



**AIR FORCE HANDBOOK 10-222, VOLUME 6**  
**1 July 2008**

## **GUIDE TO BARE BASE FACILITY ERECTION**



**DEPARTMENT OF THE AIR FORCE**

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**Operations**

**GUIDE TO BARE BASE FACILITY ERECTION**

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This handbook addresses the procedures used to erect and disassemble the most common types of bare base facilities. These facilities include the Small Shelter System (SSS); Tent, Extendable, Modular, Personnel (TEMPER); Expandable Shelter Container (ESC); Medium Shelter System (MSS); and the General Purpose (GP) Shelter. Specifically, the handbook discusses site selection and layout, major components of each facility, erection procedures and disassembly procedures. This handbook applies to civil engineer personnel, including Air National Guard (ANG) units and Air Force Reserve Command (AFRC), when setting up their quarters and work centers and assisting other base personnel in establishing their shop areas. Users of this booklet are assumed to have a basic knowledge of bare base assets and their function and should reference the applicable technical orders. When coupled with information contained in AFPAM 10-219, Volume 5, *Bare Base Conceptual Planning Guide*, applicable technical orders, and training received at Silver Flag Exercise Sites, personnel should be capable of effectively erecting and tearing down these common bare base facilities. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using AF IMT 847, *Recommendation for Change of Publication*; route AF IMT 847s from the field through Major Command (MAJCOM) publica-

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**SUMMARY OF CHANGES.** This document is substantially revised and must be completely reviewed. Of major significance is the addition of the chapters and attachments on the SSS and MSS.

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## Chapter 1

### INTRODUCTION

**1.1. General Information.** The five facilities discussed in this handbook comprise the majority of expeditionary structures contained in the Basic Expeditionary Airfield Resources (BEAR) deployment sets ([Figure 1.1](#)). These structures are designed for use at austere airfields and their purpose is to provide environmental protection to support personnel, equipment and supplies.

**Figure 1.1. Bare Base Facilities.**



**1.2. Factors for Success.** Successful BEAR facility erection depends on several actions being carried out prior to and during the arrival of personnel at a bare base. Some of these actions are easy to control; others are not easily influenced. The ones easily influenced include the degree of training the base populace has had on erecting BEAR facilities (which could dictate the degree of involvement engineers will have in erecting facilities for others) and the order and timing of facility asset arrival at the bare base. For purposes of this handbook, it is assumed that both of these actions are positive (e.g., the base populace is generally knowledgeable in facility erection and assets flow into the base in a reasonable manner).

**1.3. Responsibilities.** From an engineer perspective, a basic premise of bare base development is that users will erect their own facilities, thereby freeing engineer personnel for other, more critical beddown tasks. There will be occasions where untrained personnel will be faced with facility erection tasks and engineers must be prepared to offer supervisory and instructional guidance. Therefore, plan to have a small cadre of personnel knowledgeable on SSS, TEMPER tent and ESC erection techniques available to assist the base populace. As basic as they may appear to be, do not encourage the base populace to attempt utility connections to facilities. The potential for damage to system components and harm to both base personnel and electrical crews is too great. Because training on MSS and GP shelters is not readily available for most base organizations, plan to erect all of these type facilities—these are probably too complex for most base organizations to handle on their own.

**1.4. Safety.** Remember to always practice proper safety procedures during the erection of all facilities. Wear safety glasses whenever using a hammer on stakes or anchors. Wear gloves when handling structural components or pulling ropes. Beware of spring tension on frame members. Ensure shelters are properly anchored to fully resist all potential wind loads for the area. Use adequate number of personnel when handling heavy components.

**1.5. Additional Information.** Reference AFH 10-222, Volume 1, *Guide to Bare Base Development*, for additional information on BEAR facilities, such as receiving, identifying, and distributing assets upon arrival at the deployed location. In addition, contact AFCEA's Reach-Back Center if you are looking for information not found in this publication or the references in Attachment 1. The Reach-Back Center can be contacted by calling 888-232-3721 (commercial), DSN 523-6995, or by emailing [AFCESAR@tyndall.af.mil](mailto:AFCESAR@tyndall.af.mil).

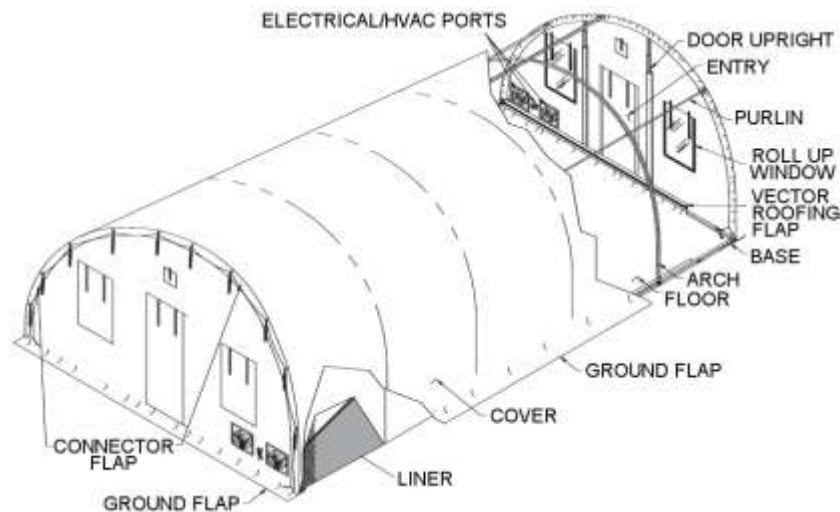


## Chapter 2

### SMALL SHELTER SYSTEM

**2.1. Purpose and Functions.** The Small Shelter System (SSS) is designed to provide protection for personnel, equipment and supplies in all types of climate and terrain, including extreme cold and heat ([Figure 2.1](#)). The system can be used in any environment of bare base missions with only normal organic support provided.

**Figure 2.1. Small Shelter System (SSS).**



**2.2. Capabilities.** The system is engineered for durability, portability and simplicity in both erection and tear down. It can be transported by all organic modes of Air Force lift. Although the SSS is used primarily for billeting, it can also support other missions including: command post, administration, messing, maintenance shops and medical facilities.

**2.3. Performance Characteristics.** The SSS is designed to withstand extended erection of 10 years with a shelf life of 20 years. Each shelter is available in tan or green for use in areas where the terrain is predominately those colors. Each shelter can be used in all types of weather such as snow, rain, hail, wind and on all types of terrain such as desert sand or frozen tundra. Ensure the shelter is properly anchored to fully resist all wind loads in the area. The shelters are designed to be set up by a trained crew of four persons. Each shelter contains string lighting with six light sockets. Each socket can handle 150 watts of light operation at 120 volts of 60 Hz and the receptacles are rated at 20 amps each.

**2.4. Shelter Description.** Each Shelter is 20-ft wide x 32.5-ft long x 10-ft high. Each shelter has a lightweight, high-strength aluminum frame, vinyl cover system, insulating liners, non-slip vinyl floor, 30-in. x 72-in. hard door, 3-ft x 7-ft zipper entry, (4) end panel windows, (2) sets of 18-in. Environmental control unit (ECU) ports, (2) 6-in. electrical ports, (1) electrical kit with light string, (1) plenum, and (2) end panel vents with net inserts. The Version 2 shelter also includes (10) side windows and (2) stove pipe vents. A reusable plastic container or wood crate is available for transporting each shelter.

**2.5. Environmental Information.** Inside shelter temperatures are maintained utilizing a three-ton air conditioner and a 10-kW heating element. Operating parameters for the shelter environments thresholds are provided in [Table 2.1](#).

**Table 2.1. Environmental Threshold Operating Parameters.**

<i>Inside Environment</i>	<i>Outside Ambient Temperature</i>
+72° F	at +125° F
+45° F	at -25° F

**2.6. Site Selection.** Choose a site location at least 35-ft x 50-ft. Ensure the area is free of any debris and make as smooth and level as possible.

**2.7. Unpacking Shelter.** The SSS container or wood crate contains one shelter with accessories, one electrical kit, and one spare parts kit. Remove the top of the container and begin unpacking directly from container base. The electrical accessories, shelter cover and end panels will be removed first;



aluminum arches, purlins and base pieces unloaded last. Inspect for any damage or missing parts (TO 35E5-6-11, *Operations and Maintenance Instructions with Parts List, Alaska Small Shelter System (AKSSS)*, Chapter 2, Tables 2-1, 2-2, or 2-3, Inventory List). When shelters and accessories are removed from the bottom of the container, re-install container top for storage. The container should be stored in this manner until needed again.

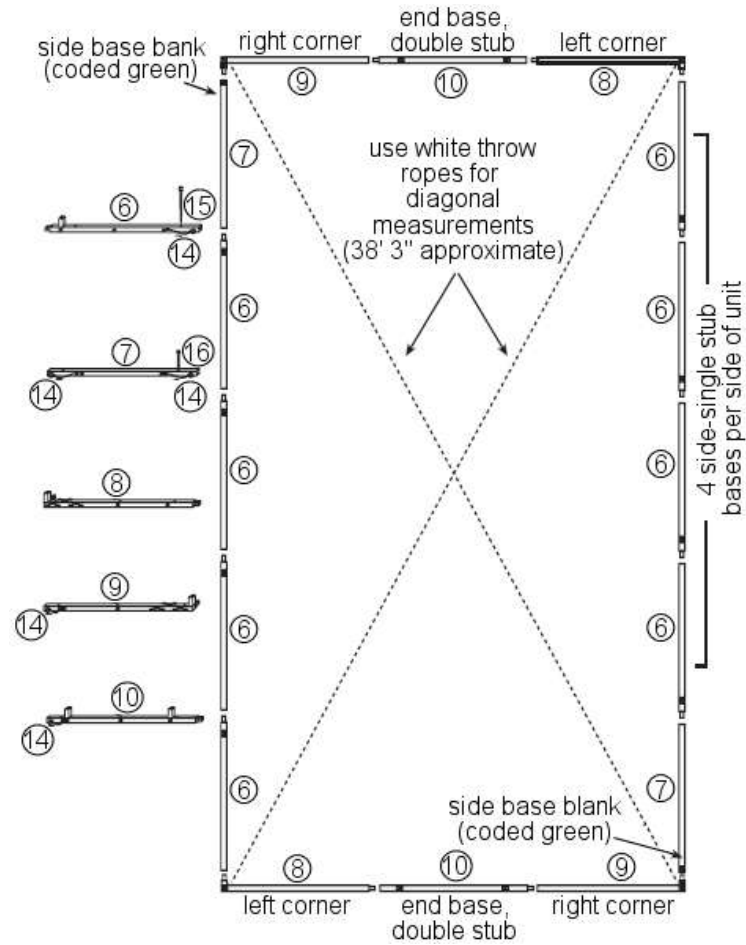
**2.8. Positioning ECU.** Using a forklift, lift the ECU and place it on the most level area at the end and right corner of the shelter site. The ECU should be placed where the shelter end panel ducts are located (approximately 12-inches from end panel). Refer to the appropriate ECU Technical Manual for further ECU installation instructions.

**2.9. Shelter Set-up.** The following paragraphs contain procedures for shelter set up. Each paragraph should be carefully reviewed prior to starting actual set up procedures (see [Attachment 2](#) for quick assembly instructions).

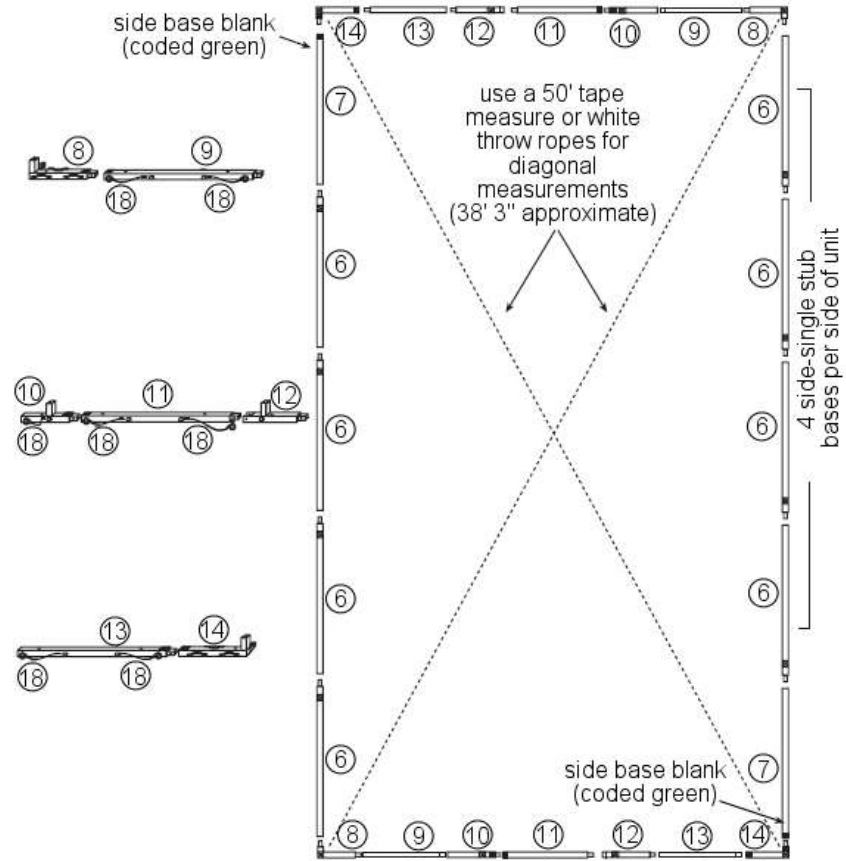
**2.9.1. Base Assembly and Anchoring.** Assemble base sections in sequence as identified in [Figure 2.2](#) or [2.3](#). Place all base pieces with base hooks on the *outside* of the shelter with the hooks facing down ([Figure 2.4](#)). Slip all sections completely together and secure using lanyard pins.

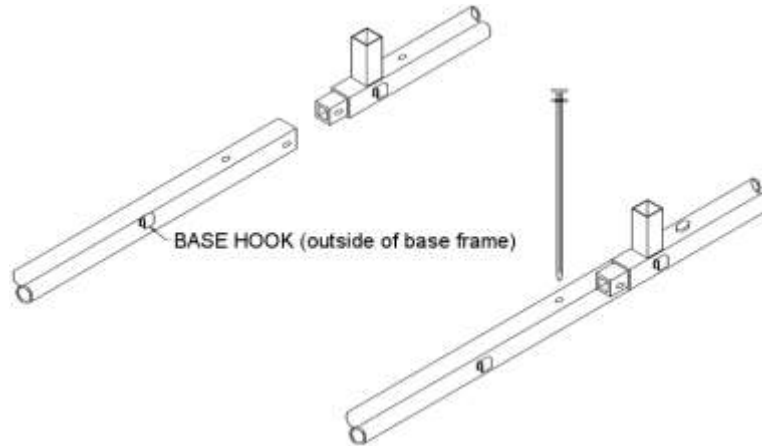
**2.9.2. Base Anchoring ([Figure 2.5](#)).** Using a rope or tape measure, square the outside corners of the base to approximately 38-ft. 3-in., then drive the 18-in. double headed spikes through the pre-drilled anchor holes in the base into the ground, using a sledge hammer or shovel. For asphalt or concrete, a hole may have to be drilled first using a 1/2-in. masonry drill bit. Drive the 18-in. double headed spikes through the pre-drilled anchor holes into the asphalt or concrete using the sledge hammer. While there is a hole in the center end base section, the shelter can be erected without a spike in the doorway.

**2.9.3. Non-slip Floor Installation.** Unfold the non-slip floor, with black side facing the ground, and slip floor cutouts over the base stubs. Ensure all bottom arches without stubs (coded red) are on the same side of the unit or damage to the equipment may result.

**Figure 2.2. Initial SSS and SSS Version 2 Base Assembly.**

**Figure 2.3. Alternate Shelter Base Assembly.**



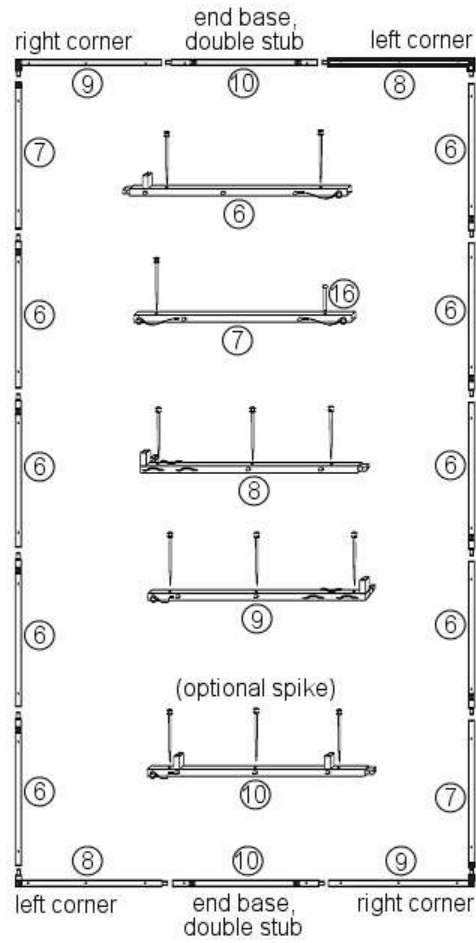
**Figure 2.4. Base Assembly Connections.**

**2.9.4. Arch Assembly and Installation.** Assemble arches on the ground (**Figure 2.6**). Keeping all joints completely slip-fitted together, stand assembled arch and set one end on base stub (**Figure 2.7**). Holding arch firmly, spring the other end onto its base stub. Repeat above procedure until all remaining arches are assembled onto base. All bottom arches without stubs (coded red) should be on the same side of the unit. **Note:** Pay special attention not to pinch the floor fabric between the arches and base sections, especially at the corners.

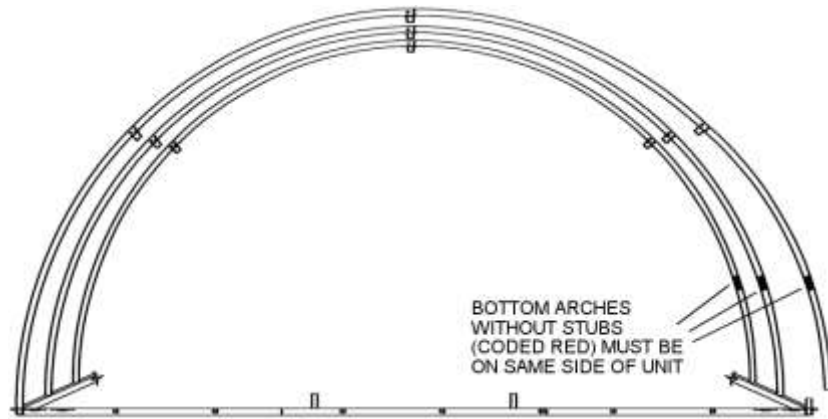
**WARNING:** Purlin pins are required during installation to ensure purlins will not come loose during assembly; otherwise injury to personnel or damage to equipment may result.

**2.9.5. Purlin Installation.** Install three rows of purlins that connect between arches (**Figure 2.8**). Purlins are slipped into purlin sleeves on arches and pinned. Ensure outside purlin pins are installed from top of arch sleeve facing downward. Start with red coded purlins on one end and work toward other end where yellow coded end purlins are used. With one person on ladder and two on ground, insert purlins between each arch simultaneously to make assembly easier and faster.

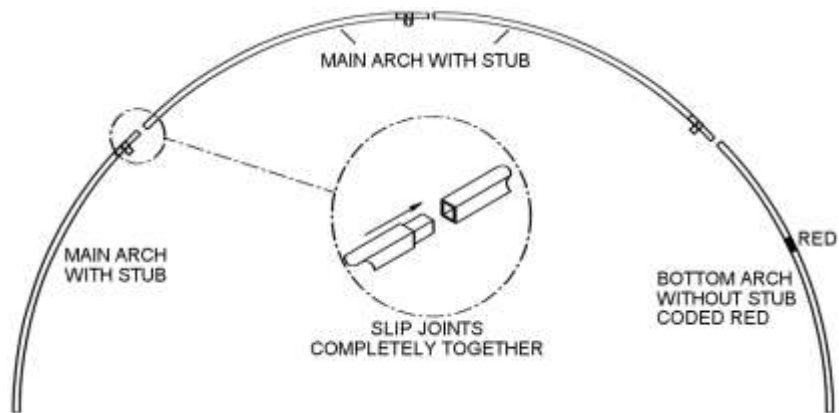
**Figure 2.5. Shelter Base Anchoring.**

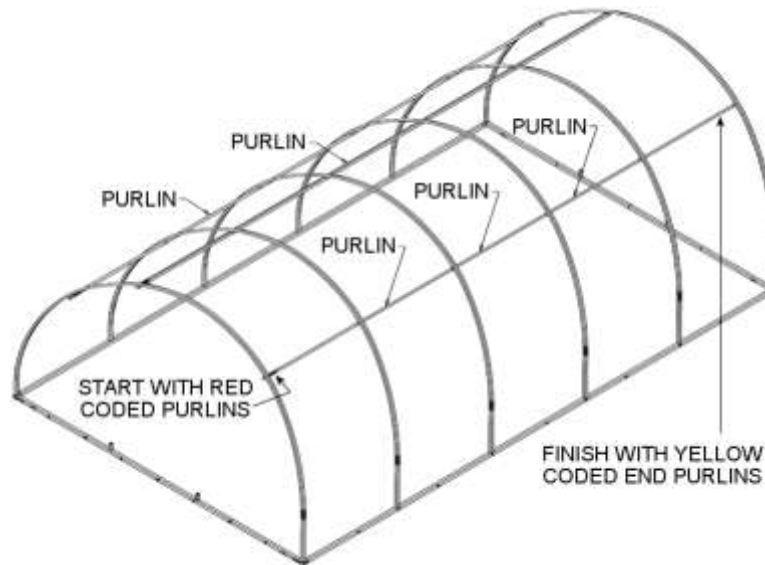


**Figure 2.6. Main Arch Layout.**

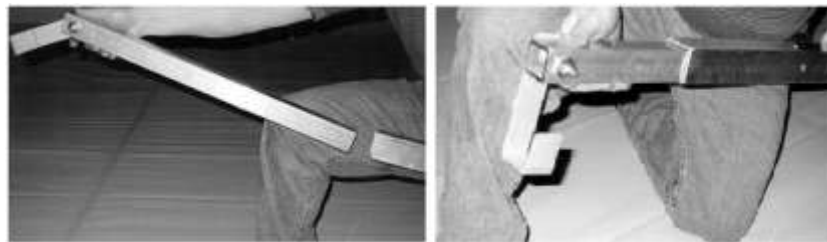


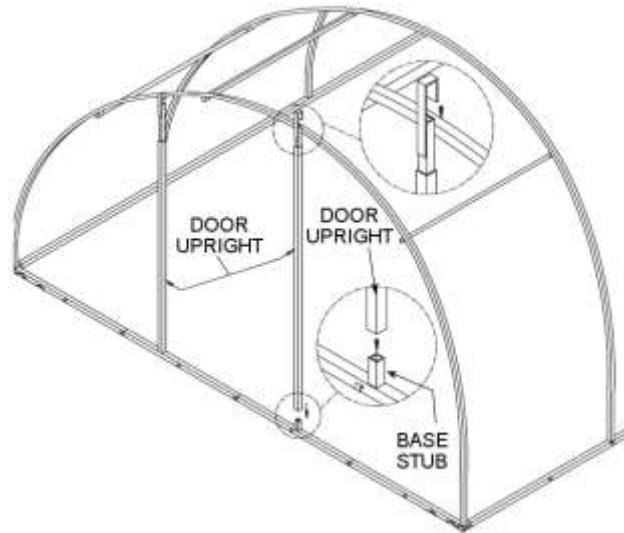
**Figure 2.7. Main Arch Assembly.**



**Figure 2.8. Purlin Installation.**

**2.9.6. End-Upright Installation.** Place the upright insert into the top of the end upright ([Figure 2.9](#)). Lift the upright and slip the insert over the arch and place the upright down onto its base stub ([Figure 2.10](#)). Pay attention to the instructions stenciled on the end uprights. Plumb end upright and ensure the insert bolt is toward the inside of the shelter.

**Figure 2.9. Assembly of End Uprights.**

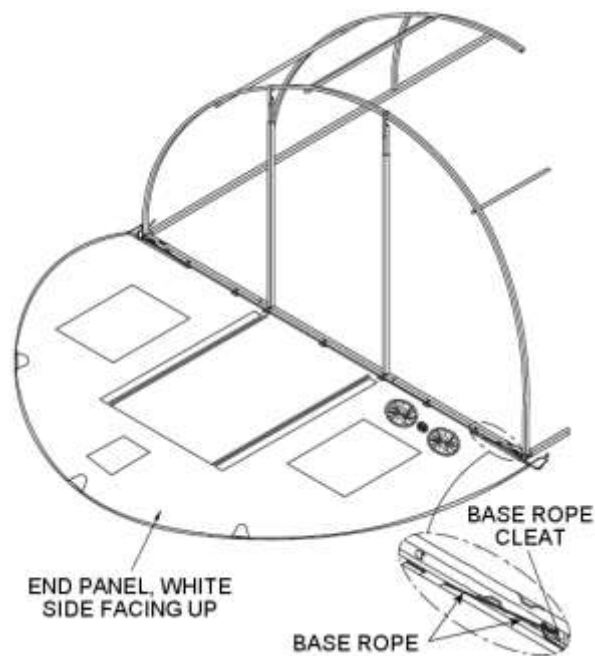
**Figure 2.10. Installation of End Uprights.**

**2.9.7. Zippered End Panel Installation.** Remove double headed spike from center of end panel, if spike was previously installed. Lay out zippered end panel at one end of unit with WHITE side facing up. Tie one end of the base rope to the YELLOW coded tie off cleat ([Figure 2.11](#)). Stretch the other end tight and secure to its YELLOW coded tie off cleat. Base ropes are hooked last with hook tools. Remove the purlin pins on the end arch only so the purlin can be separated from purlin connection and the end cover rope can be slipped underneath purlin. Start with the center of the end panel and work toward each side. Lift the end panel up and work the contour edge up and over the end arch. Slip the contour rope under the disconnected purlins and then reconnect purlins and pin ([Figure 2.12](#)). Keeping the end panel centered, tension both ends of the contour rope tightly by running the rope under the green tie off cleat and using a foot to pry on the rope. Continue working the edge of the end panel over the arch. When the end panel is snug, and the rope is tensioned, tightly secure the contour rope ends to the GREEN coded tie off cleat. Using the hook tools, secure the end panel base rope to the base hooks.

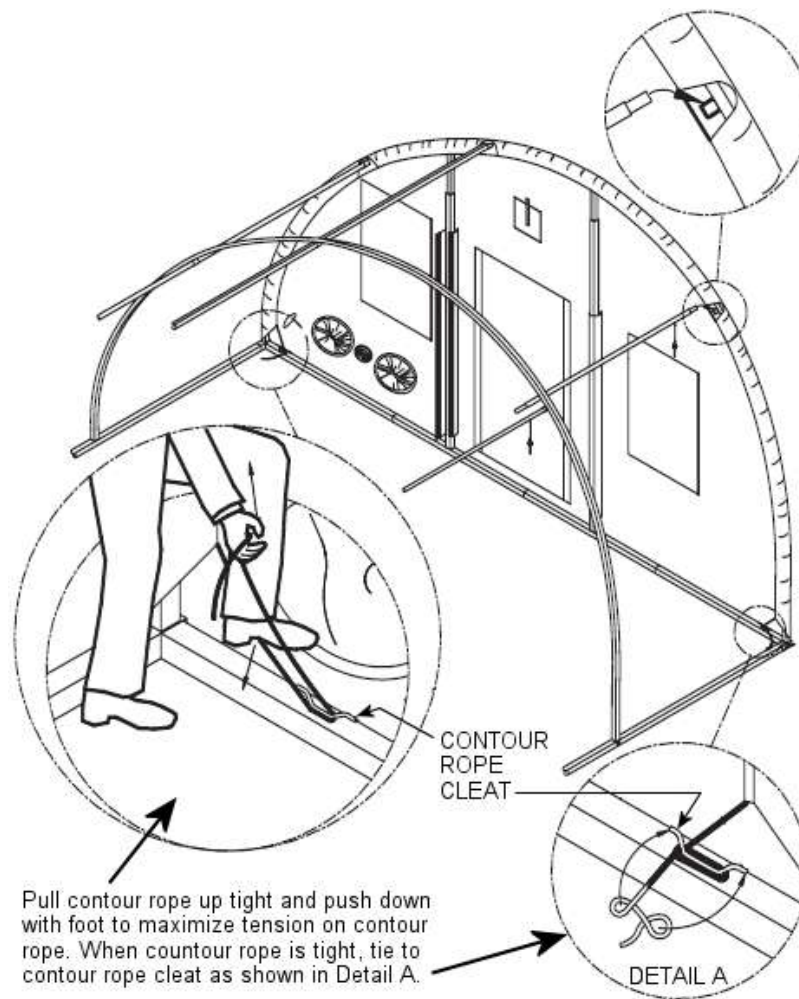


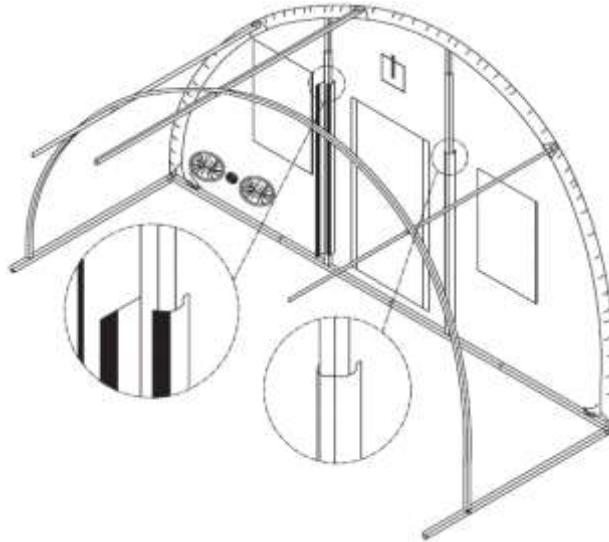
Secure end panel to uprights using flaps with hook and loop fasteners on end panel ([Figure 2.13](#)). Repeat end panel installation procedures for the other end panel. Open zipper door for ingress and egress during installation. Open zipper door for ingress and egress during installation.

