MAIN AND INTERMEDIATE DISTRIBUTION FRAMES

This E.I. describes installation practices for Main and Intermediate Distribution Frames and includes:-

The practices to be used in the assembly of the steel frame and its supports;

A description of cabling practices and precautions to be taken; and

Details of electrical and mechanical tests of fittings, the sequence of fitting, and the use of each item.

INDEX.

1. GENERAL.

1.1 The Main Distribution Frame (M.D.F.) is a mild-steel structure on which is mounted equipment to provide facilities for the connection, protection and testing of line plant and exchange apparatus.

The underground cables terminate on fuse mountings on the line side, and the exchange cables terminate on protector strips on the equipment side of the frame. Terminal blocks, etc., are fitted in some instances where protection is not required on the exchange side of the frame. Circuits are cross-connected between these by means of jumper wires.

1.2 An Intermediate Distribution Frame (I.D.F.) is a mild-steel structure on which terminal blocks are mounted on both sides. These are known as Horizontal and Vertical blocks. The main purposes of the I.D.F. are:-

(i) The incoming cables terminate on the vertical side and the cables outgoing to the next unit or rank of equipment are connected to the horizontal side.

(ii) An I.D.F. may be provided between the M.D.F. and the equipment racks to interconnect the subscribers' line equipment with the final selector multiple or, in a C.B. manual exchange, the subscribers' multiple.

(iii) An I.D.F. may also be used as a connecting field between two succeeding ranks of equipment. It replaces a Trunk Connecting Frame when the number of circuits exceeds the capacity of a T.C.F.

1.3 A Combined Distribution Frame when used in small exchanges combines the functions of the M.D.F. and I.D.F.

1.4 Other classes of rack distribution frames include Sectional I.D.F's. (S.I.D.F.), Link Distribution Frames (L.D.F.), Trunk Distribution Frames (T.D.F.), Trunk Connecting Frames (T.C.F.). The installation practices for these are in the appropriate Internal Plant Installation E.Is.

1.5 The assembly of tie-bars and cable runways at the head of the M.D.F. is covered in E.I. INTERNAL PLANT INSTALLATION Assembly I 4010.

1.6 Responsibility. The officer in charge of the installation of the M.D.F. or I.D.F. is responsible for the assembly, fitting, wiring and the testing of its components. This responsibility includes :-

(i) For Assembly:-

the checking of all material supplied for quantity and finish;
the safe storage of the material;
the allocation of staff;
the precautions to ensure safe working conditions for the staff;
the locating and marking out;
the prevention of damage to walls and floors during the assembly of the frame;
the assembly of the frame;
arranging for the location of the M.D.F. on the floor to be correctly marked in the particular case where the frame is to be assembled by Workshops staff.

(ii) Fitting and Wiring:-

the positioning of all fittings included on the appropriation drawings;
following the correct sequence of operations, as in this E.I., when fitting and wiring fuse mountings, protector strips, terminal blocks, tone bars, etc.

2. M.D.F. AND I.D.F. ASSEMBLY OF STEEL FRAME.

2.1 Assembly Order. The M.D.F. or I.D.F. steel frame must be assembled in the following sequence:-

(i) Mark the correct position of the base angle iron members.

(ii) Mark and drill fixing holes

(iii) Mark and drill walls or ceilings for overhead structural supports -

(a) tie-bar wall angle, or
(b) overhead brackets.

(iv) Fix the base angles to the floor.

(V) Check the base angles with carpenter's level and pack, where necessary, to ensure a level base for the frame.

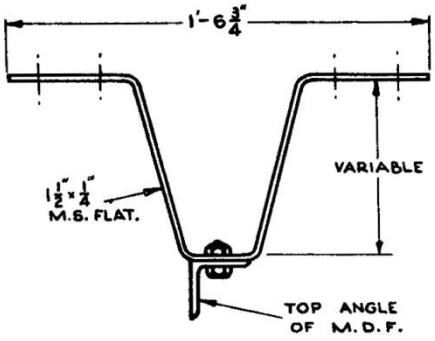
(vi) Erect the first and last verticals in a section and provide temporary stays. Fix the top angle iron to these verticals, fix the overhead supporting structure (i.e., tie-bars or brackets). See Fig. la, (Where tie-bars are not used.) Add sufficient additional verticals and fix some horizontal bracing members to give stability to the structure.
Add all the remaining verticals, horizontal braces, and struts and tighten all bolts.

(vii) Check for vertical and horizontal levels of the completed structure before finally tightening all fixing bolts.

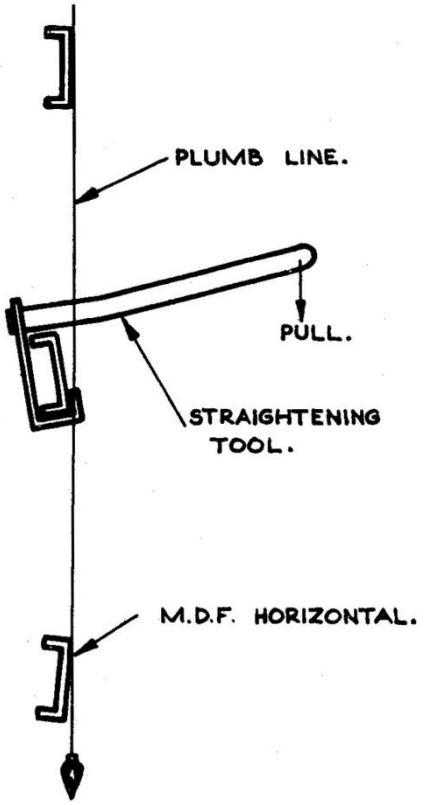
(viii) Check with plumb line and adjust horizontal channel iron members. See Fig. 1b.

(ix) Assemble and fix bottom and end guard rails.

For marking methods see E.I. INTERNAL PLANT INSTALLATION Practice M 6010.



(a) Overhead Supporting Bracket.



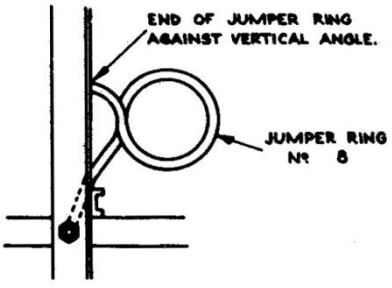
(b) Checking and Aligning Horizontal Channel Iron Member.

FIG. 1. M.D.F. ASSEMBLY.

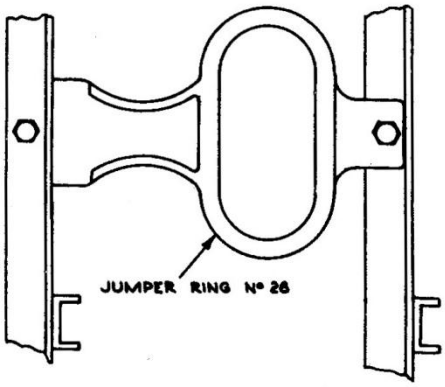
2.2 Assembly Aids.

(i) Jumper Ring No. 8 is used as a fixing bolt and must be positioned with its free end against the vertical angle, as in Pig. 2a.

(ii) Jumper Ring No. 28 replaces the majority of the horizontal bracing members of the Mo D.F. This jumper ring is shown in Fig. 2b.



(a) Jumper Ring No. 8.



(b) Jumper Ring No. 28.

FIG. 2. FITTING JUMPER RING.

2.3 Mezzanine Platforms. When an M.D.F. has a mezzanine platform it must be in accordance with the details included in the appropriate drawings supplied for the job. The platform is supported By Bearer rods which are anchored to the ceiling. It is stayed to the adjacent walls on the line side and by offset stays to the ceiling on the equipment side.

Before starting the assembly of the platform, transfer the' floor plan outline to the ceiling as in E.I. INTERNAL PLANT INSTALLATION Practice M 6010.

The pre-marking of the ceiling facilitates the assembly which must be done in the following sequence:-

(i) Mark, drill and fix vertical Bearer rods.
(ii) Fix platform cross-member bearers.
(iii) Check and adjust these members so that the finished platform will Be level.
(iv) Fix stays to side wall and to ceiling.
(v) Place all checker plates or flooring in position.
(vi) Fix guard rails and steps.
(vii) Lay and fix rubber insulating floor covering.

2.4 Painting. When the steel frame assembly for the M.D. F. and the platform has been finished, it must be painted with one coat of light Battleship grey, British Standard specification 381, colour 831.

During this operation the following surfaces of the M.D.F. must be masked:-

(a) that end of the horizontal member to which the protector strip is fixed; see Fig. 3a.
(b) the bracket to which the earthing bar is fixed. See Fig. 3b.

After the enamel on the remainder of the frame has dried, these unpainted surfaces must be cleaned and given a coat of metallic aluminium paint.

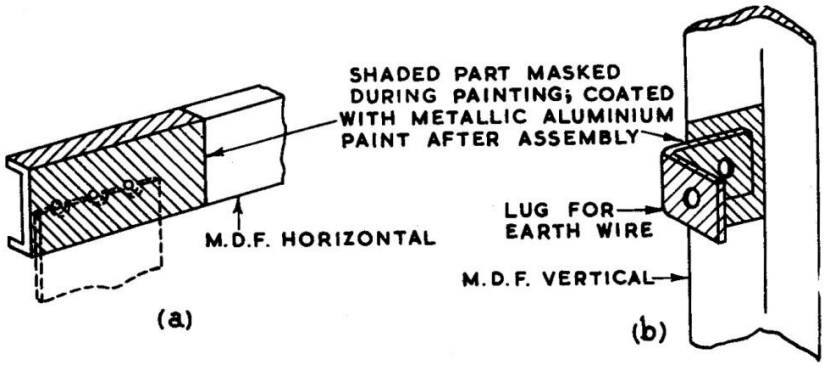


FIG. 3. PARTS OF M.D.F. STRUCTURE TO BE MASKED WHEN PAINTING.

2.5 Cement Apron.

(i) cement apron below an M.D.F. or I.D.F. facilitates cleanliness and prevents the splashing of solder on the floor covering and the collection of rubbish in the area formed By the angle base members of the frame. An apron must be provided for all island type M.D.F's. and I.D.F's. See Figs. 4 and 5. However, when existing M.D.F's. and I.D.F's. which have been finished as in sub-para (iii) are extended, the original method of finishing must be used.
(ii) The cement apron must be fitted as in Fig. 4. The wood curb at the edges must be fitted before filling-in with cement.
(iii) In earlier types of frames, the space between the base angles only was filled with cement. See Fig. 5.
(iv) In each case the cement must be steel trowelled to a smooth finish and painted and stippled to match the linoleum or other floor covering.
(v) Lead-covered cables passing through the apron must be protected from contact with the cement. See Figs. 20a and 20b for approved methods.

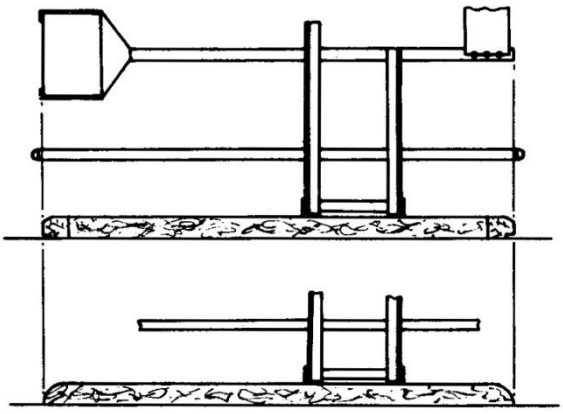


FIG. 4. CEMENT APRONS UNDER M.D.F.

