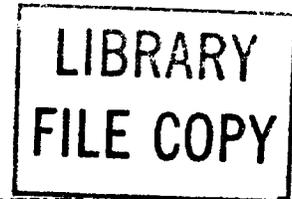


**CABLE CLIPS
INSTALLATION
GENERAL EQUIPMENT REQUIREMENTS**



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NOTICE

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SECTION 800-614-158

- 800-612-153—Forming, Fanning, Sewing, and Skinning
- 800-612-156—Placing, Securing, and Supporting Cable Forms Including Unequipped Forms
- 800-612-162—Selection of Switchboard Cables (Including Coaxial and Twin-Conductor Shielded Office Cable)
- 800-612-164—Forming, Grounding, Splicing, and Terminating Shielded Wiring and Coaxial and Twin-Conductor Shielded Office Cable
- 800-614-152—Switchboard, Power and Local Power Cables—Installation
- 800-614-153—Sheathing for Cable Openings — Installation
- 800-614-157—Cable Racks—Installation
- 801-006-158—Cableway Systems for Electronic Offices Using 7-Foot Frameworks Equipment Design Requirements — Common Systems
- 801-801-155—Lineup Cable Racks and Cross Aisle Troughs for 7-Foot Framework
- 801-801-182—General Engineering Information — Cable Distribution Systems and Systems Assembly in Electronic Offices Using 7-Foot Frameworks
- 802-001-180—Protective Grounding Systems — General Grounding Requirements for Communication Systems in Central Offices, Radio Stations and Other Structures
- 802-005-180—Assembly and Installation of Power Plant Bus Bar and Wiring

B. Cabling Guidelines

1.05 Cabling associated with 7-foot-high equipment that meets NEBS standards should be installed in accordance with Section 801-801-182, covering the general engineering information for cable distribution systems and systems assembly in electronic offices using 7-foot frameworks. The Cable Pathways Plan covered in Section 801-801-182 coordinates the locations of cabling, lighting, cooling air diffusers/slots, fire detectors, and various building elements over the life of the equipment-building system. To achieve the full benefits of this plan, it should be incorporated into the early stages of planning an office and the pathways should be indicated on central office record drawings.

1.06 In the layout of cable racks and the routing of cables, critical lead length and cable segregation requirements for the equipment systems involved shall be satisfied. Congestion of the cable racks shall

be avoided and cable length shall be minimized. To control fire and smoke propagation in the event of a fire, interfloor cable holes must be properly closed and fire-stopped, and consideration shall be given to minimizing the number of cable holes opened during the installation intervals, consistent with any established plan which may exist for cabling the office. The following guidelines apply to the layout of cable distribution systems and to the routing of cables in both new offices and additions:

- (a) Equipment system requirements governing critical lead length and cable segregation shall be met.
- (b) Congestion of cable racks shall be avoided.
- (c) Cable distribution systems shall be installed in agreement with any established plan for the offices. In particular, for offices meeting NEBS standards per Section 800-610-164, the Cable Pathways Plan shall be followed as described in Section 801-801-182. The Cable Pathways Plan, modified to suit job conditions, shall also be applied in non-NEBS and existing space.
- (d) In all additions to existing central offices, the adjustable ceiling closure plate (ED-92116-73) shall be installed in all cable holes opened during the installation, if not already so equipped.
- (e) The cable pileup on all vertical cable runs shall be limited so that it is not closer than 3 inches to the side of the cable hole, thus providing the clearance necessary to properly pack the hole with KS-5048 bags. See Section 801-006-151.
- (f) In additions to existing central offices, cables shall be routed so as to minimize the number of cable holes to be opened, consistent with items (a) through (e) above. It is economical to increase the total amount of cable in a run by a total of 75 feet for switchboard cable, or 30 feet for power cable, to avoid opening a cable hole. For example, for a switchboard cable run of 5 cables, it is economical to increase the length of the runs up to 75 feet (15 cable feet/5 cables) to avoid opening a cable hole equipped with an adjustable cover.
- (g) In new offices, the planning and layout of the cable distribution system, including vertical cable runs for the ultimate office, should include provision for growth and seek to minimize the number of holes required to be opened during a sin-

gle installation job, consistent with the requirements of items (a) through (e) above.

2. TYPES AND USES OF CABLE CLIPS

A. Adjustable-Type Clips

2.01 Anchor clips, KS-5370-01, designated A-1 in Fig 1, are used to fasten directly to 1-by 1/2-inch channel-type, cable rack straps or similar supports and provide the means for attaching adjustable clips, as shown in Fig 2.

2.02 Start clips, KS-5370-01, designated SA, SB, SC, or SD in Fig 1, are used with a regular clip to enclose and fasten the first group of cables in each layer of clips, as shown in Fig 2. These clips are also used as regular clips for fastening small groups of cables.

2.03 Regular clips, KS-5370-01, designated RA, RB, RC, or RD in Fig 1, are used to enclose and fasten the cables in groups across the cable rack. These clips are arranged to engage with anchor, start, or other regular clips for building up the cable run, as shown in Fig 2, 4 to 8, and 10.

Note: The series R- and S-type clips, covered by specification KS-5370-01, differ from the R- and S-type clips previously manufactured in accordance with KS-5370, in that the clips are now furnished in four depths instead of three. They are designed so that each size may not be forced beyond a predetermined point during engagement; thus, damaging cables in lower layers is prevented. The clips in this series are designed to be used interchangeably with the previous series and shall engage with any of the flat-type clips now in use. The vertical range in the heights of cable that the several KS-5370-01 clips will accommodate is as follows:

RA and SA, 5/8 to 29/32 inches, inclusive

RB and SB, 29/32 to 1-3/16 inches, inclusive

RC and SC, 1-3/16 to 1-15/32 inches, inclusive

RD and SD, 1-15/32 to 1-3/4 inches, inclusive.

B. Nonadjustable-Type Clips

2.04 Steel wire-spring clips, KS-5373, designated U-type in Fig 3, are used for fastening a cable or group of cables to the underside of and at right angles to the transverse arms of distributing frames, as shown in Fig 13.

3. FITTING OF CLIPS

3.01 Clips shall hold the cables securely, but not so tightly as to cause objectionable unevenness of the cable run or damage to the cable covering.

3.02 Where the vertical legs of flat-type adjustable clips extend more than two slots beyond the edge of the engaged anchor clip, the leg of the clip shall be bent against and around the bottom edge of the anchor clip, as shown in Fig 4.