**Figure 2.11. Zippered End Panel Layout.**



**Figure 2.12. Installation of Zippered End Panel.**

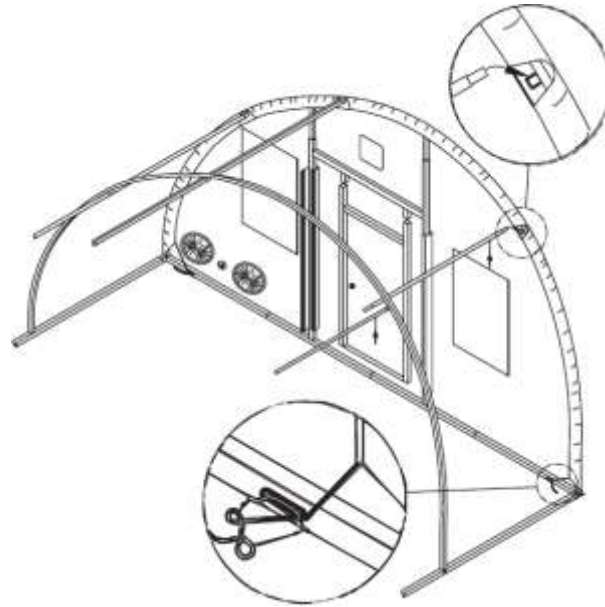


**Figure 2.13. Zippered End Panel Attachment to End Uprights.**

2.9.7.1. Hard Door End Panel Installation. Remove double headed spike from center of end panel, if spike was previously installed. Unwrap the end panel from around the door and place door evenly between the end uprights (make sure white side of door faces inside). Place the door on top of base so that the metal stub under the door frame slips into the spike hole in the base. Attach end panel to the end arch in same manner as the zippered end panel ([Figure 2.14](#)).

2.9.7.2. From inside shelter, connect door header to top of door frame by sliding the header stubs into the top of the door frame ([Figure 2.15](#) and [2.16](#)). Secure header to uprights by pushing header pins through pre-drilled holes in uprights. Secure end panel to end uprights utilizing the flaps with hook and loop fasteners on inside of end panel.

**Figure 2.14. Hard Door End Panel Installation.**



**Figure 2.15. Sliding Header Stubs into Top of Door Frame.**



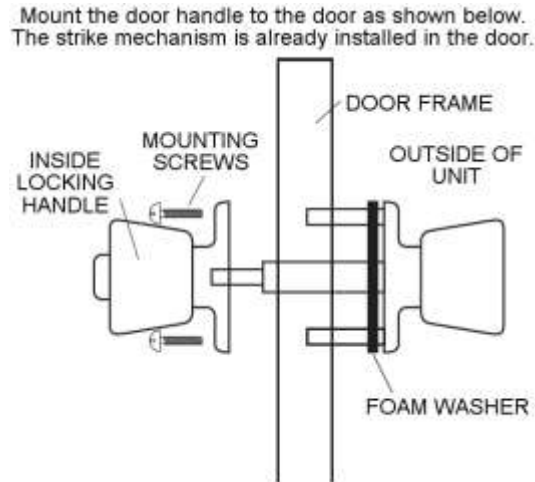
**Figure 2.16. Hard Door End Panel Installed.**



2.9.7.3. To open hard door, remove the (2) door brackets by using a Phillips head screwdriver ([Figure 2.17](#)). Install door knob set ([Figure 2.18](#)). If door does not close properly, adjust the strike mechanism on the inside of the door frame with a Phillips head screwdriver. **Note:** Before packing hard door end panel, remove door knob set and re-install door holder brackets.

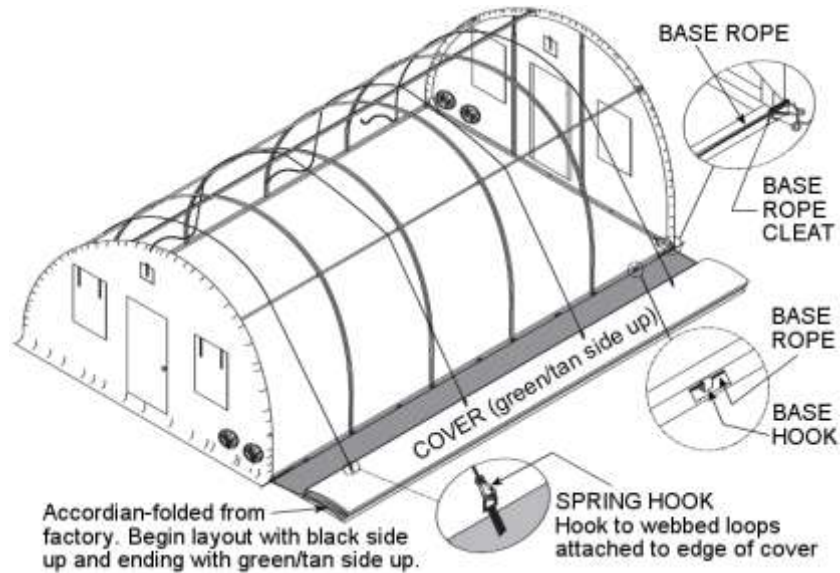
**Figure 2.17. Removal of Door Bracket.**



**Figure 2.18. Door Handle Assembly.**

**2.9.8. Shelter Cover Installation.** Lay out main cover along one side of the shelter (**Figure 2.19**) so that when the cover is pulled over, the ground flap will be on the outside of the shelter and the BLACK side to the inside of the shelter. Tie off one end of the shelter cover's base rope to the SILVER tie off cleat. Stretch the other end of the rope and secure this end to its SILVER tie off cleat. Throw four pull-over ropes over the unit and attach the rope snaps to the pull-over loops along the base edge of the cover that is to be pulled over the frame.

**2.9.8.1.** To pull cover over the frame, four persons should pull in unison on pull-over ropes. Pull the cover up and over the shelter. The GREEN/TAN color should now be on the outside of the shelter. Secure the base rope on the second side of the unit in the same manner as the previous base rope. Align exposed portions of the base rope with base hooks. Work the ends of the cover over the end arches with one person on a ladder and two persons helping from ground level. The cover should overlap the end panel by 4- to 5-in. Ensure the overlap of the cover is the same at each end of the shelter (guy rings should be directly over arches).

**Figure 2.19. Cover Installation.**

2.9.8.2. Starting at one end of the cover, slip the cover contour ropes through the slits in the ground flap. Raise ground flap and secure/tension the contour rope to the RED cleat, using your foot until cover is tight and overlaps the end arches by about 5-in. on each side of the shelter. Once the cover is tensioned securely, attach these ropes to the RED coded cleats on the end of the shelter. Repeat for the other end of the cover. Using the hook tools, secure the base rope along each side of the cover to the base hooks.

**2.9.9. Guy Rope Installation.** Install guy ropes by driving 18-in. guy anchors approximately 36-in. out from side of shelter ([Figure 2.20](#)). Angle top of anchor away from shelter and in line with each arch. Snap end of rope with tent slip to guy loop on shelter and attach other end with snap to guy anchor and tighten tent slip. **Note:** For wind conditions over 40 MPH, install guy ropes.

**Figure 2.20. Guy Rope Installation.**

**2.9.10. Attachment of Floor to Cover End Panels.** Attach floor to the cover ([Figure 2.21](#)); the end panels connect to the floor in a similar fashion.

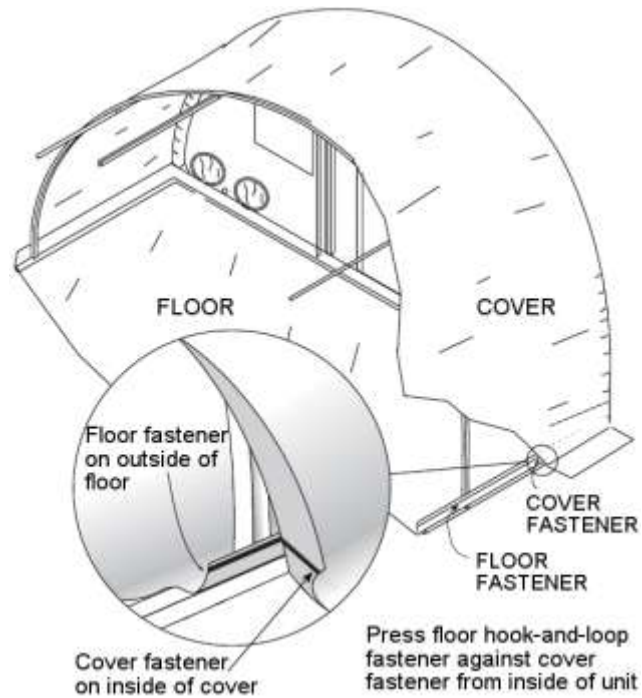
***NOTE:** Paragraph 2.10 deals with the installation of liners no longer in production, but still in use in the field. The Interior Liner Panels (AK-ILP) have been replaced by the improved interchangeable Universal Liner Panels (AK-ULP). Only one set of Liners will be included with each shelter shipped.*

## **2.10. Liner Installation.**

**2.10.1. Interior Liner Installation (AK-ILP).** Line up the beginning of liner with bottom of the first two arches (starting from the end wall) and fasten each side of the liner to the midpoint of each arch. Feed the liner under the first purlins continuing to fasten liner to center purlin. Feed the liner under the center purlin and continue to next purlin feeding the liner under the side purlin. Only side purlins are exposed. Remember, the upper portion of the liners adjacent to the end walls are fastened to the flap from the end walls ([Figures 2.22](#) thru [2.24](#)).



**Figure 2.21. Attachment of Floor to Cover and End Panels.**



**Figure 2.22. Interior Liner Panel Installation.**



**Figures 2.23. Mating Interior Liner Panels.**



**Figure 2.24. Interior Liner Panel Installed.**



**2.10.1.1. “Mid” Liner Installation (MLP01).**

2.10.1.1.1. Layout “mid” liner on ground, with SILVER side up, in the center bay of shelter (mid liner is marked "mid" in middle of SILVER side of liner).

2.10.1.1.2. Feed each end of the liner over the side purlins.

2.10.1.1.3. Line up purlin cutouts on liner with each of the side purlins for proper position of liner.

2.10.1.1.4. Attach the two center hook and loop straps around the arch, one strap on each side of the center purlin.

2.10.1.1.5. Attach remaining hook and loop straps on arch.

2.10.1.1.6. Repeat strap attachment to other arch for other edge of liner.

**2.10.1.2. “Side” Liner Installation (SLP01).**

2.10.1.2.1. Layout liner marked “side” liner, with the SILVER side up, next to “mid” liner in shelter. **Note:** The long edge of the “side” liner without the hook and loop straps must be adjacent to one edge of the “mid” liner.

2.10.1.2.2. Feed “side” liner over side purlins and line up purlin cutouts on the liner with each side purlin (same as steps 2 & 3 of “mid” liner installation).

2.10.1.2.3. Attach hook and loop straps on the next bare arch using procedures similar to the “mid” liner.

2.10.1.2.4. Attach other edge of “side” liner to face of “mid” liner all along hook and loop edge.

**2.10.1.3. “End” Liner Installation (ELP01).**

2.10.1.3.1. Layout liner marked “end”, SILVER side up, next to the “side” liner. **Note:** Edge of liner with hook and loop straps must be facing the end arch in the shelter.

2.10.1.3.2. Feed liner over side purlins and line up purlin cutouts on the liner with each side purlin. Note: The end wall contour rope may be loosened for ease of liner strap installation. However, if loosened, ensure that the end wall contour rope is re-tightened after installation of “end” liner is completed.

2.10.1.3.3. Attach hook and loop fasteners on “end” liner to the end arch. Begin by attaching the straps around each bottom arch section of the end arch, starting at the side purlin and working down to the floor.

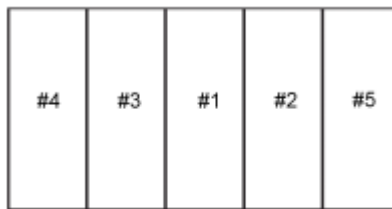
2.10.1.3.4. Attach other edge of liner to face of “side” liner starting from the center purlin and working towards the floor.

2.10.1.3.5. Attach hook fastener on SILVER side of liner to loop fastener flap on end panel above doorway; then attach next two straps above the side purlins.

**2.10.2. Universal Liner Installation.** These interchangeable liners replace ILP liners.

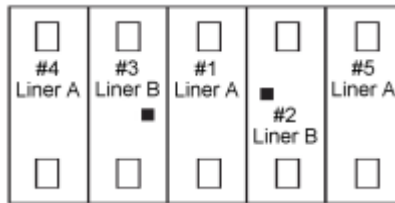
2.10.2.1. **First Liner Installation.** There are 5 interchangeable interior panels for the SSS and Alternate Shelter ([Figure 2.25](#)). There are 3 liners with windows (Liner A) and 2 liners with windows and stove pipe openings (Liner B) for the Version 2 Shelter.

**Figure 2.25. Universal Liner Layout.**



2.10.2.1.1. Layout first liner on ground with SILVER side up, in center bay #1 ([Figure 2.26](#) or [2.27](#)).

**Figure 2.26. Version 2 Shelter Liner Layout.**



**Figure 2.27. Attaching Center Hook and Loop Fasteners on Center Arch.**



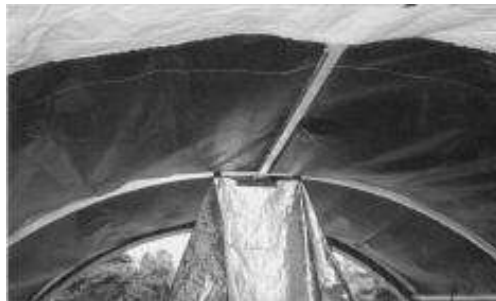
2.10.2.1.2. Attach the two center hook and loop fasteners around the center arch, one strap on each side of the center purlin (**Figure 2.28**).

**Figure 2.28. Remaining Fasteners Attached to Center Arch.**



2.10.2.1.3. Attach remaining hook and loop fasteners on to the center arch (**Figure 2.29**).

**Figure 2.29. Center Hook and Loop Fasteners Attached to Mid Arch.**



2.10.2.1.4. Repeat hook and loop fastener attachment to other arch for other edge of liner.

**2.10.2.2. Second/Third Liner Installation.**

2.10.2.2.1. Layout second liner, SILVER side up, next to the first liner in the 2nd center bay.

2.10.2.2.2. Attach the two center hook and loop fasteners on Liner #2 to the mid arch between the end panel and the center arch (**Figure 2.30**).

**Figure 2.30. Second Liner Attached to Face of First Liner.**



2.10.2.2.3. Attach the Second Liner to the face of the First Liner. Begin by attaching the liner to the peak of the end panel and work down to the floor (**Figure 2.31**).

**Figure 2.31. Liner Attached to End Panel.**



2.10.2.2.4. Repeat the same actions for the Third Liner.

**2.10.2.3. Fourth/Fifth Liner Installation.**

2.10.2.3.1. Layout Fourth Liner next to end panel, SILVER side up.

2.10.2.3.2. Attach Fourth Liner to the shelter end panel by attaching the hook and loop fastener (on the face of the liner) to the hook and loop fasteners sewn to the overhang on the end panel. Start at the peak of the shelter and work down to the floor ([Figure 2.32](#)).

**Figure 2.32. Fourth/Fifth Liner Installed.**



2.10.2.3.3. Attach other edge of Fourth Liner to the face of the Second Liner. Start at the peak of the shelter and work down to the floor ([Figure 2.32](#)).

2.10.2.3.4. Repeat for Fifth Liner.

**2.11. Electrical System Installation.** Installation of the electrical system has been modified with new parts and procedures. The next paragraph details the original wiring harness assembly procedures using the plastic distribution box (EL-DB), and receptacles which may still be in use, but have been discontinued. [Paragraph 2.11.2](#) details the modified electrical system using a metal distribution box (EL-DB01) and universal receptacle lines with molded triplex outlets. See Attachment 3 for power distribution box recommended wiring modifications.

**2.11.1. Plastic Distribution Box (EL-DB) and Receptacle Lines.** The distribution box is installed on the upright pole adjacent to the 16-in. ECU return inlet. Place the distribution box approximately 4-ft high and fasten it to

upright pole. There are 3 cables from the distribution box with female connectors for the string lights and receptacles, and 1 cable with male connector for incoming power. Facing distribution box, connect first string of 4 receptacles to the distribution box and place the cable along the left side of the end wall approximately 2-ft high to the arch frame. Continue to run the cable along side of the shelter and fasten a receptacle on each arch. Take the second string of four receptacles and place the cable over the doorway to the right side of the shelter and fasten receptacles on each arch frame ([Figure 2.33](#)).

**Figure 2.33. Plastic Distribution Box Installed.**

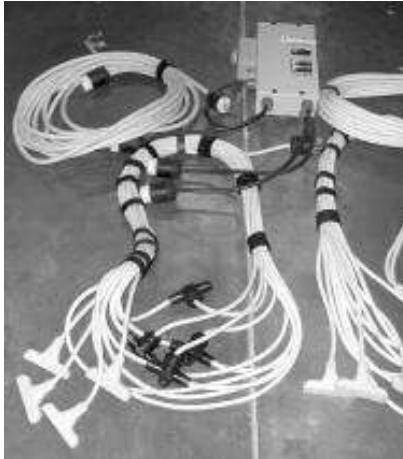


**2.11.2. Metal Distribution Box (EL-DB01) and Universal Receptacle Lines.** The metal distribution box is installed on the upright pole adjacent to the 16-in. ECU return inlet. Place the distribution box approximately 4 feet high and pin to the upright pole. There are 3 cables extended from the distribution box with female connectors for the string lights and receptacles, and 1 cable with male connector for incoming power. The 18-ft and 25-ft receptacle lines have been replaced with (4) pre-molded triplex receptacle hubs (8 total electrical receptacles) each having (3) electrical outlets, for a total of (24) electrical outlets per shelter. The Universal Receptacle line attaches to the



purlins in the shelter by the use of hook and loop straps, and the “hubs” hang down on each arch approximately 2-ft from the ground ([Figure 2.34](#)). Facing the distribution box, connect the first receptacle line of 4 receptacle hubs to the distribution box and place the cable along the left side of the end wall approximately 2-ft high to the arch frame. Continue to run the cable along side of the shelter and fasten a receptacle on each arch. Take the second receptacle line of 4 receptacle hubs and place the cable over the doorway to the right side of the shelter and fasten receptacles on each arch frame.

**Figure 2.34. Metal Distribution Box w/Receptacle Lines & Power Cable.**



**2.11.3. String Lights.** Run the string light cable from the distribution box over the top of the window to the left side (facing the distribution box) of the end wall. Continue to place the cable along side of the purlins and place the first three light sockets approximately 10-ft apart. Next, run the cable along side the fifth arch to the purlins on the right side of the shelter. Place the next three light sockets approximately 10' apart along the purlins heading back in the direction of the distribution panel ([Figure 2.35](#)).

**WARNING:** Double check all connections per the above paragraph for proper hookup prior to applying electrical power.

**Figure 2.35. Modified String Lights & Receptacle Lines, Triplex Outlets.**

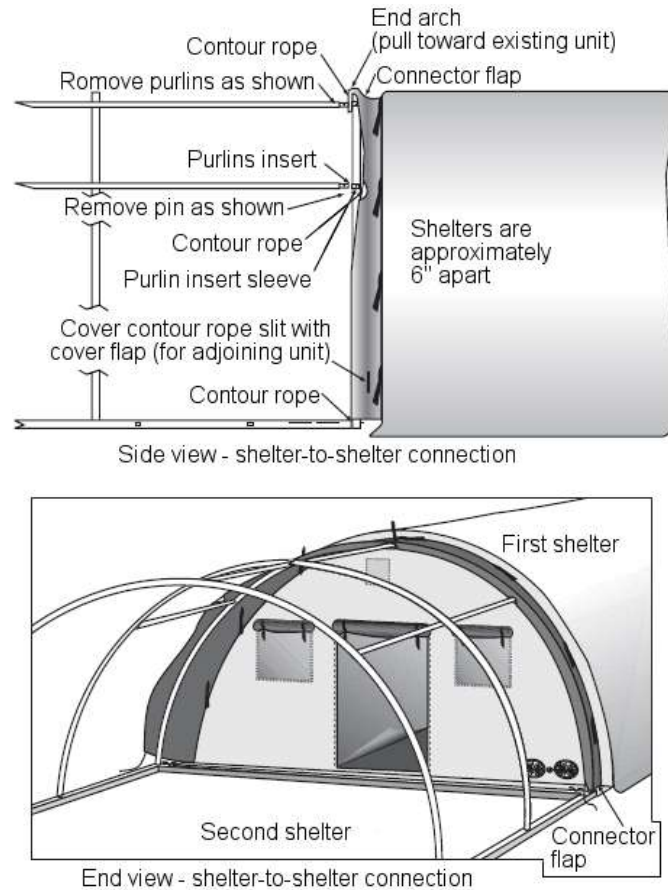


2.11.4. **Electrical System Checkout.** Once the above electrical connections have been made and double checked, turn on circuit breakers in the distribution box and function test all lights and receptacles. If a problem is found, use troubleshooting procedures in TO 35E5-6-11, paragraph 3-7.1.

**2.12. Plenum Installation.** Lay out the straight section of the plenum on the shelter floor parallel with the center purlins. Attach the first grommet to the second center purlin from the end wall where the ECU will be set up. Take the next strap attached to the plenum (straight section) and attach it to the third center purlin ([Figure 2.36](#)). Continue the procedure to install the rest of the straight section. After the plenum straight section is completely installed, connect the elbow section to the inlet (supply) of the air conditioner ([Figure 2.37](#)). Take available strap or strings and connect it to the appropriate grommet (elbow section) and tie it to purlins and end section arch to prevent the plenum from blocking the end section window.

**Figure 2.36. Plenum Installed in Peak of Shelter.****Figure 2.37. Plenum Attachment to ECU Supply Duct.**

**2.13. Shelter-to-Shelter Connection.** After the first shelter is complete, start erecting the second shelter 6-in. from the end of the first shelter with the connector flap ([Figure 2.38](#)). After the frame section of the second shelter is complete (including the base frame closest to the 1st shelter), pull over the connector flap (first shelter) to the end arch frame section (second shelter) and attach the connector flap to the frame. This can be done with the zippered end panels on each shelter facing each other, with either end panel on only one shelter, or with both shelters with no end panels.

**Figure 2.38. Shelter-to-Shelter Connection – Side & End Views.**

**NOTE:** If an end panel is desired on the 2nd shelter, the end panel on the 2nd shelter must be installed before attaching the connector flap to the 2nd shelter frame.

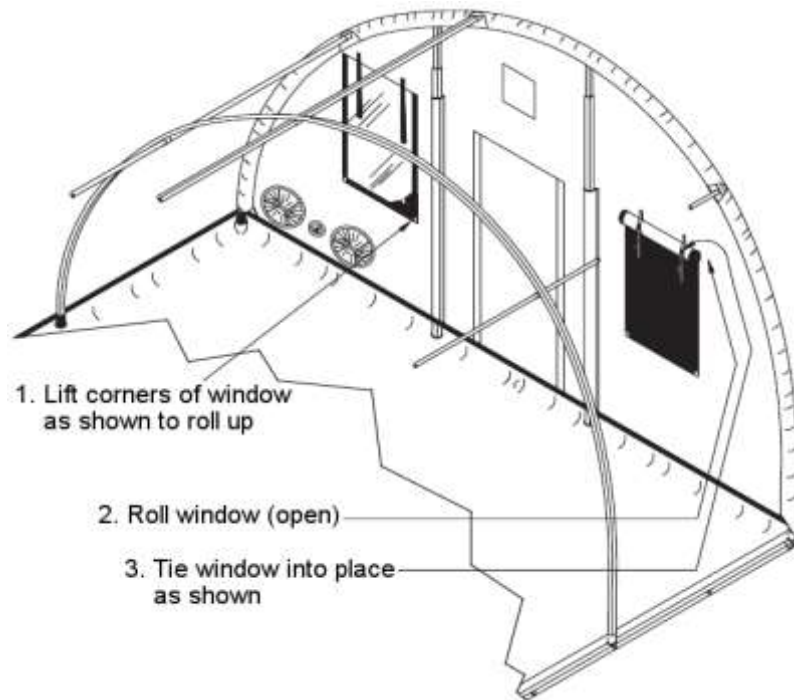
2.13.1. To attach the connector flap to the end arch frame section, disconnect the end purlins and insert the contour rope under the end purlins and reconnect the end purlin to the end arch frame (the same procedure as connecting an end wall panel section). Then pull and tie the connector flap contour rope to the GREEN tie-off cleat on the second shelter end base frame. Do not tie the connector flap contour rope so tightly that the connector flap is “drum” tight. Allow the connector flap to develop a “V” shape trough between the two shelters to aid with water runoff. The next step is to pull the cover over the second shelter frame.

***NOTE:** The second shelter connector flap must be on the opposite side of the second shelter in reference to the first connector flap. When pulling the cover over the frame, place the end of the cover in the “V” shaped trough between the shelters, then feed the cover contour rope through the rope slit on the connector flap ([Figure 2.38](#)). Maximize the tension and tie the contour rope to the RED cleat on the second shelter end base frame and continue to follow the normal cover installation procedures.*

2.13.2. When two shelters are connected end to end, it is recommended that the double headed spike in the center end base piece be removed to eliminate a tripping hazard (see [paragraph 2.14](#) for Spike Puller Usage).

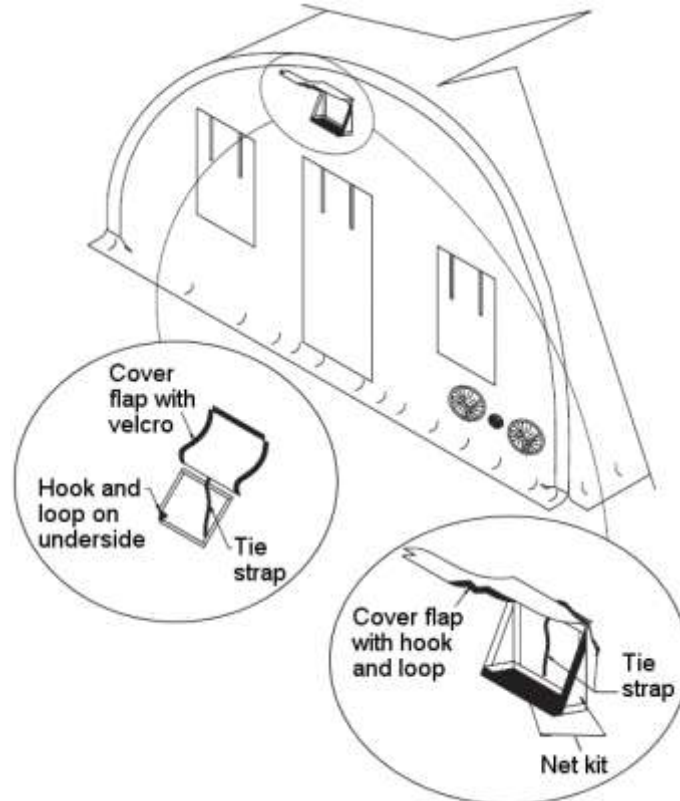
**2.14. Spike Puller Usage.** Place a piece of dunnage or sledgehammer (head section) next to the shelter’s base frame. Put the flat portion of the spike puller between the bottom and top of the spike’s head. Make sure the spike puller is resting on the dunnage. This will prevent damage to the aluminum base frame. Exert downward pressure from the top of the spike puller to separate the spike’s head from the base frame. If necessary, add more dunnage to increase leverage and continue to pry the spike.

**2.15. Installation of Shelter Windows.** See [Figure 2.39](#) for location of windows and roll-up instructions.

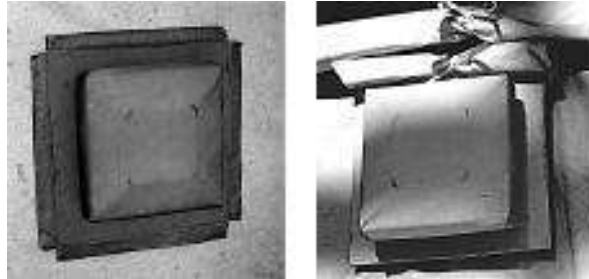
**Figure 2.39. Shelter Windows.**

**2.16. Installation of End Panel Net Inserts.** The mesh screen inserts attach to the 12-in. x 12-in. vent opening above each door with hook and loop fasteners ([Figure 2.40](#)).

***NOTE:** Plastic Vent Caps are no longer in production, but are still in use in the field. They have been replaced with an attached part (Net Vent opening in the end panel). Plastic Vent caps will appear in both the Inventory and Parts List, but may not be in inventory if shelter has the modified end panel.*

**Figure 2.40. End Panel Net Inserts.**

**2.17. Plastic Vent Cap Installation.** Loosen the 16-in.x16-in. flap from the loop fastener at the upper portion of the end wall. Roll the flap inward until it clears the entire opening and tie it with the tie strap. This will prevent water accumulation. Place the plastic vent over the opening and fasten the four flaps from the plastic vent to the four flaps of the opening. Make sure all flaps are completely sealed. This will aid the cooling and heating process of the shelter ([Figure 2.41](#)).

**Figure 2.41. Plastic Vent Cap Installation.**

**2.18. Stove Pipe Flange Installation.** A modification kit is available for adding a 6-in. diameter stove pipe flange to any existing SSS. The kit includes a 6-in. stove pipe flange sewn to a 12-in. x 12-in. piece of green or tan vinyl ([Figure 2.42](#)). To install, lay the cover out and carefully measure and mark the position of each flange kit to be added ([Figure 2.43](#)). Each flange can be attached to the cover of the shelter with vinyl glue or by using a hand-held heat welder (instructions for using a hand-held heat welder are available from the manufacturer upon request).

**2.19. Emergency Shutdown.** In case of fire or other critical emergency situation, disconnect electrical power at the distribution box or, if time permits, at the electrical power generator system.