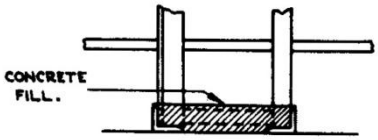


FIG. 5. CEMENT FILL BETWEEN BASE ANGLES OF M.D.F.

3. M.D.F. AND I.D.F. - PROVISION OF FITTINGS.

3.1 This section describes the methods to be used in fixing jumper rings, protector strips, fuse mountings, terminal blocks, etc., on Main and Intermediate Distribution Frames.

3.2 Appropriation Drawing. The M.D.F. appropriation drawing for the job, detailing the positions and types of the major items to be fitted, must be studied before work starts.

3.3 Jumper Rings are provided on frames to facilitate the orderly running of jumper wires. They provide for changing the direction of run of jumper wires and for feeding them neatly into the various terminating strips. The standard types, their applications and methods of fitting are in Table A and Figs. 2, 6 and 7.

Type No.	Applications	Methods of Fitting
8	On M.D.F. to feed jumpers from horizontal plane on line side to vertical plane on equipment side.	Threaded end passed through M.D.F. vertical angle iron and horizontal brace. Acts as a fixing bolt.
10	Grouping of Jumper wires to serve a particular fuse mounting on M.D.F.	Threaded leg fixed with nuts to horizontal brace; other leg located in hole in brace to prevent twisting.
27	On M.D.F., feeds jumpers from horizontal plane on line side to vertical plane on equipment side.	Bolts onto M.D.F. vertical.
28	On M.D.F. feeds jumpers from horizontal plane on line side to vertical on equipment side.	Bolt either side to M.D.F. verticals, Obviates use of horizontal brace.

TABLE A. STANDARD TYPES OF JUMPER RINGS.

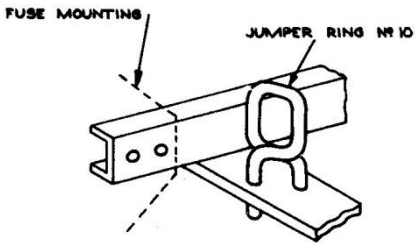


FIG. 6. JUMPER RING NO. 10.

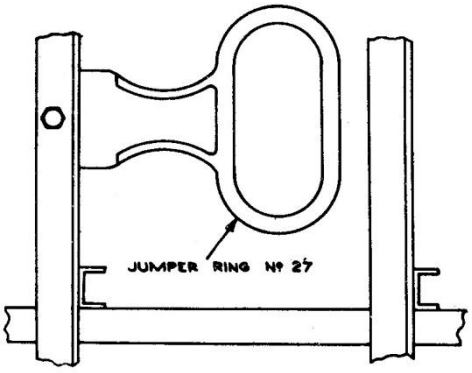


FIG. 7. JUMPER RING NO. 27.

3.4 Fuse Side of M.D.F. (Line side).

(i) Fuse mountings, terminal blocks, test jack strips and battery jacks are located on the fuse side of the M.D.F. as directed on the appropriation drawing; soldering iron holders are provided as required. The methods of fitting these items and the sequence of operations are in Table B.

(ii) Before fuse mountings are fitted they must be examined as follows:-.

(a) Mechanical. Check that the springs have adequate tension and that spring-fixing screws are not over-tightened.

(b) Insulation Resistance (with fuses fitted). Check that this is not less than 1,000 megohms with a 500 volt megger.
(i) between the frame and all springs commoned, and
(ii) between each spring in turn and all other springs commoned.

(c) Type of Insulation. Ascertain if this is of moulded plastic, in which case take special care when soldering - see Section 4, para 4.5.

Item	Figure	Sequence of fitting	Remarks
Fuse mountings	Fig. 8	After tails have been positioned	Before fitting, check horizontal channel supports for vertical alignment with the aid of a plumb line. Adjust with tool shown in Fig. 1. Wiring is facilitated if the mountings are fitted one vertical at a time. Terminate this vertical before fitting next vertical
Test jack field	Fig. 9	After cables positioned and fuse mountings wired.	See Fig. 25 for method of shaping cable form.
Battery jacks	Fig. 10 and Fig. 11	Fitted and wired before soldering begins.	Wired to 50V A.C. if available direct to transformers; or 50V DC via busbar fuse system installed on adjacent rack.
Soldering iron holder	Fig. 12	Concurrently with battery jacks.	
Terminal blocks	Fig. 13	After cables formed and fanned out.	When terminating on horizontal side of I.D.F.

TABLE B. FITTINGS ON FUSE SIDE OF M.D.F.

3.4 Exchange Side of M.D.F.

(i) Protector strips, terminal blocks (various), P.B.X. and Junction busying strips, NU tone bars, test and special circuit jack boxes and battery

jacks are located as directed on the appropriation drawing. The methods of fitting these and other items and the sequence of operations are detailed in Table C.

(ii) Before protector strips are fitted they must be examined as follows:-

(a) Spring Tension. On new strips, check one spring assembly on each strip. On damaged, recovered and reused strips, check each spring assembly. Spring tensions must be:-

(i) Inner test spring to exert pressure of 1 lb. minimum, on heat coil, with outer test spring held-off.
(ii) Outer test spring to exert pressure of 2 lb. minimum on inner test spring at the point of contact.
(iii) With the heat coil fully operated or removed, the pressure at the point of contact shall be 6 oz. minimum.
(iv) Outer and inner test springs combine to exert a minimum pressure of 3 lb. and a maximum pressure of 5 lb. on the heat coil.

Use Tool No. 67 for adjustments.

(b) Insulation Resistance. With arresters and heat coils fitted, use a 250 volt megger to check that this is not less than 1000 megohms

(i) between the frame and all springs commoned, and
(ii) between each spring in turn and all other springs commoned.

(c) Type of Insulation. See if this is moulded plastic, in which case take special care when soldering - refer Section 4, para 4.5.

Item	Figure	Sequence of Fitting	Remarks
Protector Strip	Fig. 3	After cables are formed and fanned out.	Wiring is facilitated if the strips are fitted one vertical at a time. Terminate before fitting next vertical.
Terminal Blocks Private wire block on protectors.	Fig. 13 Fig. 14	After cables are formed Fit concurrently with protector strips.	(i) Power Distribution. (ii) Ring Distribution. (iii) Busy tone Distribution. Used for 3rd wire termination.
P.B.X. and junction busying strips.	Fig. 14	Before fitting fanning strip to frame.	Fit to left-hand side of fanning strip.
M.D.F. Fanning Strips for Arrestors;	Fig. 14	After running but before butting cables and before fitting protector strips.	Aids in forming and fanning cables.
N.U. Tone Bar	Fig. 14	After fitting fanning strips but before fitting protector strips.	Fit to right-hand side of fanning strips.
Jack boxes (i) Test jacks only. (ii) Test and special circuit jacks	Fig. 9	Fit holding brackets when assembling steel frame or Fit during assembly of designation board.	Wire after major wiring operations on frame are completed.

TABLE C. FITTINGS ON PROTECTOR SIDE OF M.D.F. (continued on next page).

TABLE C. FITTINGS ON PROTECTOR SIDE OF M.D.F. (continued).

Item	Figure	Sequence of Fitting	Remarks
Battery Jacks	Fig. 10 & 11	Fitted and wired before soldering begins.	Wired to %)V A.C. if available, direct to transformers; or 50V D.C. via busbar system.
Soldering iron holder	Fig. 12	Concurrently with battery jacks.	

FITTINGS ON VERICAL SIDE OF I.D.F.

I.D.F Terminal Blocks	Fig. 13	After running cables but before butting.	Aids in forming and fanning cables.

3.6 Maintenance Aids.

(i) A cabinet for spare fuses, arresters and heat coils and dummies may be fitted on M.D.F's, or adjacent walls or columns. A typical cabinet is shown in Fig. 15.

(a) Fit a cabinet at each end of the frame when the number of verticals exceeds 30 (200/300 type M.D.F.).
(b) Fit additional cabinets as required on 300/400 type M.D.F's.

(ii) Storage of Test and Special Circuit Cords.

Cords are provided on an M.D.F. to connect circuits as required to the jack boxes located at the top of the frame, and means must be provided to preserve a neat and tidy appearance of these cords.

Typical arrangements for holding cords when in use are:-

(a) An open cage beneath the frame, shown in Fig. 16.
(b) Support rings above the frame, shown in Fig. 17.

(iii) Jumper Storage Reel.

This will be required adjacent to the fuse side of M.D.F's when the number of verticals exceeds 20. A typical fitting is shown in Fig. 18. On M.D.F's of less than 20 verticals jumper coils should be stored on pegs.

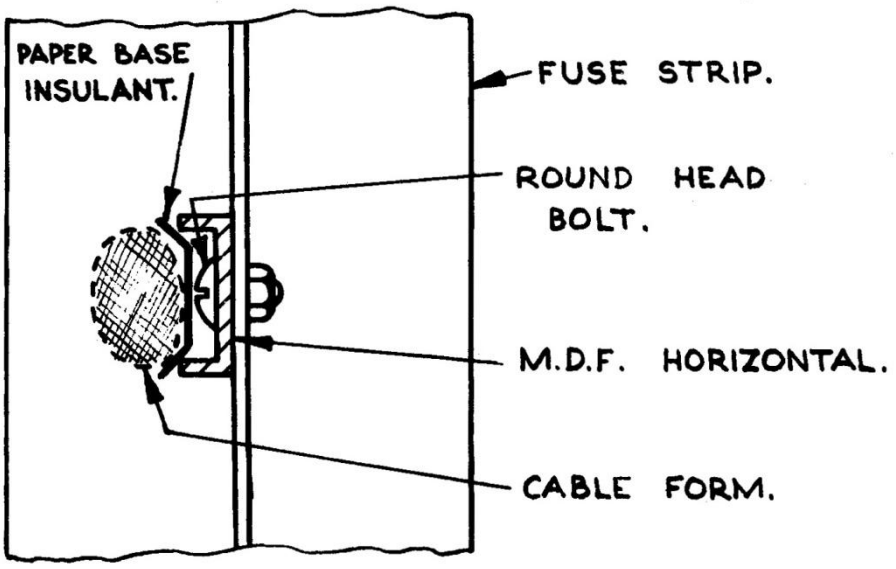


FIG. 8. FITTING FUSE MOUNTINGS TO HORIZONTAL CHANNEL IRON.

