



David Tompos, NTA Inc
Project Engineer

**“Increased quality leads
to increased prices”**

or

**“Increased quality leads
to decreased costs”**

- Role of the Engineer is to compile technical specifications that meet design goals:
 - energy conservation, environment,
 - safety, security, durability,
 - accessibility,
 - cost-benefit, functionality, and
 - operational considerations
- Engineer also ensured that the goals are met in the unit construction through Quality Assurance and Quality Control



Quality Assurance Steps:

- MS Fire Marshall office and HUD were consulted through the bid design stage and assisted in a prompt review and approval process.
- All construction documents had to be submitted to the State of Mississippi and the Department of Housing and Urban Developments' agent for final approval prior to construction
- The MEMA homes were inspected during construction and a 100% final inspection to insure that the construction met the MEMA bid document specifications. This 100% inspection insured that the highest quality of construction was being provided for the MEMA homes.
- The state allowed the design team to “prototype”, or build the first unit, with each manufacturer to establish the “standard of quality.” Thousands of pictures were taken of things for our employees and the factory personnel to watch and police so our Quality standards were met.



DESIGNED TO MEET MULTIPLE CODES: Manufactured Home Construction & Safety Standard (HUD Standard) AND the International Residential Code (IRC)

STATE OF MISSISSIPPI
Mississippi Emergency Management Agency
Mississippi Park Model - Elevation A
Procurement Specifications
 Dated: June 25, 2007

Specification	
Clarifications:	Where there is a discrepancy between the written specifications and the drawings, the written specifications will govern.
Manufacturer's Drawings:	The manufacturer shall produce shop drawings prior to the start of construction for review by the engineer of record.
Inspections:	The first unit shall be inspected by the engineer (or his representative) and a representative of the State of Mississippi.
Design Requirements	
Codes:	International Residential Code 2003 National Electrical Code 2005 International Plumbing Code 2003 International Mechanical Code 2003 International Gas Code 2003 International Energy Conservation Code 2003 International Fire Code 2003 A119.5 Park Model ASCE-7 2002
Approvals:	State of Mississippi Modular (State label required) A119.5 Park Model (RPTIA label required) Professional Engineering certification (State of Mississippi).
Roof:	Live load 30 psf
Wind:	150 MPH 3 sec gust exposure B
Sizing and Configuration	
Road Height:	15' - 6" max
Roof Pitch:	7/12 main roof, 6.5/12 HIP roof
Overhangs:	7-1/2" eaves sides and rear; 10-1/2" porch front overhang and side overhang.
Unit Length:	40 ft (34'-2" living plus 5'-10" open porch).
Unit Width:	11' - 4"
Unit Size:	396 sf
Ceiling:	8'-0 1/4" ft. flat ceiling
Frame	
Main I-Beam:	M10 x 9 I-Beam
Front/Rear Header:	M10 x 9 I-Beam full width with (7) 7/16" holes for lags
A-Frame:	M10 x 9 I-Beam underslung detachable with reinforcement necessary for transportation with standard jack and 2-5/16" coupler to support unit. Detachable hitch removed and stored under porch after set-up.
Crossmember:	1 1/2" x 3" x 1 1/2" x 13 GA "C" 4" o.c. with additional crossmembers added at 2' o.c. in axle area.
Axles:	Axles may be refurbished and shall have a 6000# rating. Quad axles two tandem spread 24" shall be equalized. Brakes shall be provided on 2 front axles.
Tires and Rims:	Tires and rims may be refurbished and shall be free of defects. Tires shall be 8 x 14.5 10 ply E. min. Rims, bolts, nuts or other related tire-mounting hardware must be new.