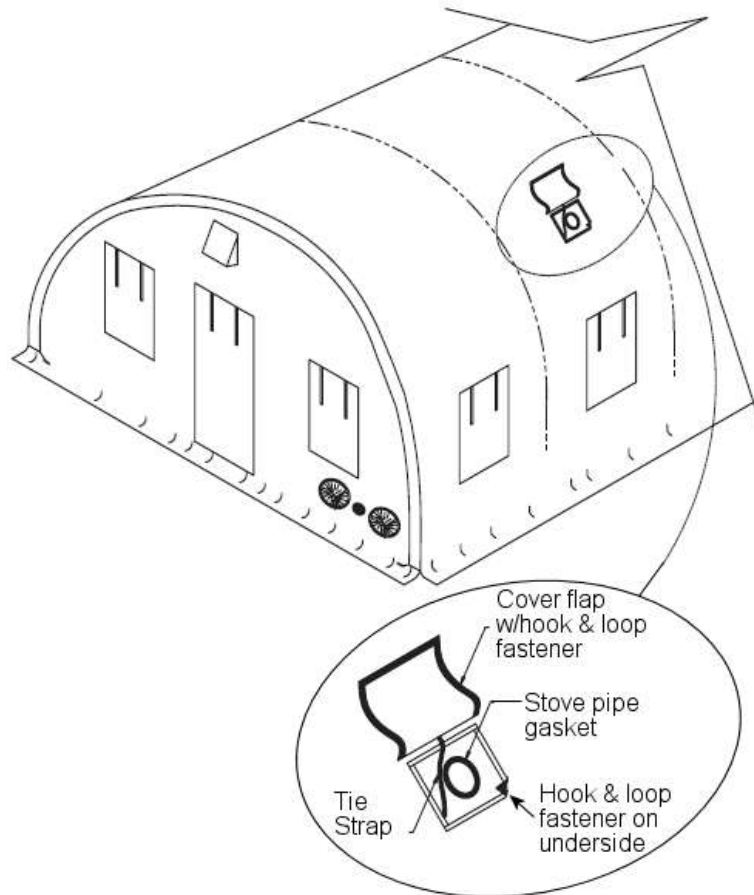
**2.20. Tear Down and Preparation for Shipment.**

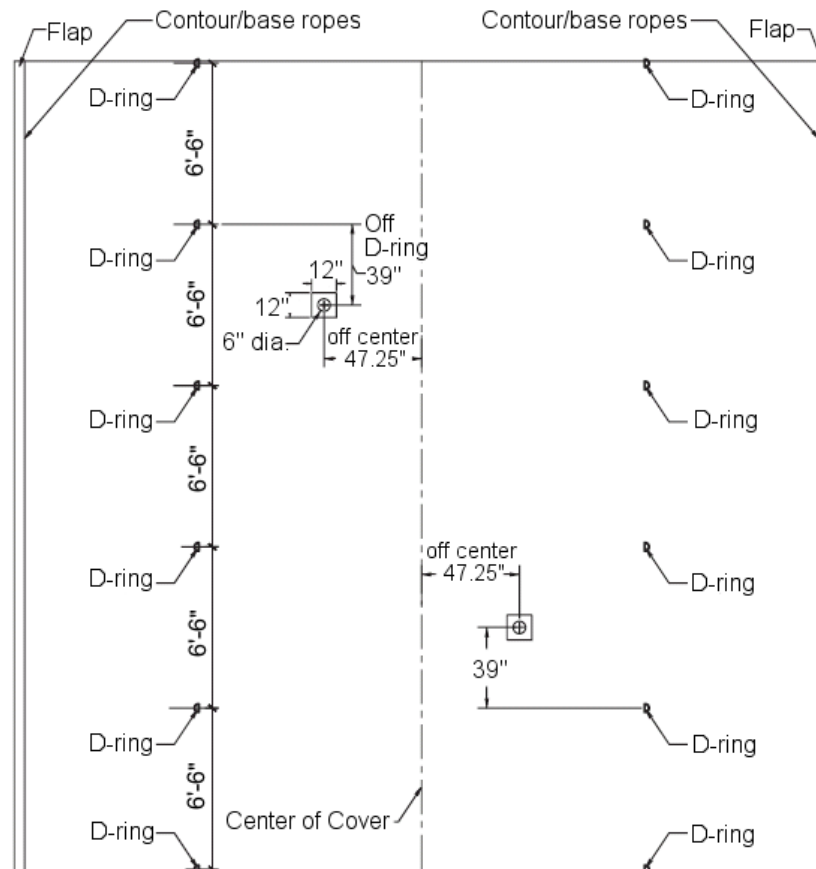
**2.20.1. ECU, Disconnect and Pack Up.** For disconnection and pack up procedures of the ECU, refer to appropriate ECU Technical Manual.

**WARNING:** Ensure all power is disconnected from electrical system at the source prior to starting disconnection and pack up. Failure to observe WARNING may result in serious injury or death to personnel.



**Figure 2.42. Stove Pipe Flange Installation Detail.**



**Figure 2.43. Location of Pipe Flanges (Top view of shelter cover).**

**2.20.2. Electrical System, Disconnect and Pack Up.** Disconnect and pack up components of the electrical system in the reverse order of installation procedures listed in [paragraph 2.11](#).

2.20.3. **Removing Spikes with Spike Puller.** Place a piece of dunnage or sledgehammer (head section) next to the shelter's base frame. Put the flat portion of the spike puller between the bottom and top of the spike's head. Make sure the spike puller is resting on the dunnage, as this will prevent damage to the aluminum base frame. Exert downward pressure from the top of the spike puller to separate the spike's head from the base frame. If necessary, add more dunnage to increase leverage and continue to pry the spike.

2.20.4. **Shelter Tear Down.** Shelter tear down is performed in reverse order of set-up procedures listed in [paragraph 2.9](#) with the following exceptions:

2.20.4.1. Pullover ropes are not required when removing cover.

2.20.4.2. Do not force pins. Wiggle joints, tap gently, and pull gently to unpin joints.

2.20.4.3. Do not throw or drop components from great heights.

2.20.4.4. Use spike puller and dunnage directly under spikes to raise spike heads. Twist spikes if necessary to loosen and pull.

2.20.4.5. All components should be clean and dry prior to packing. Do not pack covers, end panels, floors, or liners if wet; if necessary to do so, take out and unfold covers, end-panels, floors, and liners to dry at first opportunity.

2.20.5. **Shelter Pack Up.** After tear down, pack shelter in containers in reverse order of removal (see TO 35E5-6-11, paragraph 4.6, for detailed procedures).



## Chapter 3

### TEMPER TENT

**3.1. Characteristics.** The TEMPER tent ([Figure 3.1](#)) is a modular soft-walled shelter consisting mainly of synthetic fabric material supported by an aluminum frame structure. Its modular construction allows many different facility sizes. The basic tent module measures 8 ft by 20 ft. These modules are connected together to form various configurations, the most common being the 32 ft by 20 ft billeting tent. This basic billeting unit weighs about 1200 pounds. In addition to the billeting tent, TEMPER tents may be used for several other functions such as latrines, administrative offices, shops, kitchens, shower/shave units and medical facilities. TEMPER tents are designed for desert, tropical and temperate climates and come in both desert tan and forest green colors. The tent is designed to withstand steady wind of 50 mph and gusts up to 65 mph. Utility support for these tents includes electrical service for lighting and convenience outlets and provisions for heating and cooling using the bare base ECU or the new field deployable environmental control unit (FDECU).

**Figure 3.1. Tent City Constructed from TEMPER Tents.**



**3.2. Major Components.** The TEMPER tent has many major components. Only the most common ones will be addressed in this handbook; consult Technical Order 35E5-6-1, *Tent, Extendable, Modular, Personnel (TEMPER)*, for expanded details.

3.2.1. Fabric. The major fabric components include the window section, end section, door section and fly ([Figure 3.2](#)). Both the window and door sections are 8-ft wide, enough to cover one section of tent frame. The end section contains door and window openings and spans the 20 ft dimension of the tent. The fly covers the roof of the tent and provides insulating support.

**Figure 3.2. TEMPER Tent Fabric Components.**



3.2.2. Frame. The TEMPER tent metal frame ([Figure 3.3](#)) consists of arches, ridge joints, headers and purlins that are pinned together to form a rigid structure.

**Figure 3.3. TEMPER Tent Frame Components.**



3.2.3. Ridge Extenders ([Figure 3.4](#)). Ridge extenders are attached to the ridge points of the frame structure to hold up the fly.

**Figure 3.4. Ridge and Eave Extenders.**



3.2.4. Eave Extenders ([Figure 3.4](#)). These items are attached to the eave of the frame structure to hold up the fly.

3.2.5. Liner. The tent liner, installed inside the tent, increases insulation value and also helps keep the inside of the tent clean ([Figure 3.5](#)).

**Figure 3.5. Installed Liner with Plenum and Lighting.**



3.2.6. Fabric Plenums ([Figure 3.6](#)). These fabric ducts are hung inside the tent to channel heated and cooled air from the ECUs.

**Figure 3.6. Fabric Plenums.**

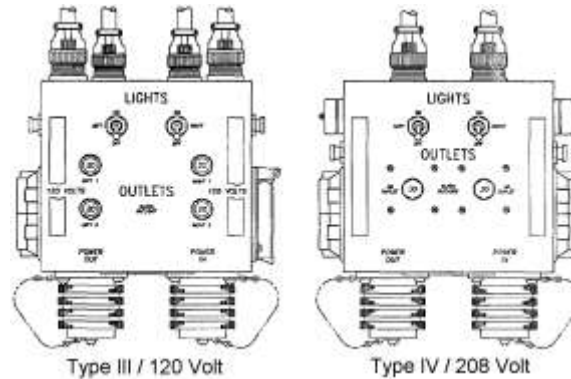


3.2.7. Vestibule. The vestibule is a covered entranceway into a tent or a covered passageway between tents ([Figure 3.7](#)).

**Figure 3.7. Vestibule.**



3.2.8. Power Distribution Box. This distribution box is mounted inside the tent and connects the external power supply to the internal lights and outlets ([Figure 3.8](#)).

**Figure 3.8. Power Distribution Box.**

**3.3. Site Preparation.** Select a site that will accommodate the number of sections to be erected and is relatively level, well drained, and free from debris such as stones, roots and underbrush. Obviously, the tents should not be placed in a location subject to jet blast or high winds.

**3.4. Component Layout.** TEMPER tents are packaged for shipment in two types of containers; the Rowley box ([Figure 3.9](#)) holds one tent and the Ship/Store Container ([Figure 3.10](#)) holds four. As you unpack the containers, make a quick inventory of the contents to ensure all major items are present. Place the components along the edge of the tent site in the order of use. Normally, the components will be laid out as identified in [Table 3.1](#).

**Figure 3.9. Rowley Box.**



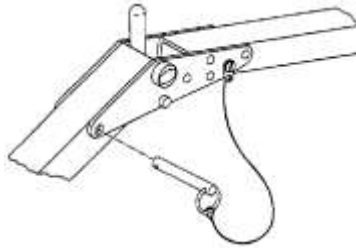
**Figure 3.10. Ship/Store Container.****Table 3.1. Component Layout Instructions.**

<i>Component Layout</i>
1. Line up each frame bundle along the site edge
2. Place window sections between frame sections
3. Place end walls at each end of the tent
4. Place fly at every other window section.
5. Place intermediate liners next to window sections
6. Place end section liners next to end sections.

**3.5. Assembly Instructions.**

**3.5.1. Frame Assembly.** Assembly of the frame is a straightforward process and is erected in three stages: kneeling, partially-erect, and erect. These stages permit the attachment of components without the aid of ladders. The arches are assembled first and then they are joined together with purlins. Take care when handling the arches during assembly to ensure they do not twist, which may damage the arch assembly. **CAUTION:** The ridge and eave hinges are common pinch points for fingers and hands. Serious injury may result if one is not paying close attention. Assemble the arches top to bottom, and an end section towards the opposite end section as follows.

3.5.1.1. Remove an arch assembly from one of the frame bundles and make sure the locking pins are hanging free. Spread the center section to align holes in the arch with those in the ridge joint and insert the locking pin as shown in [Figure 3.11](#).

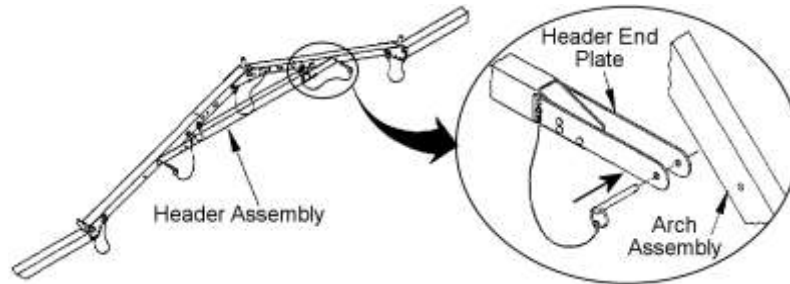
**Figure 3.11. Ridge Joint Assembly.**

**NOTE:** Insert locking pins towards the inside of the tent on the end assemblies. The tent fabric may tear if they are inserted towards the outside.

3.5.1.2. Connect the roof arch assembly and side arch assemblies to form a complete arch assembly by aligning the holes and inserting locking pins as shown in [Figure 3.12](#).

**Figure 3.12. Connecting Roof and Side Arch Assemblies.**

3.5.1.3. Pin the header assembly to the arch assembly between the ridge and eave. With the interior angle of the header assembly end plate facing up, slide the header assembly end plates over the arch assembly and insert the locking pins ([Figure 3.13](#)).

**Figure 3.13. Header-to-Arch Connection.**

3.5.1.5. Repeat the above procedures for the remaining arches required for the tent size being erected.

3.5.1.6. Gather five purlins to connect two arches (one at the ridge, two at the eaves, and two at the bases).

**NOTE:** Special purlins are used at entrance doors—and can be recognized by a flat plate in the center of the purlin. Ensure door sill purlin is used with door section.

3.5.1.7. Starting at the end arch, hold two arch assemblies upright eight feet apart and parallel in the kneeling position. Install the purlin at the ridge by inserting the end tabs into each arch assembly boss simultaneously ([Figure 3.14](#)).

**Figure 3.14. Purlin-to-Arch Connection.**

3.5.1.8. Rotate the purlin 90 degrees so that tab locks in the boss of both ridge joints.

3.5.1.9. Connect the diagonal purlin braces by unfastening the restraining straps and rotating them toward the arch assembly.

3.5.1.10. While holding the brace shackle at the end of the purlin braces, align and insert the brace tabs into the arch assembly slot located two feet from the ridge (**Figure 3.15**).

**Figure 3.15. Diagonal Brace to-Arch Connection.**



3.5.1.11. Rotate the brace shackles 90 degrees to lock tabs into the arch slots and lock the diagonal braces by pressing the brace shackles down towards and along the arch assembly leg until they are secure (**Figure 3.16**).

**NOTE:** Locking brace shackles towards the purlin diagonal brace may collapse the arch assembly causing injury to personnel or damage to equipment.

**Figure 3.16. Locking Tab Handle.**



3.5.1.13. Continue installing purlins until all arches have been connected. Alternate the direction of ridge purlin diagonal braces to provide added structural rigidity. The braces on the eave purlins are installed pointing toward the base of the tent. When the entire frame assembly is complete, it should remain in the kneeling position as shown in **Figure 3.17**. The frame structure will not be raised until fabric components are attached.

**Figure 3.17. Assembled TEMPER Tent Frame.**



**3.5.2. Fabric Covering.** This phase of TEMPER tent erection involves placing the window and door sections on the frame, attaching the end walls and installing the fly. A minimum of two personnel are required to accomplish the fabric covering tasks. Make sure door sections, if used, are placed where door purlins have been installed and stovepipe openings of all sections are on the same side of the frame.

**3.5.2.1. Window/Door Section.**

3.5.2.1.1. With one person on each side of a window/door section, locate the large spindle grommets at the center of each side of the section.

3.5.2.1.2. Carry the section to the center of the frame and place the spindle grommets over the spindles at the ridge joints (**Figure 3.18**).

**Figure 3.18. Large Grommet Placed Over Ridge Joint Spindle.**



3.5.2.1.3. Repeat the previous two steps for each roof section to be installed. If it is known where the ECU for the tent will be located, ensure the duct ports in the tent are appropriately installed near the unit's position.

3.5.2.1.4. Once all the window and door sections are in place on the frame, lacing of the sections can begin. Only one side of the tent roof is laced initially; the second side is laced after the fly is partially installed. To make the lacing easier, place the large eave grommet of one section out of each pair being laced over its eave spindle. This tightens one side of the section pairs. Begin lacing at the ridge joint and progress down to the eave line.

3.5.2.1.5. Insert the first and second laces through the first and second grommets near the ridge.

3.5.2.1.6. Run second lace up through the loop in the first lace and pull second lace tight away from the ridge ([Figure 3.19](#)).

3.5.2.1.7. Insert third lace through third grommet and through loop in second lace and pull tight away from the ridge.

3.5.2.1.8. Close the hook and pile fastener weather flap as lacing progresses ([Figure 3.20](#)).

**Figure 3.19. Typical Lacing Pattern.**



**Figure 3.20. Closing of Hook and Pile Fastener Weather Flap.**



3.5.2.1.9. Continue lacing in the same manner until reaching the next-to-last lace from the eave. Run the next-to-last lace through the loop in the last lace. Pull the next-to-last lace back toward the ridge and tie it off with a half-hitch knot ([Figure 3.21](#)).

**Figure 3.21. Tying Half-Hitch Knot in Last Lace at Eave.**

3.5.2.1.10. Make sure the large eave grommet of the second section of the pair is placed over the eave spindle. Do not lace below the eave line at this time.

3.5.2.1.11. Continue lacing sections together up to the eave on the one side until completed.

#### 3.5.2.2. End Wall Sections.

3.5.2.2.1. Place the large grommet at the peak of the end wall over the ridge spindle ([Figure 3.22](#)). Next, place the eave grommet of the end wall (side with laces) over the eave spindle.

**Figure 3.22. Placement of End Wall Peak Grommet.**

3.5.2.2.2. Lace both sides of the end wall to their adjacent respective window sections and tie off with half hitches. Install second end wall in same fashion.

3.5.2.3. **Tent Fly.** Once end walls are in place, the tent fly is installed.



3.5.2.3.1. Place ridge extenders over all ridge spindles and secure with locking pins (**Figure 3.23**).

**Figure 3.23. Installation of Ridge Extenders.**



3.5.2.3.2. Lay out tent fly sections on the ground adjacent to the side of the tent and lace sections together. Start lacing at the ridge grommets and work toward the eaves (**Figure 3.24**). Close weather flap as you go.

**Figure 3.24. Lacing of Tent Fly.**



3.5.2.3.3. Once the fly is completely laced, roll it from both sides toward the middle where the ridge grommets are located. If internal tent heaters are to be used, make sure vent stack ports in the fly are on the same side of the tent as the ports in the tent roof.

3.5.2.3.4. With an individual at each center grommet, pick the rolled fly up and carry it to the ridge line of the tent on the roof side of the tent that has not been laced up yet.

3.5.2.3.5. Place the center grommets of the fly over the ridge extenders and install the hitch-pin clips to secure the fly ([Figure 3.25](#)).

**Figure 3.25. Placement of Tent Fly Over Ridge Extenders.**



3.5.2.3.6. Unroll the fly down the sides of the roof to the eaves. The roof side of the tent that has not yet been laced should be laced now and weather flap closed as the fly is being unrolled.

3.5.2.3.7. Make sure eave grommets of all window/door sections are over eave spindles. Install eave extenders over eave spindles (brace of eave extender points toward ridge). Insert the hitch-pin clips to secure eave extender to eave spindle ([Figure 3.26](#)).

3.5.2.3.8. Place eave grommets of the fly over eave extender spindles and secure the fly in place with hitch-pin clips as shown in [Figure 3.27](#).

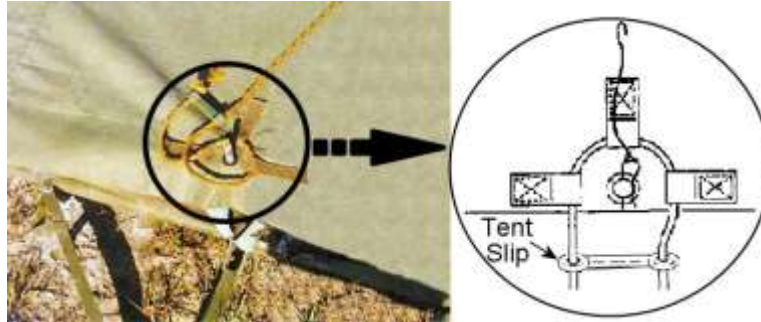
**Figure 3.26. Installation of Eave Extenders.**



**Figure 3.27. Tent Fly in Place over Eave Extenders.**



3.5.2.3.9. Attach guy ropes to the tent fly at each eave extender spindle location and both ridge extender spindle locations on the end walls. The guy rope is threaded through one side of a tent slip, then through the webbing loops of the fly and back through the other side of the tent slip ([Figure 3.28](#)). Knot the end of the rope so it doesn't slide back through the tent slip.

**Figure 3.28. Attachment of Guy Rope to Tent Fly.**

3.5.2.3.10. Additional guy ropes are attached to eave and end wall ridge extenders at their bases. The guy rope is threaded through a tent slip, placed through the brace and around the pole of each extender and back through the other side of the tent slip (**Figure 3.29**). Again, the rope is knotted off at the tent slip.

**Figure 3.29. Attachment of Guy Ropes to Eave and Ridge Extenders.**

**3.5.3. Frame Erection.** When the tent fly is in place, the tent frame is lifted to the partially-erect position. Any desired internal components are then installed before raising the second side of the tent.

3.5.3.1. Roll up the unlaced sidewalls of the tent and place them between the roof and tent fly. Ensure guy ropes are also out of the way. **Caution:** Prevent fabric from falling into the ridge and eave hinge joints to prevent the material from ripping or tearing.

3.5.3.2. Ensure the locking pin at each eave joint is hanging freely and locking holes in arches are clear of foreign materials.

3.5.3.3. With two people at each eave joint, lift the frame to shoulder height. Pull in the leg of the arch and place the weight of the tent assembly on the arch leg (**Figure 3.30**). Be careful not to twist or bend frame components when lifting the tent assembly.

**Figure 3.30. Raising Tent Frame Assembly.**



3.5.3.4. Align the holes of the eave joint and arch leg and insert the locking pin (**Figure 3.31**). Insert locking pins towards inside of tent on end assemblies; this will prevent the locking pin's tip from tearing the tent fabric.

3.5.3.5. Secure the roof fabric to the eave purlins using the hook and pile fastener connections on the purlin flap (**Figure 3.32**). The tent is now in the partially-erect stage.

**Figure 3.31. Eave Joint Assembly.**



**Figure 3.32. Securing Purlin Flaps.**



3.5.3.6. At this point, install internal components as described in [paragraph 3.6](#) before fully erecting the tent frame.

3.5.3.7. Fully erect the frame by raising the second side of the tent in the same fashion as used to partially-erect the frame on the first side.

3.5.3.8. Roll down the tent walls, lace up all the sides and close the weather seal flaps.



3.5.3.9. Use 12-inch metal steel pins to stake down frame footings at the base of each arch. Stake one side of the tent first, and then adjust the other side to ensure it is a maximum of 20-ft and 4-in. at the base. If you have installed the flooring, stake the side of the tent that the flooring is tied to first.

3.5.3.10. Attach bottom purlin flaps to the base purlins.

3.5.3.11. Pull the sod cloth under the base purlins and end walls ([Figure 3.33](#)).

**Figure 3.33. Sod Cloth Placement.**



3.5.3.12. Install 24-in. wooden stakes 10-ft from sides and ends of tent at each eave extender. Normally, stakes are slanted toward the tent.

3.5.3.13. Connect guy rope from the eave extender to bottom notch of the stake and the guy rope from the tent fly goes to the top notch of the stake.

3.5.3.14. If high winds are expected, secure high wind lines from the fly (between the eave extenders) to the top notch of stakes on each side of lines.

**3.6. Internal Component Installation.** Most internal components (e.g., single ply flooring, liner, electrical system, and plenum) of the TEMPER tent are partially installed while the tent frame is in the partially-erected position and

then completed after the tent frame has been fully erected. The single ply flooring, liner, electrical system, liner and plenums will be addressed.

3.6.1. Clear and level the ground before installing the floor to prevent sharp objects from damaging the tent floor. Unfold the flooring sections and install one 8-foot section at a time black side down ([Figure 3.34](#)).

**Figure 3.34. Flooring Section Installation.**



3.6.2. Tie the edge of each flooring section to the base purlins on the raised side of the tent frame using the tie straps attached to the flooring.

3.6.3. Spread all the flooring sections out alternating hook and pile fasteners. Smooth out the flooring as much as possible and cover all exposed ground.

3.6.4. Remove the electrical distribution box from the electrical component package and place it on the floor to the left of the tent entrance.

3.6.5. Route the power supply cables leading out of the box so that they will be between the liner and end wall. Wrap them once around the end wall arch header to relieve strain on the cables.

3.6.6. Route supply cables for convenience outlets down the end wall arch and out on the eave purlins. The outlet lines will be plugged into these supply cables once the liner is up. Route supply cables for overhead lighting along the end wall arch header down to the header-arch connection ([Figure 3.35](#)). Overhead lighting cables will connect to these supply lines once liner is up.



**Figure 3.35. Electrical Cable Routing.**



3.6.7. Install light support strap assemblies between arches near the arch-header connection points ([Figure 3.36](#)). Let the white straps on the support strap assemblies hang freely.

**Figure 3.36. Light Support Strap Assemblies.**



3.6.8. Bring a tent liner section inside the tent and unfold it.

3.6.9. Locate the three support straps on the liner, wrap one end of each strap around the ridge purlin and connect it to the corresponding end ([Figure 3.37](#)).

**Figure 3.37. Overhead Liner Connections.**



3.6.10. Use bow knots to tie center tie tapes to headers and side tie tapes to adjacent frame members.

3.6.11. Install remaining liner sections to include end walls. Fasten liners together using the hook and pile fastener strips along their edges.

3.6.12. Prepare end wall or sidewall plenums for installation. Attach intake end of plenum to ventilation sleeve in the tent wall ([Figure 3.38](#)). Attach the plenum duct to arch headers using the ties along the sides of the plenum.

**Figure 3.38. Plenum Connection to Ventilation Sleeve.**



3.6.13. Attach plenums together using the hook and pile fasteners and connect them to tent frame headers until required length is reached. Install plenum cap on last section.

3.6.14. Raise the second side of the tent frame using the same procedures as described in [paragraph 3.5.3](#).

3.6.15. Lace the remaining end and sidewall sections and close weather flaps.

3.6.16. Attach tent fabric purlin flaps to base purlins and pull sod cloth under the base.

3.6.17. Spread out floor sections, connect them together using the hook and pile fasteners and tie them to the base purlins.

3.6.18. Place electrical distribution box stand between the liner and end wall tent fabric adjacent to where the electrical box was initially placed.

3.6.19. Extend the stand until its upper flange meets the header, insert the hitch-pin clip near the base of the stand to lock the stand in place, and then stake it to the ground ([Figure 3.39](#)).

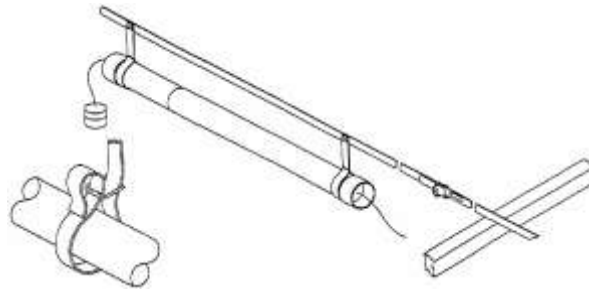
**Figure 3.39. Electrical Distribution Box Stand.**



3.6.20. Hang the distribution box on the stand plate by inserting the mounting bolts in the rear of the box through keyhole slots on the plate.

3.6.21. Prepare light fixture for installation by wrapping light hanger straps inside the rubber end caps at each end of the fixture (**Figure 3.40**). Secure straps using their hook and pile fasteners. Ensure male plug end of fixture is facing the electrical distribution box.

**Figure 3.40. Installation of Light Fixtures (liner removed for clarity).**



3.6.22. Install all remaining light fixtures on both sides of the tent and plug them together. Plug fixture strings into supply lines from the distribution box. Also attach convenience outlet strings to their supply lines. Route cables as necessary through the liner.

3.6.23. The lighting system described in the preceding paragraphs is commonly used in specialized BEAR facility packages such as the air transportable hospital. When low level lighting is adequate, TEMPER tents used by Air Force personnel will have an incandescent lighting system installed. This system consists of a junction streamer, two light streamers (3 lights each), and two outlet streamers. The junction streamer is plugged into the power distribution panel (part of the BEAR electrical system) located outside the tent and is run under the outside fabric and into the tent (a qualified electrician should make the connection). The outlet and light streamers are plugged into a receptacle box at the end of the junction streamer. The lights have hooks attached to them enabling them to be hung from the tent frame structure and slipped through the tent liner at the hook and pile fastener seams.

The light strings also have receptacles and plugs at their ends allowing them to be connected together. Normally one light streamer is installed on each side of the tent air plenum. All cabling is installed between the tent and its liner as much as possible.

**3.7. Vestibule Assembly.** The vestibule assembly is used either as an entranceway to a tent or as a connecting passageway between two tents. While a vestibule is useful in helping maintain cleanliness of the tent and providing a weather barrier at an entrance, it is not required for a TEMPER tent to function properly. A vestibule can be connected to either an end wall or side wall door opening. It is installed as follows.

3.7.1. Unroll the vestibule adapter around the door opening. Unfold and spread out the vestibule fabric itself.

3.7.2. Find and align the center grommets in the adapter and the vestibule fabric. Lace the vestibule to the adapter starting at the ridge and working down to eaves. Tie off at the eave using a half hitch knot.

3.7.3. Assemble the three vestibule frames by inserting the frame legs into the vestibule frame headers ([Figure 3.41](#)). Insert locking pins to secure the legs.

**Figure 3.41. Vestibule Frame Assembly.**



3.7.4. Take one frame, place it under the adapter/vestibule connection and insert the spindles on the frame through the three grommets, one on the ridge and two at the eaves.