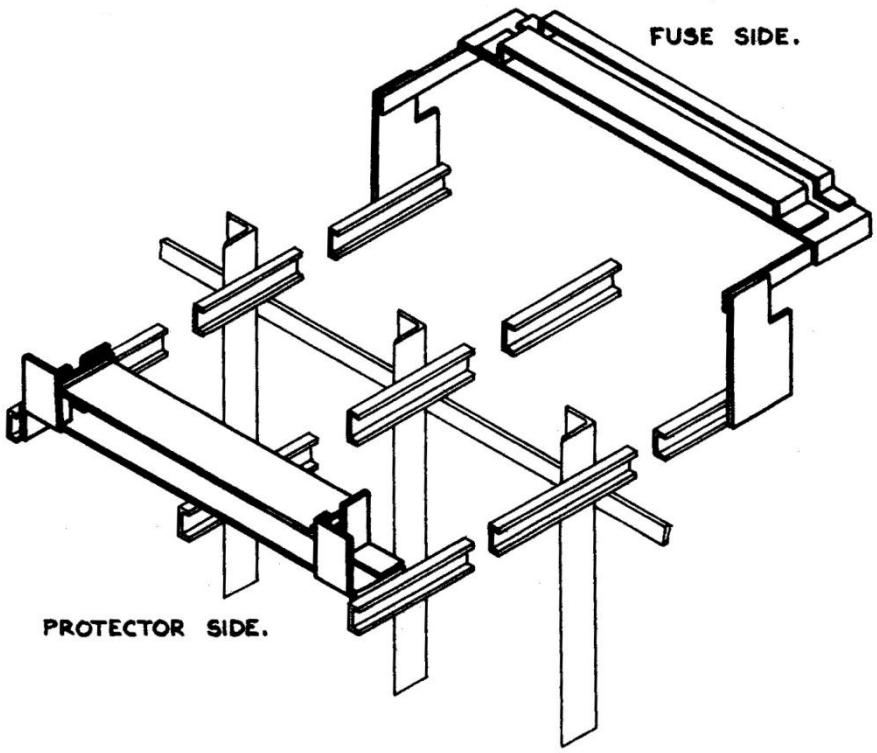


FIG. 9. FITTING BRACKETS FOR TEST JACK FIELD.

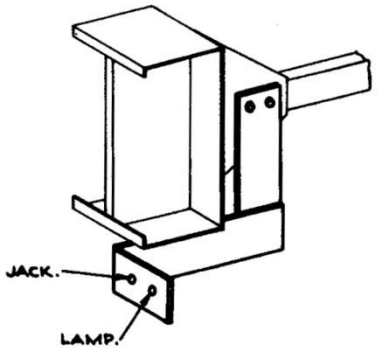


FIG. 10. LINE SIDE.

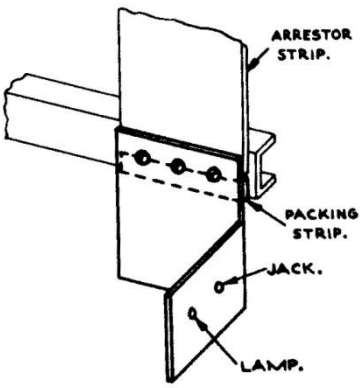


FIG. 11. EQUIPMENT SIDE.

FITTING BRACKETS FOR BATTERY JACKS (Note Pilot Lamp).

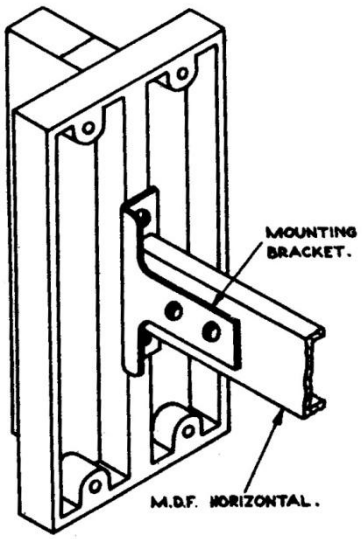


FIG. 13. MOUNTING TERMINAL BLOCKS.

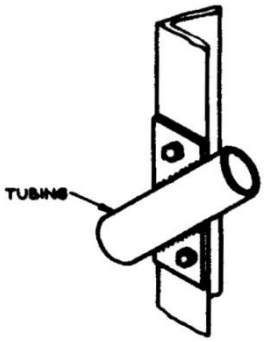


FIG. 12. SOLDERING IRON HOLDER.

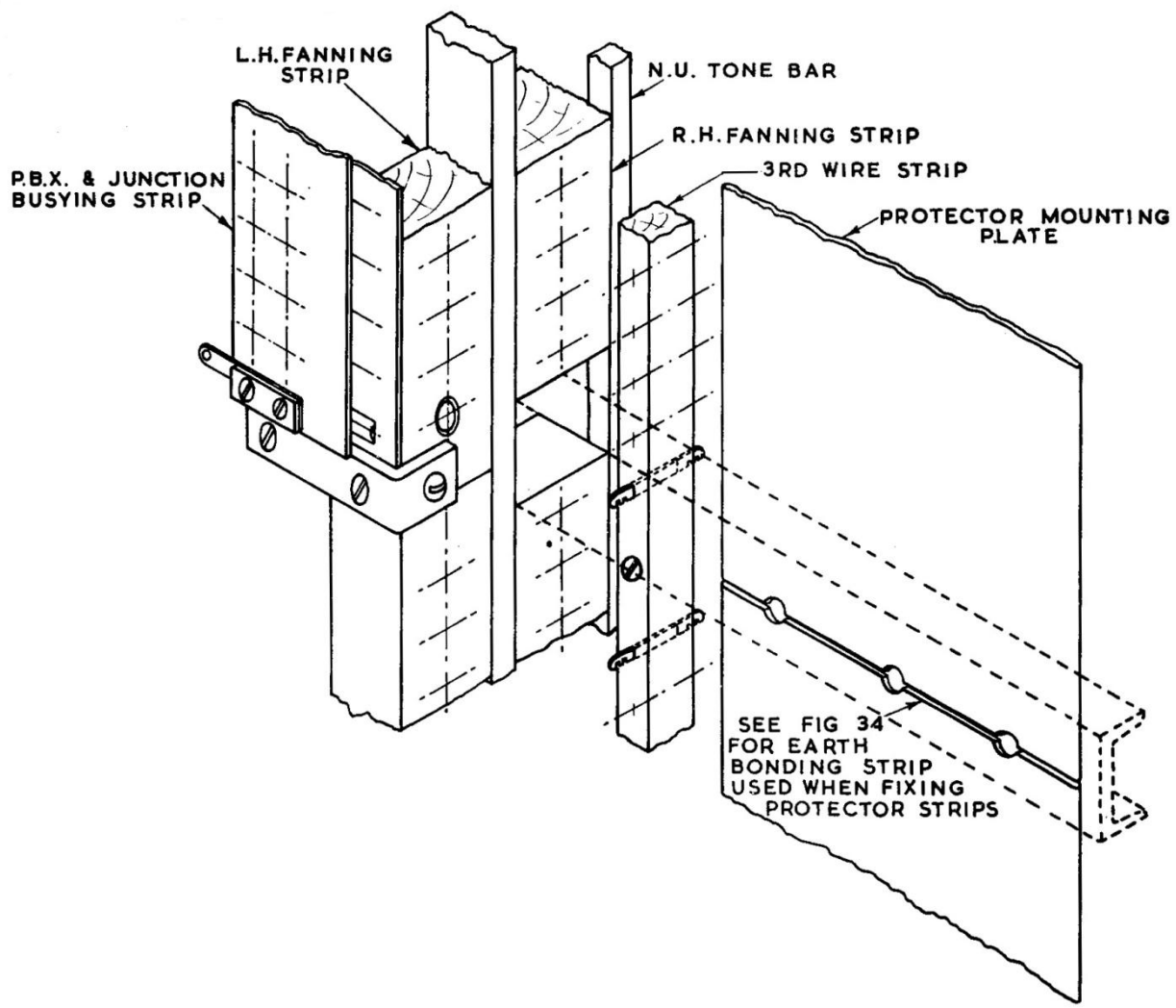


FIG. 14. FITTING P.B.X. BUSYING STRIP, 3RD WIRE AND FANNING STRIPS AND PROTECTOR MOUNTING.

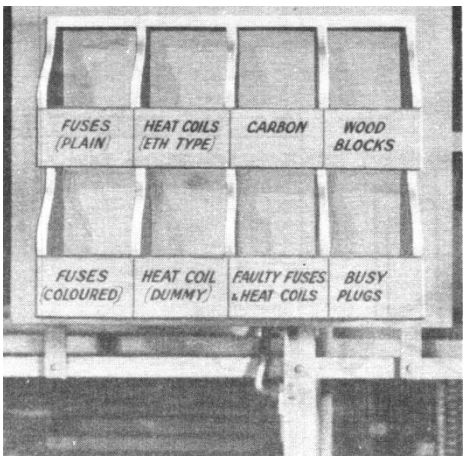


FIG. 15. M.D.F. CABINET FOR SPARE FUSES ETC.

