





## SHELTERFOR-M

### Outdoor Metal Clad Switchgear

### Field Assembly Instructions

#### INTRODUCTION

This instruction book has been prepared to familiarize the Purchaser's engineering, installation and operating staffs with the Shelterfor-M (Pronounced shelterform) Outdoor Metal Clad Switchgear supplied by Westinghouse Electric Corporation for this installation. Personnel responsible for installation of this equipment should be given copies of this book well in advance of the starting date for the installation work.

The descriptions herein apply to the standard Shelterfor-M construction. If unusual conditions or problems are encountered, which are not covered in these instructions, they should be referred to the nearest District Office where trained personnel are available for additional assistance.

#### DESCRIPTION

Shelterfor-M switchgear is basically indoor metal clad switchgear to which has been added weatherproofing which includes a sheltered aisle space for breaker removal and maintenance.

The description herein will apply only to the weatherproofed enclosure. A description of the metal clad cells is given in the instruction book "Metal Clad Switchgear with Type "DH" Air Circuit Breakers".

The weatherproof enclosures are constructed of formed sections of hot rolled stretcher-levelled steel. Weatherproof hinged doors, including ventilating louvers backed up with fiberglass filters, are provided at each end of the enclosure. The doors are provided with "crash" hardware for safety so that the doors can be opened from the inside even if padlocked on the outside.

#### RECEIVING, HANDLING AND STORING

The switchgear is shipped with the cell units completely assembled. The outdoor enclosure front panel assembly is assembled across the front of the shipping group. Since the outdoor enclosure front panel is not required in double bus arrangements using a common aisle, a protective structure will cover the instrument panels in this case. The aisle and its enclosure, which includes the door assembly, floor plates and aisle roof sections, are manufactured on a "per unit" basis and shipped separately. Normally the shipping groups consist of as many units as can be handled and shipped together, unless the Purchaser has specified smaller groups.

#### RECEIVING

When the switchgear is received, the Purchaser should check the material actually received against the shipping list to be sure that all parts have been received. This will avoid delays in installation.

If the metal clad switchgear is to be installed as soon as received, it is recommended that the unpacking be done as required for installation as outlined under the paragraphs which follow. If the switchgear is to be stored or held for sometime before installing, it is advisable to unpack the shipment sufficiently to check the shipment for completeness and condition.

#### HANDLING

Each shipping group is equipped with lifting angles for handling by a crane.

Each shipping group is also provided with a shipping angle at each end of the shipping group. During shipment these angles are used for cross bracing to the freight car.

## STORING

If the Shelterfor-M switchgear is received before installation is scheduled, or if the switchgear is not immediately energized after installation, temporary power must be made available for the operation of the heaters to provide dry warm air to prevent condensation until placed in service. Temporary power may be connected to the heater in the cable compartment of any feeder unit by bringing the cable in through the cable cut-out located at the rear of the unit. This power should be fused and brought into each shipping group.

In order to prevent excessive condensation in the Shelterfor-M switchgear the aisle doors are provided with louvers at the top and bottom and the ventilation in the rear of the units is equivalent to the ventilation provided on indoor metal clad switchgear. These louvers are backed up with fiberglass filters which should not be removed except for maintenance. Space heaters are provided and should be used to prevent condensation during weather when high humidity prevails or whenever there is a probability of condensation within the equipment. The purpose of the heaters is to safeguard the equipment and it is important that they be used.

It is recommended that the heaters be energized for a normal period of 24 hours after the installation is complete and before the equipment is energized.

## INSTALLATION

### Foundation

It is only necessary to install a suitable foundation on which to set the Shelterfor-M switchgear since channels are included as part of the switchgear. This foundation may be a solid concrete pad or pillars. The pillars may run in the same direction as the channels or perpendicular to them.

The concrete foundation or pillars upon which the switchgear is to be erected must be designed for sufficient strength to withstand

the weight of the structure plus the shock of the breakers opening under short circuit conditions. Table No. 1 gives approximate dead and impack weight for the various ratings of Shelterfor-M switchgear. Actual weights will vary somewhat with the individual units, depending on the type and amount of auxiliary equipment that is specified for the unit. Adequate safety factors must, of course, be used in designing the floor or foundation.

