

Structural Modular Innovation LLC

SET MANUAL

SMI and Builder responsibilities for module erection
and site installation procedures



1.1 DATA PLATES AND STATE SEALS	4
1.2 DATA PLATE INFORMATION.....	4
1.2.1 IMPORTANT MASSACHUSETTS NOTE::	4
1.3 MODULE ERECTION AND SITE INSTALLATION PROCEDURES.....	5
1.4 FOUNDATION	6
1.4.1 FIGURE 1.....	6
1.4.2 FIGURE 2.....	7
1.4.3 CRANE SETTINGS	8
1.4.4 FIGURE 3.....	9
1.5 TRUSS ROOF SET SEQUENCE	9
1.5.1 Ranch and Split Foyer.....	9
1.5.2 FIGURE 4.....	10
1.5.3 FIGURES 5 and 6.....	11
1.5.4 FIGURE 7.....	12
1.5.5 FIGURE 8.....	12
1.5.6 FIGURE 9.....	13
1.6 Split Level	14
1.6.1 FIGURE 10.....	14
1.7 Four Section Two Story	15
1.7.1 FIGURE 10.1.....	15
1.8 Four Section Contemporary Two Story.....	16
1.9 RAFTER ROOF SYSTEMS	17
1.9.1 5/12 AND 7/12 SYSTEMS.....	17
1.9.2 9/12 & 12/12 SYSTEMS	18
1.9.3 12/12 SYSTEMS	19
1.10 VAULTED CEILINGS.....	19
1.11 SET SEQUENCE FOR SHED DORMER	20
1.12 SIDING SKIRT TRIM.....	21
1.12.1 FIGURE 11.....	21
1.13 GABLE SIDING.....	22
1.13.1 FIGURE 12.....	22
1.14 PAINTING.....	23
1.15 INSULATION	23
1.16 INTERIOR TRIM.....	23
1.17 FIGURE 13.....	24



1.18 SUGGESTED GENERAL FINISHING SEQUENCE.....	26
1.19 ELECTRICAL CONNECTIONS.....	27
1.19.1 General Connections:.....	27
1.19.2 Crawl Space:.....	27
1.19.3 Two Story Electrical Connection:	27
1.19.4 Basement:	27
1.20 ELECTRICAL.....	28
1.21 PLUMBING CONNECTIONS.....	29
1.21.1 General Connections:.....	29
1.22 PLUMBING.....	30
1.22.1 Supply.....	30
1.22.2 DWV	30
1.22.3 Plumbing – Basement Variations and Exceptions from Crawl Space System	31
1.23 ERECTION OPTIONS.....	31
1.24 FASTENING SCHEDULE FOR ON-SITE CONNECTIONS.....	32
1.24.1 FLOOR.....	32
1.24.2 ROOF/CEILING	32
1.25 ORGANIZATIONAL PROVISIONS FOR FIELD REPAIR	33



1.1 DATA PLATES AND STATE SEALS

STRUCTURAL MODULAR INNOVATIONS, LLC. HOMES AND STATE SEALS:

1. LOCATION OF THIRD PARTY AND STATE SEAL IS UNDER THE KITCHEN SINK OR AS SHOWN ON APPROVED DRAWINGS.
2. EACH CERTIFIED PREMANUFACTURED UNIT SHALL HAVE A DATA PLATE. DATA PLATE SHALL BE PERMANENTLY AFFIXED IN A VISIBLE LOCATION AS SHOWN ON APPROVED SYSTEMS DRAWINGS.

CAUTION: DO NOT ALTER, DEFACE, OR REMOVE LABELS OR DATA PLATE UNDER ANY CIRCUMSTANCES!!!

1.2 DATA PLATE INFORMATION

STRUCTURAL MODULAR INNOVATIONS, LLC. CERTIFIES THAT EACH **STRUCTURE IS NOT A MANUFACTURED HOME SUBJECT TO THE PROVISIONS OF THE NATIONAL MANUFACTURED HOUSING CONSTRUCTION AND SAFETY STANDARDS ACT** AND IS...

- DESIGNED ONLY FOR INSTALLATION ON A SITE-BUILT PERMANENT FOUNDATION
- NOT DESIGNED TO BE MOVED ONCE SO INSTALLED
- DESIGNED OR MANUFACTURED TO COMPLY WITH STATE CODES
- TO THE MANUFACTURER'S KNOWLEDGE IS NOT INTENDED TO BE USED OTHER THAN ON A SITE-BUILT PERMANENT FOUNDATION.

1.2.1 IMPORTANT MASSACHUSETTS NOTE::

Per 780 CMR: State Board of Building Regulations and Standards Section 110.R3.8.1.1 Owner's Agent. A CSL, duly licensed in accordance with 780 CMR 110.R5, shall, in accordance with 780 CMR 1.00: Scope and Administration, be hired by and act as the agent for the owner for the purpose of applying for and obtaining any and all permits required for the field installation of all product. The CSL shall be responsible for the construction of the foundation system, the attachment to the foundation, and the completion of the product, and all pertinent site work required by section 105 of 780 CMR and shall provide at least 48 hours notice to the Office and the building official before the placement and connection of such units shall begin.

Per the MA Building Code, 10th Edition

Section 107.6.3 **Construction Contractor Services.** The actual construction of the work shall be the responsibility of the general contractor as identified on the approved permit and shall involve the following:

- 1 Execution of all work in accordance with the approved construction documents.
- 2 Execution and control of all means and methods of construction in a safe and satisfactory manner in accordance with all applicable local, state, and federal statutes and regulations.
- 3 Upon completion of the construction, certification in writing to the responsible registered design professional that, to the best of the contractor's knowledge and belief, construction has been done in substantial accord with section 107.6 and with all pertinent deviations specifically noted. The building official may require a copy of this certification.



1.3 MODULE ERECTION AND SITE INSTALLATION PROCEDURES

Erection instructions, as outlined herein, are intended to indicate necessary steps required for completion of the field installation of Structural Modular Innovations, LLC. manufactured buildings. The installer must first review the construction drawing for individual buildings involved. As installation work in the field may vary with individual models and buildings, advanced planning in anticipation of the crane location and module transporters will allow for the installation to be completed in a minimum amount of time. Connection details and system inter-connected requirements will be shown on the drawings and calculated, and are to be used in conjunction with related information outlined in these procedures.

The builder will determine the sequence in which the finishing work is to be accomplished considering site conditions, weather, and availability of utilities for heat and power load.

Initially, **the units must be weatherproofed as early as possible**. The electrical power and heating hookup within the unit should be next. The electrical hookup can be made as soon as the junction from module to module is made. Plumbing hookups can be made immediately after structural connections are completed.

To allow early completion of basement stairs, basement and garage floors should be poured before delivery of the units. This will also allow for easier garage erection, if provided. Unfinished floors increase reaching distance and make setting operations more dangerous and difficult. Unpoured garage floors make the settling of two car garage headers more difficult for the builder because of the height that the heavy beam must be carried by ladder. Therefore, **foundation work must be completed as early as possible**.

Delivery includes towing tractor, trailer, flag car, transport permits, and cargo insurance. Rates for each haul will be predetermined. It does not include tow costs at the site. Each trailer is allotted two hours for unhooking at the site, after which waiting time will charged to the purchaser.

No responsibility will be assumed by Structural Modular Innovations, LLC. for damage to basement walls. It is the builder's obligation to shore (brace) and backfill.

The following is a suggested list of minimum **builder requirements** that are to be met:

1. Adequate access to the site and satisfactory unloading areas are to be provided by the builder.
2. Entrance to the site and unloading area cannot slope more than 12" to 20'. The access and delivery area need to be compacted or the area should be on undisturbed soil capable of supporting the units and transporting equipment and the area smoothly graded.
3. Shrubs, wires, and trees are to be removed to allow access for the trailer and modules.
4. Tow-in costs are the responsibility of the builder and include idle crew labor costs while waiting for adequate tow-in equipment to arrive.
5. The unloading area (generally the front of the house) should also be level and compacted or undisturbed soil with adequate clearance for the crane and all module units. It should also provide the installation crew ample room to work in safety.



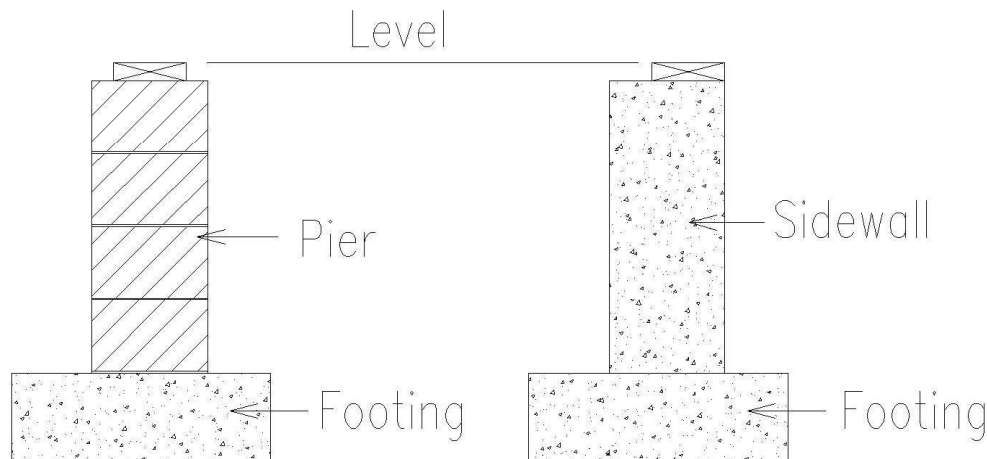
6. All access roads to the job site should also be compacted or undisturbed soil, be smoothly graded and have a clearance width of a minimum of 15' with a clearance height of 14', and allow maneuvering of the crane and modules without right angle or sharp turns to prevent damage to the house or lifting crane. **The crane operator should be contacted ahead of the delivery date to visit the site** to assure that he has no problems with the operation of his equipment for its intended use and the 24' figured between modules is adequate.

