

# Standard Floor Plan Design Specifications – All Units

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## Part 1: Design Requirements

### A. Referenced Codes and Standards

Codes and standards listed below may be referred to by their abbreviations shown in parentheses. An asterisk (\*) indicates required compliance with a code or standard throughout the entirety of each home. Otherwise, compliance is required only where referenced.

Manufactured Home Construction and Safety Standards 24 CFR 3280 & 3282 (HUD Code)\*

2009 International Building Code (IBC)\*

Uniform Federal Accessibility Standards (UFAS)\*

2010 ABA Standards for Accessible Design (ABA)\*

National Electrical Code (NFPA 70)\*

Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes (NFPA 13D)\*

2012 International Plumbing Code (IPC)\*

2015 International Mechanical Code (IMC)\*

United States Access Board Final Guidelines for Emergency Transportable Housing 2014: 36 CFR Part 1191 (ETH)\*

South Coast Air Quality Management District VOC Rules (SCAQMD)\*

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California Air Resources Board Airborne Toxic Control Measure 93120 Title 17 (CARB ATCM 93120 Title 17)\*

ANSI/Kitchen Cabinet Manufacturers Association A161.1 – 2012 (KCMA)\*

United States Department of Transportation Federal Lighting Equipment Location Requirements for Trailers (USDOT)

California's Wildland-Urban Interface Code (California Wildlands)

United States Environmental Protection Agency ENERGY STAR (ENERGY STAR)

## **B. Classifications and Requirements**

Manufacturers shall build each housing unit to meet the following HUD Code 24 CFR 3280 classifications:

- Northern Zone roof load
- Wind Zone III
- Thermal Zone III

## **Part 2: Envelope Construction**

Fastening shall be as shown in the Fastening and Tie-Down Schedules, or, alternatively, as approved by the DAPIA.

### **A. Exterior Construction**

#### ***Chassis Frame***

- **7 holes** shall be located in front and rear crossmembers for 9mmx3" f.t. lags
  - 2 within 12" of each end
  - **2 within 6" of each I-beam**
  - 1 located at mid-point
- All metal-to-metal contact with 1/8" fillet shall be welded
- Floor shall be lagged to frame with frame clip, 9mmx3" f.t. lags each joist
- 9mmx3" lags shall have a minimum bending yield stress of 190,000 PSI
- Clips shall be welded to I-beam
- Frame shall be completely coated with waterproof paint after all welding is complete
- Tire, axles, brakes, and brake wiring shall meet all federal standards
- Tires shall be new 8x14.5 10 ply "E"
- New axles (triple equalized plus tandem equalized spread) shall be used, with **brakes as indicated on drawings**
- Rims, bolts, nuts, or other related tire-mounting hardware must be new

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- Serial number must be stamped on the front crossmember in 3/8" high letters
- Camber shall be added to main I-beam per industry standards
- Express chassis shall have flat-bar or tubing for spacing between I-beams and bottom-board, as shown in the Express Chassis Frame Welding Detail
- See Chassis Frame drawings for assembly layout. I-beams shall be 12" except for in the Express unit, where they shall be 8"

### **Floors**

- Framing
  - The floor joists shall be 2 X 8 #2 SPF and run transverse to the length of the unit.
  - The Floor joists shall be spaced 16" O.C with an additional joist added at the shear walls.
  - Rim joists at end walls shall be doubled at 2 X 8 # 2 SPF or equal.
- Decking
  - The floor decking shall be 23/32" OSB or plywood APA rated 24" O.C.
  - Long edges of the panel shall be tongue-and-groove installed perpendicular to the floor joist
  - All seams must be sanded
  - Decking must be water proofed 4' X 4' area at the exterior doors as well as in the TPS closet and in the DHW Closet.
- Insulation
  - The insulation shall have a flame spread of 25 or less and a smoke develop of 450 or less
  - The insulation shall be identified and marked by an approved testing and inspecting agency, conforming to ASTM E84, ASTM E119 and ASTM E136
  - The floor insulation shall be R-28 FG blanket Insulation without a vapor barrier
  - **The perimeter of the floor shall be insulated with R-28 Batt Insulation**
  - The floor insulation shall be installed without voids
  - Coordinate location of piping to ensure that it is placed on the warm side of insulation and insulation encapsulates pipes
- Bottom Board
  - Rolled Bottom Board, meeting beach puncture test with all penetrations sealed per bottom board manufacturer's instruction.
  - The bottom board shall be secured under the unit to prevent rodents from entering and shall be moisture resistant.
  - The manufacturer shall install wooden board or other material that shall deflect or prevent material from tire blowouts from damaging the "Bottom Board" or other items above the tires.