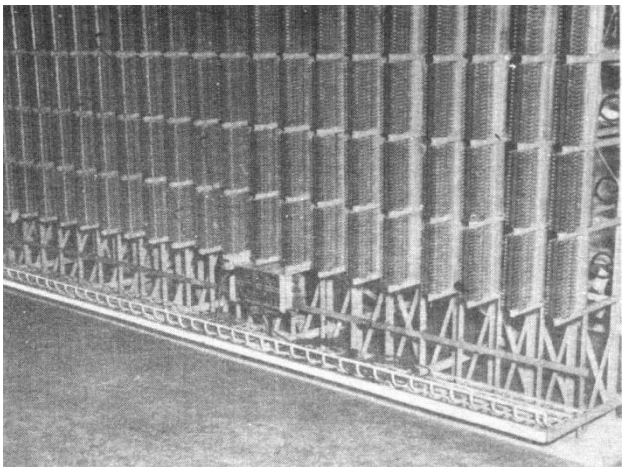
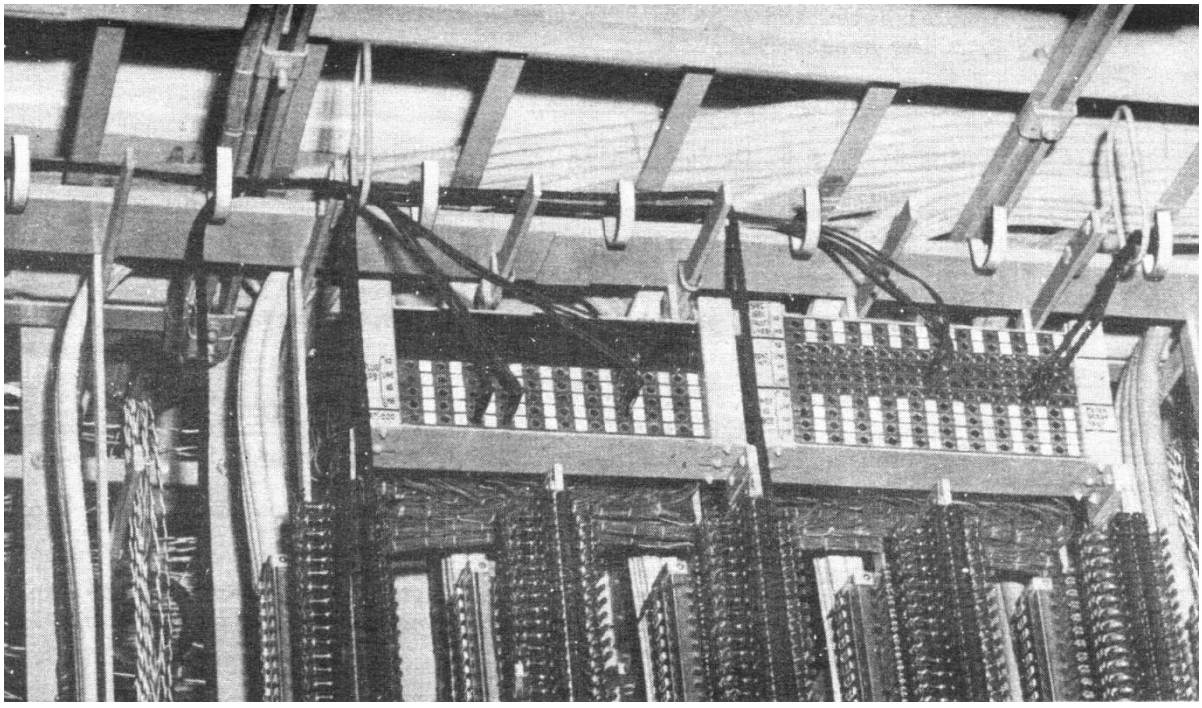
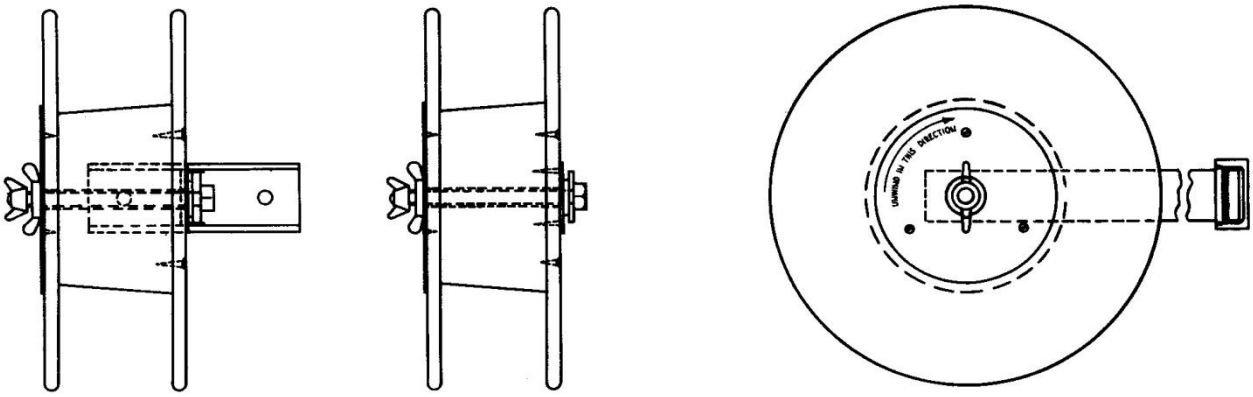


FIG. 16. OPEN TYPE CAGE FOR HOLDING M.D.F. CORDS.



SUPPORT FOR M.D.F. CORDS

FIG. 17.



JUMPER STORAGE REEL.

FIG. 18.

4. M.D.F. AND I.D.F. - CABLING.

4.1 This section describes cabling, insulating and terminating methods on M.D.F's and I.D.F's. Special attention must be directed to cable economy and to the insulation of wiring from the steelwork.

4.2 Cabling and Terminating on Line Side of M.D.F.

Double Stripping of E. & C. C. L.C. Tails

(i) Cable economy results from double stripping (see Fig. 19a) which must be used in future installations.

(ii) A chart to facilitate double stripping is in Fig. 19b and c. Due allowance must be made for the position of the cable on the vertical.

(iii) Marking for clockwise or anti-clockwise

(a) When it is terminated on the frame one tail will follow the colour code, bottom to top, and the second tail of the pair will be reversed.

(b) The lay of the cable will be clockwise in the first tail, anti-clockwise in the second tail.

(c) Each tail must therefore be stamped lightly but clearly at the cable end thus; clock or anti-clock., (according to the lay of the cable looking at that end).

Special Note:- Before using the above method the Divisional Engineer in charge of the appropriate Lines Engineering Division must be advised so that he can take action to arrange for correct jointing into the U.G. cable.

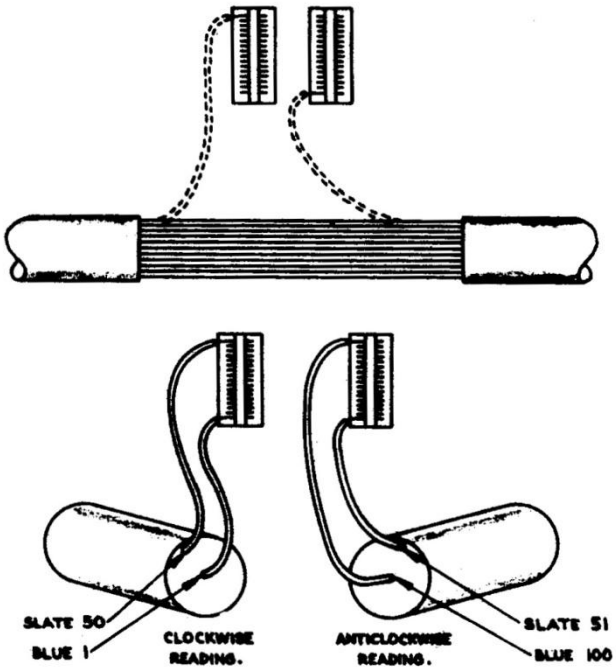
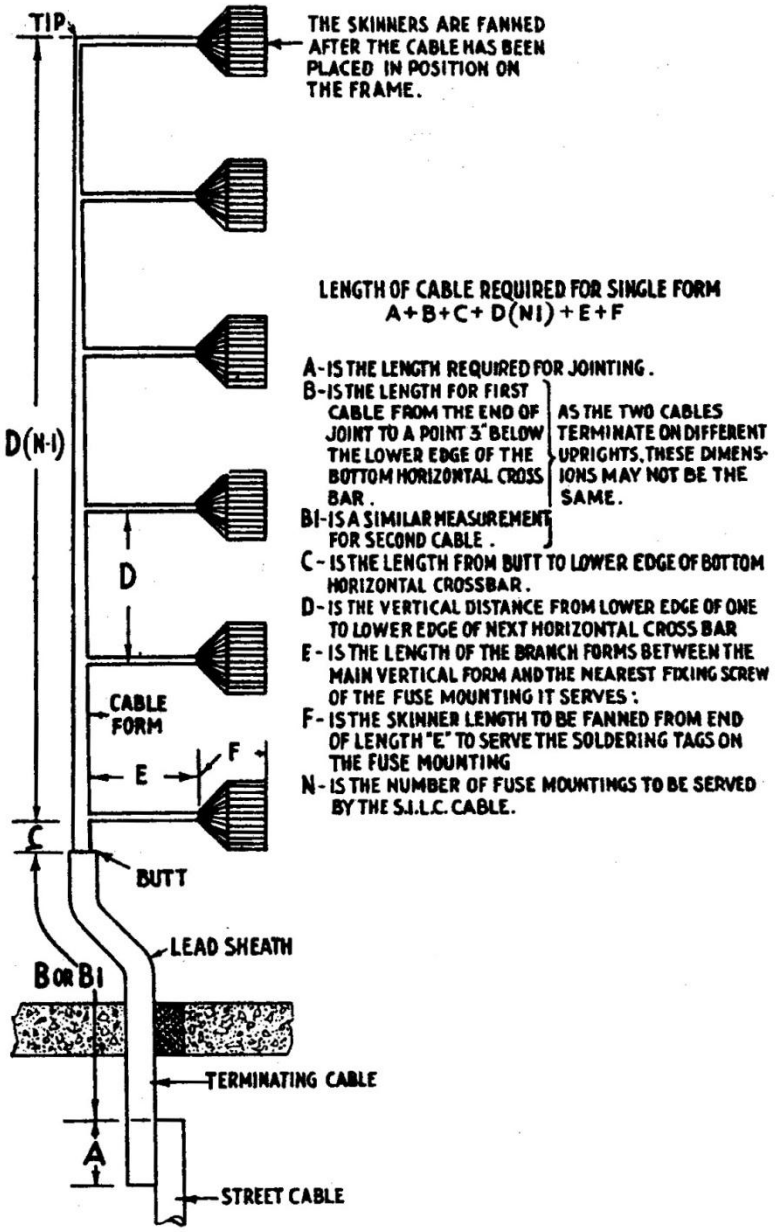


FIG. 19(a). DOUBLE STRIPPING E. & C. C. L.C. TAILS.



COMPLETED FORM FOR ONE UPRIGHT.

FIG. 19(b).

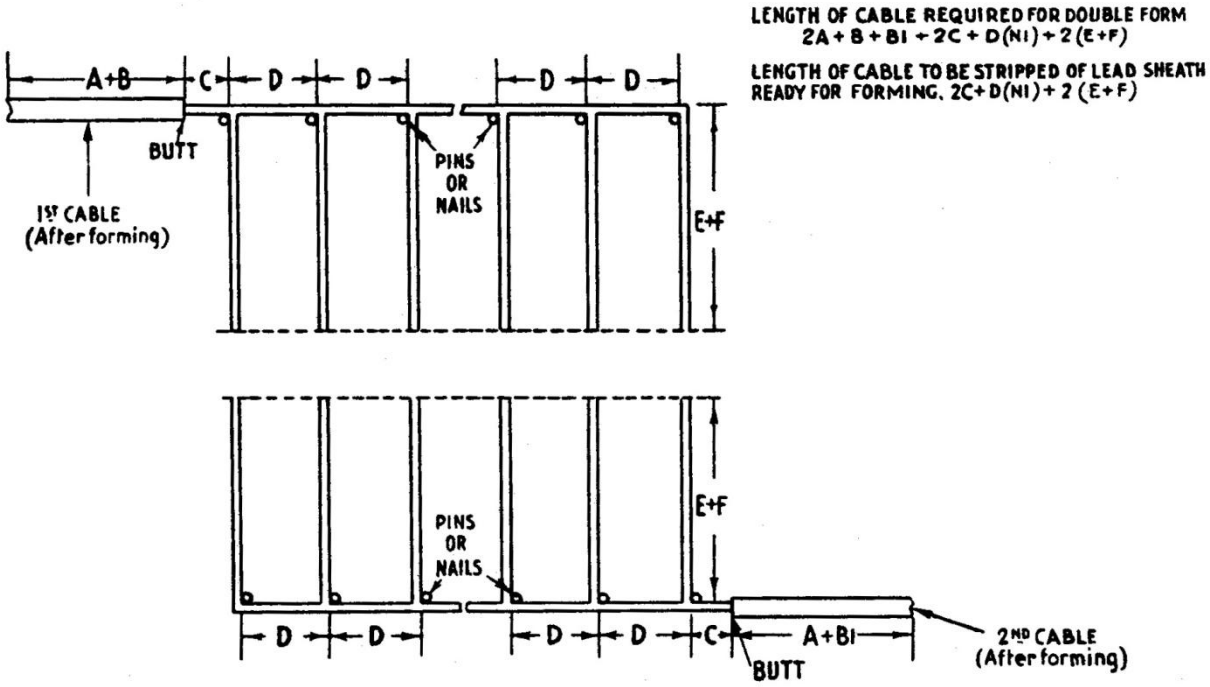


FIG. 19(c). MAKING DOUBLE FORMS FROM ONE LENGTH OF CABLE.