1.4 FOUNDATION

See FIGURE 1

Simply put, a manufactured home cannot be positioned on a foundation that is not accurately built. **It is critical that the foundation be checked for length, width, squareness and plumb.** If the foundation is not correct, it must be corrected to allow for the mating of the house to the foundation. The units cannot be changed in shape by twisting and racking to fit a foundation that is not correct. Required heights of foundation, walls, and piers or basement beam columns must be checked to allow for accurate position of the unit. Refer to the construction prints for support and all dimensions.

Check foundation for size and triangulate for squareness. The top of the foundation must be straight (check with string) and level (shoot grade with transit). See **FIGURE 1**.

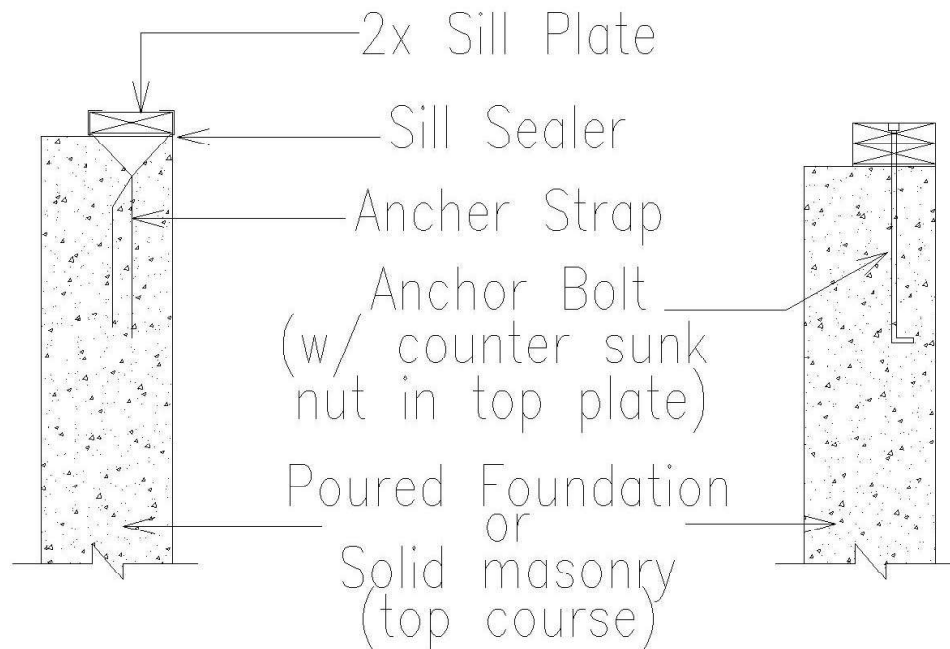


1.4.1 FIGURE 1



If the top of the foundation is out of level or has high and low spots, the house will settle to conform to these conditions, using drywall cracks, binding of doors, and windows.

1. Diagonal: Maximum Variation $+1/2''$
2. Level: Maximum Out of Level $1/8''$
3. **A set crew can refuse to set a house on a foundation if it feels the foundation is inadequate.**
4. Structural Modular Innovations, LLC. will not be liable for damages to the foundation or module resulting from foundations not prepared according to prints.
5. Basement floors need not be poured prior to setting the house, but if they are not poured, concrete support footings must be installed. The basement must be drained and a satisfactory surface provided for lifting jacks.
6. If exposed basement walls are to be used, one wall, full or half, can be wood framed. Consult factory for extra charges and construction requirements.
7. Sill plate or mudsill. 2 x sill plates are the builder responsibility with every unit. Run sill plates full width of foundation. These must be fastened with anchor straps or foundation bolts set by the builder. Plates must be put down over sill seal material.



1.4.2 FIGURE 2

CAUTION: MAKE SURE THAT NUTS ARE COUNTERSUNK AND ANCHOR BOLTS DO NOT EXTEND MORE THAN $1 \frac{1}{2}''$ ABOVE TOP OF FOUNDATION SO THAT PROTRUDING ENDS DO NOT INTERFERE WITH MODULER BOX. IF ANCHOR BOLTS ARE USED TO FASTEN SILL PLATE A SECOND PLATE WILL BE REQUIRED SO THAT THE BOTTOM PLATE IS FULL HEIGHT AND THE BOLT CAN BE COUTERSUNK INTO THE TOP SILL PLATE.



ERECTION INSTRUCTIONS

1.4.3 CRANE SETTINGS

- Level site to grade. This will allow halves to be spotted at a location that is sufficient to crane the home on the foundation without being re-positioned.
- Individual module weights vary depending on the length and amount of finishing material packed in unit.
Generally, a 46' unit weighs from 13 to 14 tons; thus a crane or sufficient load requirement is recommended for setting modules. A crane having a maximum safe distance from the boom foot to the lift point center of the spreader bar (measured horizontally) makes back filling and close transporter placement important.
- Under ideal conditions, position modules and crane as shown in **FIGURE 3**. **To minimize crane time, locate transporters before crane arrives.** Under ideal conditions with an adequate crane, position transporters perpendicular to foundation, 24'0" apart (check with the crane company to confirm the 24' distance) centered with foundation per drawing. Position crane between transporters near foundation, perpendicular to foundation, and centered between transporters. Start with back modular first (Unit "B"). This will avoid having boom or spreader frame over unit not yet set and not having to lift over any unit.

IDEAL CRANE SET UP

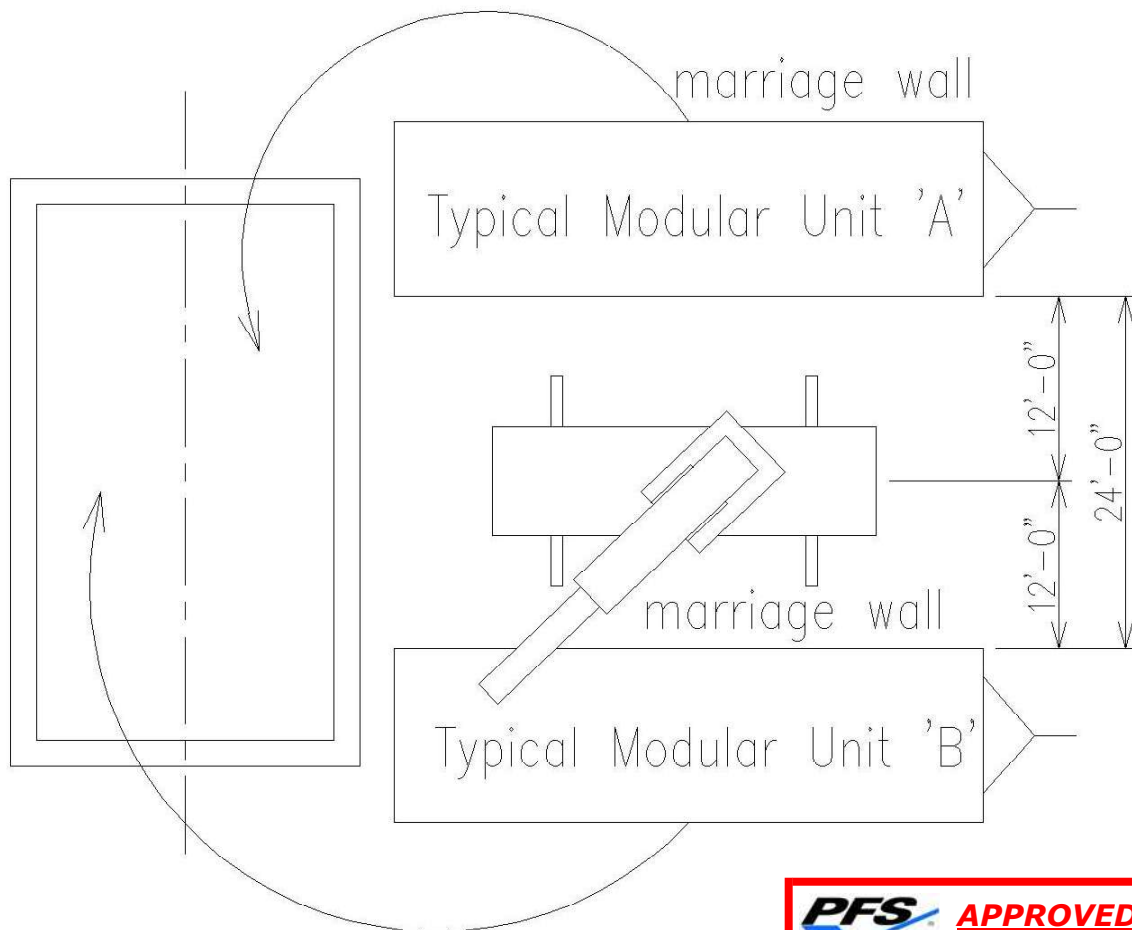


FIGURE 3



1.4.4 FIGURE 3

CAUTION: DO NOT REMOVE ANY DEADMAN SUPPORTS

- d. The “B” side of home is the kitchen, bath side (wet half) unless it is a reverse floor plan. The “A” side of house is the living room side. The center bearing wall may be a split bearing wall. Each half has a 2 x 4 wall and is simply butted up against each other. Typical two story first floor mate walls will be full 2 x 4 construction drawings.
- e. The foundation dimensions should be the same as the rough floor of the actual unit. It is suggested that the sill plates be laid on the foundation square and to the actual dimensions of the rough floor of the unit.
- f. Pick points for lifting the units will be marked on the units. The pick points will run through the floor perimeter of each unit. Shorter units will have 2 pick point locations and larger unit typically longer than 52’ will have 4 pick point locations.