### **Exterior Walls**

- Framing

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- The exterior wall framing shall be 2 X 4 #3 SPF or equal at 16" O.C
- Wall framing shall be 8' tall
- Sidewall top plates shall be double 2 X 4 #3 SPF with splices staggered at 48" O.C
- Endwall top plates shall be single 2 X 4 #3 SPF
- Bottom plate shall be single 2 X 4 # 3 SPF
- Air Infiltration
  - All major joints—wall to wall, wall to ceiling, wall to floor—shall be caulked to prevent air infiltration
- Batt Insulation
  - The insulation shall have a flame spread of 25 or less and a smoke develop of 450 or less
  - The insulation shall be identified and marked by an approved testing and inspecting agency, conforming to ASTM E84, ASTM E119 and ASTM E136
  - The wall insulation shall be R-13 FG fiberglass batt Insulation with a vapor barrier
  - The wall insulation shall be installed without voids
- Structural Sheathing
  - 7/16" APA-rated oriented strand board (OSB) shall be attached to the wall studs, as diagramed in the Sheathing Elevations
- Rigid Insulation
  - Two (2) 8' x 4' extruded polystyrene (XPS) boards of 1" thickness shall be stapled to the OSB sheathing
  - Where envelope penetrations or interruptions exist, the board shall be cut to fit around the interruption
  - Compatible tape shall be used to seal all joints in the foam board (according to manufacturer instructions) to act as a continuous weather barrier
- Siding
  - Siding shall be vinyl (or fiber cement in the case of California Fire Hazard Severity Zone)
  - Vinyl siding shall be 8" lap
  - The siding shall be approved for 150 mph winds exposure and for HUD Wind Zone III requirements.
  - Siding type:
  - Thickness:
  - Weight:
  - Pattern:
  - Finish:
  - Siding Accessories:
  - Fasteners: Stainless Steel
  - Elastomeric Joint Sealant:
  - Installation: Install lap siding to framing members and secure with fasteners as per the manufacturer's instructions for 150mph wind exposure. Provide continuous sealant at

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all joints with dissimilar construction including wood trim, lighting/electrical fixtures, hose bibs, dryer vents etc.

## **Roof**

- Framing
  - The roof trusses are engineered to meet the design loading conditions listed in Part 1 and should be approved as such. The trusses shall be spaced 16" O.C max with an 8" overhang in the 1, 2, 3 bedrooms and a ½" overhang in the Express Unit.
  - The roof pitch will be 3/12 (with a heel height of 5½").
  - The roof trusses shall not be cut for the passage of any electrical, plumbing or mechanical system.
- Insulation
  - The ceiling insulation shall be R –38 fire retardant blown fiberglass or cellulose insulation
  - The ceiling insulation shall be installed uniformly
  - A 1" min air space shall be maintained between the roof decking and insulation using baffles
- Attic Ventilation
  - The roof shall have a ridge vent and soffit vents for the 1, 2 and 3 bedrooms **and fascia vents beneath the lower shingles for the Express Unit** (as detailed in the construction drawings) to provide the ventilation required to meet the IRC and HUD Code.
- Roof Decking
  - The roof sheathing shall be at least 3/8" structurally rated OSB
  - Roof felt shall be 2 layers of 15# felt or 1 layer of 30# felt, or IRC approved roof covering
  - The felt or roof covering shall be cemented to the roof decking with a 6" wide strip of cement, around the perimeter of all felt
  - The self-adhering rubberized asphalt shall be a minimum 40 mils
  - Ice and weather shield shall be installed at the eaves
  - All the longitudinal joints in the roof sheathing shall be covered with a 4" wide piece of self-adhering rubberized asphalt
- Roof Covering
  - Exterior roof coverings shall be secured to 3/8" structural rated OSB sheathing. The roof shall have shingle roof covering.
  - Roofing shall meet a class C fire resistance rating and shall be installed to resist the loads indicated in the Table of Design Wind Pressures in 24 CFR 3280.305 for Wind Zone III, as specified in Part 1 of this document

