

SEWED FORMS  
SUPERIMPOSING, SECURING, PROTECTING AND SUPPORTING

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<u>1. GENERAL</u>	<u>2.2 Supplies</u>
1.1 <u>Scope of Section</u>	R-2916 Twine
1.11 This section covers requirements and methods for superimposing, securing, protecting and supporting sewed cable forms, loose wire forms and supplementary local cable forms.	R-3359 1/2" Wide Gray PVC Tape
1.12 The requirements covered in this section shall be followed, except as modified, by job specifications and/or drawings.	R-3428 3/4" Wide Gray PVC Tape
1.13 Each figure in this section illustrates only conditions to which reference is made in the text and should not be considered as covering other conditions that may be shown.	R-4065 Adjustable Nylon Cable Form Clamp
1.2 <u>Precautions</u>	R-4265 1 1/4" (Max.) Nylon Cable Tie
1.21 Any specific precautions to be taken against personal injury, equipment damage or service interruptions is covered in this section along with the associated methods. General precautions are covered in Handbook 0 and are to be observed at all times.	L-1
	R-4265 2" (Max.) Nylon Cable Tie
	L-2
	R-4265 3" (Max.) Nylon Cable Tie
	L-3
	R-4265 4" (Max.) Nylon Cable Tie
	L-4
	R-4458 PVC Insulated Strip
	KS-7851 Fiber Glass Sleeving
	L-3
	RM-583101 1/64" Gray Sheet Fiber
	RM-591127 3/4" Wide Gray Friction Tape
	RM-552458 1/2" X 32" Lg. PVC Tubing
	RM-552417 3/4" X 33" Lg. PVC Tubing
	RM-552448 1" X 36" Lg. PVC Tubing
	RM-587082 1 1/4 X 23" Lg. PVC Tubing
	RM-552452 1 1/2" X 29" Lg. PVC Tubing
<u>2. INSTALLING EQUIPMENT</u>	<u>3. REQUIREMENTS AND METHODS</u>
2.1 <u>Tools</u>	3.1 <u>General</u>
R-1682 5" Electricians Scissors	3.11 Shop made forms should be left in the shipping boxes as long as possible to eliminate potential form damage. When ready to position on the frame, straighten out all unnecessary kinks and bends in the form so it can be placed, secured and connected with a minimal amount of effort.
R-3209 Insulated Sewing Needle	
R-4266 Cable Tie Fastening Tool	
R-4827 Cable Tie Fastening Tool (Variable Setting)	

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3.12 Shop formed cables, as opposed to installer made local cables, are furnished with skinner lead lengths 1-2" longer than what would be considered as normal. This additional lead length allows for some flexibility in placing the supplemental form on the existing frame form.

3.13 Shop made or installer made local cable forms that are added to an existing frame form, shall be superimposed by sewing or banding with approved twine or banded with nylon cable ties.

3.14 Where forms pass through metalwork, casings, or other within confined areas of a keyshelf, the added wires should be distributed evenly around the existing form to eliminate possible insulation damage.

3.15 When cable forms are superimposed on existing cable forms they shall not:

A. Cover up any of the various types of "C" wiring in the form, or "C" wiring previously superimposed on the form.

B. Cover up or make inaccessible any wiring associated with unused circuits, circuit features or options, or feature wiring sewed back on the form.

C. Cover up any existing fire detection wire (RED), or any of the AM or BH loop return wires. It may however, cross these leads at right angles.

D. Come within 2" of open wire (not enclosed in armor or in conduit) carrying service current (AC service).

E. Interfere with apparatus which may require repair, adjustment, replacement or cleaning.

F. Interfere with movable parts, or removable equipment, such as keyshelf braces, etc.

### 3.2 Placing Forms

3.21 Place the superimposed form on the side, bottom, or in front of the existing wiring (viewed from wiring side). Ordinarily place the superimposed form to the right side or in front of the existing vertical form, or in front or below of the existing horizontal form. This placement will facilitate utilization of shop made forms with long skinner lead lengths (see Figure 1).

3.22 If the optional placement of this superimposed form, as shown in Figure 1, does not absorb the long skinner lead lengths furnished in shop formed cables, the leads should be reskinned as required to provide proper dress of the skinner leads.

### 3.3 Superimposing Forms

3.31 Supplementary formed local cables shall be superimposed on the existing form by either sewing with twine, banding with twine or banding with nylon ties.

3.311 When superimposing loose wire, or one form on another form, a single strand of twine shall be used when the combined diameter of the (2) forms totals 3" or less. A double strand of twine shall be used when the combined diameter is greater than 3".

3.312 Stitches used for superimposing one form on another shall be placed 4" apart. These stitches should be placed approximately midway between the stitches of the superimposed form which should have stitches spaced at 4" intervals.

3.313 Additional stitches shall be placed at break-outs of branch arms, or skinner lead break-outs as required to prevent the superimposed form from pulling away from the main form (refer to Figure 2).

3.32 Where two or more closely adjacent parallel unsupported forms or arms serve the same or adjacent apparatus and presents an unworkmanship appearance, they should be banded together with twine or nylon ties at both ends and at intermediate points as necessary to make a compact neat appearing form.

3.33 When superimposing KS-21112 or KS-19689 types of coaxial cable(s) to other coaxial cables, local cable forms, or switchboard cable forms with bands of twine or nylon ties, the following procedures should be used.

A. Embed these cables in the middle of other cables not requiring special protection and band with either twine or nylon cable ties. These cables shall not make physical contact with either the twine or cable ties.

B. Where it is impossible to embed these cables inside other cables not requiring special protection, or at cable form breakouts, two layers of R-3428 PVC Tape or a layer of RM-583101 Gray Sheet Fiber, approximately one inch wide shall be applied around the form before securing with twine or cable ties.

C. Secure superimposed KS-21112 or KS-19689 Type Coaxial Cable(s) to sewed cable forms or to other cables with R-3428 or R-3359 PVC Tape applied with a minimum of one and a one-half turns. The spacing of these PVC Tape Bands shall not be spaced farther apart than five times the diameter of the largest cable in the form. Where tape is applied at bends, it shall completely cover the bend of the form.

D. Where cable forms that are normally considered as sewed forms are made up principally of rubber or neoprene insulated wire, or KS-21112 or KS-19689 Type Coaxial Cables, tape the form completely with R-3428 or R-3359 Gray PVC Tape instead of sewing with twine.

### 3.4 Securing Forms

#### 3.41 Methods and Requirements

3.411 Secure sewed forms to cable brackets or other framework details with nylon ties or approved twine unless otherwise specified. Where forms or tubes are more than 3/8" in diameter, use two strands of twine. If forms are less than 3/8" in diameter, use a single strand of twine.

3.412 When securing the form in place with twine, use either the Chicago or Kansas City stitch. Where additional rigidity is required, the Chicago stitch shall be applied (refer to Figures 3, 4 and 5).

