MANUFACTURED HOUSING CONSENSUS COMMITTEE
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MINUTES
MHCC MEETING

October 18-20, 2022
November 15-17, 2022

MINUTES
MANUFACTURED HOUSING CONSENSUS COMMITTEE (MHCC) MEETING

October 18-20, 2022 & November 15-17, 2022

Meeting 1, Day 1: Tuesday, October 18, 2022

Call to Order

The Manufactured Housing Consensus Committee (MHCC) meeting was held on Tuesday (October 18, 2022), Wednesday (October 19, 2022), and Thursday (October 20, 2022) at the Holiday Inn Washington Capitol in Washington D.C. Kevin Kauffman, Administering Organization (AO) Home Innovation Research Labs, called the roll and announced that a quorum was present. See Appendix A for a list of meeting participants.

Introduction and Opening Remarks

David Tompos, the vice chair of MHCC, thanked everyone for their time and called the meeting to order. The MHCC members and the Department of Housing and Urban Development (HUD) staff introduced themselves. Teresa Payne, Administrator of the Office of Manufactured Housing Programs, and Designated Federal Officer (DFO) thanked everyone for their time and made some administrative announcements. Ms. Payne stated that the work done by this committee is very important and emphasized that the discussions will affect the entire industry.

The Administrative Procedure Act (APA) rulemaking was explained in a presentation by Kyle Helmick, OGC, Office of Legislation and Regulations. The presentation can be found in Appendix B. The presenter clarified general questions raised by the committee members regarding the timeline of the publication of proposed and final rule, and the number of people who can or are involved in making a proposed rule.

Teresa Payne thanked the OGC representative for the presentation and introduced Julia Gordan, the Assistant Secretary for Housing, Federal Housing Commissioner. Ms. Gordon appreciated the work of the committee members and their contributions towards addressing the nation's safe and affordable housing shortage. She emphasized that the committee's work would be vital to HUD's work of increasing safe and affordable housing availability which is critical to the American public. Ms. Gordon also expressed the need to align the DOE rules to the HUD standard as it would be very difficult for the entire industry if the rule conflicted with HUD standard or if the enforcement did not come from the correct entity.

Approval of the Minutes

The members discussed minor amendments to the combined draft minutes from September 23, October 8, October 20, and November 19, 2021, MHCC meetings.

MHCC Motion: Approve as Modified the combined draft minutes from September 23, October 8, October 20, and November 19, 2021, MHCC meetings.

Maker: James Husom **Second: Joseph Sullivan**

The motion carried unanimously.

Public Comment Period

See Appendix C for written public comments received prior to each meeting.

Lesli Gooch, MHI, appreciated the work of the committee members and thanked Julia Gordon for the announcement. Ms. Gooch expressed her delight on the updated financing. Ms. Gooch emphasized that wholesale adoption of the DOE rule into the HUD code is not appropriate because HUD and the DOE rule had substantially different standards and they were created under different statutory requirements.

> "The Manufactured Housing Construction Safety Standards Act of 1974 required the HUD Code to balance energy efficiency with affordability and increased homeownership. This is a statutory mandate required to be met by HUD. HUD should not yield to DOE's rulemaking carried out under a completely different statutory purpose by just adopting and incorporating the Energy Rule into the HUD Code. HUD should craft its own revision to its own code that carries out its statutory mandate to BALANCE energy efficiency with affordability and increased homeownership. The Energy Rule is based on flawed calculations and methodologies and will price tens of thousands of households out of homeownership. DOE's own analysis showed that the Energy Rule will increase costs for homebuyers without reciprocal energy savings, but its flawed benchmarks underestimated the increased costs. Additionally, testing and compliance must be considered as part of the cost, which is something DOE readily admits that it did not include in their costs. Further, the MHCC told the Department of Energy that the IECC was not intended and was not suited for manufactured housing, but that recommendation was ignored, along with many other recommendations made to the Department of Energy. Because of the many conflicts, ambiguities, and impossibilities of the Energy Rule when applied to manufactured home construction, wholesale adoption of the Energy Rule into the HUD Code is not appropriate. MHI urges the MHCC to reject the framework of the Pre decisional Draft as the starting point for this discussion."

John Weldy, Clayton Homes, thanked everyone for their time. He expressed the importance of energy efficiency and his support for a balanced energy code but argued that having higher cost impact for manufactured housing is not effective. Mr. Weldy also emphasized issues like supply and demand of insulation, and its additional cost burden. He expressed his concern towards lack of clarity on enforcement of the DOE rule and encouraged the committee to promulgate their own rule without referencing the DOE rule. He asserted that by doing so, it would make DOE enforcement of the standards to manufactured housing redundant, it would reduce the interpretation of the code by two governmental agencies and would make HUD the authority of compliance.

Mark Bowersox, MHI, reiterated the issue with supply chain in implementing the DOE rule. He expressed his concern about the cost impact of the DOE rule on the lower income people. He stated that affordability for manufactured housing is important and that increases in cost would make homeownership unattainable for thousands of people. Mr. Bowersox believes that the DOE's cost estimates are significantly underrated, and they have not considered the cost of testing, engineering, etc. in their analysis. The goal is to understand how we can meet the 4 million affordable housing that is missing in the nation.

Mark Weiss, MHARR, expressed his belief that the DOE rule is destructive, and it is critical that the committee go on the record that they do not agree with this rule. He suggested that the committee disapprove the pre-draft document they have been provided. He stated that there were too many unknowns to properly address or estimate the cost associated with the changes and suggested the committee state how destructive the DOE rule is.

BREAK

Timothy Ballo, Earth Justice, expressed his confusion regarding why it would take 5 meetings for this committee to adopt DOE standards. He asserted that the DOE standard is the law of the land, and it was a simple matter of complying or not complying. He stated that unlike the HUD code, there is no preemption attached to the DOE rule and that any state or local body can adopt the DOE rule. He also stated that it seemed the only choice is to adopt the DOE rule and reinstitute federal preemption.

Mark Weiss reminded the committee that no other state has adopted the 2021 IECC except for Nevada. The rest of the 49 states have the older version of IECC.

Lesli Gooch expressed her disagreement with what the Earth Justice rep said. The DOE standard has a lot of conflicts, and the MHCC committee members are the panel of experts. She stated that it was the committee's job to solve these conflicts. IECC is a code for site-built homes which is very different from factory-built MH. DOE created conflicts and ambiguities by not fulfilling its job according to the statute to ensure things are cost effective and consulting with HUD. Ms. Gooch appreciated the legal opinion that was just given but encouraged the committee to do their job and keep working on how to implement the rule.

Teresa Payne also reinforced to the committee that HUD was following its statutory requirements which is to have changes first go through the MHCC before any changes are made to the Manufactured Home Construction and Safety Standards.

Review and Consideration of HUD's Proposed Revision of the Manufactured Home Construction and Safety Standards to Align with the Department of Energy's Energy Conservation Standards for Manufactured Housing.

The current working document showing all the MHCC modifications to the Manufactured Home Construction and Safety Standards as of the end of the November 2022 meeting can be found in Appendix D.

Manuel Santana, Cavco Industries, explained the approach MHI had taken to revising the Manufactured Home Construction and Safety Standards to align with the Department of Energy's Energy Conservation

Standards for Manufactured Housing. MHI had minimal changes targeted on definitions, air barrier, installation of insulation, compliance paths and their two tiers. The HUD Proposed Revision of the Manufactured Home Construction and Safety Standards document and the MHI Proposal can be found in Appendix E and Appendix F respectively.

The members discussed the values of defining various terminologies. It was pointed out that the term 'Mechanical ventilation' needs to be defined but it would be redundant to incorporate definition of 'furnace fan'. It was also suggested to remove the definitions of 'pressure envelope' and 'continuous air barrier' as air barrier meant the same thing and having 'air barrier' in the definition would suffice.

LUNCH BREAK

The members continued reviewing the proposed revisions to the Manufactured Home Construction and Safety Standards by HUD and MHI side by side. Questions were raised on whether the electrical boxes should be sealed on the exterior wall. Implications of air barrier and vapor barrier on the exterior or interior of wall were thoroughly discussed.

Public Comment Period

Mark Weiss, MHARR, urged the committee to resolve the ambiguities like the ones discussed in the meeting within the committee because the DOE does not have the expertise.

Lesli Gooch, MHI, asserted that the pre-decisional draft circulated by HUD to the MHCC does not seek to "align" the MHCSS with the Energy Rule, but rather seeks to wholesale adopt the Energy Rule by reference, while simultaneously deleting any corresponding section of the MHCSS that deals with the same subject matter. She recommended that HUD revise the MHCSS to comply with HUD's mandate to balance energy efficiency with affordability of manufactured homes so that HUD can maintain preemptive authority over construction and energy efficiency of manufactured housing and align the Energy Rule with realities of MH. Around 2010, HUD adopted its own standards related to formaldehyde emissions standards for all hardwood, plywood, medium-density fiberboard, and particleboard, including when incorporated into finish goods such as manufactured homes, rather than adopting by reference the new Composite Wood Products Act passed by Congress. HUD in fact chose not to adopt several regs in the CWPA in their final version. The MHCC should follow the precedent set by HUD in relation to the EPA formaldehyde standards to ensure that future changes to the Energy Rule do not result in changes to the MHCSS without any consultation with HUD or the MHCC. Drafting specific language incorporating the energy rule provides the opportunity to implement testing methods left out of the energy rule and align the energy rule with the realities of manufactured home construction. By just adopting the DOE language as is without HUD code creating its own specific language to enforcement, testing and compliance provisions, it could create a host of issues. In sum, the MHI proposal handed out to you has tried to address these issues of incorporating the DOE rule by reference rather than HUD adopting its own code. Ms. Gooch appreciated the committee's reliance on MHI's proposal. She introduced Spenser Templeton and requested her to speak on this issue.

Spenser Templeton, MHI, stated that it was important to come up with the committee's own code instead of following DOE's standards and encouraged the committee to solve these ambiguities and not just the definition but also their provisions because unsolved, they have serious impacts on different levels of the industry. She stated that this may also cause a multitude of litigation issues throughout the nation and will be against the main goal of affordable housing.

John Weldy, Clayton Homes, stated that a lot of committee members were comparing Vapor barrier to Air barrier that makes it confusing. Ultimately both are acting somewhat as an air barrier, but the bottom line is which one is continuous air barrier that would also act as vapor barrier. He acknowledged that this discussion is a great example of how provisions for factory-built homes vary from site-built homes and this committee is bringing about these rules for factory-built MH. Because manufactured housing may be going to any location, we should want to keep it as simple as possible.

Wrap Up – DFO & AO

Teresa Payne thanked everyone for their time and announced that the topic of air barrier could be further discussed tomorrow.

Adjourn

The motion to adjourn the meeting was carried.

Meeting 1, Day 2: Wednesday, October 19, 2022

Call to Order

The Manufactured Housing Consensus Committee (MHCC) meeting reconvened Wednesday, October 19, 2022, at Holiday Inn, Washington D.C. Kevin Kauffman, Administering Organization (AO) Home Innovation Research Labs, called the roll and announced that a quorum was present. See Appendix A for a list of meeting participants.

Introduction and Opening Remarks

Teresa Payne, Administrator of the Office of Manufactured Housing Programs, and Designated Federal Officer (DFO) welcomed the participants and thanked them for their time.

Public Comments Period

See Appendix B for written public comments received prior to each meeting.

Mark Weiss, MHHR, asked the status of the proposal pertaining to the enforcement of the alignment of the DOE rule to the HUD standard. He urged HUD to put something on the table regarding that.

Teresa Payne clarified that there are currently discussions with HUD and DOE about the enforcement of the rule.

Lesli Gooch, MHI, acknowledged that they needed to move forward with clarity and thanked everyone for their time. She appreciated the committee members for moving through this phase and stated that the next step would be to discuss the cost. She reminded the committee that HUD has the task of balancing updates to the standard with cost.

Continued Review and Modification of Working Document: Modifications to MHCSS based on DOE Final Rule

The current working document showing all the MHCC modifications to the Manufactured Home Construction and Safety Standards as of the end of the November 2022 meeting can be found in Appendix D.

The committee discussed that air sealing around windows is different for factory-built houses depending on whether the air barrier is installed on the interior or exterior side of the walls.

Manuel Santana, Cavco Industries, described the intent of MHI's changes to the remaining sections of the document.

The committee suggested identifying performance and prescriptive pathway options in the section title. It was also pointed out that the introductory information about the tiers was not clear under the DOE rule. The committee imported some language from the DOE rule into the working document and modified them to match the appropriate sections.

It was pointed out that it would be valuable to include Puerto Rico in the table of Climate Zones. The Climate Zone table from the DOE rule in addition to the map was imported into the working document.

BREAK

The differences between the prescriptive and performance approach were discussed. The significant increase from Tier 1 to Tier 2 in U_o value was also pointed out.

It was also pointed out that the prescriptive U value requirement for Climate Zone (CZ) 3 is more stringent making it more thermally efficient and manufacturers were more likely to follow the performance path instead of building with this high prescriptive requirement for CZ 3. It was discussed that there might be significant difference in the U value requirements for performance and prescriptive paths, but generally prescriptive path is a more conservative approach.

The cost-benefit was also brought up for homes with higher thermal performance, but the committee members weren't sure of the exact number (or % saving vs. % cost increase). The percentage of sales for these manufactured homes with higher thermal performance were also unknown.

The members also pointed out that the industry could benefit from having more time before the new standards came into effect, which could address the numerous backlogs of the manufactured housing industry and the potential supply chain issue with the new standard.

A question was raised on whether the proposed standard exceeded the current requirements for modular homes. It was clarified that that was not the case because it depended on what state and local codes imply. It was also pointed out that there are very few states that have adopted the 2021 IECC and the other states may have lesser energy requirements.

Public Comments Period

See Appendix B for written public comments received prior to each meeting.

Mark Weiss, MHARR, stated that the enforcement mechanism should be in place for the standards and that the HUD standard should take precedence.

Lesli Gooch, MHI, pointed out that IECC in various states may be adopted with IECC amended or unamended versions. She mentioned that it's not suitable for MHCC to assume that the IECC complies with the HUD code without knowing whether they adopted the amended or unamended versions. She urged that the new proposal that the committee is dealing with has not been passed through the committee because there are two different committees that oversee HUD and DOE. The lead representative warned the congress about the proposal because the IECC is a code for the site-built house and HUD code is built in factory which is very different. She urged the committee to amend the HUD code, so it is very specific to factory-built homes. This group needs to state where this code should be in effect and HUD also has a responsibility for cost.

Spenser Templeton, MHI, clarified that if there are two different set of standards from HUD and DOE, HUD is the standard for manufactured housing and a good legal argument that DOE rule should not go into effect would be if this committee could confirm that they don't want to adopt DOE. She urged the committee to not be swayed by the DOE rule and to do what is best for the industry.

John Weldy, Clayton Homes, mentioned that the 2021 IECC adoption is a little confusing because the adoption can be on all levels- state and local. Industrialized housing is different for residential and commercial and their adoption at different levels may or may not align. We don't have a conduit with the DOE and we have sent a couple of questions and not received a positive response. We must comply with both the DOE and HUD rules if they go into effect because they are both federal rules. The DOE rule would legally pose conflict for the MHCC because they don't currently align and it would be problematic if the DOE rule goes into effect, specifically because the increased thermal requirements included in the DOE rule do not properly consider affordability. Implementing the DOE rule would also call for over a million bags of insulation and the industry might have to investigate alternative material because of the supply-chain issue. He urged the committee to send a message that this is not suitable for affordable housing.

Mark Weiss, MHARR, stated that there is no enforcement mechanism for the DOE standard while there is penalty.

Continued Review and Modification of Working Document: Modifications to MHCSS based on DOE Final Rule

The committee discussed the values of thermal envelope requirements and decided to determine them in the November meeting.

It was discussed that the DOE rule requirement for exterior insulation increased the height of the roof that would conflict with shipping height requirements and decided not to include in the standard.

Language was edited to clarify the provision of the standard while incorporating sections of the DOE rule.

LUNCH BREAK

It was pointed out that there was a significant jump in the U value from tier 1 to tier 2 and an incremental change was necessary. The committee decided to calculate the number and discuss them in the next meeting, in November 2022.

It was discussed that the additional requirements increased the cost of manufactured housing significantly. It was also pointed out that increasing the cost of manufactured housing through increased energy requirements would result in more people opting for park models or RVs and the committee discussed that these park models have very low energy efficiency and that it was dangerous to live in them full time.

BREAK

The committee continued discussing and making proposed edits to align the Manufactured Home Construction and Safety Standards with the DOE Final Rule Energy Conservation Program: Energy Conservation Standards for Manufactured Housing.

Public Comments Period

See Appendix B for written public comments received prior to each meeting.

Lesli Gooch, MHI, thanked everyone for their consideration for the proposal and asserted that MHI will provide the necessary justifications as the committee requires for the next meeting regarding the due process. She emphasized that MHI is not trying to be the obstacle to energy efficiency, but it only intends to elevate housing innovation and expand attainable home ownership and that is not possible through increased cost.

Wrap Up – DFO & AO

Teresa Payne gave the closing comments and assured the members that they were in a good place getting justifications down and showing the changes to the HUD code and DOE rule. She thanked everyone for their hard work and reminded the members that the next meeting would focus on compliance.

Adjourn

The motion to adjourn the meeting was carried.

Meeting 1, Day 3: Thursday, October 20, 2022

Call to Order

The Manufactured Housing Consensus Committee (MHCC) meeting reconvened on Thursday, October 20, 2022, at Holiday Inn, Washington D.C. Kevin Kauffman, Administering Organization (AO) Home Innovation Research Labs, called the roll and announced that a quorum was present. See Appendix A for a list of meeting participants.

Introduction and Opening Remarks

Teresa Payne, Administrator of the Office of Manufactured Housing Programs, and Designated Federal Officer (DFO) thanked the members for their time and appreciated their hard work in the past few days. She also thanked the MHCC chair for running a great meeting.

Megan Garguilo, Rainmaker Strategic Solutions, made some administrative announcements regarding evaluation forms and general logistics.

Public Comments Period

See Appendix B for written public comments received prior to each meeting.

Lesli Gooch, MHI, wished everyone a good morning.

Mark Weiss, MHARR, thanked everyone for the committee's work and reiterated that the work of this body is very important for industry and consumers and that the DOE's rule in its current form would be very harmful for all.

Continued Review and Modification of Working Document: Modifications to MHCSS based on DOE Final Rule

The current working document showing all the MHCC modifications to the Manufactured Home Construction and Safety Standards as of the end of the November 2022 meeting can be found in Appendix D.

The members discussed different requirements for thermostat and programmable thermostats. It was discussed that the programming changes should come from the manufacturer of the device and programming changes made during the installation should not be listed in the standard because it may be confused with the requirements for manufacturers of MH. It was also noted that power is not continuously supplied to the homes and factory pre-programming may be lost.

Differences in heated water circulation system and service hot water were discussed and language was edited to indicate that heated water circulation systems are not mandatory. Definitions were either added or removed as deemed suitable for the purpose of the standard.

BREAK

The members continued to review and edit the working document. The difference in duct leakage and total leakage was discussed and clarified. The number of tests required for factory-built vs site-built homes were shortly discussed. It was pointed out that this is a quality control metric and, in the site-built industry, not all homes are tested. This discussion was left open for the next meeting in November.

Public Comments Period

Lesli Gooch, MHI, thanked everyone for their work and reiterated how the DOE rule creates conflicts and ambiguity. HUD is the primary enforcement body for manufactured housing and the DOE's rule does not fit into the manufacturing process, so this committee is very important and the work it does is not a simple process as was seen this week. A lack of understanding about factory-built homes and their conversion to site makes it very complex and DOE should have consulted with this committee from the very beginning. She emphasized that MHI provides and will provide the committee with not only cost benefit justification but also evidence why something is not okay. She wished everyone safe travels.

Mark Weiss, MHARR, thanked everyone, wished to see everyone in November and hoped that this will be complete so something can be submitted to the MHCC.

Wrap Up – DFO & AO

David Tompos, the MHCC vice chair, thanked everyone for their hard work.

Jason McJury gave the closing comments and assured the members that their work was very much appreciated by HUD staff. He thanked all supporting members for facilitating the meeting and looked forward to seeing everyone in the next meeting in November 2022.

Adjourn

The motion to adjourn the meeting was carried.

MEETING 2, Day 1: Tuesday, November 15, 2022

Call to Order

The Manufactured Housing Consensus Committee (MHCC) meeting was held on Tuesday (November 15, 2022), Wednesday (November 16, 2022), and Thursday (November 17, 2022) at Double Tree by Hilton Hotel, Washington D.C. Kevin Kauffman, Administering Organization (AO) Home Innovation Research Labs, called the roll and announced that a quorum was present. See Appendix A for a list of meeting participants.

Introduction and Opening Remarks

David Tompos, the vice chair of MHCC, welcomed everyone. He announced that he brought copies of the standard for the members' reference. Mr. Tompos reminded that the DOE rule had languages that seem to have been taken from the IECC that is in violation with the ICC copyrights and since the committee has used DOE's language, it is necessary to address that.

Teresa Payne welcomed everyone back for another round of the MHCC meetings. Ms. Payne appreciated everyone's hard work at aligning the standard with the DOE's rule and thanked their dedication to the committee.

Public Comment Period

See Appendix B for written public comments received prior to each meeting.