4.3 The sequence of operations, methods to be used and precautions to be taken when cabling the line side of an M.D.F. are in Table D.

The forming of LC tails on to Fuse Mountings can be facilitated by the use of the mild steel Forming Jig illustrated in Fig. 26a, its use is especially applicable to areas of high humidity. The tail should be laced to within 3" of the position from which the wires fan to the fuse strip and sufficient lacing twine left to complete the lacing at the end of the terminating. The jig (shown clearly as an insert in Fig. 26a) is positioned by removing the nut from the bolt nearest the fuse strip and then screwing the bolt into the forming jig. After the wires have been formed and terminated, the jig is removed and the spare lacing twine is then used to complete the form up to the changing direction of the wires. This will result in neat forming and will assist in preventing damage to the enamelled wire which may otherwise occur if a tight strain is placed on the clove hitch at the end of the normal form.

The Jig (or forming device) can also be used to simplify forming from a butted and laced form which approaches a terminal block at right angles.

Operation		Figure	Method	Remarks
Feeding E. & C.C. forms on to M.D.F.	From below M.D.F. (i) Using copper tube	Fig. 20a	Bell mouth both ends of the tube and sweat cables to the lower end of the copper tube.	Avoid kinking the lead tails. The earthing wires, at the appropriate verticals, may be fed through the tubes at this stage.
	(ii) Using wood ferrule	Fig. 20b	Wedge cables into position and screw shaped wood-block to top of ferrule.	Keep lead sheath away from cement. Wood ferrules should be treated with wax before placing in position.

TABLE D. CABLING LINE SIDE OF M.D.F. (continued on next page).

Operation		Figure	Method	Remarks
Feeding E. & C.C. forms on to M.D.F. (continued)			In methods (i) and (ii) seal hole with cotton waste and beeswax. A Bitumastic compound must not be used for this purpose as it will corrode the lead sheath.	
	From Above M.D.F. Using formed channel.	Fig. 21		Take care to avoid kinking cables when placing in the channels.
Insulating cable form from MDF – vertical run.	When fixed in to angle iron	Fig. 22	Use (i) "Scotia" timber moulding. (ii) Paper base insulant. (Prespan)	Before fitting (i) recess flat surfaces to take MDF fixing bolts. Timber to be kiln dried and treated with wax or varnish before fixing in position.
	When fixed to horizontal channel support.	Fig 23	Insulate with (i) paper base insulant; (ii) waxed tape on support	Waxed tape shall not be used on cable form except at the sheath butt.
Fixing cable and cable form.	(i) to vertical angle. (ii) to horizontal channel support.	Fig. 26	Lace. Lace or clip and fitting tool – refer to Fig. 26.	See para 4.3.
Butting		Fig. 27		Immediately above or below first feed-off when feeding from top or bottom of MDF respectively.
Forms to fuse mountings.		Fig. 27	Take out below horizontal bracing member of frame.	This obviates cutting of form if cable sags.
		Figs. 23 & 26 Fig. 27	Insulate from steel work with – (i) paper base insulant; (ii) clear plastic tube. Tie or clip to channel support.	Plastic tubing should not be used in areas of high humidity. See para 4.3 also.

TABLE D. CABLING LINE SIDE OF M.D.F.

4.4 Cabling and Terminating on Equipment side of M.D.F. The sequence of operations, methods to be used and precautions to be taken are in Table E.

Operation	Figure	Method	Remarks
Butting and fixing braided cables On Terminal Blocks.	Fig. 28a	Butt at next horizontal support above the first terminal to be served by the cable. Fix not less than 2½" behind T.B. fanning strip.	Feed braided cables on left-hand side and well forward towards protectors or terminal blocks.
On fanning Strips		Butt at horizontal support above the first terminal to be served by cables.	
Fanning and terminating on protectors and P.W. terminal blocks. etc.			Fanning to be done before fixing protector strip or Private Wire terminal block.
(i) Protector strips)			Stringers shall have sufficient slack for ease of termination.
(ii) P.B.X and Repeater Busying Strip)	Fig. 24	Spare wire. Loop back through next hole below in fanning strip.	
(iii) Private wire terminal block)			Precaution when soldering near moulded plastic insulation – refer para 4.5.
NU tone Distribution		Wired to miscellaneous terminal block from A.E.R Rack.	Jumper or wire from miscellaneous terminal block or M.D.F. to NU Tone Bars.
Forming and terminating on test jack boxes.	Figs. 25, 29 & 30.		An "S" form must be used to aid maintenance.

CABLING EQUIPMENT SIDE OF M.D.F.

TABLE E.

4.5 Soldering Precaution on Fuse Strips Fitted with Moulded Plastic Insulation. Plastic insulation is moulded in a single sheet with separating ridges to isolate the spring assemblies of these mountings; it is easily detected by examination. The officer in charge of the installation must check to see if the fuse strips are fitted with plastic moulded insulation and if so mast advise the staff of the following soldering precautions:-

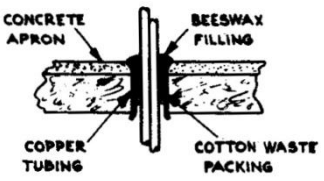
(i) Plastic insulation distorts at temperatures close to soldering temperature; this distortion may cause the holding screws to slacken.

(ii) Apply the soldering bit to the tags for a minimum of time, and check the fixing screws for tightness after soldering the strip.

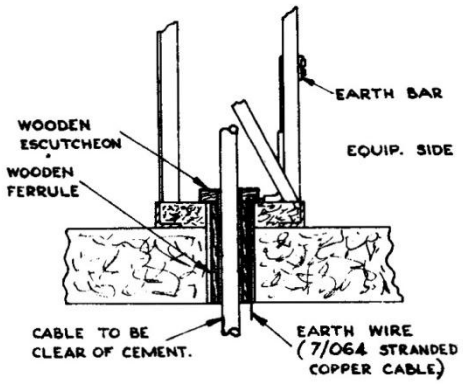
4.6 Cabling and Termination on I.D.F's. The method to be used for positioning cables, butting and fanning out the terminal blocks is shown for:-

(i) Vertical side - in Fig. 28a.

(ii) Horizontal side - in Fig. 28b.



(a) Using copper tube.



(b) Using wood ferrule.

FIG. 20. FEEDING E. & C.C. FORMS ONTO M.D.F. FROM BELOW M.D.F.

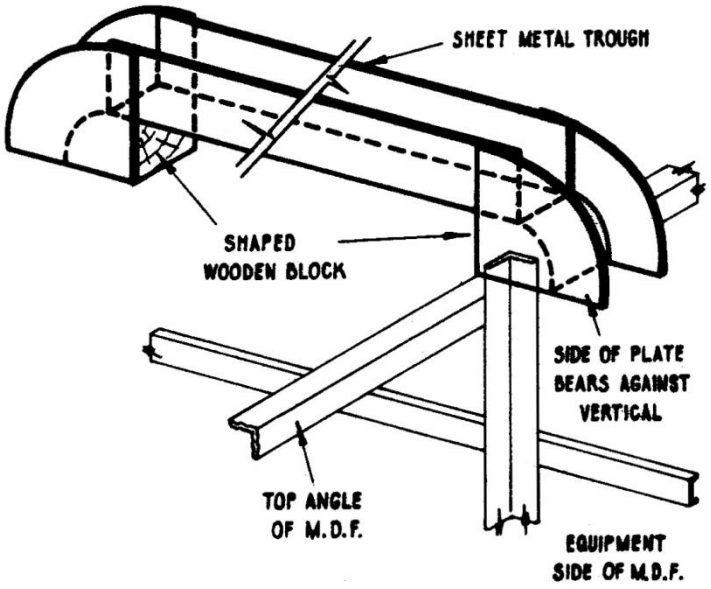
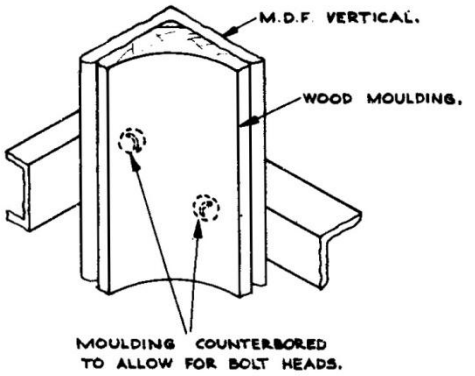


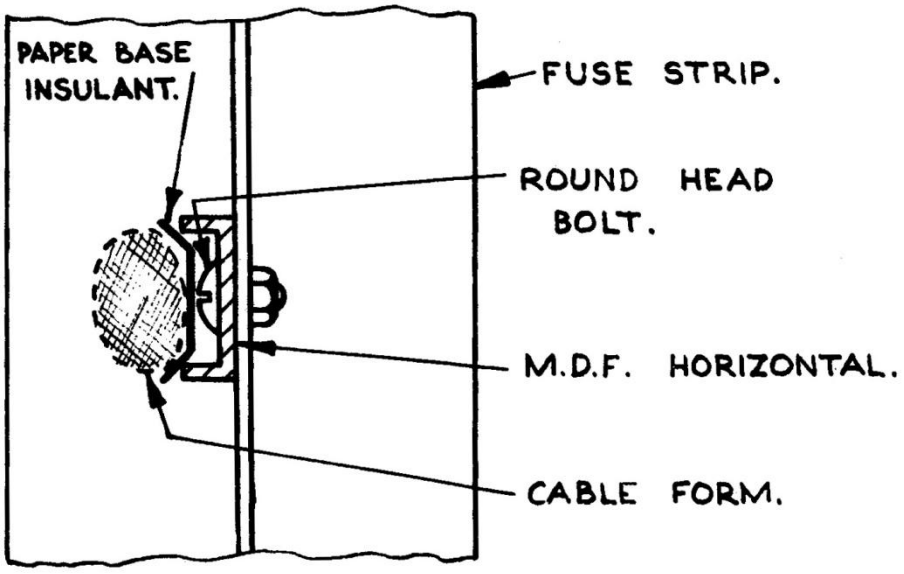
FIG. 21. FEEDING E. & C.C. FORMS ONTO M.D.F. FROM ABOVE M.D.F USING FORMED CHANNEL.



INSULATING CABLE FORM FROM M.D.F. – VERTICAL RUN

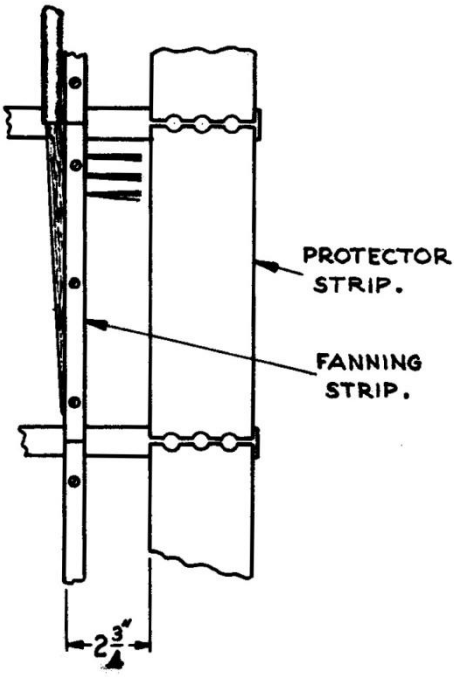
IN ANGLE IRON. USING "SCOTIA" MOLDING.