3.03 Where the horizontal legs of flat-type adjustable clips extend beyond the start clips on runs a single group wide, the protruding end of the regular clips shall be bent down against the adjacent clip, as shown in Fig 4.

(a) On the top layer (regardless of future cabling), the end of the clip shall be inserted in the start clip, as shown in View A of Fig 4.

(b) On single group wire vertical runs, the protruding clip ends on all layers shall be disposed of, as shown in View A of Fig 4, where the clip ends would otherwise be exposed and present a hazard.

4. CLIPPING CABLES ON CABLE RACKS

A. Horizontal Resting Runs

4.01 In general, cables shall be clipped on the straight sections of the run with adjustable clips completely across every third cable rack strap, as shown in Fig 5.

(a) The outer layers of cable of small diameter which have a tendency to bulge or sag shall be clipped at closer intervals, the added clips being installed in a similar manner to 4.10(a).

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4.02 Incomplete groups, except on the bottom layer, shall be securely fastened with twine on installation, in accordance with Section 800-614-152. These groups, when subsequently completed to fill a regular clip, shall be clipped.

- (a) On the bottom layer, incomplete groups shall be clipped to the cable rack straps with anchor clips and regular or start clips as required by the size of the groups.

B. Vertical and Inverted Horizontal Switchboard Cable Runs

4.03 Vertical cable runs shall be clipped as follows:

- (a) If the ultimate pile-up of cables is 6 inches or less, clip only at every other strap, as shown in Fig 7A.
- (b) If the ultimate pile-up of cables exceeds 6 inches, clip the inner 6 inches at every strap and the outer 6 to 12 inches at every other strap, as shown in Fig 7B.
- (c) Cable clips shall be pushed home to a snug fit. Viewed from the side of the rack, there is frequently a tendency for the clip line to slant downward as the pile-up of cables builds outward. Actual sagging, resulting in the edges of the clip pressing sharply into the cable covering, is to be avoided.

4.04 Inverted horizontal cable runs shall be clipped at every strap, as shown in Fig 6.

- (a) Inverted horizontal cable runs which are three or more clips deep shall be equipped with auxiliary supports as specified in Section 800-614-152 on installation of switchboard, power, and local power cables.

4.05 Incomplete groups, except in the layer at the cable strap, shall be securely fastened with twine in accordance with Section 800-614-152 on the installation of switchboard, power, and local power cables. These groups, when subsequently completed to fill a regular clip, shall be clipped.

- (a) In the layer next to the cable rack, incomplete groups shall be clipped to the cable rack straps with anchor clips and regular or start clips as required by the size of the groups.

4.06 In general, cables dropping down into frames and racks will be sewed except for those locations where U clips are specified. Flat clips may be used where the regularity of the cables and the design of the cable brackets make them practicable.

C. Turning and Butting Points

4.07 On turns in the same plane, place a full set of clips at the supports adjacent to the turn. Secure the cables with twine throughout the turn in accordance with the requirements for sewing cables.

4.08 On turns from a horizontal plane to a vertical plane, a full set of clips shall be placed at each cable rack cross strap adjacent to the turn.

- (a) On outside turns from a horizontal to a vertical rack where the depth of the run is such that the clipping locations will become more than 18 inches apart (measurement along the cable), additional sets of clips, as shown in Fig 8, shall be placed over the cables as anchors and clipping continued at the additional locations so the space between the clipping points will not exceed 18 inches.

- (b) Where special sections of cable rack turns are provided, such as for multiple cables in cable turning sections and power cable runs having turns with cross straps on close centers, the clips shall be placed on alternate straps.

- (c) Power cables No. 00 and larger turning upward from a horizontal to a vertical rack shall be installed on a rack having a 45-degree section at the turn. If the uninterrupted rise exceeds two floors, the cross straps shall be removed from the angle section. The first strap in the horizontal portion of the run shall be covered with a P-68616 fiber insulator.

4.09 On 45-degree offset cable runs, a full set of clips shall be placed at the supports adjacent to the turns with the inclined portion of the run being clipped in the same manner as a horizontal resting run.

4.10 Where clipping at every third strap, as specified in 4.01, does not adequately secure cables at points where cables turn off the run or where butted, place additional clips at the last cross strap before the turn.

(a) Clips placed at these turnoff points need not be built from the bottom up to secure cables in upper layers of runs at turns. Clips shall be placed over the cables immediately below the cables which are to be turned. These clips will serve as anchors for the clips that secure the cables which break off.

4.11 Where cables turn through the rack, they shall be sewed to the last cable strap, except where this strap is a normal clip location.

4.12 Particular care shall be used where the cables turn at or near the point of support to bend the cables to prevent the edges of the clips from cutting sharply into the cables.

4.13 Clips shall not be used where they are at an angle to the cable which may result in the clips cutting into the cable covering. Even pressure along the side or top of the clip without cutting into the cable covering is satisfactory.

(a) It is permissible to clip cables at tapering runs where the taper of the cables is sufficiently gradual so that the clip will not damage the cable covering.

D. Spirals

4.14 Sew all spirals and 90-degree double turns, since clipping has a tendency to cut into the cables especially as the pile-up increases. In addition, clamps per ED-91987-01 shall be placed as reinforcement at each spiral as follows:

(a) If the vertical run turns to a horizontal position near the ceiling of the floor below the one on which a spiral is located, the clamp shall be placed immediately above the spiral, as shown in Fig 9A.

(b) If the vertical run turns to a horizontal position immediately above the spiral, the clamp shall be placed below the spiral, as shown in Fig 9B.

(c) If the spiral is in a straight vertical run, so that the run continues the distance between two or more adjacent floor lines beyond the spiral in both directions, a clamp shall be placed directly above and another directly below the spiral, as shown in Fig 9C.

(d) Supplementary clamps are not required on horizontal spirals or 90-degree double turns.

E. Clipping Additional Cables on Runs Previously Sewed

4.15 Use adjustable flat-type clips where the amount of cable to be added, the size and length of the run, and the formation of existing cables is such that clipping would be economical and would result in a attractive finished run.

(a) On horizontal resting runs, place clips on top of the run with approximately the same spacing as for a similar completely flat clipped run. Cover with a layer of cables and clip the cables to the clips below. Clip subsequent layers in the usual manner.

(b) On vertical and horizontal inverted runs, place clips on the top of the run with approximately the same spacing as for a similar completely flat clipped run. Cover with a layer of cables and sew this layer to the existing cable, thereby holding the adjustable clips in place. Clip this and subsequent layers in the usual manner. Place clips on vertical runs above the existing wire clips or sewing where practicable, to prevent them from slipping downward.