Lesli Gooch, MHI, thanked and welcomed everyone. Ms. Gooch informed the members that MHI had managed to get the cost analysis as promised in the previous meeting. She pointed out the areas they wanted to draw the members' attention to- 1) MHI'S proposed thermal requirements provided better cost savings than that of DoE's rule, 2) HUD had greater requirements for cost effectiveness and the economic analysis performed by MHI's third party showed that DOE rule fails the requirement, and 3) the MHI analysis shows that DoE's assumptions are outdated and flawed. Ms. Gooch pointed out that the DOE did not properly include transportation and testing into their cost analysis. It was also pointed out that the DOE cost analysis is based on improper assumptions, and they underestimated the number of people who will be priced out of the market. Many architectural features are going to no longer be permitted based on the new DOE rule. Documents provided by MHI during the meeting can be found in Appendix G.

Mark Weiss, MHARR, stated that written comments were provided for this meeting that follows two main points: HUD cannot implement the DOE rule as written as they do not take into account affordability, and the full cost has never been calculated. Mr. Weiss urged the committee to state that the DOE rule violates our statute for affordability, and any update to our standards go through full update of public comment law making process.

Continued Review and Modification of Working Document: Modifications to MHCSS based on DOE Final Rule

The members discussed the working document and reviewed changes made in the previous meeting. Members discussed whether prescriptive or performance paths have more stringent requirements. It was noted that having prescriptive and performance paths leads to more flexibility for the manufacturers to properly construct homes for multiple environments. The base hour of each path should be close.

The market of manufactured housing and stick-built homes was discussed, and questions were raised whether the manufactured housing purchase increases with stick-built homes becoming more expensive. It was discussed that while cost difference was a huge factor, there are also other drivers like local jurisdiction and perception MH. It was pointed out that the committee should focus on minimum requirements for manufactured housing and not the above code measures.

Jayar Daily, American Homestar Corporation, gave a presentation regarding *"Exhibit B"* from the handouts from MHI, see Appendix G.

BREAK

Manual Santana, MHI, presented *"Exhibit A"* from the MHI handouts, see Appendix G.

The members discussed the data shared in the presentations and the questions raised were addressed by the presenters.

Teresa Payne appreciated the information being presented and questioned what percentage increase in cost was predicted from the MHI proposal. It was mentioned that the MHI proposal would lead to a 20% increase in energy efficiency from the current HUD code whereas the DOE rule would result in a 30% increase.

LUNCH BREAK

Manual Santana continued with the presentation and addressed the remaining questions about energy savings, payback period, and material choices.

The members continued discussion on the working document. The insulation R-value requirements for exterior walls and roofs were discussed and the U-value requirements for various climate zones were edited from the DoE rule.

BREAK

Public Comment Period

See Appendix B for written public comments received prior to each meeting.

Lesli Gooch, MHI, thanked everyone for the discussion and circled back to the reason for committee's work. Ms. Gooch reminded how important the work is. The HUD code and DOE have profoundly different statutory mandates, so it is important that the HUD does not do a wholesale adoption of the DOE rule. HUD is required to balance energy efficiency with affordability so HUD should not bend to DOE rule that does not balance it. DOE does not take into consideration the various factors that a factory-built home is unique from site-built home. Since MHI showed that the DOE cost benefit analysis is flawed, Ms. Gooch requested the committee to continue working on suggesting better code for MH.

Continued Review and Modification of Working Document: Modifications to MHCSS based on DOE Final Rule

The members continued discussions of the various U-values requirements for different Climate Zones.

Additional edits were made to the HUD document with revised R-values for floor insulation. The members completed discussion and revision of thermal envelope requirements and proceeded to duct leakage testing discussion.

HUD provided a Proposal for Duct Leakage Testing, see Appendix H.

David Tompos, ICC, gave a background to the section. The appropriate frequency of duct testing was discussed. It was pointed out that the usual practice was to test them once a month. The committee discussed how IPIA conducts their test randomly and this test once a month is to make sure that the training is consistent because once the installers are trained, it will be the same way of installation for all homes. The committee also discussed whether it was effective to test a single unit or a multi-unit for ducts leakage.

Wrap Up – DFO & AO

David Tompos thanked everyone for their work.

Adjourn

The motion to adjourn the meeting was carried.

Meeting 2, DAY 2: Wednesday, November 16, 2022

Call to Order

The Manufactured Housing Consensus Committee (MHCC) reconvened on Wednesday, November 16, 2022, at Double Tree Hill by Hilton Hotel, Washington D.C. Kevin Kauffman, Administering Organization (AO) Home Innovation Research Labs, called the roll and announced that a quorum was present. See Appendix A for a list of meeting participants.

Introduction and Opening Remarks

Jason C. McJury, Deputy Administrator of the Office of Manufactured Housing Programs, welcomed the participants and thanked them for their time.

Public Comments Period

See Appendix B for written public comments received prior to each meeting.

Lesli Gooch, MHI, thanked everyone for their time. Ms. Gooch assured that this was the right process to follow, and that the conversation was necessary to be able to find the right resolution and to make sense for all interested parties.

Continued Review and Modification of Working Document: Modifications to MHCSS based on DOE Final Rule

The members continued the discussion for duct testing process. It was pointed out that there is minimal additional cost to running the test once the procedures have been implemented. Other than the initial test and there might be a few maintenances but there is little ongoing cost. The time of testing was also discussed. The process of whole manufacturing might be slowed down by 15-20 minutes. It was also mentioned that there may be time, labor, and maintenance components but the members were not sure how the DOE came up with their estimated cost figures.

Robert Parks, explained the processes and significances of Manual J and Manual S. The committee discussed that the load calculation per these manuals were more complicated for factory-built homes since the calculation considers climate zone, location, and orientation and with factory-built house, the manufacturer may not know any of these.

BREAK

The members continued discussion of the remaining sections. Clarification was added on changes made to some sections. Additional comments were also provided to the previous MHCC comment letter to HUD on Energy Conservation Program: Energy Conservation Standards for Manufactured Housing.

LUNCH BREAK

Public Comments Period

See Appendix B for written public comments received prior to each meeting.

Mark Weiss, MHARR, stated that there is no harm, only benefits in the recommendations made to HUD. Mr. Weiss asserted that the changes recommended by the committee will be published as a proposed rule which follows the statutory requirements.

Lesli Gooch, MHI, pointed on the impact of this process on minorities and low-income families. Ms. Gooch mentioned that there are some languages in the MHI's comment letter that shows cost impact and suggested it might be a good idea to talk about lower income and minority consumers in the comment. She also introduced Daniel Weber.

Daniel Weber, MHI, commented that HUD is not only the enforcement body but a body responsible for the development of Manufactured Housing Standards.

Continued Review and Modification of Working Document: Modifications to MHCSS based on DOE Final Rule

The committee decided to add the MHI written comments for November as appendix in the MHCC comment letter addressed to HUD.

The MHCC ended the current session to allow the Structure and Design and Technical Systems Subcommittees to meet to discuss their assigned Log Items.

BREAK

The committee reconvened after the two subcommittees had finished their work.

Public Comments Period

See Appendix B for written public comments received prior to each meeting. There were no comments made during this period.

Review and Action on Log Items from 2022-2023 Cycle

The MHCC discussed the 3 Log Items from the 2022-2023 Cycle that just received subcommittee recommendations.

Log 216 - § 3280.715 (a)(7) Supply system

MHCC Motion: Approve as Modified

Maker: Aaron Howard **Second:** Michael Moglia
The motion was carried unanimously

Log 225 - § 3280.607(b)(3) Shower Compartment

MHCC Motion: Approve

Maker: Aaron Howard **Second:** Rita Dilenno
The motion was carried unanimously

Log 226 - § 3280.305 (K)(3)

MHCC Motion: - Disapprove

Maker: Rita Dilenno **Second:** Joseph Sullivan
The motion was carried unanimously

Public Comments Period

See Appendix B for written public comments received prior to each meeting.

Mark Weiss, MHARR, thanked everyone for their hard work.

Danielle Webber, MHI, thanked everyone for their hard work and for fulfilling their duties in the right manner.

Wrap Up – DFO & AO

Teresa Payne reminded the deadline for application to the MHCC committee and asked the interested members to fill out the application. She thanked the committee for the work and dedication.

Michael Moglia pointed out that it would be nice if the committee had manufactured home installer.

Adjourn

The motion to adjourn the meeting was carried.

Meeting 2, Day 3: Thursday, November 17, 2022

Call to Order

The Manufactured Housing Consensus Committee (MHCC) reconvened on Thursday, November 17, 2022, at Double Tree by Hilton Hotel, Washington D.C. Kevin Kauffman, Administering Organization (AO) Home Innovation Research Labs, called the roll and announced that a quorum was present.
See Appendix A for a list of meeting participants.

Introduction and Opening Remarks

David Tompos called the meeting to order.

Public Comments Period

See Appendix B for written public comments received prior to each meeting.

Lesli Gooch, MHI, wished everyone a good morning and thanked them for their time.

Mark Weiss, MHARR, thanked everyone for their hard work and looked forward to the meeting.

Continued Review and Modification of Working Document: Modifications to MHCSS based on DOE Final Rule

David Tompos, ICC, pointed out the potential copyright infringement information when reviewing changes to the MHCSS. Some of the definitions imported from the DOE rule were straight out of the IECC but other changes were mostly modified by the committee. Mr. Tompos pointed out that the MHCC was asked to include some sort of recognition of the IECC because their document is the source for some of the information.

The members discussed and added comments on the MHCC's comment letter addressed to HUD to recognize IECC.

MHCC Motion: Approve Working Document as Recorded during the Meeting and send recommendations to HUD.

Maker: Leo Poggione **Second:** Manual Santana
The motion was carried with 2 negative votes

Wrap Up – DFO & AO

David Tompos, the MHCC vice chair, thanked everyone for their hard work and congratulated the members on this accomplishment. Mr. Tompos assured the MHCC that this was a big deal, and the committee did a great job ensuring the proper processes were followed and the affordability of manufactured housing was maintained.

Ms. Payne recognized the members Development who are rolling off at the end of this year, Dave Anderson, Lucca Brammer, and James Husom, with certificates from the Department of Housing and Urban and commended them for their dedicated service on the committee. Ms. Payne thanked everyone for their time over the last 3 days.

Ms. Payne also asked the members their preference of location for another meeting.

Various members expressed their gratitude to David Tompos for carrying out an efficient meeting. They also expressed gratitude to HUD and organizing/planning members for carrying out their tasks well.

Adjourn

The motion to adjourn the meeting was carried.

Appendix A:
MHCC Attendees and Guests

October 2022 MHCC Meeting

	MHCC Attendees, October 18-20, 2022			
	Name	**Attendance, Day 1**	**Attendance, Day 2**	**Attendance, Day 3**
General Interest / Public Official	Mitchel Baker			
	Tara Brunetti	Y	Y	Y
	Aaron Howard	Y	Y	Y
	James Husom	Y	Y	Y
	Michael Moglia	Y	Y	Y
	Robert Parks	Y	Y	Y
	David Tompos	Y	Y	Y
Producers	Luca Brammer			
	Phillip Copeland	Y	Y	Y
	Peter James			
	Manuel Santana	Y	Y	Y
	Cameron Tomasbi	Y	Y	Y
	Leo Poggione	Y	Y	Y
	Jayar Daily	Y	Y	Y
User	Dave Anderson	Y	Y	Y
	Rita Diienno	Y	Y	Y
	Stacey Epperson	Y	Y	Y
	Joseph Sullivan	Y	Y	Y
	Nicole Hebbe			
	Russell Watson			
	Catherine Yielding	Y	Y	Y

HUD Staff
Geraldine (Uju) Aguolu
Barry Ahuruonye
Dennaire Anderson
Adrian Browner
Tommy Daison
Jessica DeStefano
Alan Field
Christina Foutz
Julia R. Gordon
Dan Hardcastle
Kyle Helmick
Mike Hollar
Leo Huott
Rodney Moody
Jason C. McJurry
Teresa Payne
Glorianna Peng
Aaron Santa Ana
Barton Shapiro
Jun Shi
Angelo Wallace

AO Staff, Home Innovation Research Labs
Kevin Kauffman
Elina Thapa

Meeting Planner Contract Staff,
Morgan Garguilo, CGMP
Jane Hofilena
Kim Rich, CGMP

Guests
Josh Adams
Timothy Ballo
Kara Beigay
Mark Bowersox
Lesli Gooch
Michael Henretty
Andrew Justus
Jeff Legault
Valentina Pasquali
Matthew Rabkin
Denis Sarvarov
Spenser Templeton
James Turner
Mark Weiss
John W. Weldy
Matthew Womack
Kristin Zucaro

November 2022 MHCC Meeting

	MHCC attendees, November 15-17, 2022			
	Name	**Attendance, Day 1**	**Attendance, Day 2**	**Attendance, Day 3**
General Interest / Public Official	Mitchel Baker			
	Tara Brunetti	Y	Y	Y
	Aaron Howard	Y	Y	Y
	James Husom	Y	Y	Y
	Michael Moglia	Y	Y	Y
	Robert Parks	Y	Y	Y
	David Tompos	Y	Y	Y
Producers	Luca Brammer			
	Phillip Copeland	Y	Y	Y
	Peter James			
	Manuel Santana	Y	Y	Y
	Cameron Tomasbi	Y	Y	Y
	Leo Poggione	Y	Y	Y
	Jayar Daily	Y	Y	Y
User	Dave Anderson	Y	Y	Y
	Rita Diienno	Y	Y	Y
	Stacey Epperson	Y	Y	Y
	Joseph Sullivan	Y	Y	Y
	Nicole Hebbe			
	Russell Watson			
	Catherine Yielding	Y	Y	Y

<u>HUD Staff</u>
Dennaire Anderson
Tommy Daison
Alan Field
Christina Foutz
Leo Huott
Jason C. McJury
Teresa Payne
Jun Shi

<u>AO Staff, Home Innovation Research Labs</u>
Kevin Kauffman
Elina Thapa

<u>Meeting Planner Contract Staff,</u>
Courtney Marshall, CGMP
Antoinette Price
Kim Rich, CGMP

<u>Guests</u>
Josh Adams
Grant Beck
Lesli Gooch
Mark Weiss
Hon. William Sherman
James Turner
Daniel Weber

Appendix B: Presentation – Rulemaking Process: General Overview

THE RULEMAKING PROCESS

General Overview

The Administrative Procedure Act

- 5 U.S.C. § 551-559.
- The APA governs rulemaking for most rules.
- Defines a rule as an "agency statement of general or particular applicability designed to implement, interpret, or prescribe law or policy…"
- Defines a rulemaking as the "agency process for formulating, amending, or repealing a rule."

Notice and Comment Process

- 5 USC § 553 establishes the rule making process.
- Requires notice to the public of the agency's intent to publish a rulemaking ("proposed rule")
- Requires the agency receive comments from the public on the proposed rulemaking.
- Requires a final rule's effective date to be no sooner than 30 days after publication.

STEP 1: HUD CLEARANCE

- Requires approval by Assistant Secretary.
- Typical Clearance Period is 14 Business Days. Does not include resolution of NonConcurrences.
- Key reviewers include all major offices including OIG.

STEP 2: OMB REVIEW

- Executive Order 12866, “Regulatory Planning and Review” (issued September 30, 1993).
- Section 6 of the Order provides for OMB review of “significant regulatory actions.”
- Some Manufactured Housing Rules are “significant.”
- OMB has 90 calendar days to review a rule.

A RULE IS “SIGNIFICANT” IF IT WILL LIKELY --

- Have an annual effect on the economy of $100 million or more;
- Materially and adversely affect the economy, productivity, competition, jobs, the environment, public health or safety, or state, local or tribal governments or communities;
- Materially alter the budgetary impact or recipient rights and obligations of a program; or
- Raise novel legal or policy issues.

Consequence of Significance Determination

- For each matter identified as, or determined by the Administrator of OIRA to be, a significant regulatory action, the issuing agency shall provide to OIRA:
- (i) The text of the draft regulatory action, together with a reasonably detailed description of the need for the regulatory action and an explanation of how the regulatory action will meet that need; and
- (ii) An assessment of the potential costs and benefits of the regulatory action, including an explanation of the manner in which the regulatory action is consistent with a statutory mandate…

STEP 3: Signature Package Circulation

- Contains final approved draft of document with cover letter from Assistant Secretary to Secretary
- Secretary gives approval to publish document
- Package flows:
  - From OGC Regulations Division
  - To program counsel
  - To program Assistant Secretary
  - To OGC front office
  - To Executive Secretariat, Deputy Secretary, Secretary

STEP 4: SUBMIT TO HOUSE AND SENATE COMMITTEES

- Authorizing Committees have 15 calendar days to review and provide comments to HUD.
- In practice, Hill comments are rarely submitted.
- Only affects rules for comment (Proposed and Interim).

STEP 5: SUBMIT TO *FEDERAL REGISTER*

- Publication typically occurs 3 to 5 business days after submission.

Proposed Rule Timeline

- *Approximate Average Calendar Days to Publication: 196 (approximately 7 months) with OIRA Review.*

- *Approximate Average Calendar Days to Publication: 85 (approximately 3 months) without OIRA Review.*

STEP 6: PUBLIC COMMENTS

- All members of the public are entitled to participate in rulemaking by submitting comments before the rule takes effect;
- Purpose is to provide information on the impact of the proposed rule, to express support or opposition, and to advocate for changes;
- Agency must consider all comments.

PUBLIC COMMENTS

- All public comments are available on line at www.regulations.gov
- Agency must respond to public comments in preamble of final rule.

Step 7: FINAL RULE

- Upon consideration of public comments and after making any changes, a final rule is drafted and published.
- Changes must be explained in the final rule and must be a "logical outgrowth" of the proposed rule.
- HUD clearance and OMB review.
- Final rule is effective after at least 30 days.

Proposed and Final Rule Timeline

- *To Publication:*
  - *Approximate Average Calendar Days: 437 (approximately 15 months) with OIRA Review*
  - *Approximate Average Calendar Days: 215 (approximately 7 months) without OIRA Review.*

- *To Effective Date (+30 days to publication totals):*
  - *Approximate Average Calendar Days: 467 (approximately 16 months) with OIRA Review.*
  - *Approximate Average Calendar Days: 245 (approximately 8 months) without OIRA Review.*

QUESTIONS?

Appendix C:
Written Public Comments

Public Comments Received for October 18, 19, & 20, 2022	
1	Lesli Gooch
2	Philip W. Schulte
Public Comments Received for November 15, 16, & 17 2022	
3	Lesli Gooch
4	Mark Weiss

October 12, 2022

The Honorable Marcia Fudge
Secretary
U.S. Department of Housing and Urban Development
451 7th Street, S.W.
Washington, DC 20410

RE: Notice of Federal Advisory Committee Meetings: Manufactured Housing Consensus Committee (FR-6348-N-01)

Dear Secretary Fudge,

The Manufactured Housing Institute (MHI) is pleased to provide feedback to the Manufactured Housing Consensus Committee (MHCC) regarding the "Notice of Federal Advisory Committee Meetings: Manufactured Housing Consensus Committee" providing notice of the MHCC's meetings scheduled for October 18-20, 2022 and November 15-17, 2022 for the "the MHCC to propose recommended changes to the Manufactured Home Construction and Safety Standards that align with the Department of Energy's Energy Conservation Standards for Manufactured Housing." This will serve as MHI's comments to the first meeting scheduled for October 18-20, 2022. MHI intends to provide additional and supplemental comments leading up to the second meeting scheduled for November 15-17, 2022.

MHI is the only national trade association that represents every segment of the factory-built housing industry. Our members include builders, suppliers, retail sellers, lenders, installers, community owners, community managers, and others who serve our industry, as well as 48 affiliated state organizations. In 2021, our industry produced nearly 106,000 homes, accounting for approximately nine percent of new single-family home starts. These homes are produced by 35 U.S. corporations in 144 homebuilding facilities located across the country. Today, MHI members represent over 85 percent of all manufactured homes produced and we are pleased to submit the following comments on behalf of this important industry.

The United States is in the midst of an affordable housing shortage crisis. Median home sales prices increased 17 percent in 2021. The average sale price for a new home was $511,000 in 2022. As of the fourth quarter of 2020, the United States had a housing deficit of 3,800,000 units. The share of entry-level homes in overall construction declined from 40 percent in the early 1980s to around seven percent in 2019. By comparison to these figures, the average price of a new manufactured home is $108,100. Today, approximately 22 million people live in manufactured homes, and the average homeowner's median household income is approximately $35,000 per year, far below the national average, and nearly one-third of the average income of all new homebuyers. It is for this reason that many government officials are heralding manufactured housing as the most attainable solution to the nation's affordable housing crisis. Because most manufactured home homeowners have modest incomes, regulations that increase the cost to purchase or maintain a home—even modest cost increases—puts homeownership out of reach for many financially vulnerable consumers. Minorities and the lowest-income consumers are particularly impacted by regulations that increase the price of manufactured homes.

The manufactured housing industry has always supported energy conservation efforts and other reasonable environmental protection initiatives, and will continue to do so. In 2020, more than 30 percent of new manufactured homes were built to meet or exceed Energy Star standards. Moreover, today's manufactured homes already consume significantly less energy than site-built homes. A study of residential energy consumption showed that manufactured homes consume the least energy of all types of homes, at 59.8 million BTUs per household, compared to 94.6 million BTUs for single-family detached homes and 70 million BTUs for townhomes. For this and other reasons, the Department of Energy's (DOE) Energy Conservation Standards for Manufactured Housing codified at 10 C.F.R. § 460 (the Energy Rule) based on the 2021 International Energy Conservation Code (IECC), a site-built code not adopted by the vast majority of state and local building departments governing site-built residential construction, is not appropriate for use in manufactured homes.

Through comment letters dated November 12, 2021, and February 28, 2022, attached hereto for reference, MHI provided substantial comments to the Energy Rule. In those comments, MHI expressed that DOE did not abide by its statutory requirements to consult with HUD or implement standards that are cost effective when considering the primary purpose of manufactured housing as the only unsubsidized form of affordable housing in the United States. MHI pointed out substantial flaws in DOE's cost analysis and offered a cost analysis of its own. MHI proposed revisions to the Energy Rule, including an incremental approach to increased energy efficiency that balanced efficiency with affordability and took into account the specific design and construction standards of today's manufactured homes. DOE rejected MHI's analysis and its proposed incremental approach to increased energy efficiency standards.