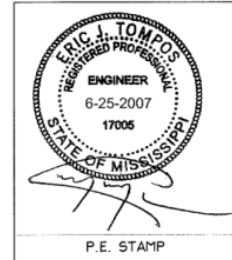
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Floor to Frame:	The frame shall be secured to floor joist system with 9mm x 3" (75mm), Fby = 190,000 psi min. ("Fastec, American Bolt 9mm x 3" lag, Fastec Listed 5/16" x 3" lag, Shelter 5/16" x 3" lag," or equal) lags each joist to frame through lag clips that are welded to frame. The lags shall be easily removable so that the frame can be divorced from the house unit for permanent installation on a foundation. The lags and clips in the porch area must be galvanized steel, approved for pressure treated lumber.
Coating:	All expose surfaces of the entire frame shall be completely coated after welding. The coating must be waterproof and prevent rust from forming on the frame.
Serial Number:	A serial number must be stamped on the front header in 3/8" high letters
Floor	
Floor Joist:	The floor joist shall be minimum 2 x 8# 2 SPF or equal, and run transverse to the length of the unit. Floor joist shall be spaced 16" o.c. with additional joist added at shear walls. The shearwall joist shall be 2x8 #2 SYP KD. (see drawing) Rim joist shall be doubled 2 x 8 #2 SPF or equal, with splices staggered 4' o.c.
Decking:	The floor decking shall be 23/32" OSB or plywood APA rated sturd-i-floor 24" o.c., or 23/32 Advantage 24" o.c. Advantage Decking to be square edge full width. Long edges of the panel shall be tongue and groove installed perpendicular to the floor joist. The decking must be mechanically fastened and 100% glued to joist. All seams must be sanded. Decking must be water proofed 5' x 4' area at the front door.
Bottom Board:	Rolled bottom board, meeting beach puncture test with all penetrations sealed per bottom board manufacturer's instruction. (Mfg: Shepherd, Mobile-Flex-MF1483, First Line, Fortifiber Polyflex type RV, Shepherd ShepWeave, Seal-Right III, HomeMate HM90, or equal, to be approved by the Engineer of Record). The bottom board is not installed under the porch area. The bottom board shall be secured to prevent rodents from entering the unit and shall be moisture resistant.
Insulation	
Specifications:	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. The testing shall conform to ASTM E84, ASTM E119 or ASTM E136. The approve manufacturers are Owens Corning, Johns Manville Corporation, Certaineed Corporation or equal, to be approved by the Engineer of Record).
Floor:	The floor insulation shall be R-11 fiberglass Batt insulation without a vapor barrier except in under floor plumbing area where R-11 blanket insulation will be used full width. The perimeter of the floor shall be insulated with R-11 fiberglass 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.
Wall:	The wall insulation shall be R-19 fiberglass Batt insulation without a vapor barrier. The wall insulation shall be installed without voids. The width of the Batts shall be friction-fitting.
Ceiling:	The ceiling insulation shall be a fire retardant blown or fiberglass Batt insulation. The ceiling insulation shall be R-30. The ceiling insulation shall be installed without voids. A 1" min air space shall be maintained between the roof decking and insulation. Baffle shall be used to maintain a 1" air space between the insulation and roof decking. Batts 24" x 24" R-30 fiberglass insulation may be installed at all edges to provide baffle for

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REVISIONS: 6/25/07 RE-BID ADDENDUM #1	SCALE: 1/8" = 1' - 0"	APPROVED BY:	STATE OF MISSISSIPPI MISSISSIPPI EMERGENCY MANAGEMENT AGENCY	TITLE: SPECIFICATIONS	PROJECT NO: STMS012507-18
	DATE: 6/1/2007	DRAWN BY: RMK		MODEL: PARK MODEL 1A ELEVATION A	DRAWING NO: 33 OF 33

DETAILED SPECIFICATION: The MSAHPP homes had detailed specifications and construction drawings, ensuring units would meet the high performance design objectives from the charrette.



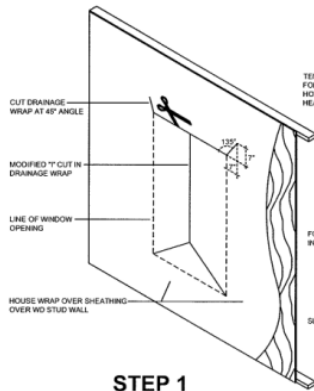
MS Park Model



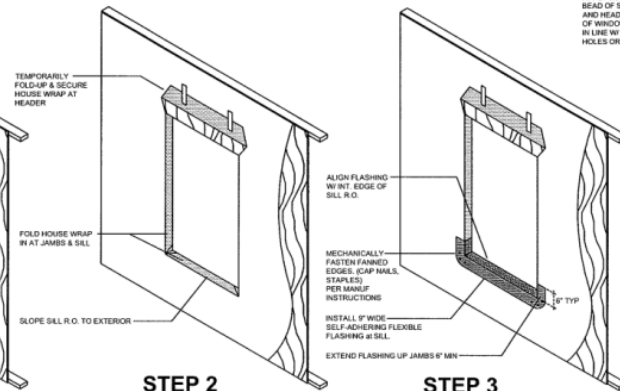
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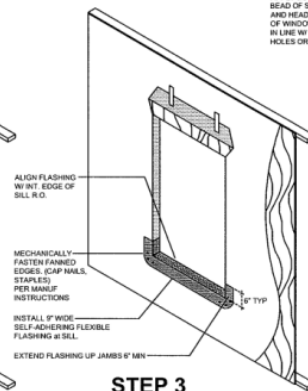
MS Park Model