3.413 Nylon ties shall not be used on forms 1/2" or less in diameter for securing to cable brackets or other supports. Vertical wiring (whether loose wire, local cable or switchboard cable) shall not be secured to horizontal wiring, towel bars or other supports designed for supporting horizontal wiring. Refer to Section 205 of this handbook for the method of applying nylon ties.

3.414 When securing cable forms made up principally of rubber or neoprene insulated wire or KS-21112 or KS-19689 Type Coaxial Cables to cable brackets, towel bars, or other parts of the framework, protect the form with a layer of RM-583101 1/64" Gray Sheet Fiber wrapped around the cables prior to securing to the cable bracket, etc. When securing a cable form that has only a few KS-21112 or KS-19689 Coaxial Cables that cannot be embedded into the cable form, wrap the cable form with at least two layers of fiber sheeting, or slit a section of semi-rigid tubing and place around the form before securing to framework. Be careful not to crush or distort these cables and do not use cable ties for securing.

### 3.42 Specific Applications

3.421 Where a vertical cable form is being secured to a vertical bar, and the weight of the form is such that it may slip and sag, it shall be wrapped tightly with five or six turns of plastic tape around the bar and form immediately below the uppermost tie. Tape shall not be used if the bar is notched to engage and hold the twine.

3.422 Secure cable forms run on woodwork with the R-4065 Adjustable Nylon Clamp. Secure the clamp with screw and washer as shown in Figure 6.

3.4221 To apply the R-4065 Adjustable Nylon Clamp, wrap the clamp around the form, lock it in place and cut off the excess material before securing it to the woodwork. Make certain the clamp is in the desired position before tightening because this type clamp cannot be released after being locked in place.

3.4222 Space the clamps at approximately 20" intervals. Extra clamps shall be used at bends, breakout points or where extra support is required. Generally, a single clamp can be used at each point of support with the mounting holes of alternate clamps being placed on opposite sides of the form. Where additional support is required, place two clamps adjacent to each other with the mounting holes placed on opposite sides of the form.

3.423 Fasten keyshelf local cable forms, including any supplementary forms, securely to the keyshelf bracket with a strap, clamp, or nylon tie as shown in Figure 7.

3.4231 Before tightening the strap or clamp, locate the fiber protection so that it will extend an equal amount on each side of the bracket and strap or clamp, as judged visually. The ends of the fiber detail should overlap. If P-160084 or P-44C680 Fiber Details are not available, similar details may be cut from 1/64" Sheet Fiber (RM-583101). Cut the details approximately 1/4" longer than the circumference of the form and approximately 1/4" wider than the width of the bracket and strap or clamp where the form rests. When nylon cable ties are used to secure the cable, the fiber shall not be used. Instead, apply two layers of tape around the form to protect the cable from damage by the bracket and nylon tie.

3.4232 Where keyshelf brackets are furnished for local cables less than 3/4" in diameter, the form shall be built up sufficiently with wrappings of strip fiber or friction tape so that they can be securely fastened to the bracket by the strap, clamp, or nylon tie. Forms built up in this manner will not require the fiber protection as specified for the regular forms.

3.4233 Where the keyshelf bracket is located on the same side of the keyshelf as the keyshelf brace, the end of the strap clamp or the locking head on the nylon tie should not protrude so as to result in a hazard when closing the keyshelf.

### 3.5 Form Protection

3.51 General - Irradiated PVC (IPVC) Insulated Wire (such as type-DP), PVC Insulated Wires (such as BU and BY), Lacquered Cotton or Cotton Braided PVC Insulated Wires (such as BW or BH), Polyethylene (PE) Insulated Wires (such as type BF and

shielded pairs in 750 and 760 Type Cables), and Teflon (TFE) Insulated Wires (such as those in KS-19195 and KS-19224 Cables) shall be protected against contact with metalwork when secured to cable brackets, wiring supports, or other framework parts not provided with an approved finish of gray insulating baked enamel (see Table A for conditions and type of protection).

3.52 All wires, whether formed or loose, shall be protected where there is a possibility of them coming in contact with sharp edges on cable brackets, wiring supports, or other parts of the equipment framework, regardless of the type of wire insulation.

3.521 All wires, regardless of the type of insulation, shall be protected at locations where there is a possibility of them being abraded by movable parts of the equipment.

3.522 In bending wire or cable forms around edges of cable brackets, wiring supports, or other part of the equipment framework, the wiring shall, where practicable, be dressed away from edges or corners that might cause damage to the wire insulation. Where this is not practicable, protection shall be provided. In no case shall wiring be dressed taut across edges or corners of metalwork, or protective strips, or other materials used to protect the wiring from metalwork.

3.53 Coaxial cables having foam type dielectric (such as the KS-21112 Type Cables) or a semi-solid type dielectric (such as the KS-19689 Type Cables) are easily deformed (crushed or distorted) when secured to other cables, cable brackets, towel bars, etc., with twine or nylon cable ties, and shall be handled according to Paragraph 3.33.

3.531 Do not kink or bend these cables beyond their normal bending radius. The bending radius for the KS-19689 Cable is 1" and for the KS-21112 Cable it is 1/2".

3.54 PVC Insulated Wires having an outer covering of lacquered cotton (PVC-CL), such as type BW or irradiated, PVC (IPVC) Insulated Wires, such as type DP, which are generally designated as SW1, D2, D3, D4, or D5 on applicable wiring drawings do not require protection except as specified in Paragraphs 3.52, 3.521, 3.522 and 3.57.

3.55 Rubber or neoprene Insulated Wire (such as KS-15141, KS-15143 or KS-20195) and similar types of flexible wire shall be protected against contact with both the metalwork, twine, clamps, or clips used to secure such wiring to cable brackets, towel bars, wiring supports, or other parts of the framework, whether or not a protective finish is provided. (Do not use nylon ties.)

3.56 PVC Insulated Conductors of KS-13385 Wire do not require protection when sewn or banded together. However, where such wire is to be secured to cable brackets or other framework parts, it shall be protected from contact with the metalwork and twine with sheet fiber.

3.57 Where forms pass through thin metal openings, the breaking of the hole edges or notches is not adequate and protection is required. If fiber escutcheons are not provided, either the form or the metalwork, whichever is practicable, must be protected.

CAUTION: PLASTIC TAPE SHALL NOT BE APPLIED TO METALWORK HAVING NITROCELLULOSE LACQUERED FINISHES, SUCH AS THE 472 FINISH. THE FINISH WILL SOFTEN FROM THE ADHESIVE.

3.58 At units having fiber escutcheons, modify the escutcheon as required. If the combined size and shape of the original and superimposed local cable interferes with the reinstallation, remove the twine from the superimposed local cable in the area where it passes through the metal and spread the wires uniformly around the existing form. Apply protection as required.

