RUNNING CABLE AND WIRE

USING R-4145 MOTOR DRIVEN CABLE PULLER

CONTENTS

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1. GENERAL

1.1 Scope of Section

1.11 This section covers information and methods relative to running cable and bulk wire on cable racks using a motor driven cable puller.

1.2 General Information Pertaining to Arrangement of Tools, Precautions, Verifications, Specifications and Drawings and Figures

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

1.3 Lubrication and Maintenance

1.31 The tools used in this section shall be lubricated and maintained in accordance with the information in Section (refer to Table of Contents) of Handbook 28 associated with the tool. The R-4145 Detail 1 Puller may require daily lubrication depending upon amount of use.

2. INSTALLING EQUIPMENT

2.1 The tools and supplies generally used for operations covered by these methods are listed in Section 200 of this handbook.

NOTE: The supervisor responsible for the cabling operations shall determine whether it would be economical to use the R-4145 Motor Driven Puller instead of pulling the cable manually. The setup time involved should be the governing factor based on the following.

(a) 100 or more cables in excess of 100 feet run over the same cable rack can be run in groups, up to six or more depending upon the size of the cables.

(b) Multifloor cabling which would normally require a large manload.

(c) Space available on cable rack for mounting sheaves. Detail 2 horizontally mounted sheave requires 8-1/2 inches plus 2 inches for the auxiliary framing bars. Detail 3 vertically mounted sheave requires 15 inches plus 2 inches for auxiliary framing bars.

3. SETTING UP POWER PULLER AND SHEAVES

3.1 Setting Up Puller

3.11 The R-4145 Detail 1 Puller has adjustable vise chains with handscrews which quickly anchors the unit to cable rack, auxiliary framing, pipe, conduit structure, or floor when the vise chains are removed. The Puller should be located at or near the terminating end of the cable run. See Figures 1 to 4 for various methods of mounting the Puller. The installer should mount the Puller to suit the job condition, arranged so the operator will work from the floor.

CAUTION: The R-4145 Detail 1 Puller has a Pulling Power in excess of 4000 lbs. This must be considered when fastening to superstructure, cable rack, etc. to insure that all supporting members are securely anchored and fastened tightly.

3.2 Puller Operation

3.21 The pulling operation is performed by winding the 5/8" Polypropylene pulling rope a few turns around the larger of two aluminum capstans. This maintains a recommended pulling rate of fifteen feet per minute when using the Power Puller. Using the small capstan will provide a pulling rate of thirty feet per minute. Releasing tension on the pulling rope will cause slippage at the Puller capstan. This places the pulling operation under control of the installer at the Puller who can quickly stop the pulling in case of trouble.

CAUTION: There should always be slippage of the Pulling Rope around the Puller capstan when no tension is applied to the Pulling Rope. The Puller Power cord should be removed from the appliance outlet whenever the Puller is left unattended.