3.7.5. Insert hitch-pin clips in the spindle and close the weather flap.

3.7.6. Insert second frame at midpoint of vestibule fabric; place spindles through grommets and insert hitch-pin clips ([Figure 3.42](#)).

**Figure 3.42. Vestibule Frame Installation.**



3.7.7. Lean total assembly back against the tent side and install third frame in vestibule fabric.

3.7.8. Extend vestibule out completely and attach guy ropes to the spindles at the eaves of the third frame section. Stake the ropes to the ground about 6 feet out, facing towards the vestibule door ([Figure 3.43](#)).

**Figure 3.43. Vestibule Final Assembly.**



3.7.9. Fasten the tie tapes inside the vestibule around the frames and finish lacing the vestibule to the adapter and close the weather seals.

3.7.10. Install 12-inch metal pins in base plates of all vestibule frames to anchor frames in place.

**3.8. Take-Down Procedures.** Care must be taken in disassembling the tent to avoid damaging it in any way or making it unserviceable for future use. As items are removed during tear down, clean them as thoroughly as possible. Do not pack wet components. Before starting disassembly, have the electrical service to the tent disconnected from the local power source and gather all packing boxes. Take-down procedures are as follows:

3.8.1. Close all windows and doors and release tension on guy ropes.

3.8.2. Untie vestibule tie tapes and pull steel pins from vestibule frame base plates.

3.8.3. Collapse vestibule against the tent and remove hitch-pin clips from vestibule frame spindles.

3.8.4. Remove the three frames from vestibule fabric and disassemble them.

3.8.5. Unlace vestibule from adapter, fold and pack vestibule fabric.

3.8.6. Remove guy ropes from stakes and pull all stakes and metal tent pins.

3.8.7. Remove and pack lighting fixtures.

3.8.8. Untie floor and liner tie tapes from base purlins and disconnect all base purlin flaps.

3.8.9. Take electrical distribution box down and remove the distribution box stand.

3.8.10. Unhook all outside fabric laces up to eave level and untie liner from sides of the frame.

3.8.11. Fold up fabric sections from the sides of the tent and placed them under the tent fly.

3.8.12. Remove electrical outlets.

- 3.8.13. With personnel at each arch, pull the locking pins at the eave connections and lower tent to the ground.
- 3.8.14. Disconnect and remove plenums and liners.
- 3.8.15. Remove electrical distribution box and light support strap assemblies.
- 3.8.16. Unfasten, fold and remove all floors.
- 3.8.17. Disconnect eave purlin flaps.
- 3.8.18. Remove hitch-pin clips and fly from eave extenders.
- 3.8.19. Remove eave extenders and unlace all roof sections.
- 3.8.20. Remove hitch-pin clip from ridge extender, remove and fold fly and disconnect ridge extenders from frame.
- 3.8.21. Remove end walls and all roof (sidewall) sections.
- 3.8.22. Disconnect all diagonal frame braces and strap them to the frame.
- 3.8.23. Rotate and remove purlins.
- 3.8.24. Lay frames on their sides and remove locking pins in header flanges.
- 3.8.25. Remove ridge locking pins.
- 3.8.26. Fold up arch frame sections and strap together.





## Chapter 4

### EXPANDABLE SHELTER CONTAINER

**4.1. Characteristics.** The ESC is a hard-walled building used to support functions that require a more substantial, weather-tight facility such as aircraft maintenance shops, command posts and laboratories (**Figure 4.1**). The ESC unfolds from a packaged shipping container (center section) to an expanded shelter mode. The foldout roof panels are hinged to the center section roof; the folded floors are hinged to the center structure floor. End walls are hinged to the foldout floors, and swing-out walls for the sides are hinged to the center structure sidewalls. The structure is leveled and supported by eight jacks. Double doors are installed in one end wall of the center section and a personnel door is in the other end. When folded, the ESC dimensions are approximately 13 feet long, 8 feet wide and 8 feet high. When expanded, its size is approximately 13 feet long, 21.5 feet wide and 8 feet high. The ESC weighs a little over 2-tons and once transported to the erection site can be fork-lifted or hoisted in position. The ESC is heated and cooled with an ECU provided in the BEAR deployment sets. The shelter can withstand windloads of 60 knots with gust to 90 knots when shelter is elevated 12 inches on jacks and anchored at the base.

**Figure 4.1. Expandable Shelter Container.**



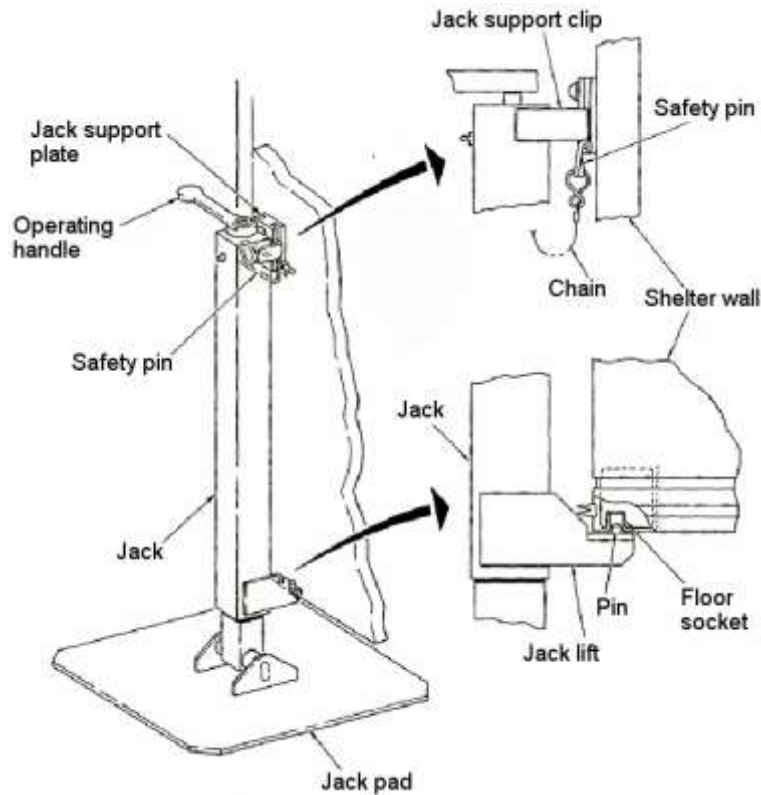
**4.2. Site Selection.** The location must have good drainage to prevent flooding or softening of the ground and sufficient maneuvering room for material handling equipment. Slope of the area should not exceed 18-inches over the projected floor area. Select a site that has adequate vehicle access and do not forget to allow space for the external ECU. Ground conditions should be firm since the entire weight of the building rests on the eight support jacks; soft ground could lead to uneven settlement and eventual facility damage. An option for erection on soft ground is to place lumber under the jacks for stabilization. Clear loose materials and undergrowth from the projected floor area.

**4.3. Expanding the Shelter.** Before expanding the shelter, position it where it will not have to be moved after weight has been placed on jacks. Expanding the shelter entails unfolding and connecting the roof, floor and walls of each side of the shelter and installing the eight leveling jacks. Some moveable pieces weigh approximately 250 pounds requiring a minimum of 6 individuals to erect this facility.

4.3.1. Shelter erection activity begins with the center section of the ESC. Remove jacks from their storage location through the shelter personnel door. Install one jack at each corner of the center section (**Figure 4.2**). Ensure the following: 1) pins on jack lift engage sockets under shelter floor; 2) that jack support clips properly engage the jack support plate at each corner; and 3) that the safety pin for each jack is fastened in place (**Figure 4.3**).

**Figure 4.2. Jack Installed at Corner of Center Section.**



**Figure 4.3. Jack Installation.**

4.3.2. Raise the shelter enough so that all parts of the base are 3-6 inches off the ground. To avoid overloading the jacks or twisting the structure, raise both jacks on one side simultaneously.

4.3.3. Place level on floor of center section parallel to the 13-ft directional wall. Raise and level the low end of the center section first using both jacks on the same side simultaneously.

4.3.4. Place level on the rim of the center section parallel to the 8-ft wall. Raise and level the low end using both jacks on the same side simultaneously.

4.3.5. Check for final level in all directions. Repeat the previous two steps again as necessary.

**WARNING:** One roof section weighs 75 pounds.

4.3.6. To raise the roof from the center section of the structure, unpin and lower the two adjustable roof support struts. Extend the strut to the point that three holes are visible below the outer tabs and then pin in place. Raise the roof to the level position and safely support it with struts on the ground ([Figure 4.4](#)). Be careful not to bind the support strut swivel. If a strut is not making firm contact with the ground due to surface unevenness, simply extend the pole by one or more holes. Check to see that the roof is raised slightly higher than level so that the roof section will clear other sections when swung outward.

**Figure 4.4. Raising Roof Panel.**



**WARNING:** Floor and wall weight is approximately 240 pounds. Do not pin brackets and pins through plates. This may result in personnel injuries. When an item cannot be lifted with ease, use two or more people to prevent injury.

4.3.7. Remove safety cable pins and brackets, rotate plates 180 degrees from the center structure slots, and pin brackets to receptacles in bottom of foldout

floor section. Lower the floor section until it is in the horizontal position ([Figure 4.5](#)). If floor does not lower properly, it may be necessary to raise the roof section by extending the roof support struts by one or more holes.

**Figure 4.5. Safety Cable Attachment.**



4.3.8. Raise end wall to vertical position ([Figure 4.6](#)) and hold it in place (**NOTE:** Do not rest end wall against the roof struts. Doing so will cause the end wall to fall!). Swing sidewalls outward and hold them in position ([Figure 4.7](#)).

**Figure 4.6. Raising End Wall.**



**Figure 4.7. Positioning Swing-out Sidewalls.**



4.3.9. Latch floor to sidewalls, then latch end wall to sidewalls.

4.3.10. Install jacks at each corner of the expanded section.

4.3.11. Lower roof onto end wall and sidewalls with support struts and latch roof to walls. Place support struts back into stowed position ([Figure 4.8](#)).

**Figure 4.8. Final Positioning of Expanded Section.**

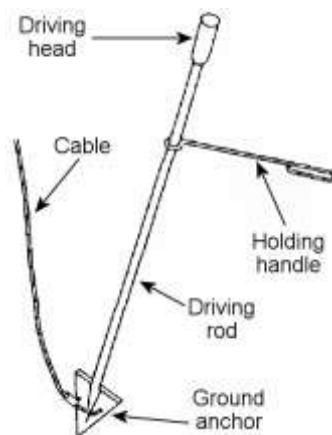


4.3.12. Remove safety cables from floor, rewrap cables on retainers, and stow them in the center section.

4.3.13. Repeat the above steps for the other side of the shelter.

**4.4. Anchoring.** To provide additional stability to the shelter and reduce the effects of wind loading, the ESC is anchored to the ground in several places. The anchors, driving rod and driving head are included with the ESC ([Figure 4.9](#)); however, a sledgehammer, crescent wrench and jack (such as an automobile jack) are also required to install the anchors, but are not furnished with the shelter. The anchors, with cables attached, are driven approximately three feet into the ground and then set using the jack.

**Figure 4.9. Anchor, Driving Rod, and Driving Head.**



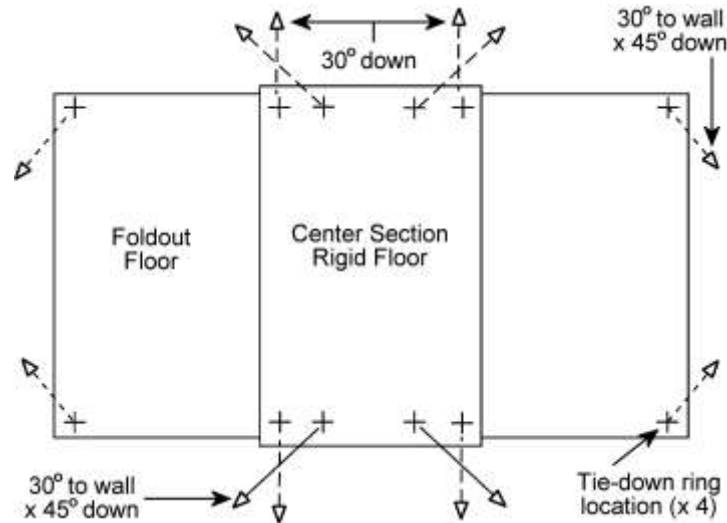
4.4.1. Anchors are installed using the following basic procedures.

4.4.1.1. Insert driving rod on top of triangular anchor into hole in end of driving rod.

4.4.1.2. Slip loop of holding handle over driving rod.

4.4.1.3. Place driving head on driving rod.

4.4.1.4. Support driving rod with holding handle and use sledge hammer to drive anchor into ground at angle noted in [Figure 4.10](#).

**Figure 4.10. Anchor Cable Layout.**

4.4.1.5. Drive anchor approximately 3 feet into ground.

4.4.1.6. Remove driving head, holding handle, and driving rod.

4.4.1.7. Set anchor using setting tool. Attach cable from anchor into setting tool and pull up on anchor until anchor is set (approximately 6 inches). This setting is required to turn anchor in the ground so that it develops maximum holding power.

4.4.1.8. After anchor is set, remove cable from setting tool.

4.4.1.9. Connect tiedowns between anchors and shelter and tighten slack in tiedown cables.

4.4.2. The center section requires eight anchors, two near each corner. Install two anchors on each side straight out from the tie-down rings on the center section pallet so cables head down at a 30-degree angle. The second anchor is placed so that the anchor cable will be 30 degrees out from the wall and head-

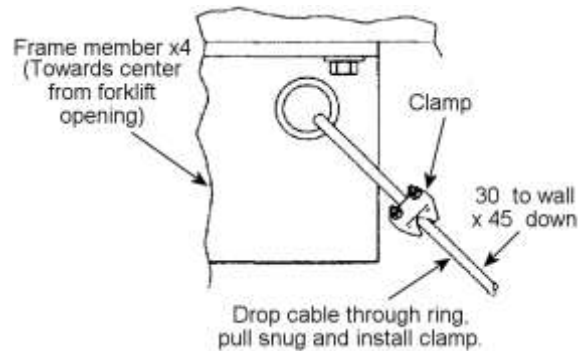


ing down at a 45-degree angle (**Figure 4.10**). The cable from this second anchor connects through a hole in the center section under-frame.

4.4.3. Anchors are also installed for the expanded sections of the ESC; two anchors per section, one at each corner (**Figure 4.10**). These anchors are installed such that the cables from the building to the anchor will be 30 degrees out from the shelter end wall and heads down at a 45-degree angle. The cables are attached to tiedown rings, which are screwed into the bottom of the end wall section floor.

4.4.4. Cables are connected to the ESC using cable clamps once the facility is leveled and expanded (**Figure 4.11**).

**Figure 4.11. Cable Connected to Tie-down Ring.**



**4.5. Electrical/Mechanical Connections.** The ESC is prewired and requires little effort to connect to supporting utilities.

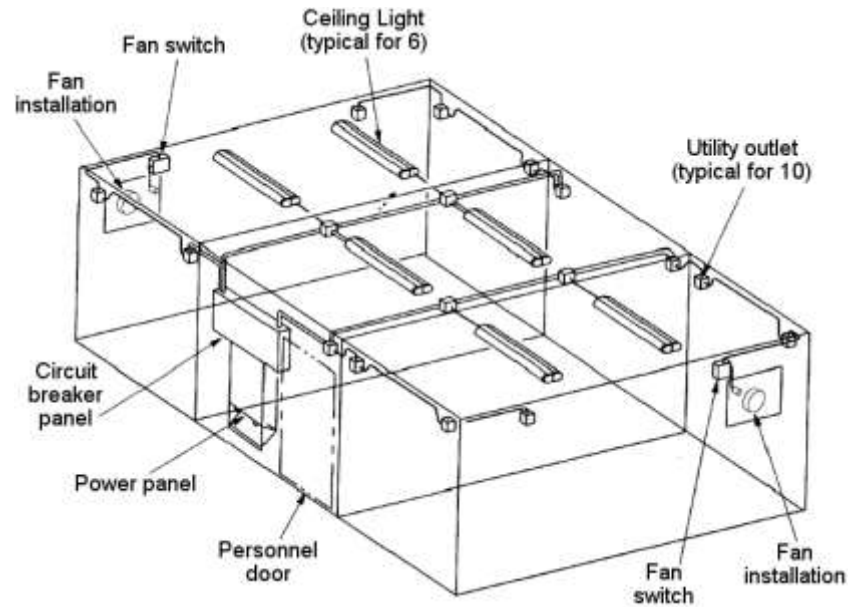
4.5.1. Electrical connections (**Figure 4.12**):

4.5.1.1. Turn off all circuit breakers.

4.5.1.2. Remove overhead light fixtures from their stowed position in the center section and install two on the ceiling of each expanded section.

4.5.1.3. Assemble exterior light fixture and mount adjacent to personnel door.

**Figure 4.12. Electrical Installation.**



4.5.1.4. Plug exterior light cable into the J3 receptacle on the exterior power panel.

4.5.1.5. Remove outlets from their stowed position and mount them on the walls of the expanded sections.

4.5.2. ECU installation ([Figure 4.13](#)):

4.5.2.1. Remove solid panels from air inlet and outlet openings.

4.5.2.2. Install louvered air inlet panel in the top opening.

4.5.2.3. Install air outlet panel without louvers in the bottom opening.

**Figure 4.13. Environmental Control Unit Installation.**



4.5.2.4. Connect flexible ducts from the ECU to the appropriate openings. If desired, the ventilation fans may be removed and replaced with the solid panels from the air inlet and outlet openings.

4.5.2.5. Connect power cable from the ECU to receptacle J2 on the exterior power panel.

4.5.2.6. Connect power-input cable from the electrical distribution system to receptacle J1 on the exterior power panel. A qualified electrician should complete this connection.

**4.6. Take-Down Procedures.** Take-down procedures include disassembling the structure and placing it back into shipping configuration. Throughout the disassembly and packing process, thoroughly clean the various components to prevent damage to the building and avoid problems with customs officials at the ports.

4.6.1. Turn all circuit breakers off.

4.6.2. Disconnect all cabling at the external power panel.

4.6.3. Remove and stow the external lighting fixture.

4.6.4. If ventilation fans were removed during assembly, replace them at this time. Disconnect the ECU flexible ducting and replace air inlet and outlet panels with solid panels.

- 4.6.5. Relocate internal overhead lighting and utility outlet fixtures to stowed positions. To prevent damage to the structure when stowing the outlet fixtures, ensure flush side of fixtures is turned toward hinged side of the wall.
- 4.6.6. Disconnect all tie-downs, remove tie-down rings and pull anchors.
- 4.6.7. Unpin roof support struts from stowed position on one of the expanded sections and place them in position to support the roof panel.
- 4.6.8. Unwrap safety cables—attach between upper center structure and floor.
- 4.6.9. Remove the jacks from the corners of the section being folded and stow the jacks in the center section.
- 4.6.10. Disconnect side walls and end wall from roof section. Using roof support struts, raise roof sufficiently to allow clearance for folding up walls.
- 4.6.11. Disconnect end wall and floor from sidewalls and rest end wall against the support struts (**NOTE:** Remember, do not rest end wall against the roof struts or it will fall).
- 4.6.12. Rotate right sidewall, then left side walls into stowed position.
- 4.6.13. Fold end wall down to the floor and then raise floor to folded position. Use the safety cable to help support the floor in increments as it is raised.
- 4.6.14. Detach safety cable from floor and place in stowed position.
- 4.6.15. Partially lower roof section and pin support struts in stowed position.
- 4.6.16. Completely lower roof section and latch into place on center section.
- 4.6.17. Repeat appropriate steps above to close other ESC expanded section.
- 4.6.18. Remove four jacks supporting the center section and stow them inside the center section.



## Chapter 5

### MEDIUM SHELTER SYSTEM

**5.1. Purpose and Functions.** The Medium Shelter System (MSS) is designed to provide shelter for communication, maintenance, and warehouse facilities in all types of climate and terrain, including extreme cold and heat ([Figure 5.1](#)). The system can be used in any environment of bare base missions with only normal organic support provided.

**Figure 5.1. Medium Shelter System (MSS).**



**5.2. Capabilities.** The MSS is engineered for durability, portability and simplicity in both erection and tear down. It is capable of being transported by air, rail, land, or sea. The MSS will primarily be used as a general purpose shelter but does have the capability to support numerous other functions including command post, administration, kitchens, messing, billeting, medical facilities, and parachute shops. Ensure structure is properly anchored to fully resist all wind loads in the area.

**5.3. System Description.** The MSS is a 29.5-ft wide x 15-ft high free-span structure that includes a quick connect wiring harness with lighting and a transport container suitable for transport on a 463L pallet. The structure is a

lightweight structural aluminum frame system that tensions into a high strength aluminum base. The modular structure is supported by the aluminum frame and covered with military spec vinyl fabric with blackout capabilities. The MSS shelter has two 32-in. x 80-in. aluminum personnel doors and two 11-ft W x 10.5-ft H vehicle doors. The MSS also includes a light weight internal liner, window vents, HVAC ducting, anchors, high wind guy kit, spares kit, and erections tools. The complete MSS weighs 3,940 lbs and may be moved by forklift.

**5.4. Power and Utility Information.** Electrical power can be provided by any system similar to the BEAR electrical system. This system provides adequate power to operate the A/E32C-39 air conditioner unit, shelter lighting and electrical outlets. The wiring harness contains the following components:

- 5.4.1. Two (2) 200 watt light cords (7 lights per cord).
- 5.4.2. Four (4) weatherproof duplex receptacles with cord and plug.
- 5.4.3. Four (4) weatherproof duplex receptacles with cord and plug, panel side.
- 5.4.4. One (1) distribution panel, 3-phase with 30 Amp receptacle.
- 5.4.5. One (1) cannon plug and commercial plug power hookup adapter.
- 5.4.6. One (1) light connector cable.

**5.5. Environmental Information.** Inside shelter temperatures are maintained utilizing four A/E32C-39 air conditioning units or equivalent ECUs. Refer to TO 35E9-267-1, , *Operation and Maintenance Instructions with Illustrated Parts Breakdown, Air Conditioner, Type A/E 32C-39*, for operation and maintenance instructions for these air conditioning units. Operating parameters for MSS environmental thresholds are provided in [Table 5.1](#).

**5.6. Site Selection.** Choose a site location approximately 35-ft x 60-ft. Ensure the area is free of any debris and make as smooth and level as possible.

**Table 5.1. Environmental Threshold Operating Parameters.**

<i>Inside Environment</i>	<i>Outside Ambient Temperature</i>
+80° F	at +125° F
+55° F	at -25° F

**5.7. Unpacking the System.**

**5.7.1. Unpacking Structure.** Locate container with the structure and accessories, wiring harness, and spare parts kit. Open latches and remove the top. The structure may now be unpacked directly from the container base. Personnel doors, covers and end panels will be removed first, with aluminum arches, bases and purlins unloaded last. Inspect for any damage or missing parts listed in Table 4-1 of TO 35E5-6-21, *Operation and Maintenance Instructions with Parts List, California Medium Shelter System*. After unloading container, replace top for storage. Container should be stored in this manner until needed again.

**5.7.2. Unpacking Insulation.** For extreme cold weather, the structure requires a cold weather kit. The cold weather kit contains: two bags labeled “Insulation Blanket Bags” and two bags labeled “Insulated Floor Pad.” Locate these bags and remove insulation from bags. Each insulation blanket bag should contain three long insulation blankets and one short insulation blanket. Each insulated floor pad bag contains one insulated sub-floor pad. Inspect for damage or missing parts (TO 35E5-6-21, Table 4-1). **Note:** The cold weather kit is an optional item to be used at temperatures lower than -25°F.

**5.8. ECU Positioning.** Refer to TO 35E9-267-1 or the manufacturer’s technical manual if an equivalent ECU is used.

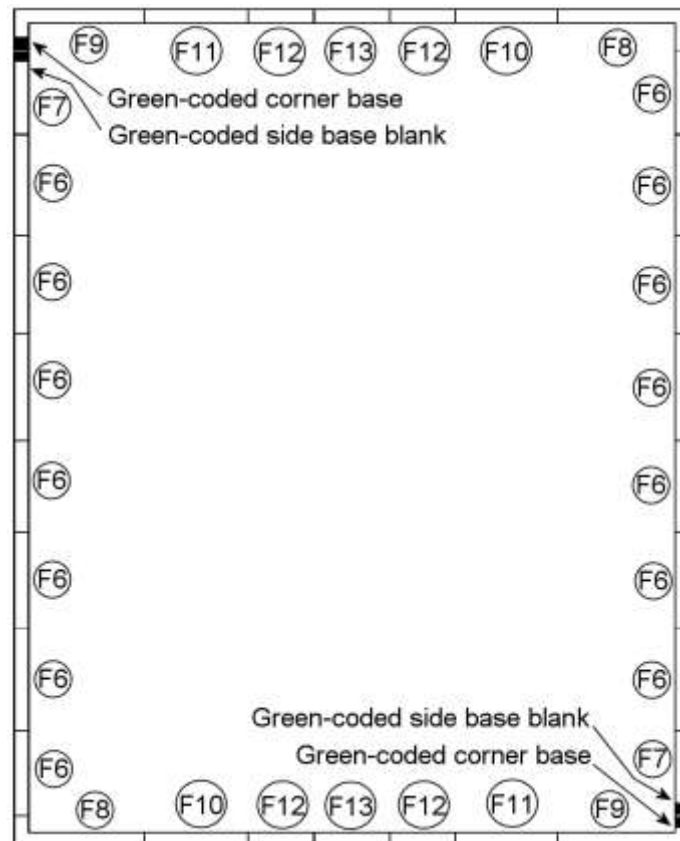
**5.9. Shelter Set-up.** The following paragraphs contain procedures for shelter set-up. Each paragraph should be carefully reviewed prior to starting actual set-up procedures. See **Attachment 4** for quick assembly checklist.

**CAUTION:** Ensure that all base hooks are on the outside of base assembly frame. Damage to equipment may result if caution is not observed.

5.9.1. **Base Assembly.** Assemble base sections as shown in [Figure 5.2](#). Slip all sections completely together.

5.9.1.1. Position end base center (F13) with elongated slots towards the inside of shelter.

**Figure 5.2. Base Assembly.**

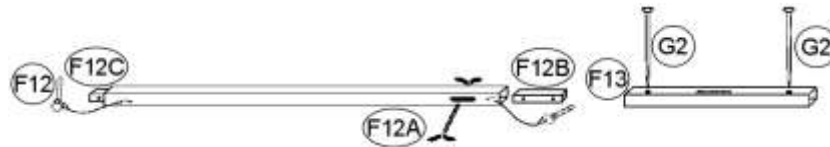




5.9.1.2. Extend inserts of “end-base off-centers (F12) (removable)” and tighten wing nuts as shown in **Figure 5.3**. These parts may be removed at a later time by loosening wing nuts and slipping insert (F12B) backwards.

**CAUTION:** These end-base off-centers (F12) should be removed to accommodate vehicles with inadequate clearance and fully loaded heavy vehicles.

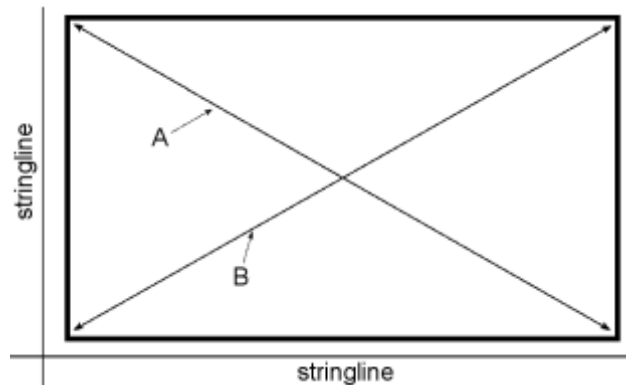
**Figure 5.3. Removable End Base.**



5.9.1.3. Insert pre-attached hitch-pin clips through sides of end base.

5.9.1.4. Use a string line to straighten one side of base and then take diagonal measurements with a 100 foot tape measure to square base frame. As shown in **Figure 5.4**, length of diagonals A and B will be approximately 59-ft and 11-in., but will vary slightly due to ground slope. Adjust frame as needed to obtain squareness.

**Figure 5.4. Squaring the Base.**



**5.9.2. Base Anchoring.** After squaring the base, drive the 18-in. double headed spikes through the pre-drilled anchor holes in the base and into the ground using the sledge hammer or spike driver socket and jack hammer. The four single headed spikes should be used to anchor the end base center (F13) frame at both ends of the shelter. Slip duckbill anchor loops ([Figure 5.5](#)) over base stubs, but do not anchor at this time. Place one duckbill anchor on each corner base stub, one on every other base stub along both sides, and one on all four square vehicle door end base stubs.

**Figure 5.5. Duckbill Anchor Loop.**



**5.9.2.1.** On asphalt, an anchor hole may have to be drilled through the asphalt using a 1/2-in. masonry drill bit. Drive the 18-in. double-headed spikes through the pre-drilled anchor holes into the asphalt using the sledge hammer. The four single-headed spikes should be used to anchor end base center (F13) frame at both ends of the shelter.

**5.9.2.2.** On concrete, use a 1/2-in. drill bit to drill a 1-1/2-in. anchor hole into the concrete. Drive the concrete anchors (through the pre-drilled anchor holes) into the concrete using the sledge hammer. Then, tighten nuts onto base.

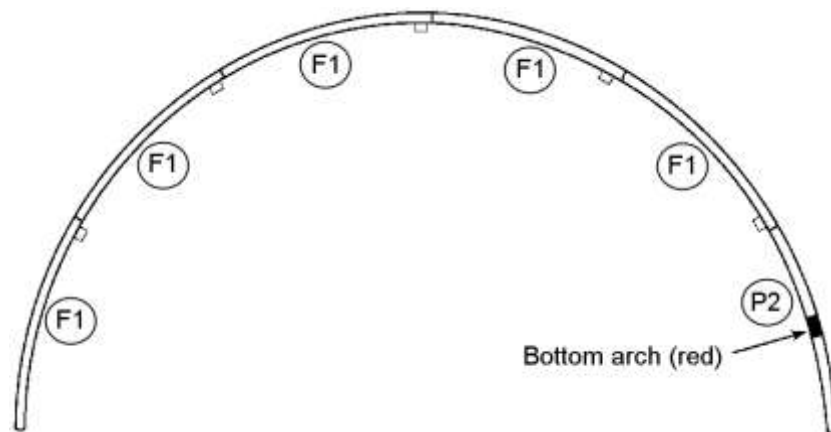
**5.9.3. Insulated Floor Pads and Floor Installation.** Insulated floor pads are optional as part of extreme cold weather kit. Unfold insulated floor pads and place between bases. Unfold non-slip floor, and with black side facing the ground, slip floor cutouts over base stubs. **Note:** If floor is to be installed, do it prior to installing arches.