F. Spliced Cables

4.16 Where the cable must be secured, the taped portion of such cables shall be sewed rather than clipped.

(a) Where future splices are specified in any cable run, sewing instead of clipping shall be used for the cables in that portion of the run in which the splices will be located.

G. Irregular Cable Runs

4.17 Sewing instead of clipping shall be used where the number and irregular size of the cables makes it difficult and uneconomical to obtain a satisfactory clip arrangement.

H. Clipping Wire

4.18 Wires, including shielded wires (except P- and BK-type shielded wires), shall be wrapped

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with 1/64-inch gray vulcanized sheet fiber at all clipping points to prevent contact between the wire and the cable clips.

- (a) Where only a few wires are to be protected, and it would be difficult to form the fiber around so few wires because of the small diameter, the fiber wrapping may include an adjacent cable.
- (b) Where wires are sewn to the tops of clips, they need not be protected from the clips until they are enclosed by clips (in case of additions).

4.19 Wires secured under a clip with cable shall be arranged so that the wires are buried between the cables and cannot touch the clips. Where this is not possible, fiber protection in accordance with 4.18 shall be provided.

I. Clipping Power Wire and Cables

4.20 Clip with adjustable flat clips in the same manner as fabric- and plastic-covered switchboard cables, except as follows and as otherwise outlined below:

- (a) Wire or cable carrying outside service current shall not be clipped, except where armored cable is used for such wiring.
- (b) Clips shall not be used in hazardous locations where it would be impracticable to adequately protect the equipment against service hazards during installation. Locations considered hazardous are power rooms, cable runs over motor-generator sets, open-type battery stands and racks, and rectifiers in other than power rooms.
- (c) Power feeders on support brackets in cross aisles need not be clipped or sewed.
- (d) Small armored cables, that tend to bulge and hang over the edges of the rack when clipped in the regular manner, shall be clipped at every strap.

4.21 Protect power wire and cable from contact with clips by wrapping each group of cables or wires with strips of P-409474 1/64-inch gray vulcanized sheet fiber at each clipping point.

- (a) Wrap the fiber around the wires or cables so as not to interfere with the placing of clips, as shown in Fig 10.

(b) On the first layer, place the fiber so that it extends over the edge of the cable rack strap sufficiently to hold the fiber close underneath the wires and cables, as also shown in Fig 10.

(c) All cables of a mixed group of power and switchboard cables under one clip shall be protected as though the clip contained only power cables. This also applies where power cables are in the same group with armored cable.

(d) Where rubber- or neoprene-covered wire, such as KS-15141, KS-15143, and KS-20195, is sewn to the tops of clips, it shall be protected with fiber at all sewing points. The KS-5482 type rubber-covered wire (which has a fabric jacket) and the KS-20921 and KS-21155 cables (which are insulated with hypalon) shall be wrapped with fiber only when they are clipped.

4.22 Horizontal resting runs composed entirely of 400,000-cm or larger cables may be clipped at every fourth cable rack strap instead of every third cable rack strap, as covered in 4.01.

4.23 Heavy vertical power cable runs extending through more than two floors (in excess of the distance from the basement ceiling to the second floor ceiling or equivalent) require that the cable clips be supplemented by power cable clamps ED-91127-70 or ED-91129-70. Such runs shall be secured as follows:

- (a) Where the runs are in exposed locations, as for example through cable slots in terminal or switchrooms, install one set of clamps per floor, located near the ceiling in each case, as shown in Fig 11. In addition, clip or sew the cables at each alternate cable rack strap.
- (b) Where the runs are located in shaftways or other enclosures, install two sets of clamps per floor, one just above the cable hole sheathing and the other about halfway up to the ceiling, but in no case less than 7 feet 0 inch above the floor, as shown in Fig 12. No clipping or sewing will be required in the vertical portion of the run for this condition.

4.24 Heavy vertical power cable runs from unsecured horizontal runs shall be supported with power cable clamps, ED-91127-70 or ED-91129-70, in addition to the regular clipping or sewing if the run passes through one or more floors. The power cable clamps shall be located as shown in Fig 11 and 12.

4.25 Vertical power cable runs shall be limited to three floors. If the run exceeds three floors, a horizontal section at least 20 feet long shall be introduced at intervals not exceeding three floors. This may be accomplished by using offset vertical shafts in the general direction of any horizontal travel or by using a horizontal loop if the same shaft must be used. The horizontal section between vertical sections shall be sewed or clipped in accordance with standard procedures.

4.26 Groups composed entirely of wire, including shielded wire, or wire not run under the same clip with cables shall be clipped at the same frequency as associated cables on horizontal runs and at every strap on vertical runs. Where the wires have a tendency to fall off the side of the rack, they shall be banded together with twine to adjacent cables. The wires shall be protected with fiber, as covered in 4.18.

(a) In vertical runs, any conspicuous bulge in such groups of wires shall be corrected by sewing the wires together with twine midway between clips.

(b) Where wires or groups of wires cannot, for any reason, be included under clips, they shall be tied to the cross straps or clips. Use two strands of twine and secure with a square knot.

J. Armored Cable

4.27 Where the cables are small and uniform in diameter, adjustable flat clips shall be used. Armored cables No. 0 and larger, and runs with various sizes shall, in general, be sewed, the cables being separated into groups on the rack, as necessary.

K. Lead-Covered Cables (Either Power- or Switchboard-Type)

4.28 Cabling of this type shall be fastened in accordance with the supplementary job information.

5. CLIPPING CABLES AT DISTRIBUTING FRAMES

A. Cables Under Transverse Arms

5.01 Clip all cables at each transverse arm with U-type clips in accordance with Fig 13, unless otherwise specified.

(a) Old distributing frames having bar-type transverse arms are an exception to the above. When bar-type transverse arms are encountered, the cables shall be sewed.

5.02 In such cases, overlap the first or outside clip which includes the butt of the cable with the second clip, as shown in Fig 13.

B. Cables Parallel to Transverse Arms

5.03 Cables which are run parallel to the transverse arms at the horizontal side of the distributing frames shall be secured to the transverse arms with KS-20986 L1, L2, or L3 nylon cable ties in accordance with Section 800-614-152.