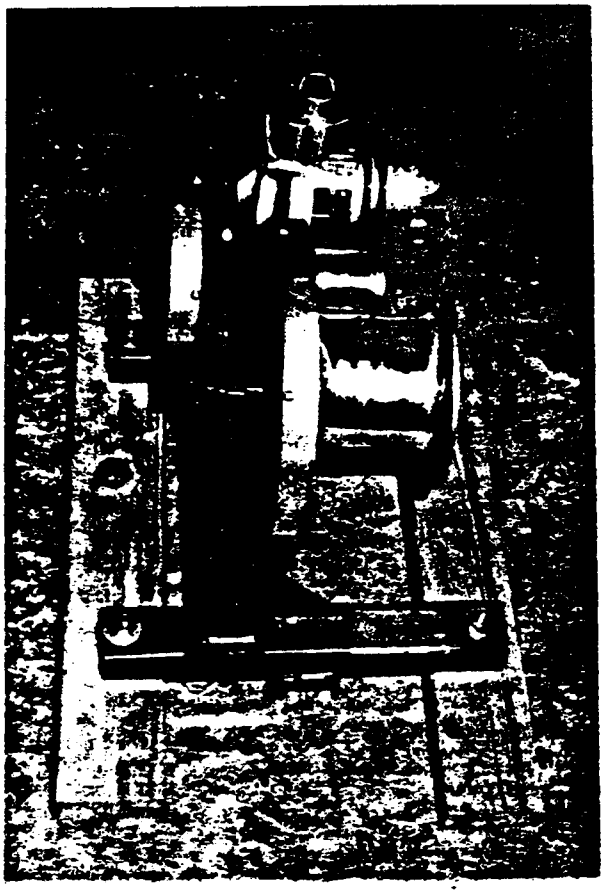

FIG. 1 R-4145 DETAIL 1 CABLE PULLER MOUNTED ON 2" x 4" LUMBER AND ANCHORED TO FLOOR WITH 3/8" BOLTS. FLOOR DRILLED FOR 3/8" EXPANSION SHIELD ADJUSTABLE VISE CHAIN REMOVED FROM PULLER (PAR. 3.11)

3.22 There are conditions where it may be advantageous to pull in the cable manually instead of using the R-4145 Detail 1 Power Puller. This would increase the pulling rate on runs that are short, or longer runs with few turns, when the pull required for pulling in the cable is light. The methods for mounting the various sheaves and running the switchboard cable detailed in this section would still be the same except for the omission of the Power Puller as the pulling rope would be then be pulled manually.

3.3 Setting Up Sheaves

3.31 Cable sheaves are arranged to mount horizontally or vertically from superstructure or above cable racks for guiding the cables on the straight-away or around turns on cable rack.

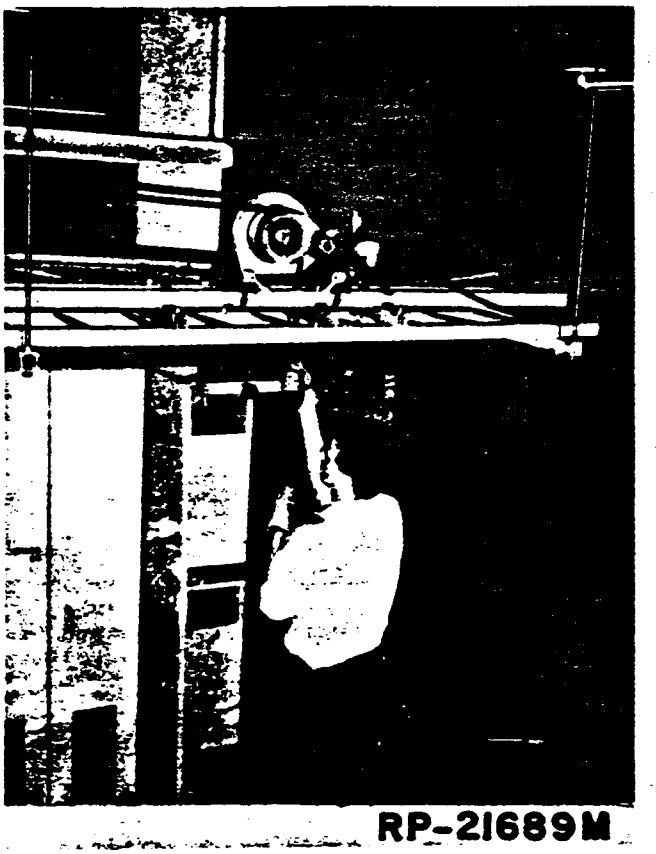

FIG. 2 R-4145 DETAIL 1 CABLE PULLER FASTENED DIRECTLY TO CABLE RACK USING PULLER VISE CHAIN (PAR. 3.11)

3.311 Detail 2 is arranged to mount horizontally from existing auxiliary framing or temporary framing bars erected in the required location. Mount temporary framing bars diagonally from corner to corner on the high type superstructure above the cable rack turn. Locate Detail 2 sheave close to the ceiling insert supported end to provide a secure anchorage. The open end of the yoke should face towards the outside of the turn. The Detail 7 pulling rope should be fed around this end. After the cable has been pulled in, the cable can then be lifted out of the open end of the sheave and placed on the cable rack. Auxiliary framing bars, 5/8 inch bolts and nuts required for temporary setup shall be provided by the installer from surplus stock on the job or requisitioned as "supplies" from Installation Stock-keeping. See Figures 5 to 7 for typical mountings.

3.312 Details 3 and 4 sheaves are arranged to mount vertically from existing auxiliary framing pipe, or temporary framing bars erected by the installer in the required location. An optional Swivel Hook is provided with the sheave for alternate means of fastening when auxiliary framing is not used. See Figures 8 to 12 for typical mountings.