**WARNING:** After assembling arches on the ground, double check that all arch joints are fully slip fitted together before raising arch assemblies. Do not stand or walk under arch assemblies while they are being raised and secured into position. Failure to observe warning may result in serious injury.

**CAUTION:** Ensure all bottom arches without stubs (coded red) are on same side of the unit. Damage to equipment may result if caution is not observed.

**5.9.4. Arch Assembly and Installation.** Assemble arches on the ground as shown in [Figure 5.6](#).

**Figure 5.6. Arch Assembly**

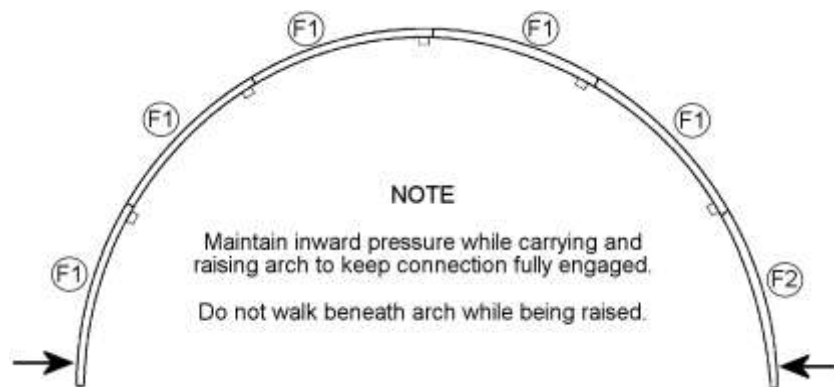


**5.9.4.1.** Four workers, two at each end of assembled arch, should pick up arch and carry to base stubs. Keep all joints completely slip-fitted together by applying pressure inward at both ends of the arch. This creates tension that keeps arch sections fully connected ([Figure 5.7](#)).

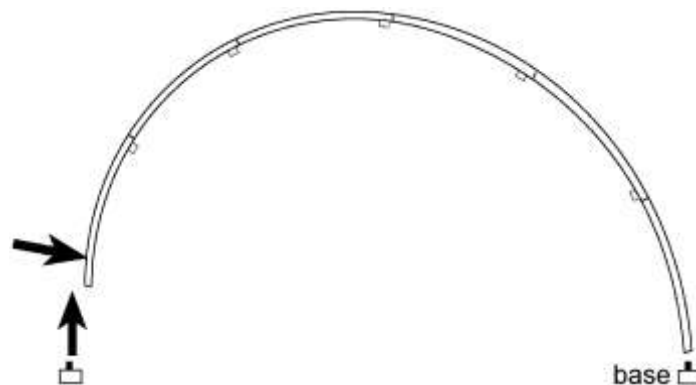
**5.9.4.2.** Stand assembled arch and set one end on base stub. Note that by raising one end of arch and pushing inward allows arch to be more easily slipped over first base stub ([Figure 5.8](#)). Holding arch firmly, spring the other end onto its base stub.

**WARNING:** Hitch-pin clips are required during installation as a safety measure to ensure purlins will not come loose during assembly. Injury to personnel or damage to equipment may result if warning is not observed.

**Figure 5.7. Raising Arch.**



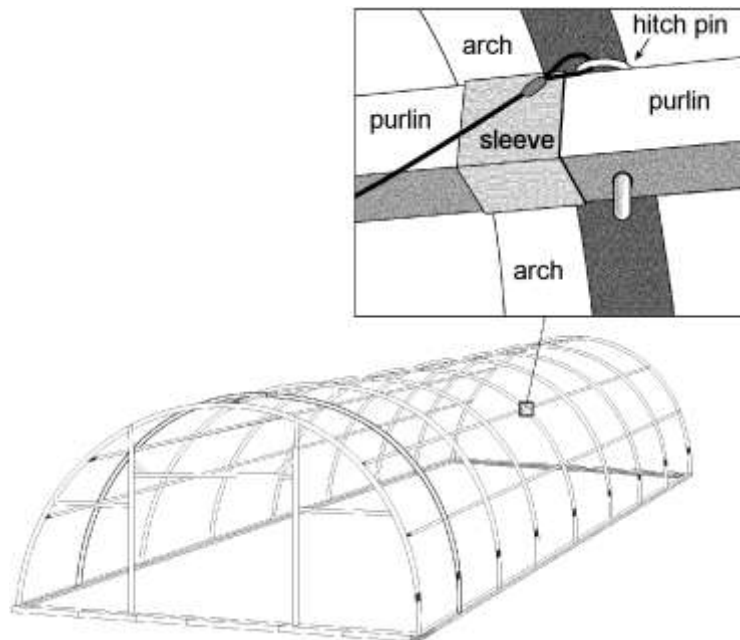
**Figure 5.8. Installing Arch on Base.**



**5.9.5. Purlin Installation.** Use step ladder for lower purlins and extension step ladder for higher purlins. Install the five rows of purlins that connect between the arches. Purlins are slipped into purlin sleeves on arches and

pinned as shown in [Figure 5.9](#). Start with red coded purlins on one end and work toward the other end where yellow coded end purlins are used. Insert top three rows of purlins between each arch simultaneously to make assembly easier and faster. Ensure that pins are installed from top down. Be certain arches are plumb to allow easy hitch-pin clip insertion.

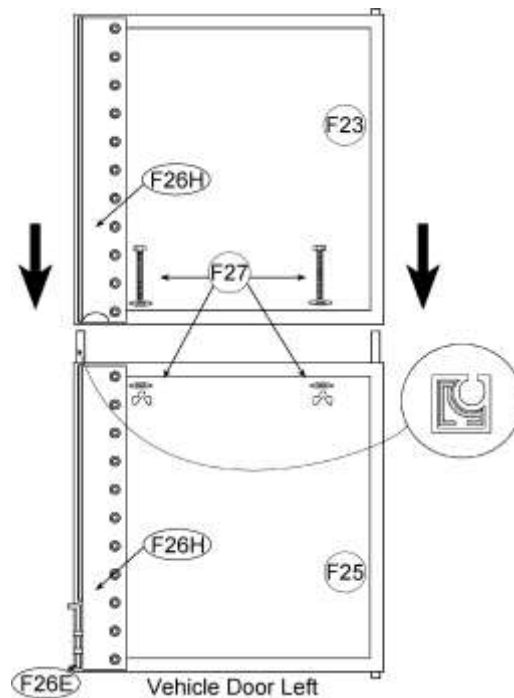
**Figure 5.9. Purlin Installation.**



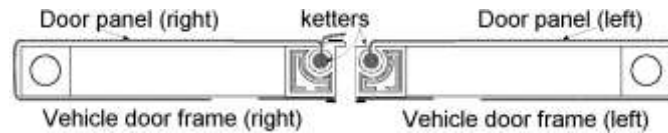
**5.9.6. Vehicle Door Frame.** Assemble vehicle door frame on ground ([Figure 5.10](#)). Locate vehicle door frame, top left (F23) and bottom left (F25) (**NOTE:** Right vehicle door frames have an edge lip which left vehicle door frames do not.). The bottom frame has two insert tubes which extend out and will slide into vehicle door frame top left. Ensure vehicle door frame connector flap (F26H) with grommets is on the same side of joined top and bottom

frames. Secure frames together with two vehicle door bolts with wing nuts (F27). Repeat procedure for right vehicle door frames.

**Figure 5.10. Assembly Vehicle Door Frames (inside view of door).**

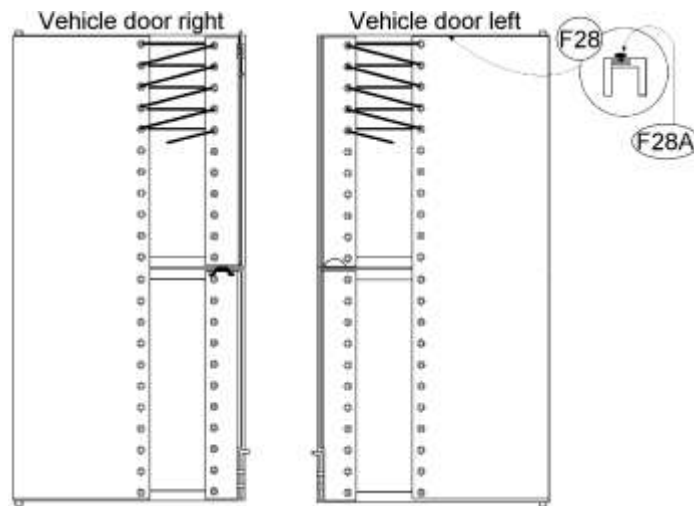


**5.9.7. Vehicle Door Panels.** Locate right and left vehicle door panels (**NOTE:** The right vehicle door panel includes a fastening flap adjacent to the ketter which the left vehicle door panel does not). Attach vehicle door panels to vehicle door frames. Slip ketter edge of panel into vertical groove of vehicle door frame (**Figure 5.11**). Ensure tan side of panel (desert tan MSS) or green side of panel (green MSS) is to the outside, and that the weather flap of panel is at bottom of vehicle door frame.

**Figure 5.11. Vehicle Door Panel Attachment (top view).**

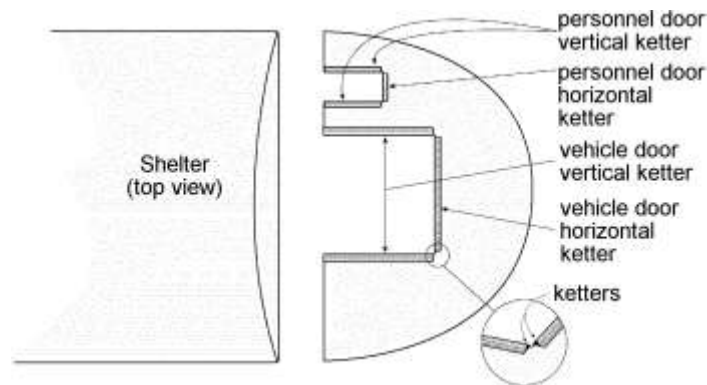
5.9.7.1. Wrap vehicle door panel around vehicle door frame lining up hook and loop fastener strip between panel and frame as you go.

5.9.7.2. Tighten vehicle door fabric into place by lacing grommets between panel and vehicle door connector flap ([Figure 5.12](#)). Seal and cover lacing with adjacent flap. Clip vehicle door top guard (F28) to top of assembled vehicle doors. The weather strip (F28A) on vehicle door top guard should be closest to the exterior of vehicle door. Slide the vehicle door rubber insert into weather flap. Repeat for all vehicle door frames and panels.

**Figure 5.12. Vehicle Door Panel Lacing (view from inside shelter).**

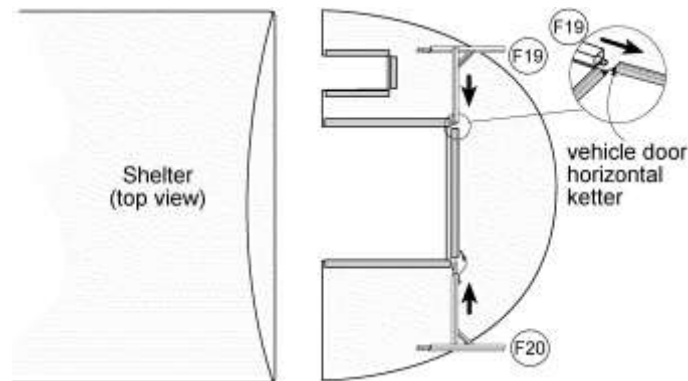
5.9.8. End Panel Installation. Lay the end panel out on ground at end of the shelter with interior green (for a desert tan MSS) or tan (for a green MSS) side facing up ([Figure 5.13](#)).

**Figure 5.13. End Panel Layout.**



5.9.8.1. Locate vehicle door headers, left (F20) and right (F19). Slide vehicle door headers onto vehicle door horizontal ketter as shown in [Figure 5.14](#).

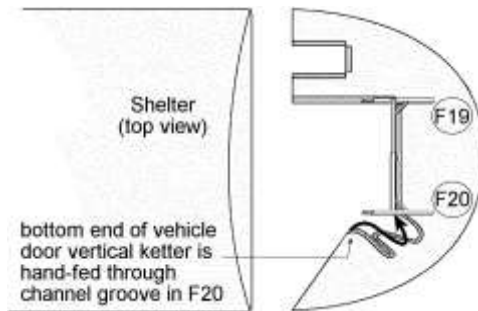
**Figure 5.14. Vehicle Door Headers Sliding onto Horizontal Ketter.**





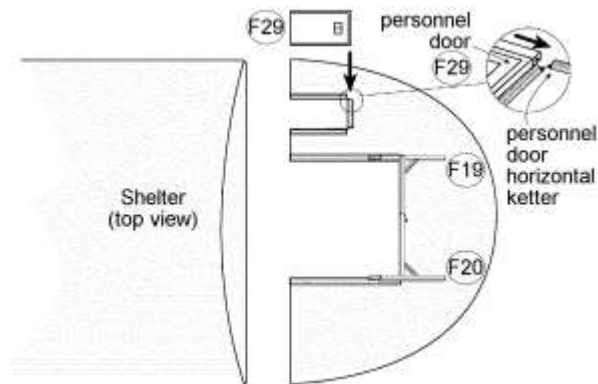
5.9.8.2. Slide vehicle door vertical ketters into vehicle door headers by folding vertical ketter back, then slide and pull ketter into aluminum track as shown in [Figure 5.15](#). Pin vehicle headers together at center with hitch-pin clip. **HINT:** As one person pulls on ketter the other can feed the ketter through header vertical aluminum track.

**Figure 5.15. Vehicle Door Vertical Ketter Sliding into Headers.**



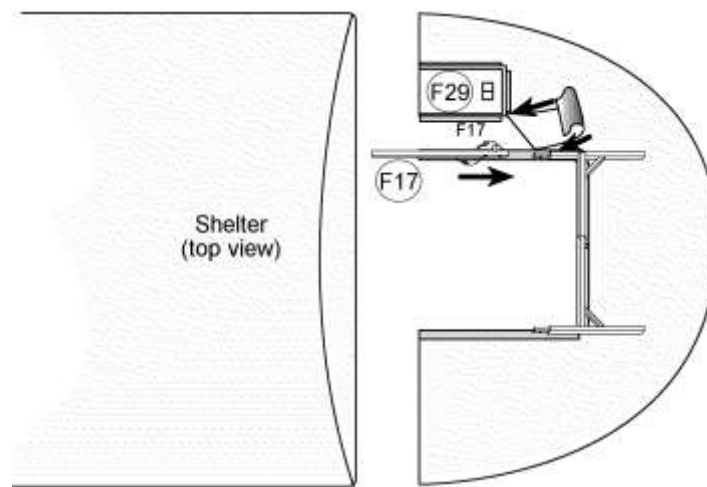
5.9.8.3. Locate aluminum personnel doors (F29). Slide personnel door onto personnel door horizontal ketter. Lift bottom of personnel door up tilting top down while sliding onto ketter ([Figure 5.16](#)).

**Figure 5.16. Attaching Personnel Door.**



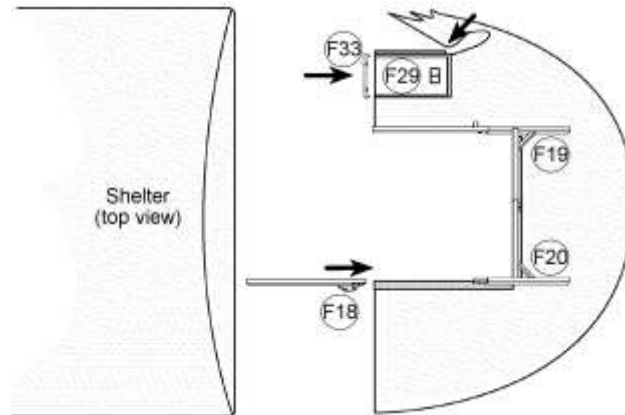
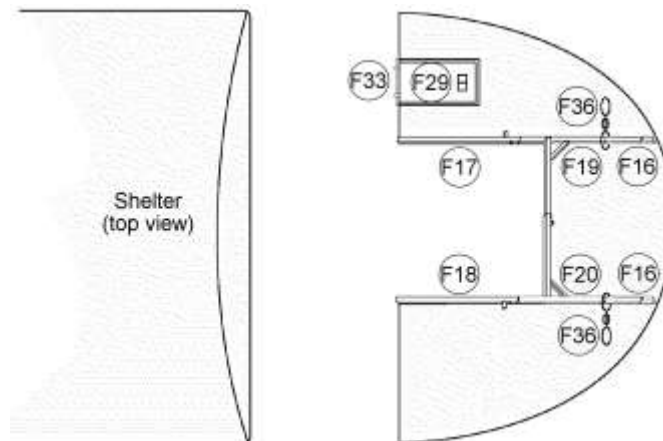
5.9.8.4. Pull fabric between personnel door and vehicle door back far enough to slide ketter on each side simultaneously down personnel door aluminum track and vehicle door upright (F17) (**Figure 5.17**). Pin vehicle door upright to vehicle door header right with hitch-pin clip.

**Figure 5.17. Attaching Uprights.**



5.9.8.5. Pull corner of end panel back to slide personnel door vertical ketter into vertical aluminum track. Slide vehicle door upright left (F18) upwards to the left onto vehicle door vertical ketter and pin with hitch-pin clip to vehicle door header left (**Figure 5.18**). Slide personnel door base frame (F33) into personnel door uprights.

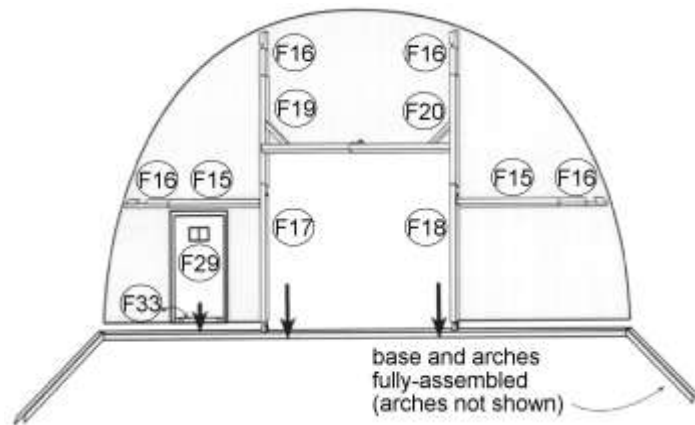
5.9.8.6. Slide vehicle door hook assemblies (F16) into vehicle door headers with hook opening facing up. End panel with installed personnel door and vehicle door frame is shown in **Figure 5.19**. Slide side adjustment cables (F36) onto the vehicle door hook assemblies.

**Figure 5.18. Completing End Panel Assembly.****Figure 5.19. Fully Assembled End Panel.**

5.9.8.7. Raise end panel onto the square stubs of the end base. Ensure the end panel weather-flap lies on ground outside of shelter. Use extension ladder to secure to end arch by hooking vehicle door hook assemblies (F16) over arch

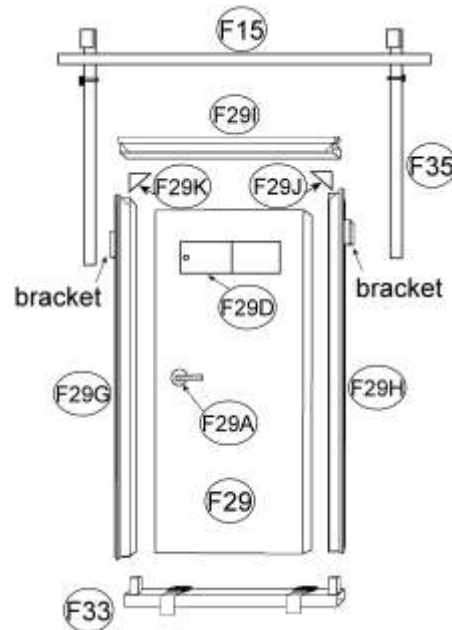
(Figure 5.20). Slide end brace hook assemblies (F16) into horizontal braces (F15). Connect horizontal braces to vehicle door uprights (F17 and F18) and pin with hitch-pin clips. Hook previously attached end brace hook assemblies over end arch (Figure 5.21) above bottom purlin. Slide personnel door hook assemblies (F35) into brackets hooking over horizontal brace (F15) (Figure 5.22).

**Figure 5.20. Installing End Panel (view from inside).**

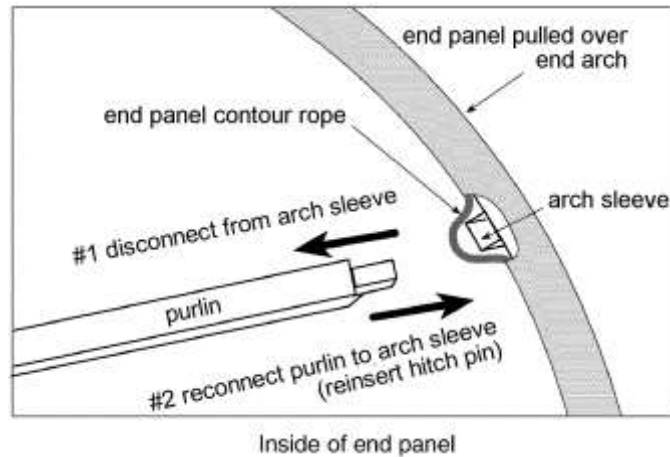
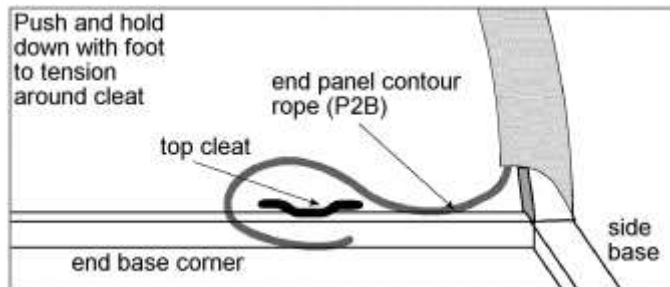


**Figure 5.21. End Framing (view from outside).**



**Figure 5.22. Personnel Door Installation (view from outside).**

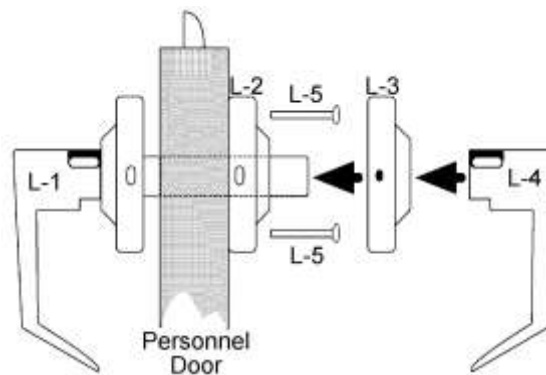
5.9.8.8. Pull end panel edge with contour rope over arch. Starting with the top purlin, loop the contour rope under purlin by temporarily detaching (unpinning) the purlin from the sleeve and slipping the purlin through the rope loop, then reconnect the purlin to the sleeve on the arch ([Figure 5.23](#)). Repeat at each purlin location along the arch. Slide side adjustment cables (F36) onto second row of purlins on each side at the same time. While keeping the end panel pulled over the arch, pull and tighten the end panel contour rope at each end and tie off to top cleat as shown in [Figure 5.24](#). Tie off end panel base rope to four cleats on front of base. Using hook tool (T2), secure the base rope to the base hooks. Repeat procedure for second end panel.

**Figure 5.23. Fastening End Panel (between arch and purlins).****Figure 5.24. Tensioning End Panel.****5.9.9. Completing Personnel Doors and Vehicle Doors.**

**5.9.9.1. Personnel Doors (Figure 5.25).** Install personnel door handle (F29A) by placing L-1, outside handle through the holes in the door from the outside, engaging the strike (already installed). Install L-2, inner plate assembly on the inside of the door through the holes. Take the two screws L-5 and insert into the holes and tighten with a Phillips screw driver. Take L-2, inner

rose plate, and snap over L-2, lining up the notch and the lateral groove. Install L-4, inner handle, by pushing it on until it clicks into place. Installation is complete.

**Figure 5.25. Personnel Door Handle (F29A).**



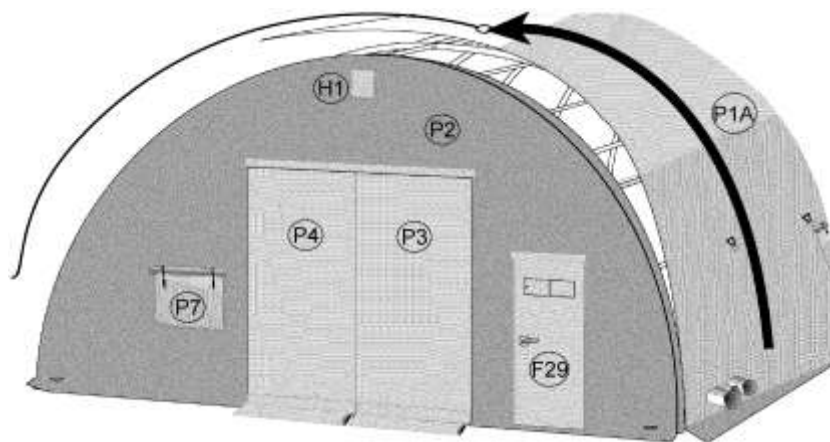
**Note:** After installing vehicle doors, be certain the vehicle door frame is square by adjusting top and side adjustment cables.

**5.9.9.2. Vehicle Doors.** Raise previously assembled vehicle door panel into position sliding onto bottom round tube of end base as panel is raised. Using an extension ladder, place the vehicle door pin through vehicle door header and into top of vehicle door panel to lock panel into place. Determine if vehicle doors are even. Use vehicle door adjustment cables to adjust vehicle door frame for smooth operation. If one is lower than the other, tension the low side by turning the turnbuckle of the adjustment cable until they are even. Once the vehicle doors are even, attach the center adjustment cable by hooking the turnbuckle to the eye on vehicle door header and wrapping the cable around the top purlin. Adjust the center cable in order to maintain a horizontal vehicle header. Attach hook and loop exterior vertical flaps together to seal door joints. Fasten high heat vents (H1) into place with hook and loop fasteners.

**CAUTION:** Use care not to snag the liner on the frame during the following procedure. Failure to observe caution may result in damage to equipment.

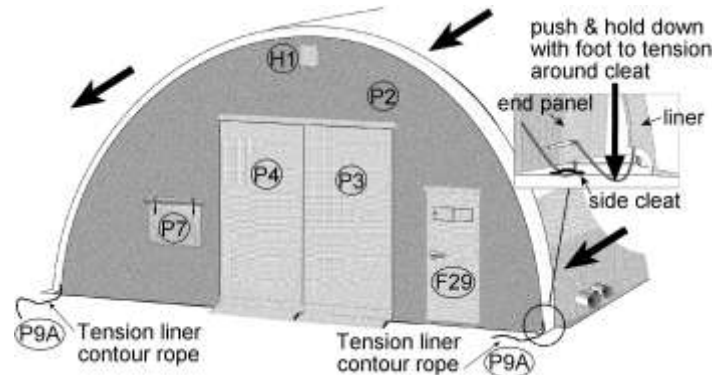
**5.9.10. Top Liner Installation.** Lay out the top liner along one side of the shelter so that when the top liner is pulled over the frame, the 4-in. fastener base flap will be on the inside of the shelter. Throw the four pull-over ropes over the frame and snap the pull-over ropes to the four liner pull-over loops. Using six persons, pull the top liner up and over the framework ([Figure 5.26](#)). (**HINT:** To reduce friction between the top liner and the shelter frame, one person on the opposite side can wave liner panel up and down to put air between the top liner and frame.) When liner is over the frame, unhook the pull-over ropes.

**Figure. 5.26. Liner Installation.**



**5.9.10.1.** Use the ladder to work the edges of the top liner over the end arches ([Figure 5.27](#)). After the liner is over the frame, make certain the frame is plumb. Do this by taking a pull-over rope and hang it over the top purlin. If frame is plumb, the pull-over rope will hang straight down.



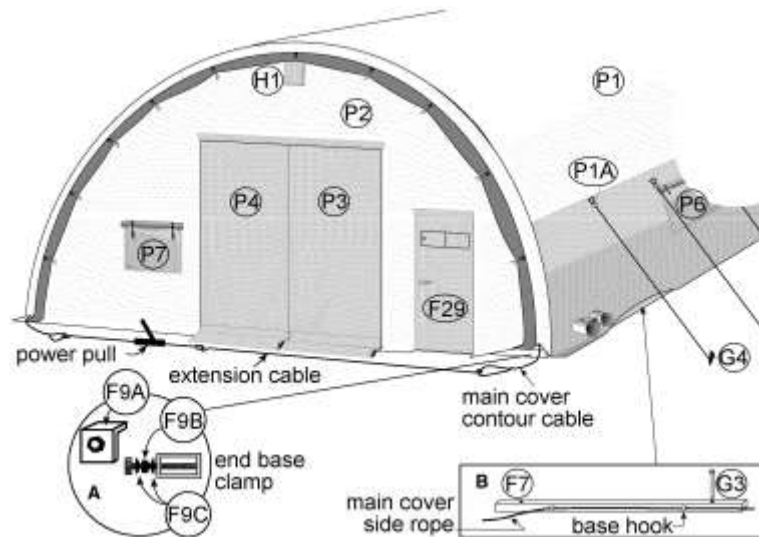
**Figure 5.27. Top Liner Tensioning.**

5.9.10.2. Slip the liner contour rope through the slits in the END ground flap. Lift the ground flap up, slip the contour rope under the end side base cleat and pull up, applying tension (**Figure 5.27** insert). Place a foot on the rope and step down, further tensioning the rope with a foot until there is approximately 4-in. of over hang on this end of the shelter. While still holding tension with the foot, secure the rope to the end side tie-off cleat. Proceed to the other end of the shelter and tension this contour rope in the same manner. Return to the first end, and retighten the contour rope. Fasten inside flap of liner to floor along both sides of the liner.