### Conduit Layout and Switchgear Floor Plan

Provisions must be made in the floor or foundation for the conduits which carry the main cables, control wiring, and ground cable when such conduits enter the switchgear from below. A floor plan and base plan drawing is made for each Shelterfor-M switchgear order. These drawings must be used for determining the final conduit layout, spacing of floor channels, and floor space required for each Shelterfor-M switchgear structure.

Conduits should project above the finished floor by approximately eight inches and be located according to the floor plan and base plan prepared especially for the individual Shelterfor-M switchgear order. If more than one control conduit is required per unit, these should be aligned in the space allotted for them on the floor plan.

### Installation of Shelterfor-M Switchgear

The following suggestions and general order of operations will assist in installing Shelterfor-M switchgear.

1. When three or more shipping groups of Shelterfor-M switchgear are to be arranged in one continuous assembly, the center shipping groups should be the first located. The other shipping groups should then be installed in successive order in each direction from the center of the structure.

When installing a unit substation, the power transformer and the adjacent metal clad group should first be lined up and set in position in accordance with the dimensions on the base plan drawing for the installation. The additional groups should then be installed.

2. Remove all crating and foreign material from the first group to be erected. Great care should be exercised in removing the crating so as not to damage any of the delicate instruments and relays which may be mounted on the switchgear.

3. Move the first group of units into position according to paragraph 1.

4. Establish a base line a few inches in front of the group of housings and parallel with the desired front of the structure. Equalize the distances from the front of the housings to the base line, thus making the face of the group parallel to the base line.

5. Remove the shipping and lifting angles from the shipping group and replace the bolts in the switchgear.

6. The second group should then be moved into position and the procedure outlined for the first group repeated. The groups should be bolted together by installing the tie bolts.

*modified*  
7. In the case of single row Shelterfor-M, the enclosure front panel assembly is unbolted from the metal clad compartment and set in position in accordance with the dimensions on the base plan drawing for the particular installation. There is no front panel assembly for double row common aisle arrangements in which one line-up of switchgear faces another with a common aisle between them.

*changed*  
When there is more than one shipping group, the joint between adjacent front panel assemblies is made weatherproof by capping it with the front panel seal and the channels under the switchgear are bolted together using  $\frac{3}{8}$  X 1-1/4 hex. head bolts.

NOTE: For location of Shelterfor-M parts refer to Figure 1 and to the "Isometric View of Switchgear" and the "Material List of Shelterfor-M Parts" drawings that are supplied by the factory.

8. The aisle roofs should be put on. The roofs should not be tightened down until later.

9. The aisle center channel is placed in position in accordance with the dimensions on the base plan drawing.

10. The aisle floor plates may now be installed. Before putting the aisle floor plates down make sure that the three channels accessible from the aisle are fastened down with the holding down lugs.

The floor consists of steel plates with a non-skid finish which are easily laid with the aisle center channel and the metal clad compartment providing the anchor points for the rear floor plates while the aisle center channel and the enclosure front panel assembly provides the anchor points for the front floor plates.

The following sequence of putting down the aisle floor plates must be followed (refer to Figure 2).

- a. Rear left hand floor plate.
- b. Rear intermediate floor plates, starting with the one on the left and proceeding toward the right.
- c. Rear right hand floor plate.
- d. Front right hand floor plate.
- e. Front intermediate floor plates, starting with the one on the right and proceeding toward the left.
- f. Front left hand floor plate.

11. The aisle end sheets are bolted to the assembly. Before bolting the aisle end sheets to the front panel assembly, remove the Tinnerman speed nuts from the front panel assembly. The bolting diagram, Figure 3, shows the location of the various bolt sizes. The aisle end sheets are pre-assembled except that the aisle door is removed for shipment. The aisle door is attached to the aisle end sheets by means of the hinge pins.

12. The aisle roof joint covers should be put on. Starting with the roof joint cover in

## SHELTERFOR-M FIELD ASSEMBLY

the middle of the line-up and working out toward the ends, all roof joint covers should first be put in place and the holes aligned with the tapped holes in the roof flanges before bolting any of them down.