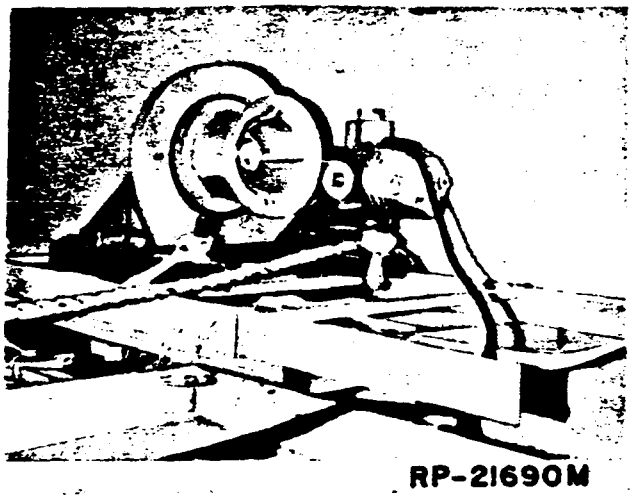

FIG. 3 R-4145 DETAIL 1 CABLE PULLER MOUNTED ON SHORT LENGTH OF CABLE RACK USING THE PULLER VISE CHAIN. THIS ASSEMBLY IS BOLTED AT RIGHT ANGLE TO THE TOP SIDE OF THE CABLE RACK IN LINE WITH CABLE TO BE PULLED (PAR. 3.11)

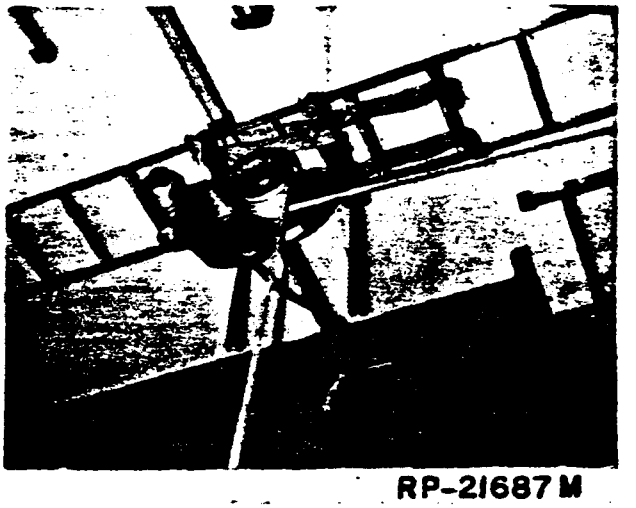

FIG. 4 R-4145 DETAIL 1 CABLE PULLER FASTENED TO UNDERSIDE OF A CABLE RACK USING THE PULLER VISE CHAIN (PAR 3.11)