By imposing a set of standards different than the Manufactured Home Construction Safety Standards (MHCSS) without consultation with HUD, without proper consideration of cost, and without any consideration of testing and certification, the Energy Rule creates an almost impossible challenge to the industry that constructs the nation's only form of unsubsidized affordable housing. The impact of the challenge created by the Energy Rule ultimately will be suffered by the hundreds of thousands of households, particularly those comprised of minorities and the lowest-income consumers, that will be priced out of the ability to obtain homeownership. The Predecisional Draft circulated by HUD to the MHCC does not seek to "align" the MHCSS with the Energy Rule, but rather seeks to wholesale adopt and incorporate the Energy Rule by reference, while simultaneously deleting any corresponding section of the MHCSS that deals with the same subject matter. MHI strongly disagrees with the Predecisional Draft's suggestion that HUD should merely adopt and incorporate by reference the Energy Rule into the MHCSS while deleting corresponding sections of the MHCSS. MHI recommends that HUD revise the MHCSS to comply with HUD's mandate to balance energy efficiency with affordability of manufactured homes so that HUD can maintain preemptive authority over construction and energy efficiency of manufactured homes and align the Energy Rule with the realities of manufactured housing.

1. *The Energy Rule is Based on Flawed Calculations and Methodologies, Fails to Consider Design and Construction Standards of Today's Manufactured Homes, Does Not Include Testing and Compliance Requirements, and Will Price Tens of Thousands of Households Out of Homeownership.*

DOE's own analysis showed that the Energy Rule will increase costs for homebuyers without reciprocal energy savings. Moreover, DOE used artificial benchmarks of savings to a consumer accumulated over 30 years based on the standards imposed by the Energy Rule compared to the minimum energy efficiency standards of the MHCSS. These benchmarks are flawed for two reasons. First, buyers usually sell their homes within seven to ten years of purchase, and it is highly unlikely that a manufactured homebuyer financing the purchase of a new manufactured home would recover the increased upfront costs of the Energy Rule at a future sale. Second, DOE failed to consider that most manufactured homes today are constructed to energy efficiency standards well above the minimum standards of the MHCSS.[1] Based on these flawed assumptions, DOE determined that the Energy Rule would result in an average cost increase of approximately $700 for a single-section home and $4,100 to $4,500 for a multi-section home. A cost-benefit analysis performed by MHI[2] and

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[1] In 2020, over thirty percent of new manufactured homes were built to meet or exceed Energy Star standards.
[2] MHI utilized much more realistic, but still conservative, assumptions of a 20-year loan term and a tenancy period of 10 years.

provided to the DOE demonstrated that the Energy Rule would result in a net loss of up to $5,500 to a consumer for a single-section home and up to $6,800 for a multi-section home depending on the location.

The National Association of Home Builders (NAHB) published a study in 2021 estimating that a $1,000 increase in the median new home price would price 153,967 households out of the market. Based on this study, even under DOE's flawed analysis, hundreds of thousands of households will be unable to obtain homeownership through manufactured housing as a result of the Energy Rule. If DOE had performed a proper cost calculation, then the number of households would be closer to or exceed 1,000,000 households priced out of homeownership. This is particularly so given that interest rates have increased substantially since the publishing of the 2021 NAHB study and close to 80 percent of manufactured home loans are personal property (i.e., chattel) loans that carry higher interest rates than site-built homes affixed to land. It must also be noted that DOE's analysis was based solely on purchase price, not the ability of a homeowner to obtain financing based on debt-to-income ratios and other factors.

The Energy Rule readily admits that DOE "has also not included any potential associated costs of testing, compliance or enforcement at this time."[3] Testing, compliance, and enforcement are integral to energy standards and will materially increase construction costs of manufactured homes and thereby the purchase price for such homes. For example, testing for duct system compliance under the Energy Rule could cost more than $600 per home for single-section homes and more than $1,000 for multi-section homes. If DOE had accounted for the cost of testing procedures related to only this one standard of the Energy Rule, then the average incremental price increase would be 46 percent greater than estimated by DOE for single-section homes and 18 percent greater for multi-section homes. Again, referencing NAHB's 2021 study, this substantial cost not considered by DOE will result in over 100,000 additional households unable to obtain homeownership.

The Energy Rule based on the 2021 IECC, a site-built code, will require vast changes to construction methods not suited for manufactured homes. Most notably, the Energy Rule will require up to 30 percent more insulation in climate zones 2 and 3, which will essentially eliminate construction of 2" x 4" wall framing in these zones in order to make room for increased insulation. It also will require increased roof pitches in these climate zones to make room for increased insulation. Every step in making homes more energy efficient costs more and saves less. Most cost savings come from the first few measures that improve performance. In seeking to optimize investment (i.e., find the best combination of increase costs to savings and efficiency), one must analyze each incremental improvement in efficiency individually. Once an energy measure begins to result in negative cost terms on a specific component, no additional measures to that component should be added. DOE did not perform this analysis, even though it has developed and promotes a Building Optimization Tool that uses this incremental approach to find the optimum investment. MHI proposed an incremental approach to increased energy efficiency standards to be adopted into the Energy Rule, but DOE rejected it.

Finally, the Energy Rule imposed an arbitrary and capricious one-year compliance deadline in contravention of its typical compliance deadline of three to five years for single appliance standards. The Energy Rule will require manufacturers across the manufactured housing industry to redesign and have reapproved by HUD every home design, of which there are thousands, in a one-year period. Manufacturers must then source the new materials required to comply with the Energy Rule during a global supply chain crisis. Of particular note, most manufacturers are currently unable to obtain more fiberglass insulation from suppliers than they already receive. Therefore, they will be forced to reduce production of homes to account for the nearly 30 percent increase in insulation requirements under the Energy Rule. Here again, DOE did not consider this issue in its haste to promulgate the Energy Rule.

[3] 87 Fed. Reg. 32758

2. Because the MHCSS and the Energy Rule Have Profoundly Different Statutory Mandates, Wholesale Adoption By Reference of the Energy Rule into the MHCSS is Not Appropriate.

While the MHCSS and the Energy Rule both deal with energy efficiency in manufactured housing, they are created under fundamentally different statutory mandates and are therefore substantially different codes. The Manufactured Home Construction and Safety Standards Act (the Act) expresses the following purpose of the MHCSS[4]:

(1) to protect the quality, durability, safety, and affordability of manufactured homes;
(2) to facilitate the availability of affordable manufactured homes and to increase homeownership for all Americans;
(3) to provide for the establishment of practical, uniform, and to the extent possible, performance-based Federal construction standards for manufactured homes;
(4) to encourage innovative and cost-effective construction techniques for manufactured homes;
(5) to protect residents of manufactured homes with respect to personal injuries and the amount of insurance costs and property damage in manufactured housing, consistent with the purposes of this section;
(6) to establish a balanced consensus process for development, revision, and interpretation of Federal construction and safety standards for manufactured homes and related regulations for the enforcement of such standards;
(7) to ensure uniform and effective enforcement of Federal construction and safety standards for manufactured homes; and
(8) to ensure the public interest in, and need for, affordable housing is duly considered in all determinations relating to the Federal standards and their enforcement.

With regard to energy efficiency of manufactured homes, the Act states that energy conservation standards in the MHCSS "shall take into consideration the design and factory construction techniques of manufactured homes and shall provide for alternative practices that result in net estimated energy consumption equal to or less than the specified standards."[5] The MHCSS itself requires energy efficiency construction methods to be "within the limits of reasonable economics."[6]

In contrast, the Energy Independence and Safety Act (EISA) requires that the Energy Rule "shall be based on the most recent version of the [IECC], except in cases in which the Secretary finds that the code is not cost-effective . . ."[7] In DOE's rulemaking, it expressly stated that "It is important to note that the statutory authority for DOE's rulemaking effort is different from the statutory authority underlying the [MHCSS]."[8] It is worth noting here that DOE failed for years to satisfy EISA's mandate to implement the Energy Rule by December 2011, and only promulgated the Energy Rule in 2022 after Sierra Club filed a lawsuit against it in 2017. As discussed below, DOE's hurried approach to the Energy Rule is evident through its purposeful refusal to include any testing or certification methods.

In sum, the MHCSS and the Energy Rule have fundamentally different statutory mandates. Under the Act, the MHCSS must balance energy efficiency with other critical goals of affordability and increased homeownership. Under EISA, the Energy Rule must start with the IECC, and only may deviate in the limited circumstance where the Secretary of DOE determines the IECC is not "cost effective." DOE acknowledges that it has a separate statutory mandate than HUD, and only carried out that mandate after being sued. DOE

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[4] 54 U.S.C. § 5401(b)(underline added)
[5] 54 U.S.C. § 5403(g)
[6] 24 C.F.R. § 3280.505(a)("The goal of the infiltration control criteria is to reduce heat loss/heat gain due to infiltration as much as possible without impinging on health and comfort and within the limits of reasonable economics.")
[7] 42 U.S.C. § 17071(b)(2)(underline added)
[8] 81 FR 39756 (June 17, 2016)

promulgated the Energy Rule without formal rulemaking from HUD involving the MHCC, so the goals of the MHCSS were not considered in promulgating the Energy Rule. Because the MHCSS and Energy Rule have profoundly different statutory mandates, wholesale adoption by reference of the Energy Rule into the MHCSS is not appropriate.

3. There is Precedent For HUD to Draft Specific Language Imposing Standards of Other Regulations Without Wholesale Incorporation.

There is recent precedent for HUD drafting specific language in the MHCSS to be consistent with standards from other regulations rather than adopt other regulations into the MHCSS by wholesale reference. In 2010, Congress passed the Formaldehyde Standards for Composite Wood Products Act (CWPA), which added Title VI to the Toxic Substances Control Act (TSCA), and established formaldehyde emissions standards for all hardwood, plywood, medium-density fiberboard, and particleboard, including when incorporated into finish goods such as manufactured homes.[9] The CWPA required HUD to update its regulations addressing formaldehyde emission standards to ensure consistency with the CWPA standards not later than 180 days after the Environmental Protection Agency (EPA) promulgated regulations under the CWPA.[10] In complying with this requirement, HUD did not merely adopt and incorporate by reference the standards set forth in regulations promulgated under CWPA into the MHCSS. Consistent with its requirement, HUD passed a final rule including specific language applying the standards of EPA regulations in the MHCSS and incorporating only the test methods from these regulations into the MHCSS.

The same result is warranted here but to a greater degree. Unlike CWPA, EISA requires that DOE update the Energy Rule within one year after any revision to the IECC, which typically takes place every three years. Therefore, if HUD adopts by wholesale reference the Energy Rule, then regular future changes to the MHCSS will occur automatically without any consultation or involvement from HUD or the MHCC. A primary example of this is seen in the Predecisional Draft that seeks to delete the climate zone map at 24 C.F.R. § 3280.506 and replace it with the identical climate zone map at 10 C.F.R. § 460.101. If the MHCSS refers only to the climate zone map at 10 C.F.R. § 460.101, then any change by DOE to the climate zone map at 10 C.F.R. § 460.101 would automatically result in substantial changes to the MHCSS without consultation with HUD or the MHCC. The MHCC should follow the precedent set by HUD in relation to the EPA formaldehyde standards in order to ensure that future changes to the Energy Rule do not result in changes to the MHCSS without any consultation with HUD or the MHCC. Specifically, in attempting to align the MHCC with the Energy Rule, HUD must make specific revisions to the MHCC to balance energy efficiency with affordability of manufactured homes as required by the Act rather than adopt the Energy Rule by wholesale reference.

4. Drafting Specific Language Incorporating the Energy Rule Provides the Opportunity to Implement Testing Methods Left Out of the Energy Rule and Align the Energy Rule With the Realities of Manufactured Home Construction.

As described above, the Act requires the MHCC to balance energy efficiency with affordability and increased homeownership. In promulgating the Energy Rule, DOE expressly declined to establish testing, compliance, or enforcement provisions and stated that it wished to "leverage the current HUD inspection and enforcement process."[11] The refusal to include any testing or certification procedures or consider the cost of testing or certification violates DOE's statutory mandate and creates substantial confusion that will increase costs and decrease affordability. Nevertheless, HUD should consider adopting testing methods that determine compliance with its standards.

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[9] 85 FR 5562
[10] *Id.*
[11] 87 Fed. Reg. 32758

Combined with a complete lack of testing and compliance methods, there are several provisions of the Energy Rule that impose ambiguous, unworkable, or redundant standards when merely adopted by reference into the MHCSS. As outlined by the non-exhaustive list of specific examples below, the Predecisional Draft's wholesale adoption of the Energy Rule into the MHCSS and its corresponding deletion of MHCSS provisions will result in confusion and unintended negative consequences.

First, the Predecisional Draft seeks to include a new section at 24 C.F.R. § 3280.716 adopting 10 C.F.R. § 460.205 that requires that sizing of heating and cooling equipment installed by the manufacturer be determined in accordance with ACCA Manual S. ACCA Manual S calculations are determined by the specific municipality in which the home will be sited. While this is feasible for site-built and modular construction where the site is predetermined in advance, it is not feasible for manufactured homes that are constructed to climate zones that are several hundred miles in diameter. Strict requirement of a ACCA Manual S calculation would make it substantially more difficult and expensive for manufacturers to size heating and cooling equipment of stock model homes to be used as inventory, which are the most efficient to manufacture and affordable to purchase. It also would run counter to the goal of the MHCSS to establish uniform performance-based standards where possible.[12] This is another instance where the Energy Rule would make manufactured home construction, that is intended to be the most affordable type of construction, more akin to more expensive modular or site-built construction without any substantial energy efficiency benefit. This unintended consequence could be avoided by, among other things, making ACCA Manual S calculation permissive if feasible or apply only to special orders with a predetermined site.

Second, the Predecisional Draft seeks to delete the current language of 24 C.F.R. § 3280.506 in its entirety and replace it with a reference to 10 C.F.R. §460.101. However, HUD recently revised the MHCSS to include Subpart K at 24 C.F.R. § 3280.1001 *et seq.* pertaining to construction of multi-unit manufactured homes. 24 C.F.R. § 3280.506(c) in its current form applies the heat loss/heat gain provisions to multi-unit manufactured homes by referencing Subpart K and its requirement for fire separation. The Energy Rule has no corresponding application to multi-unit construction. As such, the Predecisional Draft would remove the current application of the heat loss/heat gain requirements to multi-unit construction under Subpart K of the MHCSS. Therefore, in order to give effect to HUD's recent changes to the MHCSS and continue to include requirements for heat loss/heat gain in multi-unit manufactured home construction, HUD should draft specific language aligning 24 C.F.R. § 3280.506 with 10 C.F.R. §460.101 instead of deleting the current MHCSS provision and incorporating by reference the Energy Rule.

Third, the Predecisional Draft seeks to delete 24 C.F.R. § 3280.508 and replace it with a reference to 10 C.F.R. § 460.103 which, among other things, requires that baffles used in conjunction with eave venting be constructed using a solid material "and extend over the top of attic insulation." MHI and several manufacturers commented to DOE that the requirement that baffles "extend over the top of insulation" is somewhat ambiguous as applied to manufactured home construction. This ambiguity can be clarified by, among other things, adding simple language that the baffles must "extend over the top of attic insulation <u>where the insulation is restricted.</u>"

Fourth, the Predecisional Draft seeks to delete 24 C.F.R. § 3280.505 and replace it with a reference to 10 C.F.R. § 460.104. When prescribing sealing methods of air barriers around electrical boxes and showers/tubs, 10 C.F.R. § 460.104 merely refers to the "air barrier." However, because manufactured homes use a variety of components as "air barriers," this reference is somewhat ambiguous. This ambiguity can be rectified by, among other things, adding simple language clarifying that "<u>When the interior wall surface acts as an air barrier</u>, "[t]he air barrier must . . ."

[12] 54 U.S.C. § 5401(b)(3)

Fifth, the Predecisional Draft seeks to delete the definitions at 24 C.F.R. § 3280.502 and incorporate the definitions of 10 C.F.R. § 460.2. However, the definition of "window" at 10 C.F.R. § 460.2 has a plain typographical error stating that "Window means win (sic) or other transparent or translucent glazing material. . ." This typographical error can be rectified by drafting language in 24 C.F.R. § 3280.502 stating that "Window means glass or other transparent or translucent material . . ." It cannot be rectified by wholesale incorporation by reference of the Energy Rule.

Because of these and other conflicts, ambiguities, and impossibilities of the Energy Rule when applied to manufactured home construction, wholesale adoption of the Energy Rule into the MHCSS is not appropriate. Because of DOE's refusal to consider these issues, HUD drafting specific revisionary language to the MHCSS is the only way to attempt to clarify and resolve them and make the challenges posed by the Energy Rule more workable to the industry.

Conclusion

Manufactured homes remain the most affordable homeownership option available in the United States today. The Energy Rule is an overly burdensome regulation that will price thousands of consumers out of homeownership in the midst of an affordable housing crisis. The Energy Rule will have a disproportionate impact on minority communities, who face the most significant burden in obtaining affordable homeownership.

The Energy Rule was passed under questionable legal auspices pursuant to a statutory mandate of EISA very different than HUD's mandate under the Act. While MHI and its members will always support sensible energy conservation initiatives, the Predecisional Draft sets a dangerous and unworkable precedent. Moreover, the Predecisional Draft misses numerous opportunities to truly align the Energy Rule to the realities of manufactured home construction and make the challenge presented by the Energy Rule less burdensome on the industry and therefore on consumers. Therefore, MHI urges the MHCC to reject the framework of the Predecisional Draft and advocate to HUD to draft specific language in the MHCSS imposing energy standards that adhere to the realities of manufactured home construction instead of adopting and incorporating wholesale the Energy Rule by reference to the exclusion of existing MHCSS provisions.

Sincerely,

Lesli Gooch

Lesli Gooch, Ph.D.
Chief Executive Officer

Attachment: MHI Letter to DOE about Draft Environmental Impact Statement for Proposed Energy Conservation Standards for Manufactured Housing (EERE-2009-BT-BC-0021).

Attachment

Manufactured Housing Institute

February 28, 2022

The Honorable Jennifer M. Granholm
Secretary
U.S. Department of Energy
1000 Independence Ave, SW
Washington, DC 20585

Re: Draft Environmental Impact Statement for Proposed Energy Conservation Standards for Manufactured Housing (EERE-2009-BT-BC-0021)

Dear Secretary Granholm,

The Manufactured Housing Institute (MHI) is pleased to provide comments to the Department of Energy (DOE) in response to the draft Environmental Impact Statement (EIS) associated with the proposed rulemaking about energy conservation standards for manufactured housing. We intend this letter to supplement our November 23, 2021, comment letter (Appendix II) on the proposed rule itself.

MHI is the only national trade association that represents every segment of the factory-built housing industry. As a result, our organization is uniquely qualified to provide detailed analysis of the proposed energy standards and to submit recommendations to fix problems in the proposed rule. Our members include home builders, suppliers, retail sellers, lenders, installers, community owners, community operators, and others who serve the industry, as well as 48 affiliated state organizations. In 2021, our industry produced more than 105,000 homes, accounting for approximately nine percent of new single-family home starts. These homes are produced by 33 U.S. corporations in 139 plants located across the country. MHI's members are responsible for close to 85 percent of the manufactured homes produced each year.

With regard to the narrow focus of this request for comment, the EIS, the proposed standards do not take into consideration current construction methods and transportation requirements or testing or compliance requirements. Therefore, the impact of the proposal on consumers and the industry is clearly and significantly underestimated in the EIS both with respect to the expected increase in costs and overall feasibility.

More broadly, we would point out that, to date, the rulemaking process implementing the underlying legislation has been plagued by legal issues, and the proposed rule raises a wide range of legal, policy, environmental, and implementation questions. In an effort to resolve those questions, MHI has attached to this letter specific technical recommendations (see Appendix I) that would address these concerns.

If adopted, these recommendations would result in a final rule that achieves the legislative goal of increased energy efficiency, without threatening low- and moderate-income families with losing the most affordable homeownership option in America, manufactured housing, as a result of excessive cost increases and feasibility challenges in the proposed standard.

Significant Problems with the Proposed Rule

Following is a short summary of the most significant legal, policy, environmental, and implementation questions regarding the proposed rule, which, if left unresolved, would undermine the adoption of a final rule:

1. **Court Injunction.** On February 11, 2022, in *Louisiana v. Biden,* the court adopted an injunction preventing the DOE, among other agencies, from "adopting, employing, treating, as binding, or relying upon" the findings of the Interagency Working Group, the calculations of Social Cost of Greenhouse Gas estimates based on global effects rather than national effects, or otherwise relying upon or

implementing Executive Order 13990 in any manner. It would appear that this injunction applies to the proposed rule since it expressly references Executive Order 13990 and "interim estimates issued in February 2021" based thereon where it states: DOE calculates the value of the reduced emissions of CO2, CH4, and N2O (collectively, greenhouse gases or GHGs) using a range of values per metric ton of pollutant, consistent with the interim estimates issued in February 2021 under Executive Order 13990. Thus, at a minimum, this injunction and the underlying legal issues cast a serious legal cloud on the proposed rule.

2. **Failure to Comply with the Statutory Requirement to be Cost Effective.** As noted in MHI's November comment letter, "The proposed energy standards fail the Energy Independence and Security Act of 2007 (EISA) statutory requirement to use the International Energy Conservation Code (IECC) **"except in cases in which the code is not cost effective** . . ., based on the impact of the Code on the purchase price of manufactured housing and on total life-cycle construction and operation costs." The result is manufactured housing will be less affordable, due to large increases in home sale prices and operating cost increases that exceed energy savings."