5.9.11. Cover Installation. Lay out main cover along side of the shelter so that when the cover is pulled over, the tan side will be on the outside of the shelter and the green side will be to the inside of the shelter (reversed for green MSS). Throw six pull-over ropes over the shelter and attach the pull rope snaps to the pull-over loops along the base edge of the main cover. To pull cover over the shelter, six persons should pull in unison on pull-over ropes. (HINT: To reduce the friction between the top liner and the main cover, one person should wave the main cover up and down on the other side of the shelter from where the personnel are pulling; this puts air between the top liner and the main cover.) The tan color should now be on the outside of the shelter (reverse for green MSS).

5.9.11.1. Utilize the ladders to work the ends of the main cover over the end arches. Working at one end of the shelter, slip the main cover contour cables through the slits in the end panel ground flap. Raise ground flap and fasten both ends of the main cover contour cable under their respective end base clamps. Move to the opposite end of the shelter, raise ground flap and position both ends of the main cover contour cable under their respective end base clamps. Check for main cover symmetry over the end arches and, when symmetrical, use the power pull and extension cable to tension the main cover contour cable until cover is tight (**Figure 5.28**). Cover is tight when cover o-rings (P1A) are centered over end arch on each side of the shelter. **Note:** Slapping cover from inside can help move cover into position.

**Figure 5.28. Cover Base Rope Fastening.**



5.9.11.2. Once the cover is tight, use 3/4-in. box-end wrench to tighten nut on the end base clamp to secure the main cover contour cable (**Figure 5.28**, insert A). Remove the power pull and extension cable, and tie off the excess main cover contour cable around the adjacent end side base cleat.

5.9.11.3. Tie off one end of the main cover side rope to the side tie-off cleat of base section (F9). Stretch the other end of the rope along the side of the shelter and secure this end to the side tie-off cleat of base section (F8). Secure the main cover side rope on the opposite side of the shelter in the same manner. Using the hook tool, secure the main cover side ropes along each side of the shelter to the base hooks ([Figure 5.28](#) insert B).

5.9.12. **Duckbill Anchors Installation.** Place anchors a few inches from the base. Using the steel drive rod and 10 pound sledge hammer, drive anchors into ground. If a jack hammer is available, the steel drive rod, driver socket and spike driver shaft may be used to drive duckbills. For harder soils and surfaces, such as asphalt, pre-drill holes for duckbill anchor with 1-in. x 21-in. drill bit provided using a hammer-action drill. Place upward tension on the cable of the anchor in order to set the duckbill. The drive-rod may be used to pry the cable upward. **NOTE:** Where shelter is anchored using concrete anchors in a reinforced 4-in. concrete pad, duckbill installation is unnecessary.

5.9.13. **Guy Rope Installation.** For winds over 40 mph, install guy ropes. Locate guy anchor spikes and guy ropes. Install the guy rope by driving guy anchors approximately 6-ft out from side of shelter at a 45 degree angle. Angle the top of anchor away from the shelter and in line with each arch. Snap end of rope with tent slip to guy loop on shelter and attach other end with snap to guy anchor and tighten tent slip.

5.9.14. **Window Flap Installation.** Locate clear window flaps for cover and ends and fasten onto inside of covers and ends. Fasten flap on end panel bottom to floor.

**Note:** At this point of erection, the label on the shelter should be marked to document the erection date.

**5.10. Installation of Electrical System.** Installation of the electrical system consists of the following wiring harness assembly procedures.

5.10.1. **Wiring Harness Assembly.** Remove wiring harness, cords and panel from shelter container. Attach distribution panel to personnel door upright right (when facing end panel from outside shelter). Personnel door upright

right has key holes to accept hanging bolts on the side of the distribution panel.

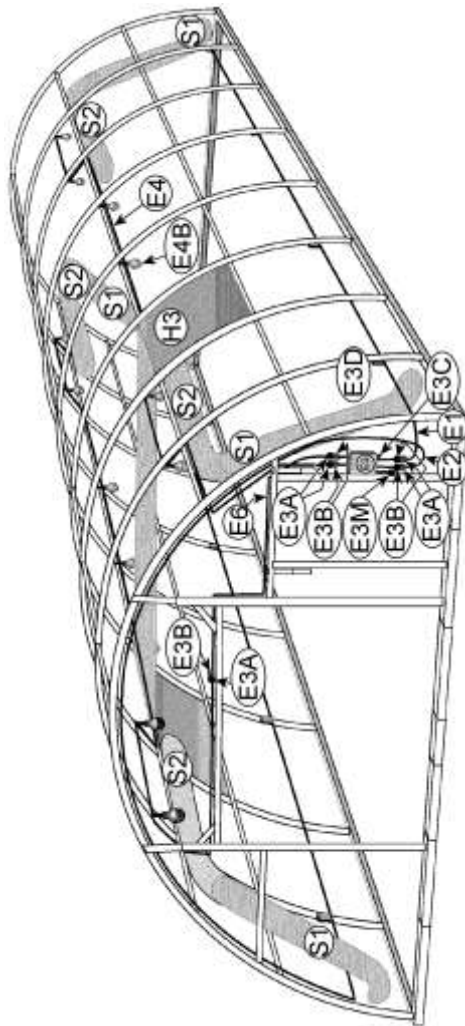
**WARNING:** Ensure one person attaches lights to the shelter arch while one other person stabilizes the ladder during the following procedure. Failure to observe warning may result in injury to personnel.

5.10.1.1. Locate the two weatherproof duplex receptacle cords. Both cords plug into the distribution panel with the two plugs at the bottom of the panel. The shorter cord attaches along the shelter side closest to the distribution panel. Duplex receptacles are evenly spaced at every other arch beginning with the first arch after the end arch. The cord between the duplex receptacles fastens around the arches. Duplex receptacles fasten onto arches (47-in. up from ground) in a vertical position. Using attached straps, the remaining duplex receptacles cord is fastened over personnel door, up vehicle door upright, and along arch to the other side of shelter where duplex outlets are spaced on every other arch ([Figure 5.29](#)).

5.10.1.2. Locate two identical light cords. Plug one cord into plug at top of distribution panel with long end of cord. Fasten cord above personnel door up to arches. A light should be placed at every arch just above the second row of purlins. Attach lights with pre-attached lanyard and snap onto each arch. Plug the light connector cord into second plug on top of distribution panel. Fasten this cord above personnel door and along first arch. Then, attach the long end of second light cord and extend to opposite row of purlins and place lights just above second row of purlins on every arch as previously accomplished ([Figure 5.29](#)).

**WARNING:** Double check all connections per the above paragraph for proper hookup prior to applying power. Failure to observe warning may result in death or serious injury to personnel.

Figure 5.29. Electrical System Illustration.



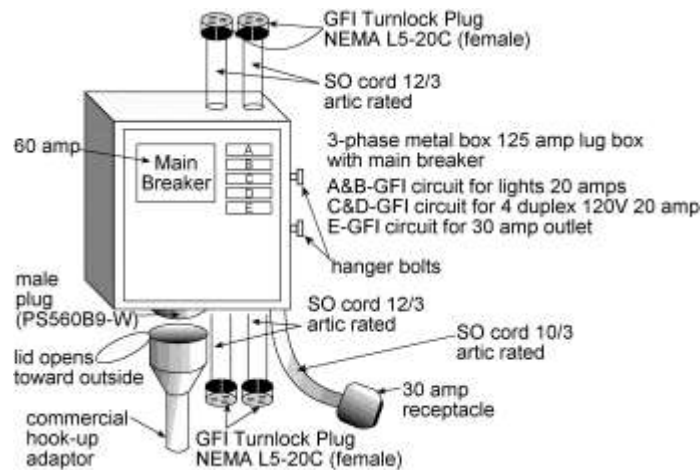
**5.11. Electrical System Checkout.** Once the above electrical connections have been made and double checked, turn on circuit breakers in the distribution panel. See [Table 5.2](#) for troubleshooting procedures.

**Table 5.2. Troubleshooting Steps.**

<i><b>Problem</b></i>	<i><b>Solution</b></i>
1. Lights not working	Are bulbs installed? Are they good?
	Are breakers turned on?
	Are all cords connected to distribution panel?
2. Receptacles not working	Are breakers turned on?
	Are all cords connected to distribution panel?
3. GFI circuit breaker keeps tripping	Call electrical technician

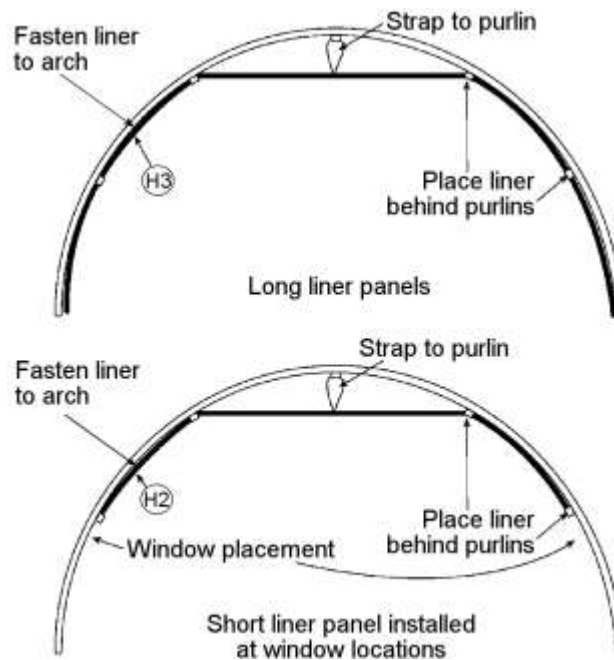
**5.12. Electrical Power.** A commercial plug connector on the distribution panel accepts a female plug to the power system. If only a military plug is available, a military plug to commercial hookup adaptor is provided ([Figure 5.30](#)).

**Figure 5.30. MSS Electrical Panel.**



**5.13. Liner Panel Installation.** Locate the eight liner panels (six long and two short). There is one panel for each bay between arches. The two short liner panels (H3) are installed in bays with windows. Liner panels must be installed with center loop fastener all facing one end of shelter in order for each liner to mate with hook fastener on matching liner panel. Using a ladder, tie straps of liner panel around center purlin using pre-attached fastening straps ([Figure 5.31](#)). Straps should be adjusted so that center of panel hangs evenly with horizontal fastener flap on inside of end panel above vehicle doors (this is also even with second row of purlins). Liner panel slips behind second row of purlins. From the second row of purlins attach liner panel to arches. After installing all panels, use ladder to fasten edges of panels together and end liner panels fasten to end panel horizontal flaps.

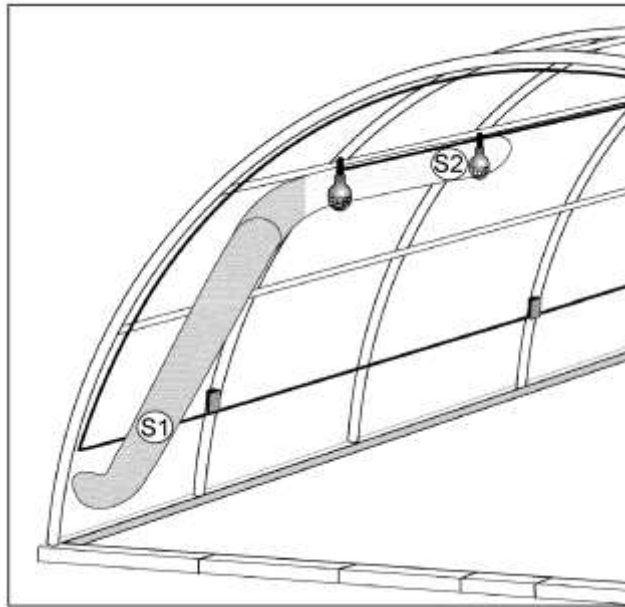
**Figure 5.31. Liner Panel Installation.**



**5.14. ECU Installation.** For installation of the A/E 32C-39 Air Conditioner Unit, refer to TO 35E9-267-1. Refer to the manufacturer's technical manual if an equivalent ECU is used. Refer to the following paragraphs for supply and return and air sock duct installation procedures.

**5.14.1. Air Sock Duct Installation.** Locate air sock start (S1) and air sock end (S2). Cinch air sock start to incoming ECU supply duct. Fasten air sock end to air sock start. Spread out assembled air sock. Using attached straps, attached assembled air sock ducts to the second row of purlins ([Figure 5.32](#)). Adjust lights up arch as needed to avoid air sock. Repeat for remaining three air socks.

**Figure 5.32. Air Sock Installation.**



**5.14.2. ECU Connection to Shelter.** To connect the ECU to the shelter, place the ECU in front of the shelter duct openings and approximately 18-in.

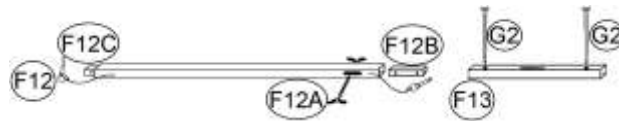


from the shelter end wall. The shelter contains four ducts, available on either side of the MSS. Refer to the appropriate technical order or manufacturer's technical manual for additional information about the ECU.

**5.15. ECU Checkout.** Refer to TO 35E9-267-1 for the A/E 32C-39 Air Conditioning Unit, or the manufacturer's technical manual for an equivalent ECU.

**5.16. Vehicle Door Base Removal.** Under each vehicle door, two end-base off-center (F12) sections may be removed. To remove, loosen wing nuts and slide insert away from end base center (F13). Unpin hitch-pin clip from end base off center (removable) (F12). Lift end and slide out ([Figure 5.33](#)).

**Figure 5.33. Removable End Base.**



**Note:** The end base center (18-in. long) is not to be removed.

**CAUTION:** All removable end base pieces should be removed to accommodate vehicles with low inadequate clearance and full loaded heavy vehicles.

**5.17. Emergency Shutdown.** In case of fire or other critical emergency situation, shut down electrical power at the distribution panel or at electrical generator system if time permits.

**5.18. Shelter Teardown.** Shelter teardown is performed in reverse order of set-up procedures with the following exceptions:

- 5.18.1. Pullover ropes are not required when removing cover, insulation or liner.
- 5.18.2. Do not force pins. Wiggle, tap and pull gently to unpin joints.
- 5.18.3. Do not throw or drop components from any height.

5.18.4. Place spike puller under spikes to raise spike heads. Twist spikes with tool if necessary to loosen and pull. For concrete anchors, loosen nut and lift base off anchor.

5.18.5. Do not pack cover, end panels and liners wet. If necessary to do so, take out, unfold, and dry at first opportunity.

**5.19. Shelter Packing.** After tear down, pack shelter in containers in reverse order of removal (see TO 35E5-6-21, paragraph 4.6, for detailed procedures).



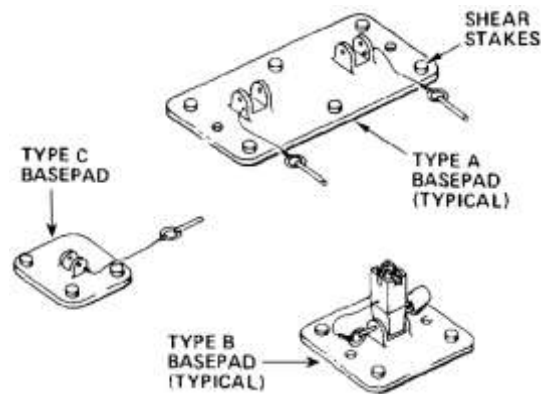
## Chapter 6

### GENERAL PURPOSE SHELTER

**6.1. Characteristics.** The General Purpose (GP) Shelter ([Figure 6.1](#)) is an air transportable, hard-walled facility used primarily as a maintenance shop. The entire facility is shipped inside a single container. This container when filled weighs approximately 11,000 lbs; therefore, you will obviously need a forklift or hoisting equipment to place GP shelter at its erection site. The building occupies a 31-ft by 48-ft area and provides about 1400 sq ft of unobstructed floor space once erected. It will take approximately 90-120 man-hours to assemble with a typical crew size of eight. The basic shelter consists of five arches, two end walls and an electrical system. Provisions are also made for connection of two ECUs. Each of the arches consists of six beam panels. Each beam panel consists of two arch beams and one panel. The arches are self-supporting and are secured to basepads anchored to the ground. The end walls consist of column-supported panels and truck doors. The electrical system includes interior lighting, exterior lighting and outlets. Several types of fabric flashing for the various joints in the facility are provided to seal against the weather. Two GP shelters can be erected end to end, with no end walls in the middle section, to form one larger facility. The shelter can withstand steady winds of 60 knots with gusts up to 90 knots. The 49th Materiel Maintenance Group's four-person large structures team (unit type code XFBJ2) can provide technical experts to assist with erection, striking, or packing the GP shelter.

**6.2. Major Components.** Three types of aluminum basepads (Types-A, -B, and -C) are used to anchor the shelter to the ground ([Figure 6.2](#)). Type-A basepads are used along the sides of the building to hold the arches in place. Type-B basepads are used at the corners of the shelter to secure the corner arch beams. Type-C basepads secure the end wall columns to the ground.

6.2.1. Five types of aluminum arch beams (Types-A, -B, -C, -D and -E) are used to provide the structural rigidity for the GP shelter. Types-B and -C arch beams attach to the basepads while types-A, -D and -E form the overhead arch members.

**Figure 6.1. General Purpose Shelter.****Figure 6.2. Type-A, -B, and -C Basepads.**

6.2.2. Panels. There are 38 panels required for typical GP shelter erection; 30 solid, 4 breached (ECU connection) and 4 specialty (end wall upper) panels.

6.2.3. End Walls. In addition to the solid and specialty panels mentioned above, the end walls require truck door entrances, support columns and headers. R1 and L1 columns support the ends of the end wall and R2/RU2 and L2/LU2 columns support the truck doors. The aluminum header spans the truck door columns and is also attached to the overhead end arch beams.

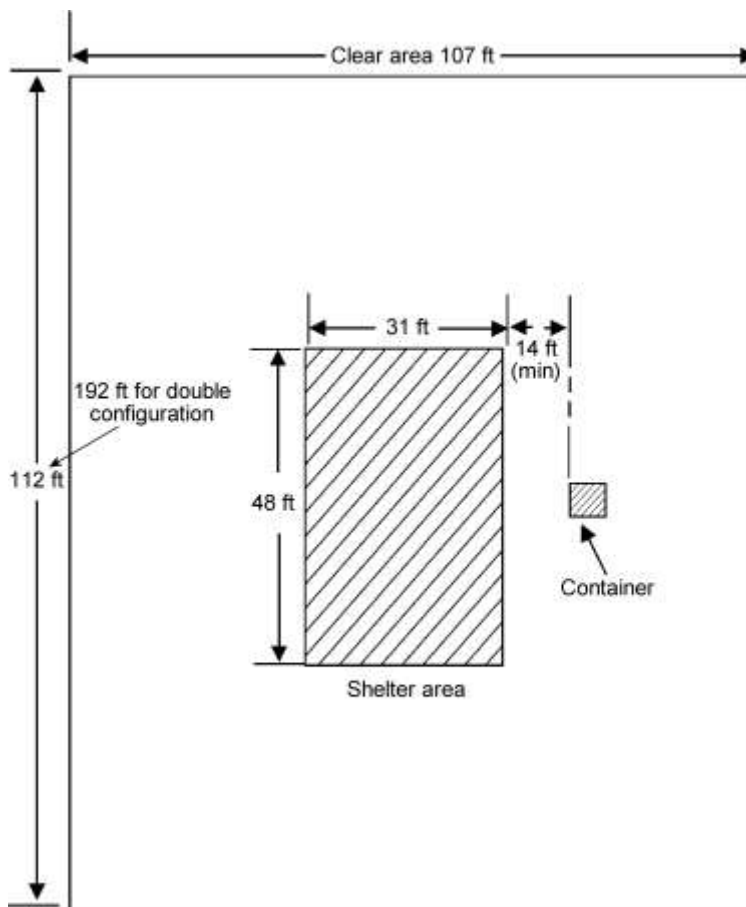
6.2.4. Shelter Flashing. Shelter joints are sealed against the weather by seven types of flashing (ridge, ground skirt, end wall, jamb, panel-to-panel, panel-to-beam, and arch counterflashing). The ridge flashing is installed along the ridge of the shelter, one section for each arch. The arch counter-flashing covers the arch-to-arch joints. Ground skirt flashing seals the base of the facility. End wall flashing protects the joint between the top of the end wall and the end arch of the shelter. Jamb flashing is used to seal the connection of the door assemblies to the end wall panels. Panel-to-panel and panel-to-beam flashing seal the joints between the panel and beam structural members.

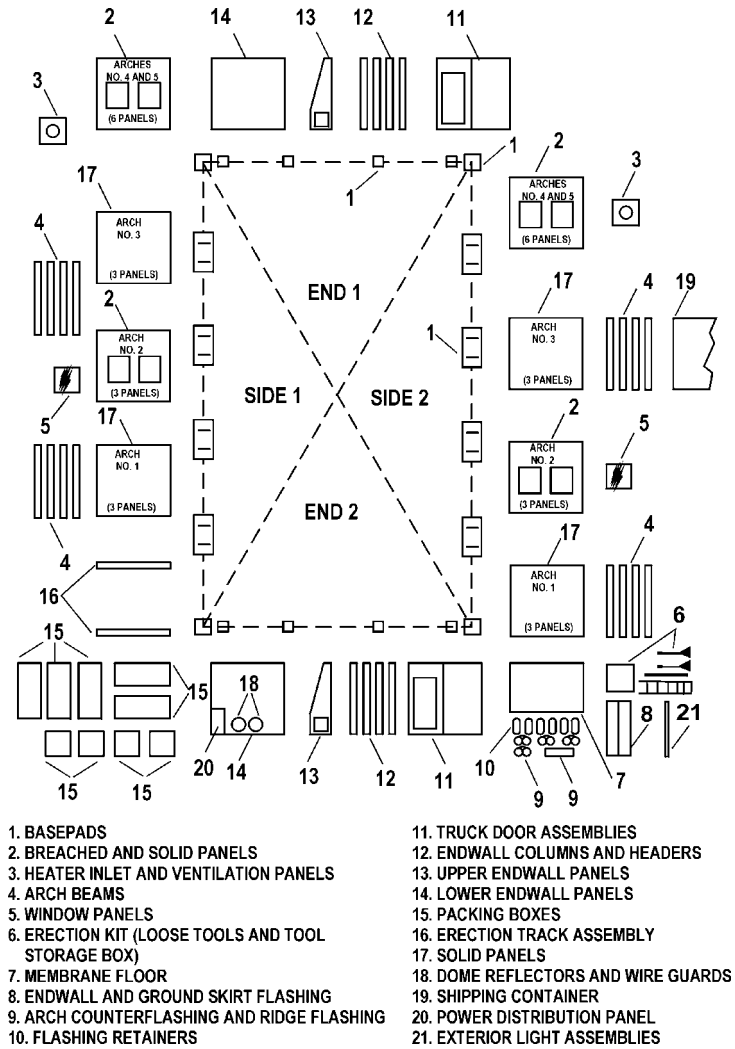
6.2.5. Electrical System. The electrical system includes a distribution panel, eight junction boxes, eight interior fixtures, two exterior light assemblies and two extension cables.

**6.3. Site Preparation.** Site the GP shelter in an area that has good vehicle accessibility/maneuvering space and adequate drainage. **Figure 6.3** illustrates a typical layout for a single GP shelter (**NOTE:** the length of the clear area for a double configuration is 192-ft). Grade the site as necessary to provide a relatively level surface for the floor area. Choose a site that is firm enough to initially support fork lift traffic and constant cargo vehicle traffic once the facility is erected. The site should be free of surface rock, trees, and other debris. As suggested in **Figure 6.3**, locate the shipping container so that it is not in the way or not too far away so that building components have to be carried great distances.

**6.4. Component Layout.** Remove the shipping container doors (approximately 55 lbs each). Loosen retaining straps inside the container as needed and place the cargo netting over the top of the container to keep it out of the way. Remove building components and place them around the shelter area as near as possible to where they will be used during shelter erection—use the diagram in **Figure 6.4** as a location guide. Make sure enough personnel are available to safely move heavier items—some weigh almost 300 lbs. Put the straps, netting, and dunnage back into the container once the shipping box is empty. Additionally, after the building is set up, place any empty packing boxes back into the container. These items will be needed when taking down and repacking the facility in the future.

**Figure 6.3. Layout Plan for GP Shelter.**



**Figure 6.4. Component Layout Diagram.**

**6.5. Basepad Layout and Anchoring.** Laying out the basepads for the GP shelter is a critical first step in shelter erection. These plates must be accurately arranged or the shelter cannot be erected properly. The steps involve aligning the A, B and C basepads, staking the basepads in place, and tying them down with ground anchors. The general procedures for these tasks are as follows:

6.5.1. Obtain basepad layout tool (two special cables used to form a right triangle) and attach type-B basepads to each of the three posts on the tool. **NOTE:** The arrows on the basepads must face toward the outside of the shelter.

6.5.2. Extend the type-B basepads to the three corner locations, ensuring layout tool cables are correctly seated in the slots on top of the posts (**Figure 6.5**). If you want to have the shelter oriented in a specific direction, now is the time to do it by adjusting the orientation of the legs of the cable triangle, e.g., paralleling one of the legs with an adjacent road surface. Keep the cables taut.

6.5.3. Stake the corner basepad (the one at the right angle of the triangle) down with four shear stakes. Drive the stakes only halfway.

6.5.4. Pull the layout tool cables tight to locate the remaining two basepads and stake each of these with four shear stakes driven only halfway.

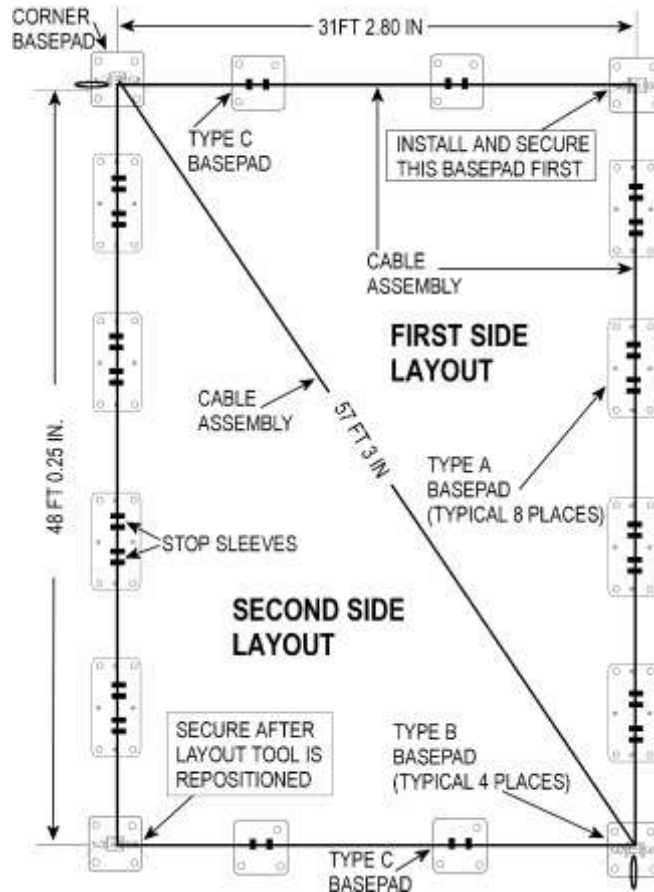
6.5.5. Recheck the position of the basepads to ensure they are in the desired location. If location is correct, drive all the shear stakes in completely.

6.5.6. Position four type-A basepads along and under the side cable (the 48-ft leg). Align the basepad lugs with the sleeves of the side cable (**Figure 6.5**). **NOTE:** Ensure arrows on the basepads point outward.

6.5.7. Place two type-C basepads along and under the end cable (the 31-ft leg). Align the basepad lugs with the sleeves of the end cable. Two additional type-C basepads will be installed later during end wall erection for a total of four type-C basepads, two on each end of the shelter.

6.5.8. Using shear stakes, completely stake down the A basepads (6 stakes) and C basepads (3 stakes).



**Figure 6.5. Basepad Layout.**

6.5.9. Leaving the 57-ft diagonal cable in place, reposition the side sections of the basepad layout tool to allow layout of basepads for the other sides of the shelter.

6.5.10. Attach a type-B basepad to the single available post, stretch the cables taut and position the basepad. Stake it in place with four shear stakes.

6.5.11. Position the remaining four type-A and two type-C basepads and stake in place. Remove layout tool and place it back in its storage container.

6.5.12. Place four anchors at each type-A and -B basepad. **NOTE:** Type-C basepads are not anchored.

6.5.13. The following procedures describe anchoring of types-A and -B basepads. They may be driven manually or by power tools.

**WARNING:** Personnel driving anchors or in close proximity must wear eye protection.

6.5.13.1. Manual Anchor Driving Procedure. In stony soil, it is best to make a pilot hole in the ground by driving a pointed tool through the rocks before driving the anchor. This will facilitate driving and minimize breakage.

6.5.13.1.1. Insert shaft of anchor into hole in end of drive rod.

**WARNING:** Stake driver and holding handle must be used to drive anchors.

6.5.13.1.2. Slip loop of holding handle over drive rod and place stake driver on drive rod.

6.5.13.1.3. Support drive rod with holding handle and use sledge hammer to drive anchor into ground at a 30-degree angle. Remove the stake driver, holding handle, and drive rod when anchor has been driven 5-ft.

6.5.13.1.4. Set anchors using the 5ft drive-rod, cable puller, and fulcrum bar ([Figure 6.6](#)). The cable puller is attached to the anchor cable and then attached to the drive rod. Set one end of the drive rod in the fulcrum bar and pull up so that the anchor sets. The anchor cable will have to be pulled about 6-in. for the anchor to set.

6.5.13.2. Power Anchor Driving Procedure.

6.5.13.2.1. Insert shaft of anchor into hole in end of power drive rod.

**WARNING:** The power driving tool weighs approximately 62 lbs. Ensure sufficient personnel/equipment is used to safely lift power driving tool.

