneous" runs, oval cables will normally be placed on edge unless they terminate in switchboards or desks.

3.22 Arrange switchboard cable and power wire run on the same rack as follows:

3.221 When power wires are equipped with power connectors, a detailed cross-section on the job cabling plan drawing will show the amount of space reserved for power wires. The intent of this provision is to insure that connectors will be accessible for inspection and tightening. Under no circumstances shall switchboard cable be installed over power wire connectors. When the job cabling plan drawing has not made this provision or when the switchboard cable being installed initially or on additions does not permit this arrangement, refer the matter to the Equipment Engineer.

3.222 When power wires are not equipped with power connectors, they may be run on a miscellaneous (mixed) basis with switchboard cabling unless otherwise specified on the job cabling drawing.

3.23 Arrange all layers of cable on the cable rack as even as practicable, and in such a manner as to permit the installation of the ultimate pileup as shown on the job cabling plan drawings.

3.24 Pile small cables in a run containing large cables so their combined height will equal, as near as possible, but will not be higher than the largest cable.

3.25 Place the cables in a formation which will permit fanning them at their terminating points with the least possible amount of twisting and fanning.

3.26 Arrange cables so as to obtain the maximum advantage of adjustable flat type cable clips, when used, thereby eliminating unnecessary clipping.

3.27 Uniformity and a minimum of crosses will result in a cabling job of good appearance.

3.28 At intersections, determine whether the job cabling plans specify the use of corner brackets. Where they are specified, the cables should be run over them as required.

3.281 Cable rack corner brackets are specified at right angle turns where the bending radius of the inside cable is greater than 8" or at intersections to permit spreading the cables to avoid excessive piling. See Figure 3.

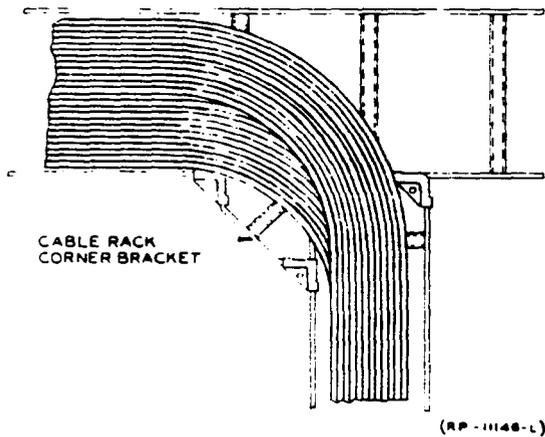


FIG. 3 TYPICAL CABLE ARRANGEMENT AT CABLE RACK CORNER BRACKET (PAR. 3.281)

3.3 Placing Unsecured Cables on Bar Type Cable Rack and Ladder Type Cable Racks with Retaining Brackets

3.31 Cables on horizontal resting runs, including up to 45° inclined resting runs, having bar type cable rack should not be otherwise secured except at turn-off points where the cables should be sewed to other cables, uprights (horns) or stringers if they cannot be made to lie reasonably flat on the rack.

3.32 Unsecured cables on bar type cable rack should be placed in a somewhat orderly manner so that there will be adequate capacity for all the cables planned for the run. The cables should lie reasonably flat and reasonably straight on the rack, piled evenly on the rack and not be pulled all to one side of the rack at turns and bends.

3.321 The storing of excessive lengths of cable on the rack should be avoided as such cables increase the height of the cable run, represent a waste of cable and have a tendency to block the run and prevent adding cables on additions.

NOTE: Multiple cables furnished shop formed at both ends have built in slack to permit flexibility in placing them on the cable rack and provide insurance against them being short due to variations in cable pileup. Where all or part of this slack is not consumed in the normal path of the cable on the cable rack, dispose of it in the bend on the cable rack at each end of the cable just before it breaks off the rack, or in one bend at either end of the cable. Observe the minimum bending radii covered in Section 100 of this handbook. Secure the bend containing slack to adjacent cables stringers or uprights with approved twine, as required to keep the bends flat on the rack and prevent unduly increasing the cable pileup.