CAUTION: FAILURE TO USE THESE PICK POINTS COULD RESULT IN DAMAGE TO THE UNITS.

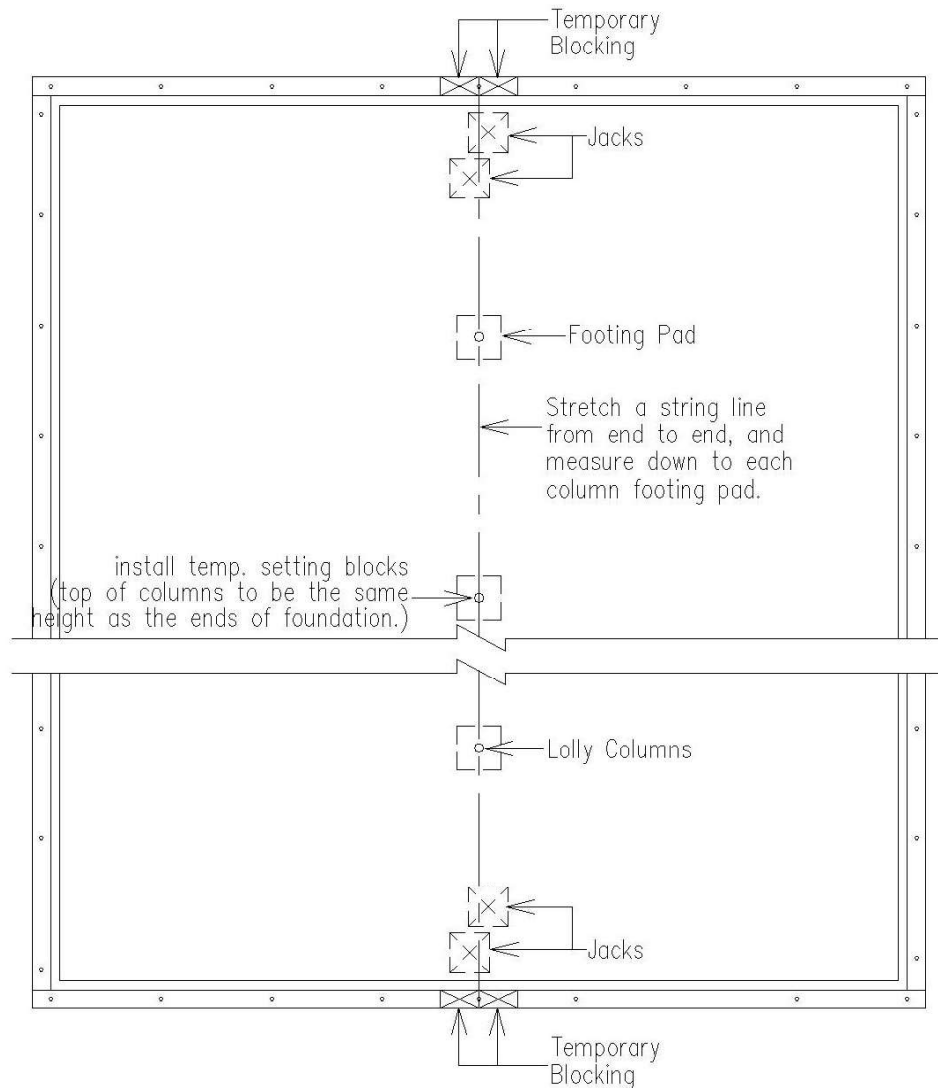
1.5 TRUSS ROOF SET SEQUENCE

1.5.1 Ranch and Split Foyer

Prep site and position modules upon delivery as shown previously. The day of set before crane arrival, try to complete the following preparation:

- a. Measure modules in quarters and drill holes at second and third quarters on outside perimeter for cables at marriage wall. Drive nails on bottom side of center beam to hold cables in place. Use this procedure on single story homes and bottom story of two story homes. Top story of two story homes must have holes drilled on both inside and outside perimeters. The holes drilled for cables should never be any higher in perimeter than the thickness of the drill bit being used.
- b. Put all nails out of strips holding plastic but still leaving plastic over module.
- c. Install siding brackets, come-a-long brackets, tag lines and have padded 4 x 4’s ready to install.
- d. Take all lags off under side of carrier.
- e. Adjust lolly columns to length. (See **FIGURE 4.**)



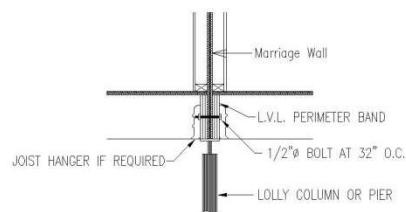
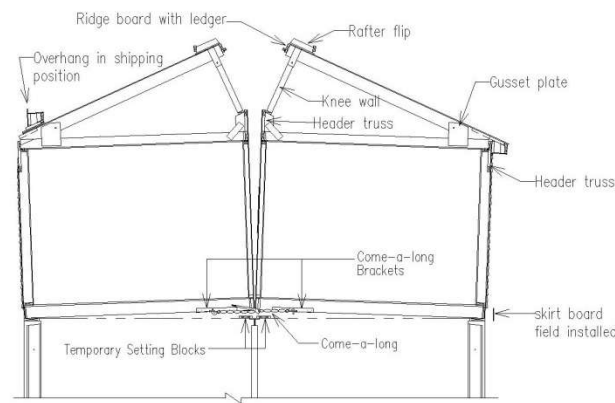


1.5.2 FIGURE 4

- f. Install setting blocks on foundation and ready to install on top of lolly columns. Have jacks set up and ready to be used inside foundation.
- g. Mark foundation at center points on both ends of sill plate.
- h. Have gable end sheathing taken off ends of modules ready to be installed.
- i. Measure foundation across corner for square.
- j. When you are sure of crane arrival, finish taking plastic and padding off modules and check marriage walls for nails or any other items protruding center point. This can be done while crane is setting up.



- k. Raise roof on first module to be set using procedures shown on pages 16 through 18. While you are standing roof on second module, install gable end sheathing on first module, and after you raise the second roof while you are setting first module, install gable end sheathing on the second roof raised. **CAUTION: DO NOT RAISE ROOF ABOVE PLANE OF FIXED ROOF SECTION AS THIS COULD DAMAGE HINGED TRUSS PLATES AND PLYWOOD SHEATHING!!!**
- l. After both roofs are raised, hook cables up by running between nails at marriage wall over top of carrier and through holes drilled during prep. Hook beackets up and have crane lift slightly to make sure cables are even so no unnecessary stress is put on the module. You should have your cables adjusted so you have a slight tilt from outside to center and from end to end. This will make positioning of module to foundation easier. If module doesn't match foundation, divide difference up at center point. This will take a minimal amount of shimming necessary before bottom strips are installed for bottom row of siding. Ease module down on foundation and on setting blocks as shown.
- m. Hook cables up to second module while easing second module into place. When both outside corners touch down, hook come-a-longs up to ends and draw tight before easing center point down. Leave come-a-longs hooked up until basement is bolted. (See **FIGURES 5 and 6.**)



1.5.3 FIGURES 5 and 6

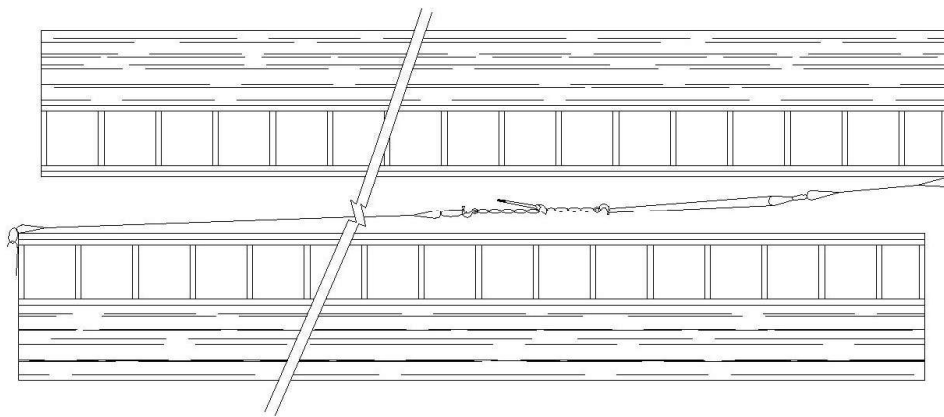
- n. Stack carriers and position so drivers can get to them without any problem. If shingles were shipped inside module, lift to roof with crane.