FIG. 22.



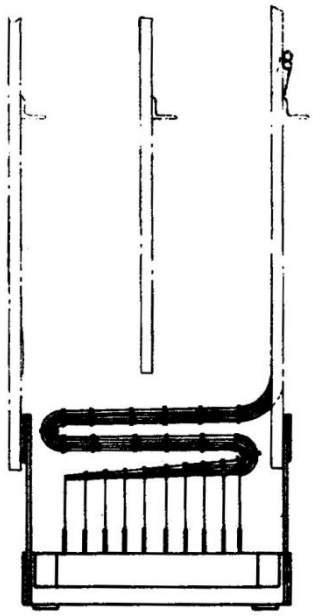
INSULATING FORM ON HORIZONTAL CHANNEL IRON.

FIG. 23.



FANNING TO PROTECTOR STRIPS.

FIG. 24.



FORMING TO TEST JACK BOX.

FIG. 25.

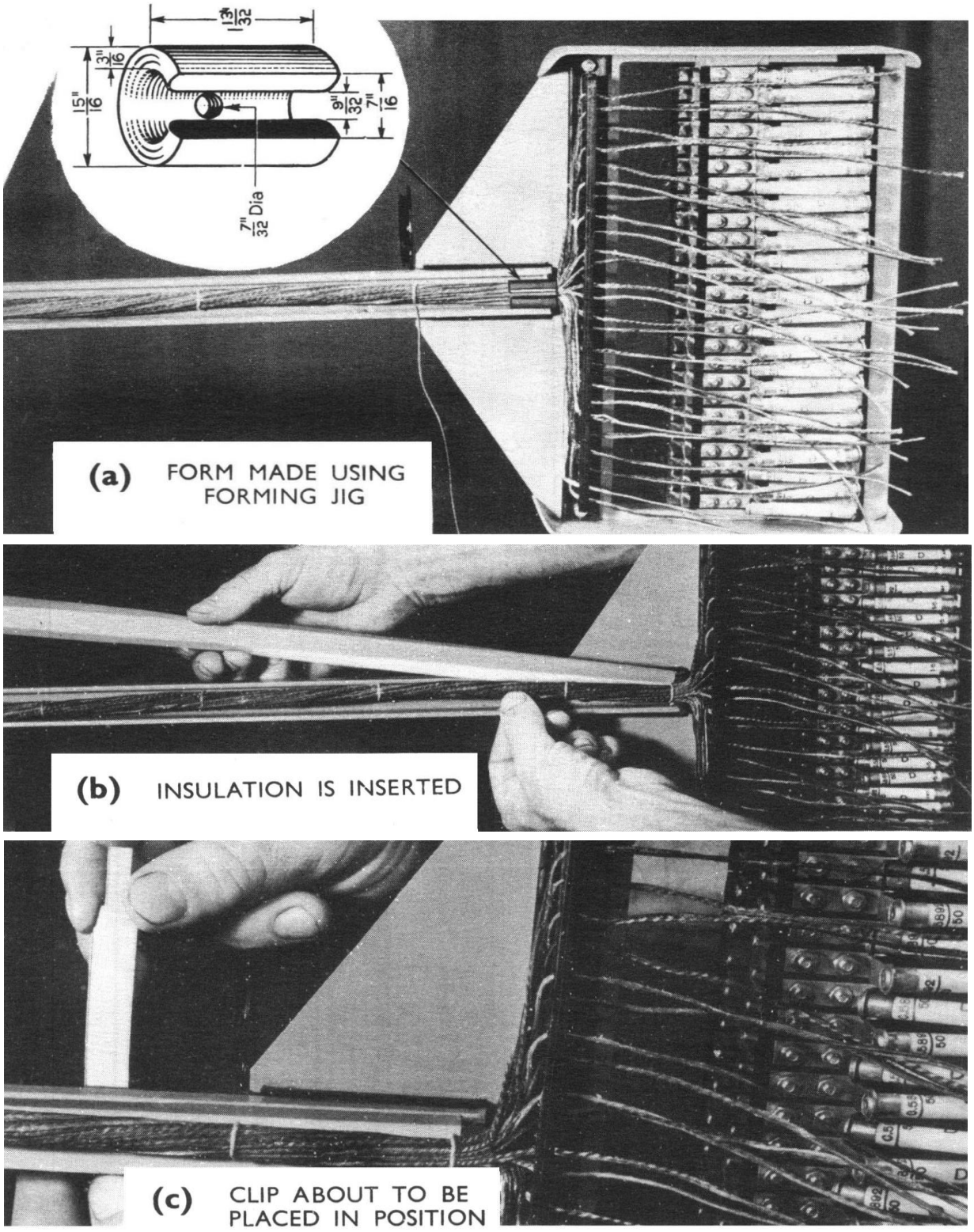
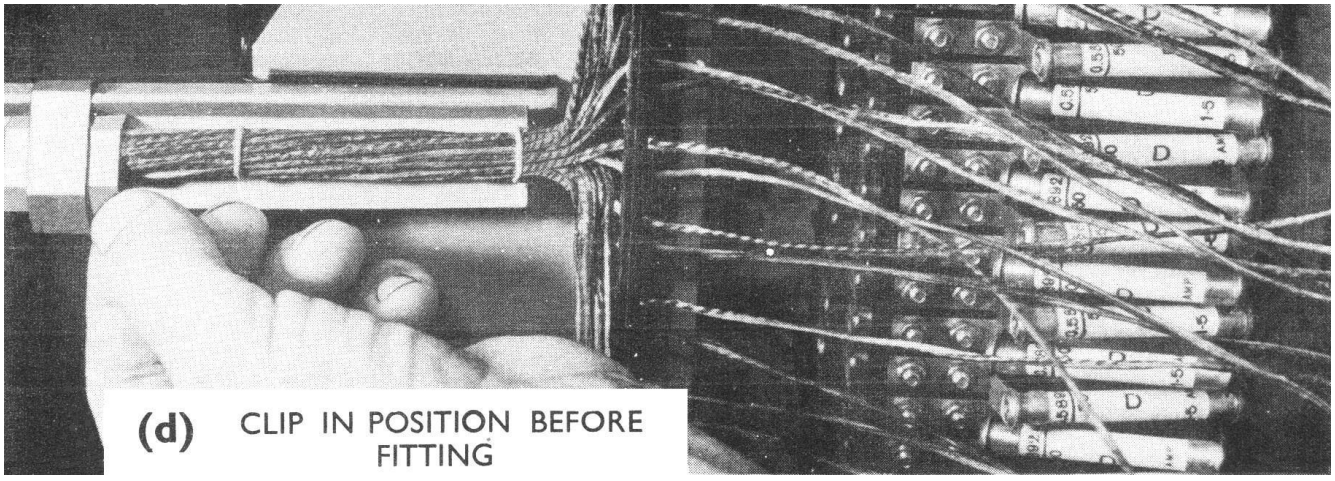
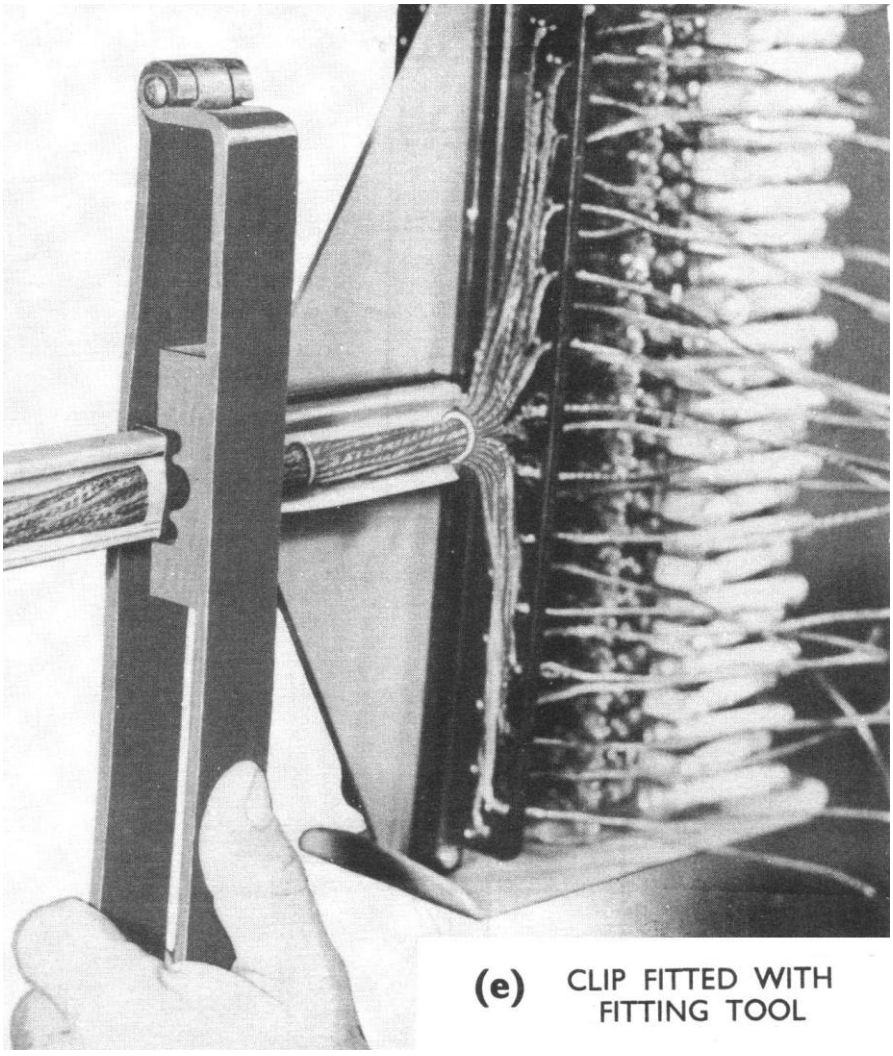


FIG. 26 FORMING, INSULATING, AND



(d) CLIP IN POSITION BEFORE FITTING



(e) CLIP FITTED WITH FITTING TOOL

FIXING FORMS TO FUSE MOUNTINGS

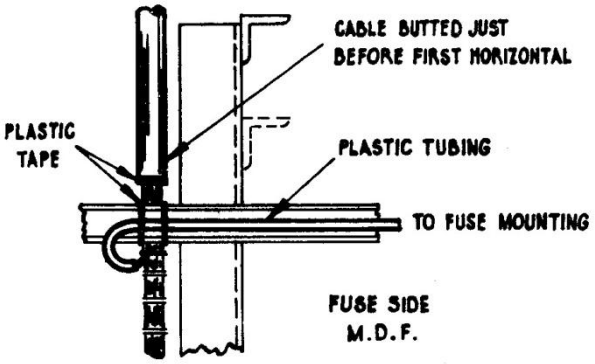
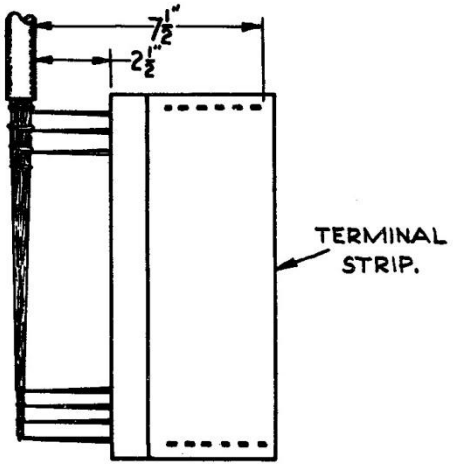
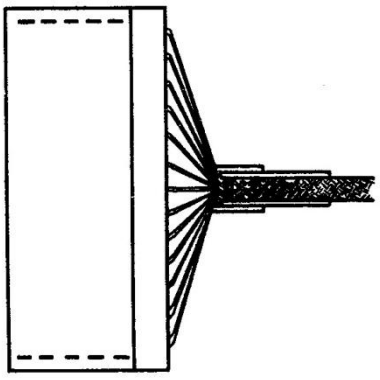


FIG. 27. BUTTING E. & C.C.L.C TAIL.