STEP 1

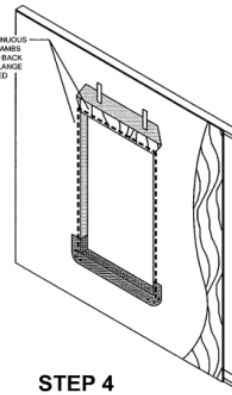


STEP 2

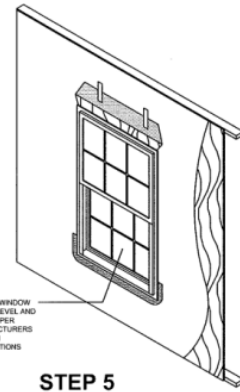


STEP 3

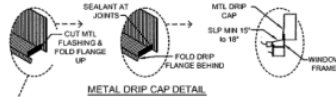
APPLY 3/8" NOM. CONTINUOUS BEAD OF SEALANT AT JAMB AND HEAD & APPLY TO BACK OF WINDOW NAILING FLANGE IN LINE WITH PRE-PUNCHED HOLES OR SLOTS.



STEP 4

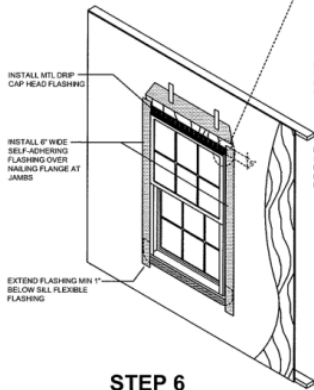


STEP 5

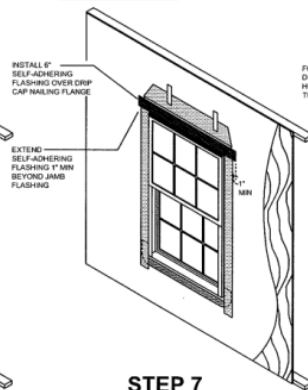


METAL DRIP CAP DETAIL

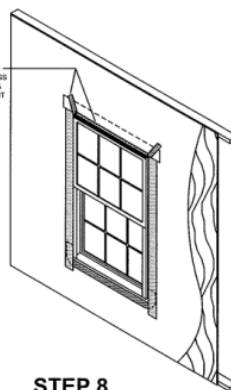
METAL DRIP CAP:
 1. SEPARATE DISSIMILAR MATERIALS TO PROHIBIT GALVANIC REACTION.
 2. STEEL FLASHING SHALL BE (MINIMUM 24 GA) PAINTED, PREFINISHED, OR STAINLESS STEEL.
 3. ALUMINUM FLASHING SHALL BE MINIMUM (40) PREFINISHED KYNAR COATED.



STEP 6

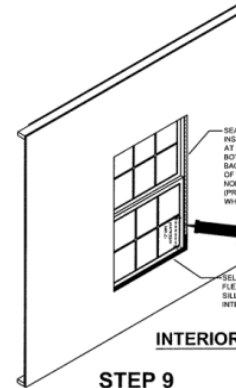


STEP 7



STEP 8

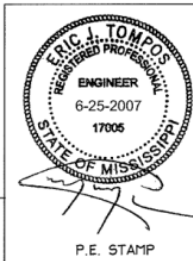
WINDOW FLASHING INSTALLATION DETAILS



INTERIOR VIEW

STEP 9

NOTE:
 1. WINDOW INSTALLATION AND FLASHING DETAILS ARE CONSISTENT WITH ASTM 2112 METHOD A-1 EXCEPT SELF-ADHERING FLASHINGS ARE USED.
 2. IT IS THE CONTRACTORS RESPONSIBILITY TO VERIFY THE COMPATIBILITY OF ALL PRODUCTS INCLUDING DRAINAGE WRAP, SEALANTS & SELF-ADHERING FLASHING MATERIALS USED DURING CONSTRUCTION.
 3. INSTALL ALL MATERIALS PER MANUFACTURERS WRITTEN SPECIFICATIONS.
 WARNING: SEALANTS/FLASHINGS MAY REACT ADVERSELY IF NOT COMPATIBLE.