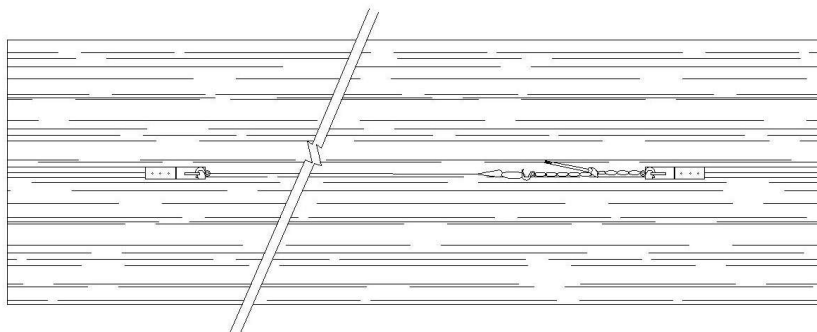
AT THIS TIME YOU SHOULD BE FINISHED WITH THE CRANE

See FIGURES 7 & 8

- o. After module to module assembly, you are finished with the crane. Making sure center beams are even, bolt halves together according to submission set. Then using jacks as shown on detail remove setting blocks and ease modules down onto foundation and lolly columns. At this time, finish roof off to complete weatherization. On twenty-four (24) foot wide homes, before fastening ridge beams, check the roof for any racking that might have occurred during shipment, and rack back even, then fasten ridge beam according to submission set, to hold in place. Then finish shingling roof to peak and cap with shingle capes or ridge vent, if called to be used. To rack a 24' wide roof, nail a come-a-long bracket on top of each ridge beam and using a heavy duty come-a-long, pull back even.
- p. For 28' wide homes, check roof for any racking that might have occurred during shipment and rack back even, install ridge cap to hold in place. To rack a twenty-eight (28) foot wide roof, fasten come-a-long brackets as shown in **FIGURES 7 and 8**.



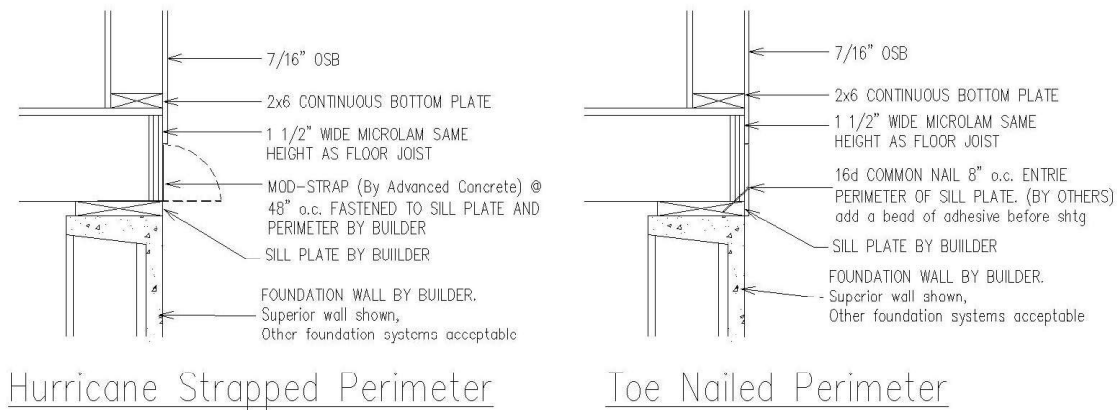
1.5.4 FIGURE 7



1.5.5 FIGURE 8

- q. After cap is fastened in place, finish running felt paper and run shingles up to peak and cap roof with shingle caps.
- r. Ease hinged overhangs down into place and fasten sheathing to stationary section of trusses according to submission set, and apply shingles left from factory. Fasten overhang to wall studding. **CAUTION: FAILURE TO PROPERLY SECURE SOFFIT OVERHANG PANELS WILL RESULT IN SEVERE DAMAGE TO HOUSE AND OCCUPANT!!!**

- s. Fasten the bottom perimeter of the house to the sill plate using one of two methods. (See **FIGURE 9.**)



1.5.6 FIGURE 9

- t. The approved drawing package may have increased sill plate anchor bolt frequency, rim joist to sill plate fastening, and additional hold down devices. The approved drawing package will supersede the set manual for those fastening applications.
- u. Once hinged roof section is fully extended and kneewall is resting firmly on the end vertical of the truss, make connections at top base of kneewall. Pivot top chord extension in line with rafter and complete fastening to rafter. In addition, nail plywood overlap from lift-up portion of roof to fixed portion at 16" o.c. After the above steps are completed, you should have the home weathertight.
- v. Overhang box finishing is to be completed after unit is set.

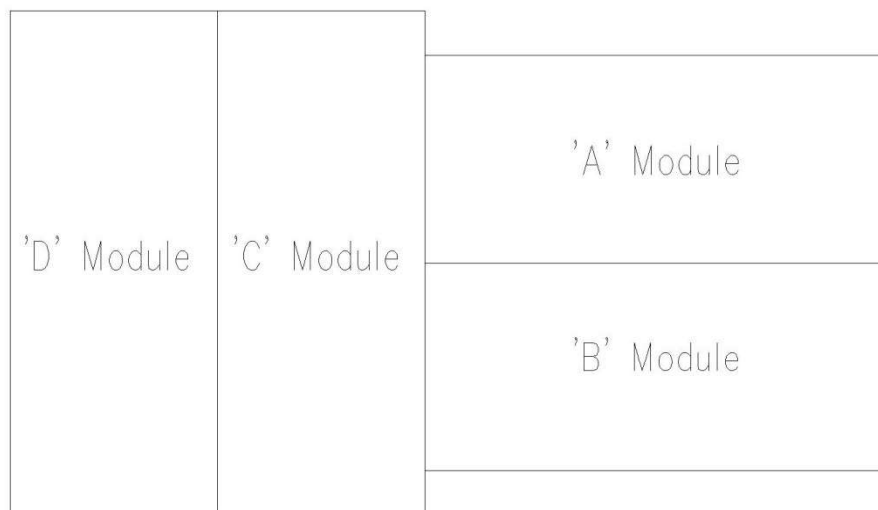
CAUTION: FAILURE TO NAIL ROOF SHEATING TO FIXED PORTION OF TRUSS WILL RESULT IN A WEAKENED ROOF CONDITION AND CREATE A DANGEROUS AND UNSIGHTLY RIDGE ACROSS ROOF.



1.6 SPLIT LEVEL

Generally, procedures are identical to ranch/split foyer erection with the following special procedures or sequences followed.

- a. It is suggested that the lower modules be placed on foundation first. Align the units with kneewall at the front. This will allow for proper tie-in of siding and/or brick. It is important that the module "B" be set in its precise location since the upper modules must butt to it and the stairwell must line up. The module "A" is set as usual with ranch houses, tilting modules from center outward with 2 x 8 x 8's. Modules "A" and "B" should be bolted underneath by erection crew while others prepare modules "C" and "D" for setting. Once tilt blocks have been removed from the "A" and "B" modules, then proceed with standard ranch erection procedures on modules "C" and "D" being careful to mate both "A" and "B" modules to "C", as well as to each other. (See **FIGURE 10.**)



1.6.1 FIGURE 10

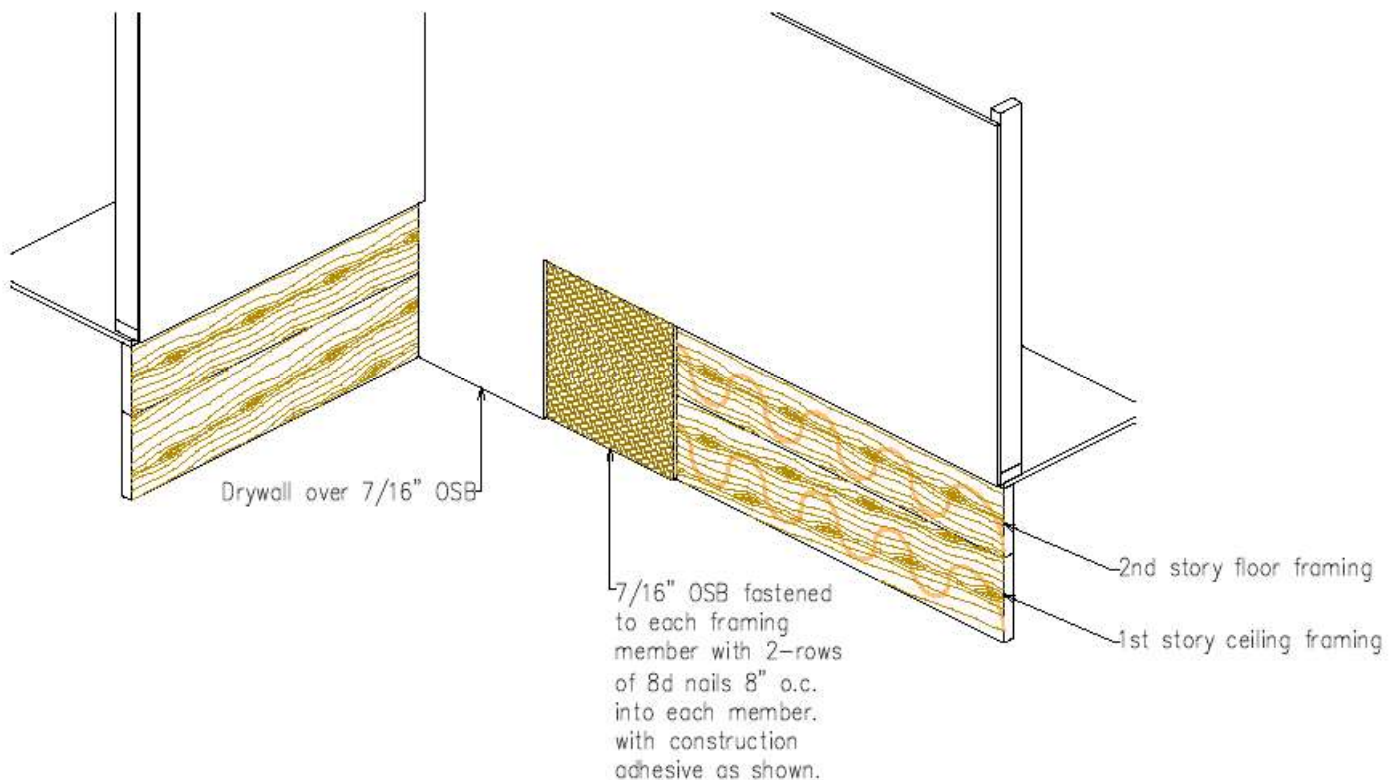
CAUTION: FAILURE TO FOLLOW THIS PROCEDURE PRIOR TO SETTING BEDROOM SECTION ON FOUNDATION WILL RESULT IN IMPROPER ALIGNMENT OF SECTIONS, ROOF, AND OVERHANGS!!!