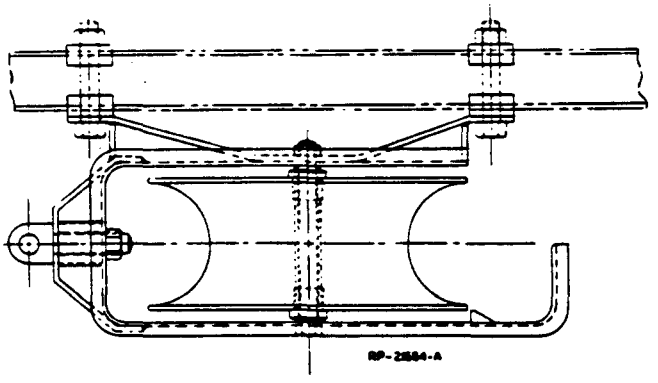

FIGURE 5

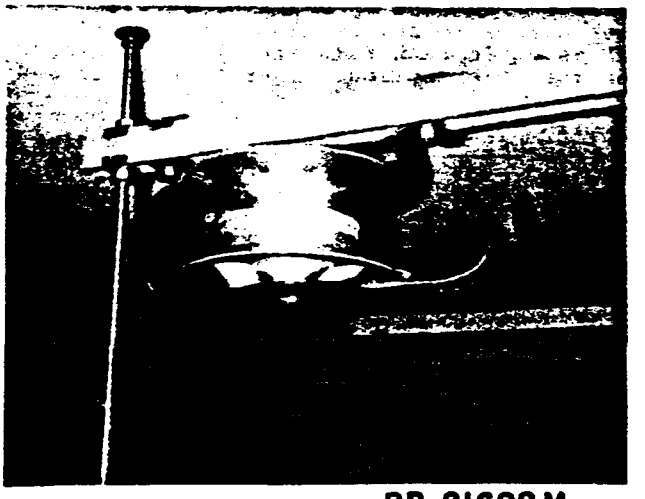

FIGURE 6

METHOD OF FASTENING R-4145 DETAIL 2 CABLE SHEAVE TO UNDERSIDE OF FRAMING BARS (PAR. 3.311)

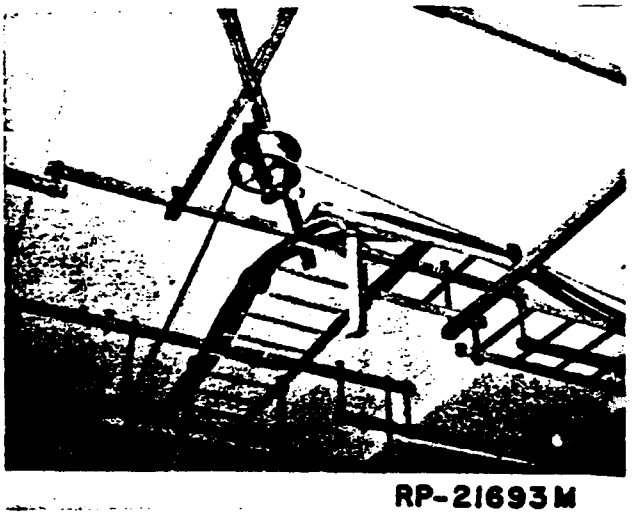

FIG. 7 R-4145 DETAIL 2 SHEAVE MOUNTED ON TEMPORARY FRAMING BARS ERECTED DIAGONALLY ACROSS A 90 DEGREE TURN (PAR. 3.311)

3.313 Details 5 and 6 Twin Yoke Frames may be used at horizontal turns when there is no available framing bars and condition does not permit erection of temporary bars. The Twin Yoke Frames should be fastened by means of R-2118 Trunk Straps to any available structure such as cable rack with the sheave centered over the intersection. (See Figures 13 and 14)

CAUTION: During the cable running, cables pass through the closed end of the yoke on Detail 3 vertical sheave and Details 4 and 5 Twin Yokes. After cables have been run the sheave pin must be removed and sheave lowered from yoke to remove the cables from the sheave. This must be considered when mounting sheaves. There should be no obstruction to prevent access to the removal of the sheave pin.

NOTE: The R-4145 Puller set contains four Detail 2 and four Detail 3 sheaves sufficient for four horizontal and four vertical turns. Two Detail 4, 6 inch sheaves are also provided for straight-away cable rack on extremely long runs to keep the cables from rubbing on existing cables or cable rack. When additional Details 2, 3 or 4 are required they should be ordered separately.

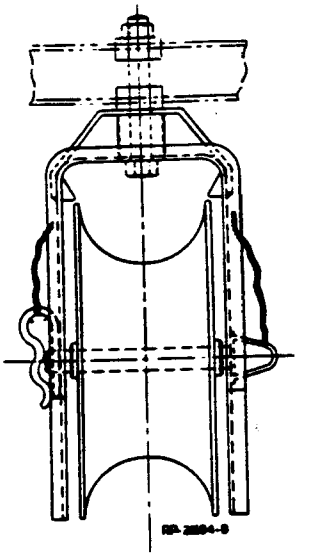

FIG. 8 R-4145 DETAIL 3 (12 INCH) CABLE SHEAVE MOUNTED TO UNDERSIDE OF FRAMING BARS (PAR. 3.312)

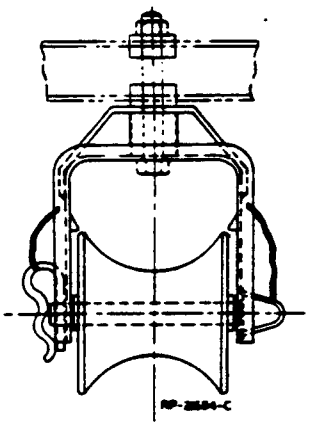

FIG. 9 R-4145 DETAIL 4 (6 INCH) CABLE SHEAVE MOUNTED TO UNDERSIDE OF FRAMING BARS. USED ON LONG RUNS BETWEEN TURNS OR WHEN SPACE IS INSUFFICIENT FOR MOUNTING DETAIL 3 SHEAVES (PAR. 3.312)