3. **Failure to Comply with the Statutory Requirement to Adopt a More Stringent Standard when it would be Cost Effective.** As noted in MHI's November comment letter, "The proposed energy standards fail the Energy Independence and Security Act of 2007 (EISA) statutory requirement to use the International Energy Conservation Code (IECC) **"except in cases in which** . . . **a more stringent standard would be more effective,** based on the impact of the code on the purchase price of manufactured housing and on total life-cycle construction and operation costs." Per this statutory requirement, the rule should have – but was not – developed by incrementally adding more and more efficiency improvements, such as thicker insulation levels, until the next incremental improvement would not be cost-effective.

4. **Failure to Address Legal Issues Regarding Primacy of the HUD Code and the Manufactured Housing Consensus Committee's role in establishing safety and construction standards.** As noted in MHI's November comment letter, in its proposed rule, DOE completely avoided discussion of the primacy of the Manufactured Housing Consensus Committee (MHCC,) with regard to the establishment of manufactured housing safety and construction standards. The proposed rule would propose standards that are inconsistent with existing energy standards as promulgated by the MHCC. We assume the rule's energy requirements would not take effect unless and until the MHCC adopts them, and further that the MHCC could make changes to the proposed requirements. However, these critical legal issues are not addressed in the proposed rule.

5. **Failure to Adequately Consult with HUD, as Required by the Statute.** As noted in MHI's November comment letter, "The proposed energy standards were developed without complying in any meaningful way with the EISA statutory requirement to consult with HUD, resulting in proposed standards that ignore the construction aspects unique to manufactured housing or the negative impact on homebuyer affordability." As a result, the proposal lacks the input of valuable expertise that HUD could have provided with respect to low- and moderate-income family housing affordability issues and the number of homebuyers that would no longer qualify for a mortgage loan because of cost increases and therefore would not achieve homeownership.

6. **Problems with the Environmental Impact Statement.** As noted in the introduction of this letter, the proposed standards do not take into consideration current construction methods and transportation requirements or testing or compliance requirements. Therefore, the impact of the proposal on consumers and the industry is clearly and significantly underestimated in the EIS both with respect to the expected increase in costs and overall feasibility.

Energy Efficiency and Manufactured Housing

MHI and its members have always supported energy conservation efforts and other reasonable environmental protection initiatives, and we will continue to do so. In fact, the vast majority of today's manufactured homes are constructed well above the required energy efficiency standards contained in the HUD Code. Not only are new factory-built homes as efficient as their site-built counterparts, but in 2020, more than 30 percent of new manufactured homes were built to meet or exceed Energy Star standards. Further, the industry is developing programming to engage all stakeholders, from manufacturers to retailers to consumers and energy providers to significantly grow the share of Energy Star.

Today's manufacturers understand the unique aspects associated with building manufactured homes and the downside the DOE's proposal will have in terms of hampering production in an industry that is operating at near capacity and driving up the costs of the only affordable housing solution in the country. The industry is continuously working on projects to improve energy efficiency and currently has four significant energy initiatives underway for manufactured housing. One with the state of California, two projects with the DOE, including one concentrating on developing a "Zero Energy Ready" manufactured home, and one with HUD to re-engineer the design and fabrication of the HVAC system in manufactured homes with all components installed in the plant under HUD's quality control regime.

Manufactured Housing as an Affordable Housing Solution

Any increase in construction costs, even modest increases in response to a new energy conservation standard, could jeopardize homeownership for hundreds of thousands of Americans at time when there is an affordable housing shortage in the country.

In the draft EIS, the DOE acknowledges this by stating that "manufactured home purchases and residents are disproportionately from lower-income and minority populations…. Increase purchase price and up-front costs might reduce access to affordable homeownership for some low-income consumers." The Energy Independence and Security Act (EISA) requires that "energy conservation standards established under this section shall be based on the most recent version of the International Energy Conservation Code (including supplements), except in cases in which the Secretary finds that the code is not cost effective…based on the impact of the code on the purchase price of manufactured housing and on total life-cycle construction and operating costs."

First, the higher home cost associated with the proposed standards will make manufactured housing far more expensive excluding potential buyers and reducing total manufactured housing sales, the latter hurting the industry and contributing to the lack of affordable housing. Second, if households are fortunate enough to qualify for a home that meets the new standards, the home they get will be more, not less, expensive to own.

As shown in DOE's proposal, using sample homes (single- and multi-section), DOE estimated energy savings by comparing homes, in select locations, built to the current HUD energy standards with homes meeting the IECC. As expected, there is a huge difference in energy use (and estimated energy costs) between these benchmarks. The large savings suggests that a whole lot of investment in energy measures can be justified, particularly if the savings are accumulated over 30 years which is an artificial construct. However, the EIS cites American Community Survey data that only "7 percent of manufactured home residents had lived in their home at least 30 years." This demonstrates that the proposal is not cost-effective for consumers and will raise the barrier for entry-level homeownership for millions of Americans at a time when there is an affordable housing shortage in the country.

Further, neither the draft EIS nor the proposed rule includes testing, compliance, or enforcement provisions which DOE says it will address at a later date. Estimating the costs of the proposed changes to consumers, without including these components is impossible, as these could significantly add to costs. Testing requirements for each of the systems being modified in the proposal must be addressed before any rule is finalized, and the costs associated with these must be included in any analysis. Additionally, it is unnecessary for the DOE to develop a new enforcement mechanism with any proposed manufactured housing energy conservation standard because HUD already has an established enforcement mechanism that mandates a uniform standard for design, construction, and installation, including federal requirements for safety, durability, and energy efficiency. Failure to partner with HUD would result in complicated, overlapping requirements that will only increase manufacturing costs, hurting existing homeowners and prospective homebuyers.

Reliance on the International Energy Conservation Code

Utilizing the 2021 International Energy Conservation Code (IECC) – a standard that was designed for site-built homes and NOT manufactured homes – as recommended in the EIS is the wrong standard to utilize. Given that the IECC essentially ignores all the construction aspects unique to manufactured housing, it is an inappropriate code for attempted enforcement upon the manufactured housing industry and could potentially cause factory closures, the loss of thousands of jobs, and an immediate affordable housing crisis for one of the largest sectors in the housing market.

As just one example, the proposed requirements adapted from the IECC will require foam insulation throughout the walls in homes in thermal zone three, in addition to batt insulation which is currently used. Foam insulation is difficult to utilize in a factory setting, expensive and will slow down the production line. Further, adding foam insulation between the studs and siding of a home, could result in separation of the siding during transport and require more on-site labor work to address the issues. Additionally, by increasing the truss heel height, increasing floor joist depth, and adding insulation outside of the studs, as these proposed requirements will require, the overall shipping envelope will change which could prevent shipping a home into an area of the country with low bridges resulting in consumers having to settle for a different style of home, or more than likely, being forced out of the housing market due to a lack of affordable housing.

Implementation Period

In the draft EIS, the DOE proposes a one-year implementation period. However, when the DOE makes changes to appliance standards there is at least a five-year compliance period. For example, on January 6, 2017, the DOE published a final rule to establish energy conservation standards for residential central air conditioners and heat pumps with a compliance date of January 1, 2023 (Docket Number EERE-2014-BT-STD-0048-0200). Additionally, on April 16, 2010, the DOE published amendments to the existing energy conservation standards for residential water heaters, gas-fired direct heating equipment, and gas-fired pool heaters. While the effective date of the rule was June 15, 2010, compliance with the standards was not required until April 16, 2015 (Docket Number EE–2006–BT–STD–0129).

Given that the process for manufactured homes is at least as complex as appliances, a minimum of five years for compliance should apply. If the proposed rulemaking is finalized as written, implementing the changes would require manufacturing plants to completely overhaul their systems and processes. Further, every home design currently being utilized – of which there are thousands – would need to be redesigned and reapproved, further slowing down the production process. Using a one-year implementation will simply stop all manufactured housing production for a significant period of time, taking approximately nine percent of new housing out of the market, at a time when the demand for affordable housing is at its highest.

Conclusion

Efforts to improve energy efficiency should not have the unintended consequence of denying a hardworking family the opportunity to achieve the American Dream of homeownership. If the proposed standards are enacted, there is no question that it will have a negative impact on the ability of entry-level homebuyers to achieve homeownership through manufactured housing. MHI stands ready to work with DOE and HUD on the development of realistic and achievable energy standards, which the industry's proposal reflects, that not only encourages innovation and conservation but also eliminates regulatory barriers that impede consumer access to safe, affordable manufactured housing.

Sincerely,

Lesli Gooch

Lesli Gooch, Ph.D.
Chief Executive Officer

APPENDIX I
Industry's Proposal for Energy Efficiency Standards for Manufactured Housing

MHI and the industry's goal in in developing this alternative manufactured housing energy standard was to provide a concrete example showing how a judicious increase in energy requirements can result in substantially improved energy efficiency *and* greater affordability. In balancing these two considerations, the financial impact of increased efficiency is measured from the homebuyer's perspective. The technical recommendations were developed by incrementally adding more and more efficiency improvements, such as thicker insulation levels, until the next incremental improvement would not be cost effective. The result is a standard that can be implemented without requiring factories to retool or use unproven technologies yet would result in dramatic reductions in energy use that financially benefit buyers of new manufactured homes.

Authority: 42 U.S.C. 17071; 42 U.S.C. 7101 *et seq*.

Subpart A – General

§ 460.1 Scope.

This subpart establishes energy conservation standards for manufactured homes as manufactured at the factory, prior to distribution in commerce for sale or installation in the field. A manufactured home that is manufactured on or after the [DATE ~~1~~ 5 YEAR AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER] must comply with all applicable requirements of this part.

§ 460.2 Definitions.

Adapted from Section R202 of the 2021 IECC and as used in this part–

Access (to) means that which enables a device, appliance or equipment to be reached by ready access or by a means that first requires the removal or movement of a panel or similar obstruction.

Air barrier means one or more materials joined together in a continuous manner to restrict or prevent the passage of air through the building thermal envelope and its assemblies.

Automatic means self-acting or operating by its own mechanism when actuated by some impersonal influence

Building thermal envelope means exterior walls, exterior floors, exterior ceiling,or roofs, and any other building element assemblies that enclose conditioned space or provide a boundary between conditioned space and unconditioned space.

Ceiling means an assembly that supports and forms the overhead interior surface of a building or room that covers its upper limit and is horizontal or tilted at an angle less than 60 degrees (1.05 rad) from horizontal.

Climate zone means a geographical region identified in §460.101.

Conditioned space means an area, room, or space that is enclosed within the building thermal envelope and that is directly or indirectly heated or cooled. Spaces are indirectly heated or cooled where they communicate through openings with conditionedspace, where they are separated from conditioned spaces by uninsulated walls, floors orceilings, or where they contain uninsulated ducts, piping, or other sources of heating or cooling.

Continuous air barrier means a combination of materials and assemblies thatrestrict or prevent the passage of air from conditioned space to unconditioned space.

Door means an operable barrier used to block or allow access to an entrance of a manufactured home.

Dropped ceiling means a secondary nonstructural ceiling, hung below the exterior ceiling.

Dropped soffit means a secondary nonstructural ceiling that is hung below the exterior ceiling and that covers only a portion of the ceiling.

Duct means a tube or conduit, except an air passage within a self-contained system, utilized for conveying air to or from heating, cooling, or ventilating equipment.

Duct system means a continuous passageway for the transmission of air that, in addition to ducts, includes duct fittings, dampers, plenums, fans, and accessory air-handling equipment and appliances.

Eave means the edge of the roof that overhangs the face of an exterior wall and normally projects beyond the side of the manufactured home.

Equipment includes material, devices, fixtures, fittings, or accessories both in the construction of, and in the plumbing, heating, cooling, and electrical systems of a manufactured home.

Exterior ceiling means a ceiling that separates conditioned space from unconditioned space.

Exterior floor means a floor that separates conditioned space from unconditioned space.

Exterior wall means a wall, including a skylight well, that separates conditioned space from unconditioned space.

Fenestration means vertical fenestration and skylights.

Floor means a horizontal assembly that supports and forms the lower interior surface of a building or room upon which occupants can walk.

Glazed or glazing means an infill material, including glass, plastic, or other transparent or translucent material used in fenestration.

Heated water circulation system means a water distribution system in which one or more pumps are operated in the service hot water piping to circulate heated water fromthe water heating equipment to fixtures and back to the water heating equipment.

2021 IECC means the 2021 version of the International Energy

ConservationCode, issued by the International Code Council.

Insulation means material deemed to be insulation under 16 CFR 460.2.

Manufactured home means a structure, transportable in one or more sections, which in the traveling mode is 8 body feet or more in width or 40 body feet or more in length or which when erected onsite is 320 or more square feet, and which is built on a permanent chassis and designed to be used as a dwelling with or without a permanent foundation when connected to the required utilities, and includes the plumbing, heating, air conditioning, and electrical systems contained in the structure. This term includes all structures that meet the above requirements except the size requirements and with respect to which the manufacturer voluntarily files a certification pursuant to 24 CFR 3282.13 and complies with the construction and safety standards set forth in 24 CFR part 3280.
The term does not include any self-propelled recreational vehicle. Calculations used to determine the number of square feet in a structure will be based on the structure's exterior dimensions, measured at the largest horizontal projections when erected on site. These dimensions will include all expandable rooms, cabinets, and other projections containing interior space, but do not include bay windows. Nothing in this definition should be interpreted to mean that a manufactured home necessarily meets the requirements of the U.S. Department of Housing and Urban Development Minimum Property Standards (HUD Handbook 4900.1) or that it is automatically eligible for financing under 12 U.S.C. 1709(b).

Manufacturer means any person engaged in the factory construction or assemblyof a manufactured home, including any person engaged in importing manufactured homes for resale.

Manual means capable of being operated by personal intervention.

Opaque door means a door that is not less than 50 percent opaque in surface area.

R-value (thermal resistance) means the inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unitarea (h × ft^2 × °F/Btu).

Rough opening means an opening in the exterior wall or roof, sized for installation of fenestration.

Service hot water means supply of hot water for purposes other than comfort heating.

Skylight means glass or other transparent or translucent glazing material, including framing materials, installed at an angle less than 60 degrees (1.05 rad) from horizontal, including unit skylights, tubular daylighting devices, and glazing materials insolariums, sunrooms, roofs and sloped walls.

Skylight well means the exterior walls underneath a skylight that extend from the interior finished surface of the exterior ceiling to the exterior surface of the location to which the skylight is attached.

Solar heat gain coefficient (SHGC) means the ratio of the solar heat gain enteringa space through a fenestration assembly to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation that is then reradiated, conducted, or convected into the space.

State means each of the 50 states, the District of Columbia, the Commonwealth of Puerto Rico, Guam, the U.S. Virgin Islands, and American Samoa.

Thermostat means an automatic control device used to maintain temperature at a fixed or adjustable set point.

U-factor (thermal transmittance) means the coefficient of heat transmission (air toair) through a building component or assembly, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films (Btu/h × ft^2 × °F).

Uo (overall thermal transmittance) means the coefficient of heat transmission (air to air) through the building thermal envelope, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films (Btu/h × ft^2 × °F).

Ventilation means the natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, any space.

Vertical fenestration means windows (fixed or moveable), opaque doors, glazed doors, glazed block and combination opaque and glazed doors composed of glass or other transparent or translucent glazing materials and installed at a slope of greater than or equal to 60 degrees (1.05 rad) from horizontal.

Wall means an assembly that is vertical or tilted at an angle equal to greater than60 degrees (1.05 rad) from horizontal that encloses or divides an area of a building or room.

Whole-house mechanical ventilation system means an exhaust system, supply system, or combination thereof that is designed to mechanically exchange indoor air withoutdoor air when operating continuously or through a programmed intermittent schedule to satisfy the whole house ventilation rates.

Window means glass or other transparent or translucent glazing material, including framing materials, installed at an angle greater than 60 degrees (1.05 rad) fromhorizontal.

Zone means a space or group of spaces within a manufactured home with heating or cooling requirements that are sufficiently similar so that desired conditions can be maintained using a single controlling device.

§ 460.3 Materials incorporated by reference.

(a) Certain material is incorporated by reference into this subpart with the approval of the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. To enforce any edition other than that specified in this section, DOE must publish a document in the Federal Register and the material must be available to the public. All approved material is available for inspection at the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, Sixth Floor, 950 L'Enfant Plaza SW., Washington, DC 20024, (202) 586–2945, *https://www.energy.gov/eere/buildings/appliance-and-equipment-standards-program*, and may be obtained from the other sources in this section. It is also available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, email: *fedreg.legal@nara.gov*,or go to: *www.archives.gov/federal-register/cfr/ibr-locations.html.*

(b) *ACCA*. Air Conditioning Contractors of America, Inc., 2800 S. ShirlingtonRoad, Suite 300, Arlington, VA 22206, 703-575-4477, *www.acca.org/*.

~~(1) ANSI/ACCA 2 Manual J–2016 ("ACCA Manual J"), *Manual J– Residential Load Calculation (8th edition)*, Copyright 2016. IBR approved for §460.205.~~

~~(2) ANSI/ACCA 3 Manual S–2014 ("ACCA Manual S"), *Manual S– Residential Equipment Selection (2nd Edition)*, Copyright 2014. IBR approved for §460.205.~~

(c) *PNL*. Pacific Northwest Laboratory, Richland, WA 99352, 800-245-2691, *www.huduser.org/portal/publications/manufhsg/uvalue.html.*

(1) PNL–8006, ("Overall *U*-values and Heating/Cooling Loads– ManufacturedHomes"), *Overall U-Values and Heating/Cooling Loads–Manufactured Homes*, C. C. Conner and Z. T. Taylor, February 1, 1992. IBR approved for §460.102(e)(1).

~~(2) [Reserved].~~

~~**§ 460.4 Energy conservation standards.**~~

~~(a) *General*. Energy conservation standard tier thresholds presented in paragraphs (b) and (c) of this section must be adjusted to the most recently available Annual Energy~~

~~Outlook (AEO) gross domestic product (GDP) time series.~~

~~(b) *Tier 1*. A manufactured home for which the manufacturer's retail list price is $55,000 or less in real 2019$ (*i.e.*, a Tier 1 manufactured home) must comply with all applicable requirements in subparts B and C of this part.~~

~~(c) *Tier 2*. A manufactured home for which the manufacturer retail list price is greater than $55,000 in real 2019$ (*i.e.*, a Tier 2 manufactured home) must comply with all applicable requirements in subparts B and C of this part.~~

Subpart B – Building Thermal Envelope

§ 460.101 Climate zones.

Manufactured homes subject to the requirements of this subpart must comply withthe requirements applicable to one or more of the climate zones set forth in Figure 460.101 and Table 460.101 of this section.

Figure 460.101 Climate Zones

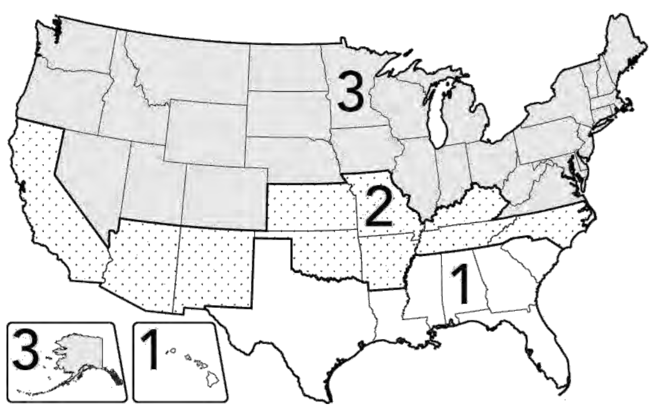


Table 460.101 U.S. States and Territories per Climate Zone

ZONE 1	ZONE 2	ZONE 3
Alabama	Arkansas	Alaska
American Samoa	Arizona	Colorado
Florida	California	Connecticut
Georgia	Kansas	Delaware
Guam	Kentucky	District of Columbia
Hawaii	Missouri	Idaho
Louisiana	New Mexico	Illinois

Mississippi	North Carolina	Indiana
South Carolina	Oklahoma	Iowa
Texas	Tennessee	Maine
The Commonwealth of Puerto Rico		Maryland
U.S. Virgin Islands		Massachusetts
		Michigan
		Minnesota
		Montana
		Nebraska
		Nevada
		New Hampshire
		New Jersey
		New York
		North Dakota
		Ohio
		Oregon
		Pennsylvania
		Rhode Island
		South Dakota
		Utah
		Vermont
		Virginia
		Washington
		West Virginia
		Wisconsin
		Wyoming

§ 460.102 Building thermal envelope requirements.

(a) *Compliance options*. The building thermal envelope must meet either the prescriptive requirements of paragraph (b) of this section or the performance requirements of paragraph (c) of this section.

(b) *Prescriptive requirements*. (1) The building thermal envelope must meet the applicable minimum *R*-value (nominal value of insulation), and the glazing maximum *U*-factor and SHGC~~, requirementsset~~requirements set forth ~~forth~~ in Table~~s~~ 460.102-1 ~~and~~ or component U-value set forth in Table 406.102-2 ~~460.102-2~~ of this section.