3.59 Care shall be taken not to cover up the fusible fire detection loop wire with protective materials.

### 3.6 Keyshelf Protection

3.61 Keyshelf cables in switchboards and desks, having keyshelf aprons with cable boots over the cable hole, shall be protected by sheet fiber extending from a point approximately 1" back of the clamps which fasten the cable to the framework, to a point not less than 4" beyond the first bend inside the apron.

3.62 When keyshelf aprons have fiber escutcheons, the cables shall be protected by fiber extending from a point not less than a 1/2" beyond the rear edge of the cord shelf, to a point not less than 4" beyond the first bend inside the apron for cables entering from the bottom, and to a point not less than 1" beyond the first bend inside the apron where the cables enter at the top.

3.63 At test boards, such as the 178 and 188 Toll Test boards that have keyshelf panels with fiber escutcheons, the keyshelf cable shall be protected by fiber extending not less than 1" on each side of the cable opening in the panel.

3.64 Where straps or clamps are used to secure keyshelf local cables, the P-160064 or P-44C680 Fiber shall be placed under the strap or clamp to protect the form from damage. If nylon cable ties are used to secure the form, two layers of tape shall be placed under the nylon tie to protect the form from damage.

3.65 Keyshelf cables in switchboards and desks not equipped with aprons shall be protected by fiber where they are likely to be damaged by cord weights or other moving parts. The fiber shall be covered with a single layer of tape (PVC or Friction) applied evenly with a half lap.

3.66 Added wiring which consists entirely of wire types not normally requiring protection from contact with metalwork, such as types AM and BH, additional protection is not required when it is placed on the existing form so as not to be subjected to damage by raising or lowering the keyshelf, except in the area where the wiring passes through the keyshelf apron.

### 3.7 Protection Methods

3.71 General - The materials generally used for protecting wiring include: Gray Friction Tape (RM-591127), Gray PVC Tape (R-3428 and R-3359) Gray Sheet Fiber (RM-583101), Non-Rigid Tubing (RM-552458, RM-55417, RM-552448, RM-587082, RM-552452), Fiber Glass - PVC Coated KS-7851E-3 Sleeving and P-44F895 Clear PVC Sleeving (see Table A). Except as otherwise specified, cable protection material shall extend at least 1/2" inch beyond each end of the wiring protection area.

CONDITIONS	TYPE OF WIRE INSULATION	TYPE OF PROTECTION	NOTES
A Form or Wire Secured To Brackets, Etc., With An Approved (483) Finish	All Except The Following	None	1
	PE, Rubber or Neoprene	Friction Tape	2, 4, 5, 6, 7
B Form or Wire Secured To Brackets, Etc., Not Having An Approved (483) Finish	Any	Friction Tape	2, 4, 5, 6, 7
		Fiber	3, 5, 11, 13
		Tubing	5, 8, 14
C Possible Contact With A Sharp or Jagged Edge	Any	Friction Tape	2, 4, 5, 6, 7
		PVC Tape	1, 2, 5, 7, 8, 9, 10
		Fiber	1, 3, 11, 13
		Tubing	1, 5, 8, 14
		PVC Strip	1, 12
D Possible Damage From Moving Parts, Abrasion Or Chafing	Any	Fiber	1, 5, 11, 13
		Tubing	1, 5, 14
E Possible Damage To Keyshelf Form	Any	Fiber	1, 17, 19, 20
		Friction Tape	1, 4, 6, 7, 18
		PVC Tape	1, 9, 10, 18
F Possible Damage From Oil Dripping	Any	PVC Tape	2, 9, 10, 15
		Tubing	16
G Possible Damage From Heat Device	Any	Fiber	8, 11

TABLE A - FORM PROTECTION  
(FARS. 3.51 and 3.71)

NOTES:

- All wires whether formed or loose, shall be protected where there is a possibility of them coming in contact with sharp edges of cable brackets, wiring supports, or other parts of the equipment framework.
- Plastic adhesive backed tape shall not be used to protect PVC, rubber, or neoprene insulated wire subjected to pressure from twine, nylon cable ties or metalwork.
- Where rubber or neoprene insulated wires, or other types of flexible wire is secured to brackets, towel bars, supports, etc., they shall be protected with a strip of fiber placed around the cables and centered under the twine band or stitch.
- Wind friction tape tightly and evenly with at least a half-lap and the last two turns applied at right angles to hold the end secure.
- Extend the protection a minimum of 1/2" beyond each side of the point requiring protection.
- Apply a coat of shellac over the friction tape, thin with solvent as required.

7. Friction tape shall be used in place of plastic tape where pressure is exerted against the form. A constant pressure applied against the plastic tape will create an undesirable "Cold Flow" condition.
8. Plastic tape or PVC tubing shall not be used for protection in areas where a soldering iron or other heat producing devices might come in contact with the tape.
9. Plastic tape shall not be applied to metalwork having nitrocellulose lacquer finish.
10. Wind plastic tape tightly and evenly with at least a 3/16" lap and the last two turns applied at right angles, without tension, to hold the end secure.
11. Where the use of tape or PVC Tubing is impracticable, use 1/64" sheet fiber cut to fit the condition. The fiber may be secured to the framework, or where conditions permit, shaped into a sleeve and banded with twine or nylon cable ties to the form. Stitches shall be spaced a maximum of 4" apart.
12. The R-4458 PVC Insulated Strips can be applied (friction fit) to the flange edge of the unequal duct type bay or other similar applications thereby eliminating the form taping operations.
13. Cut 1/64" sheet fiber to fit the surface of the bracket or support to which the form may be in contact. Where possible, use the P-68616 Fiber Detail for this purpose. Tie the fiber to the bracket or support with twine or nylon ties to hold the protection in position.
14. Where a straight portion of a form requires protection, a proper length of PVC Tubing may be split lengthwise and wrapped around the form (1/2" minimum lateral overlap) and secured in place with nylon cable ties or two strands of twine spaced at 4" maximum intervals.
15. Overlap the edges of the tape and locate them on the side of the form opposite the source of the oil dripping.
16. PVC Tubing may be substituted for tape when used to protect against oil drippings or when wiring or long lengths of local cables require protection from metalwork with unapproved finish.
17. Cut 1/64" sheet fiber to extend from a point 1" back of the rear support clamp (or cord shelf) to a point at least 4" beyond the first bend inside the apron. Where aprons are not provided, extend the fiber along the straight portion of the form to a point near where the form is secured to the bracket. Make up a detail for the bend inside the apron as shown in Figure 2. Cut sheet fiber as required to wrap around the straight portion of the form in the shape of a sleeve, place the fiber details around the form with the edges and the ends overlapping 1/2" and temporarily hold the details in place with bands of tape or twine.
18. Start the taping at a point 1" back of the end of the fiber outside the apron. Continue taping over the fiber details and extend it to a point 1/2" beyond the bracket inside the keyshelf. Tape the form at all other locations where it is attached to, or may come in contact with metalwork.
19. When cable boots are not provided and fiber escutcheons are to be used on the keyshelf apron, fit the escutcheon around the form so as to leave sufficient clearance between one side of the escutcheon and the form to avoid undue strain on the form when the keyshelf is opened. In general, do not allow clearances greater than 3/8" when the keyshelf is closed. Provide a clearance of 1/8" between the top of the form and the escutcheon.
20. Drill and file the escutcheon as required so they fit close but not too tight around the form. Remove all sharp corners and edges.