## **B. Interior Construction**

### **Interior Walls**

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- Framing
  - Interior walls shall be framed as specified in “Interior Wall Framing” and “Shear Wall Framing” drawings
- Shearwalls
  - Shearwalls shall be constructed, fastened, and tied down as indicated in the “Shear Wall Framing” drawings, or as otherwise approved by DAPIA with dimensions enabling design as shown and accessibility as per UFAS, ABA, and ETH specifications

### ***Wall and Ceiling Finishes***

- Wall interiors shall be faced with ½” gypsum board fastened to the studs, installed according to the Gypsum Board Application and Finish Standard: ASTM G840 and GA-216
- Gypsum board shall run vertically along the entire 8’ of wall interiors and shall be mechanically fastened and 100% glued. Walls shall be sanded as needed to assure a smooth finish
- Ceiling shall be faced with ½” or 5/8” high strength gypsumboard fastened to the trusses with an approved IRC foam, foam nail, or equal. Foam system shall be installed in accordance with the manufacturer’s instructions
- Ceiling and walls facing interior spaces shall be painted with latex, low-VOC, antimicrobial paint (high permeability for walls, semipermeable for ceiling)
- Paint shall have a smooth, egg-shell finish
- Paint shall have a primer coat and be finished as per manufacturer’s instructions

### ***Floor Covering***

- Industry-standard laminate flooring shall be installed on all interior floors of the home
- Laminate (including veneer and fiberboard) shall be low-VOC and conform to CARB ATCM 93120 Title 17
- No carpet shall be used anywhere in the home

### ***Molding***

- Crown and baseboard molding shall be industry standard and used throughout the home, MDF or equal, to be approved by the Engineer of Record
- The casing around doors and windows shall be 1 X 4 MDF flat or equal, to be approved by the engineer of record
- Molding shall be color-matched to interior paneling. All seals, joints, door and window frames, corners (in plain view or not), etc., shall be finished with appropriate matching moldings.

### ***Soffits***

- Where soffits for fire-sprinkler piping is specified, crown molding may be omitted, as long as joints are properly sealed to prevent air infiltration into home at wall-ceiling junctions

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- The fire sprinkler system shall be concealed using a soffit that is attached to the structural members of the MHU.
- Commercial products such as Decoshield, JGI Interlock Concealment system, Soffi-Steel, or their equivalent must be used to conceal fire-suppression-system piping
- The soffits shall have easily removable air-transfer grills not more than 5' apart to permit passive heating of the pipe and permit visual inspection when required
- Prior to delivery, the manufacturer shall ensure that all joints (between trim and walls, molding and walls, molding and floors, etc.) shall be sealed and caulked with appropriate caulking material to ensure that there is a tight seal

### Part 3: Doors and Windows

#### A. Exterior Doors

- Doors shall be insulated fiberglass or steel with assembly U-value no greater than 0.35 BTU/(hr °F ft<sup>2</sup>)
- Door assemblies shall contain all elements shown in the design details, including a J-channel installed above the door assembly, extending beyond the width of the door, as well as a rubber door sweep attached to the exterior, as shown
- The door frame shall be constructed as detailed, in compliance with UFAS guidelines, as shown in the door detail drawing
- Door thresholds shall have a beveling on the exterior and interior, with each increment no higher than ¼". Alternatively, ramps may be provided with slope no greater than 1:2, wherever a door threshold is greater than ¼"
- Doors shall open to the exterior, with the hinge at the tail end
- Doors shall be 80" tall with 36" clear width when door is opened 90 degrees
- Doors shall meet HUD CFR 3280 requirements (further requirements subject to bulk-water testing)
- All doors shall have lever-type handles in compliance with UFAS 4.1.3
- Doors shall be provided with a dead-bolt lock and a brushed satin nickel lock set
- Peep holes and other parts shall be installed as per the designs
- Doors shall be installed as per the manufacturer's instructions and shall meet the flashing requirements as per the drawings