13. The aisle end roof trims should also be put on and the holes aligned before any bolting is done.

14. After the aisle roof joint covers and end roof trims are aligned, they should be bolted down using the assembly of 5/16 bolts with gasketed washers for all bolting on the top of the roofs. The aisle door frame mounting spacer should be placed between the aisle end roof trim and aisle door frame mounting before bolting the aisle end roof trim to the aisle end sheet.

### CAUTION

Tighten the roof bolts only until the gasket starts to compress. If the bolts are tightened to much, the washers, which are initially dished up, will dish in the opposite direction and break the weatherproof seal.

15. Fasten down the aisle roofs by means of the studs on the bottom of the roofs that protrude into the aisle.

16. Install the aisle lights. For location and quantity of lights see the "Material List of Shelterfor-M Parts" drawing. The following sequence should be followed:

a. Remove the lock nut from the end of the conduit away from the lamp receptacle.

b. Put the wires and conduit through the hole at the front of the roof.

c. Fasten the lamp mounting bracket to the roof by means of the 1/4 - 20 bolts.

d. Connect the wires to the corresponding lettered point on the terminal block in the unit.

17. Use the paint that is supplied with the switchgear to cover the external bolts and washers and to touch up the exterior as required to achieve maximum protection.

TABLE NO. 1. APPROXIMATE WEIGHTS OF SHELTERFOR-M SWITCHGEAR UNITS.

Note: Actual weights of units will vary in proportion to amount and type of auxiliary equipment in the units.

| TYPE OF UNIT                | CURRENT RATING | DEAD WEIGHT<br>INCLUDING BREAKER<br>POUNDS | TOTAL IMPACT<br>AND DEAD WEIGHT<br>POUNDS |
|-----------------------------|----------------|--|---|
| 50-DH-75 Breaker.           | 1200           | 2600                                       | 2850                                      |
| 50-DH-75 Aux. 26" Wide      | --             | 2200                                       | --  |
| 50-DH-75 Aux. 36" Wide      | --             | 2400                                       | --  |
| 50-DH-150/250 Breaker       | 1200<br>2000   | 3500<br>4100                               | 4050<br>4750                              |
| 50-DH-150/250 Aux. 26" Wide | --             | 3200                                       | --  |
| 50-DH-150/250 Aux. 36" Wide | --             | 3600                                       | --  |
| 50-DH-350 Breaker           | 1200<br>3000   | 6700<br>6900                               | 7950<br>8150                              |
| 50-DH-350 Aux.              | --             | 3900                                       | --  |
| 75-DH-250/500 Breaker       | 1200<br>2000   | 5200<br>5600                               | 5650<br>6050                              |
| 150-DH-150 Breaker          | 1200           | 5000                                       | 5950                                      |
| 150-DH-250/500 Breaker      | 1200<br>2000   | 5000<br>5400                               | 5950<br>6450                              |
| 75/150-DH-150/250/500 Aux.  | --             | 4100                                       | --  |
| 150-DH-750 Breaker          | 1200<br>2000   | 5900<br>6300                               | 7150<br>7650                              |
| 150-DH-750 Aux.             | --             | 4500                                       | --  |
| 150-DH-1000 Breaker         | 1200<br>3000   | 7600<br>8400                               | 5250<br>9350                              |
| 150-DH-1000 Aux.            | --             | 4900                                       | --  |