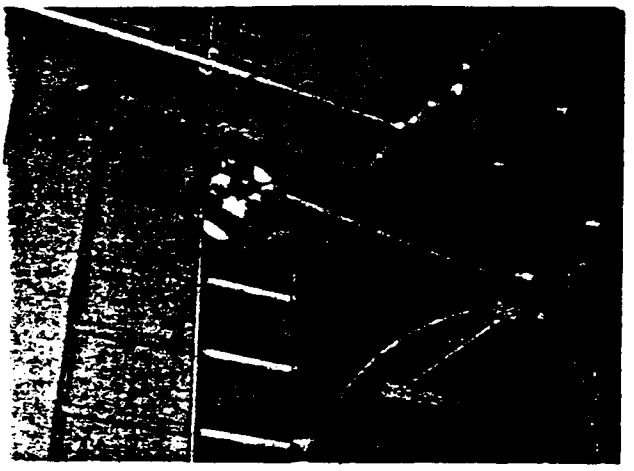

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FIG. 10 R-4145 DETAIL 3 (12 INCH) MOUNTED TO GUIDE CABLE FROM HORIZONTAL CABLE RACK TO VERTICAL CABLE RACK (PAR. 3.312)

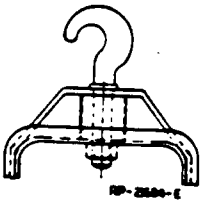

FIG. 11 OPTIONAL SWIVEL HOOK FOR USE WITH R-4145 DETAILS 3 OR 4 (PAR. 3.312)

4. REQUIREMENTS AND METHODS

4.1 General Procedure

4.11 The same requirements and methods as outlined for switchboard cable in Section 210 shall be followed in running switchboard cable using the R-4145 Motor Driven Cable Puller.

4.2 Determining Direction of Pull

4.21 When all cable sheaves are in place the Detail 7, 5/8" polypropylene rope should be fed through them starting at the lowered numbered floor, or terminating end if the cable run is on the same floor, to the originating end where the cable reels are setup. If job condition does not permit the mounting of the puller on the lowered numbered floor or the cable reels cannot be setup on the higher numbered floor, the above setup may be reversed and the cables pulled up. It may also be advisable to pull up when there is a long vertical drop on the cable run. In this case the puller will also act as a brake while running the cable.