1.7 FOUR SECTION TWO STORY

- Set first floor sections "A" and "B" on foundation as outlined previously. Bolt the floor and ceiling at center girders with $\frac{1}{2}$ " x 8" machine bolts (supplied) at 32" o.c. in floor and 48" o.c. in ceiling.
- Next, set the second story section (unit "D") lining up with the bottom story perimeter. Nail floor girder of "D" module to ceiling girder of "B" module with 16 D common nails every 16" at marriage point before you set "C" module.
- Next set the "C" unit aligning stair and door openings. Toenail box perimeter together with 16D common nails where exposed along floor between the two second story sections and install sheathing around exterior perimeter of the first and second story perimeter. The sheathing must be glued and nailed. According to submission set, see fastening schedule for sheathing.

1.7.1 FIGURE 10.1



NOTE:

The aligning 1st story ceiling framing and the 2nd story floor framing, Such as stair openings, open to below areas.. are oversized to allow the framed openings to be overlayed with 7/16" OSB applied directly over the framing, Then overlayed with drywall.



1.8 FOUR SECTION CONTEMPORARY TWO STORY

- a. Set first floor sections "A" and "B" on foundation as outlined previously. Bolt the floor and ceiling at center girders with ½" x 8" machine bolts (supplied) at 32" o.c. in floor and 48" o.c. in ceiling.
- b. Set the next second story section "D" ensuring proper alignment of exterior walls and interior openings. Next set the second story section "C" making certain that the stairwell opening aligns properly between the first and second story sections and allows for field installation of trim between sections. Toenail together with 16D common nails where exposed along floor between the two second story sections "D" to first. If applicable, fasten cantilevered second story section "D" to first story section "B" with Teco TY-DOWN rafter or equivalent for each joist.
- c. After units are set and properly secured, raise 2 x 6 rafters and insert kneewall. Fasten top and bottom of kneewall with 16D toenailed each side and install 1 ½" x 10 x 26 gauge galvanized metal straps at 16" o.c. using 3 10D nails each end. Fasten gusset plates to rafter with 16D nails, 4 each side staggered. Mating wall kneewall should be fastened to module "C" ceiling beam with 1 ½" x 26" gauge galvanized metal straps nailed with 3 10D nails.
- d. Rotate 2 x 6 panel from folded position until it meets the mating wall kneewall. Nail upper rafter panel to lower rafter panel with 10D nails at 8" o.c. Fasten top and bottom of kneewall with 16D nails toenailed each side. Install 1 ½" x 10" x 26" gauge galvanized metal straps at 16" o.c. using 3 10D nails each end.
- e. AFTER UNITS HAVE BEEN SET TOGETHER
- f. Set gable end panels into place. The roof may need to be slightly lifted to allow gable panel to be set.
- g. Install one layer of #15 felt paper over ridge.
- h. Install shingles on each side of peak.
- i. Cut felt and shingles at peak to keep open 3" air space for attic ventilation whenever ridge vent is required.
- j. Install vent-a-ridge metal cap at roof peak, making sure that the end caps are installed at each end of vent-a-ridge.
- k. Install roof caps, as needed.
- l. The second floor modular units are to be securely toenailed to the first floor using 16D common nails spaced 8" o.c. around the perimeter of the unit.
- m. See figure 10.1 for fastening around finished openings between the lower-level and upper-level modules. OSB is to be installed over the ceiling/floor joint as shown, then overlaid with drywall



1.9 RAFTER ROOF SYSTEMS

1.9.1 5/12 AND 7/12 SYSTEMS

CAUTION: On these rafter systems, you can set both halves on foundation, using the same procedures as a truss system, and raise the roofs before or after.

- a. Install kneewalls according to print shipped in builder packets. On all rafter systems, ½" tolerance is figured between end wall and rafter. Shim as necessary.
- b. Flip paneled extension pieces and fasten according to submission set.
- c. Finish shingling remainder of shingles omitted at factory.
- d. If applicable, ease flipped overhang sections down and fasten according to submission set.
- e. Finish remainder of unshingled section to complete weatherization.
- f. Asphalt shingles must be applied over solid sheathing. Maximum of ¼" gap between sheathing joints.
- g. Shingles installed on site must be installed in accordance with the manufactures installation instructions.



1.9.2 9/12 & 12/12 SYSTEMS

CAUTION: On these rafter systems, you set both halves on foundation, using the same procedures as a truss system, except **DO NOT RAISE ROOFS UNTIL MODULES ARE SET DOWN ON FOUNDATION AND COLUMNS.**

- a. Modules are set in accordance to the standard setup procedures before erection of cape roof.
- b. Lift hinged section of roof using the same lifting guide as shown previously. Install kneewalls fastening them into place temporarily.
- c. Install gable end walls according to individual prints shipped in warranty packets. NOTE: On all rafter roofs, gable end walls are designed with $\frac{1}{2}$ " tolerance in height. Shim as necessary.
- d. Rotate panels from folded position until they meet at peak. Panels must be temporarily supported until all connections have been made. Nail 2 x 4 rafter panel to 2 x 6 rafter panel with 10D nails at 8" o.c. Next, nail ridge boards together with 10D nails at 8" o.c. Once this is completed, attach 1 $\frac{1}{2}$ " gauge galvanized steel ridge straps at 48" o.c. using 3 6D nails for each strap, on each side. A 1 x 4 ridge tie at 48" o.c. fastened with 3 8D nails on each tie at each end may be used as an alternative to steel ridge straps, if preferred.
- e. Finish stacking carriers and lifting roof material onto roof to finish with crane.
- f. Fasten a collar tie at each end of roof after you are sure of a true pitch and roof line. Stretch a string from end to end to install remainder of collar ties according to submission set.
- g. Fasten kneewalls, color ties and ridge line as follows; finish remainder of shingling to complete weatherization of the home.
- h. After units are set and box sills in floor are bolted together with 5/8" machine bolts (supplied) at 48" o.c., raise 2 x 6 rafter panels and insert kneewall. Secure kneewalls to rafters with two Teco TY-DOWN SENIORS or equal with 16D nails at top and bottom (anchor required at the top, 1 at the bottom of kneewall and staggered for 24' wide models). Next, fasten gusset plates to rafter with 6D galvanized nails, 6 each side staggered. Install collar ties to each rafter and fasten with 8 10D nails (6 16D alternate) on each tie at each end.
- i. Install 4 x 8 sheets of sheathing over mating line (2'0" each side of mating line) with 6D nails or equal at 6" o.c. floor/ceiling girder consists of 4 or 6 members, bolt girder together with $\frac{1}{2}$ " x 8 (or 11") machine bolts at 48" o.c. before installing sheathing.
- j. On cape modules with a 24' wide room and the remainder of the house 27' wide, you must use the following setting sequence for raising the roof. Raise the roof section on the back module, (the section with the full 27' wide living space) the same as regular cape and then raise the paneled extension section up in a 90 degree position from the roof and brace temporarily in this position. Then raise the 24' section of the roof and complete flipping paneled extension sections as you would on a normal cape roof.



1.9.3 12/12 SYSTEMS

CAUTION: On this rafter system, you set both halves on foundation, using the same procedures as a truss system, except **DO NOT RAISE ROOFS UNTIL MODULES ARE SET DOWN ON FOUNDATION AND COLUMNS.**

- a. Modules are set in accordance to the standard setup procedures before erection of roof.
- b. Lift hinged section of roof using the same lifting guide as shown previously. Install columns at end beams, fastening them temporarily.
- c. Install gable end walls according to individual prints shipping builder packets. NOTE: On all rafter roofs, gable end walls are designed with ½" tolerance in height. Shim as necessary.
- d. Rotate panels from folded position until they meet at a peak. Panels must be temporarily supported until all connections have been made. Nail ridge boards together with 10D nails at 16" o.c. Once this is completed, attach 1 ½" gauge galvanized steel ridge straps at 48" o.c. using 3 6D nails for each strap, on each side. A 1 x 4 ridge tie at 48" o.c. fastened with 3 8D nails on each tie at each end may be used as an alternative to the steel ridge straps, if preferred.
- e. Finish stacking carriers and lifting roof material onto roof to finish with crane.
- f. Fasten a collar tie at each end of roof after you are sure of a true pitch and roof line. Stretch a string from end to end to install remainder of collar ties according to submission set.
- g. Fasten beams, columns, collar ties and ridge line as follows: Finish remainder of shingling to complete weatherization of the home.
- h. After units are set and box sills in floor are bolted together with 5/8" x 8" machine bolts (supplied) at 48" o.c., raise 2 x 6 rafter panels and insert columns under the ends of beam. Secure column and beam to rafter with Simpson "Strong Tie" LSTA 24 or equal. Install collar ties to each rafter and fastened with (6) 12D nails on each tie at each end.
- i. Install 4 x 8 sheets of sheathing over mating line (2' 0" each side of mating line) with 6D nails or equal at 6" o.c. If floor/ceiling girder consists of 4 or 6 members, bolt girder together with ½" x 8" (11") machine bolts at 48" o.c. before installing sheathing.
- j. On cape modules with a 24' wide room and the remainder of the house 27' wide, you must use the following setting sequence for raising the roof. Raise the roof section on the back module, (the section with the full 27' wide living space) the same as regular cape and then raise the paneled extension section up in a 90 degree position from the roof section and brace temporarily in this position. Then raise the 24' section of the roof and complete flipping paneled extensions sections as you would on a normal cape roof.