6. REASONS FOR REISSUE

6.01 Paragraph 1.04 covering supplementary information is added.

6.02 Paragraphs 1.05 and 1.06 covering cabling guidelines are added.

6.03 Former paragraph 2.04 covering sheet steel spring clips (N-type) is deleted.

6.04 Fig 2 covering method of assembling flat-type clips is revised to show plastic sleeves over short leg of clips.

6.05 Fig 3 covering nonadjustable cable clips is revised to delete N-type clips.

6.06 Paragraph 4.06 covering cables dropping down into frames or racks is revised to delete reference to N-type clips.

6.07 Paragraph 4.17 covering irregular runs is revised to delete last sentence which specified sewing on vertical runs only where clipping is impossible.

6.08 Paragraph 4.21 (d) covering power wire and cable is revised to add reference to KS-20195 neoprene-covered wire and KS-20921 and KS-21155 hypalon-insulated cables.

6.09 Paragraph 4.26 covering shielded wire is revised to delete reference to "BRC" wire.

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6.10 Former paragraphs 5.03 (a) through (e) and 5.04 covering securing cables to transverse arms of distributing frames with N-type clips are deleted.

6.11 Paragraph 5.03 covering cables parallel to transverse arms is revised to substitute KS-20986 nylon cable ties in place of N-type clips for securing cables.



A-I
(997919519)

ANCHOR CLIP



SA
(400122149)



SB
(400122156)

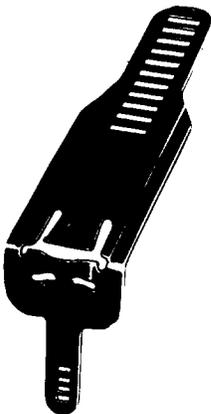


SC
(400122164)

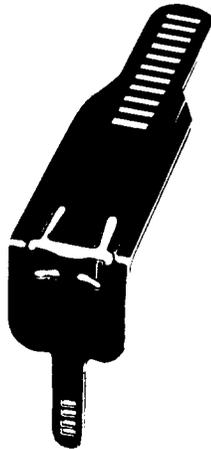


SD
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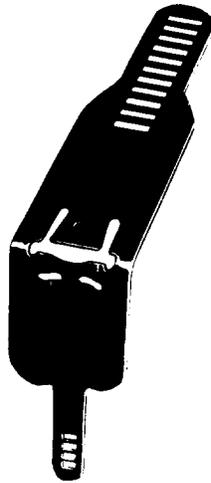
START CLIPS



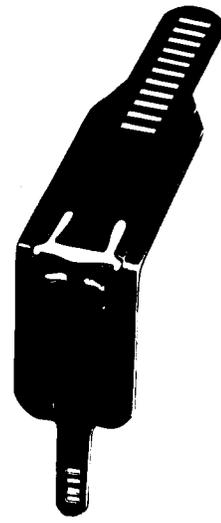
RA
(400122107)



RB
(400122115)



RC
(400122123)



RD
(400122131)

REGULAR CLIPS

**Fig 1—Adjustable Flat-Type Cable Clips—Plastic
Sleeves Not Shown**

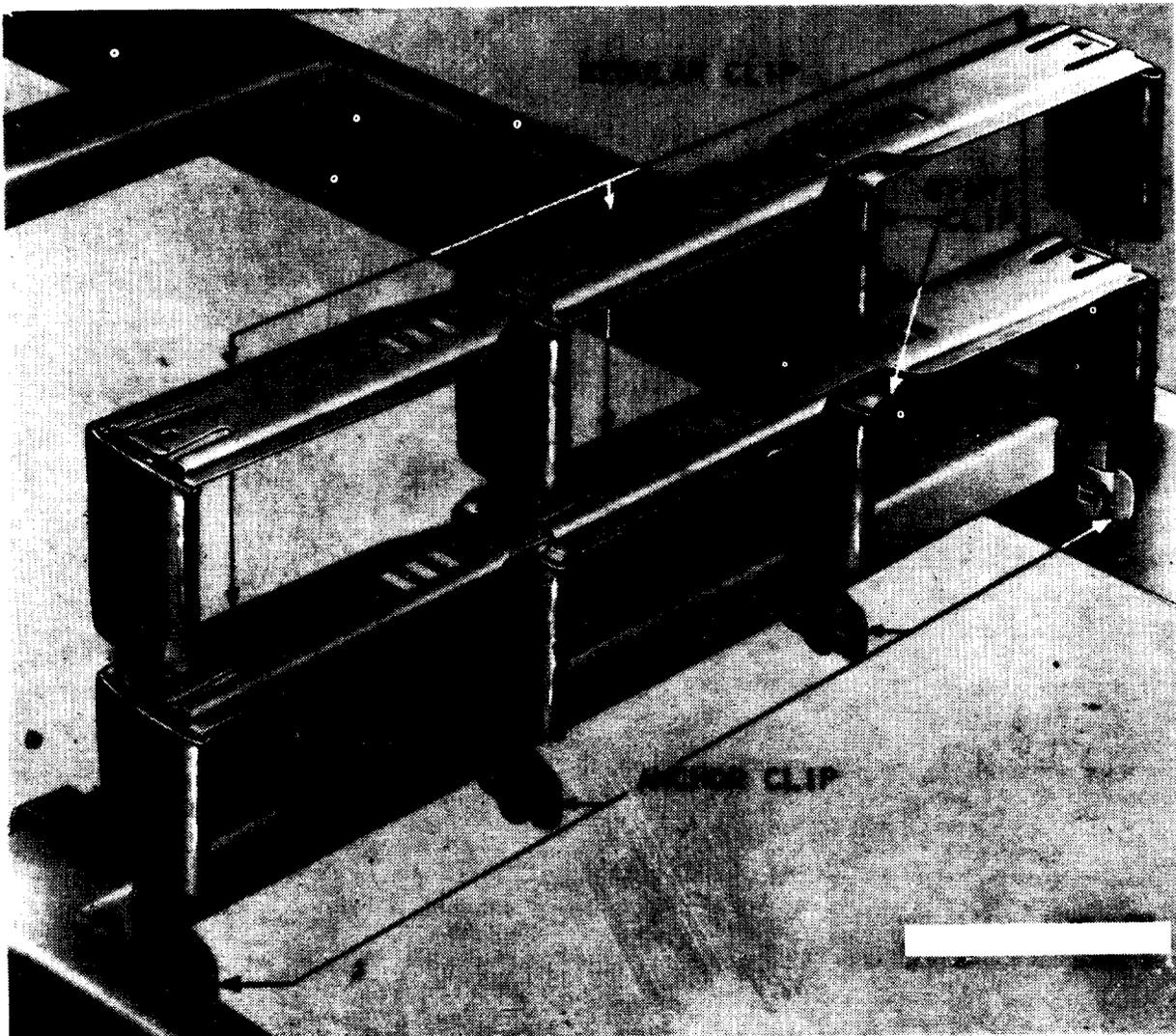
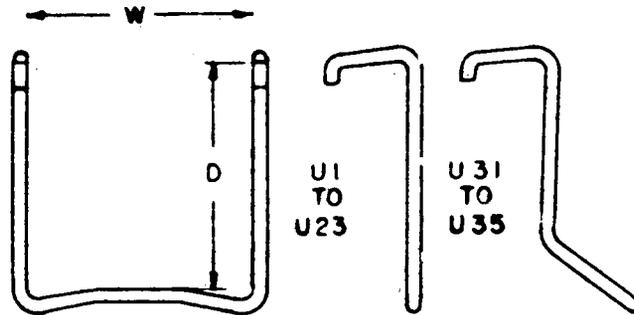