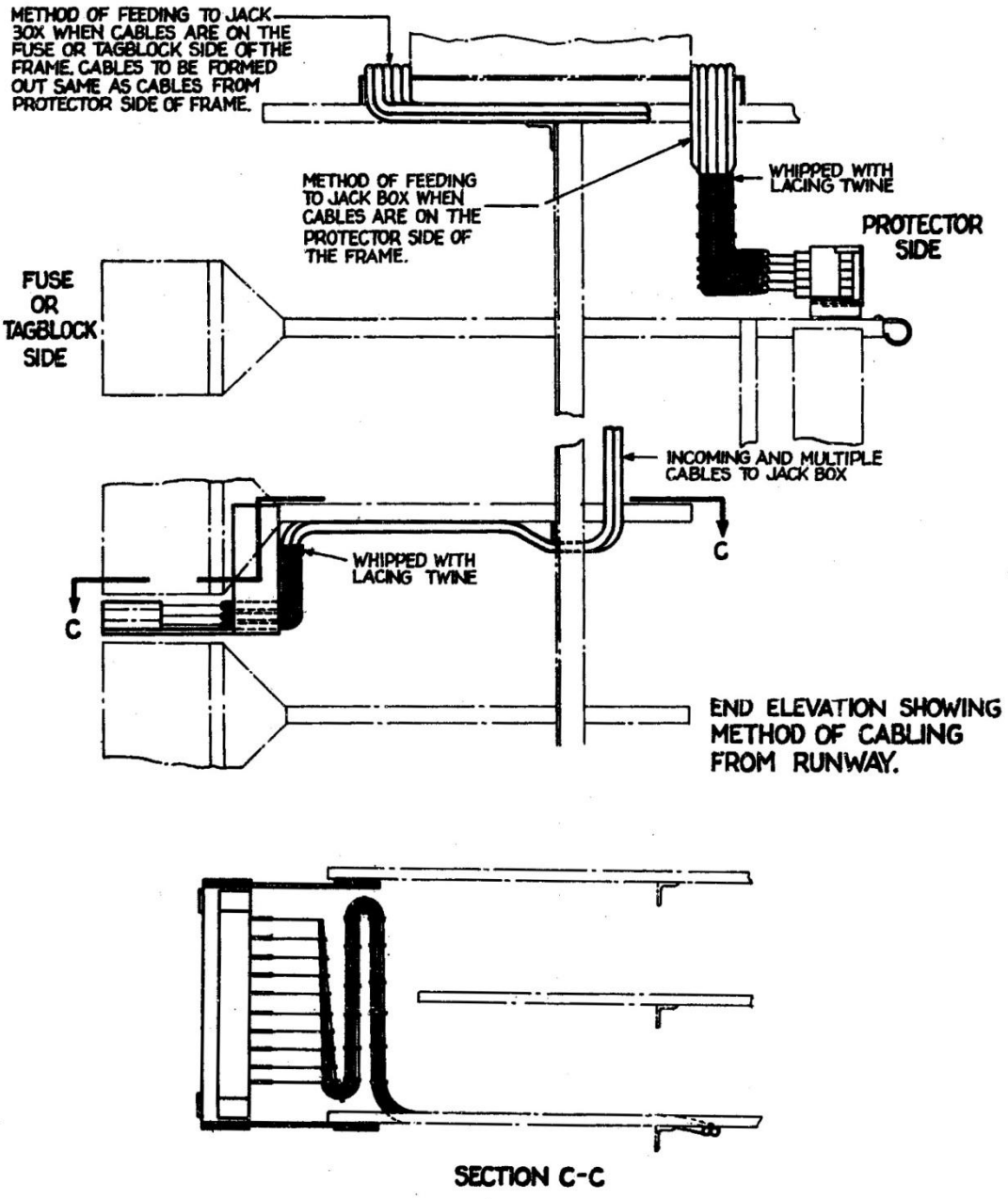


(a) Vertical Side.



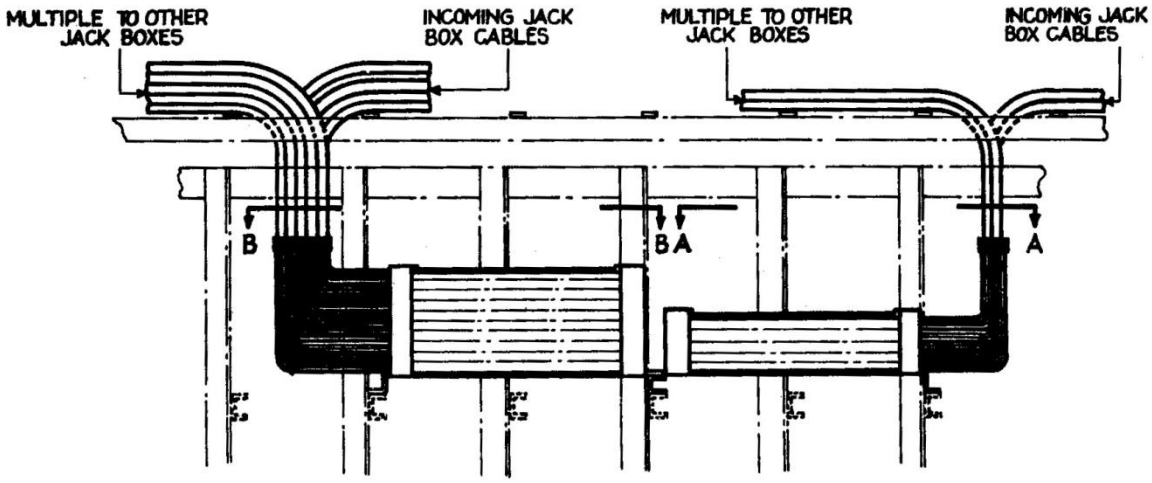
(b) Horizontal Side.

FIG. 28. CABLING AND FANNING OUT ON I.D.F.

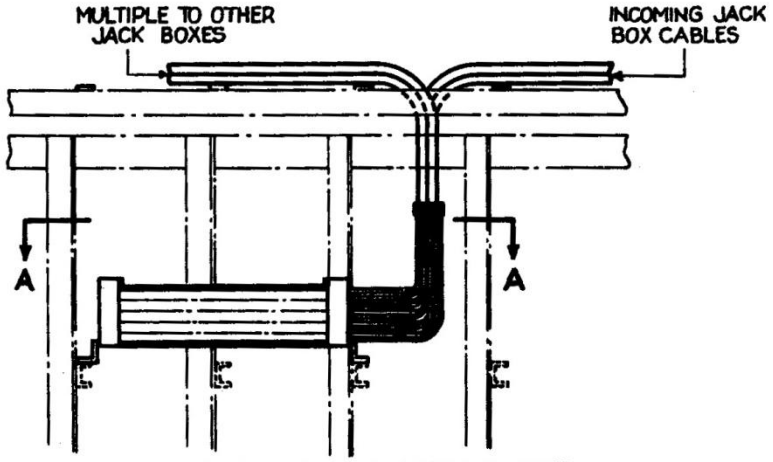


FORMS AND TERMINATING ON TEST JACK BOXES. LINE SIDE.

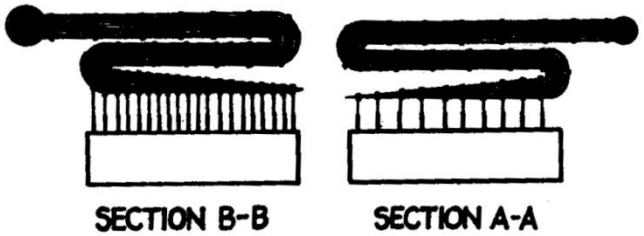
FIG. 29.



ELEVATION ON PROTECTOR SIDE
FOR DOUBLE JACK BOXES



ELEVATION ON PROTECTOR SIDE
FOR SINGLE JACK BOX



SECTION B-B SECTION A-A

FORMS AND TERMINATING ON TEST JACK BOXES. EQUIPMENT SIDE.

FIG. 30.

5. JUMPERING ON M.D.F'S and I.D.F's.

5.1 Jumper wires to cross-connect circuits must be run in an orderly manner to avoid congestion and to give a neat appearance. Adequate slack must be provided.

5.2 Broadcast lines must be cross-connected on M.D.F's with shielded jumper wire. These are not fused and the jumper must be connected direct to the cable side of the fuse mountings.

5.3 Junction Carrier Pairs must be specially labelled at fuse and arrester fitting.

5.4 The method of terminating in E.I. INTERNAL PLANT INSTALLATION Wires and Cables T 3010 must be used when terminating jumper wires.

6. M.D.F'S AND I.D.F's DESIGNATIONS.

6.1 Designation Board on Protector Side of M.D.F. A designation board is required on this side of an M.D.F. to indicate the functions of the verticals. It must be fitted at the top of the frame after all cabling has been completed. See Fig. 31.

6.2 Designation Labels.

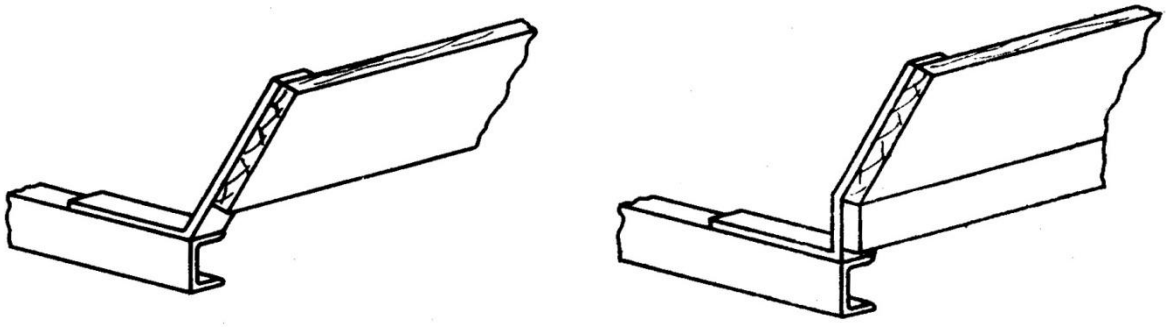
(i) Protector Side - fit label to Fig. 32b on each protector strip.