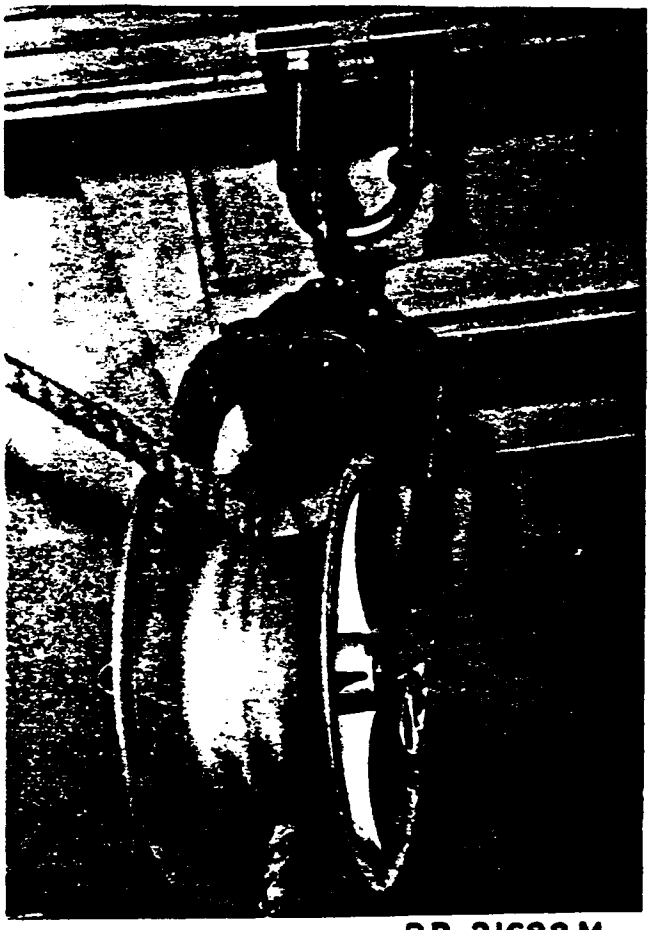

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FIG. 12 R-4145 DETAIL 3 SHEAVE USING OPTIONAL SWIVEL HOOK, AND "U" BOLT FASTENED UNDER FRAMING BARS (PAR. 3.312)

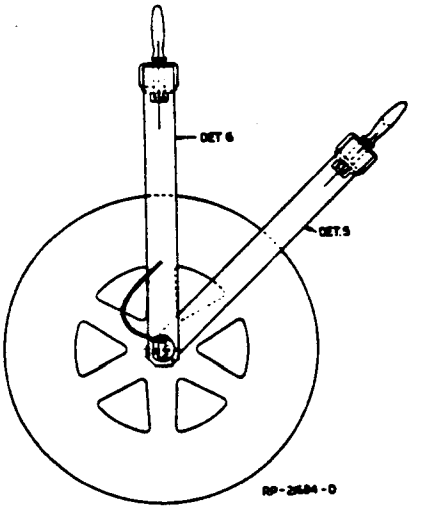


FIG. 13 R-4145 DETAILS 5 AND 6 TWIN YOKE (PAR. 3.313)

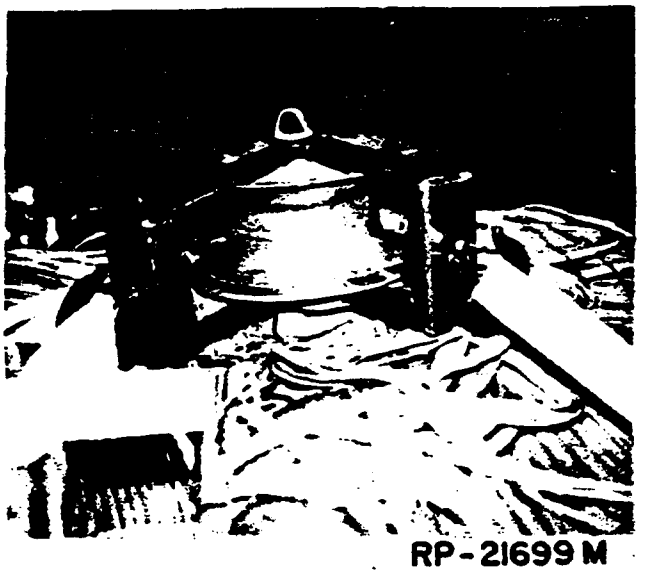


FIG. 14 R-4145 DETAILS 5 AND 6 TWIN YOKE (PAR. 3.313)

4.3 Determing Size and Attaching Details 9 and 10 Cable Grips

4.31 There are two sizes of cable grips furnished with the R-4145 Puller Set. Detail 9 pulling grip is used for groups of cables with a circumference between 3-1/8" and 4". Detail 10 is for groups of cables having a circumference between 5-1/2" and 6-1/4". Determine the size grip to used by measuring the envelope of the cables to be run including the 3/16" Detail 18 rope which is used to return the 5/8" pulling rope after each group of cables are run in. Tie bands using No. 12 twine around the group of cables approximately 2" from the end and at 6" intervals for a total of 5 ties. This is required to hold the cables which are not in contact with the mesh of the pulling grip from pulling out of the group. Attach the cable group to the cable pulling grip by expanding the grip to go over the cable and inserting the cable group as far as possible. Couple Detail 14 Swing Link to Details 9 or 10 Cable Grip and to Detail 13 Swivel. See Figure 15. If Detail 7 Polypropylene Rope is not spliced to Detail 13 Swivel, the installer shall fasten same by means of an eye splice. See Figure 16.