Fig 2—Method of Assembling Flat-Type Clips



TYPE	SIZE		COMCODE NUMBER
	W	D	
U1	$1\frac{1}{4}$ "	$1\frac{1}{4}$ "	997891064
U2	$1\frac{1}{4}$ "	$1\frac{17}{32}$ "	997891072
U3	$1\frac{1}{4}$ "	$1\frac{27}{32}$ "	997891080
U4	$1\frac{1}{4}$ "	$2\frac{5}{32}$ "	997891098
U5	$1\frac{1}{2}$ "	$2\frac{15}{32}$ "	997891106
U21	$1\frac{13}{16}$ "	$1\frac{3}{4}$ "	997891262
U22	2"	$1\frac{7}{8}$ "	997891270
U23	$2\frac{1}{8}$ "	$1\frac{29}{32}$ "	
U31	$1\frac{21}{32}$ "	$1\frac{9}{32}$ "	997891213
U32	$1\frac{21}{32}$ "	$1\frac{19}{32}$ "	997891221
U33	$1\frac{21}{32}$ "	$1\frac{29}{32}$ "	997891239
U34	$1\frac{21}{32}$ "	$2\frac{7}{32}$ "	997891247
U35	$1\frac{21}{32}$ "	$2\frac{17}{32}$ "	997891254

