DIVISION OF WORK BETWEEN SITE AND FACTORY

The essence of the projects being discussed in this guide is that site modifications and additions are necessary to the basic package shipped from the factory. Some of these modifications have been discussed in Chapter 2, including tilt-up roofs, site-installed doors and trim, site-finished wallboard, completion of HVAC work, and site constructed eaves and overhangs.

HUD regulations about the extent of on-site modification are under intense review. In general, more work is being allowed at the site, as long as an acceptable inspection process is developed to cover the HUD-Code work completed in the field (such as that instituted in California). Any field changes to a HUD-Code home generally require alternative construction letters (AC letters). If accessory elements can be more or less completed in the factory, they may fall under the HUD Code, which can be an advantage to the builder/developer. While it is typically the case that factory completion of such elements is not cost-effective, bringing them under the HUD Code might balance the extra cost.

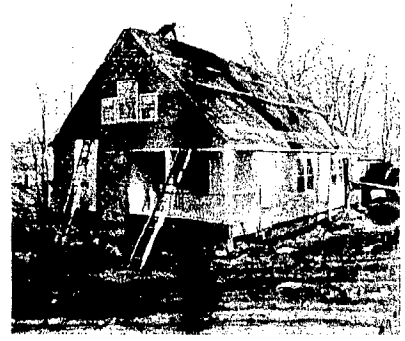
Consider, for example, a home shipped to the site with sidewalls as high as will fit within the prevailing road clearance, perhaps 11'-6" high, with a second floor above an 8'-0" ceiling. Unlike a Cape Cod design, where only a portion of the second floor is usable, (because of the short walls) nearly all the second floor can be used for living space or storage. The gable-end, side dormer, and roof pieces could be prefabricated and shipped loose for erection at the site. Since the product is fabricated under in-plant supervision, the roof plate can be designed as a structural diaphragm, economically transferring the side-thrust of the roof to the gable ends. The result would be a home common on the East Coast, known as a "story-and-a-half" house. Since the plant already has all of the tables, jigs, and tools to quickly frame perfectly square walls, and since all of the material needed is already located at the fabrication point, one would think that this is a workable solution. This example is a good illustration of new options open to MHPs and site builder/developers achieved by ingenious combination of the two technologies.

Garages

Efforts have been made to prefabricate garages. The goal is to utilize the same in-plant con-

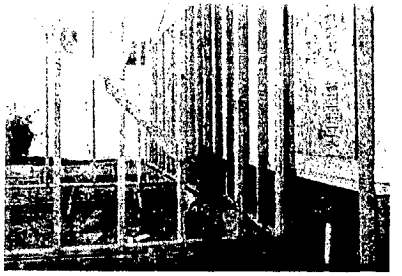
struction tools and procedures that make framing the whole manufactured home so cost-effective and high quality. If the garage is panelized into small enough components, it can be shipped inside the manufactured home, virtually eliminating its transportation costs. There are several obstacles that have discouraged more factory fabrication:

- Unless the garage is constructed by a utility crew, or after regular production ceases, it throws the factory line out of balance.
- In order for a prefabricated garage to fit the house properly, the foundations for the house and garage must be precise. Any mistake in sill heights, or in establishing a perfectly flat plane on which the panelized walls will rest, and the anticipated savings will be lost by making corrections.
- If the pieces that are built in the factory are small enough to fit inside the house with the weight evenly distributed, then they will sometimes require labor time to assemble and fit on site. If the pieces are too big, a forklift or other heavy lifting equipment will also be needed on site.
- After experimenting with all of these variables, it has become a universal assumption among those who build site-enhanced manufactured homes that it is better to construct the garage on site. However, there are numerous techniques that can be employed to keep the cost of the garage down and speed assembly, resulting in a better-looking and more functional garage.
- Wherever possible, plan for a three-wall garage. Potentially, $500 to $1,000 can be saved by not building the redundant wall abutting the manufactured home and not pouring the footing for the fourth wall. To accommodate this, the manufacturer should provide blocking for framing connections within the manufactured home's sidewall at the garage intersection point. This can be accomplished by placing an extra 2x4 turned flat at this location.
- The manufacturer should ship the house with the gypsum finish (required by the local code for fire-resistance) facing the garage.
- The manufacturer should provide the fire-rated door required by local code at the garage/house entry.
- The manufacturer should prepare the roof deck for the over-framing of the garage roof. The old practice of providing a garage dormer has caused more problems than it has solved. Only after the garage sidewalls are completed will the carpenter know where the garage ridge will

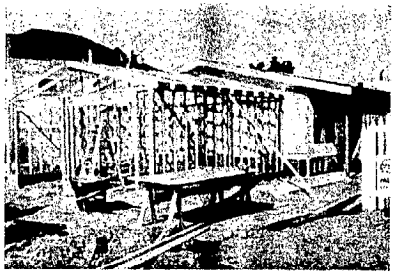


NextGen House, Danbury, CT
Steven Winter Associates, Inc.