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REVISIONS: 6/25/07 RE-BID ADDENDUM #1	SCALE: 1/8" = 1'-0"	APPROVED BY:	STATE OF MISSISSIPPI MISSISSIPPI EMERGENCY MANAGEMENT AGENCY	TITLE: WINDOW DETAILS	PROJECT NO: STM5012507-18
	DATE: 6/11/2007	DRAWN BY: RMK		MODEL: PARK MODEL IA ELEVATION A	DRAWING NO: 24 OF 33

DETAILS: The MSAHPP windows, doors, and other assemblies were detailed to resist high wind pressures, provided with impact resistant coverings, and detailed to prevent water infiltration.



EXCEEDING MINIMUM SAFETY STANDARDS: The MSAHPP homes were designed to meet a 150mph wind design speed, yet in many of the communities where they are deployed the local code only requires 120mph.



INSPECTIONS: The MSAHPP homes were provided with an exterior covering, roof and siding all of which were certified by accredited testing agencies to meet the design standards. All of these reports were reviewed by the QA/QC personnel.



Exceeding Safety Minimums - Indoor Air Quality and Formaldehyde:

- In addition to meeting HUD code requirements,
- Materials containing formaldehyde were used minimally, and
- All exposed surfaces of wood products were sealed.
- All interior finishes were required to be low to no volatile organic compound emissions and
- required independent third party inspection and evaluation.



Energy Related Characteristics of Mississippi FAS Homes (May 15, 2007)

Parameter	Description	House Model				
		Park Model 1A	Cottage 1B (Hip Roof)	Cottage 1B (Gable Roof)	Cottage 1C (Hip Roof)	Cottage 1C (Gable Roof)
Weather City	Mobile, Alabama					
Floor/Foundation	Crawlspace, R-19	396 sq ft.	728 sq ft.	728 sq ft.	840 sq ft.	840 sq ft.
Walls	Frame Wood with R-11 Insulation	396 sq ft.	728 sq ft.	728 sq ft.	840 sq ft.	840 sq ft.
Ceiling	R-30 Batt or Blown with Vented Attic	396 sq ft.	728 sq ft.	728 sq ft.	840 sq ft.	840 sq ft.
Windows	Low-E Single vinyl frame with SHGC Glass (U = 0.36, SHGC = 0.35)	74 sq ft.	93.23 sq ft.	93.23 sq ft.	106.5 sq ft.	106.5 sq ft.
Window to floor area ratio	window area/floor area	18.68%	12.80%	12.80%	12.67%	12.67%
Doors	Insulated	20 sq ft.	32.28 sq ft.	32.28 sq ft.	40 sq ft.	40 sq ft.
Heating System	Electric Heat Pump, HSPF 8.5	7.7 kBtuh Calculated Heating Load	12.2 kBtuh Calculated Heating Load	12.2 kBtuh Calculated Heating Load	13.9 kBtuh Calculated Heating Load	13.9 kBtuh Calculated Heating Load
Cooling System	Electric Heat Pump - SEER 14	0.62 Ton Calculated Cooling Load	1.042 Ton Calculated Cooling Load	1.042Ton Calculated Cooling Load	1.233 Ton Calculated Cooling Load	1.233 Ton Calculated Cooling Load
Air Distribution System	Supply in Attic Return and AHU Interior	Proposed Duct Leakage Target Qn = .06*	Proposed Duct Leakage Target Qn = .06*	Proposed Duct Leakage Target Qn = .06*	Proposed Duct Leakage Target Qn = .06*	Proposed Duct Leakage Target Qn = .06*
Water Heater	Electric	EF = 0.9	EF = 0.9	EF = 0.9	EF = 0.9	EF = 0.9
Infiltration	Proposed	ACH50=6	ACH50=6	ACH50=6	ACH50=6	ACH50=6
HERS 2006 Index	≤ 85 = Energy Star	83	84	83	85	84

The MEMA homes were designed to meet Energy Star® requirements, analyzed by Florida Solar Energy Center (FSEC).

Accessibility

The MEMA 2 bedroom and 3 bedroom homes were designed to be adaptable to the Uniform Federal Accessibility Standard. A percentage of the homes were designed to meet all of the UFAS requirements.

Working with FEMA, a comprehensive checklist was developed to use in the factory and in the field to insure the homes are compliant.



MS Cottage



MS Park Model