3.72 Taping - Gray Friction Tape (RM-591127) or Gray Plastic Adhesive Tape (R-3428, R-3359) should be used to protect cable forms, except where there is a tendency to chafe, or a possibility of damage from moving parts. The plastic tape is satisfactory protection against oil drippings, however, it should not be used in locations where a hot soldering iron or other heat producing devices might come in contact with the tape. Plastic tape should not be used where it might be subjected to constant pressure, such as on wiring secured to framework.

3.721 Friction Tape should be applied to a cable form by winding it tightly and evenly around the form or wires with an overlap of at least half the width of the tape. The last two turns shall be applied at right angles to the form so the end will adhere to the taped portion of the form. After taping, apply one coat of R-3455 Shellac to the form. If the shellac is too thick and heavy, thin as necessary with R-4343 Shellac Solvent.

3.722 PVC Tape (R-3359 or R-3428) should be kept as clean as possible during application to assure a good adhesion and prevent unraveling (flagging). Due to the tendency of the PVC Tape to recede, the last two turns shall be applied at a right angle to the form and shall be applied without tension. Do Not apply shellac to the PVC Tape.

3.723 PVC Tape shall be applied to a cable form in the same manner as described in Paragraph 3.721.

3.73 Tubing - Semi-rigid PVC Tubing may be used for protection of small cable forms or loose wiring leads where taping is impracticable because of the long length of wiring requiring protection. PVC Tubing should not be used in locations where soldering irons or other heat producing devices might come in contact with the tubing.

3.731 Semi-rigid PVC Tubing may also be used to protect long lengths of local cables which are fastened to metal framework with an unapproved finish or where there is danger of contacting sharp edges. The appropriate diameter tubing may be slit lengthwise and applied around the form and secured in place. A minimum 1/2" lateral overlap of the tubing is required.

3.74 Gray Sheet Fiber - 1/64" (RM-583101) may be substituted for tape or tubing where cable forms or wiring requires protection. However, sheet fiber shall not be used for protection against oil drippings.

3.741 When cable forms are to be secured to brackets, towel bars, etc., not having an approved protective finish, or where cable forms require protection from the twine or nylon cable ties used to secure the forms to the brackets, etc., sheet fiber strips should be cut and wrapped around the form prior to the securing operation.

3.75 PVC Protection Strip - R-4458 PVC Strips should be applied to the edges of framework, such as those found on unequal duct type bays, where the danger of sharp edges could damage the cable forms. These PVC Strips are friction fit onto the framework and are furnished in 42" lengths, however, they can be cut to fit individual conditions requiring protection. Because these strips are "friction fit" type, lengths under 5" are not recommended unless they are secured in place (see Figure 8).

3.76 Fiber Escutcheons are used to protect stationary cable forms passing through metalwork (such as cable forms on toll repeater panels and sender casings) and shall be cut out and fitted closely around the forms to ensure proper separation between the form and the metalwork. Where the cable form passes through the escutcheon, the form shall be taped to prevent scuffing by the sharp edges of the fiber.

3.77 Sleeving - The KS-7851 L3, PVC Coated-Fiber glass Sleeving, should be used as a means of protection where there is a possibility of damage from heat producing devices. However, this sleeving is only furnished in very small diameters to accommodate a few leads in a loose wire form or individual component axial leads.

3.771 Clear PVC Sleeves are being furnished by some manufacturing locations to protect the bare unconnected wire ends of local cable forms. These P-44F895 Sleeves are BTL approved under the ASTM-D922 Specification and therefore can be used in a similar manner as the KS-7851 L3, Sleeves.

3.8 Supporting Methods

3.81 General - Cable supports, cable brackets, towel bars, wooden cleats, or other supporting details, as illustrated in Figures 9, 10 and 11, shall be used except where their use is impracticable.

3.811 Where it is impracticable to secure the cable forms to supports, brackets, etc., or to the metal framework, they shall be securely tied to adjacent forms or cables which are fastened to the supports, brackets, etc., with approved twine or nylon cable ties.

3.812 Where cable forms are to be fastened to "L" and "U" Type Cable Brackets, or similar type brackets, the forms shall be secured with nylon cable ties or approved sewing twine.

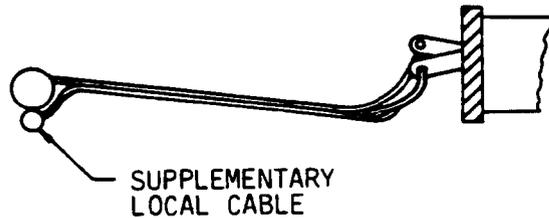
3.813 Cable forms shall be supported at approximately 20" intervals.

3.814 Where leads at unequipped positions (other than at the tip of the form) require additional support to hold the form in proper position, place a split PVC Tube over the form and secure to support Detail P-423307.

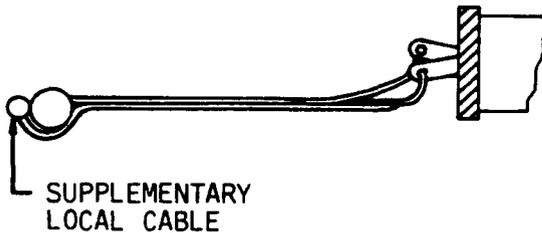
3.82 Specific Applications - Support partially equipped fuse and lamp panel forms that are not selfsupporting, per Figure 12. One support placed midway between the butt and tip of the form will generally be sufficient. An additional support shall be provided where the tip of the form is not equipped.

3.821 Where it is necessary to support a form serving a single row fuse panel of 60 fuse capacity or a lamp panel form at the center of the form, using a P-423307 Support, place a split PVC Tube over the form at the center of the form and tie to the P-423307 Support.

3.822 Use brackets, as shown in Figure 13 to support cable forms for relays, resistances and similar apparatus on strip type mounting plates, where the distance between equipped apparatus positions or between the equipped apparatus and the butt of the form exceeds 15".