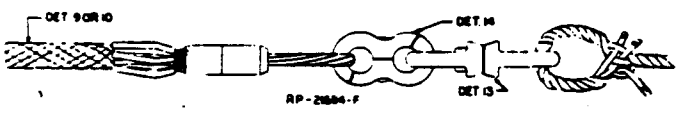


FIG. 15 COUPLING OF DETAILS 9 or 10, 13 AND 14 (PAR. 4.31)

4.4 Pulling Switchboard Cable

4.41 The operator at the pulling end where the R-4145 Puller is located should take up the slack in the pulling rope and wrap the rope several turns around the larger of the puller capstans. A talking line should be setup between floors to provide communications between the installers stationed on the cable run. The operator at the puller should start the puller motor after the "OK" signal has been received from the originating end. It is advisable that the man at the puller should work on the floor instead of on the cable rack or superstructure location of the puller. During the cable pulling the line should be taut at all times to prevent snagging. The cables being run in should be under observation along the entire run to insure that the pulling rope and cables do not snag and that there is no excessive stress placed on the sheaves or their supports. If there is an excessive amount of twist on a sheave it should be counter-braced by using a R-2118 Trunk Strap wrapped around the sheave yoke and a convenient support such as, superstructure, cable rack or threaded rod at ceiling insert. While the cable is being pulled the operator at the cable puller should be elert to any excessive pull which would also be indicated by the change in sound from the puller ratchet. This may be caused by a snag along the cable run and the pulling operation should be stopped immediately and investigated. During the pulling operation the installer at the cable reels should assist by helping to pull the cables off the reels. When the cables reach their destination on the run the Details 9 or 10 Cable Pulling Grip should be detached from the Swing Link Detail 14. Detail 14 should then be uncoupled from Detail 13 Swivel. Tie Detail 18, 3/16" return rope to the swivel for returning the 5/8" pulling rope to the originating end. The installers along the cable run should remove the cables from the sheaves leaving the 3/16" return line in the sheaves for returning the pulling rope. On long runs with numerous turns it may be found that the 3/16" return line has been twisted excessively around the cables. In this case the 3/16" return line should not be run with the group of cables. The 5/8" pulling rope should then be returned through the sheaves as the cables which have been run are placed on the cable rack. When the cables being run are to be secured and the cables are found to be excessively tangled it may be necessary to reduce the number of the cables being run as a group.

4.5 Continuous Loop

4.51 When the complete run is on one floor the sheaves may be arranged on the cable racks to form a continuous loop. In this case the 5/8" pulling rope should be run through the sheave starting at the puller and continuing around the loop back to the puller. The pulling end of the rope should be wrapped three turns around the larger of the two aluminum puller capstans. If the operator is to work from the floor add sufficient rope to form a convenient loop, then cut the rope.

EYE SPLICE

1. FIRST STEP IS TO UNLAY THE END OF THE ROPE FOR A SHORT DISTANCE.

2. FORM THE DESIRED SIZE LOOP. TAKE MIDDLE STRAND OF UNLAYED END AND TUCK THROUGH ANY STRAND OF THE "STANDING" PART OF THE ROPE. TAKE ADJACENT STRAND MARKED "2" IN PICTURE. PASS OVER STRAND UNDER WHICH "1" IS TUCKED. THEN PASS UNDER ADJACENT STRAND OF THE "STANDING" PART. THE R-1102 FIBER SPUDGER CAN BE USED TO MAKE AN OPENING FOR THE STRANDS TO PASS THROUGH.

3. TUCK REMAINING STRAND THROUGH LAST STRAND OF THE "STANDING" PART OF THE ROPE, ON OTHER SIDE.

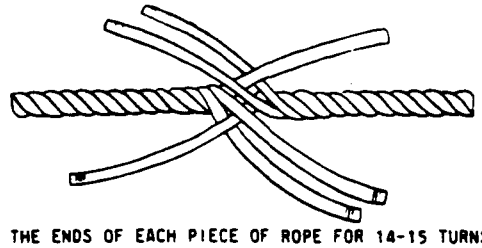
4. TUCK EACH STRAND ALTERNATELY OVER AND UNDER, WORKING AGAINST THE LAY OF THE ROPE. TAPER OFF BY HALVING THE YARNS ON THE LAST TWO TUCKS. MAKE 5 FULL TUCKS AND TWO 1/2 STRAND TUCKS.

5. POUND AND ROLL. THEN CUT OFF REMAINING STRANDS CLOSE TO THE ROPE. POLYPROPYLENE ROPE MAY BE CUT BY MELTING USING THE R2733 SOLDERING COPPER.