~~**Table 460.102-1 Tier 1 Building Thermal Envelope Prescriptive Requirements**~~

~~Climate Zone~~	~~Exterior Wall Insulation *R*-value~~	~~Exterior Ceiling Insulation *R*-value~~	~~Exterior Floor Insulation *R*-value~~	~~Window *U*-factor~~	~~Skylight *U*-factor~~	~~Door *U*-factor~~	~~Glazed Fenestration SHGC~~
~~1~~	~~1113~~	~~2522~~	~~22~~	~~1.08~~	~~0.75~~	~~0.40~~	~~0.7~~
~~2~~	~~1113~~	~~2522~~	~~19~~	~~0.5~~	~~0.55~~	~~0.40~~	~~0.6~~
~~3~~	~~19~~	~~22~~	~~22~~	~~0.35~~	~~0.55~~	~~0.40~~	~~Not applicable~~

Table 460.102-~~2~~1 ~~Tier 2 Building Thermal~~ Envelope Prescriptive Requirements

Climate Zone	Exterior Wall Insulation *R*-value	Exterior Ceiling Insulation *R*-value	Exterior Floor Insulation *R*-value	Window *U*-factor	Skylight *U*-factor	Door *U*-factor	Glazed Fenestration SHGC
1	13	30	13	0.~~3~~ ~~2~~50	0.75	0.40	0.33
2	~~21 or 13+ 520 +5~~ 13	30	19	0.~~3~~ ~~0~~35	0.55	0.40	0.25

3	~~21 or 13+5~~ 5 ~~20+5~~15	38	~~30~~25	0.~~3~~ ~~0~~32	0.55	0.40	Not applicable

(2) For the purpose of compliance with the exterior ceiling insulation *R*-value requirement of paragraph (b)(1) of this section, the truss heel height must be a ~~minimum of~~minimum of5.5 inches at the outside face of each exterior wall.

(3) A combination of R-21 batt insulation and R-14 blanket insulation may be used for the purpose of compliance with the floor insulation R-value requirement of Table 460.102-~~2~~1, climate zone 3.

(4) An individual skylight that has an SHGC that is less than or equal to 0.30 is not subject to the glazed fenestration SHGC requirements established in paragraph (b)(1) of this section. ~~Adapted from section R402 of the 2021 IECC.~~

(5) *U*-factor alternatives to *R*-value requirements. Compliance with the applicable requirements in paragraph (b)(1) of this section may be determined using the maximum component *U*-factor values set forth in Tables 460.102-~~3~~ 2~~and 460.102-4~~, which reflect the thermal transmittance of the component, excluding fenestration, and not just the insulation of thatcomponent, as an alternative to the minimum nominal *R*-value requirements set forth in Tables 460.102-1~~ and 460.102-2, respectively~~.

- ~~[R402.3.3]~~ Glazed fenestration exemption. Not greater than 15 square feet (1.4 m2) of glazed fenestration per dwelling unit shall be exempt from the U-factor and SHGC requirements- (Table 460.120-1)~~in Section R402.1.2~~. This exemption shall not apply to the Total U~~A~~-value alternative ~~in Section R402.1.5~~(Table 460.120-2).
- ~~[R402.3.4]~~ Opaque door exemption. One side-hinged opaque door assembly

not greater than 24 square feet (2.22 m2) in area shall be exempt from the U-factor requirement (Table 460.120-1). This exemption shall not apply to the Total U-value alternative (Table 460.120-2).~~in Section R402.1.2. This exemption shall not apply to the Total UA alternative in Section R402.1.5.~~

~~Table 460.102-3 *U*-factor Alternatives to Tier 1 *R*-value Requirements~~

~~Climate Zone~~	~~Exterior Ceiling *U*-factor~~		~~Exterior Wall *U*-factor~~	~~Exterior Floor *U*-factor~~
	~~Single-section~~	~~Multi-section~~		
~~1~~	~~0.061~~	~~0.057~~	~~0.094~~	~~0.049~~
~~2~~	~~0.061~~	~~0.057~~	~~0.094~~	~~0.056~~
~~3~~	~~0.061~~	~~0.057~~	~~0.068~~	~~0.049~~

Table 460.102-~~4~~ 2 U ~~-factor~~ value Alternatives to ~~Tier 2~~ *R*-value Requirements

Climate Zone	Exterior Ceiling *U*-~~factor~~value		Exterior Wall *U*-~~factor~~value	Exterior Floor *U*-~~factor~~value
	Single-section	Multi-section		
1	0.045	0.043	0.094	0.078
2	0.045	0.043	0.094~~47~~	0.056
3	0.038	0.037	0.076~~47~~	0.~~03~~~~2~~036

(c) *Performance requirements*. (1) The building thermal envelope must have a Uo-value that is less than or equal to the applicable value specified in Tables 460.102-~~5~~ 3~~and 460.102-6 of this section~~.

Table 460.102-~~3~~5 ~~Tier 1 Building Thermal& Multi-~~ Thermal Envelope Performance Requirements

Climate Zone	Single-Section Uo-value	Multi-Section Uo-value~~Multi-~~

		~~Section U_o~~
1	0.093~~0.110~~	0.090~~0.096~~
2	0.081~~0.091~~	0.076~~0.079~~
3	0.065~~0.074~~	0.061~~0.073~~

~~**Table 460.102-6 Tier 2 Building Thermal Envelope Performance Requirements**~~

~~Climate Zone~~	~~Single-Section U_o~~	~~Multi-Section U_o~~
~~1~~	~~0.086~~	~~0.082~~
~~2~~	~~0.0760.062~~	~~0.0730.063~~
~~3~~	~~0.0670.053~~	~~0.0640.052~~

(1) Area-weighted average vertical fenestration *U*~~-factor~~ value must not exceed 0.48 inclimate zone 2 or 0.40 in climate zone 3.~~ Adapted from section R402 of the 2021 IECC.~~

(2) Area-weighted average skylight *U*-factor must not exceed 0.75 in climate zone 2 and climate zone 3.~~ Adapted from section R402 of the 2021 IECC.~~

(3) Windows, skylights and doors containing more than 50 percent glazing by area must satisfy the SHGC requirements established in paragraph (b)(1) of this section on the basis of an area-weighted average.~~ Adapted from section R402 of the 2021 IECC.~~

(d)) *Determination of compliance with paragraph (c) of this section*. (1) U_o~~ must~~value must be determined in accordance with Overall *U*-Values and Heating/Cooling Loads – Manufactured Homes (incorporated by reference; see §460.3)

~~(2) [Reserved]~~

§ 460.103 Installation of insulation.

Insulating materials must be installed according to the insulation manufacturer's installation instructions and the requirements set forth in Table 460.103 of this section, ~~which is adapted from section R402 of the 2021 IECC.~~

Table 460.103 Installation of Insulation

COMPONENT	INSTALLATION REQUIREMENTS
General	Air-permeable insulation must not be used as a material to establish the air barrier.
Access hatches, panels, and doors	Access hatches, panels, and doors between conditioned space and unconditioned space must be insulated to a level equivalent to the insulation of the surrounding surface, must provide access to all equipment that prevents damaging or compressing the insulation, and must provide a wood-framed or equivalent baffle or retainer when loose fill insulation is installed within an exterior ceiling assembly to retain the insulation both on the access hatch, panel, or door and within the building thermal envelope.
Baffles	Baffles must be constructed using a solid material, maintain an opening equal or greater than the size of the vents, and extend over the top of the attic insulation where insulation is restrained from full depth in order to maintain 1' minimum air space between insulation and roof decking~~.~~
Ceiling or attic	The insulation in any dropped ceiling or dropped soffit must be aligned with ~~the air~~the air barrier.
~~Eave vents~~	~~Air-permeable insulations in vented attics within the building Thermal envelope must be installed adjacent to eave vents.~~
Narrow cavities	Batts to be installed in narrow cavities must be cut to fit or narrow cavities must be filled with insulation that upon installation readily conforms to the available cavity space.
Rim joists	Rim joists must be insulated such that the insulation maintain permanent contact with the exterior rim board.
Shower or tub adjacent to exterior wall	Exterior walls adjacent to showers and tubs must be insulated.
Walls	Air permeable exterior building thermal envelope insulation for framed exterior walls must completely fill the cavity, including within stud bays caused by blocking lay flats or headers.

§ 460.104 Building thermal envelope air leakage.

Manufactured homes must be sealed against air leakage at all joints, seams, and penetrations associated with the building thermal envelope in accordance with the component manufacturer's installation instructions and the requirements set forth in Table 460.104 of this section. Sealing methods between dissimilar materials must allow for differential expansion, contraction and mechanical vibration, and must establish a continuous air barrier upon installation of all opaque components of the building thermal envelope. All gaps and penetrations in the exterior ceiling, exterior floor, and exterior walls, including ducts, flue shafts, plumbing, piping, electrical wiring, utility penetrations, bathroom and kitchen exhaust fans, recessed lighting fixtures adjacent to unconditioned space, and light tubes adjacent to unconditioned space, must be sealed with caulk, foam, gasket or other suitable material. ~~The air barrier installation criteria is adapted from section R402 of the 2021 IECC.~~

Table 460.104 Air Barrier Installation Criteria

COMPONENT	AIR BARRIER CRITERIA
Ceiling or attic	The air barrier in any dropped ceiling or dropped soffit must be aligned with the insulation and any gaps in the air barrier must be sealed with caulk, foam, gasket, or other suitable material. Access hatches, panels, and doors, drop-down stairs, or knee wall doors to unconditioned attic spaces must be weather-stripped or equipped with a gasket to produce a continuous air barrier.
Duct system register boots	Duct system register boots that penetrate the building thermal envelope or the air barrier must be sealed to the subfloor, wall covering or ceiling penetrated by the boot, air barrier, or the interior finish materials with caulk, foam, gasket, or other suitable material.
Electrical box or phone box on exterior walls	The air barrier must be installed behind electrical and communication boxes or the air barrier must be sealed around the box penetration with caulk, foam, gasket, or other suitable material.
Floors	The air barrier must be installed at any exposed edge of insulation. The bottom board may serve as the air barrier.
Mating line surfaces	Mating line surfaces must be equipped with a continuous and durable gasket.
~~Recessed lighting~~	~~Recessed light fixtures installed in the building thermal envelope must be sealed to the drywall with caulk, foam, gasket, or other suitable material.~~
Rim joists	The air barrier must enclose the rim joists. The junctions of the rim board ~~to the sill plate and the rim board~~ and the subfloor must be air sealed.
Shower or tub adjacent to exterior wall	The air barrier must separate showers and tubs from exterior Walls when interior wall surface is used as an air barrier~~.~~
Walls	The junction of the top plate and the exterior ceiling, and the junction of the bottom plate and the exterior floor, along exterior walls must be sealed with caulk, foam, gasket, or other suitable material.
Windows, skylights, and exterior	The rough openings around windows, exterior doors, and skylights must be sealed with caulk or foam.

COMPONENT	AIR BARRIER CRITERIA
doors	

Subpart C – HVAC, Service Hot Water, and Equipment Sizing

§460.201 Duct system.

Each manufactured home equipped with a duct system, which may include air handlers and filter boxes, must have supply ducts and be sealed to limit total air leakage to less than or equal tofour (4) cubic feet per minute per 100 square feet of conditioned floor area. Building framing cavities must not be used as ducts or plenums when directly connected to mechanical systems. ~~The duct total air leakage requirements are adapted from section R403 of the 2021 IECC.~~

Duct systems must be sealed against air leakage in accordance with the duct manufacturer's installation instructions and the following provisions:

- All metal ducts and fittings shall be sealed. For glass fiberboard ducts, the manufacturer's sealing instructions shall be followed. Sealants are in addition to mechanical fastening (if used).
- Connections and routing of manufacturer installed ductwork completed without kinks or sharp bends that would significantly impede air flow.
- Flexible ducts in unconditioned space not installed in cavities smaller than outer duct diameter; in conditioned space not installed in cavities smaller than inner duct diameter

§460.202 Thermostats and controls.

(a) At least one thermostat must be provided for each separate heating and coolingsystem installed by the manufacturer. The thermostat and controls requirements are adapted from section R403 of the 2021 IECC.

(b) Programmable thermostat. Any thermostat installed by the manufacturer that controls the heating or cooling system must–

(1) Be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature set points at different times of the day and different days of the week;

(2) Include the capability to set back or temporarily operate the system tomaintain zone temperatures down to 55 °F (13 °C) or up to 85 °F (29 °C); and

(3) ~~Initially be programmed with a heating temperature set point no higher than70 °F (21 °C) and a cooling temperature set point no lower than 78 °F (26 °C).~~ Homeowner manuals should include recommendation that homeowners program thermostat with a heating temperature set point no higher than 70 °F (21 °C) and a cooling temperature set point no lower than 78 °F (26 °C).

(c) Heat pumps with supplementary electric-resistance heat must be provided with controls that, except during defrost, prevent supplemental heat operation when the heat pump compressor can meet the heating load.

§ 460.203 Service hot water.

(a) Service hot water systems installed by the manufacturer must be installed according to the service hot water manufacturer's installation instructions. ~~Where service hot water systems are installed by the manufacturer, the manufacturer must ensure that any maintenance instructions received from the service hot water system manufacturer are provided with the manufactured home The service hot water requirements are adapted from section R403 of the 2021 IECC.~~

(b) Any automatic and manual controls, temperature sensors, pumps associatedwith service hot water systems must provide access.

(c) Heated water circulation systems must–

(1) Be provided with a circulation pump;

(2) Ensure that the system return pipe is a dedicated return pipe or a cold watersupply pipe;

(3) Not include any gravity or thermosyphon circulation systems;

(4) Ensure that controls for circulating heated water circulation pumps start thepump based on the identification of a demand for hot water within the occupancy; and

(5) Ensure that the controls automatically turn off the pump when the water in thecirculation loop is at the desired temperature and when there is no demand for hot water.

(d)) All hot water pipes–
~~(1)~~ Outside conditioned space must be insulated to a minimum *R*-value of *R*-3,~~;~~
~~(2)~~
and

~~(3)~~ From a service hot water system to a distribution manifold must be insulatedto a minimum *R*-value of *R*-3.

~~(4)~~

~~**§460.205 Equipment sizing.**~~

~~Sizing of heating and cooling equipment installed by the manufacturer must be determined in accordance with ACCA Manual S (incorporated by reference; see §460.3) based on building loads calculated in accordance with ACCA Manual J (incorporated by reference; see §460.3). The equipment sizing criteria are adapted from section R403 of the 2021 IECC.~~

APPENDIX II

Manufactured Housing Institute

November 23, 2021

The Honorable Jennifer M. Granholm
Secretary
U.S. Department of Energy
1000 Independence Ave. SW
Washington, DC 20585

Re: Energy Conservation Program: Energy Conservation Standards for Manufactured Housing (EERE-2009-BT-BC-0021)

Dear Secretary Granholm,

The Manufactured Housing Institute (MHI) is pleased to provide comments to the Department of Energy (DOE) in response to the supplemental notice of proposed rulemaking titled "Energy Conservation Program: Energy Conservation Standards for Manufactured Housing." While we appreciate DOE listening to the feedback it has received and providing updated data and analysis, as well as extending the comment deadline, the proposed rule is still not workable for the manufactured housing industry and homebuyers seeking affordable homeownership.

MHI is the only national trade association that represents every segment of the factory-built housing industry. Our members include home builders, suppliers, retail sellers, lenders, installers, community owners, community operators, and others who serve the industry, as well as 48 affiliated state organizations. In 2020, our industry produced nearly 95,000 homes, accounting for approximately nine percent of new single-family home starts. These homes are produced by 33 U.S. corporations in 138 plants located across the country. MHI's members are responsible for close to 85 percent of the manufactured homes produced each year.

To be clear, MHI and its members have always supported energy conservation efforts and other reasonable environmental protection initiatives, and we will continue to do so. Not only are new factory-built homes as efficient as their site-built counterparts, but in 2020, more than 30 percent of new manufactured homes were built to meet or exceed Energy Star standards. Further, today's manufactured homes already offer many energy efficient options. Just like site-built homes, manufactured homes are constructed and fitted with energy efficient features that are tailored to the climate demands of the region in which each home will be sited.

Today's manufactured homes already consume significantly less energy than site-built homes. According to the U.S. Energy Information Administration, "most energy end-uses are correlated with the size of the home. As square footage increases, the burden on heating and cooling equipment rises, lighting requirements increase, and the likelihood that the household uses more than one refrigerator increases. Square footage typically stays fixed over the life of a home and it is a characteristic that is expensive, even impractical to alter to reduce energy consumption."[1] According to the U.S. Census Bureau, the median size of a completed single-family house in 2020 was 2,261 square feet, while the median size of a manufactured home was 1,338 square feet. The significant difference is size correlates with a significant reduction in energy usage. A study of residential energy consumption showed that manufactured homes consume the least energy of all types of homes, at 59.8 million BTUs per household, compared to 94.6 million BTUs for single-family detached homes and 70 million BTUs for townhomes.[2]

[1] https://www.eia.gov/consumption/residential/reports/2009/square-footage.php
[2] ce1.1.xlsx (eia.gov)

Further, the controlled environment of the factory-built process not only offers consumers unmatched quality and affordability due to technological advancements and other advantages, but the industry is a pioneer in the development of processes that value efficiency and reduce waste. Our in-factory home builder members are constantly developing new initiatives and technologies, such as comprehensive recycling programs, to reduce waste. The factory-built process utilizes exact dimensions and measurements for most building materials, eliminating waste. Today's modern manufacturing plants are so efficient that nearly everything is reused or recycled such as cardboard, plastic, carpet padding, vinyl siding, scrap wood and much more.

The proposal provided by the DOE will add significant costs to manufactured homes, which are currently the most affordable, unsubsidized homeownership option for American families. Any increase in construction costs, even modest increases in response to a new energy conservation standard, could jeopardize homeownership for hundreds of thousands of Americans at time when there is an affordable housing shortage in the country. As currently drafted, the proposed rule would:

- Contradict the objectives of the Administration's January Executive Order on "Advancing Racial Equity and Support for Underserved Communities" and undermine the Administration's September initiative to "Increase Affordable Housing Supply."

- Significantly raise the cost of new manufactured homes by an average of $3,914 to $5,200 for most new manufactured homes with an estimated cost increase of over $7,000 for a multi-section home located in climate zone 3 – without including the costs of energy testing or compliance (Tier 2 Standard) – thereby exacerbating homeownership affordability challenges in the wake of the recent escalation of home prices.

- Fail the statutory requirement of being cost effective, by increasing the cost of owning a new manufactured home by more than claimed energy savings.

Thus, MHI makes the following comments and recommendations regarding the proposed rule:

1. The proposed energy standards fail the Energy Independence and Security Act of 2007 (EISA) statutory requirement to use the International Energy Conservation Code (IECC) "except in cases in which the code is not cost effective or a more stringent standard would be more effective, based on the impact of the code on the purchase price of manufactured housing and on total life-cycle construction and operation costs." The result is manufactured housing will be less affordable, due to large increases in home sale prices and operating cost increases that exceed energy savings.

2. The $55,000 or $63,000 low-income price cap threshold for streamlined energy efficiency requirements should be eliminated or significantly increased to at least $110,260. Further, if the DOE proceeds with a tiered approach, the Department must seriously consider, as it did in its updated data and analysis, an alternative approach such as square footage or sections. Not doing this would result in DOE failing to accomplish its stated goal of protecting low-income homebuyers from steep price increases resulting from the new standards.

3. The proposed energy standards are inappropriate for the manufactured housing industry as they do not take into consideration the current construction methods, transportation demands and short on-site completion duration unique to manufactured housing. Further, they do not include testing requirements or compliance and enforcement provisions.

4. The proposed energy standards were developed without complying in any meaningful way with the EISA statutory requirement to consult with HUD, resulting in proposed standards that ignore the construction aspects unique to manufactured housing or the negative impact on homebuyer

affordability. Further, DOE ignored the primacy of manufactured housing construction standards established under the Manufactured Housing Improvement Act of 2000.

5. The proposed energy standards ignore the large number of homebuyers that will no longer be able to buy a manufactured home, because they no longer qualify for an FHA, GSE, or non-agency mortgage loan, due to the impact of increased mortgage payments on debt-to-income ratios.

Detailed below is a summary of MHI's recommendations, along with several Appendices that explain in more detail our concerns as follows:

- Appendix I – MHI's Cost Benefit Analysis
- Appendix II – MHI's Comments on the DOE Rule's Proposed Changes by Section
- Appendix III – MHI's Responses to Issues on Which the DOE Requests Comment

SUMMARY OF MHI'S RECOMMENDATIONS

1) The DOE Proposed Rule Fails Statutory Requirement Not to Use IECC When Not Cost Effective

One of the tenets of the National Manufactured Home Construction and Safety Standards Act (NMHCSS Act) is the importance of ensuring that manufactured housing remains an affordable housing option for all consumers considering homeownership. It also states that energy conservation standards for manufactured homes must "ensure the lowest total construction and operating costs" and be cost-effective. Echoing that language, EISA requires that "energy conservation standards established under this section shall be based on the most recent version of the International Energy Conservation Code (including supplements), except in cases in which the Secretary finds that the code is not cost effective*,* or a more stringent standard would be more cost effective, based on the impact of the code on the purchase price of manufactured housing and on total life-cycle construction and operating costs."

Increasing the costs of manufactured homes could jeopardize homeownership for millions of Americans at a time when there is an affordable housing shortage. This increase will have a disproportionate impact on minority communities, who face the most significant burden in obtaining affordable homeownership. This would be in direct contrast to the Administration's goal of achieving racial equity in homeownership.

Use of the IECC is Not Appropriate

While the IECC is respected in the construction industry, it was developed over many years for utilization in both site-built residential homes and commercial buildings. Although EISA directs the DOE to establish energy conservation standards for manufactured housing based on the most recent version of the IECC unless it is found to be not cost effective, to date no state has adopted the 2021 IECC standards and the vast majority of states are using amended versions of the 2009, 2012 or 2015 IECC.