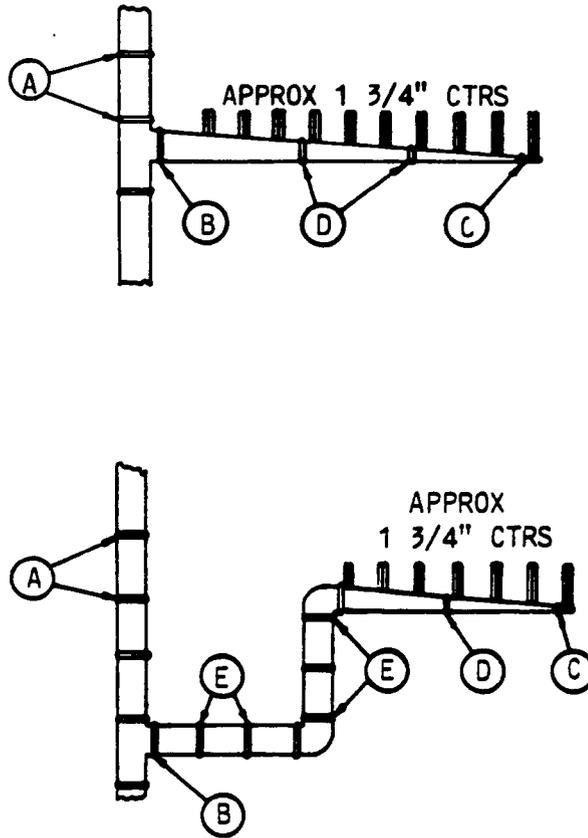
NOTE: PLACED TO RIGHT SIDE (VERTICAL FORM) OR BOTTOM SIDE (HORIZONTAL FORM)



NOTE: PLACED ON FRONT SIDE OF EITHER HORIZONTAL OR VERTICAL FORMS

RP-0073

FIG. 1 OPTIONAL PLACEMENT OF SHOP FORMED SUPPLEMENTARY LOCAL CABLES (PARS. 3.21, 3.22)



- A MAIN LEG BANDED AT 8" INTERVALS AND AT BRANCH ARMS.
- B PLACE BAND AT START OF BRANCH ARM.
- C PLACE BAND AT TAIL END OF BRANCH ARM.
- D WHERE MAIN FORM IS CONNECTED ON 1-3/4" OR LESS INTERVALS - PLACE BANDS AT 8" OR LESS INTERVALS.
- E WHERE FORM IS NOT CONTROLLED BY BRANCH ARM - PLACE BANDS AT 4" INTERVALS.

RP-0074

FIG. 2 BANDING SUPPLEMENTARY SHOP LOCAL CABLES (PAR. 3.313)

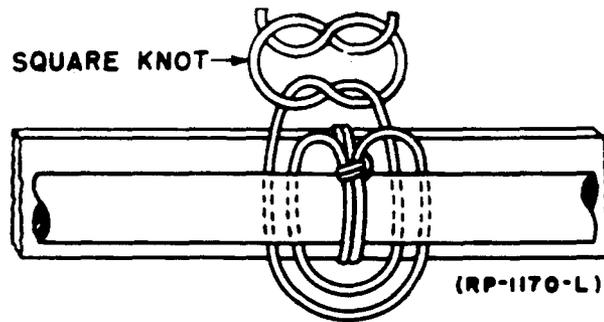


FIG. 3 SECURING FORM PARALLEL TO SUPPORT WITH KANSAS CITY STITCH (PAR. 3.412)

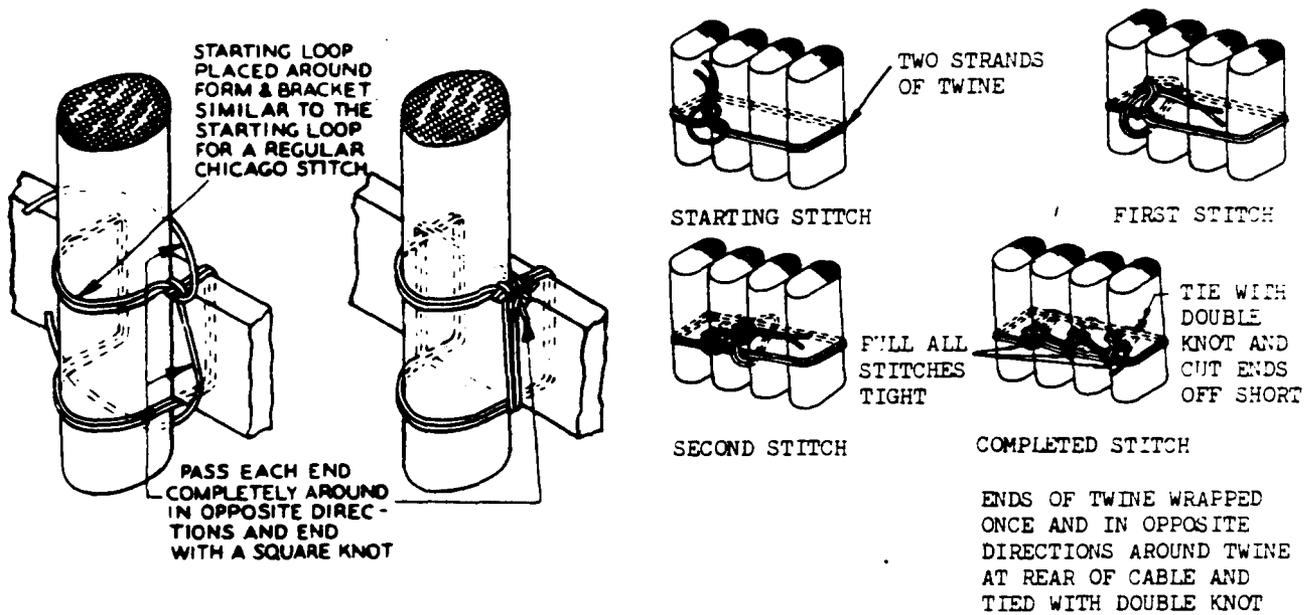


FIG. 4 SECURING FORM PERPENDICULAR TO SUPPORT WITH CHICAGO STITCH (PAR. 3.412)

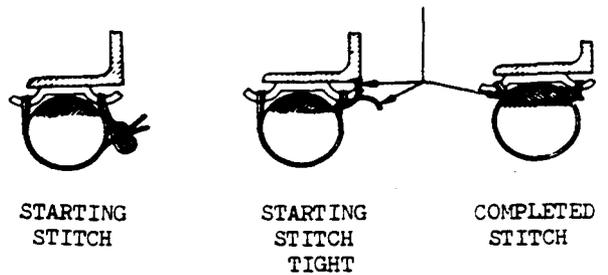


FIG. 5 SECURING BAY CABLE (PAR. 3.412)

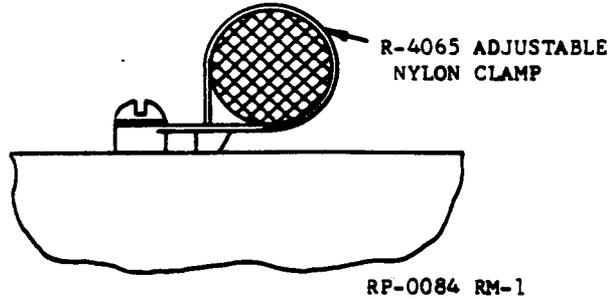


FIG. 6 SECURING SEWED FORMS ON WOODWORK (PAR. 3.422)