FIG. 16 (PARS. 4.31,4.51)

LONG SPLICE

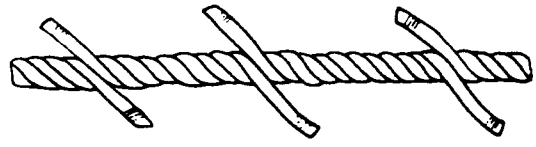
TO JOIN TWO PIECES OF ROPE, WHEN THEY HAVE TO RUN AROUND A PULLEY, OR THROUGH A BLOCK THAT DOES NOT OFFER TOO MUCH CLEARANCE.



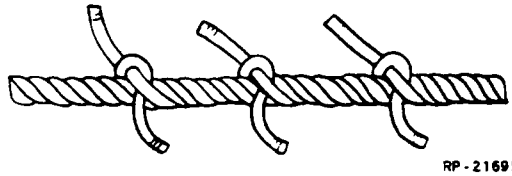
1. UNLAY THE ENDS OF EACH PIECE OF ROPE FOR 14-15 TURNS.

2. PLACE THE TWO PIECES OF ROPE TOGETHER, WITH THE STRANDS OF ONE ALTERNATING WITH THE STRANDS OF THE OTHER.

3. START WITH ANY ADJACENT PAIR. UNLAY ONE STRAND AND FILL IN WITH THE STRAND FROM THE OPPOSITE ROPE. TAKE ANOTHER PAIR OF STRANDS AND DO THE SAME THING, BUT THIS TIME WORK IN OPPOSITE DIRECTION. LEAVE THE THIRD PAIR OF STRANDS WHERE THEY ARE.



4. TO FINISH, MAKE TWO TUCKS WITH EACH STRAND AS IN THE SHORT SPLICE, BUT WORKING WITH THE LAY OF THE ROPE, SO EACH TUCK IS CONSTANTLY GOING AROUND THE SAME STRAND. TAPER OFF WITH TWO OR MORE TUCKS, REDUCING THE NUMBER OF YARNS EACH TIME.



5. ROLL AND POUND WELL, AND CUT OFF STRANDS CLOSE TO THE ROPE. POLYPROPYLENE ROPE MAY BE CUT BY MELTING USING THE R2733 SOLDERING COPPER.

FIG. 17 (PAR. 4.51)

The rope can be cut by melting, using the hot tip of the R-2733 soldering copper. The two ends of the rope should then be joined using the Long Splice shown in Figure 17. The soldering copper may also be used to melt the ends of cut strands of polypropylene rope to prevent unraveling. Wrap a double layer of KS-14090-L9 gray plastic tape around the rope or strands before cutting. Apply tension on the pulling rope and allow the splice to advance approximately 25 feet. Determine the required number of points needed to connect the cables to be pulled on the 5/8" pulling rope. This would normally be, one at the puller and one at a distance on the rope away from the puller equal to the longest cable run. On extremely long cable runs more connecting points may be added as needed. This will allow cables to be run to be attached to the first point, cable run in, second group of cables connected and run, etc. For each of the connecting points the installer should requisition one R-4195 B Plastic Rope. This is a 3 foot length of 3/8" Polypropylene Rope which should be made into a short eye splice per Figure 16. Splice the standing part of the rope of the eye splice to the 5/8" rope. Use the same method as shown in Figure 16. Do not half the yarns on the last two tucks. Splice an eye splice to each of the previously determined locations on the

pulling rope. Band the loops of the eye splice to the pulling rope when they are not being used to prevent snagging. The groups of cables to be run are placed in the required cable grip and connected to the loop of the eye splice using the Detail 14 Swing Link. After completing the cable runs on the continuous loop, remove the eye splices from the pulling rope. Do not remove the loop. Place the eye loops in the R-4145 Tool Chest for future use. Requisition new R-4195 B Plastic Rope when these loops need replacement. The pulling operation is performed the same as in Paragraphs 3.21 and 3.22. Add or remove turns of rope around the puller capstan to maintain slippage when the tension is removed from the pulling rope.

CAUTION: Heat applied to the polypropylene rope melts the rope. Observe caution when using the R-2733 soldering copper not to melt any adjacent strands which would weaken the rope.

Manager, Engineering Planning