#### B. Interior Doors

- All doors shall be swing doors with lever-type handles in compliance with UFAS 4.1.3
- Interior passage doors shall be wooden with a 36" clear width when doors are open 90 degrees
- Closet doors shall be 22" wide
- DHW closet doors shall be 24" wide
- TPS closet shall have a double-swing door with a clear width of 5'2"

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- Interior door handles shall be nickel, and door hinges shall be 3 nickel mortised hinges per door
- Door jambs shall be ½" by 4-5/8" MDF white
- Interior doors shall have a floor-to-door clearance of between ½" and ¾"
- Doors shall have air grilles build into the bottom of the doors for return-air pathways. No doors shall be undercut more than ¾"
- Door stops shall be installed on the wall or door at each door connecting rooms and at wardrobe and linen closets

### C. Windows

- Windows shall be low-e with vinyl frame, with a maximum SHGC of 0.25 and a maximum assembly U-value of 0.32 BTU/(hr °F ft<sup>2</sup>)
- Windows shall meet HUD CFR 3280 requirements and a **minimum NAFS rating of R50 (subject to bulk-water testing)**
- Windows shall be installed as per manufacturer's specifications and per the construction drawings
- Windows shall meet the flashing specification shown on the drawings
- A drip cap should be installed above the windows, as detailed
- All windows shall be provided with blinds that have 1" slats

### D. Flashing

- Install self-adhering flexible flashing at perimeters of doors, windows, louvres, vents, and penetrations of exterior wall surfaces
- Flashing shall be a waterproofing membrane consisting of a 0.32"-thick pliable and adhesive rubberized asphalt membrane, factory-bonded to a 0.008"-thick Polyethylene in sheet form, providing a minimum 0.40" overall thickness with removable release liner of 12" width minimum
- Cut flashing in lengths required for application as indicated on drawings
- Remove release liner and apply membrane starting from lowest point and work upward, securing the flashing firmly in place with staples and self-adhering adhesive backing
- Seal seams, laps, protrusions, and accidental cuts with manufacturer's recommended mastic
- At sills of openings, provide dams extending 4" up sides of openings. Fold minimum 4" into vertical plane of wall over building
- Use flashing manufacturer's standard priming and bonding products for securing flashing materials to substrates as required.
- See door and window flashing details in drawings

## Part 4: Appliances, Fixtures, and Furniture

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All furniture and furnishings shall remain in packaging. See ship-loose drawings in designs for storage of furniture. Tape shall not be used to secure furniture. Furniture coatings and materials shall conform to SCAQMD VOC limits and CARB ATCM 93120 Title 17.

## **A. Living Area**

### ***Express Unit***

- Two (2) 2' x 2' wooden or metal armchairs shall be provided. Cushioning may be provided
- Manufacturer shall provide one end table for the living room, whose dimensions are 12" x 12" square x 15" tall

### ***1-, 2-, and 3-Bedroom***

- A sofa (on wheels) shall be provided whose dimensions are 6' long by 3' deep.
- An arm chair shall be provided, whose dimensions are 3' wide by 2'8" deep
- One coffee table shall be provided, whose length and width are 2'6" x 1'6", respectively
- Manufacturer shall provide one end table for the living room, whose dimensions are 12" x 12" square x 15" tall

## **B. Kitchen**

All refrigerators shall be ENERGY STAR qualified and have the ENERGY STAR label affixed to the appliance when delivered with the MHU. All other appliances shall be energy-efficient and meet federal requirements.

Range and oven controls shall be at the front of the appliance. Finishes on adjacent surfaces to the range/oven must have a flame spread rating not exceeding 50. Bottoms of adjacent cabinets (within 6" horizontally from range) shall be protected with at least 5/16"-thick gypsum board or equivalent limited combustible material, per HUD code.

Range hoods shall extend the length and width of the range, be centered on the range, and extend 3" beyond the depth of the range (per HUD CFR 3280.204). Controls shall be provided at accessible reach, as shown in the electrical drawings. Accessible controls must be provided for light and fan separately, and for adjusting fan speed.