3.322 Running the cables between frames before running the cables between lineups will help to hold the shorter cables in place.

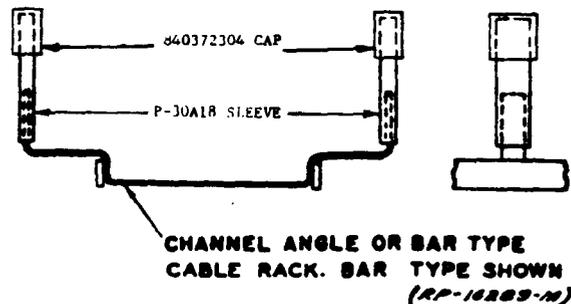


FIG. 4 EXTENSIONS FOR CABLE RACK (PAR. 3.33)

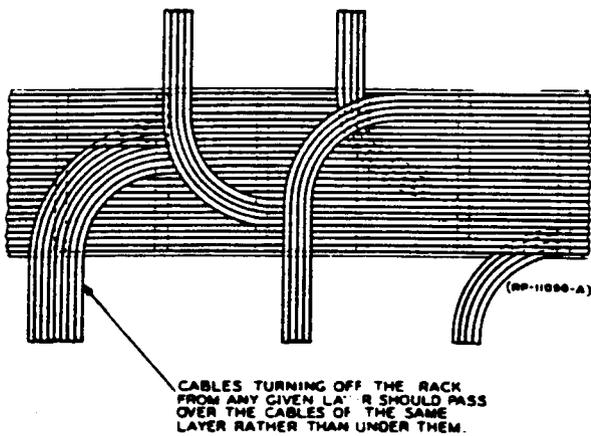


FIG. 5 TURNING CABLES FROM CABLE RACKS (PARS. 3.41 AND 3.42)

3.33 Flat tubular extensions (P-30A318 Sleeve) arranged to fit over the uprights as shown in Figure 4 are available for increasing the capacity of channel, bar and angle type cable racks. They are furnished as an equipment item in the cable rack specification and should be used where the cable pileup warrants it. Extension sleeves should also be installed at all T-intersections of bar-type over aisle cable racks on the ends of cross straps on both sides of the intersection. When installing P-30A318 Extension Sleeves, always apply an 840372304 Finishing Cap to the sleeve.

3.4 Turning Cables From Cable Rack

3.41 At equipment frames and bays, cables are generally turned over the cable rack stringers as illustrated in Figure 6.

3.411 At ladder type cable racks when the racks are located directly above the frames, the cables in the bottom layer may be dropped through the rack as illustrated in Figure 7 when it is advantageous to do so. When cabling plan drawings specify that cables be dropped through the rack, the cables should be run in the bottom layer or space should be reserved on the rack to permit cables on upper layers to turn through the rack.

3.42 At frames served by bar type cable rack, turn cable off the side of over aisle or over frame cable racks. Where frames are located under cross aisle cable racks, turn the cables off the rack through the intersection as covered in Section 131, Figures 10, 11, and 12, of this handbook. When access to the opening between the racks at the intersection of the cross aisle and over aisle is blocked by existing cables, the cables may be turned over the side of the cable rack and run under the cross aisle rack to the vertical drop point.