"U" TYPE CLIPS

Fig 3—Nonadjustable Cable Clips

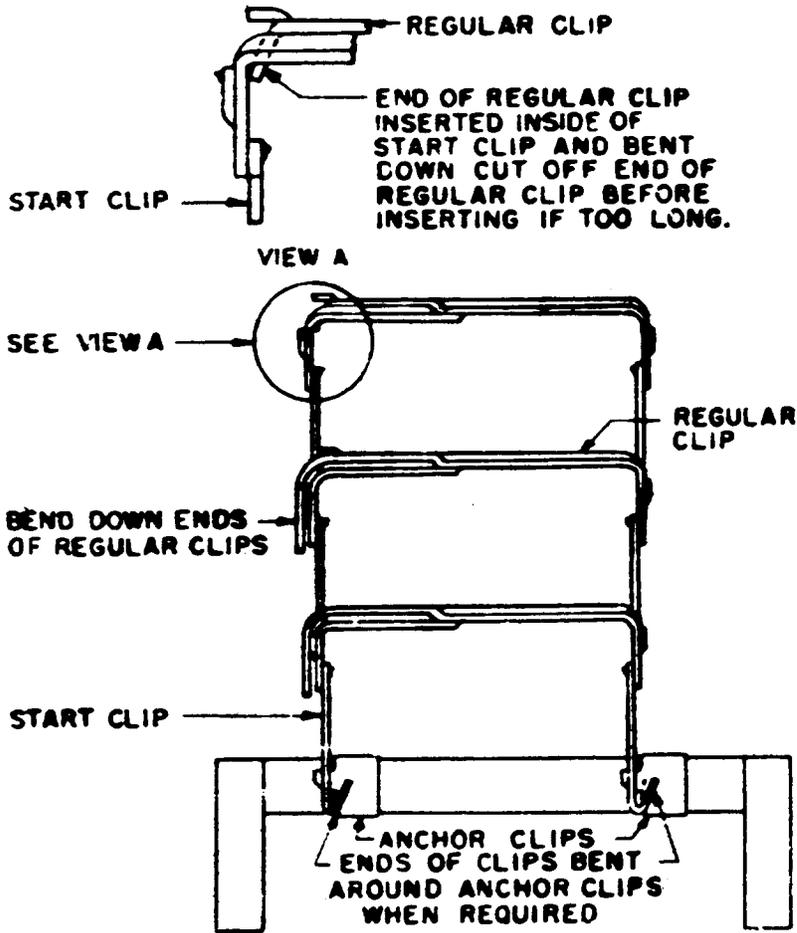


Fig 4—Disposal of Cable Clip Projections

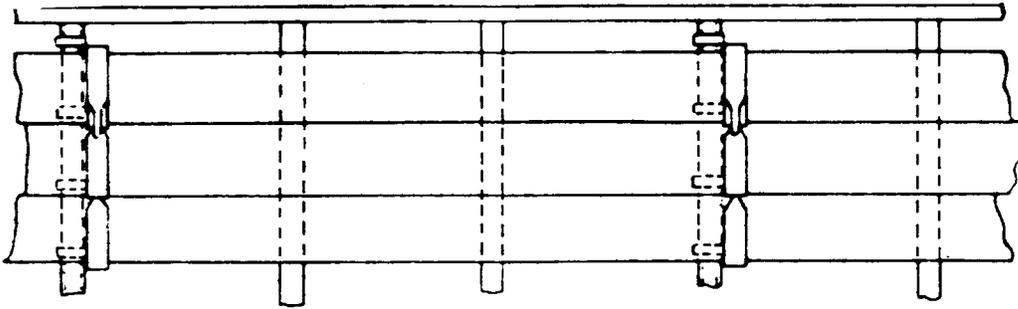


Fig 5—Clipping Horizontal Resting Runs

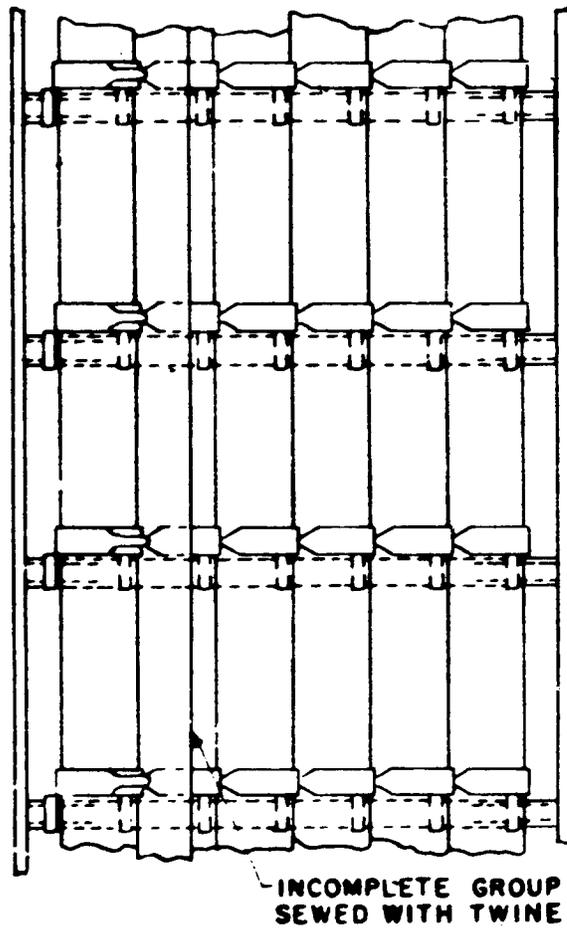


Fig 6—Inverted Horizontal Cable Runs

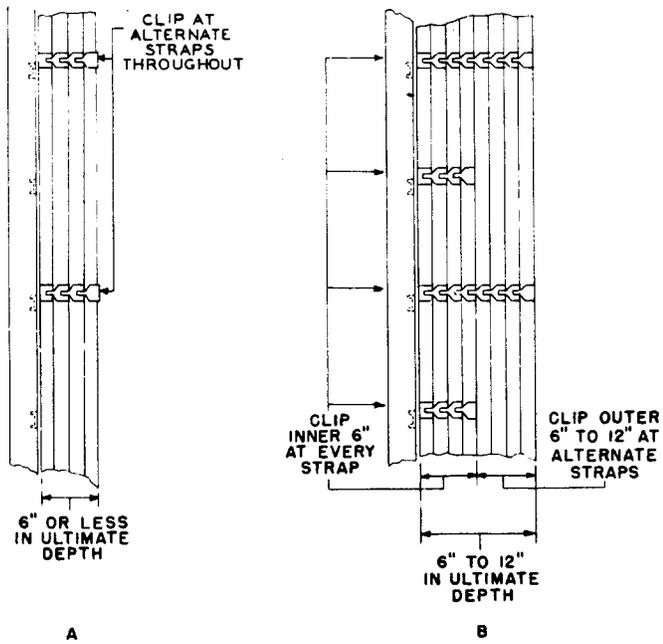


Fig 7—Clipping Vertical Switchboard Cable Runs

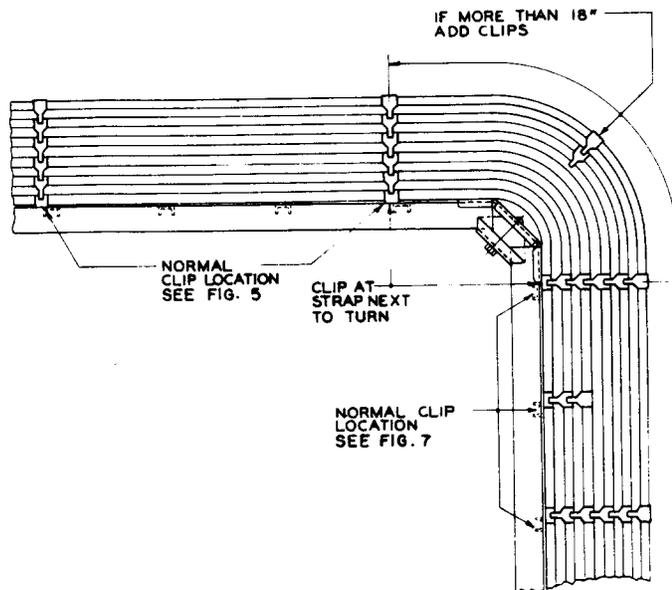
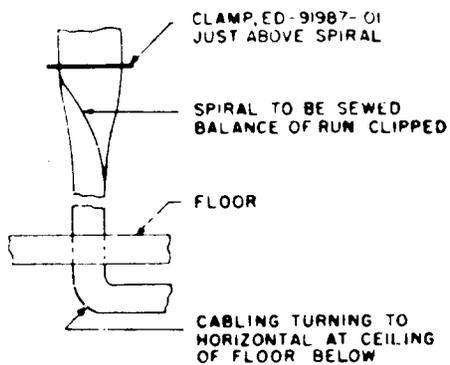
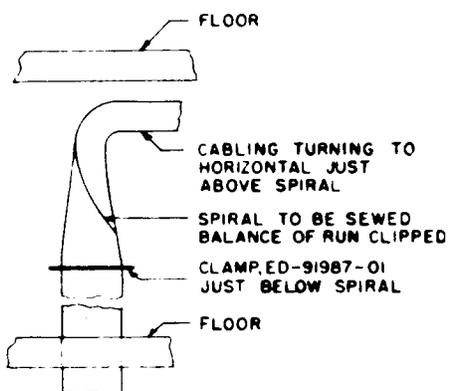


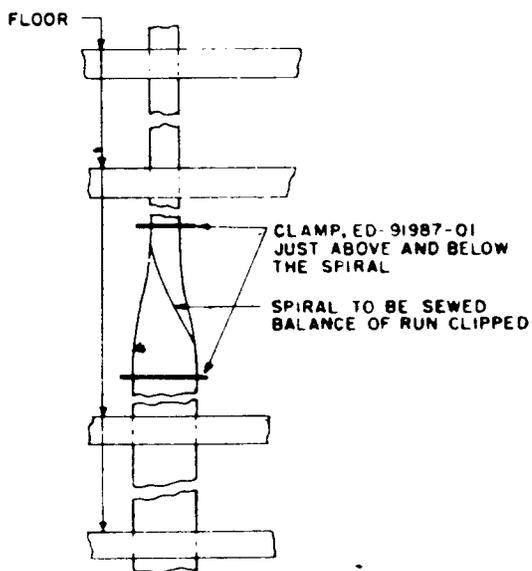
Fig 8—Clips at Outside Horizontal to Vertical Turns