All cabinets shall be modular type with finished underside. Kitchen base cabinets shall have back panels. All kitchen cabinets shall adhere to KCMA standards.

Countertops shall be made of high-pressure laminate post formed with a flame spread of 50 or less. All edges and underside of countertops shall be sealed against moisture penetration.

Backsplash shall be 4" high and shall be made of high-pressure laminate post formed.

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Scald protection device shall be used at kitchen sink.

Kitchen sink shall have a water-spray unit as defined in the ETH Guidelines.

### ***Express Unit***

- Refrigerator shall be **11.5 cubic feet** minimum in capacity and shall have the following maximum dimensions: 2'1" wide x 2'4.5" deep (without handle) x 5'6" tall. Height may be greater than listed, as long as both refrigerator and freezer space meet UFAS and ABA requirements, with at least half of usable space in each compartment below 54" high. The depth at the door must be such that the door clears the 2' countertop. All compartment doors shall hinge on the right
- The microwave shall be 120V, 15A, and shall have a minimum capacity of 1.2 cubic feet. Its maximum exterior depth shall be 19" so as to fit on the countertop with space to plug into the wall. It shall have a child-lock feature and shall be stored in the bedroom closet with the glass plate secured under the living room sofa cushions
- The range/oven shall be a **24"-wide** self-cleaning electric cooking range/oven combination. It shall have a thermostatically controlled and lighted oven. The range shall have indicator lights showing when burners are operating. Insulation shall be built in on all sides to prevent excessive heat exposure. The range shall have 3 to 4 burners. The appliance shall be plugged into the oven/range receptacle at the time of delivery.
- The range hood shall be lighted and power-vented, with venting to the outside through the wall (back-vented), not the ceiling, so as to avoid unsightly ducting above the cabinetry. Range hood shall be capable of 100 cfm. The vent opening shall be screened with a corrosion-resistant, noncombustible wire mesh with ¼" openings or equivalent, to meet California Wildlands requirements.

### ***1-, 2-, and 3-Bedroom***

- Refrigerator shall be 18 cubic feet minimum in capacity and shall have the following maximum dimensions: 2'6" wide x 2'8.5" deep (without handle) x 5'7" tall. Height may be greater than listed, as long as both refrigerator and freezer space meet UFAS and ABA requirements, with at least half of usable space in each compartment below 54" high. All compartment doors shall hinge on the left
- The microwave shall be 120V, 15A, and shall have a minimum capacity of 1.2 cubic feet. Its maximum exterior depth shall be 19" so as to fit on the countertop with space to plug into the wall. It shall have a child-lock feature and shall be stored in the bedroom closet with the glass plate secured under the living room sofa cushions
- The range/oven shall be a **30"-wide** self-cleaning electric cooking range/oven combination. It shall have a thermostatically controlled and lighted oven. The range shall have indicator lights showing when burners are operating. Insulation shall be built in on all sides to prevent excessive

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heat exposure. The range shall have 4 burners. The appliance shall be plugged into the oven/range receptacle at the time of delivery.

- The range hood shall be lighted and power-vented, with venting to the outside through the wall (back-vented), not the ceiling, so as to avoid unsightly ducting above the cabinetry. Range hood shall be capable of 100 cfm. The vent opening shall be screened with a corrosion-resistant, noncombustible wire mesh with ¼" openings or equivalent, to meet California Wildlands requirements.

### **C. Dining Area**

Dining tables shall be made of wood or metal. Dining seating shall be made of wood or metal (matching table), with or without cushions.

#### ***Express Unit***

- A 2' wide x 3' long dining table with seating for 2 people shall be provided

#### ***1-, 2-, and 3-Bedroom***

- A dining table shall be provided with the following dimensions and seating:
  - 1- and 2-Bedroom – 3' wide x 5' long with seating for 4
  - 3-Bedroom – 3' wide x 6'6" long with seating for 6

### **D. Bathrooms**

A shower rod and plastic shower curtain with rings shall be provided for all shower/bath fixtures.

Grab bars and accessibility features shall be installed where detailed on drawings.

