Universal Floorplan Design for FEMA Disaster-Relief Housing

SME Panel Meeting #2

Wednesday, December 16, 2015
Teleconference & GoToMeeting 3:00 pm – 4:00 pm Eastern

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Delmo Payne, President, River Birch Homes
Tom Rehrig, Special Projects Manager, Clayton Homes
Manuel Santana, Director of Engineering, Cavco Industries
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Harold Weaver, President, Lexington Homes
Bert Kessler, Vice President, Engineering, Palm Harbor Homes
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FEMA Representative
Matthew Rabkin, MHU PMO Manager, FEMA

Staff
Emanuel Levy, Executive Director, Systems Building Research Alliance, *Panel Facilitator*
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Meeting Minutes

I. Survey responses

Michael Wade summarized the results from the first survey, beginning with the most commonly mentioned inefficiencies, inconveniences, and challenges of building to FEMA specifications.

A. Summary of survey responses (survey questions can be viewed on website)

- Frequently mentioned challenges were the required sprinkler system (7), Bard units (5), cabinets, molding, and trim (4), floor width limitations for Express units (4), moisture-resistant drywall (3), galvanized screw jacks (2), and general brand/model-specific appliances (2).
- Most issues had to do with procurement time, quality assurance and engineering beyond good practice, and retooling requirements.
- Rabkin helped identify requirements that were set in stone and those up for interpretation as follows:
    - **Bard units**, specifically, are no longer required. A split system could be placed on an extended frame or mini-splits can be used. Kessler pointed out that mini-splits may be most conducive to designing for CONUS. Payne suggested looking into ducted systems within the floor, although care must be taken to prevent damage to ducts if floor blowouts occur during transportation. Further research is needed on

the efficacy of placing vents overhead or on the floor.
It was determined that cost would be a driving factor in the choice of the mechanical system. Mini-splits may be a less expensive solution compared to the current cost of operating Bard systems. Manufacturers like River Birch Homes have experience delivering manufactured homes equipped with split systems.

- **Sprinkler system** is necessary and FEMA is developing new designs. The requirements are listed in NFPA 13D - Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes, with additional requirements related to concealed piping and enclosing the whole sprinkler system within the thermal envelope.
  A suggestion was made to include the sprinkler system inside all except the Express units. An external/internal pump system for the tank with a standardized connection on the back of the unit and 30 amp electrical service is recommended for Express units. Heat-trace cable is currently in the specs, but a redesign by GSH and Talco may be in the works to incorporate the heat trace into the tank/pump system instead. Rabkin indicated that he would share details of the tank and pump systems with the panel.
- **Cabinets, finishes, and trim**—Terrian suggested using "industry standard" instead of KCMA-certified cabinets. Rabkin clarified that the specification is KCMA "or equal," and FEMA does not want particle board or MDF. Payne brought up the issue of water getting trapped in the floor molding after mopping.
- **Floor width limitations**—Wade pointed out that Express units are top-heavy and narrow, making both production (plants need to modify catwalks and incorporate other safety features) and transport more difficult. Others expressed concern about a ceiling diaphragm width of less than 10'. Rabkin explained that FEMA no longer uses travel trailers and has transitioned to manufactured homes, so the Express design fills the need of quick disaster response. In order to transport homes rapidly without a permit, they must be 8'-6" or narrower. 10'-wide manufactured homes can be transported without a flag car, but 8'-6" homes can be transported country-wide without a permit. Additionally, in high-density areas, Express units can often fit in people's driveways to prevent relocation as much as possible. Express units arrive on site within 2 days.
  Typical Express unit size is 8'-6" x 48' with 5' for the tongue. The length of the unit should be <53' for transportation without a permit.
- **UFAS Express units**—FEMA may be granted an exception from HUD for thermal requirements of UFAS Express unit because 6" walls may be too limiting. R-15HD with 2x4 walls may work. Further research is required.
- **Sidewall height requirements**—sidewalls can be shorter than 8' as long as they meet NFPA 13D standards for sprinkler head height.
- **Moisture-resistant materials**—Rabkin explained that storage is a major issue with the units in terms of moisture control and the intent is to reduce mold and water penetration. Rabkin advised to avoid potential issues like overhead ceiling lights becoming fishbowls and requests that moisture-trapping design elements be minimized in the developed design. Kessler suggested that there are ways of building dry units without moisture-resistant drywall, including using a mini-split to counter interior moisture. However, the challenge of storage remains, as mechanical systems do not run during the storage period and cannot counter humidity during this period.

- **Exterior doors and bulk water protection**—There was debate over leaking potential with outswing vs. inswing doors. The option of incorporating a canopy for overhead bulk-water protection was mentioned. Storm doors cannot be used because exterior doors must open outwards as per recent specifications.
- **Galvanized screw jacks**—Rehrig explained that, while the screw jacks may be galvanized, what they are welded to is not, and painted jacks tend to work just fine. Rabkin suggested powder-coated, or even perhaps painted jacks, as long as they can withstand frequent moving without rust.
- **Remaining questions about FEMA unit specifications**–Some reasons for certain requirements are unclear—e.g. the galvanized metal cap over the top of DWV is perhaps intended to prevent water from going down the pipe, but Rabkin will look into this further.

II. Draft schematic layout of non-UFAS Express units

A. Summary of unit specifications

- **Code requirements**–Express units are to be built as HUD-designated manufactured homes with the ability to travel like travel trailers. They must also meet DOT trailer requirements.
- **Accessibility**—FEMA's unit types are "UFAS" and "enhanced," meaning that all accessibility features are present in the enhanced versions, except for mobility features reserved for UFAS units (e.g. roll-under sinks, showers, turning radius, different heights for counters and cabinets etc.). This standardization and minimization of variation may be preferable from a production standpoint. Perhaps features could be made adjustable, but this adds expense. Currently, removable cabinetry can be included that meets UFAS requirements.
- **Challenges**–Issues with uniform accessibility features:
  - Families with children will likely want tubs instead of showers, so tubs would be preferred wherever possible.
  - Levered door handles are easy for children to open, posing a danger for doors opening to the outside.

B. Presentation and review of alternative designs (see Attachments A & B)

Initial comments–Rabkin suggested a 3' continuous countertop length and extending the unit to 48'. For Express units, it is recommended that the whole length allotment be used as FEMA sees no advantage of smaller units.

- **Questions**—A question was raised about whether the 8'-6" requirement is the footprint requirement or the total width requirement (to be clarified later, but exterior parts are generally not counted in this except in Wyoming and Georgia). The use of overhangs was recommended to prevent water intrusion.
- **Maximizing space**—Using 2x4 wall framing will help increase the interior area. This needs further investigation.
- **Flexibility in requirements**—FEMA is flexible with regard to furniture dimensions, including table length and number of chairs in dining space. Table could be 3' to 4' instead of 5', or perhaps the requirement should be in terms of place settings/chairs. Rabkin recommended using two chairs since the unit is designed for an occupancy of two. The UFAS requirements provide for a dining table on wheels. Living room

furniture could be minimized to simply a chair and loveseat or two chairs to fulfill space requirements.

- **Consensus**—There was agreement that Layout A is better in terms of front- and back-door placement. Doors should be hinged to the rear of the unit with the tongue being hooked to the front. The main entrance door is typically on the passenger side of the unit during transportation.

III. Wrap up

- Next meeting: Tuesday, February 9; 9:00 am – 12:00 pm EST
  Location: FEMA HQ, Washington D.C.
- Design revisions and new designs will be presented. Discussion of mechanical systems will lead into MEP specifications for the following meeting.