# SHELTERFOR-M FIELD ASSEMBLY

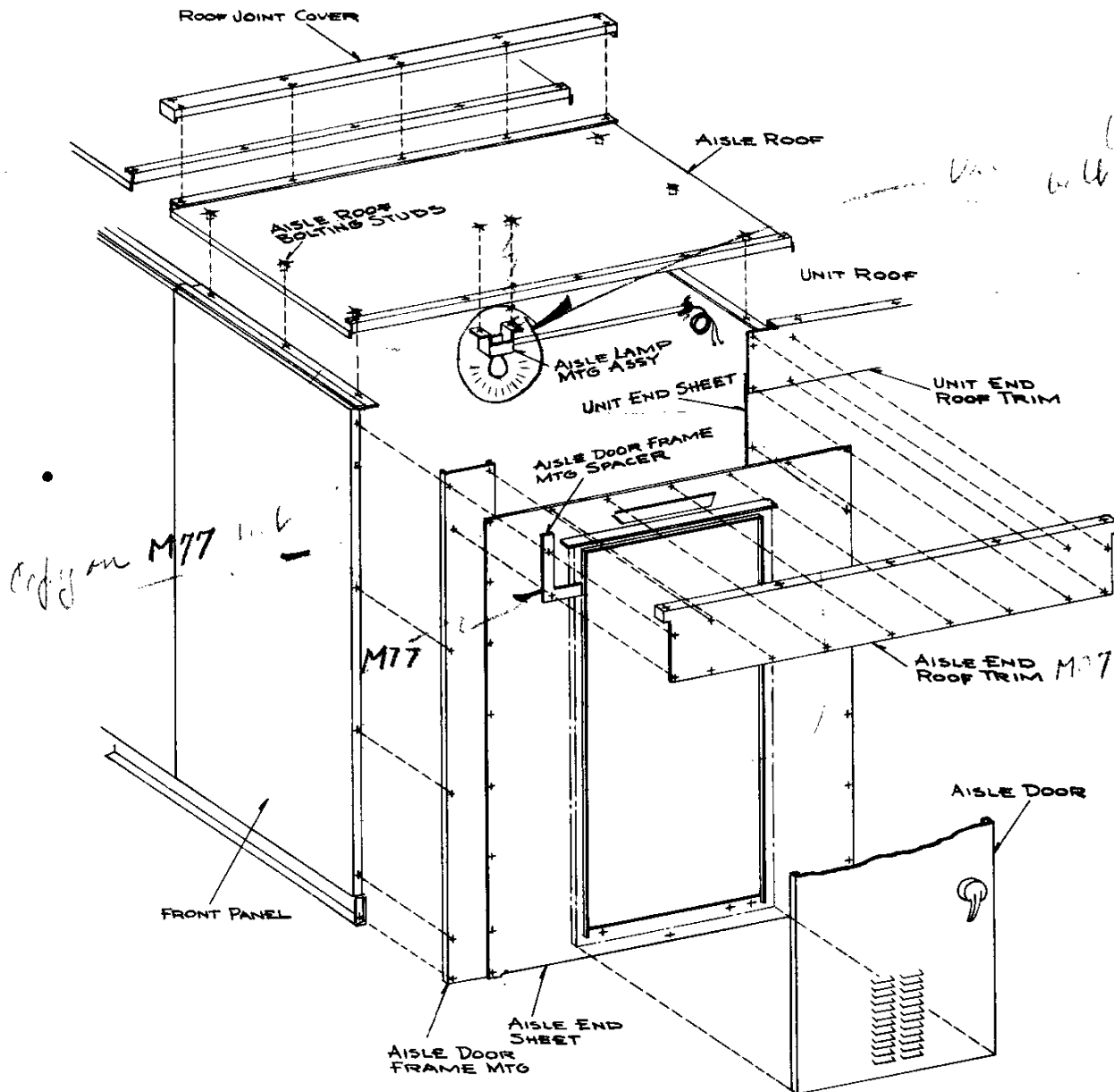


FIG No. 1  