Toilets and sinks shall be white porcelain.

Toilets shall be floor-mounted, tank type, low consumption, white round front bowl with matching tank.

Toilets shall adhere to UFAS and ABA accessibility requirements.

Scald protection shall be used at all hot-water appliances throughout the home.

#### ***Express***

- Sink shall be no greater than 20" in width and shall be wall-mounted to provide for a 48" clear space between it and the door
- Pipes to the sink shall be wrapped according to UFAS standards and as shown in section drawings
- Tub shall be a 1-piece white 60" fiberglass tub/shower combination with grab bars and controls repeated on side within reach of the seat, compliant with UFAS

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**Bathroom 1** (1-, 2-, and 3-Bedroom)

- Sink shall be no greater than 17" in depth (and extend no farther than 17" from the back wall) so as not to interfere with the door swing
- Pipes to the sink shall be wrapped according to UFAS standards and as shown in section drawings
- Tub shall be a 1-piece white 60" fiberglass tub/shower combination with grab bars and controls repeated on side within reach of the seat, compliant with UFAS

**Bathroom 2** (3-Bedroom)

- Pipes to the sink shall be wrapped according to UFAS standards and as shown in section drawings
- Tub shall be a 1-piece white 60" fiberglass tub/shower combination but does not need to be UFAS compliant

**E. Bedrooms**

Note: NOAA weather radios shall be provided in each bedroom as specified in "Lighting and Electrical" and in the drawings.

**Express**

- Bedroom shall be furnished with one full-sized bed, 54" x 74", with a bed frame, mattress, and box spring
- One five-drawer dresser shall be provided with the following dimensions: 48" high x 33" wide x 18" deep
- A closet space shall be provided, enclosed by a door and equipped with a shelf and rod running the length of the closet and supported on both ends. Closet space shall be built to the dimensions shown and shall be compliant with UFAS

**Bedroom 1** (Bedroom at tail end in 1-, 2-, and 3-Bedroom)

- Bedroom shall be furnished with one full-sized bed, 54" x 74", with a bed frame, mattress, and box spring
- One five-drawer dresser shall be provided with the following dimensions: 48" high x 33" wide x 18" deep
- A closet space shall be provided, enclosed by a door and equipped with a shelf and rod running the length of the closet and supported on both ends. Closet space shall be built to the dimensions shown and shall be compliant with UFAS
- One nightstand shall be provided, with the following dimensions: 12" x 12" square x 15" high
- Night stand (where provided) shall be stored in the closet during shipping, as shown in ship-loose drawing

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**Bedroom 2** (Bedroom at hitch end in 2- and 3-Bedroom)

- Bedroom shall be furnished with one full-sized bed, 54" x 74", with a bed frame, mattress, and box spring
- One five-drawer dresser shall be provided with the following dimensions: 48" high x 33" wide x 18" deep
- A closet space shall be provided, enclosed by a door and equipped with a shelf and rod running the length of the closet and supported on both ends. Closet space shall be built to the dimensions shown and shall be compliant with UFAS
- One nightstand shall be provided, with the following dimensions: 12" x 12" square x 15" high
- Night stand shall be stored in the closet during shipping, as shown in ship-loose drawing

**Bedroom 3** (Middle bedroom in 3-Bedroom)

- Bedroom shall be furnished with one free-standing wooden bunk-bed frame, complete with ladder, slats, and safety guardrail, with two twin-XL-sized mattresses (39" x 80" each)
- One five-drawer dresser shall be provided with the following dimensions: 48" high x 33" wide x 18" deep
- A closet space shall be provided, enclosed by a door and equipped with a shelf and rod running the length of the closet and supported on both ends. Closet space shall be built to the dimensions shown and shall be compliant with UFAS
- One nightstand shall be provided, with the following dimensions: 12" x 12" square x 15" high
- Night stand shall be stored in the closet during shipping, as shown in ship-loose drawing

**F. Hallway**

Washer and dryer space shall be provided as specified. No washer/dryer shall be provided. Electric washer/dryer hookups and venting shall be installed where shown, with a vent cap provided and secured to the dryer vent.