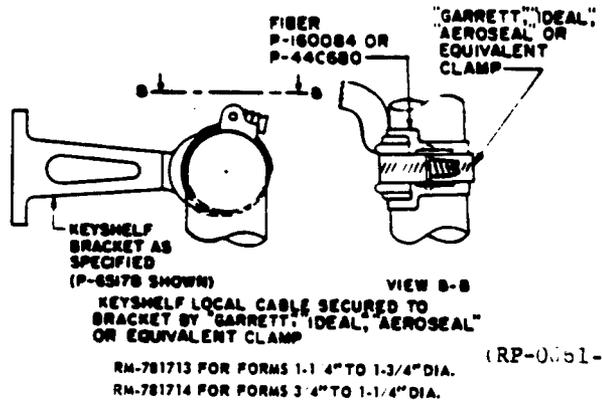
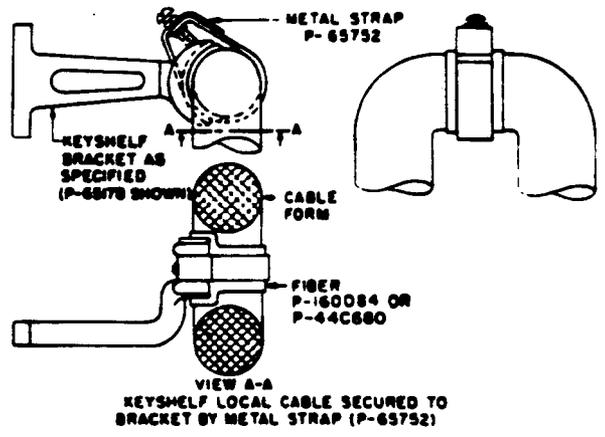


FIG. 7 FASTENING KEYSHEAF LOCAL CABLES TO BRACKETS (PAR. 3.423)

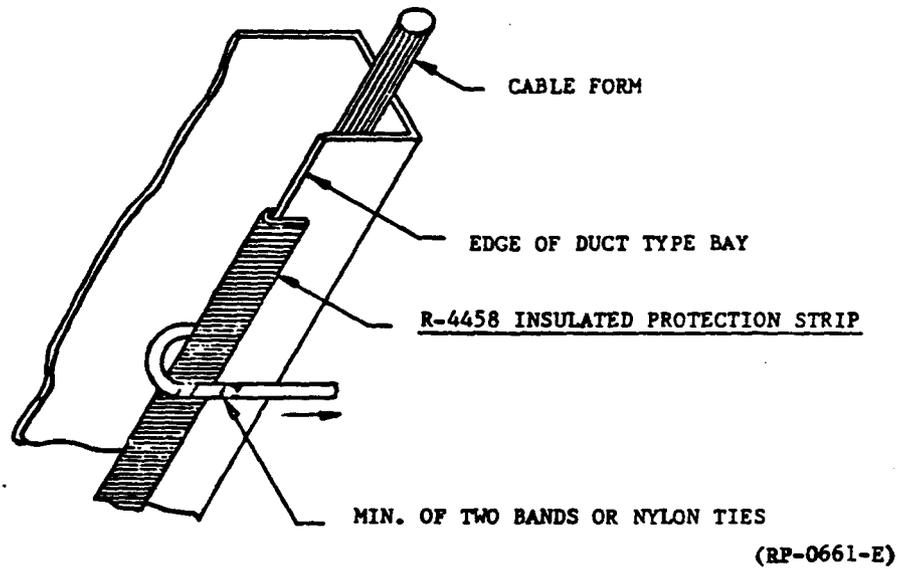
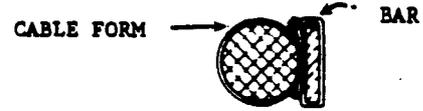
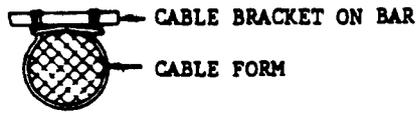
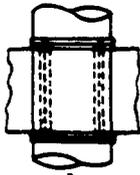


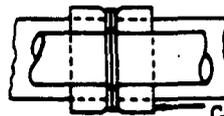
FIG. 8 R-4458 INSULATED PROTECTION STRIP  
(PAR. 3.75)



FASTENING CABLE FORM TO BAR ON CABLE BRACKET PARALLEL TO CABLE



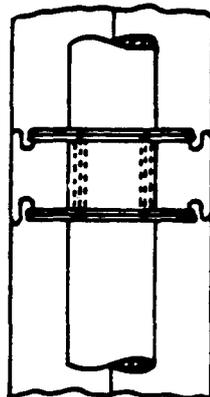
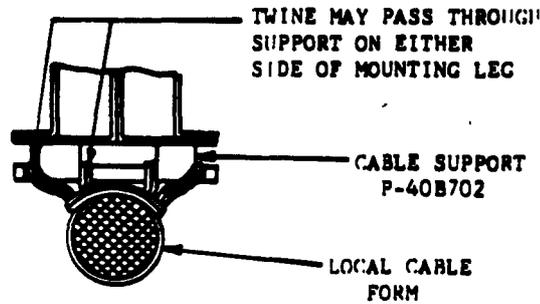
FASTENING CABLE FORM TO BAR OR CABLE BRACKET AT RIGHT ANGLES TO CABLE



CABLE CLEAT  
P-401901



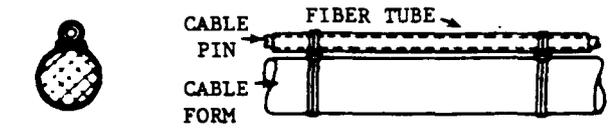
FASTENING CABLE FORM TO BAR OR PARALLEL TO CABLE USING CABLE CLEAT



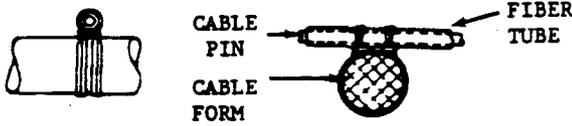
METHOD OF SUPPORTING MAIN CABLE ARM ON DOUBLE RAY FRAMES

RP-0234

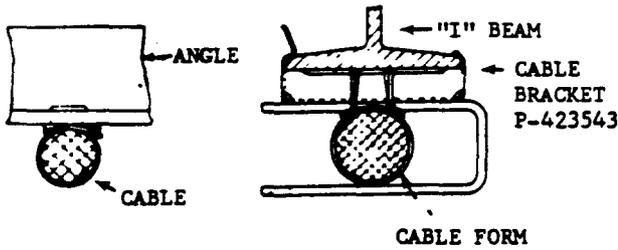
FIG. 9 FASTENING CABLE FORMS TO CABLE BRACKETS OR BARS (PAR. 3.81)