1.10 VAULTED CEILINGS

- a. Modules are set according to the standard rafter roof set up procedures before erection of the roof.
- a. Raise the hinged section of the vaulted ceiling area, and install gable and walls to hold in place.



- b. Fasten the four pieces of laminated beam shipped for the wind column together and set into place using the crane.
- c. Raise the hinged sections of the standard cape roof sections, using the procedures as outline for cape roof. Rotate panels from folded position until they meet at peak. Panels must be temporarily supported until all connections have been made.
- d. Lift shipped loose panels of vaulting ceiling and fasten according to submission set to complete vaulted ceiling to peak. Check the height of wind column and make sure the vaulted section of roof and standard cape sections are even.
- e. After you have both roof sections even and fastened together, install the remainder of the sheathing left off from the factory, to tie the two sections together and finish tar papering and shingling to complete weatherization.

ONCE THESE STEPS HAVE BEEN FOLLOWED, COMPLETE ALL FASTENING USING STANDARD CAPE INSTALLATION PROCEDURES.

1.11 SET SEQUENCE FOR SHED DORMER

1. Set two modules together according to manual. Stand roof section 12/12 according to manual. Flip the hinged section of roof using temporary braces to hold in place at ridge line. Install dormers using crane.
2. Finish up with crane stacking carriers and lift all material for shed dormer on top of "B" module and all gable end walls. Install outside wall of shed dormer.
3. Install gable end walls.
4. Install rafters on shed dormer making sure outside wall is plumb and straight.
5. Install ceiling joist every 4' to help hold everything plumb and straight.
6. Lift kneewall up on top of ceiling joist and laminated beams one on each side of kneewall.
7. Install ceiling joist every 4' to help hold everything plumb and straight.
8. Lift kneewall up on top of ceiling joist and laminated beams one on each side of kneewall.
9. Finish sheathing and install felt paper and shingle roof to complete weatherization of shed dormer.
10. At this time, finish installing remainder of ceiling joist and install kneewall and laminated beams according to submission set.

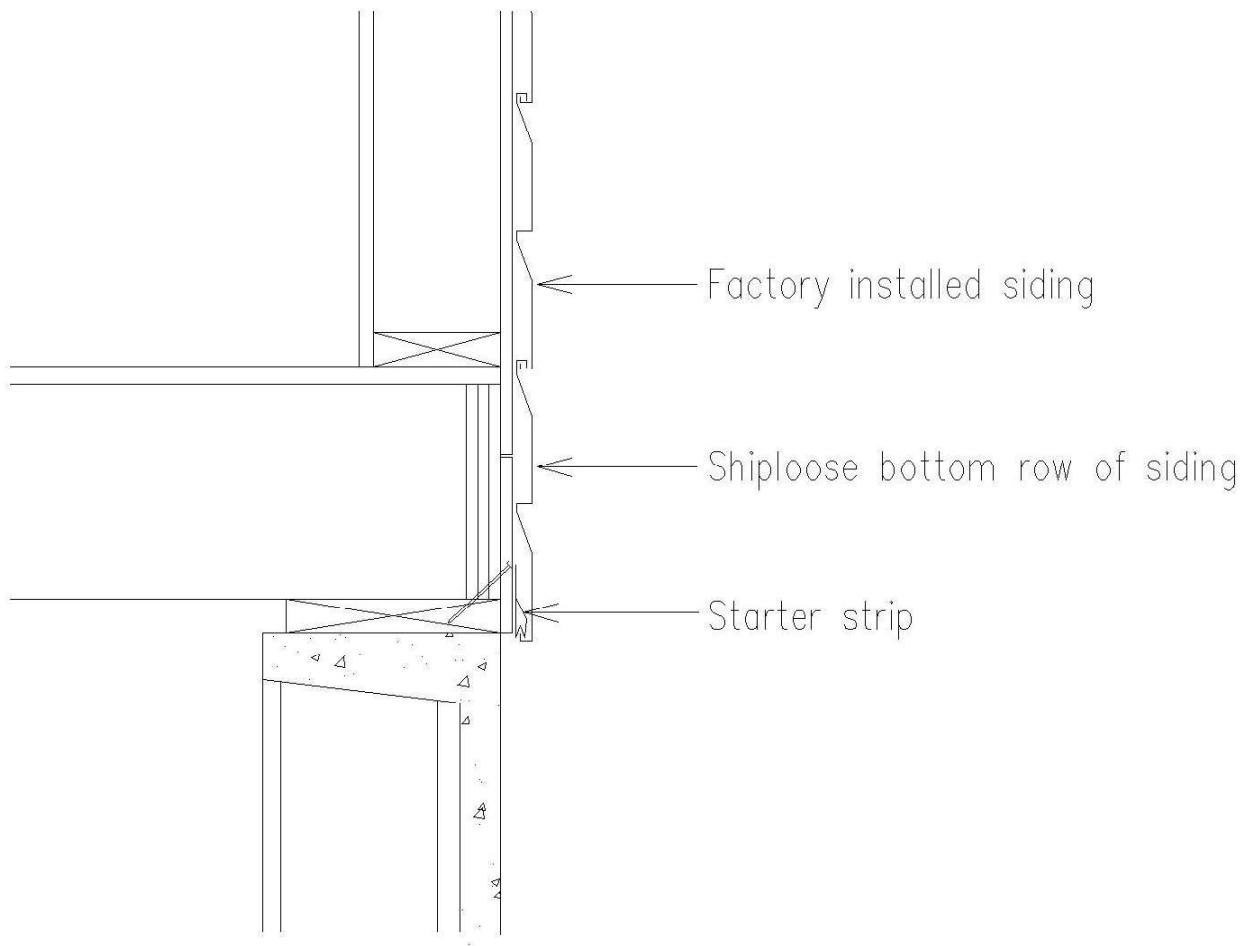


1.12 SIDING SKIRT TRIM

See FIGURE 11

Siding is to be applied in the following manner, depending on whether it is vertical or horizontal.

- a. Remove shipping clip installed to hold bottom row of siding. Nail starter strip (supplied) onto plywood strips as shown in FIGURE 11. Slide siding along bottom edge of factory installed siding and starter strip. Install starter strip and sub-corners on ends of house and complete siding by conventional method. Corners snap over the sub-corners. See FIGURE 11.