Photos this page, Steve Hultiburger, The Home Team



Example of panelized garage built on site. Panelized garage walls set on foundation adjacent to a manufactured home.



Completed panel assembly.

Sheathing, siding, eaves and fascia completed.

be, and only then can it intersect the house roof at a reasonable point, rather than trying to match to an existing ridge on a factory-built dormer. If possible, the manufacturer should leave a triangle-shaped area of the roof unshingled (with sheathing, felt or ply-dry, and temporary polyethylene only) so that the framers and roofers don't have to tear off existing shingles and risk leaks.

- The floor plan should be double checked so that a furnace flue or water heater jack does not end up in a garage valley or ridge.
- The manufacturer should ship appropriate quantities of shingles, vinyl siding, or paint from the same batches that were used on the house to avoid color shifts on garages or porches.
- Electrical hardware for lighting, power tools, and garage door openers should be mounted at the appropriate places on the garage firewall.
- In mild climate areas, mounting the water heater in the garage can add useful space to the house, and avoid a long-time headache (water heater compartments, exterior water heater doors, having to use electric water heaters to avoid flues, etc.).
- All of these techniques should be planned out by the manufacturer, who should obtain full DAPIA approvals.
- If these planning techniques are used, the cost savings gained by panelizing or precutting in the factory may end up being small. Despite this, the development of a flexible, reliable garage system by a manufacturer would be useful to the industry. The same approach applies to porches, decks, and other exterior elements.

Site-installed Eaves

In order to build and ship the widest possible house, and at the same time provide for full sidewall overhangs, a site-installed eave system was devised several years ago that prevents sagging, misalignment, irregular "bumps" in the roofing, and other ills inherent in the various types of "flip" or "hinge" eave systems. With this system, the eaves are fabricated in the factory and shipped loose with the home. The eave has integral sheathing that extends onto the roof when it is installed on site. The sheathing on the roof is held back from the edge to accept the eave sheathing and align the eave properly.

Example of a sagging eave.

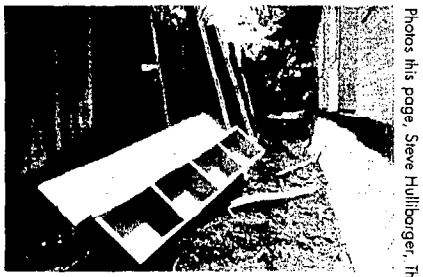
Doors

Because of potential shifting during shipment, it may be advisable to tack doors in a loose position to be fully installed in the field, or level the floors on the assembly line and set the doors for a flush and square fit. In homes with a very stiff floor system, doors parallel to the long axis of the home can be finished in the factory, but those that are perpendicular may still shift during transport. On these doors, it may be best to leave the casing off and tack the shims in place. If the door is out of square when the home is set, the shims can be adjusted and the casing installed on site.

Site-installed Exterior Materials

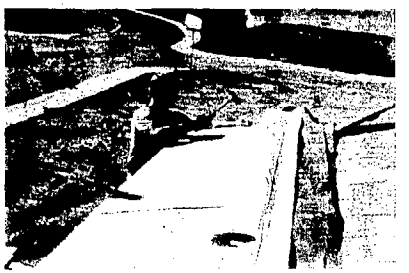
Architectural compatibility of exterior materials will stimulate greater homebuyer interest of manufactured homes. The field installation of custom roofing materials (such as cedar shingles and shakes, Spanish tiles and concrete shakes) and custom exterior siding materials (such as stucco, lap siding, cultured stone, shingles, and masonry) helps tie the house, foundation, and garage together visually.

Some work has been done to eliminate redundancy costs, but more planning for incomplete structure shipments will make this work speedier, less costly, and more inviting to developers and builders.



Sequence of installation for site installed eaves.

The integral sheathing extends onto the roof for a smooth line without sagging.



The completed eave is ready for roofing.

Photos this page, Steve Hullibarger, The Home Team

The tile roof on this manufactured home brings a regional flavor to the design. Steve Hullibarger, The Home Team

DESIGN DOCUMENTS AND APPROVAL ARRANGEMENTS

Once the design is developed, the construction documents are produced by the manufacturer. On residential development projects these drawings will require input from the entire project team, including the architect, the field engineer, the manufacturer's engineer, and the general manager of the plant. Site-built components to be attached to the manufactured unit are also shown in these drawings, to show DAPIA where connections are made. Once DAPIA approval is attained, the drawings are included with the building permit set for local officials. Some jurisdictions will allow the manufacturer's drawings for a permanent foundation, rather than requiring site-specific drawings. It is an asset to a developer if a manufacturer can provide such drawings.