FASTENING CABLE FORM TO CABLE PINS PARALLEL TO CABLE

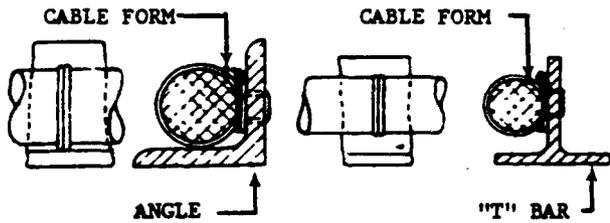


FASTENING CABLE FORM TO CABLE PINS AT RIGHT ANGLES TO CABLE



FASTENING CABLE FORM TO ANGLE AT RIGHT ANGLES TO CABLE

FASTENING CABLE FORM TO "I" BEAM UPRIGHTS

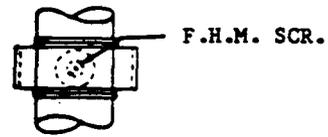
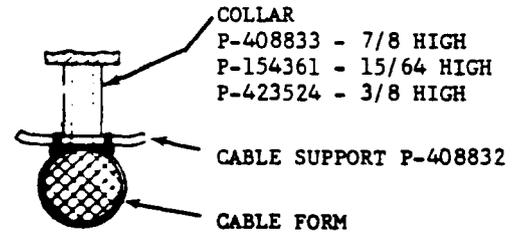


FASTENING CABLE FORM TO ANGLE PARALLEL TO CABLE

FASTENING CABLE FORM TO "T" BARS

(RP-15258M)

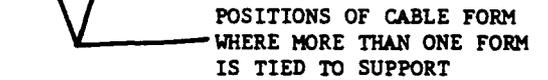
FIG. 10 FASTENING CABLE FORMS TO CABLE PINS ANGLES, "T" BARS AND "I" BEAMS (PAR. 3.81)



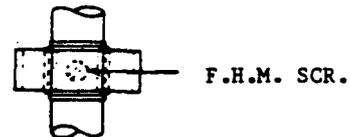
F.H.M. SCR.



CABLE SUPPORT P-69690



POSITIONS OF CABLE FORM WHERE MORE THAN ONE FORM IS TIED TO SUPPORT



F.H.M. SCR.

(RP-15260M)

FIG. 11 FASTENING CABLE FORMS TO CABLE SUPPORTS (PAR. 3.81)

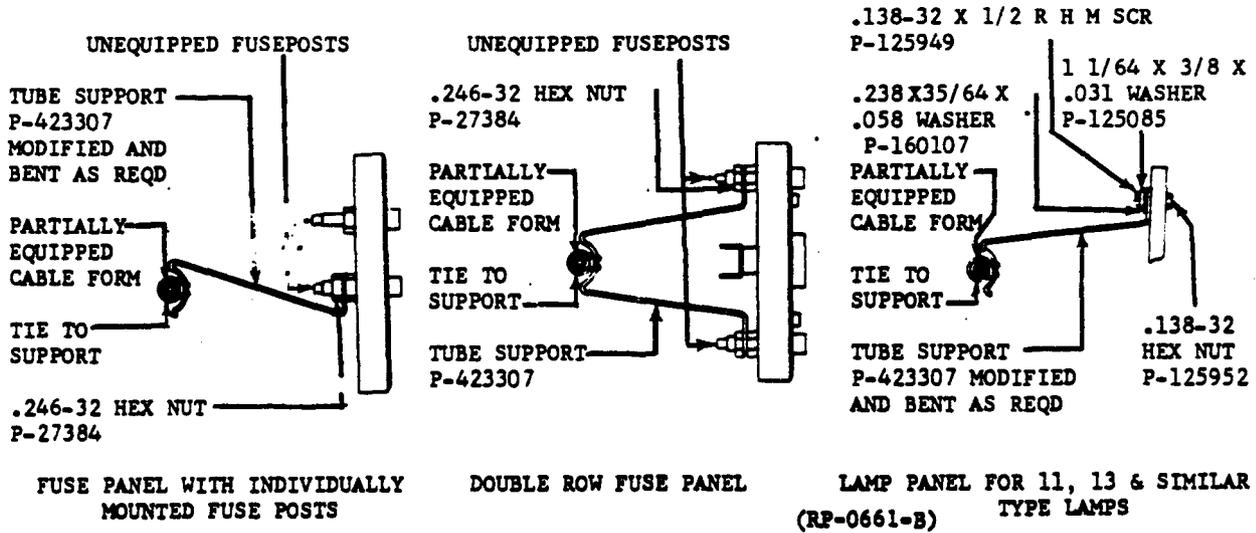


FIG. 12 SUPPORTING CABLE FORM AT PARTIALLY EQUIPPED FUSE AND LAMP PANELS (PAR. 3.82)

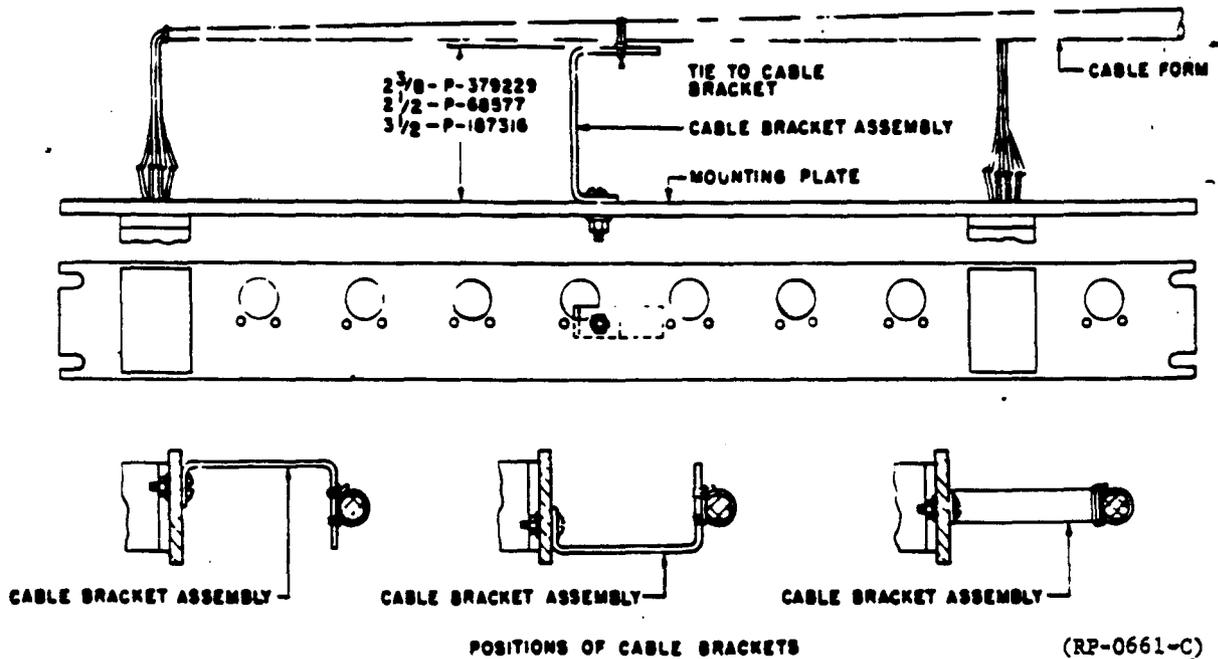


FIG. 13 SUPPORTING CABLE FORMS AT UNEQUIPPED APPARATUS POSITION (PAR. 3.822)