EXPLODED VIEW OF SHELTERFOR-M

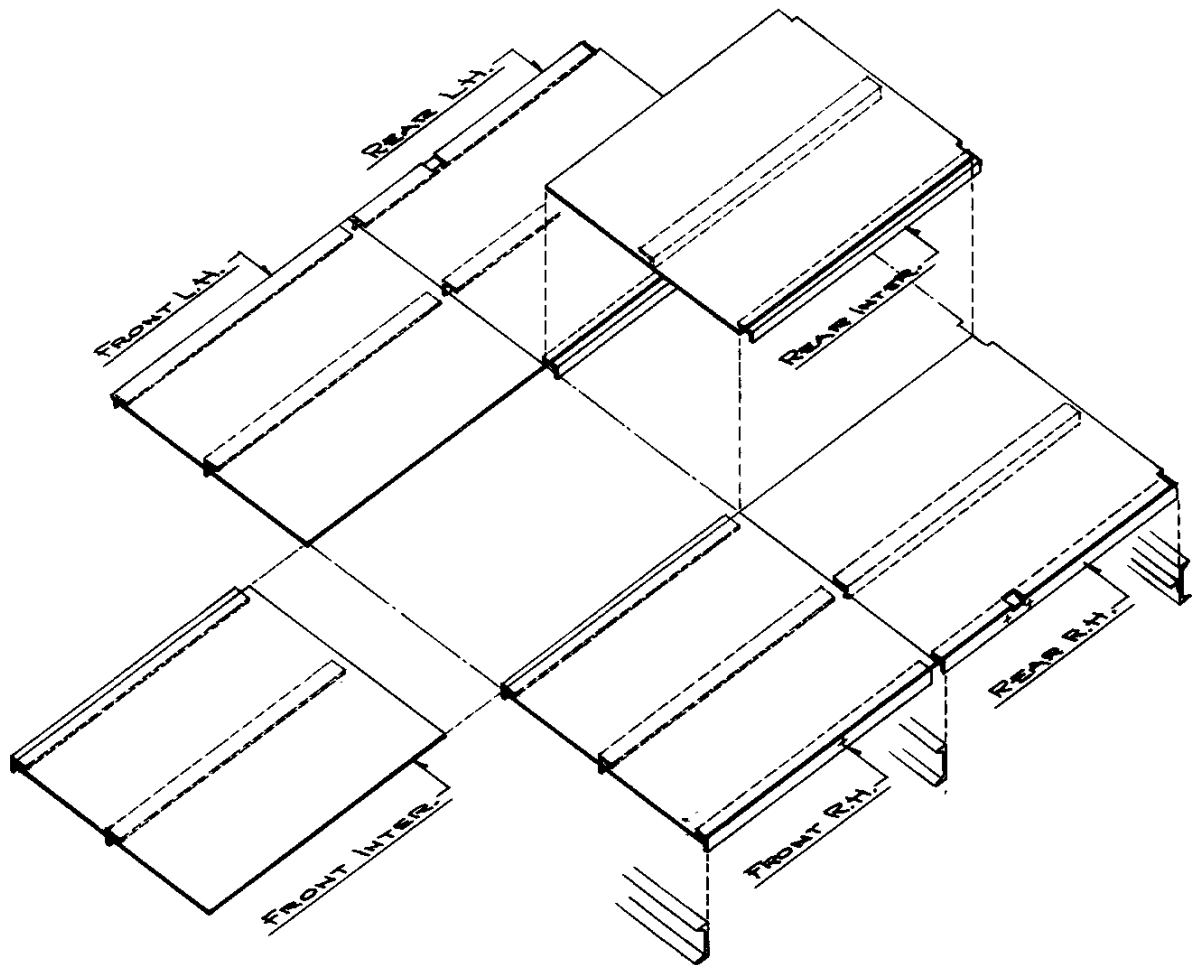
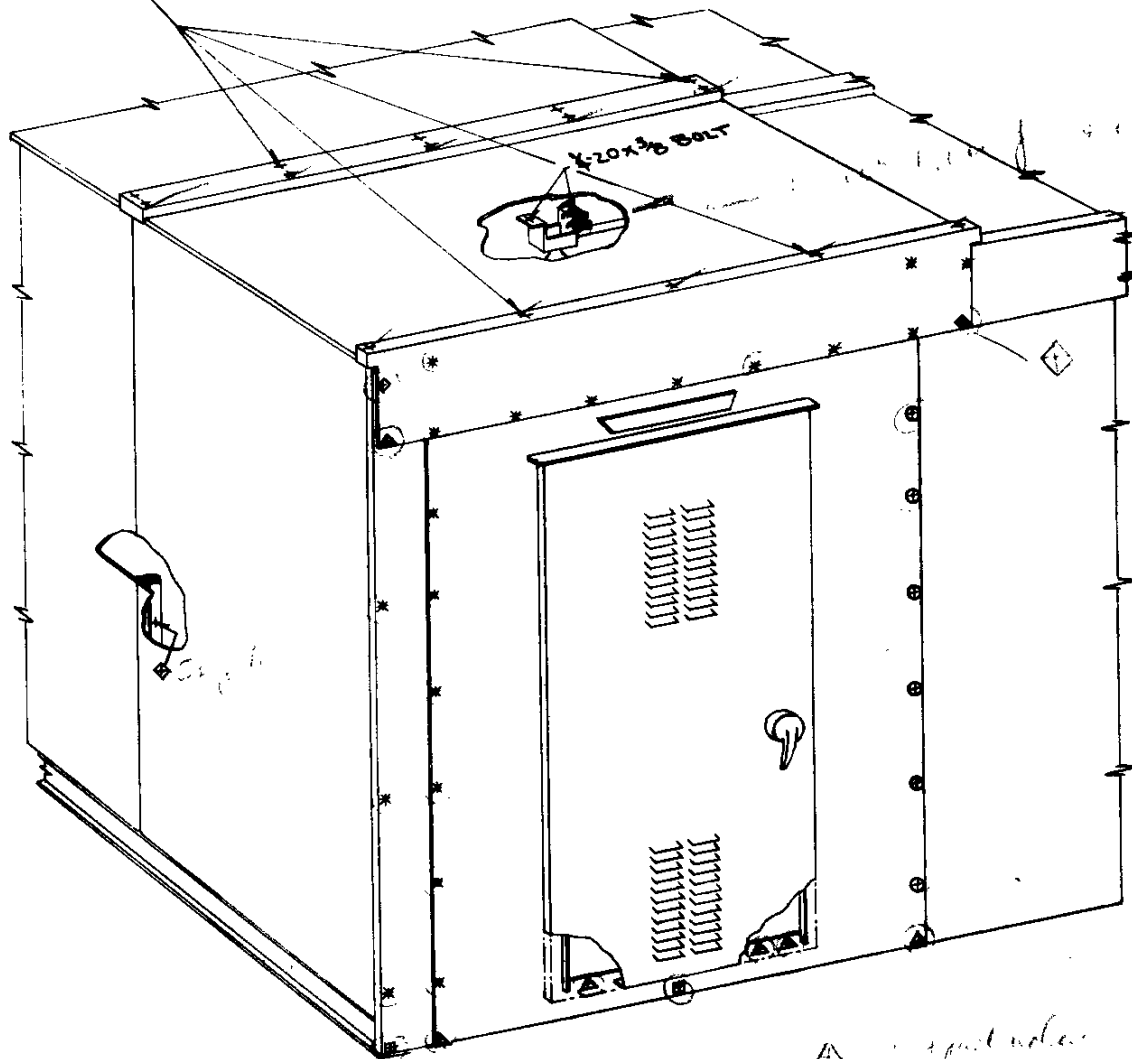