The IECC was never intended nor designed to be implemented in the manufactured housing sector. Given that the IECC essentially ignores all the construction aspects unique to manufactured housing, it is an inappropriate code for attempted enforcement upon the manufactured housing industry and could potentially cause factory closures, the loss of thousands of jobs, and an immediate affordable housing crisis for one of the largest sectors in the housing market. Because the IECC was not designed for manufactured housing, it is NOT a cost-effective standard, which is why its use does not result in a cost-effective change to energy standards.

First, the higher home cost associated with the proposed standards will make manufactured housing far more expensive excluding potential buyers and reducing total manufactured housing sales, the latter hurting the industry and contributing to the lack of affordable housing. Second, if households are fortunate enough to qualify for a home that meets the new standards, the home they get will be more, not less, expensive to own. This is all but guaranteed by the method DOE used in conducting the Life Cycle Cost analysis which demonstrates why the IECC is not an appropriate building code for manufactured homes.

DOE Proposal Uses Incorrect Calculations and Methodologies

DOE's own analysis shows the proposal will increase costs for homebuyers without reciprocal energy savings, and many households will simply be priced out of homeownership due to this proposal. One of the major inputs to a Life Cycle Cost analysis is estimated cost savings. As noted in DOE's Technical Support Document, using sample homes (single- and multi-section), DOE estimated energy savings by comparing homes, in select locations, built to the current, relatively easy to meet HUD energy standards with homes meeting the IECC. As expected, there is a huge difference in energy use (and estimated energy costs) between these benchmarks. The large savings suggests that a whole lot of investment in energy measures can be justified, particularly if the savings are accumulated over 30 years which is an artificial construct. If, conversely, DOE had started with a baseline less than the current HUD standards (e.g., zero insulation, leaky building, etc.) a 30-year Life Cycle Cost would show enough savings to justify building such an energy efficient home. But that is because energy improvements have diminishing returns and today's manufactured homes are already energy efficient.

Every step in making homes more energy efficient costs more and saves less. Most of the savings comes from the first few measures to improve performance. For example, adding R-5 insulation to a wall that is R-10 saves more energy than adding the same amount of insulation to a wall that is already R-20, but costs the same. If you are aiming to optimize investment (i.e., find the lowest combination of construction and operating costs) the proper way to do the analysis is by examining each incremental improvement in efficiency, individually. Each improvement in performance must be cost justified and stand on its own. Once an energy measure begins to result in negative returns, you stop adding any additional measures. DOE did not do this in its analysis, even though the Department developed and promotes a Building Energy Optimization Tool that uses this incremental approach to find the optimum investment. By combining all the energy measures together into a single figure, the slim benefits of adding the last, least cost-efficient measures, is subsumed in and masked by the benefits of adding the first, most cost-effective measures. Even based on a 30-year perspective, the optimum investment, representing the minimum total of construction and operating cost, is less stringent than the 2021 IECC.

Further, the DOE's proposal is based on improper calculations and methodologies including underestimating the current costs of homes and the costs of the new materials to construct them, and not considering the cost of testing procedures and compliance. The DOE also significantly underestimates the fact that the first buyer of an energy efficient manufactured home would likely never reap the economic benefit. Based on MHI's industry data, buyers usually sell their homes within seven to ten years of purchase, and it is unlikely that a manufactured homebuyer financing the purchase of a new manufactured home would even recover these upfront costs at a future sale. Consequently, as result of the DOE's proposal, homeowners will not realize incremental value for energy features that increase a home's purchase or sale price.

At the efficiency levels proposed by the DOE in its recent rulemaking, MHI's survey of manufacturers found that it is unlikely that a buyer purchasing a new home and financing 90 percent of the purchase price would even recover these upfront costs at a future sale. Instead, the DOE's proposal would likely yield a negative return over the ownership period. While several reasons contribute to this, including purchase price and availability of financing options, the fact that homebuyers usually sell their homes within the first seven to ten years of purchase is the most relevant.

Using the DOE's assumptions of cost and location as outlined in the Technical Support Document, which assumes a 30-year mortgage which is not the norm for manufactured housing, MHI conducted a cost-benefit analysis using more realistic financing options that are being utilized in the market today. Assuming a downpayment of 10 percent, an interest rate of nine percent – which is at the high end of today's mortgage rates – a loan term of 20 years, and a tenancy period of 10 years, MHI's cost-benefit analysis found that the DOE's proposal would result in a net loss of between $890 to $5,500 for a single-section home and $1,300 to $6,800 for a multi-section home depending on location (See Appendix I). This would be financially devasting for homebuyers looking to finance the purchase of a manufactured home.

It is important to note that the only place that MHI's analysis shows a savings is in Fairbanks, Alaska, where the savings is only $369 after ten years. In 2020, Alaska had only 64 homes shipped to the state and as of September 2021 only six homes have been shipped there. Further, many of the locations selected by the DOE for its analysis are not locations where manufactured housing is prevalent.

Given these facts, any new energy conservation standard must avoid creating a scenario where the upfront increase to the purchase price of a home prices many consumers out of the market, even if those upfront costs could be amortized over the duration of the homeowner's tenancy and recouped over time.

2) The DOE Proposal Fails to Accomplish its Stated Goal of Protecting Low-Income Homebuyers from Steep Price Increases

Using a tiered system based on price shows a fundamental lack of understanding of the factory-built process. There is no manufacturer's suggested retail price for manufactured homes. Home price is determined by the retailer based on the home features selected by the consumer. The approval for floor design and layout with respect to HUD Code requirements are made regardless of those selections, and long before the consumer has made them. Requiring approval of every floorplan AFTER consumer choices are made determining the price, would mean each and every individual house would have to be approved separately – adding astronomical costs to the process and slowing down the production line so as to remove all efficiencies. If a tiered system based on price is used, the price point in Tier 1 must be significantly increased to better reflect the costs of today's manufactured homes.

According to the National Association of Homebuilders' data, new homebuyers have an average income of $101,811. In contrast, the median annual household income of a manufactured home buyer is only $33,000. Manufactured homes are clearly more affordable, serving homebuyers with much lower incomes.

The proposed rule creates two tiers, based on whether the manufacturer's retail list price is below $55,000/$63,000 or above. The rule estimates that the new energy requirements will raise prices in Tier 1 by an average of $663 for a single-section unit and $839 for a multi-section unit. The rule estimates that the average price increases for homes in Tier 2 are more than six times higher - $3,914 for a single-section unit and $5,289 for a multi-section unit.

In the section "Development of the Current Proposal," the rule states that Tier 1 was established to protect "low-income buyers." However, the $55,000/$63,000 threshold is arbitrary, and it excludes significant numbers of low income manufactured homebuyers, using HUD metrics. The result is that DOE completely failed in their stated goal of shielding low-income homebuyers from price increases.

The HUD national median income for a four-person family is $79,900. HUD defines a "low-income" family as a family making 80 percent or less of median income which would be $63,920. Further, HUD defines a "very low-income family" as a family making 50 percent or less of median income which would be $39,950.

Additionally, HUD defines housing for lower income families as "affordable" when the family pays no more than 30 percent of their income for housing. However, in practice, that ratio is much higher for most families. Nevertheless, consider a new home at $110,260 – more than twice DOE's proposed Tier 1 threshold. Assuming an eight percent mortgage rate on a typical 15-year manufactured home, the monthly cost for mortgage, property tax, and rent would be $1,236. Thus, a low-income family could buy a $110,260 manufactured home and only pay 23.6 percent of their income for housing – well below the HUD standard for being "affordable."

Second, consider a "very low-income family" at the top of that income range. On a $110,260 home, a very low-income family would pay 34 percent of their income for rent. This is only slightly above HUD's ideal benchmark of 30 percent. Moreover, it is well below FHA's 43 percent Debt to Income (DTI) requirement for a mortgage.

Thus, DOE's arbitrary $55,000/$63,000 cutoff – whose stated purpose is to protect low-income families – does not protect significant numbers of low-income families – or even significant numbers of very low-income families.

MHI's analysis for using $110,260 as the cutoff price for Tier 1 is based on an extensive rulemaking conducted by the Consumer Financial Protection Bureau (CFPB) on its Qualified Mortgage (QM) rule. The CFPB selected this $110,260 threshold to give loans below this level more protections including more flexibility on permissible points and fees. While this is not a perfect analogy, MHI is using this metric to illustrate how arbitrary and unreasonably low the $55,000/$63,000 Tier 1 level is.

MHI requests that if a tiered system by price is used, the Tier 1 threshold be raised to at least $110,260, and potentially higher, based on a more detailed analysis along the lines of what we presented. Further, it must be updated annually to reflect actual costs, which can change dramatically. For example, according to the Census Bureau's Manufactured Housing Survey the average price of a new manufactured home in June was $106,800 up from $95,000 in January.

3) The DOE Proposal Fails to Consider the Design and Construction Standards of Today's Manufactured Homes and Does Not Include Testing and Compliance Requirements

Manufactured housing is the only form of housing regulated by a federal building code. Unlike site-built homes, which are subject to different state and local regulations, manufactured homes are built to one uniform federal code, the Manufactured Home Construction and Safety Standards Act of 1974 (i.e., the HUD Code). The HUD Code's single regulatory framework for home design and construction includes standards for health, safety, energy efficiency, and durability.

DOE's proposed rule seeks to use the IECC to make changes related to the building thermal envelope; air sealing; installation of insulation; duct sealing; heating, ventilation, and air conditioning (HVAC); service hot water systems; mechanical ventilation fan efficacy; and heating and cooling equipment sizing for manufactured homes. As proposed, many of these changes conflict with current HUD Code requirements and no direction is given as to how the two differing standards should be integrated which will result in complicated, overlapping requirements that will only increase manufacturing costs, hurting existing homeowners and prospective homebuyers.

The proposed changes to the manufactured housing energy conservation standards contain requirements that raise potential issues with certain components and materials currently being used in the production of today's manufactured homes. Below are a few examples of how the proposed changes conflict with current manufacturing processes.

Insulation

Manufacturers are currently using R-11 for most of the insulation which is predominantly used in the walls and floors for Zones 1 and 2. Further, manufacturers typically prefer to use two layers of R-11 if they need more insulation in the floors. However, the current proposed changes do not use R-11, but rather the lowest insulation value used is R-13. Therefore, this may cause a supply issue for the manufacturers that have ramped up to supply large quantities of R-11. The same supply issue will be present for R-20 and R-19, which is currently not used in large quantities. Further, it will be difficult to source a material to use as the R-5 continuous exterior insulation that will meet the requirements of the proposed changes as well as the current HUD Code. Section 3280.504 has requirements for the perm rating of the exterior wall assemblies. The perm ratings of the rigid foam may also lead to redundant vapor barriers and stud cavities that may not breath properly. This is a potential area where the proposed changes and the current HUD Code may have a conflict.

Duct Systems

Section 460.104 of the proposed changes states that duct system register boots that penetrate the thermal envelope of the air barrier must be sealed to the subfloor. However, in manufactured homes with the heat ducts installed in the belly of the home, there is no need to seal the duct registers and boots to the subfloor because they are installed within the thermal envelope. Table 406.103 states that access hatches, panels, and doors between conditioned space and unconditioned space must be insulated to a level equivalent to the insulation of the surrounding surface. However, this requirement does not seem to be consistent with the discussion around exterior doors in the earlier section of the proposed standards.

Section 460.201 also states that total duct leakage must be limited to four cubic feet per minute. However, with homes where the duct system is installed in the belly, any duct leakage that may occur is still within the thermal envelope of the home. Further, the required testing for the duct leakage limitation is also unknown at this time and therefore has not been included in the DOE cost analysis.

Thermostats

Section 460.202 states that any thermostat installed by the manufacturer must be programmable. It has been the observation, that many of the current homeowners do not use these thermostats correctly or have them replaced with a simpler version. Based on current observations, the programmable thermostat is not perceived as "providing value" to the current consumer and should not be mandated.

ACCA Manual S and ACCA Manual J

Section 460.205 states that heating and cooling equipment shall be sized using the ACCA Manual S and the ACCA Manual J. ACCA Manual J analysis requires knowledge of the orientation of the home with respect to the sun for cooling load analysis. Because the orientation of the home is often unknown until installed, the proposed rule must establish a default orientation. ACCA Manual S establishes sizing limits for heating and cooling equipment and these limits presume that thermal loads are established for a specific location and specific building orientation. The variation in design parameters within a single thermal zone exceeds the sizing limits of ACCA Manual S. The proposed rule must establish alternate criteria for using ACCA Manual S where the design parameters vary within a thermal zone.

Transportation challenges

Several of the proposed changes in the rule focus on changes to the building thermal systems which will affect the overall shipping height and width of a home. By increasing the truss heel height, increasing floor joist depth, and adding insulation outside of the studs, the overall shipping envelope will change. In some cases, this change could be significant. For example, the additional height could prevent shipping a home into an area of the country with low bridges resulting in consumers having to settle for a different style of home, or more than likely, being forced out of the housing market due to a lack of affordable housing. Further, an additional escort or pole car may be required to accompany the home that goes beyond maximum width or height, which could add thousands of dollars to the price of the home for the consumer.

Current Construction Requirements and Climate Zones

As described in DOE's rulemaking, the proposed climate zones are consistent with the climate zones currently used in the HUD Code. Because the new and existing climate zones remained consistent, MHI was able to compare the current construction requirements and future construction requirements. While performing the thermal analysis of the prototypical homes that were presented in the Technical Support Document, MHI observed several issues in the four different categories as outlined below:

- **Tier I Prescriptive Requirements**
  Based on the calculations that MHI performed, it appears that the Tier I prescriptive requirements represent a modest upgrade to the current HUD Code requirements and would require only minor changes from homes currently being constructed today.

- **Tier 2 (Untiered) Prescriptive Requirements**
  The Tier II requirements represent significant changes over the current HUD Code and will be more of a challenge to implement in a cost-effective manner.

Tier 2, Zone 1

Table III.8 lists the exterior ceiling insulation as R-30. Due to the thicker insulation in the ceiling, the proposed code states that a 5.5-inch truss heel height would be required. This change in the truss profile will affect the overall shipping height of the home unless other conciliatory changes are made.

Tier 2, Zone 2

Table III.8 lists the exterior ceiling insulation as R-30, which is the same issue as Zone 1. Further, Table III.8 lists the exterior wall insulation as R-20+5, which represents R-20 in the walls and a continuous R-5 on the exterior of the studs. The requirement of R-20 in the exterior wall will force the sidewall to 2x6 construction resulting in the following:

- The installation of the exterior insulation will be more costly for manufacturers to install. The overall cost of the home will be higher from the increased material costs, but also the increased labor costs.
- The exterior insulation will also require most plants to re-work their production stations to allow time for this installation.
- The exterior insulation will also create an additional problem for fastening the exterior finish siding. The siding would now have to be fastened thru the exterior insulation, and currently there are no approved fasteners to penetrate thru the 1-inch exterior insulation. These fasteners would also have to support the siding during transportation.
- Windows and doors will need to be installed on framed extensions to pack out nailing surfaces to the thickness of the continuous R-5 insulation.
- Continuous flashing may be required at the bottom edge of the rigid insulation layer to protect from exposure to weather and infestation.
- The extra thickness of insulation on the exterior wall would either increase the shipping width or decrease the habitable space on the interior. For houses currently designed to maximize the legal shipping width, there is no additional width available on the exterior. Therefore, the space for the exterior insulation on these homes would have to be taken from the interior of the home.

Table III.8 also lists the exterior floor insulation as R-19. Currently, most manufacturers use a blanket insulation for the floors. However, the lack of availability of R-19 in the blanket style could cause issues for this requirement or force further production changes to accommodate other styles of insulation.

Tier 2, Zone 3

Table III.8 lists the exterior ceiling insulation as R-38. This depth of insulation will be difficult to achieve on lower sloped roofs and cathedral style truss profiles. This insulation requirement could cause some home options to become unavailable for the consumer.

Further, Table III.8 lists the exterior wall insulation as R-20+5 which is the same issue we expressed concerns about in Tier 2, Zone 2.

Table III.8 also lists the exterior floor insulation to be R-30. According to the Technical Support Document, the floor joist will need to be 2x8 when any insulation equal to or over R-30 is used. This change will be more costly than just the insulation if the entire floor system must go to 2x8. This increased joist depth would also further impact the transportation of the home by making it 2 inches taller. Further, the availability of R-30 insulation in a blanket style may be an issue in meeting this requirement or force further production changes to accommodate other styles of insulation.

- **Tier 1 Performance Requirements**
  Based on the calculations that MHI performed, it appears that the Tier 1 performance requirements represent a modest upgrade to the current HUD Code requirements and would require only minor changes from homes currently being constructed today.

- **Tier 2 (Untiered) Performance Requirements**
  The Tier 2 requirements represent significant changes over the current HUD Code and will be more of a challenge to implement in a cost-effective manner. These values will require many changes to the current home construction methodologies. Because this part of the changes is listed as "performance," there are multiple pathways to try and achieve the listed overall U-factor.

  Tier 2, Zone 1
  The overall U-factor listed in Table III.12 is 0.086 for single- and 0.082 for multi-section homes. Based on the calculations MHI performed on prototypical homes, the proposed Zone 1 requirements should be able to be met with upgraded insulation and upgraded windows.

  Tier 2, Zone 2
  The overall U-factor listed in Table III.12 is 0.062 for single- and 0.063 for multi-section homes. Based on the calculations MHI performed on the prototypical homes, the proposed Zone 2 requirements would require many changes such as upgraded insulation, 2x6 wall construction, upgraded windows, and taller truss heel. MHI also found that this overall U-factor requirement was more difficult to meet as the homes became smaller.

  Tier 2, Zone 3
  The overall U-factor listed in Table III.12 is 0.053 for singles and 0.052 for multi-section. Based on the calculations MHI performed on the proto-typical homes, we were not able to satisfy the overall U-factor requirements using common options that are available to most manufacturers. Further, MHI found this became even more difficult to achieve as the homes became smaller. Upgrading insulation, 2x6 exterior walls, deeper trusses, deeper floor joists, and upgraded windows did not lower the overall U-factor enough to meet the value in the Table III.12. For the calculations that MHI performed, we did not evaluate the addition of continuous exterior insulation due to the installation and transportation issues involved with this product.

Compliance, Enforcement and Testing

Testing requirements for each of the systems being modified in the proposal are not included and must be addressed before any rule is published. Determining the impact of a system change without knowing the testing parameters is impossible, especially in response to specific metrics like "§460.201 Duct system." For example, the proposed rule requires testing of air handlers and filter boxes. However, manufactured homes often utilize uncased evaporator coils (a-coils) that prevent the air handler from being readily tested. Oftentimes, it is necessary to temporarily remove the air handler in order to test the duct system for leakage due to the difficulty sealing the air handler.

For multi-sectional units where ductwork is installed on-site, the rule does not establish enforcement procedures for testing. More specifically, what qualifications are required for those performing the testing? Can installers certify their own work? What training is required for installer personnel performing this work? How are the test results documented? Is the installer responsible for any remedial work that may be required after the testing is performed? These questions must be answered in order to determine the additional costs which may be attached to such.

If testing is required to be performed by a third-party or in cases where the installer is not capable of performing the testing, the additional cost of testing could be $600 or more. For Tier 1 homes this nearly doubles the cost increase for single-section construction and increases the installed cost by more than 50-percent for multi-section homes. This cost was not considered in the DOE purchase price increase analysis performed. DOE must not propose a rule without including the required testing requirements, so any analysis can include the true cost impact.

Further, the proposed rule does not include compliance and enforcement provisions which DOE says it will address at a later date. MHI believes it is unnecessary for the DOE to develop a new enforcement mechanism with any proposed manufactured housing energy conservation standard because the HUD Code is an already-established enforcement mechanism that mandates a uniform standard for design, construction, and installation, including federal requirements for safety, durability, and energy efficiency. Failure to partner with HUD would result in complicated, overlapping requirements that will only increase manufacturing costs, hurting existing homeowners and prospective homebuyers.

4) <u>The DOE Proposal Fails to Comply with the Statutory Requirement to Consult with HUD</u>

Because the DOE has no real expertise, knowledge, or understanding of housing and home financing, EISA required the Department to consult with HUD in developing these new energy requirements. However, to our knowledge, DOE has made no discernible effort to consult with HUD, and by extension FHA and the Manufactured Housing Consensus Committee (MHCC), in any meaningful way. While DOE provided detailed justifications for the new energy requirements in the narrative for the proposed rule, the Department offered no evidence that it utilized any of HUD's housing expertise that could have led to a more informed rulemaking.

This is not an insignificant failure. This lack of consultation with HUD shows up in several critical areas that reflect a complete failure to consider the realities of buying and owning a manufactured home. First, the establishment of an artificially low $55,000/$63,000 Tier 1 price point for low-income families completely ignores the reality that much higher home prices are affordable to "low-income families" (as defined by HUD) – and even HUD-defined "very low-income families" qualify for a loan twice as large. The use of a three percent discount rate is wildly inappropriate for chattel manufactured home loans, which lack access to federal agency mortgage loans, and is measurably lower than actual mortgage and other price-related increased costs of real property manufactured home loans. This fatally undermines DOE's contention that the new requirements result in net savings to homeowners and results in a real-world impact that punctures any DOE contention that it complied with EISA's statutory cost effectiveness requirement. Further, failure to consult with FHA completely ignores the meaningful percentage of homebuyers that will no longer qualify for an FHA, Fannie Mae, Freddie Mac, or non-agency mortgage loan because of significantly increased home prices that even DOE acknowledges in the proposed rule will price consumers out of the housing market. Additionally, DOE's failure to consult with HUD also ignores the primacy of the HUD Code with respect to safety and construction standards.