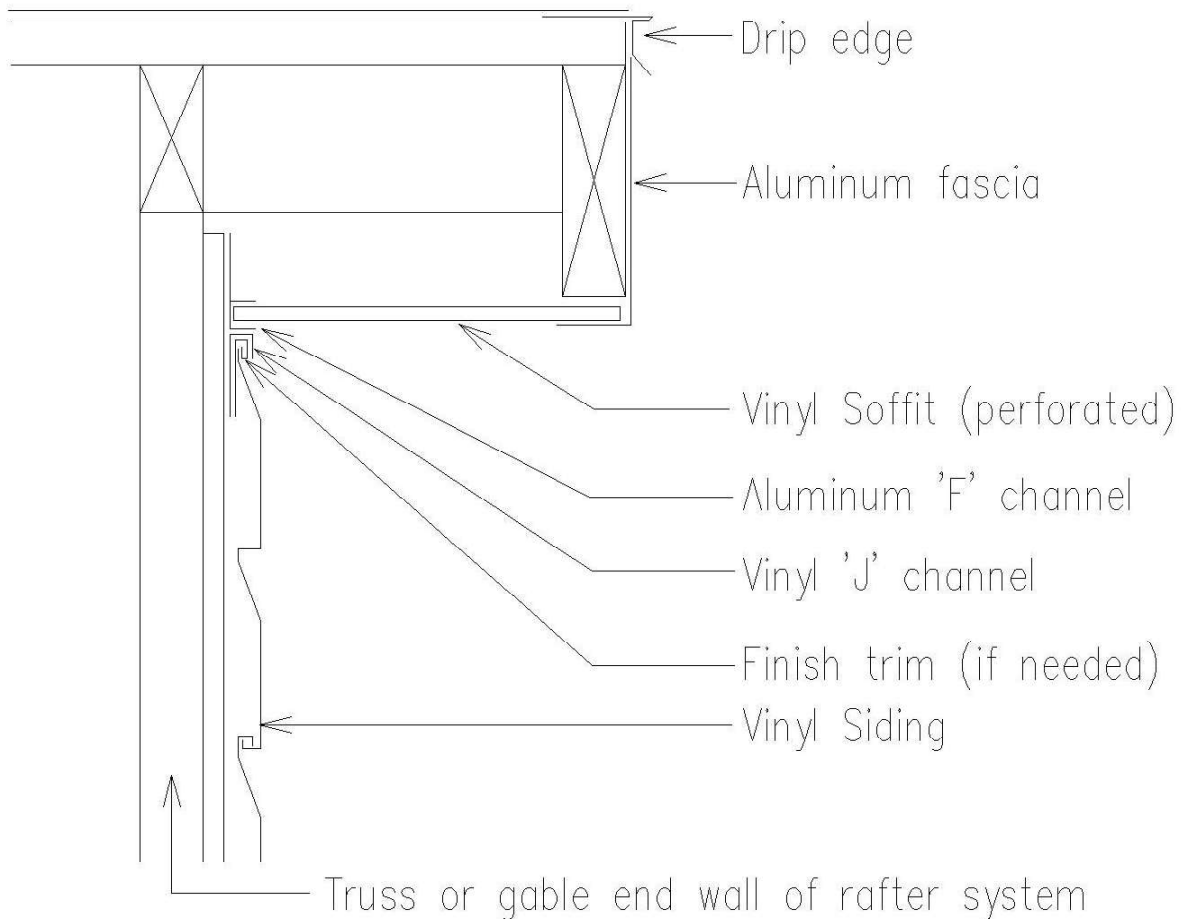
1.12.1 FIGURE 11



1.13 GABLE SIDING

See **FIGURE 12**

- a. Siding on the gabled ends is installed from the bottom up.
- b. Line up the starter strip with the front and rear. Complete rake or barge trim by placing vinyl trim over 2 x 4 sub rake. All other cracks are caulked. See **FIGURE 12**



1.13.1 **FIGURE 12**



1.14 PAINTING

Painting of raw surfaces is the last sequence for completing exterior finish.

- a. If a garage is included in the unit package, exterior painting is generally done after garage erection and completion.
- b. Decorative porch posts and porch soffit.
- c. Front door jambs and brick mold trim adjustment. Nail holes should be pulled before painting.
- d. Siding frieze or band boards around house (special evaluations)
- e. Doors need to be caulked at siding gap next to trim mold.
- f. General touchup on spots bruised during delivery and erection.
- g. Soffit under floor of overhang, i.e. floor overhang of split entry model.

1.15 INSULATION

IMPORTANT: After the modules are set, insulation or caulking need to be applied to the following areas:

- a. Between the center beam of floor joists.
- b. In the crack between modules at all doorway openings of common wall.
- c. In the crack between modules at both end walls.
- d. In the crack between center girder of ceiling joists.
- e. On cape roof systems, between the crack in gable end walls.
- f. This is necessary to prevent air infiltration from the attic between the units and into the living areas of the modules.

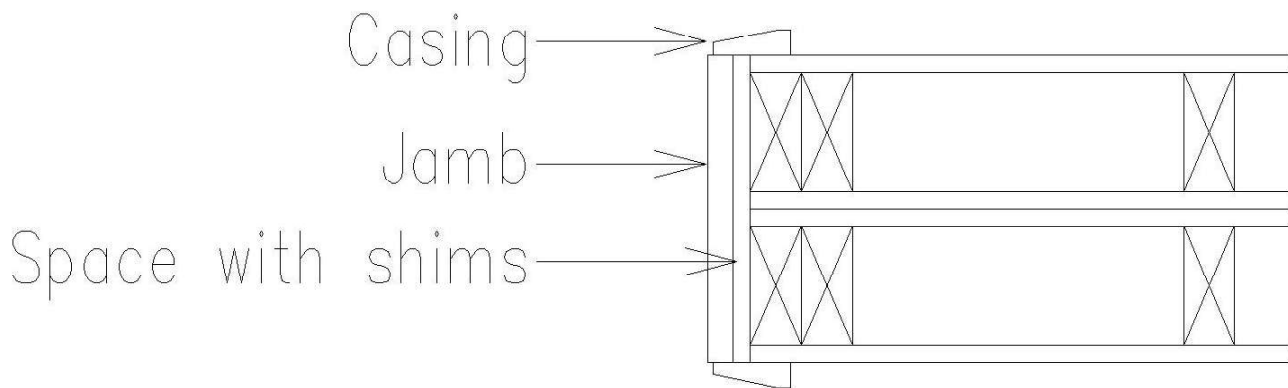
1.16 INTERIOR TRIM

See FIGURE 13

Interior trim should follow this sequence after insulation and adhesive seal has been completed at all center doorway cracks between modules (jamb, header, and threshold) and modules are structurally tied together at floor and ceiling.



- a. Draw center wall sections of each cube together with “C” clamps or gluing clamps. Tie doorway studs together using 3/” perforated banding to achieve correct wall thickness.
- b. Fold carpet back from threshold of common wall doorways and build up threshold to level of module floor decks. This may require slight jacking of center beam of one module and shims over piers to level out decks. “Therefore, be sure that decks are level before bolting of units is completed. To close the small crack, use trips of felt paper, adhesive, shim shingles or plywood strips, as appropriate to get proper level. Install galvanized flashing over shims to eliminate possible wear of carpet and/or vinyl.
- c. If carpeting is on both sides of doorway, it should be stretched with “knee kicker” and tacked to floor with small nails 6” from doorway threshold. Overlap two pieces of carpet and using sharp carpet knife or razor knife with a straight edge, cut through both segments of carpet at once to give a neat butt joint in the center of threshold. Cut proper length of carpet seaming tape and, using seaming iron, tape carpet together from the underside. Do not remove nails until the tape has been allowed to cool and set. Leave this operation until final cleanup.
- d. F vinyl-to-carpet opening is trimmed; metal thresholds are to be installed. In closet or bedroom doorways, carpet is turned under and tacked securely. Metal thresholds should be installed at the top of basement stairs and on vinyl-to-vinyl seams between modules.
- e. Door units are shimmed against studs for level and square door jamb installation. CAUTION: Be sure that casing trim at door headers lines up with plant installed door trim. This is a special problem when installing doorways in carpeted areas since the carpet will force doorway higher than doors over vinyl areas. In these cases, force jambs tightly against carpet to minimize header differences. Never change the revel at headers to compensate for these differences.
- f. Door openings at mate walls are to be trimmed using the following detail. See **FIGURE 13**.



1.17FIGURE 13



- g. Finish drywall cracks by raking 1/8" rove out of all cracks, applying drywall joint compound, and in some instances, drywall tape. Top all cracks and feather edges at least 4" either side of crack. After drying, sand and paint to match wall texture. CAUTION: Special paint is sprayed and rolled on walls during plant finishing. This creates a unique pattern wall paint finish. Touch up carefully. Corner cracks can, in some instances, be corrected with the application of caulking and repainted.

NOTE: Sufficient paint from the dye lot used in plant finishing is shipped with the house. If this paint is allowed to freeze, matching paint will be difficult. Age and accumulated air borne dirt on paint will make matching of paint difficult. In later repairs and entire walls may have to be repainted for correct appearance. Therefore, be sure to retain all paint left from finishing operations. Also, paint used is especially prepared for modular housing and may be purchased from Structural Modular Innovations, LLC. or by contacting Structural Modular Innovations, LLC. for manufacturer's specifications.

- h. Some models require wood trim boxing at openings or ceilings and walls. This trim is painted. After insulation, caulk nail heads with latex caulk; then touch up. Arches are to have jambs set and cased.
- i. Basement and split models require site installation of stairs. Be sure to install basement stair light for proper lighting at stairwell. Install the vinyl threshold at top of stairs and handrail.
- j. All doors and windows should be checked to be sure they open and close correctly. If doors will not latch, striker plates may need to be adjusted. If bi-fold doors bind on carpet adjusting and leveling screws need to be adjusted. Cracks between bi-fold doors and other doors and jambs should be equal at any point. Bi-fold door track pin adjustments and hinge screw adjustment must be made for proper appearance and function.



1.18 SUGGESTED GENERAL FINISHING SEQUENCE

1. Basement or crawl space cleared of standing water and dried out. Crawl space vapor barrier installed.
2. Module set and leveled and posts secured in proper position basement.
3. Units weatherproofed. Ceiling ties installed and braces nailed. Roof shingled. Vent cap installed at peak of roof, if applicable.
4. Insulation packed into center wall, as required.
5. Units boiled together before inside trimming started.
6. Siding finished on gables and front-back.
7. Electrical connection made between units.
8. Utilities connected (electric, gas, and water) ASAP.
9. Heat ducts installed.
10. Drywall, patched, sanded, and painted.
11. Plumbing stacks installed and couplings connected.
12. Carpeting seamed.
13. Inside trim completed and doors adjusted.
14. Exterior trim installed and painted.
15. Gutter and downspouts installed.
16. Exterior site work completed.
17. Drop-in-stove option; countertop cut by builder.



1.19 ELECTRICAL CONNECTIONS

1.19.1 General Connections:

- a. Connections between manufactured sections to be made with “AMP” connectors or junction boxes in attic or basement space. Attic area is accessed through ceiling access panel or pull down stairs. Wiring to be spliced is identified for proper connection.

1.19.2 Crawl Space:

- a. Crawl space house has panel box with breakers installed and prewired.
- b. Bonding cable is supplied, but service entrance cable is not supplied.

1.19.3 Two Story Electrical Connection:

- a. Two story electrical connections are made within junction boxes / AMP connectors for first and second story and are shown on plans.