(ii) Line Side - fit label to Fig. 32a to top fuse mounting in each vertical.

6.3 Designations and Methods. Designations on the designation board, fuse mountings, protector strips, terminal blocks, test and special jack boxes, etc., shall adequately describe the circuit function.

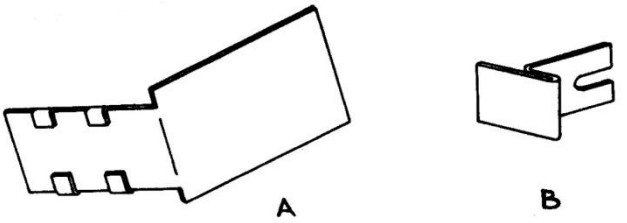
Abbreviations and methods to be used when designating are described in E.I. TELEPHONE General Z 2002.

Signwriting for M.D.F. verticals must be on metal plates which can be clamped between the vertical angle iron and the horizontal brace. See Fig. 33.



TYPES OF M.D.F. DESIGNATION BOARDS.

FIG. 31.



(A) Line Side. (B) Protector Side.

FIG. 32. M.D.F. LABEL.

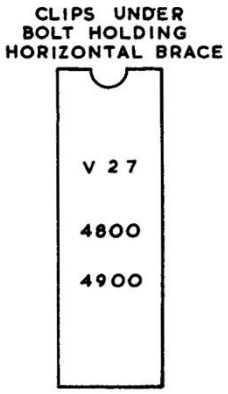


FIG. 33. LABEL FOR M.D.F. VERTICALS (INDICATES VERT. NO. AND EQUIPMENT SIDE CIRCUITS.

7. EARTH SYSTEM ON AN M.D.F.

7.1 The provision and wiring of the earthing system on an M.D.F., its connection to the earthing bar on the cable terminating frame, to the power discharge panel and to the earth electrode system is described in this Section.

7.2 Fitting Copper Earthing Bars. Copper earthing bars must be fitted as follows:-

On the M.D.F.

(i) When a Cable room is below M.D.F.	Fit 1" × ¼" bar below protector strips. Fig. 37.
(ii) When a U.G. cable frame is provided in an equipment room.	Fit 1" × ¼" bar above Protector strips.
On the Underground Cable Terminating Frame.	Fit 2" × ¼" bar – refer Fig. 37.

The steel surfaces to which earthing bars are fixed must be scraped clean and coated with metallic aluminium paint before fixing.

Joints in the earthing bar. The surfaces of the copper earth bar and fish plate must be cleaned, the surfaces drawfiled, then smeared with vaseline, before bolting.

7.3 Earthing Protector Strips.

(1) Before fitting protector strips.

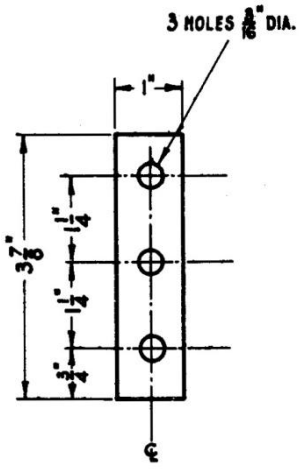


FIG. 34. TINNED COPPER EARTH BONDING STRIP.

(a) the horizontal M.D.F. supporting members must be Scraped clean and coated with metallic aluminium paint;
(b) lacquer, if present, must be scraped off the fixing surfaces;
(c) a tinned copper earth bonding strip must be fitted between adjacent protector strips and the horizontal channel supports. See Fig. 34.

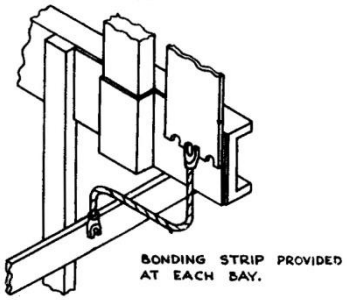


FIG. 35. CONNECTION OF PROTECTOR STRIPS TO EARTH BAR.

(2) Gaps in Protector Field. Where a protector strip is not installed in the vertical, the frames of adjacent protectors must be joined, with bare copper wire (7/.036) (fitted with a lug and connected to the bonding strip at each end.) Similar arrangement to Fig. 35.

(3) Connection of Protector Strips to Earthing Bar. The bottom strip in each vertical must be connected to the earthing as in Fig. 35.

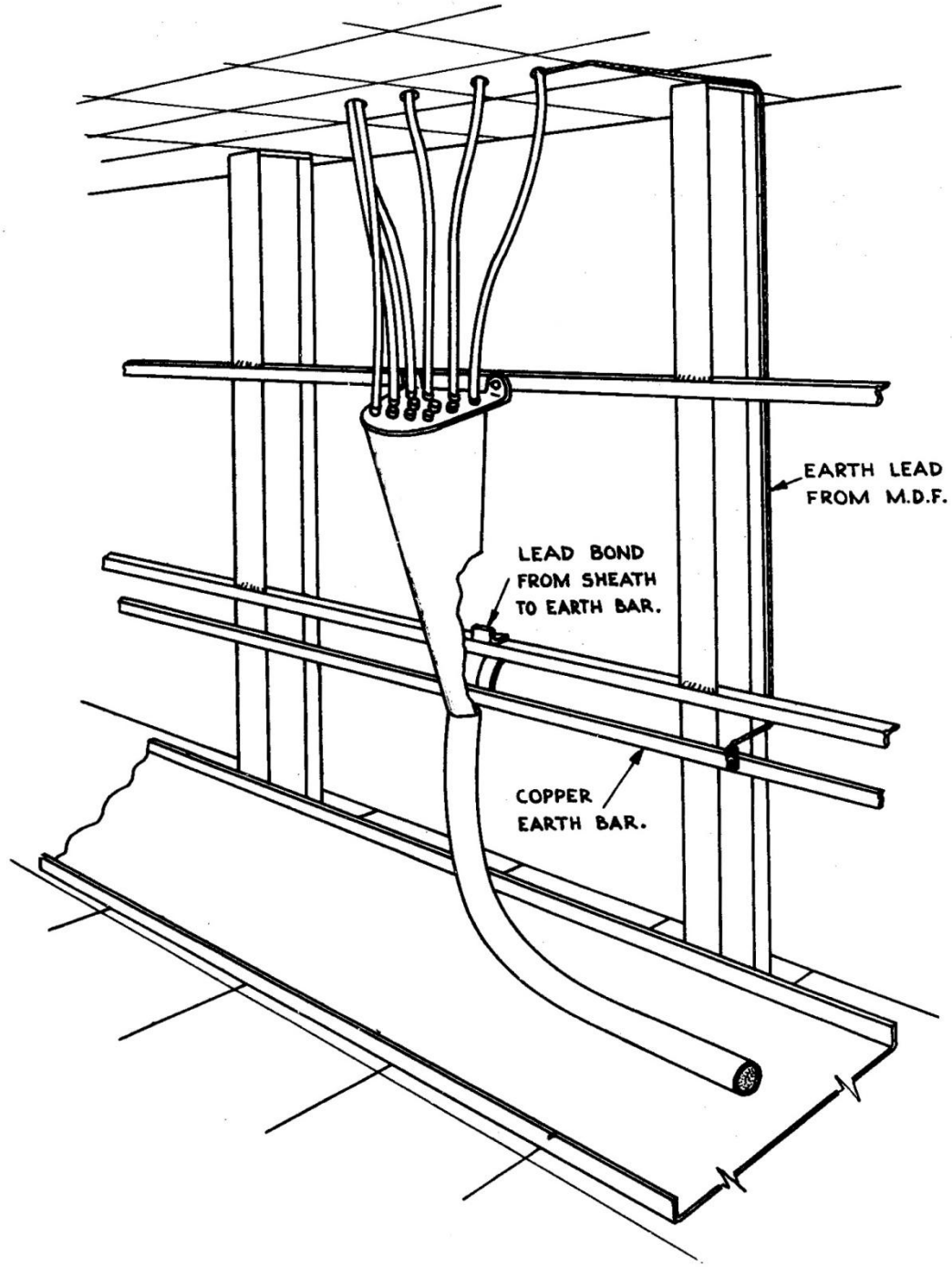


FIG. 36. FITTING EARTH BAR AND BONDING CABLE SHEATH TO IT.

7.4 Connection between M.D.F. and Cable Terminating Frame Earthing Bars.

(i) When a cable well is below the M.D.F. a 7/.036 bar copper wire must be run between the respective earthing bars at each tenth vertical (see Fig. 37).

(ii) When an Underground cable terminating frame is in the equipment room, the earthing bar on this frame must be connected at one end by a bare 19/.064 copper cable to the M.D.F. earthing bar.

7.5 Connection of positive busbar of Power Discharge Panel to Earthing System.

(i) This connection must be run in bare copper cable generally in a conduit set into the floor and connected at the M.D.F. to the earth bar.

(ii) It may be connected to whichever earthing bar (main Distributing frame or Cable Terminating Frame) is the more convenient.

7.6 Connection of Earthing Bars to Earth Electrode System. Refer to E.I. INTERNAL PLANT INSTALLATION General E 7010.

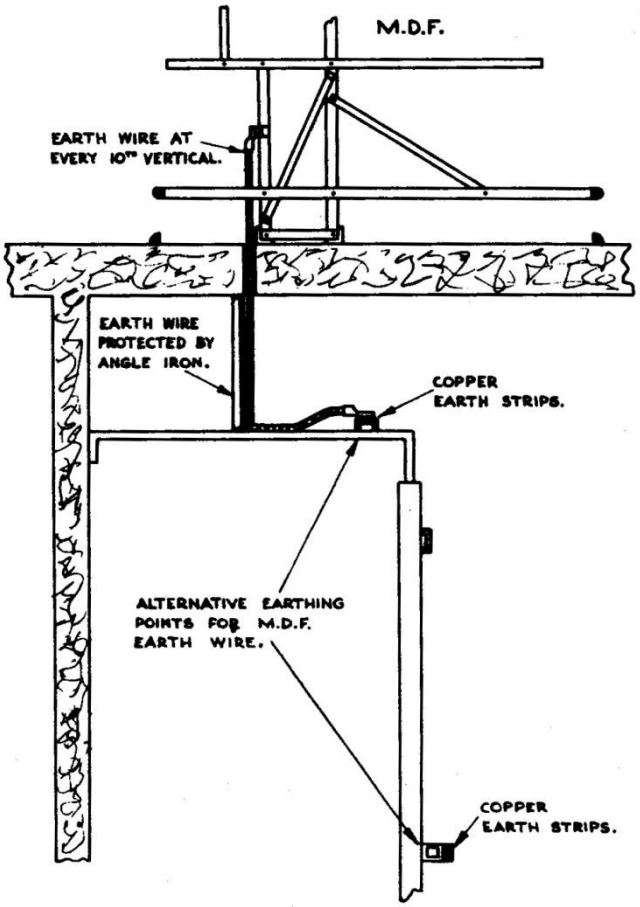


FIG. 37. CONNECTION BETWEEN M.D.F. AND C.T.F. EARTHING BARS WHERE CABLE WELL IS BELOW M.D.F.

END.