The NMHCSS Act states "the Federal manufactured home construction and safety standards established by HUD shall include preemptive energy conservation standards."[3] Further, EISA mandates that the DOE must consult with HUD, which may seek further counsel from the MHCC, when it comes to developing energy conservation standards for manufactured housing.[4] Additionally, any updated energy conservation standard that the DOE proposes should take into consideration the unique design and factory construction techniques specific to manufactured housing.[5]

Because of these mandates, the DOE must first consult with HUD and the MHCC to assess the economic impact that a new energy conservation standard will have on manufactured housing homeownership. The DOE and HUD should then work together to develop the standard, as well as an efficient and practical implementation strategy that HUD will enforce.

Similar, to the 2016 proposed rule, the DOE did not work with HUD or the MHCC before it drafted its proposed rule. Further, the MHCC was only given a preview of a small portion of the proposed rule

[3] 42 U.S.C. § 5403(g)(1).
[4] *Id.* at 17071(a)(2)(B).
[5] *Id.* at1 7071(b)(2)(A).

approximately two months before it was published, which raised many concerns amongst its members and the public to both the affordability and feasibility of what was presented. Because DOE did not work with HUD on these proposed changes, the proposed rulemaking is resulting in complicated, overlapping requirements that will increase manufacturing costs, hurting existing homeowners and prospective homebuyers. Moreover, it demonstrates a fundamental lack of understanding of the factory-built process.

5) The DOE Proposal Does Not Consider How These Changes Will Make Homebuyers Unable to Obtain Financing

EISA requires that the energy standards be based on the most recent version of the IECC "except in cases in which the code is not cost effective or a more stringent standard would be more effective, based on the impact of the code on the purchase price of manufactured housing and on total life-cycle construction and operation costs."

Thus, the statute explicitly requires that the cost effectiveness standard be based on the impact on the purchase price. Yet, there is no consideration in the entire narrative of the proposed rule that any consideration was given to the impact of home price increases, which the rule acknowledges range from $3,914 to $5,289 for most homes in Tier 2, on a potential homebuyer's ability to buy a home in the first place. Put simply, all the pages and pages of theoretical savings in the rule are meaningless if the price increase causes the homebuyer to no longer qualify for a mortgage loan, because they no longer meet Debt to Income (DTI) underwriting requirements.

An increased home purchase price will result in a proportionate increase in the debt burden. FHA's customary DTI requirement is 43 percent. Therefore, any homebuyer at the edge of this 43 percent DTI requirement will no longer qualify for an FHA loan because of the higher price caused by the new energy standards. And, for example, a homebuyer at a 41 percent DTI ratio that would have more easily qualified for a loan, will now be just over the permitted DTI.

Additionally, the proposed rule includes no real consideration of the impact of the increased down payment that will result from the new energy requirements. Based on the average home price increases ranging from $3,914 to $5,289 that the rule projects for Tier 2 homes, and based on an assumption that a homebuyer must make a down payment of 10%, the energy requirements will raise down payment requirements on new manufactured homes by an average of $391 to $529. For the low- and moderate-income homebuyers that makes up the bulk of the manufactured home purchase market, with an average income of $33,000, this is a not insignificant amount.

Further, the analysis on the impact of the rule is fundamentally marred by a discount rate ranging of three percent to seven percent for computation of future projected energy savings. The impact of significantly understating the discount rate is that it significantly overstates the net savings to the manufactured homebuyer. Higher home prices (e.g., ranging on average from $3,914 to $5,200) for most manufactured homes that are in Tier 2 directly translates into higher mortgage amounts and higher property taxes related to the increased home purchase price.

Mortgage rates on personal property loans (i.e., chattel loans), where the manufactured home is not permanently attached to land, comprise 78 percent of new manufactured home purchases. These loans are currently in the nine percent range, and mortgage rates on real estate loans, where the manufactured home is attached to the land, are in the range of four percent. Assuming a one percent property tax rate on the higher cost, DOE should have used a much higher discount rate of around ten percent for personal property/chattel loans. This resulted in the DOE significantly overestimating the homebuyer benefits from the new energy requirements.

While it is difficult to quantify the percentage of individuals that will no longer qualify for a mortgage loan because of the higher purchase price resulting from the new energy standards, it will clearly result in some percentage of previously eligible homebuyers that will no longer be able to buy a home. It is disturbing that the DOE narrative on the rule did not even consider this factor in assessing compliance with the requirement to deviate from using the IECC based on whether standards are cost effective with respect to impact on purchase price.

<u>Conclusion</u>

While MHI and its members will always support sensible energy conservation efforts, the overly burdensome regulations proposed by DOE will price many consumers out of homeownership. This increase will have a disproportionate impact on minority communities, who face the most significant burden in obtaining affordable homeownership and would be in direct contrast to the Administration's goal of achieving racial equity in homeownership. It also contradicts the Administration's goal of increasing manufactured housing development in order to address the lack of affordable housing supply.

Further, the proposed rule demonstrates a profound lack of understanding of the factory-built process for constructing manufactured homes and a lack of knowledge about the existing HUD Code standards. It also lacks information about testing and enforcement, which makes any true cost analysis challenging and incomplete. All costs imposed by the proposed rule must be factored, and enforcement and testing are factors that must be included in the cost. Finally, the proposal has a fundamental misunderstanding of housing affordability and the fact that most manufactured homes are currently affordable for even low-income individuals.

MHI stands ready to work with DOE and HUD on the development of realistic and achievable energy standards that not only encourages innovation and conservation, but also eliminates regulatory barriers that impede consumer access to safe, affordable manufactured housing.

Sincerely,

Lesli Gooch

Lesli Gooch, Ph.D.
Chief Executive Officer

Appendix I – Cost Benefit Analysis

The tables below provides MHI's Life Cycle Cost results for the DOE proposed rule. The figures offer a glimpse of the benefits and costs for a homebuyer purchasing either a single- or multi-section home. The inputs for location selection, average home cost, increase in home cost related to the energy investment and resultant monthly energy savings match DOE's assumptions contained in the Technical Support Document (TSD). The table sums the major costs and benefits as experienced by the buyer over a ten-year, average occupancy period to yield a net benefit (cost) including incremental mortgage payment, added down payment and monthly energy savings. A negative value indicates that the buyer can expect to lose money on the energy investment making the home less affordable. For example, a purchaser of a single section home in Phoenix, AZ, can on average expect to experience a net cost of nearly $4,900 over the 10-year period of occupancy. Other assumptions made in generating the tables are provided below. Note: all figures are expressed in current dollars. Further, it is assumed that the buyer does not realize an incremental price increase associated with the energy measures at the time of sale, an assumption that is based on a lack of evidence that energy features can demand a higher home price.

Assumptions	
Down payment	10%
Principal	90%
Mort. interest rate	9%
Loan term (yrs)	20
Occupancy term (yrs)	10
Principal recapture rate	0%

			Single-Section Home								
HUD Standards Climate Zone	**Sample Locations**	**Average home cost (DOE)**	**Increase in home cost (DOE)**	**Percent increase in cost**	**Down payment**	**Inc. in mortgage**	**Inc. monthly mort. pay.**	**Energy savings ($/mth) (DOE)**	**Net Mthly. Savings/ Cost**	**Principal repayment**	**Net benefit (cost)**
1	Miami	$57,300	$2,574	**4.5%**	$257	$2,317	$21	$20	($1)	$1,646	**($2,010)**
1	Houston	$57,300	$2,574	**4.5%**	$257	$2,317	$21	$24	$3	$1,646	**($1,493)**
1	Atlanta	$57,300	$2,574	**4.5%**	$257	$2,317	$21	$29	$8	$1,646	**($891)**
1	Charleston	$57,300	$2,574	**4.5%**	$257	$2,317	$21	$26	$5	$1,646	**($1,340)**
1	Jackson	$57,300	$2,574	**4.5%**	$257	$2,317	$21	$28	$7	$1,646	**($1,048)**
1	Birmingham	$57,300	$2,574	**4.5%**	$257	$2,317	$21	$27	$7	$1,646	**($1,106)**
2	Phoenix	$57,300	$4,820	**8.4%**	$482	$4,338	$39	$28	($11)	$3,081	**($4,897)**
2	Memphis	$57,300	$4,820	**8.4%**	$482	$4,338	$39	$32	($7)	$3,081	**($4,432)**
2	El Paso	$57,300	$4,820	**8.4%**	$482	$4,338	$39	$30	($9)	$3,081	**($4,658)**
2	San Francisco	$57,300	$4,820	**8.4%**	$482	$4,338	$39	$23	($17)	$3,081	**($5,543)**
2	Albuquerque	$57,300	$4,820	**8.4%**	$482	$4,338	$39	$30	($9)	$3,081	**($4,666)**
3	Baltimore	$57,300	$4,659	**8.1%**	$466	$4,193	$38	$33	($4)	$2,978	**($3,967)**
3	Salem	$57,300	$4,659	**8.1%**	$466	$4,193	$38	$26	($12)	$2,978	**($4,892)**
3	Chicago	$57,300	$4,659	**8.1%**	$466	$4,193	$38	$34	($4)	$2,978	**($3,930)**
3	Boise	$57,300	$4,659	**8.1%**	$466	$4,193	$38	$28	($10)	$2,978	**($4,605)**
3	Burlington	$57,300	$4,659	**8.1%**	$466	$4,193	$38	$35	($3)	$2,978	**($3,812)**
3	Helena	$57,300	$4,659	**8.1%**	$466	$4,193	$38	$36	($2)	$2,978	**($3,686)**
3	Duluth	$57,300	$4,659	**8.1%**	$466	$4,193	$38	$49	$11	$2,978	**($2,144)**
3	Fairbanks	$57,300	$4,659	**8.1%**	$466	$4,193	$38	$69	$32	$2,978	**$369**

			Multi-Section Home								
HUD Standards Climate Zone	Sample Locations	Average home cost (DOE)	Increase in home cost (DOE)	Percent increase in cost	Down payment	Inc. in mortgage	Inc. monthly mort. pay.	Energy savings ($/mth) (DOE)	Net Mthly. Savings/ Cost	Principal repayment	Net benefit (cost)
1	Miami	$108,500	$4,143	3.8%	$414	$3,729	$34	$33	($1)	$2,648	**($3,134)**
1	Houston	$108,500	$4,143	3.8%	$414	$3,729	$34	$40	$6	$2,648	**($2,313)**
1	Atlanta	$108,500	$4,143	3.8%	$414	$3,729	$34	$48	$15	$2,648	**($1,306)**
1	Charleston	$108,500	$4,143	3.8%	$414	$3,729	$34	$42	$8	$2,648	**($2,065)**
1	Jackson	$108,500	$4,143	3.8%	$414	$3,729	$34	$46	$12	$2,648	**($1,597)**
1	Birmingham	$108,500	$4,143	3.8%	$414	$3,729	$34	$45	$11	$2,648	**($1,696)**
2	Phoenix	$108,500	$6,167	5.7%	$617	$5,550	$50	$40	($10)	$3,942	**($5,714)**
2	Memphis	$108,500	$6,167	5.7%	$617	$5,550	$50	$45	($5)	$3,942	**($5,170)**
2	El Paso	$108,500	$6,167	5.7%	$617	$5,550	$50	$42	($8)	$3,942	**($5,496)**
2	San Francisco	$108,500	$6,167	5.7%	$617	$5,550	$50	$31	($19)	$3,942	**($6,835)**
2	Albuquerque	$108,500	$6,167	5.7%	$617	$5,550	$50	$42	($8)	$3,942	**($5,535)**
3	Baltimore	$108,500	$5,839	5.4%	$584	$5,255	$47	$45	($2)	$3,732	**($4,584)**
3	Salem	$108,500	$5,839	5.4%	$584	$5,255	$47	$34	($14)	$3,732	**($5,949)**
3	Chicago	$108,500	$5,839	5.4%	$584	$5,255	$47	$46	($2)	$3,732	**($4,502)**
3	Boise	$108,500	$5,839	5.4%	$584	$5,255	$47	$37	($10)	$3,732	**($5,508)**
3	Burlington	$108,500	$5,839	5.4%	$584	$5,255	$47	$47	($0)	$3,732	**($4,364)**
3	Helena	$108,500	$5,839	5.4%	$584	$5,255	$47	$48	$0	$3,732	**($4,271)**
3	Duluth	$108,500	$5,839	5.4%	$584	$5,255	$47	$66	$18	$3,732	**($2,105)**
3	Fairbanks	$108,500	$5,839	5.4%	$584	$5,255	$47	$94	$47	$3,732	**$1,292**

Appendix II – MHI's Comments on the DOE Rule's Proposed Changes by Section

Subpart A – General

§ 460.1 Scope.

MHI Comments:
MHI has no comments to this section.

§ 460.2 Definitions.

MHI Comments:
Revise the following definition to include the addition of the underlined text to read as follows:

"Whole-house mechanical ventilation system" – Exhaust system, supply system, or combination thereof that is designed to mechanically exchange indoor air with outdoor air when operating continuously or through a programmed intermittent schedule to satisfy the whole house ventilation rates.

As currently proposed in the rule, this definition would include all exhaust fans, including bath fans and range hoods, which are systems MHI does not believe should be included. The suggested underlined change has been copied from the 2021 IECC.

§ 460.3 Materials incorporated by reference.

MHI Comments:
Incorporation of ACCA Manual J and ACCA Manual S are examples of trying to use a site-built code for manufactured housing that just does not work. See "§460.205 Equipment sizing" for more detailed information.

§ 460.4(a) Energy conservation standards.

MHI Comments:
The application of the Annual Energy Outlook (AEO) to the adjustment of home price needs to be standardized and established in the rule for the purposes of enforcement. The proposed rule must establish trigger points for reevaluating the "price" of a home. For example, would Tier 1 models need to be "limited approvals" that expire after a period of time? Or would it be based on a percentage increase in price? Further, the proposed rule must establish the monitoring mechanisms to be used by production inspection primary inspection agencies (IPIAS) and design approval primary inspection agencies (DAPIAS) for the purposes of prompting manufacturers to resubmit updated information for Tier 1 homes.

§ 460.4(b) and (c) Energy conservation standards.

MHI Comments:
Using a tiered system based on price shows a fundamental lack of understanding of the factory-built process and should be eliminated. There is no manufacturer's suggested retail price for manufactured homes. The use of "price" is unworkable from an enforcement standpoint as a standardized method for pricing does not exist and it would not be possible for a DAPIA to evaluate whether a price is "reasonable" or "correct." The methods used by manufactures to establish pricing constitute trade "secrets" and dissemination of pricing information in the form of Tier 1 and/or Tier 2 model plans would potentially lead to inappropriate price-fixing or price manipulation among manufacturers in violation of federal (including Sherman Act, Clayton Act, Federal Trade Commission Act, and

Robinson-Patman Act) and state antitrust/competition laws.

Further, the use of price as a threshold is overly simplistic and fails to account for regional variations in average housing cost and construction methods. For example, an "affordable" home in the southeastern U.S. is much less expensive and constructed differently than a home of relative affordability in the northeast and/or west. At a minimum, a distinct Tier 1 price point should be established for each thermal zone. Moreover, manufacturers do not set a "retail list price" so that measure is not applicable.

From an enforcement standpoint the regulation does not establish how the "price" would be conveyed to the enforcement bodies, such as the IPIA and/or DAPIA. Because the price of a home depends on options, such as interior finishes (e.g., board and batten verses finished drywall), each Tier 1 model plan submission would need to specifically define the finish attributes required to meet the Tier 1 price limit. Moreover, models that exist in both tiers, due to available options, would need to be submitted for review and approval in both "Tier 1" and "Tier 2."

If a tiered system based on price is used, the price point in Tier 1 must be significantly increased to at least $110,260 to better reflect the costs of today's manufactured homes.

Subpart B – Building Thermal Envelope

§ 460.101 Climate zones.

MHI Comments:
MHI appreciates DOE's use of the HUD Code zones to match manufacturing practices more appropriately. However, as written the proposed rule would require a home in southern Virginia, which would be in climate zone 3 under the IECC, to meet the same requirements as a home located in Fairbanks, Alaska, which would be located in climate zone 8 using the IECC. MHI encourages the DOE to lower proposed thermal envelopment requirements within zone 3 to align with IECC climate zone 3 requirements more closely.

§ 460.102 Building thermal envelope requirements.

MHI Comments:
MHI recommends deleting the following sentence and reference wherever it appears in this section: "Adapted from section R402 of the 2021 IECC."

Additionally, the R-20 wall insulation listed in Tier 2 for Zones 2 and 3 may not be readily available in roll form, as typically used in production. Having a continuous insulation on the outside of the studs may become problematic for siding installation due to transportation. The siding fasteners would have to penetrate through the continuous insulation which would pose an issue, especially for siding applications with more weight. MHI recommends revising exterior wall insulation to R-11 and increasing ceiling insulation to R-25 in Tier 1 for Zones 1 and 2. Allowing for R-11 would provide valuable flexibility in the current restricted fiberglass insulation market.

MHI also recommends revising 20+5 wall R values to 21 or 13+5. This is consistent with the 2015 IECC and would provide manufacturing options to avoid continuous insulation sheathing which would reduce home rigidity which could cause transportation issues.

In addition, MHI recommends adding the following language to this section:

- [R402.3.3] Glazed fenestration exemption. Not greater than 15 square feet (1.4 m2) of glazed fenestration per dwelling unit shall be exempt from the U-factor and SHGC requirements in

Section R402.1.2. This exemption shall not apply to the Total UA alternative in Section R402.1.5.

- [R402.3.4] Opaque door exemption. One side-hinged opaque door assembly not greater than 24 square feet (2.22 m2) in area shall be exempt from the U-factor requirement in Section R402.1.2. This exemption shall not apply to the Total UA alternative in Section R402.1.5.

For "Table 460.102-5 – Tier I Building Thermal Envelope Performance Requirements," MHI recommends the following changes:

Change Zone 1 total Uo to 0.098 for single and 0.096 for multi-sectional, Zone 2 total Uo to 0.081 for single and 0.079 for multi-sectional, and the Zone 3 total Uo to 0.076 for singles and 0.073 for multi-sectional.

For "Table 460.102-6 – Tier 2 Building Thermal Envelope Performance Requirements," MHI recommends the following changes:

Change Zone 2 total Uo to 0.076 for single and 0.073 for multi-sectional and the Zone 3 total Uo to 0.067 for single and 0.064 for multi-sectional.

These energy levels better align with current Energy Star requirements and provide an aggressive first step in enhancing energy conservation in manufactured homes. Further, these changes will reduce the pay off period and provide better value to homeowners.

§ 460.103 Installation of Insulation

<u>MHI Comments:</u>
The following strikethrough text should be deleted from this section:

"Insulating materials must be installed according to the insulation manufacturer's installation instructions and the requirements set forth in Table 460.103 of this section.~~, which is adapted from section R402 of the 2021 IECC~~."

In Table 460.103 the instructions should clarify the location where baffles are required by adding the following underlined text:

Component	Installation Requirements
Baffles	Baffles must be constructed using a solid material, maintain an opening equal or greater than the size of the vents, and extend over the top of the attic insulation <u>where insulation is restrained from full depth in order to maintain 1-inch minimum air space between insulation and roof decking.</u>

In Table 460.103 instructions for "eave vents" should be deleted. This requirement is not within the 2021 IECC nor does it provide insulation installation instructions. Furthermore, it should be acceptable to use nonpermeable insulation adjacent to ventilated soffits as long as required free air path is maintained.

§ 460.104 Building thermal envelope air leakage.

MHI Comments:
The following strikethrough text should be deleted from this section:

"Manufactured homes must be sealed against air leakage at all joints, seams, and penetrations associated with the building thermal envelope in accordance with the component manufacturer's installation instructions and the requirements set forth in Table 460.104 of this section. Sealing methods between dissimilar materials must allow for differential expansion, contraction and mechanical vibration, and must establish a continuous air barrier upon installation of all opaque components of the building thermal envelope. All gaps and penetrations in the exterior ceiling, exterior floor, and exterior walls, including ducts, flue shafts, plumbing, piping, electrical wiring, utility penetrations, bathroom and kitchen exhaust fans, recessed lighting fixtures adjacent to unconditioned space, and light tubes adjacent to unconditioned space, must be sealed with caulk, foam, gasket or other suitable material. ~~The air barrier installation criteria is adapted from section R402 of the 2021 IECC~~."

Table 460.104 should revise the "rim joists criteria" by deleting the following strikethrough text. Mud sill plates are not typically used in manufactured housing and, if used, would be installed on-site by others outside the scope of this rule.

Component	Air Barrier Criteria
Rim joists	The air barrier must enclose the rim joists. The junctions of the rim board ~~to the sill plate and the rim board~~ and the subfloor must be air sealed.

In Table 460.104 the component "Shower or tub adjacent to exterior wall" should be deleted or clarified to apply only when interior wall surface is used as an air barrier. Exterior sheathing or house wrap products are often used as home air barrier and these products are not installed between shower walls.

Subpart C – HVAC, Service Hot Water, and Equipment Sizing

§460.201 Duct systems.

MHI Comments:
The following underlined text and strikethrough text changes must be made to the following section:

"Each manufactured home equipped with a duct system, which may include air handlers and filter boxes, must <u>have supply ducts</u> be sealed to limit total air leakage to less than or equal to four (4) cubic feet per minute per 100 square feet of conditioned floor area. Building framing cavities must not be used as ducts or plenums when directly connected to mechanical systems. <u>Multi-section homes may have each home section isolated and tested separately.</u> ~~The duct total air leakage requirements are adapted from section R403 of the 2021 IECC."~~

MHI also recommends revising this section based on R403.3.6 of the 2021 IECC as follows:

- <u>Rough-in test:</u> The total leakage shall be less than or equal to 4.0 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m2) of conditioned floor area where the air handler is installed at the time of the test. Where the air handler is not installed at the time of the test, the total leakage shall be less than or equal to 3.0 cubic feet per minute (85 L/min) per 100 square feet (9.29 m2) of conditioned floor area.