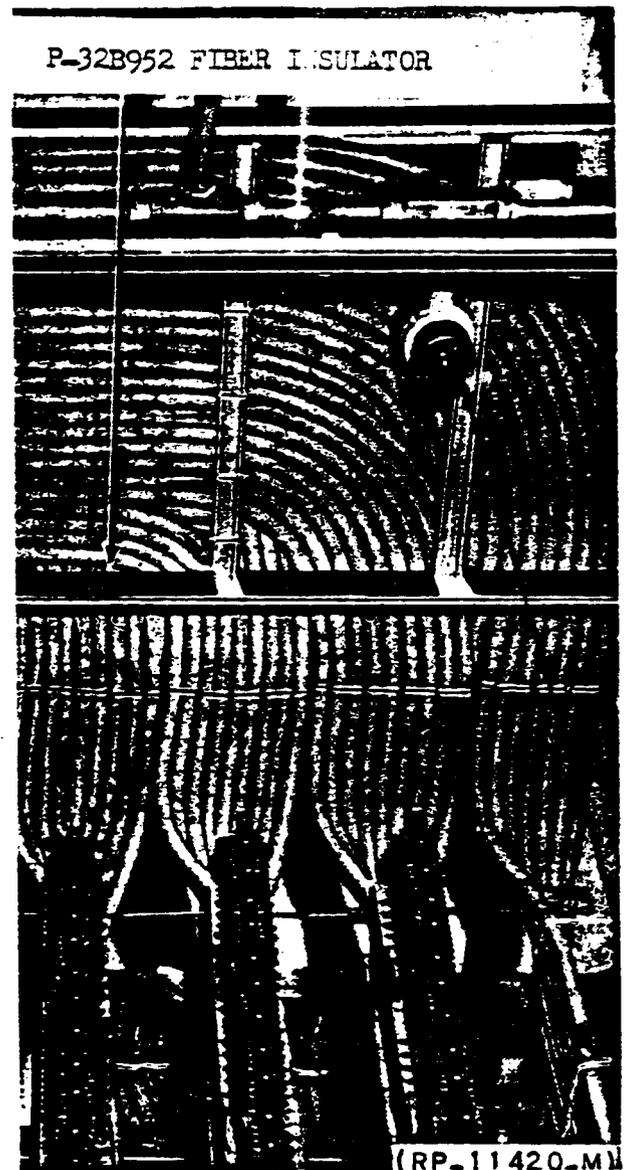


FIG. 6 TURNING CABLES FROM CABLE RACK AT DISTRIBUTING FRAMES (PAR. 3.41)

NOTE: Since alterations of the metal plate on the cross aisle racks to provide larger than normal openings may be difficult to perform after cables have been run to these locations, determine whether the normal opening is adequate before running cables to these locations. The sequence of running cables should also be considered as cables running across the intersection may also block access to the opening.

3.43 After the cable formation have been made at the turns and bends and the slack has been worked back to the cable reel, determine the point at which the cable should be cut so as to leave 12" of excess cable beyond the length required to reach the equipment which it serves. Use the Cable Shears (R-1514) or 8" cable cutters to cut the cable

3.44 Correct the lengths of cable marked on the cable reels to indicate the amount of cable left over after completing a run, or if running or removing cable from a coil of bulk cable, correct the length of cable marked on the shop tag and replace tag on the outer end of the coil.

3.5 Precutting Cable

3.51 Where floor space permits, such as on precabing jobs, precutting cable before running will allow running more cables at once as opposed to running directly from cable reels as covered in Paragraph 3.1.

3.52 When precutting cable, it is recommended that cables not be cut to the lengths listed in the FT. columns of job prepared or printed cable tags or the FT. columns in cable running lists in cable specifications. The lengths in these columns represent estimates and may result in some cables being short or excessively long. It is recommended that the following method be used.

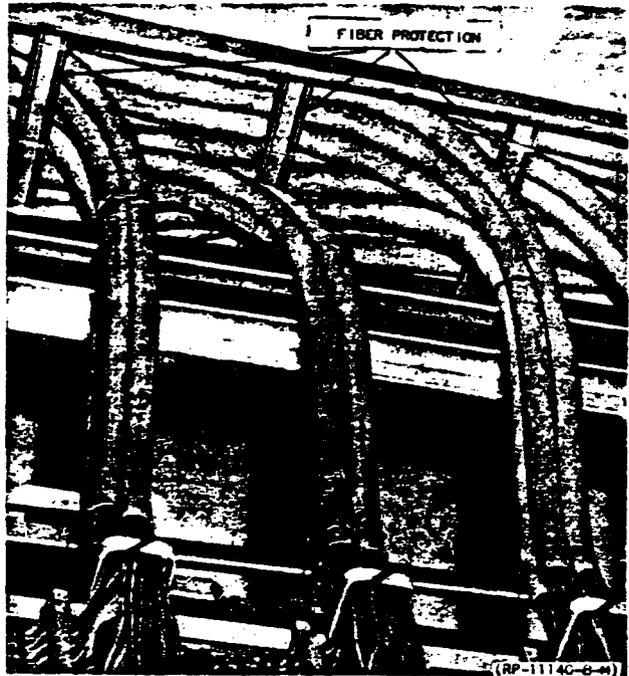


FIG. 7 TURNING CABLES THROUGH CABLE RACKS (PAR. 3.411)

3.521 Measure the cable route by using the R-4133 "Measuring Device". This measuring device permits the Installer to measure "cable routes" while remaining at floor level.