6.5.13.2.2. Start and warm up power driving tool before placing tool on drive rod. This will help avoid stalling or erratic operation while driving anchors.

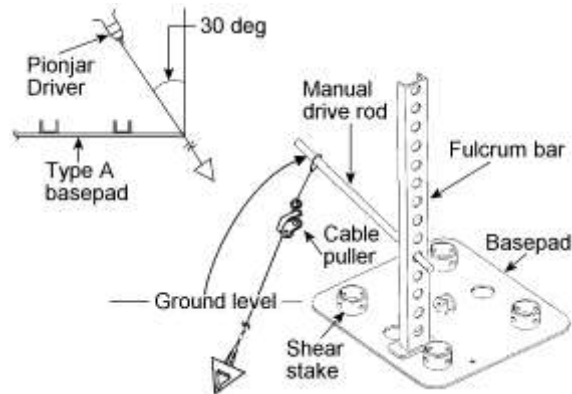
6.5.13.2.3. Insert power drive rod into the tool-holder of the power driving tool and secure with spring-holder.

6.5.13.2.4. Place anchor at driving location. Start tool and drive anchor at a 30-degree angle until it is 5-ft into the ground and then remove the power driving tool and power drive rod.

6.5.13.2.5. Set anchor in same manner as described in [paragraph 6.5.13.1.4](#).

6.5.14. Drive anchors at each corner of each basepad as described above ([Figure 6.6](#)). Thread anchor cables through the most direct holes in heads of the shear stakes of basepads directly opposite each other on both sides of the shelter ([Figure 6.7](#)).

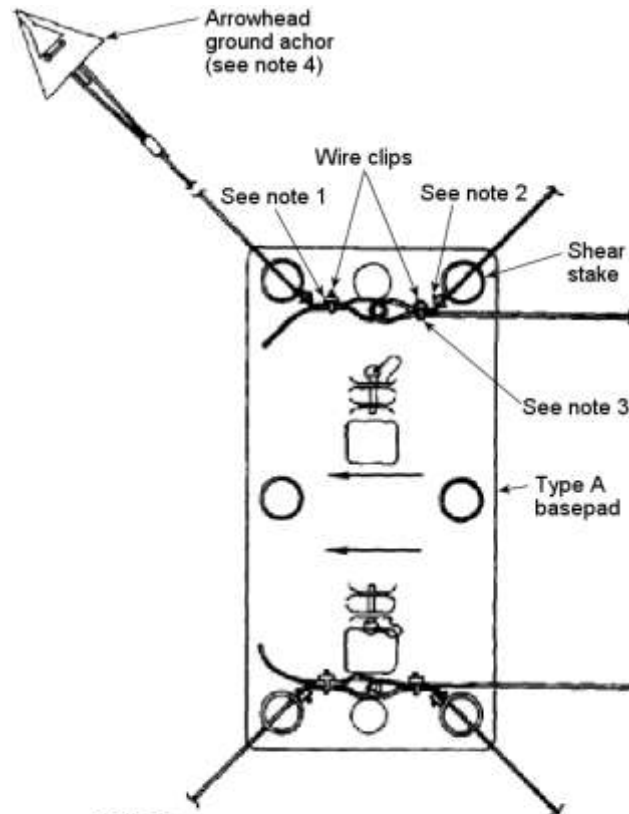
**Figure 6.6. Basepad Anchoring.**



6.5.15. Loop anchor cables near shear stakes and attach wire rope clamps, but tighten only the wire rope clamps on the outside loops ([Figure 6.7](#)). **NOTE:**

The two cables on each basepad are interconnected—the inside cable is run through the outside cable loop.

**Figure 6.7. Interconnected Anchor Cable Loops.**



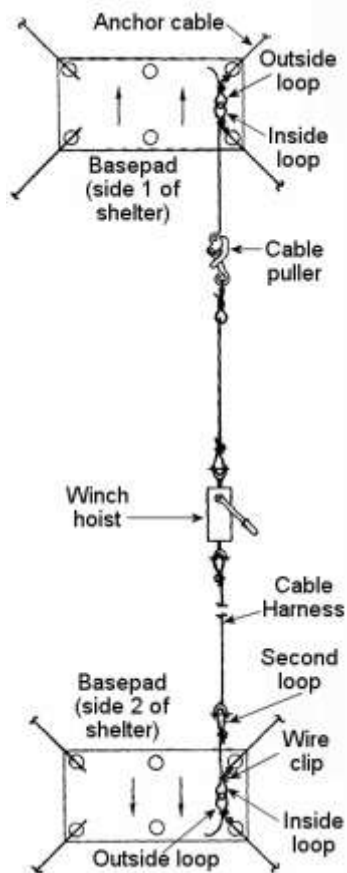
**NOTES:**

1. Secure only these wire clips before tightening cables.
2. After cables are tightened, secure wire clip as close to shear stakes as possible.
3. Secure after cables are tightened.
4. Anchors driven at 30-degree angle.

6.5.16. Form a second loop in the end of one of the inside anchor cables and attach the clevis of the erection harness to it.

6.5.17. Attach the cable puller to the inside cable at the opposite basepad. Install winch hoist between erection harness and cable puller ([Figure 6.8](#)).

**Figure 6.8. Anchor Cable Tensioning.**



6.5.18. Use the winch hoist to tighten the anchor cables and secure inside cable wire rope clamps.

6.5.19. Remove winch hoist, cable puller, and erection harness and check anchor cables between shear stakes of basepads for tightness.

6.5.20. Repeat the above cable tightening steps for the remaining sets of cable pairs on all basepads.

**6.6. Arch Assembly and Erection.** Arches are erected individually beginning at either end of the shelter. Each arch is comprised of six beam panels connected together by pins and hinges. The arches are raised using a winch and track assembly and pinned at the “keystone area” and basepads. Erection of shelter arches begins at the right hand corner as you face the end wall from outside the structure area.

6.6.1. Place the mounting end of a type-B arch beam near the type-B basepad with spacer bars facing out and flashing fastener strips facing up. Place the mounting end of a type-C arch beam near the type-A basepad with spacer bars facing out and flashing fastener strips facing up.

6.6.2. Place a solid panel (with exterior flashing attached faces up, the white side of the panel faces down) between the two arch beams on the arch beam support lips ([Figure 6.9](#)). The panel edge with the flashing retainer strip is placed such that the flashing from the next arch panel can be attached.

6.6.3. Secure the panel to the arch beams by rotating the latch assemblies. **NOTE:** Listen for an audible click to indicate the latch is fully engaged.

6.6.4. Attach panel-to-beam flashing to the flashing fastener strips on both beams.

6.6.5. Assemble panel #2 in the same fashion as panel #1 using one type-E arch beam, one type-D arch beam and a solid panel section.

6.6.6. Pin the top hinge of the type-D arch beam of panel #2 to the type-C arch beam of panel #1 ([Figure 6.10](#)).

**Figure 6.9. No. 1 Arch Layout.**



**Figure 6.10. Beam-to-Beam Pin Connection.**



6.6.7. Pin the top hinge of the type-E arch beam of panel #2 to the type-B arch beam of panel #1.

6.6.8. Lift the panel assemblies to an inverted “V” position and pin the lower hinges of the types-D and -E arch beams to the links in the types-C and -B arch beams.

6.6.9. Position the basepad mounting ends of the type-B and -C arch beams on the first panel assembled on the type-A and -B basepads and pin into place ([Figure 6.11](#)).

6.6.10. Fasten panel-to-panel flashing between the first panel assembled and the second panel.

6.6.11. Assemble a third panel section using two type-A arch beams and one solid panel.

6.6.12. Pin the third panel assembly to the second at both the upper and lower hinges of the arch beams.

6.6.13. Fasten the panel-to-beam flashing of the third panel and the panel-to-panel flashing between the third and second panels.

6.6.14. Assemble a fourth panel section using a type-B arch beam, a type-C arch beam and a solid panel.



**Figure 6.11. Pinning of Panel to Basepads.**



6.6.15. Assemble a fifth panel section using a type-D arch beam, a type-E arch beam and a solid panel.

6.6.16. Pin the fourth panel assembly to the fifth at both the upper and lower hinges of the arch beams.

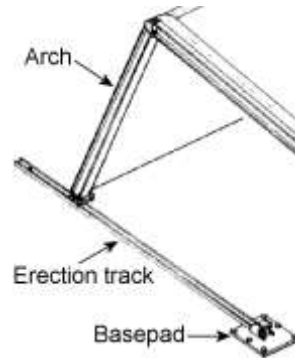
6.6.17. Fasten the panel-to-beam flashing of both panels and the panel-to-panel flashing between the fourth and fifth panels.

6.6.18. Assemble a sixth panel section using two type-A arch beams and a solid panel.

6.6.19. Lift one end of panel section 6 and the free end of panel section 3 and pin the top hinges of panel section 6 to the top hinges of panel section three. Allow the free end of panel section 6 to remain on the ground.

6.6.20. Place panel sections 4 and 5 adjacent to panel section six so that the top hinges of sections 5 and 6 can be pinned.

6.6.21. Install erection tracks on basepads A and B on the left-hand side as you face the end wall. Panel section 4 will eventually connect to these basepads. The tracks are pinned in place and positioned such that they extend outward from the basepads ([Figure 6.12](#)).

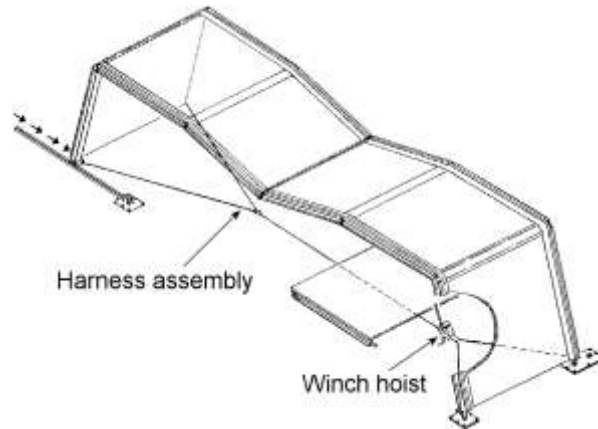
**Figure 6.12. Erection Track Placement.**

6.6.22. Lift the arch assembly sufficiently high enough so that the lower hinges of panel sections 5 and 6 can be pinned. As the panels are lifted for pinning, guide the arch beam ends of panel four into the erection tracks (**Figure 6.13**).

6.6.23. Assemble erection harness to winch hoist and secure harness to arch beams (**Figure 6.14**).

6.6.24. For protection against cable breakage, place a solid end wall section over the winch hoist cable (**Figure 6.14**).

**Figure 6.13. Placement of Panel Sections Prior to Erection.**

**Figure 6.14. Winch Hoist and Harness Assembly.**

6.6.25. Operate the winch hoist; the unpinned end of the arch will be drawn inward. After the unpinned end has been drawn in about 1-ft, lift the center point of the arch until the arch is about 5-ft off the ground.

6.6.26. Continue operating the winch hoist until the arch beam ends of panel section #4 slide into the basepads.

6.6.27. Unpin the erection tracks and slide them out of the way. Use the anchor driving rod as a lever to raise the panel 4 arch beams sufficiently to align the beam mounting holes with the basepad lugs. Once the basepad lugs and beam mounting holes are aligned, pin the arch beams to the basepads. To prevent damage to the panels, lift only on the aluminum beams.

6.6.28. Pin the lower hinges of panel sections 3 and 6 together and remove erection tracks and erection harness from arch number 1.

6.6.29. The remaining arches of the GP shelter are erected similarly to the first one. These adjacent arches share type-A basepads. Arches 2 and 4 differ slightly in that breached panels are installed in panel sections 1 and 4 instead of solid panels. These breached panels ([Figure 6.15](#)) have openings for windows and mechanical system connections. Both the windows ([Figure 6.16](#))

and mechanical connection panels ([Figure 6.17](#)) insert into the side wall panel openings and are secured in place using latches tightened by thumbscrews. [Figure 6.18](#) illustrates the typical connection of the bare base ECU to the shelter walls.

**Figure 6.15. Breached Panel Section.**



6.6.30. As adjacent arches are erected, they are joined together with spacer bars to provide structural rigidity. Two spacer bars are built into each type-A, B and C arch beam. Their installation is straightforward.

**Figure 6.16. GP Shelter Windows.**



**Figure 6.17. GP Shelter Mechanical Connection Panel.**



**Figure 6.18. Bare Base ECU Attached to GP Shelter.**



6.6.30.1. Starting at the bottom arch beam (work from outside of the shelter), unpin and swing the lowest spacer away from its attached arch beam and loosen the hand knob on the spacer.

6.6.30.2. Extend the spacer bar until it meets with the angle bracket on the adjacent arch beam, align the holes and pin it in place ([Figure 6.19](#)). Then, hand-tighten the hand knob.

**Figure 6.19. Spacer Bar Attachment.**

6.6.30.3. Use installed spacer bars as a ladder to reach higher spacer bars. As spacer bars are installed, check panel-to-panel and panel-to-beam flashings for correct attachment.

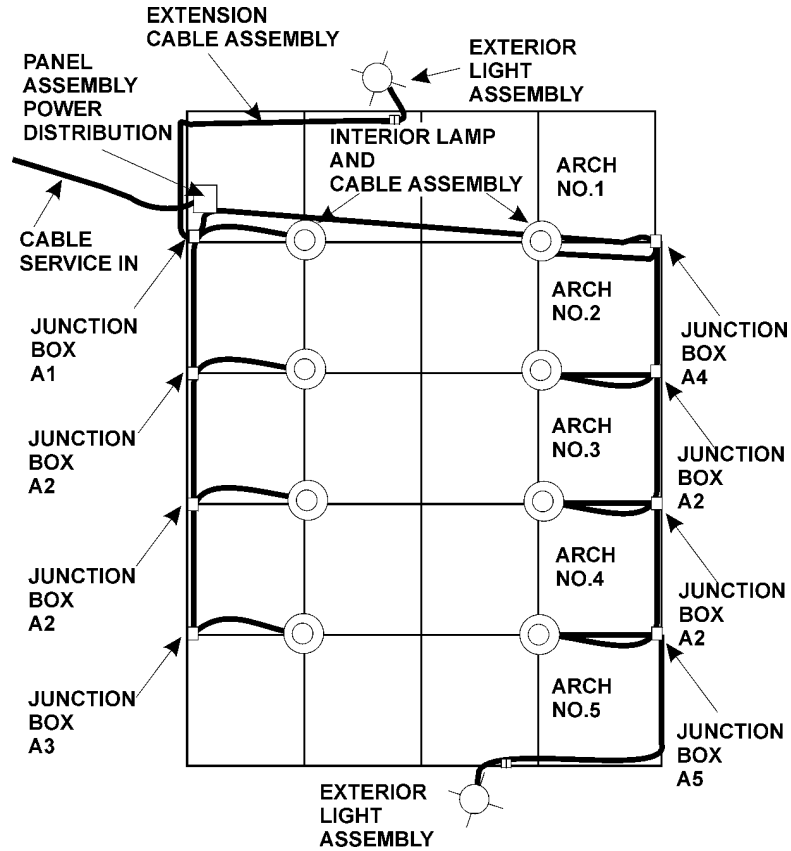
**6.7. Interior Electrical System Installation.** The interior electrical system for the GP shelter consists of a power distribution panel, several junction boxes, overhead lighting fixtures and associated cabling. The types of lighting fixture may vary depending on the model of the shelter but both are incandescent; therefore, the installation principles are similar. Basic installation is as follows:

6.7.1. Find the boxes containing the electrical components and unpack them. Place the electrical components adjacent to their installation locations (**Figure 6.20**). Note that there are several types of junction boxes. In some cases you may have to assemble the lighting fixtures.

6.7.2. Run the light hanger wire rope up and over the first spacer bar of panel section 3 and connect the loop end of the wire rope to the hook on the top of the lighting fixture.

6.7.3. Run the cable from the light fixture up and over all the spacer bars in panel section 2 (**Figure 6.21**).

6.7.4. Install the remaining lights in the same manner at their respective locations.

**Figure 6.20. Interior Electrical System Component Positioning.**

**Figure 6.21. Lighting Fixture Cable Run.**

6.7.5. Attach the power distribution panel to the adjacent arch beams of panel section 1 on the first and second arches erected—see [Figure 6.20](#).

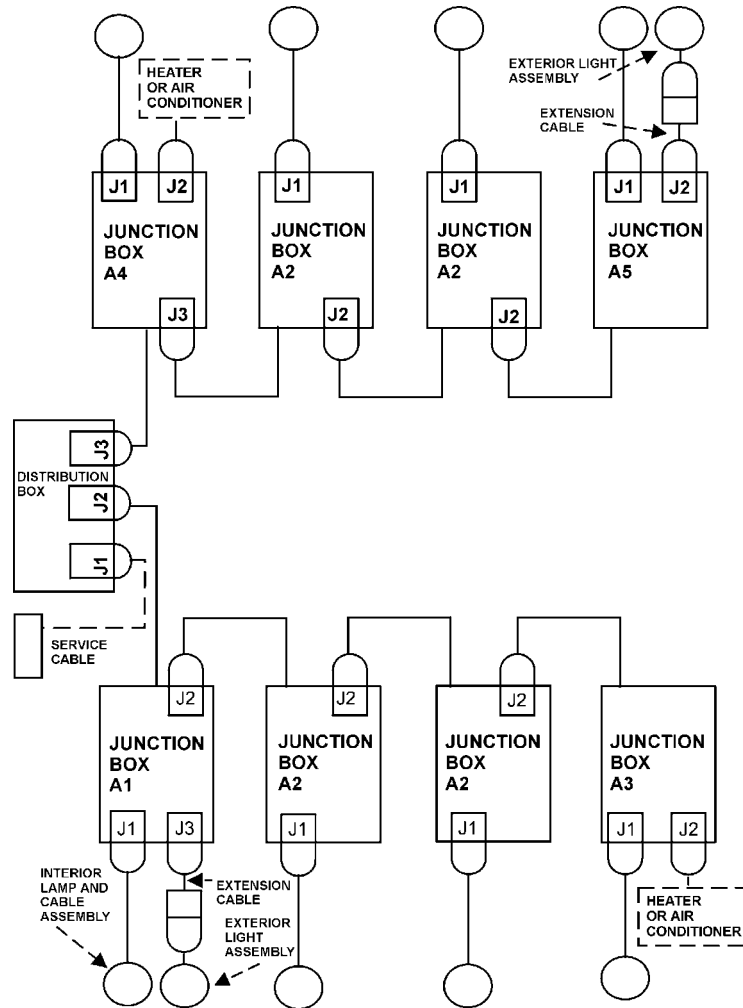
6.7.6. Attach junction box A1 to the fourth spacer bar from the ground between panel sections 1 of the first and second arches erected.

6.7.7. Install the seven remaining junction boxes in the locations shown in [Figure 6.20](#) (see [Figure 6.22](#) for electrical schematic).

6.7.8. Connect the electrical cables between the lights, junction boxes and power distribution panel. Connect the extension cables for the outside lights to the J3 connector of junction boxes A1 and A5, but leave them coiled on the ground for now.

**6.8. Ridge Flashing Installation.** Once the spacer bars are positioned and interior electrical work is complete, ridge flashing is installed. Five flashing strips are used; one at each of the joints of panel sections 3 and 6 at the ridge of the shelter. The strips are unrolled over the joints and the rubber seals on the flashing are inserted into the retainers on the panels ([Figure 6.23](#)).



**Figure 6.22. Interior Electrical System Schematic Diagram.**

**Figure 6.23. Ridge Flashing Installation.**

**6.9. End Wall Erection.** Erection of the end walls consists of column erection, panel installation, door installation and flashing installation. Both end walls are erected in an identical manner. Installation of the RU-2 and LU-2 columns and placement of the type-B clamps can also be done prior to raising the end arches if desired. This option makes the end wall erection a little easier since the arch beams are easily accessible and stepladders will not be needed.

**6.9.1. Column Erection.**

6.9.1.1. Obtain the end wall column locator bar and columns RU-2 and LU-2.

6.9.1.2. Lay the column locator bar on the lower flange of the arch beam of panel section 3, then butt locator bar up against end of the hinge.

6.9.1.3. Attach column RU-2 to the arch beam (**Figure 6.24**). Snug the clamp on the end of the column up to the end of the locator bar and tighten clamp hand knob. **NOTE:** Knob should be facing in toward the inside of the shelter.

6.9.1.4. Attach column LU-2 to lower flange of panel section 6 in a manner similar to installation of column RU-2.

**Figure 6.24. Column Attachment to Arch Beam.**



6.9.1.5. Join the two halves of the header together with the “T” pin, then pin the header unit between columns RU-2 and LU-2 ([Figure 6.25](#)).

**Figure 6.25. Installation of Header.**



6.9.1.6. Secure the header to panel section 6 arch beam using the header support clamp ([Figure 6.25](#)).

#### 6.9.2. Panel Installation.

6.9.2.1. Place end wall columns L1 and L2 on the ground about 7-ft apart with latches facing in and flashing fastener strips up.

6.9.2.2. Place a panel section between the columns and fasten latches with latch wrench.

6.9.2.3. Attach panel flashing to columns.

6.9.2.4. Build second end wall panel section using columns R1 and R2.

6.9.2.5. Lift the L1/L2 panel section into place, pinning column L2 to column LU-2 ([Figure 6.26](#)).

**Figure 6.26. L2/LU-2 Column Connection.**



6.9.2.6. Attach column L1 to panel section 5 arch beam using the column clamp assembly.

6.9.2.7. After placing a type-C basepad under column L1, remove the outside pin of the L2/LU-2 column connection and swing panel section inward away from the basepad.

6.9.2.8. Stake basepad in place.

6.9.2.9. Swing panel back to vertical position, pin locking bars of L1 and L2 columns to basepads and replace pin in L2/LU-2 connection.

6.9.2.10. Install the R1/R2 panel section on the right side of the end wall.

6.9.2.11. Mount two type-B clamp assemblies on the lower flange of both panel section 2 and 5 arch beams.

6.9.2.12. Position the upper left side panel in place (flashing on outside) and latch to column LU-2. Position and tighten the two type-B clamp assemblies ([Figure 6.27](#)).

**Figure 6.27. Upper Panel Section Placement.**



6.9.2.13. Secure panel-to-panel and panel-to-column flashing.

6.9.2.14. Install upper right side panel in same manner as left side.

6.9.3. Door Installation.

6.9.3.1. Assemble left door by inserting splice bars and mounting bracket of upper door panel into the channel and mounting bracket of lower door panel ([Figure 6.28](#)). Put right door together in a similar manner.

**Figure 6.28. Door Assembly.**



6.9.3.2. Obtain door positioning tool and install it on lower end of column R2.

6.9.3.3. Place hinged side of right door on positioning tool and turn adjusting knob until hinge mounting bolts are lined up with column R2 mounting inserts ([Figure 6.29](#)).

**Figure 6.29. Door Hinge Mounting Bolts and Column Mounting Inserts.**



6.9.3.4. Screw mounting bolts into column inserts. Remove positioning tool.

6.9.3.5. Place positioning tool on column L2 and install left door.

6.9.3.6. Adjust door hinge mounting bolts so that the lock assembly works properly and the spring bolt engages the header correctly. Tighten nuts on mounting bolts after doors are adjusted.

6.9.3.7. Using retainer clips secure door flashing over panel flashing along the end wall column flanges ([Figure 6.30](#)).

6.9.4. End Wall Flashing Installation.

6.9.4.1. Find midpoint of end wall flashing and roll both ends of flashing toward the center.

6.9.4.2. Place midpoint of flashing at ridge of the end wall and unroll both sides down the arch. **NOTE:** Half of the flashing should remain on the roof of the shelter; the other half should hang over the edge of the end wall.

**Figure 6.30. Door Flashing Attachment.**



6.9.4.3. Starting at the ridge, work down both sides of the shelter pressing the rubber edge of the flashing into the end wall flashing channel (**Figure 6.31**).

**Figure 6.31. Attaching End Wall Flashing to End Wall Panels.**



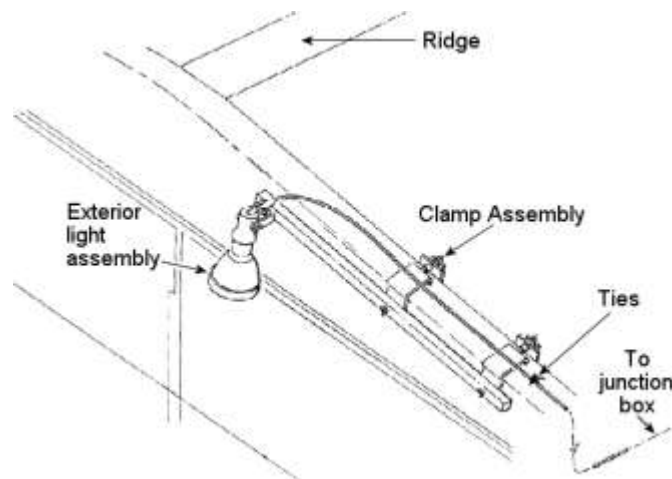
6.9.4.4. Once columns R1 and L1 are reached, attach flashing to inner flange of these columns using retainer clips. **NOTE:** Leave bottom 2-ft of flashing loose at this time.

6.9.4.5. After securing the end wall edge flashing, start back at the ridge to secure the other side of the flashing strip. Attach the flashing to the upper

flange of the arch beams from the ridge down the arch to ground level.  
**NOTE:** Leave the bottom 2-ft of flashing loose at this time.

**6.10. Exterior Electrical System Installation.** The exterior electrical system simply consists of exterior lighting at both ends of the shelter. The light assembly cable is plugged into junction box A1 at one end, and A5 on the other end, and then run up the end wall flashing to the ridge of the shelter. The light fixture is attached to the shelter at the ridge of the end wall using the two clamp assemblies attached ([Figure 6.32](#)).

**Figure 6.32. Exterior Electrical System Installation.**



**6.11. Arch Counterflashing Installation.** Arch counterflashing is one continuous strip for each arch joint. This flashing is installed over each arch joint after all interior and exterior electrical work has been completed and ridge and end wall flashings have been installed.

6.11.1. Find the midpoint of the counterflashing and roll both ends of the flashing toward the center. The midpoint of the counterflashing is notched.

6.11.2. Starting with the midpoint at the ridge of the shelter, unroll the counterflashing down the arch joint.



6.11.3. Secure counterflashing to arch beams with retainer clips ([Figure 6.33](#)). Leave bottom 2-ft of counterflashing loose at this time.

**Figure 6.33. Arch Counterflashing Attachment.**



**6.12. Electrical Power Connections.** Connection of the power cable to the shelter must be accomplished by a qualified electrician. The 208/120 volt source line is normally run from an outside power distribution panel to the J1 receptacle on the shelter's internally mounted distribution panel.

**6.13. Installation of Ground Skirt Flashing.** Ground skirt flashing is attached to keep water out and wind from blowing dust into the facility. These flashing pieces are attached to the bottoms of the end wall panels and arch panel sections 1 and 4.

6.13.1. Separate the two types of flashing (end wall and sidewall).

6.13.2. Attach the panel-to-panel flashing of the end/side panels to the ground skirt by pressing the rubber seal of the panel-to-panel flashing into the retainer channel on the ground skirt ([Figure 6.34](#)).

6.13.3. Attach lower ends of the arch counterflashing (using the 2-ft of flashing left loose in [Figure 6.33](#)) to the arch beams. At the arch joints make sure the ground skirt is under both the arch counterflashing and panel-to-beam flashing.

6.13.4. Anchor down the ground skirt flashing with sandbags or other suitable material.

**Figure 6.34. Installation of Ground Skirt Flashing.**



6.13.5. Some GP shelter configurations come with a membrane floor—refer to the technical order for its installation. Other flooring to consider include plywood or AM-2 matting, or the new light-weight flooring in light loading situations as existing ground loading conditions dictate. Once your shelter is up, be sure all tools, dunnage, packing boxes and packing straps are placed back into the shelter's shipping container.

**6.14. Take-Down Procedures.** Taking down the GP shelter is essentially the reverse of the erection procedures. Remember to clean the various components as you disassemble them, not only to prolong the life of the facility, but also to ensure customs clearance goes smoothly if applicable. Refer to TO 35E4-132-1, *Erection and Maintenance Instructions with Illustrated Parts Breakdown, Bare Base General Purpose Shelter*, for detailed procedures on folding components and packing the shipping container. Before starting, have a qualified electrician disconnect the electrical service.

6.14.1. Removal of Ground Skirt Flashing.

6.14.1.1. Remove sandbags from around ground skirt.

6.14.1.2. Separate ground skirt flashing from arch and end wall panel flashings and arch counterflashing.

6.14.1.3. Stack, roll up and secure (with ropes) ground skirt flashings.

6.14.2. Removal of End Wall Flashing.

6.14.2.1. Remove exterior light assemblies and clamp assemblies from end wall ridges.

6.14.2.2. Disconnect exterior light cabling from distribution box and put lights and cables aside for packing later.

6.14.2.3. Remove retainer clips that secure the end wall flashing to the arch beams and end wall columns.

6.14.2.4. Separate end wall flashing from retainers in end wall panels.

6.14.2.5. Take down, fold and secure end wall flashing.

6.14.3. End Wall Disassembly.

6.14.3.1. Separate door flashings from end wall columns.

6.14.3.2. Unscrew hinge mounting bolts of right door from end wall column.

6.14.3.3. Lower door to the ground and separate the upper and lower door sections.

6.14.3.4. Take down left hand door in similar fashion as right hand door.

6.14.3.5. Remove upper end wall panels by disconnecting flashing, removing the type-B clamps and opening the panel latches. Take down both right and left upper panels.

6.14.3.6. Loosen the clamp at the top of column R1 and unpin the R2/RU-2 column connection and the bases of both columns R1 and R2. Remove the lower right end wall panel.

6.14.3.7. Remove the lower left end wall panel in a similar manner. Put both the right and left panels aside for disassembly later.