A



B



C

Fig 9—Clamping Spiral Cable Runs

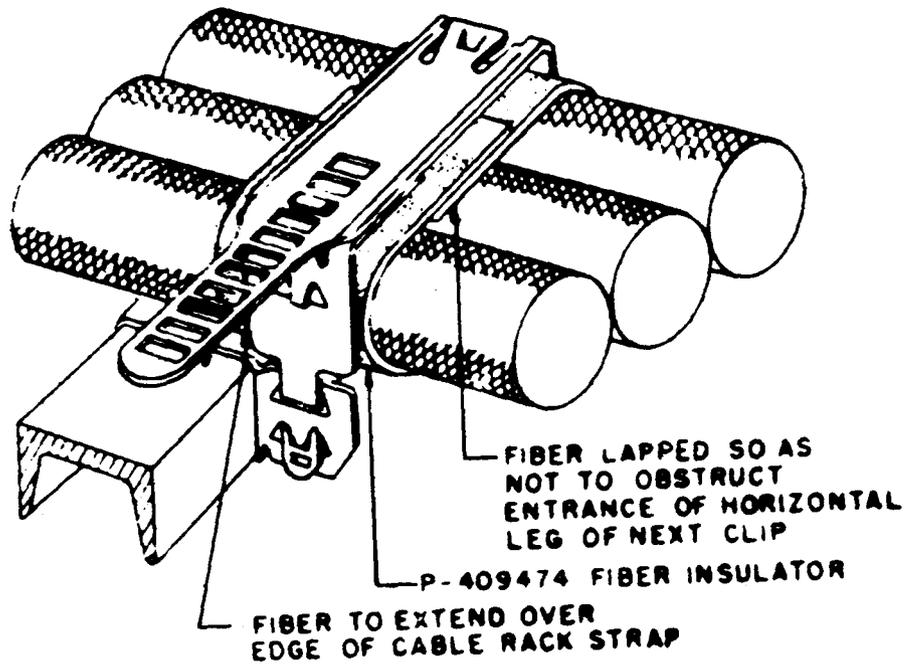


Fig 10—Protection of Power Wires and Cables at Clips

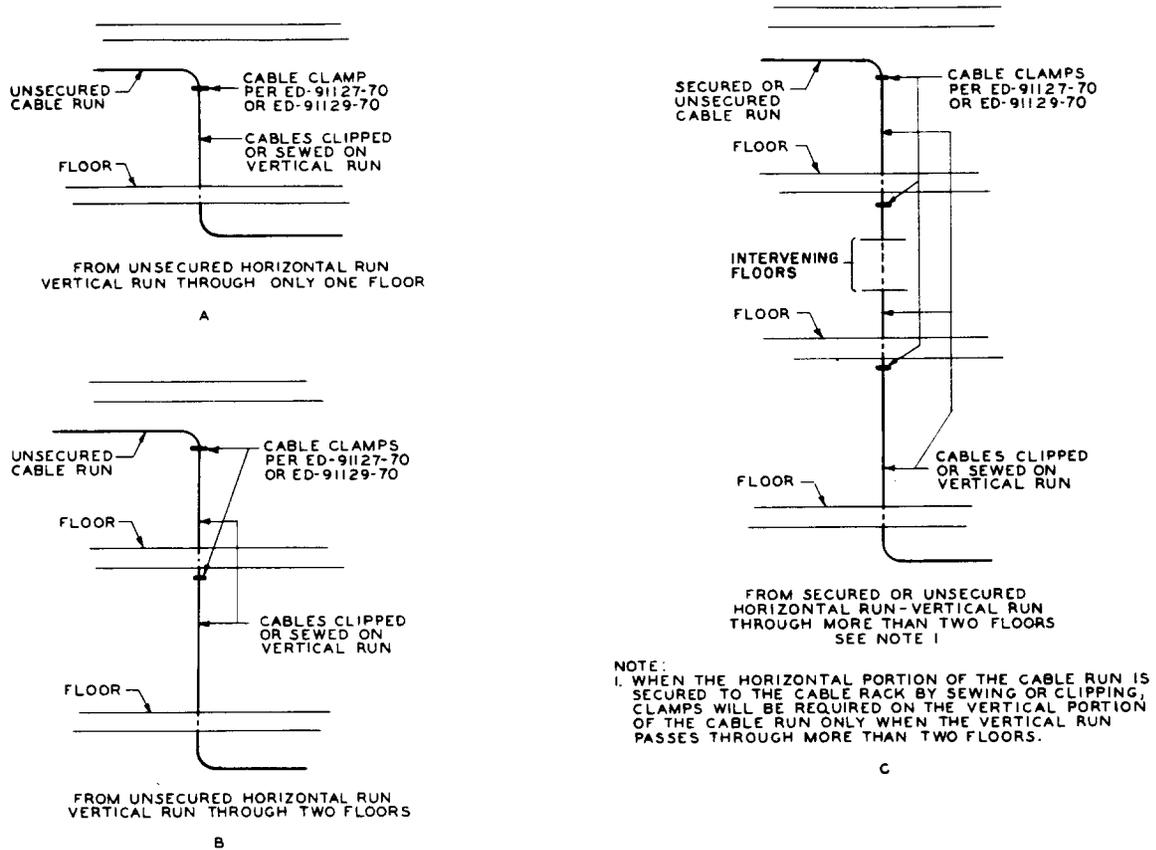
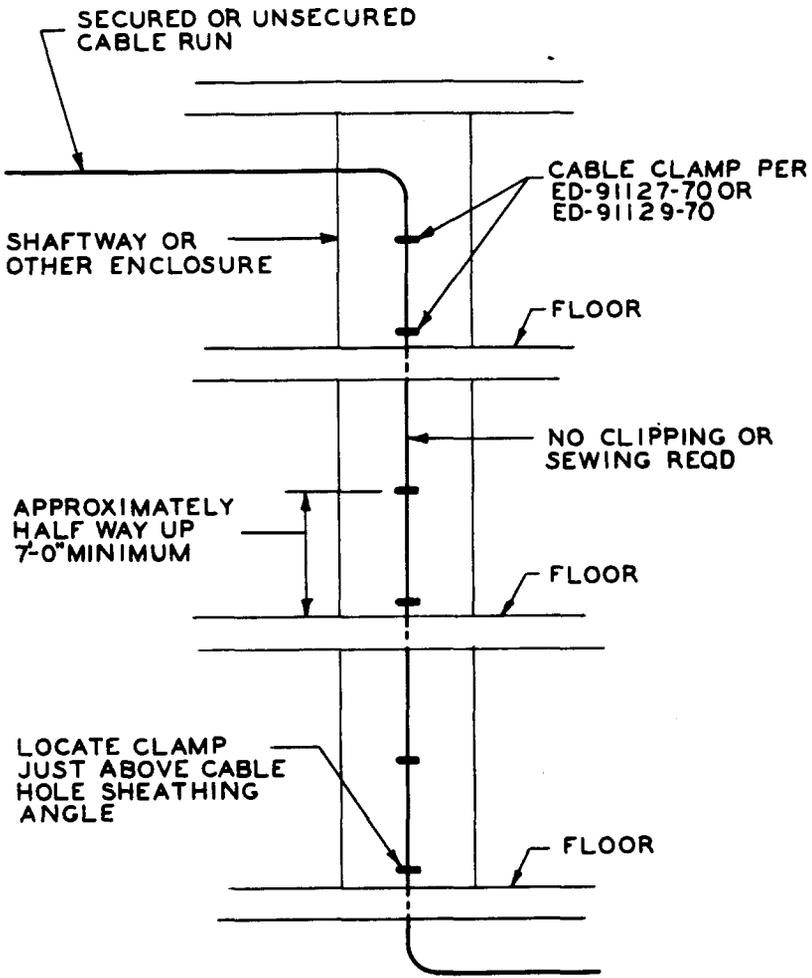