**Part 5: Lighting and Electrical**

Lighting and electrical shall be installed as shown in electrical drawings. See drawings for further details.

Lighting and electrical shall comply with NFPA 70.

Light bulbs shall be provided everywhere where lighting is specified. Bulbs shall be CFL or LED (as appropriate for the fixture), equivalent to 60-watt incandescent bulbs in lumens. Lighting shall be white in color.

Ceiling fixtures in the living/dining area, kitchen, and bedrooms shall have two (2) CFL or LED bulbs each.

The bathroom vanity light shall be a wall-mounted light bar with three (3) bulbs.

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The overhead bathroom light/exhaust fan shall be white with a 50-cfm fan. Fan and light shall be on separate switches. Bath fan shall have a time-delay feature.

The range hood shall have a light and 100-cfm fan, with separate switches.

The exterior porch light shall be a jelly-jar light.

Light switches and thermostat must be installed at 40" above the finished floor, as shown in section drawings.

Light switches shall be plate-rocker type.

Transportation lighting for the Express unit shall comply with USDOT requirements and shall be configured as shown on the Trailer Lighting plan.

Interconnected smoke detectors shall utilize the home's primary power source and shall have battery backup. Smoke detectors shall have a strobe function as required by UFAS for visual signal of smoke or fire. Push-button testing is required with temporary silencing devices. Smoke detectors shall be placed where indicated on electrical plans.

## **A. Emergency Systems**

### ***Weather Radio***

- A weather radio shall be provided in each bedroom. In the Express unit, the weather radio shall be wall-mounted by the door along the accessible path. In all other units, the weather radio shall be stored in the night stand to be later placed on top of the night stand
- Weather radios shall be UFAS compliant and shall be approved by the Federal Communications Commission (FCC) and National Oceanic and Atmospheric Administration (NOAA)
- Weather radios shall have a strobe component
- Weather radios shall work with both electrical power and battery backup

### ***Transponder***

- The manufacturer shall provide a location (transponder sled) to mount a transponder with the following dimensions: 7.25" long x 3.25" wide x 1in deep (184mm x 83mm x 25 mm), with weight of 13 ounces (369 g) (without mounting bracket) or 7.61 x 3.52 x 1.06in (192.42mm x 89.82mm x 26.9mm) with a mounting bracket. The transponder mounting (transponder sled) location shall not impact the functionality and performance of the transponder or damage the MH and/or the transponder under any circumstance
- The transponder location shall be as shown in the drawings and shall allow for removing the transponder without any special tool without damaging the MHU, the surface, or the transponder

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- The transponder shall be mounted such that the top of the transponder points to the sky (up position). There shall not be any object obstructing the signal that is emitted and/or received from the satellites

## Part 6: Mechanical Systems

### A. Water Heater

Water heaters shall electric storage tank dual-element quick-recovery water heaters, 240V and 30A, with a minimum energy factor of 0.95 or federal minimum—which ever is greater. Water heater shall be placed on a dedicated circuit clearly marked and taped in the off position; tape shall be labeled, “Water Heater: Do not turn on until water service operational and tank is filled.”

Water heaters must be equipped with a pressure-release valve, as well as a corrosion-resistant drain pan 2” greater in diameter than the water heater itself, and a metal tank drain valve.

Water heater closet shall be locked and accessible by the same master key as that which accesses the TPS closet. Light switch shall be located on the side wall of the water-heater closet.

#### *Express*

- Water heater shall be approximately 30 gallons in capacity and measure no greater than 19” in diameter (jacket dimension)

#### *1-, 2-, and 3-Bedroom*

- Water heater shall be approximately 40 gallons in capacity and measure no greater than 20” in diameter (jacket dimension)

### B. HVAC

TBD

#### FEMA HVAC OPTIONS

Function	Single Packaged Vertical Unit (SPVU)	Ductless heat pump
Heating/Cooling	1.5 ton single stage exterior mounted ducted heat pump (or AC + electric resistance heat)	Wall-mounted ductless mini-split heat pump (single head; perhaps two heads in 3-bedroom); sizes available from 0.75 ton and up; sized for max cooling load
Backup heat	~5kW built into SPVU	Resistance baseboard or wall heaters; except perhaps Express