3.6 Removal of Cable Tags

3.61 Unless otherwise specified and wherever possible, cable tags should be left on cables until all final test are made and trouble cleared. Remove them prior to final inspection.

4. VERIFICATION

VERIFICATION ITEMS AND BRIEF STATEMENT OF REQUIREMENTS	REFERENCE	
	Par. No.	Fig. No.
4.1 <u>Arrangement of Secured Cables on Ladder Type Racks</u>		
4.11 <u>Regular Runs</u> : Cables arranged according to predetermined arrangement in cross-sectional views on job cabling drawings.	3.211	
4.112 Oval cables normally placed on edge unless they terminate in switchboards or desks.	3.213	
4.12 <u>Miscellaneous Runs</u> : Installed in complete layers across width of rack, except when other arrangement is indicated on cable drawing.	3.212	

4. VERIFICATION (Cont.)

VERIFICATION ITEMS AND BRIEF STATEMENT OF REQUIREMENTS		REFERENCE	
		Par. No.	Fig. No.
4.13	<u>Switchboard and Power Wires Run on same Rack</u>		
4.131	Power wires equipped with connectors placed on rack as detailed in cross-section on the job cabling drawing in space reserved for power wires. Connectors should be accessible for inspection and tightening. No switchboard cable are to be installed over power wires with connectors.	3.221	
4.132	Arrange all layers of cables on the cable rack as even as practicable.	3.23	
4.133	Small cables run with large cables so that height will equal as near as possible but will not be higher than the largest cable.	3.24	
4.134	Cables placed in a formation which will permit fanning at terminating ends with the least amount of twisting.	3.25	
4.135	Cables arranged to obtain maximum advantage of adjustable flat type cable clips.	3.26	
4.14	Corner brackets installed where specified on job cabling plans and cables run over them as required.	3.28	
→ 4.141	Cable rack corner brackets installed at right angle turns where bending radius of the inside cable is greater than 8" or at intersections to permit spreading the cables to avoid excessive pileup.	3.281	3
4.2	<u>Placing Unsecured Cables on Bar Type and Ladder Type Cable Racks with Retaining Brackets</u>		
4.21	Cables not otherwise secured except at turn off points where cables are sewed to other cables, uprights or stringers if they cannot be made to lie reasonably flat on the rack.	3.31	
4.212	Unsecured cables placed in somewhat orderly manner, reasonably flat and reasonably straight on rack piled evenly and not pulled all to one side of the rack at turns and bends.	3.32	
4.213	Excessive lengths of cable not stored on cable rack.	3.321	
4.3	<u>Turning Cables From Rack</u>		
4.31	<u>At Ladder Type Cable Rack</u>		
→ 4.311	Turn cable over the cable rack stringers at equipment frames and bays.	3.41	6
→ 4.312	Cables in bottom layer of cable rack dropped through the rack when cable rack is directly above the frame.	3.411	7

4. VERIFICATION (Cont.)

VERIFICATION ITEMS AND BRIEF STATEMENT OF REQUIREMENTS	REFERENCE	
	Par. No	Fig. No.
4.4 <u>At Bar Type Cable Racks</u>		
→ 4.41 Cables turned off the side of over aisle or over frame cable racks.	3.42	
→ 4.411 Cables dropped through the rack only at T intersections of cross aisle racks and over frame or over aisle racks.	3.42	

→ Indicates new or
changed information.

[Vertical lines at side of paragraph
indicates requirements

Engineering Planning Manager
Common Installation and Services

Reason for Reissue:

To remove preparatory operations such as placement of cable guides and cable protection, which is duplicated in Section 131.