FIG. No. 2  
AISLE FLOOR PLATE ASSEMBLY



SHELTERFOR-M FIELD ASSEMBLY

ALL ROOF BOLTING TO BE  
ASSEMBLED  $\frac{5}{16}$  BOLTS, WITH  
GASKETED WASHERS



- B1 19 \* -  $\frac{5}{16} \times \frac{7}{8}$  BOLTS WITH  $\frac{5}{16}$  WIDE WASHERS ON OUTSIDE, &  $\frac{5}{16}$  STD WASHERS  
 ON INSIDE, LOCK WASHERS & LOCK NUTS  
 B2 16 -  $\frac{5}{16} \times \frac{3}{4}$  BOLTS WITH  $\frac{5}{16}$  WIDE WASHERS, LOCK WASHERS & LOCK NUTS  
 2 -  $\frac{5}{16} \times 1\frac{1}{4}$  BOLTS WITH  $\frac{5}{16}$  STD WASHERS, LOCK WASHERS & LOCK NUTS  
 1 -  $\frac{5}{16} \times \frac{7}{8}$  BOLTS WITH  $\frac{5}{16}$  WIDE WASHERS  
 2 -  $\frac{1}{2} \times \frac{7}{8}$  BOLTS WITH  $\frac{1}{2}$  STD WASHERS

FIG No.3

SHELTERFOR-M BOLTING DIAGRAM