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Function	Single Packaged Vertical Unit (SPVU)	Ductless heat pump
Ventilation	ERV integral with SPVU with ~50cfm capacity (Bard custom model)	<ul style="list-style-type: none"> <li>• ERV (e.g. Panasonic Whispercomfort 40cfm spot-ERV; fails to meet HUD 50cfm minimum but meets ASHRAE 62.2-2010 except for 3 bed with 6 people)</li> <li>• Exhaust fan in hallway (will increase latent loads)</li> <li>• Ventilating dehumidifier (e.g. Ultra-Aire 70 or Honeywell DR90/120A2000)</li> </ul>
Dehumidification	Stand-alone dehumidifier (supplementary dehumidification coil in Bard SPVU is only available for 2 ton units or larger)	<ul style="list-style-type: none"> <li>• Heat pump "dry mode" + in-wall dehumidifier (e.g. Ultra-Aire MD33 - may be insufficient capacity)</li> <li>• Heat pump "dry mode" + ventilating dehumidifier</li> <li>• Heat pump with split coil RH control function (e.g. Daikin Quaternity)</li> </ul>
Distribution	Duct in attic/soffit, ceiling registers	Transfer fans

## Part 7: Plumbing

The plumbing system shall comply with HUD code and IPC 2012.

Units shall be ready to hook up to municipal sewage or an on-site septic system.

Supply piping shall be ¾" CPVC or PEX tubing, as shown in plumbing diagrams.

Main potable water supply pipe shall be equipped with a metal, ¾" meter shutoff gate valve or quarter-turn ball valve, as well as a frost-free hose bib.

Panels shall be provided in the walls at all points where plumbing joints exist. Access panels shall match the wall color and finish.

An individual shutoff valve shall be provided at each installed plumbing fixture except for the tub/shower.

Water piping shall be tested appropriately for the type of piping used. When the manufactured home is delivered to FEMA, the entire water system shall be dry without any water in it.

The drainage system shall connect to the main sewer line, which shall run below the floor, above the bottom board, as shown in the plumbing diagrams.

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The exit pipe shall protrude at least 6", but not more than 8", from the bottom board, shall have a threaded end, and shall be capped with a removable plastic cap and chain. Piping extending below the floor joists shall be insulated with R-X insulation. The drainage system shall be accessible without removing the wheels and/or axles during the installation and deactivation (un-installation) process.

## **Part 8: Fire Safety**

### **A. Fire Extinguisher**

Each home shall be equipped with a 5-pound A-B-C-type fire extinguisher and a mounter bracket, where shown on the section drawings. The mounting bracket shall be secured to a wall stud and shall be mounted 40" about of floor surface along the accessible route, as shown.

### **B. Fire Sprinkler Tank-and-Pump System (TPS)**

Requirements in progress; FEMA to provide

### **C. Sprinkler Distribution System**

Sprinkler distribution system shall be approved by a fire-protection engineer and installed by the manufacturer as shown on the drawings, or equivalent, in adherence to NFPA 13D. A sprinkler shall also be provided in bathrooms and in the DHW closet.

Sprinklers shall be UL listed, ordinary temperature, with a flat or domed cover plate and glass bulb thermal elements.

Sprinklers using eutectic metal heat sensitive elements shall not be used due to the risk of cold flow during storage.

Sprinkler cover plates shall be shipped in packaging (one box per MHU) to protect from transportation damage and shall not be installed at the factory.

One spare sprinkler of each type used in the MHU shall be provided and placed within a spare sprinkler cabinet along with a sprinkler wrench, secured inside the fridge during transportation, as shown in the ship-loose drawings.

The sprinkler-system pipe or tubing shall be installed in a horizontal or near-horizontal orientation as per 24 CFR 3280.

All pipes shall be located within the thermal envelope of the MHU, just below the ceiling. (The temperature of the water and pipe must be maintained at or above 42F.)

The fire-sprinkler system shall be concealed using a soffit. The soffits shall be securely affixed to the structural members of the MHU and not attached into the drywall or cabinetry.

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All sprinkler pipes shall be labelled at every 5 linear feet, unless concealed.

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