FIELD INSPECTION OF MANUFACTURED HOMES

All manufactured homes need Production Inspection Primary Inspection Agency (IPIA) and DAPIA approval. Depending on the jurisdiction, those components that are site-built will also need local code approval. The coordination of inspections between the local code officials and the manufacturer's inspection process varies. Utility connections, foundations, and the final installation are usually inspected by the local building inspector, as well as any other site-built components, such as a garage or porch. In cases where the site-built structures modify the exterior envelope of the HUD-Code home the inspection can be performed by the local building inspector or the IPIA. This can include "three-wall garages," porches that bear on the

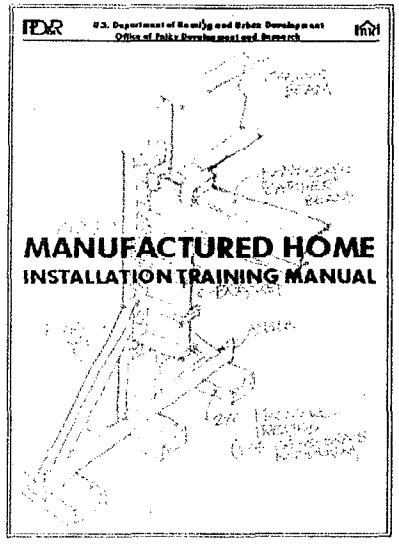
home, roof line modifications, etc. On-site inspections for alternative construction (AC) letters can also be completed by the IPIA or local building inspector.

HUD is in the process of developing a limited on-site completion rule that will allow certain changes to units to no longer require AC letters. It is also intended to speed up the process for approvals on those changes still requiring AC letters. The rule is now in draft form, but is expected to be finalized in the near future.

WARRANTY ISSUES

Manufacturers should be aware of what builder/developers will want for their own protection and what they typically offer their customers for site-built homes. The typical warranty policy may need to be revised for the site-built market. To clearly see where both parties stand, in the early stages of negotiation the manufacturer should take time to carefully review how his/her warranty works, and what procedures have been set up to administer it. Manufacturers and dealers are used to working together on warranty issues and each knows what constitutes a "dealer set-up" problem and what constitutes a "factory" problem. However, when dealing with a builder/developer who is using manufactured homes for the first time, it is the manufacturer's duty to thoroughly explain to the builder/developer what are often taken-for-granted manufactured housing industry practices, including who is responsible for various aspects of the work. Otherwise many builder/developers may repair problems as they are discovered, not realizing that those repairs may be the manufacturer's responsibility and are potentially reimbursable. This can lead to significant cost and frustration for the builder/developer. Conversely the builder/developer may assume the manufacturer is responsible for certain items that the producer is not aware of. Clearly written warranty policies should explain what items are covered by the warranty and establish areas of responsibility. The following are suggested issues to include in the warranty statement.

- It is suggested that the manufacturer warrants the factory-built portion of the home (including materials shipped loose from the factory) and the builder/developer warrants the site-built components and other site work (including on-site assembly of factory-shipped materials).
- It is highly advisable that the warranty include language requiring the foundation be level,



HUD's Manufactured Home Installation Training Manual.

square, and to the correct dimensions. Note that no construction detail can be expected to be 100% precise; therefore dimensions should include acceptable tolerances (e.g. foundation level to 1/8"). The builder/developer needs to understand that manufactured housing will require more precise foundations than stick building. Refer to the discussion of foundations in Chapter 2.

- The MHP should strongly suggest that the builder/developer inspect the home immediately upon its arrival and fax a report of its condition and any material shortages to the plant as soon as possible.
- The MHP should strongly suggest that the home be installed by an experienced set-up contractor. Some builders and developers believe that they can do this with their own crews, even if they have no experience setting up a manufactured home. This greatly increases the risk of damage to the house, and compromises the safety of personnel. The MHP should provide the builder/developer with a list of contractors known to be reliable installers. The manufacturer can also refer the builder/developer to the *Manufactured Home Installation Training Manual*, available from HUD.
- The MHP should establish whether warranty repairs will be undertaken by the developer, with the MHP reimbursing their costs upon prior authorization.
- Many disputes can be avoided if the manufacturer also commits to working within certain tolerances, primarily because the builder/developer does not know what to expect from a manufactured home versus a site-built home. Establishing tolerance levels for gypsum cracking, for example, is advised, since the cracking of gypsum during transportation is virtually unavoidable. The policy should establish the extent to which gypsum can crack without it being a warrantable item by the manufacturer. Parameters might include stress cracks appearing at window and door headers along the sidewalls, the repair of which should be borne by the builder/developer; cracks that open up along taped gypsum joints, or are large (open more than 1/8"), or in the middle of a wall should be the responsibility of the manufacturer; ceiling cracks or wall/ceiling joint cracks should be the manufacturer's responsibility.
- The manufacturer should address door installation standards, and whether they will be finished in the plant or require field adjustments to be properly square and flush. Consult the section on doors in Chapter 2 for different approaches to door installation.