1.19.4 Basement:

- a. Basement house has panel box with breakers and wiring cables cropped under floor for sufficient length to install panel in basement where shown on basement plans. Breakers are not supplied for any basement circuits.



1.20 ELECTRICAL

- a. Structural Modular Innovations, LLC. will provide the distribution panel in the factory per house plan. For basement models, the distribution panel will temporarily hung from the floor joists or on end of unit for field installation on end basement wall. No conduit stubs or outside holes are provided due to the many possible service entrance drops and sizes. Some basement models will have the distribution panel installed in the house.
- b. Builder is responsible for supplying and installing the meter base, service mast or riser, service entrances cable for meter to panel (or conductors in conduit) etc. Builder must also install #6 bare copper ground wire (#4 for 200 AMP panels) in the panel and bring this wire into the crawl space or basement and then outside to grounding rod supplied by the builder, or to the water supply line. Installation should be checked with local authorities to comply with National Electrical Code and local codes. Structural Modular Innovations, LLC. provides #4 wire for crawl space inside panels.
- c. Mount exterior wall bracket lights supplied by Structural Modular Innovations, LLC., at front and rear entries. Wiring and boxes for exterior lights have been factory installed.
- d. Re-check all electrical devices, appliances and circuits.
- e. Circuit protection breakers are marked in the panel box. For specific outlet circuit connection, consult with Structural Modular Innovations, LLC. since each model has a special schematic.
- f. CAUTION: No basement wiring is provided except for one stairwell light or junction box for on-site stairwell light and J-box for smoke detector. All labor and materials are to be supplied by builder for basement outlets.
- g. Optional garage wiring details for attached garages are shown in details on drawings. Structural Modular, Inc. will furnish a minimum of one standard light fixture and box, one switch box and cover, and one exterior light.
- h. Range hood is normally installed in the house. Wiring is stubbed through wall and capped off, if range hood is not factory installed.
- i. Dryer Options: Crawl space models have one integral 220 volt and one 110 volt outlet provided in the laundry location. Washer and dryer outlets are not provided in the basement models and must be installed in the field. No dryer pigtails or flex gas pipe is provided. If dryer is located on external wall, Structural Modular Innovations, LLC. will install the dryer vent. Otherwise, materials are shipped loose.



1.21 PLUMBING CONNECTIONS

1.21.1 General Connections:

- a. All waste, vents and water pipes are stubbed out within floor system. These must be connected together and run to the waste and water service by the customer. All basement houses have 2" dry vent for future basement plumbing. Vents are extended through roof except where conditions exist to prohibit their extension, such as where vent occurs under a hinged overhang or is placed too high on the roof where road restrictions prohibit fixed high roof slopes using roof extension panels. Where these restrictions prohibit fixed high roof slopes using roof extension panels. Where these restrictions occur, the vent extension with roof flange is strapped within the attic at the approximate location with a hole pre-cut in the roof. These extension vent joints must be glued, roof cap installed and adjacent shingles completed.
- b. All plant installed joints and connections are air tested for leaks; however, all mechanical compression and trap nuts should be checked before water is turned on, as vibration in transportation and erection may loosen them, creating leaks. **MAKE SURE TO BLEED HOT WATER HEATER AFTER FILLING IT WITH WATER OR THE TOP ELECTRIC ELEMENT WILL BURN OUT AS SOON AS ELECTRIC CURRENT IS APPLIED. HOT WATER ELEMENTS ARE NOT GUARANTEED!**
- c. All field work and connections must be finished in compliance with the local codes and regulations by the builder. This work is subject to inspection by local inspection authorities.
- d. Plumbing connections are made within chases and access areas as noted on plans. These connections of waste, vent, and water pipes must be field tested by a pressurized air test and inspected by local inspection authorities. After inspection and approval, drywall to be completed in those areas by the builder.
- e. All plumbing and electrical components have been installed in conformance with the applicable building code and inspected by the in-plant inspector and TPIA in the factory.
- f. Upon completion of the plumbing systems, all finished plumbing must be tested in conformance with the applicable code, and inspected by the jurisdiction having authority. All testing is coordinated by the builder on site. See P2503.5.2 and P2503.7 for testing requirements



1.22 PLUMBING

1.22.1 Supply

- a. Prior to ordering, determine type and size of water supply lines required by local code and inform Structural Modular Innovations, LLC. of all special conditions.
- b. Structural Modular, Inc. completes all pressurized system connections as specified in approved systems drawings.
- c. Standard installations are ½" copper hot and cold water lines installed to 4" below floor line for field connections.
- d. Check floor plan, plumbing schematic and foundation prints for supply drop location and plumbing runs.
- e. Structural Modular Innovations, LLC. pressure test all water supply systems installed prior to shipment. Due to possible transportation damage, these lines must be re-tested by a pressurized air test after unit is erected. Structural Modular Innovations, LLC. will not be responsible for any damage occurring from transportation off hard road surface or erection.
- f. It is recommended that the water supply system be chlorinated after all connections are made in the field to sterilize the system.

1.22.2 DWV

- a. Prior to ordering, determine type and size of sewer lines required by local codes and inform Structural Modular Innovations, LLC. of all special conditions. Structural Modular Innovations, LLC. does not complete DWV system connections. Drain and waste lines are stubbed through the floor for on-site connection. Vent systems between first and second floors of two story homes are connected together and run to a common drain (whenever possible) for field connection.
- b. Standard installations are PVC=DWV Schedule 40 plastic lines of various sizes (see plumbing drawing) stubbed to a 4" below floor line for glued slip field connection.
- c. Check floor plan, plumbing schematic and foundation prints for DWV drip locations.
- d. Structural Modular Innovations, LLC. tests all DWV systems installed prior to shipment. Due to possible transportation damage, these lines should be re-tested by a pressurized air test after unit is erected. Structural Modular Innovations, LLC. will not be responsible for any damage occurring from transportation off hard road surfaces or erection.



1.22.3 Plumbing – Basement Variations and Exceptions from Crawl Space System

- a. Below floor connections for water supply and shut-off valves, the connection of stacks to building drain is the builder's responsibility. Variations to include basement laundry facilities, floor drain(s) or sump(s), water softeners and basement baths are builder's option. Design, installation, labor, and materials are entirely builder's responsibility. For these installations, Structural Modular Innovations, LLC. cannot alter its standard plumbing installations to provide re-vent drops for basement laundry facilities or similar designs due to the individualized nature of these designs.
- b. This is especially true for water softener requirements, which are not supplied as options.

NOTES: Water heaters are shipped loose for on-site basement installation. Electrical connections and plumbing connections for these must be made in the field.

On basement models, no main level laundry outlet box is provided, nor are there any water supply line drops provided anywhere, because of the many possible laundry locations in the basement, unless otherwise requested by Builder/Dealer.

1.23 ERECTION OPTIONS

While not including all on-site (field) items which must be completed by the builder, the following is a partial list of common on-site functions.

1. Place sill seal or insulation.
2. Place sill plates.
3. Place kneewalls and kneewall window frames.
4. Set house.
5. Adjust and bolt together.
6. Secure at sill plate.
7. Drop overhang.
8. Set shingles and ridge vent.
9. Install gable inserts.
10. Split entry models – close in; seal front entry.
11. Protect exposed gypsum.
12. Split entry models – install stairs and landing.
13. Seal all exterior joints and cracks.
14. Install siding.
15. Install soffit material.
16. Install fascia and rake trim.
17. Install gutter and downspout.
18. Install shutters, where applicable.
19. Set exterior porches and trim.
20. Frame / side / roof attached garages.
21. Hang garage door.
22. Caulk and repair all components.
23. Paint unfinished trim.



24. Secure mate wall at openings.
25. Insulate all openings between manufactured units.
26. Seal all openings between manufactured units.
27. Insulate overhangs, kneewalls, entry, and band joist.
28. Jamb and case all mate wall arches.
29. Trim mate wall openings and set doors.
30. Reset all doors and hardware.
31. Install loose light fixtures.
32. Touch up drywall and paint.
33. Secure carpet and/or vinyl at mate walls.
34. Secure stairs in basement or entries.
35. Stretch carpet on stairs.
36. Lay vinyl at entry landings.
37. Set base / casings /shoe mouldings, where applicable.
38. Set rails and stair mouldings, where applicable.
39. Set nails, putty, and paint areas, where applicable.

1.24 FASTENING SCHEDULE FOR ON-SITE CONNECTIONS

1.24.1 FLOOR

Perimeter beam to perimeter beam --- 1/2" lag bolt at 32" o.c. (Connecting two units together at marriage wall)

1.24.2 ROOF/CEILING

Header truss to header truss --- 1/2" tag bolt 4' o.c. (Connecting two units together at marriage wall)

Ridge board to ridge board (at roof peak) --- (2) 10D common nails at 24" o.c.

Collar tie to rafter / truss --- (3) 10D common nails at each end.

Note: The approved drawing package may have increased fastening frequency. The approved drawing package will supersede the set manual for those fastening applications.



1.25 ORGANIZATIONAL PROVISIONS FOR FIELD REPAIR

- A list is completed by the set-up crew and the home buyer to document any problems, shortages, and cosmetic repairs necessary.
- The homebuyer must inform his/her builder of any shortages and repairs that must be completed. The builder then contracts the Structural Modular Innovations, LLC. service manager to request shipment of shortages or servicemen to make the repairs.
- The service manager then schedules the servicemen to report to the construction site on a given day. The servicemen deliver the shortages or make repairs and return the unused materials or replaced items to a holding area at Structural Modular Innovations, LLC. -