6.14.3.8. Disconnect the header clamp assembly from the arch beam.

- 6.14.3.9. Unpin and take down the header assembly. Separate the two header pieces.
- 6.14.3.10. Unclamp and remove the RU-2 and LU-2 columns (this also can be done later when the end arches are lowered).
- 6.14.3.11. Take down the end wall at the other end of the shelter using the same procedures.
- 6.14.4. Removal of ECU/Window Panels.
  - 6.14.4.1. Disconnect ECU ductwork.
  - 6.14.4.2. Loosen thumbscrews and turn latches.
  - 6.14.4.3. Remove ECU/window panels.
  - 6.14.4.4. Tighten thumbscrews.
- 6.14.5. Removal of Ridge Flashing and Arch Counterflashing.
  - 6.14.5.1. Remove retainer clips holding counterflashing to arch beams.
  - 6.14.5.2. Take down, roll up and secure arch counterflashing (roll both ends toward middle).
  - 6.14.5.3. Separate ridge flashing seal from retainer strips on panels.
  - 6.14.5.4. Take down and stack ridge flashing.
- 6.14.6. Removal of Interior Electrical System.
  - 6.14.6.1. Disconnect all overhead lights from their respective junction boxes.
  - 6.14.6.2. Take down overhead lights.
  - 6.14.6.3. Remove lights and cables from shelter and set aside.
  - 6.14.6.4. Disconnect and remove cabling between all junction boxes and the distribution panel.
  - 6.14.6.5. Take down and remove the power distribution panel from shelter.
  - 6.14.6.6. Take down and remove all junction boxes from shelter.

6.14.7. Disassembly of Arches.

6.14.7.1. Attach erection harness to arch and place end wall panel over cable for safety.

6.14.7.2. Starting at the top of the arch disconnect all spacer bars and pin them to their arch beams. Detach all panel-to-panel flashing.

6.14.7.3. Using the anchor driving rod as a lever, lift panel section 4 enough to permit removal of all pins holding panel to the basepad.

6.14.7.4. Position and pin erection track to basepad.

6.14.7.5. Lift center of arch and remove pins in the lower hinges of the connection of panels 3 and 6.

6.14.7.6. Ensure panel section 4 arch beam ends are properly in the erection track. Pull outward on panel 4 as the winch releases the cable. The center of the arch will lower. Eventually, pressure will not be required outward on panel 4, at which time gravity will take over allowing the winch to fully control the downward movement of the arch.

6.14.7.7. Lower arch to the ground, then remove erection harness and safety guard.

6.14.7.8. Remove pin from bottom hinge of panel 5 and 6 connection and lower second half of arch to the ground.

6.14.7.9. Separate panel 6 from panels 3 and 5 and remove from shelter area.

6.14.7.10. Move panels 4 and 5 from the shelter area and separate the two panel sections.

6.14.7.11. Disassemble panels 4, 5 and 6 by opening arch beam latches and separating panels from beams.

6.14.7.12. Remove pin from lower hinge connection of panel 2 and 3 and lower arch half to the ground.

6.14.7.13. Remove pin from top hinge of panels 2 and 3, separate panel 3 from panel 2, and disassemble panel 3.

6.14.7.14. Unpin panel 1 from basepad. Move panels 1 and 2 away from shelter area, separate the panels and disassemble both units.

6.14.8. Removal of Basepads.

6.14.8.1. Remove wire rope clips from anchor cables and remove anchor cable from shear stakes.

6.14.8.2. Attach stake puller to shear stake.

6.14.8.3. Using the fulcrum bar and drive rod, pry stakes out of the ground ([Figure 6.35](#)).

**Figure 6.35. Pulling Shear Stakes.**



6.14.8.4. Clean stakes and basepads thoroughly.



## Chapter 7

### Information Collection, Records, and Forms

**7.1. Information Collections.** No information collections are created by this publication.

**7.2. Records.** The program records created as a result of the processes prescribed in this publication are maintained in accordance with AFMAN 33-363 and disposed of in accordance with the AFRIMS RDS located at [https://afrims.amc.af.mil/rds\\_series.cfm](https://afrims.amc.af.mil/rds_series.cfm).

### 7.3. Forms (Adopted and Prescribed).

#### 7.3.1. Adopted Forms.

AF Form 847, Recommendation for Change of Publication.

7.3.2. Prescribed Forms. No prescribed forms are implemented in this publication.

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**Attachment 1**

**GLOSSARY OF REFERENCES  
AND SUPPORTING INFORMATION**

***References***

AFPAM 10-219, Volume 5, *Bare Base Conceptual Planning Guide*, 1 June 1996

AFH 10-222, Volume 1, *Guide To Bare Base Development*, 1 February 2006

AFH 10-222, Volume 2, *Guide To Bare Base Assets*, 1 April 2006

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TO 35E4-94-1, *Erection, Shipment, Stowage, and Maintenance Instructions with Illustrated Parts Breakdown, Bare Base Expandable Shelter/Container*, 6 June 1997

TO 35E4-132-1, *Erection and Maintenance Instructions with Illustrated Parts Breakdown, Bare Base General Purpose Shelter*, 16 March 2001

TO 35E5-6-1, *Operator, Unit, and Direct Support Maintenance Manual for Tent, Extendable, Modular, Personnel (TEMPER)*, 30 September 2005

TO 35E5-6-11, *Operations and Maintenance Instructions with Parts List, Alaska Small Shelter System (AKSSS)*, 1 December 2004

TO 35E5-6-21, *Operation and Maintenance Instructions with Parts List, California Medium Shelter System*, 9 March 2000

TO 35E9-267-1, *Operation and Maintenance Instructions with Illustrated Parts Breakdown, Air Conditioner, Type A/E 32C-39*, 30 September 1997

***Abbreviations and Acronyms***

**AFRC**—Air Force Reserve Command

**ANG**—Air National Guard



**BEAR**—Basic Expeditionary Airfield Resources  
**ECU**—Environmental Control Unit  
**EL-DB**—Electrical distribution box  
**ELP**—End liner panel  
**ESC**—Expandable Shelter Container  
**FDECU**—Field Deployable Environmental Control Unit  
**GFCI**—Ground fault circuit interrupter  
**GP**—General purpose  
**ILP**—Interior liner panel  
**MLP**—mid liner panel  
**MSS**—Medium shelter system  
**SLP**—Side liner panel  
**SSS**—Small shelter system  
**TEMPER**—Tent, extendable, modular, personnel  
**TO**—Technical order  
**ULP**—Universal liner panel



## Attachment 2

### SSS QUICK ASSEMBLY AND RECONSTITUTION CHECKLIST

**A2.1. Introduction.** The checklist in [Table A2.1](#) provides abbreviated SSS set-up and reconstitution procedures. If problems are encountered, refer to the step-by-step procedures in [Chapter 2](#) or TO 35E5-6-11.

**Table A2.1. SSS Quick Assembly & Reconstitution Checklist.**

<i>Step</i>	<i>Action</i>
<b>___1.</b>	<b>Unpack.</b> Unpack all containers and bags.
<b>___2.</b>	<b>Shelter Assembly Set-up.</b> ___a. Layout and assemble base. ___b. Anchor base. ___c. Attach non-slip floor to base. ___d. Assemble and raise arches. ___e. Install purlins. ___f. Install uprights. ___g. Install end panels. ___h. Install cover. ___i. Install internal liners. ___j. Install electrical system. ___k. Install plenum. ___l. Install guy ropes if wind conditions are over 40 MPH.
<b>___3.</b>	<b>Electrical System Installation.</b> ___a. Install distribution box. ___b. Install lights. ___c. Install receptacles. ___d. Attach power cable to distribution box.
<i>Table continues on next page.</i>	

<i>Step</i>	<i>Action</i>
___4.	<b>Environmental Control Unit Duct Installation.</b> ___a. Place ECU near end of shelter 12" away from duct openings. ___b. Pass ducts through end panel duct ports. ___c. Secure duct ports to each duct with strap. ___d. Attach plenum to supply duct. ___e. Attach plenum to shelter frame.
___5.	<b>Reconstitution.</b> ___a. Disassemble. ___b. Inspect for damage. ___c. Inspect for rodents, bugs, and critters. ___d. Clean all parts. ___e. Repackage into container.



## Attachment 3

## TEMPER TENT ABBREVIATED SET-UP INSTRUCTIONS

**A3.1. Introduction.** The checklist in [Table A3.1](#) provides abbreviated TEMPER Tent set-up procedures. If any problems are encountered during this procedure, refer to the step-by-step procedures in [Chapter 3](#).

**Table A3.1. TEMPER Tent Abbreviated Set-Up Instructions.**

<i>Step</i>	<i>Instruction</i>
___1.	Open up frame and align the hole at the ridge and lock in place by inserting pin.
___2.	Align holes on header with holes in roof portion of arch and secure in place with pin. Do same to other side of header.
___3.	Start constructing the frame by joining 2 assembled arches with purlins as follows: ___a. Starting at the ridge, 2 personnel working together, one on each end of purlin, align and insert purlin stud in hole in frame and rotate 90 degrees to lock purlin to frame. ___b. Then, align stud in purlin diagonal brace with hole in the arch, insert stud in hole and lock in place by rotating the handle right or left 90 degrees. ___c. Push handle down until it is parallel with frame, but do <b><u>not</u></b> lay handle in the brace channel.
___4.	Place roof section over frame starting at one end, find ridge grommet and insert it over pin protruding up from frame, then do the same at the eaves.
___5.	After the first roof section, join end wall starting at the ridge. Insert grommet over pin and then join the roof section and end wall by engaging the loops. Place remaining roof sections on frame and join together by engaging the loops. Then put on the other end wall and join it to the roof sections.
<i>Table continues on next page.</i>	

<i>Step</i>	<i>Instruction</i>
___6.	After end walls and roof section are in place and secured, place and secure the extender in their respective places. Place extenders over pin protruding from frame. Align hole in extender with hole in pin and lock in place with securing clip. Use one 19-ft guy line on eave extenders and 2 19-ft guy lines on ridge extenders. Pass sewn end of guy line around ridge or eave extenders and thru eye splice. After guy lines are in place, pass sewn end of guy lines thru both holes in tent slips and place knot in sewn ends.
___7.	Place fly on extenders starting at the ridge. Place grommet over pin and lock in place (securing clip attached to fly) with clip thru hole in pin. Repeat this sequence to secure fly to eave extenders. All eave extenders have 2 securing clips attached. All eave extenders should have guy lines.
___8.	When roof sections, end walls, fly, and guy lines are secured in place, the tent can be raised. Place 2 people at each arch section at the eave location. The NCOIC should make certain that the frame is raised evenly and simultaneously at each arch. On the NCOIC's command, raise the shelter (at eave line) and swing the lower leg of the frame into place, then secure in place with pin. <b>NOTE:</b> Personnel at each end of shelter should make certain that the fabric does not get caught in the frame hinge.
___9.	Now, finish closing the tent by engaging the loops and securing them. When tent is in this position, check screen flap lines and guy lines to ensure they are free to operate.
___10.	Now, raise the opposite side in the same manner. Finish closing the tent.
___11.	Go inside the tent to secure the roof section to the frame at the eave and lower purlin by engaging the nylon hook and loop fastener around the purlin.
<i>Table continues on next page.</i>	

<i>Step</i>	<i>Instruction</i>
___12.	After dressing the tent, secure the guy lines to the ground stakes, 2 guy lines to one ground stake. One from the fly and one from the base of the extender. Before closing tent, drive steel ground pins in hole of footplate, door purlins and loops on bottom of tent sections.
___13.	Install end section liner by securing the tie tapes to the arch and purlins. Intermediate liner shall be installed in a similar way and shall be fastened to the end liner by securing the fastener tape.
___14.	Assemble 3 vestibule frames and place in front doorway. Attach adapter to one frame and prepare for assembly of vestibule.
___15.	Place vestibule over adapter frame and other 2 frames. Place guy lines over frame spindles and secure with hitch-pin clips. Secure tie tapes on inner walls to all 3 frames. Pull vestibule outward away from tent and stake guy lines to ground with wood stakes. Install single ply vestibule floor by securing tie tapes to vestibule frames and fastening the hook and pile fasteners on the floor to those on the vestibule walls. Place vestibule insulated floor on top of single ply floor. Attach vestibule door to adapter by placing grommets over frame spindles then lacing loops together as described in Step 5. Secure weather flaps over laces by means of the hook and pile fasteners. Drive steel ground pin through loops on bottom of vestibule.
___16.	Install one of the single ply tent floor sections by aligning notches with frame members then securing tie tapes to frame. Additional floor sections are installed by mating the hook and pile fasteners along edge of floor then securing tie tapes to frame.
___17.	Insulated floor panels are installed by placing them over the single ply floor sections and locking together by mating hook and pile fasteners along edge of floor sections.



**Attachment 4****SSS RECOMMENDED POWER DISTRIBUTION  
BOX WIRING MODIFICATIONS**

**A4.1. Description.** This attachment is provided to illustrate wiring in older model power distribution boxes that are in still in use and newer models with recommended modifications. **Figure A4.1** represents the plastic distribution box with light switch (EL-DB). **Figures A4.2** through **A4.5** represent the metal distribution boxes with light switch and 4 pigtails (EL-DB01) respectively.

**A4.2. Power Distribution Box.** The wiring instruction on the power distribution panel cover does not apply to the current BEAR set application. The instruction is applicable if using a main breaker. If your power source to the shelter is protected by its own ground fault control indicator (GFCI) system and the shelter power panel is wired as illustrated in **Figure A4.2**, this configuration may cause the GFCI systems to be extremely sensitive causing the breakers to trip.

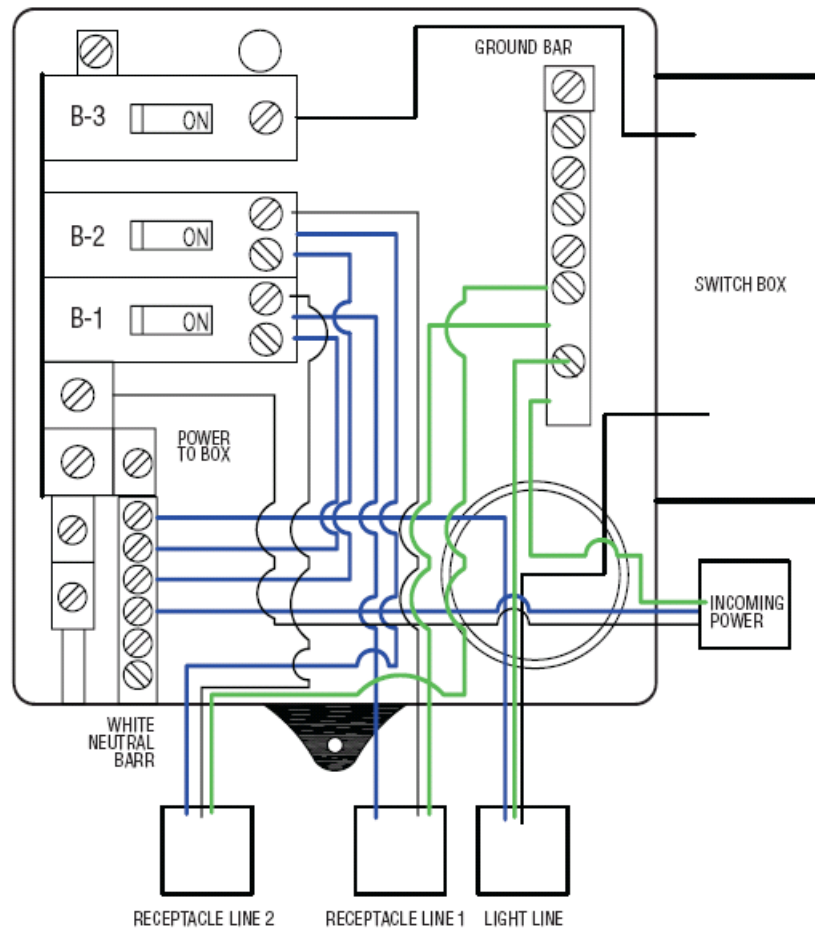
**WARNING:** Disconnect all electrical power to the distribution box before attempting any wiring modifications. Only qualified electricians should perform these modifications.

**A4.2.1. Temporary Field Modification.** If the problem noted above occurs in the field, an immediate, but temporary fix can be made by separating the ground wire from the neutral bus bar (**Figure A4.3**). See TO 35E5-6-11SS-1 for detailed instructions.

**A4.2.2. Ground Bus-Bar Modification.** It is recommended to modify the wiring for the EL-DB01 by adding a ground bus bar for ALL ground wires for a permanent solution to breakers tripping (**Figure A4.4**). Alaska Structures will provide the ground bus-bar as needed by contacting them at 505-541-9116 or fax 505-523-2084. See TO 35E5-6-11C for ground bus bar installation instructions.

**A4.2.3. Switch Ground Wire Modification.** The EL-DB01 has been further modified with the addition of a switch ground wire ([Figure A4.5](#)).

**Figure A4.1. Plastic Distribution Box (EL-DB).**





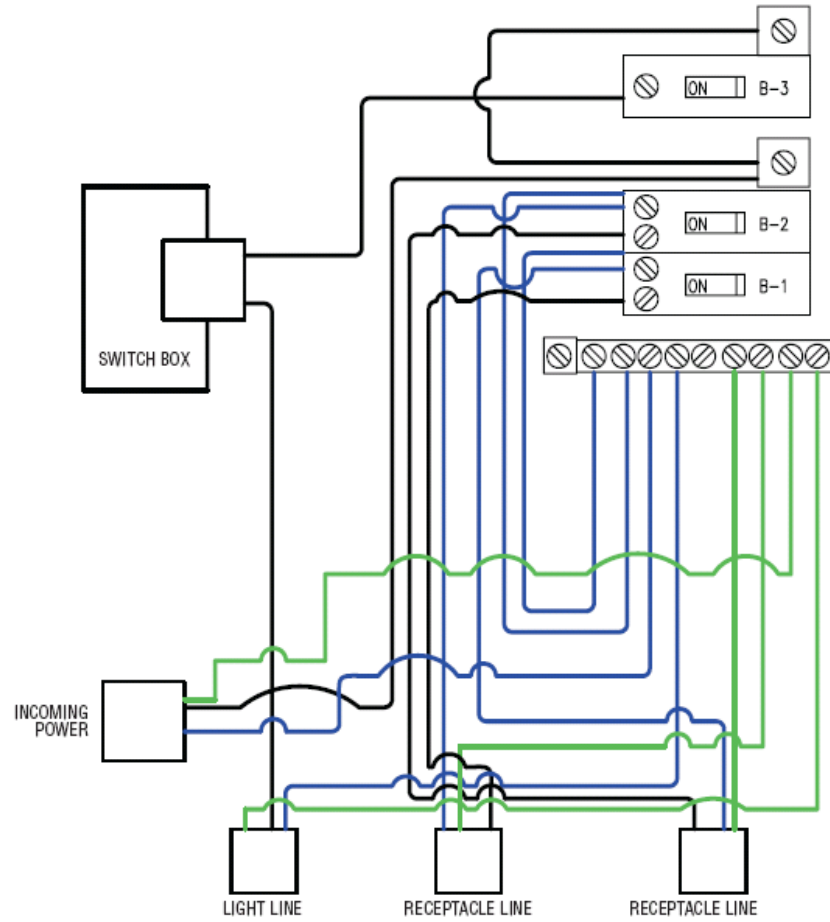
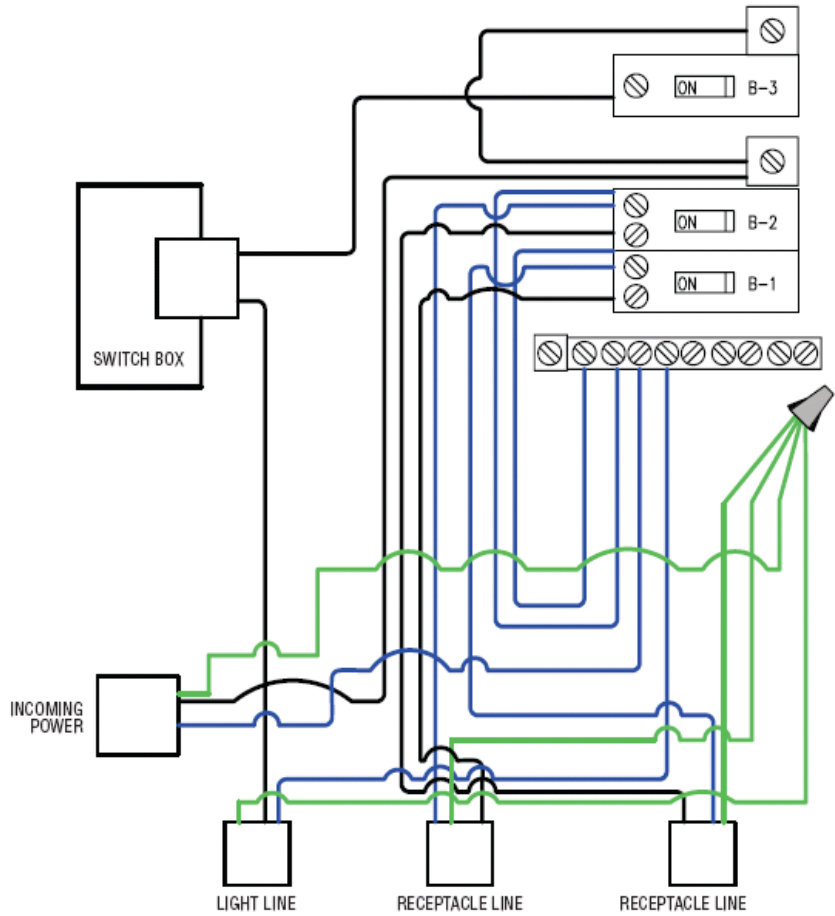
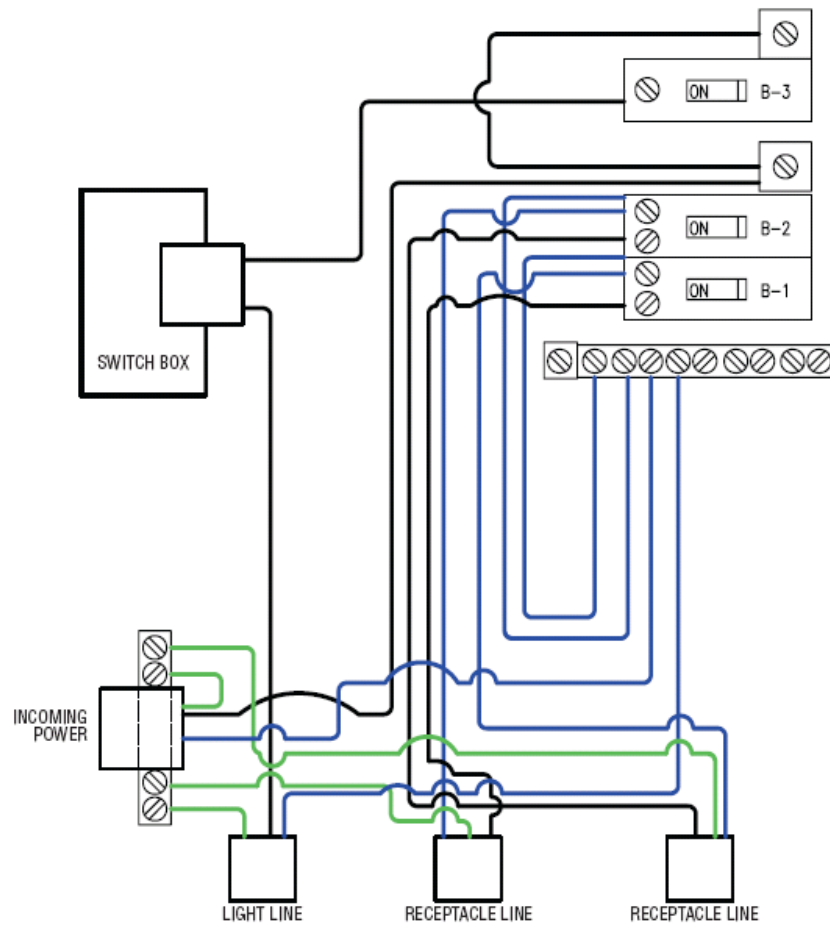
**Figure A4.2. Wiring Configuration Breakers to Trip (EL-DB01).**

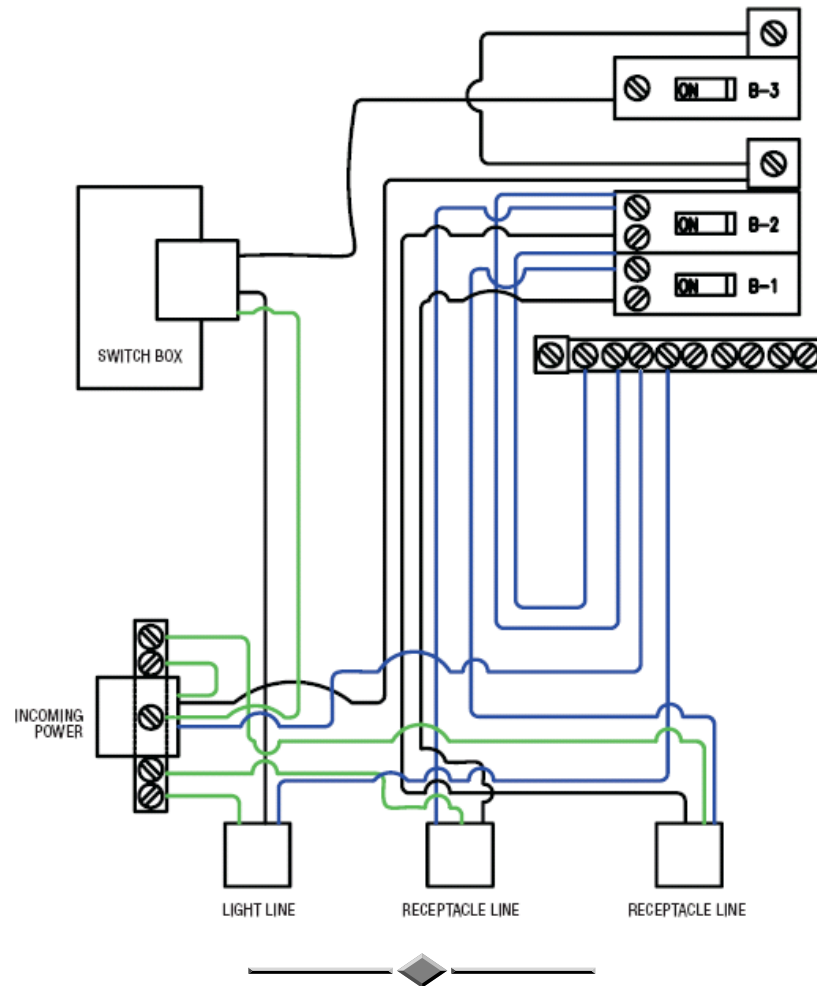
Figure A4.3. Separate Ground Wire from Neutral Bus Bar (EL-DB01).



**Figure A4.4. Recommended Distribution Box Wiring Configuration—  
Add Ground Bus Bar for ALL Ground Wires (EL-DB01).**



**Figure A4.5. Distribution Box Wiring Configuration with Added Switch Ground Wire (EL-DB01).**



## Attachment 5

MSS QUICK ASSEMBLY AND  
RECONSTITUTION CHECKLIST

**A5.1. Introduction.** The checklist in [Table A5.1](#) provides abbreviated MSS set-up and reconstitution procedures. Review the warning at beginning of [Chapter 5](#) prior to assembly. If any problems are encountered during this procedure, refer to the step-by-step procedures in [Chapter 5](#).

**Table A5.1. MSS Quick Assembly & Reconstitution Checklist.**

<i>Step</i>	<i>Action</i>
<b>1.</b>	<b>Unpack.</b> Unpack all containers and bags.
<b>2.</b>	<b>Structure Assembly Set-up.</b> <ul style="list-style-type: none"> <li>___ a. Layout and assemble base.</li> <li>___ b. Square base frame.</li> <li>___ c. Anchor base frame to ground, asphalt or concrete.</li> <li>___ d. Lay Duckbill anchors over base, but do not anchor yet— Duckbill anchors are not needed when shelter is anchored to 4-in. thick reinforced concrete.</li> <li>___ e. Attach floor to base.</li> <li>___ f. Complete arch assembly on ground.</li> <li>___ g. Assemble and raise arches—do not stand or walk under arches while being raised, secure with bottom purlin.</li> <li>___ h. Install purlins—one bay at a time starting with top purlin—be sure arches are plumb.</li> <li>___ i. Assemble vehicle door panels.</li> <li>___ j. Layout end panel and attach vehicle door headers, uprights, and personnel doors.</li> <li>___ k. Raise end panels into position by hooking over end arch.</li> <li>___ l. Tension end panels to end arches.</li> <li>___ m. Complete personnel doors installation, including handles.</li> <li>___ n. Place vehicle door panels into erected door frame on ends.</li> </ul>
<i>Table continues on next page.</i>	

<i>Step</i>	<i>Action</i>
	<ul style="list-style-type: none"> <li>___o. Adjust vehicle doors with vehicle door adjustment cables.</li> <li>___p. Install top liner.</li> <li>___q. Install cover.</li> <li>___r. Install receptacles along arches (4 per side—evenly spaced).</li> <li>___s. Install lights.</li> <li>___t. Install liner panels.</li> <li>___u. Install air socks.</li> <li>___v. Set duckbill anchors.</li> <li>___w. For wind conditions over 40 MPH, install guy ropes when not anchored in 4-in. thick reinforced concrete.</li> </ul>
___3.	<b>Wiring Harness Hookup.</b> <ul style="list-style-type: none"> <li>___a. Install distribution panel.</li> <li>___b. Install receptacles.</li> <li>___c. Install lights.</li> <li>___d. Plug in distribution panel.</li> </ul>
___4.	<b>Environmental Control Unit Duct Installation.</b> <ul style="list-style-type: none"> <li>___a. Place ECUs near side corners of shelter 18-in. away from duct openings.</li> <li>___b. Pass ducts through any side of shelter duct ports.</li> <li>___c. Secure duct ports to each duct with cinch.</li> <li>___d. Attach air sock to supply duct.</li> <li>___e. Attach air sock to shelter frame.</li> </ul>
___5.	<b>Reconstitution.</b> <ul style="list-style-type: none"> <li>___a. Disassemble.</li> <li>___b. Inspect for damage.</li> <li>___c. Inspect for rodents, bugs, and critters—if bugs are present, use household bug spray to decontaminate.</li> <li>___d. Clean all parts.</li> <li>___e. Repackage into container for shipping/storage.</li> </ul>