## 4. VERIFICATION

VERIFICATION ITEMS AND BRIEF STATEMENT OF REQUIREMENTS		Reference	
		Par. No.	Fig. No.
4.01	Local cable forms superimposed by sewing or banding with twine or cable ties.	3.13 3.31	
4.02	Forms passing through metalwork, casing, etc. - spread leads around form to prevent insulation damage.	3.14	
4.03	When superimposing cable forms they shall not:		
	A. Cover up various types of "C" wiring.	3.15A	
	B. Cover up wiring for unused circuits, features or options.	3.15B	
	C. Cover up fire detection wire or loop return wires.	3.15C	
	D. Come within 2" of open service current.	3.15D	
	E. Interfere with repair, adjusting, cleaning or replacement of apparatus.	3.15E	
	F. Interfere with movable or removable equipment.	3.15F	
4.04	Reskin shop formed cable leads when skinner leads are too long for proper dressing.	3.22	1
4.05	Use (2) strands of twine when superimposing and combined diameter of forms is greater than 3".	3.311	
4.06	When superimposing - space stitches approximately 4" apart.	3.312	
4.07	Additional stitches required at branch arm and skinners.	3.313	2
4.08	At closely adjacent parallel unsupported forms - band them together for appearance.	3.32	
4.09	When superimposing KS-21112, KS-19689 to other coaxial cables, LC forms, or switchboard cable forms they shall:		
	A. Not make physical contact with twine or cable ties.	3.33A	
	B. Be embedded inside of other cables in form or protect with tape or fiber.	3.33B	
	C. Where impracticable to embed, band with 1-1/2 laps of tape.	3.33C	
	D. Be completely taped with PVC tape, when the form is principally made up of rubber, neoprene, or KS-21112 or KS-19689 Coaxial Cables.	3.33D	
4.10	Secure forms or tubes over 3/8" in diameter with (2) strands of twine to brackets, towel bars, etc.	3.411	
4.11	Do not secure forms 1/2" or less in diameter to brackets, etc.	3.413	
4.12	Rubber, neoprene, or KS-21112 and KS-19689 Coaxial Cables require protection when securing to brackets, etc.	3.414	
4.13	Vertical form secured to vertical bracket should utilize tape to prevent slipping.	3.421	
4.14	Forms run on woodwork should be secured with R-4065 Clamps spaced at 20" intervals.	3.4221 3.4222	6

## 4. VERIFICATION (Cont'd)

VERIFICATION ITEMS AND BRIEF STATEMENT OF REQUIREMENTS	Reference	
	Par. No.	Fig. No.
4.15 Use fiber protection with R-4065 Clamp.	3.4231	
4.16 Forms under 3/4" diameter should be built up with fiber strips or tape to fit securely.	3.4232	7
4.17 Types of wire, condition, and protection per Table A.	3.51	
4.18 Protect all wiring from sharp edges.	3.52	
4.19 Protect all wiring from abrasion.	3.521	
4.20 No wiring to be dressed taut across edges or corners of metalwork, protective strips, etc.	3.522	
4.21 Foam type dielectric coaxial cables require protection.	3.53	
4.22 Do not bend cables beyond normal bending radius.	3.531	
4.23 SW1, D2, D3, D4 or D5 does not require protection except as specified in Paragraphs 3.52, 3.521, 3.522 and 3.57.	3.54	
4.24 Rubber, neoprene and similar flexible wire shall be protected from metalwork, twine, clamps or clips when secured to brackets, etc. (no nylon cable ties).	3.55	
4.25 KS-13385 Wire requires protection when secured to brackets or other framework parts.	3.56	
4.26 Forms passing through thin metal opening - protect.	3.57	
4.27 Protection material not to cover up fire detection wire.	3.59	
4.28 At keyshelf aprons with fiber escutcheons cables shall be protected with fiber.	3.62	
4.29 Keyshelf cables in switchboards and desks shall be protected by sheet fiber.	3.63	
4.30 Where straps or clamps are used to secure local cables, place fiber under strap or clamp. If nylon ties are used, protect with two layers of tape.	3.64	
4.31 Protect keyshelf cables from cord weights and other moving parts.	3.65	
4.32 Do not use PVC Tape to protect against moving parts where chafing is possible, or where subjected to pressures, or heat producing devices.	3.72	
4.33 Last two turns of friction tape applied at right angles - apply one coat of shellac.	3.721	
4.34 PVC Tape applied with an over-lap and last two turns applied without any tension. Do not shellac PVC Tape.	3.722	

## 4. VERIFICATION (Cont'd)

VERIFICATION ITEMS AND BRIEF STATEMENT OF REQUIREMENTS		Reference	
		Par. No.	Fig. No.
4.35	Do not PVC Tubing where heat producing devices could come in contact.	3.73	
4.36	PVC Tubing slip lengthwise has a minimum 1/2" lateral over-lap.	3.731	
4.37	Do not use sheet fiber to protect against oil dripping.	3.74	
4.38	Use sheet fiber strips to protect form from uninsulated metalwork and twine or nylon ties used for securing.	3.741	
4.39	When using R-4458 PVC Strips for protection, secure lengths under 5" long.	3.75	
4.40	Fiber escutcheons should be cut and fit around form to provide proper separation of form and metalwork.	3.76	
4.41	Use cable supports, brackets, etc., where practicable.	3.81	9,10,11
4.42	Where (Paragraph 3.81) is impracticable, secure to adjacent forms or cables that are secured.	3.811	
4.43	Where forms are to be fastened to "L, U", and similar brackets, use twine or nylon ties.	3.812	
4.44	Support cable forms at approximately 20" intervals.	3.813	
4.45	Where leads are not connected at unequipped positions (other than tip of form) and rigidity is required, a PVC should be secured to the detail.	3.814	
4.46	Partially equipped fuse and lamp panel forms supported midway between butt and tip. Additional support required at tip when unequipped.	3.82	
4.47	Use brackets to support forms serving relays, resistances, and similar strip mounted apparatus where distance between apparatus positions or butt of form exceeds 15".	3.822	13

No arrows due to extensive changes.

[ Indicates requirement.

Engineering Planning Manager  
(Installation)