Fig 11—Heavy Vertical Power Cable Runs in Exposed Locations—Location of Clamps

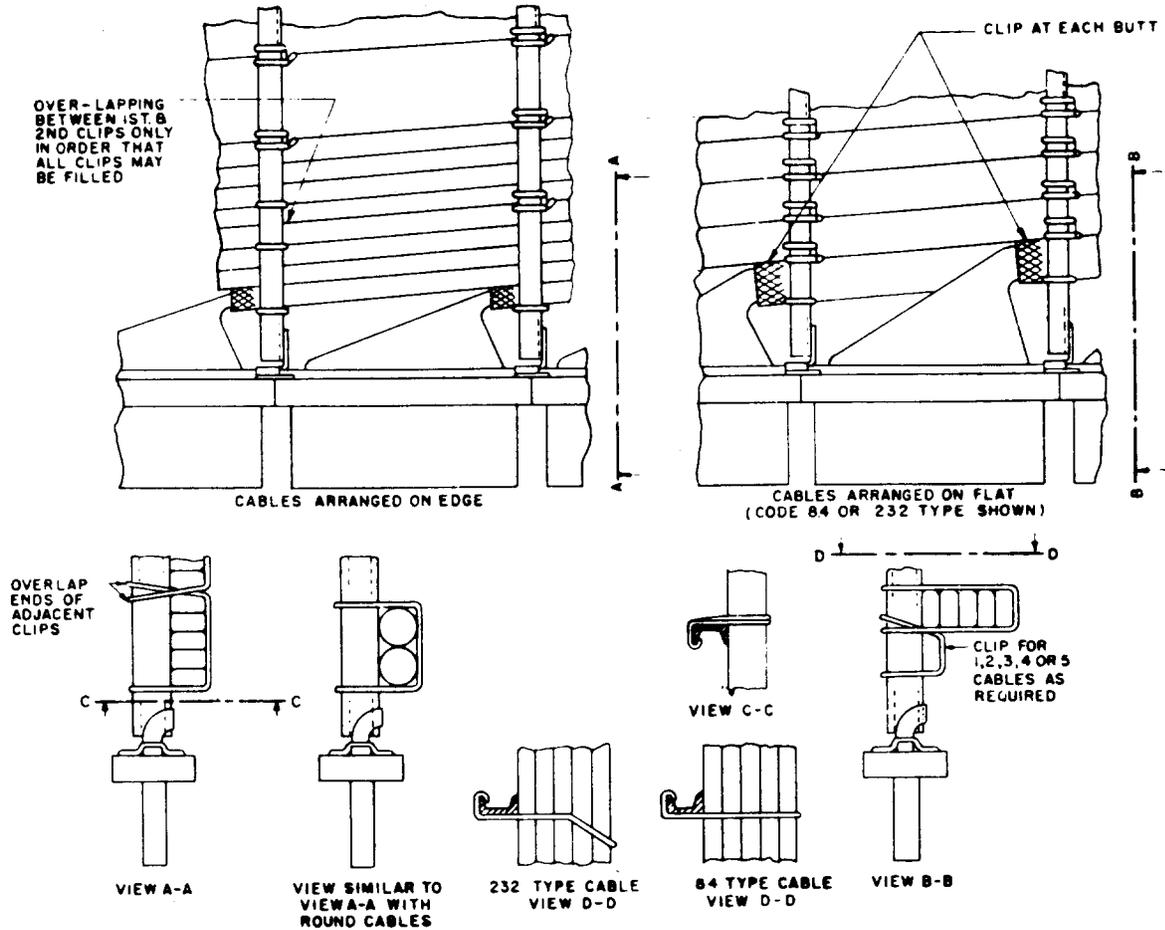


FROM SECURED OR UNSECURED
HORIZONTAL RUN - VERTICAL RUN
THROUGH MORE THAN TWO FLOORS
SEE NOTES 1 & 2

NOTES:

1. WHEN THE HORIZONTAL PORTION OF THE CABLE RUN IS SECURED TO THE CABLE RACK BY SEWING OR CLIPPING, CLAMPS WILL BE REQUIRED ON THE VERTICAL PORTION OF THE CABLE RUN ONLY WHEN THE VERTICAL RUN PASSES THROUGH MORE THAN TWO FLOORS.
2. WHERE THE HORIZONTAL PORTION OF THE CABLE RUN IS UNSECURED, CLAMPS, AS SHOWN WILL BE REQUIRED ON THE VERTICAL PORTION OF THE RUN IF THE RUN PASSES THROUGH ONE OR MORE FLOORS.
3. SEWING OR CLIPPING AT EVERY CABLE RACK STRAP IS REQUIRED ON VERTICAL PORTION OF THE CABLE RUN IF THE RUN PASSES THROUGH ONE OR TWO FLOORS AND IS NOT CLAMPED.

**Fig 12—Heavy Vertical Power Cable Runs in Shaftways
or Other Enclosures—Location of Clamps**



NOTES:
 1. WHEN U TYPE CLIPS WILL NOT ACCOMMODATE ROUND CABLES, THE CABLES SHALL BE SEWED.

Fig 13—Clipping Cables Under Transverse Arms of Distributing Frames