- Postconstruction test: Total leakage shall be less than or equal to 4.0 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m2) of conditioned floor area.
- Test for ducts within thermal envelope: Where all ducts and air handlers are located entirely within the building thermal envelope, total leakage shall be less than or equal to 8.0 cubic feet per minute (226.6 L/min) per 100 square feet (9.29 m2) of conditioned floor area.

MHI also has significant concerns that testing was not included in this proposal and these concerns are demonstrated in this section which requires testing of air handlers and filter boxes. However, manufactured homes often utilize uncased evaporator coils (a-coils) that prevent the air handler from being readily tested. Oftentimes, it is necessary to temporarily remove the air handler in order to test the duct system for leakage due to the difficulty sealing the air handler.

For multi-sectional units where ductwork is installed on-site, the rule does not establish enforcement procedures for testing. More specifically, what qualifications are required for those performing the testing? Can installers certify their own work? What training is required for installer personnel performing this work? How are the test results documented? Is the installer responsible for any remedial work that may be required after the testing is performed?

If testing is required to be performed by a third-party or in cases where the installer is not capable of performing the testing, the additional cost of testing could be $600 or more. For Tier 1 homes this nearly doubles the cost increase for single-section homes and increases the installed cost by more than 50 percent for multi-section homes. This cost was not considered in the DOE purchase price increase analysis performed. DOE must not propose a rule without including the required testing requirements, so any analysis can include the true impact.

§460.202 Thermostats and controls.

MHI Comments:
MHI recommends deleting the following sentence and reference wherever it appears in this section: “Adapted from section R403 of the 2021 IECC.”

MHI also recommends revising §460.202 (b)(3) to the following:

“Homeowner manuals should include recommendation that homeowners program thermostat with a heating temperature set point no higher than 70 °F (21 °C) and a cooling temperature set point no lower than 78 °F (26 °C).”

§ 460.203 Service hot water.

MHI Comments:
MHI recommends deleting the strikethrough text from “section (a)” as typical water heater instructions do not include maintenance instructions and such when available are readily available on-line. Further, this information is already accommodated in 24 CFR Part 3280.

“(a) Service hot water systems installed by the manufacturer must be installed according to the service hot water manufacturer’s installation instructions. ~~Where service hot water systems are installed by the manufacturer, the manufacturer must ensure that any maintenance instructions received from the service hot water system manufacturer are provided with the manufactured home. The service hot water requirements are adapted from section R403 of the 2021 IECC~~.”

§460.204 Mechanical ventilation fan efficacy.

MHI Comments:
MHI recommends deleting the following sentence and reference wherever it appears in this section: "Adapted from section R403 of the 2021 IECC."

As referenced in § 460.2 Definitions, the definition of "whole-house mechanical ventilation system" must be revised to include the addition of the underlined text as shown below. Further, this section must clarify it does not apply to bath fans and range hoods.

"Whole-house mechanical ventilation system" – Exhaust system, supply system, or combination thereof that is designed to mechanically exchange indoor air with outdoor air when operating continuously or through a programmed intermittent schedule to satisfy the whole house ventilation rates.

§460.205 Equipment sizing.

MHI Comments:
Incorporation of these manuals is an example of trying to use a site-built code for manufactured housing that just does not work as outlined below.

The design parameters provided in ACCA Manual J are location specific rather than based on zones in the proposed rule. The proposed rule must provide the required design parameters to perform an ACCA Manual J analysis within the context of the three thermal zones in the proposed rule.

ACCA Manual J analysis requires knowledge of the orientation of the home with respect to the sun for cooling load analysis. Because the orientation of the home is often unknown until installed, the proposed rule must establish a default orientation, such as the front door is assumed to face south.

ACCA Manual S establishes sizing limits for heating and cooling equipment, these limits presume that thermal loads are established for a specific location and specific building orientation. The variation in design parameters within a single thermal zone exceeds the sizing limits of ACCA Manual S. The proposed rule must establish alternate criteria for using ACCA Manual S where the design parameters vary within a thermal zone.

Current equipment sizing methods are not based on Manual J or Manual S. The use of this software, as proposed, will add additional time and cost for each model plan submission.

The rule must establish a threshold for requiring a revised Manual J or Manual S analysis. For example, where a home model has options that affect the glazing area or insulation value, are distinct Manual J and Manual S analysis required for each possible option?

If equipment sizing is limited by Manual S, homes can only be placed in their respective thermal zones under the proposed rule because placing a home in a zone for which it was not designed would violate the sizing limits of Manual S. For example, under the current standard a Zone II home can be placed in Zone I, as Zone II is considered more restrictive. However, under the new standard, this common practice would not be permitted because equipment sized for Zone II would be oversized for Zone I and would violate the proposed rule. This would restrict current sales practices in the industry especially for retailers located near the Zone boundaries.

Appendix III – MHI's Responses to Issues on Which the DOE Requests Comment

1. DOE invites comment on whether (1) the manufacturer's retail list price threshold for Tier 1 under the tiered proposal is appropriate, (2) the untiered proposal in this SNOPR is cost-effective, generally, and (3) the untiered proposal is cost-effective for low-income consumers.

Using a tiered system based on price shows a fundamental lack of understanding of the factory-built process. There is no manufacturer's suggested retail price for manufactured homes. Home price is determined by the retailer based on the home features selected by the consumer. The approval for floor design and layout with respect to HUD Code requirements are made regardless of those selections, and long before the consumer has made them. Requiring approval of every floorplan AFTER consumer choices are made determining the price, would mean each and every individual house would have to be approved separately – adding astronomical costs to the process and slowing down the line so as to remove all efficiencies.

Moreover, the setting of either $55,000/$63,000 as the threshold for Tier 1 is arbitrary and relates affordable housing ONLY to the manufactured housing market. To determine if a home is affordable, it is necessary to consider the entire housing market. Manufactured homes at any price point provide a significant source of affordable housing – with the average price of a new manufactured home being $87,000 compared to $308,597 for a new site-built home not including land.[6] Furthermore, recent labor and supply shortages have increased those prices significantly (as they have also done in the site-built home industry). According to the Census Bureau's Manufactured Housing Survey the average price of a new manufactured home in June was $106,800 up from $95,000 in January.

2. DOE welcomes comment on approaches for testing, compliance and enforcement provisions for the proposed standards and alternative proposal. DOE also welcomes comments and information related to potential testing, compliance and enforcement under the current HUD inspection and enforcement process, and potential costs of testing, compliance and enforcement of the proposed standards and alternative proposal in this document.

MHI has significant concerns that testing was not included in this proposal, and finds it challenging to consider the costs and impacts of a number of the proposed changes without knowing what the testing protocols will be. All costs imposed by the proposed rule must be factored, and enforcement and testing are parts of that cost. For example, will the duct testing require every unit to be tested thus requiring each manufacturer to hire one individual to test the ducts in line? Additionally, each multi-section home will need to be tested on-site which will cost around $1,000 per unit, assuming the duct system passes the first time. If a duct system fails the testing on-site, additional costs will be incurred with bringing the duct system into compliance and then another site test will be required.

Furthermore, it is unnecessary for the DOE to develop a new enforcement mechanism because the HUD Code is an already-established enforcement mechanism that mandates a uniform standard for design, construction, and installation, including federal requirements for safety, durability, and energy efficiency. While MHI recognizes that the DOE has the authority to develop an energy conservation standard for manufactured housing, it should be developed in coordination with HUD to ensure that any proposed rules are integrated into the HUD Code for enforcement.

3. DOE requests comment on the use of a tiered approach to address affordability and PBP concerns from HUD, other stakeholders, and the policies outlined in Executive Order 13985. DOE also requests comment regarding whether the price point boundary between the proposed tiers is appropriate, and if not, at what price point should it be set and the basis for any alternative price points. DOE also requests comment on its assumptions regarding the use of high-priced loans (*e.g.,* chattel loans) by low-income purchasers, or other purchasers, of manufactured housing.

[6] 2020 U.S. Census Bureau's Manufactured Housing Survey.

Manufactured housing is a critical component of the success of Executive Order 13985, officially titled "Advancing Racial Equity and Support for Underserved Communities." According to the Urban Institute, "the gap in the homeownership rate between black and white families in the U.S. is bigger today than it was when it was legal to refuse to sell someone a home because of the color of their skin." Addressing systemic barriers to minority homeownership is imperative and increasing the supply of quality affordable housing must be an integral part of the effort. This is where manufactured housing comes in. With the average cost of a new manufactured home itself being around $87,000, it is common for the purchase of a manufactured home to be a less expensive option than renting.[7] Unlike other affordable homeownership options, which are often aging housing stock in need of extensive improvements and rehabilitation, a family can attain homeownership in a brand-new home that has the latest innovations, energy efficient features, and modern floor plans and amenities. Any federal regulations that impact the affordability of housing could make it even harder for minority homeowners to access homeownership.

4. DOE also requests comment on alternate thresholds (besides price point) to consider for the tiered approach, including a size-based threshold (*e.g.,* square footage or whether a home is single- or multisection). DOE requests comment on the square footage and region versus sales price data provided in the notice (from MHS PUF 2019) and how that data (or more recent versions of that data) could be used to create either a size-based or region-based threshold instead. DOE further requests input on whether there should be single national threshold as proposed, or whether it should vary based on geography or other factors, and if so, what factors should be considered.

The Department must seriously consider, as it did in its updated data and analysis, an alternative approach such as square footage or sections. Thresholds must be established differently for different regions of the country because the features and amenities in an "affordable" home vary geographically. Further, the pricing for a manufactured home can differ greatly depending on the location of where the home will be sited. For example, below are the 2020 average prices of a manufactured home in several states across the country[8]:

- Arizona - $106,800
- California - $118,700
- Colorado - $88,200
- Florida - $89,200
- Texas - $88,200

Further, from an approval and enforcement standpoint, it is not clear how designs of varying levels of affordability would be distinguished by production inspection primary inspection agencies (IPIAS) and design approval primary inspection agencies (DAPIAS).

5. DOE requests comment on using the AEO GDP deflator series to adjust the manufacturer's retail list price threshold for inflation. DOE requests comment on whether other time series, including those that account for regional variability, should be used to adjust manufacturer's retail list price.

While MHI does not believe a price threshold is at all appropriate, if used there absolutely needs to be an index to increase the price over time if a price tier is used. The proposed rule should establish the Federal agency tasked with providing the annually adjusted threshold values. Whether it is HUD or the DOE, a single adjusted value must be provided to ensure consistency across the industry.

6. DOE requests comment on whether a one-year lead time would be sufficient given potential constraints that compliance with the DOE standards may initially place on the HUD certification process, and whether a longer lead time (e.g., a three-year lead time) or some other alternative lead-

[7] 2020 U.S. Census Bureau's Manufactured Housing Survey.
[8] *Id.*

time for this first set of standards (e.g., phased-in over three years, with one-year lead-times thereafter) should be provided.

When DOE makes changes to appliance standards there is generally a five-year compliance period. Given that the process for manufacturing homes is at least as complex as appliances, the same time period should apply. If the proposed rulemaking is finalized as written, implementing the changes would require manufacturing plants to completely overhaul their systems and processes. Further, every home design currently being utilized – of which there are thousands – would need to be redesigned and reapproved, further slowing down the process.

7. DOE requests comment on its understanding of the definitional changes in the 2018 IECC and the 2021 IECC. DOE also requests comments on its changes to the proposed definitions as compared to those proposed in the June 2016 NOPR.

MHI recommends revising the definition of whole-house mechanical ventilation system to: "Exhaust system, supply system, or combination thereof that is designed to mechanically exchange indoor air with outdoor air when operating continuously or through a programmed intermittent schedule to satisfy the whole house ventilation rates." As currently proposed, the definition would include all exhaust fans including bath and range hoods – systems we do not believe are intended to be included.

8. DOE requests comment on incorporating by reference ACCA Manual J, ACCA Manual S, and "Overall U-Values and Heating/Cooling Loads–Manufactured Homes" by Conner and Taylor.

Incorporation of these manuals is an example of trying to use a site-built code for manufactured housing that just does not work as outlined below.

ACCA Manual J analysis requires knowledge of the orientation of the home with respect to the sun for cooling load analysis. Because the orientation of the home is often unknown until installed, the proposed rule must establish a default orientation, such as the front door is assumed to face south.

ACCA Manual S establishes sizing limits for heating and cooling equipment, these limits presume that thermal loads are established for a specific location and specific building orientation. The variation in design parameters within a single thermal zone exceeds the sizing limits of ACCA Manual S. The proposed rule must establish alternate criteria for using ACCA Manual S where the design parameters vary within a thermal zone.

Current equipment sizing methods are not based on Manual J or Manual S. The use of this software, as proposed, will add additional time and cost for each model plan submission.

The rule must establish a threshold for requiring a revised Manual J or Manual S analysis. For example, where a home model has options that affect the glazing area or insulation value, are distinct Manual J and Manual S analysis required for each possible option?

If equipment sizing is limited by Manual S, under the proposed rule homes can only be placed in their respective thermal zones because placing a home in a zone for which it was not designed would violate the sizing limits of Manual S. For example, under the current standard a Zone II home can be placed in Zone I, as Zone II is considered more restrictive. However, under the new standard, this common practice would not be permitted because equipment sized for Zone II would be oversized for Zone I and violate the proposed rule. This would restrict current sales practices in the industry especially for retailers located near the Zone boundaries.

9. DOE requests comment on basing the climate zones on the three HUD zones instead of the June 2016 NOPR-proposed four climate zones, or other configuration of climate zones. DOE further requests input on whether energy efficiency requirements should be based on smaller geographic areas than provided with the 3 or 4 zone model.

MHI supports utilizing the current HUD climate zones for the purpose of this rulemaking. However, as written the proposed rule would require a home in southern Virginia, which would be in climate zone 3 under the IECC, to meet the same requirements as a home located in Fairbanks, Alaska, which would be located in climate zone 8 using the IECC. MHI encourages the DOE to lower proposed thermal envelopment requirements within zone 3 to align with IECC climate zone 3 requirements more closely

10. DOE requests comment on the Tier 1 energy conservation standards, which would be applicable to manufactured homes with a manufacturer's retail list price of $55,000 or less. DOE also requests comment on the proposed energy conservation standards based on the most recent version of the IECC for the Tier 2 and untiered standards and the consideration of R-21 sensitivity for exterior wall insulation for climate zones 2 and 3.

Per our response to Question 1, MHI does not support a tiered approach based on retail price.

11. DOE requests comment on the additional energy efficiency requirements from the 2021 IECC and whether they should apply to manufactured homes, including those that DOE has initially considered as not applicable to manufactured homes. If so, DOE requests comment on how these requirements would apply and the costs and savings associated with these requirements.

While the IECC is respected in the construction industry, it was introduced as a standard specific to commercial and site-built residential housing with no input from the manufactured housing industry. Given that the IECC essentially ignores all the construction aspects unique to manufactured housing, requiring the industry to comply with a building code that was developed without the benefit of our industry's knowledge or participation is not an appropriate solution. Thus, an integration process of individual evaluation and strategic merging of any increased energy standards would be a much more prudent approach rather than attempting a "broad scale, one size fits all" approach as is currently being suggested. For that to work, the most appropriate code to utilize to update energy standards for manufactured homes is the HUD Code.

12. DOE requests comment on the proposal to not require that exterior ceiling insulation must have uniform thickness or a uniform density.

MHI agrees that manufactured homes should NOT have to require uniform thickness of installation. Installing insulation with a nonuniform thickness is required to construct most manufactured homes due to shipping height restrictions and the need to minimize truss heel height. Below is further supporting information as to why MHI supports not requiring uniform thickness based on the DOE proposal.

- The loose fill spray applied ceiling insulation was assumed to be R-31 per inch in the DOE analysis. Therefore, as the required R-value for the ceiling insulation is increased the required depth will also increase.
- Due to shipping restrictions across the U.S., most manufacturers limit the truss heel height to allow the most conservative shipping heights.
- When the heel height is less than the depth of insulation required, a compressed area of insulation occurs at the eave areas. The deeper the required insulation, the further the compressed area extends toward the center of the home.
- Because of the compressed area at the eave, the manufacturers typically increase the depth toward the center of the home to provide an average depth that meets the requirements.
- Approximately 30 percent of homes produced have a "vaulted" ceiling instead of "flat" ceiling as assumed in the DOE proposal. The insulation depths that are being proposed for Tier 2 prescriptive requirements would eliminate the production of homes with vaulted ceilings unless the trusses are redesigned with higher heel heights or steeper exterior roof slopes. These changes will then increase the shipping height and require truss re-designs.

- The DOE proposal includes assumptions that heel heights will increase as the required depth of insulation increases to minimize the compressed area. The DOE document states that the truss heel height is assumed to be 2.5 inches for ceilings using less than or equal to R-22, 5.5 inches for insulation between R-22 and R-30, and 7.5 inches for over R-38. This increased heel height assumption will require the trusses to be re-designed and will increase shipping heights. Homes with increased shipping heights will be more costly to ship based on state-by-state restrictions.

13. DOE requests comment on the proposal not to limit the total area of glazed fenestration.

MHI agrees that the DOE should not limit the amount of glazed fenestration. The 2021 IECC already includes exemptions that must also be included in this proposed rule. Further, MHI recommends adding the following language to this section of the proposal:

"(6) [R402.3.3] Glazed fenestration exemption. Not greater than 15 square feet (1.4 m2) of glazed fenestration per dwelling unit shall be exempt from the U-factor and SHGC requirements in Section R402.1.2. This exemption shall not apply to the Total UA alternative in Section R402.1.5."

14. DOE requests comment on removing the proposed requirement that exterior floor insulation installed must maintain permanent contact with the underside of the rough floor decking.

MHI supports exempting manufactured housing from this requirement. In manufactured home construction, the floor insulation between the I-beams is inherently not in contact with the underside of the floor decking. This must be exempted to permit standard construction practices as outlined below.

The typical insulation used in the production environment is blanket style insulation that is installed between the bottom of the floor and the chassis frame which keeps the HVAC supply duct system inside the thermal boundary of the building. Changing this method of installation would effectively remove the HVAC supply duct system from inside the thermal boundary of the building and would cause an increased heat gain and heat loss, effectively decreasing energy efficiency. This would be contradictory to the purpose and scope of the IECC. For this reason, most manufacturers do not currently install floor insulation between the floor joists that would be in contact with the underside of the floor decking. Therefore, production facilities are not set-up to efficiently install insulation that is contact with the underside of the floor decking. However, interior perimeter rim joist insulation is a common practice.

Installing insulation between the floor joists will also increase the production labor to install the insulation. This additional labor will add around 20 minutes of production time to each floor produced. For a plant producing eight floors per day, the increased production time will be around 160 minutes per day. At that rate of production, the line will have to move about every 50 minutes. Therefore, the increased labor required will either slow production or require new additional labor resources. Whether production is reduced, or additional labor is required, the overall cost of the home will be increased, but these costs were not considered in the DOE analysis.

Further, the DOE analysis assumes that the floor joists are 2x6 with insulation up to and including R-22, and 2x8 floor joists insulated to R-30 and above. Currently, 90 percent of floors produced use 2x6 floor joists. Therefore, the increased joists depth will add approximately a 33 percent material cost increase which will be around $200 per 14x76 floor. This 2-inch floor joist change will also increase the shipping height. This additional 2 inches only compounds the issue discussed about the truss changes.

15. DOE requests comment on the proposed updates to the installation of insulation criteria as it applies to manufactured homes construction only.

In Table 460.103 the instructions should clarify the location where baffles are required by adding the following underlined text:

Component	Installation Requirements
Baffles	Baffles must be constructed using a solid material, maintain an opening equal or greater than the size of the vents, and extend over the top of the attic insulation <u>where insulation is restrained from full depth in order to maintain 1-inch minimum air space between insulation and roof decking.</u>

In Table 460.103 instructions for "eave vents" should be deleted. This requirement is not within the 2021 IECC nor does it provide insulation installation instructions. Furthermore, it should be acceptable to use nonpermeable insulation adjacent to ventilated soffits as long as required free air path is maintained.

16. DOE requests comments on whether there are any of the 2021 IECC updates relevant to manufactured housing that should be considered as part of this rulemaking. Specifically, DOE requests comment on whether the 2021 IECC updates for installation criteria for access hatches and doors, baffles and shafts are applicable to manufactured housing and should be considered in this rulemaking.

While the IECC is respected in the construction industry, it was introduced as a standard specific to commercial and site-built residential housing with no input from the manufactured housing industry. Given that the IECC essentially ignores all the construction aspects unique to manufactured housing, requiring the industry to comply with a building code that was developed without the benefit of our industry's knowledge or participation is not an appropriate solution. For example, the baffle requirements included in the proposal will not work because the closest you can get to the rim rail is inside the face and not the outside edge. That simply will not work for manufactured homes.

17. DOE requests comment on the proposed updates to the air barrier criteria as it applies to manufactured homes construction only. Further, DOE requests comment whether the SNOPR proposal continues to be designed to achieve air leakage sealing requirements of 5 ACH.

There is substantial evidence that the prescriptive building thermal envelope air leakage standards incorporated within the rule are adequate to ensure homes achieve an air leakage rate of 5ACH. Further, MHI believes that whole house air leakage testing is unnecessary.

18. DOE requests comments on whether there are any of the 2021 IECC updates relevant to manufactured housing that should be considered as part of this rulemaking. Specifically, DOE requests comment on whether the 2021 IECC updates for air barrier criteria for recessed lighting, narrow cavities and plumbing are applicable to manufactured housing and should be considered in this rulemaking. If so, DOE requests comment on whether the requirements would alter the 5 ACH designation.

MHI does not believe that recessed lighting needs specification on air leakage rates as these fixtures are usually IC rate and significantly airtight. Further, MHI does not believe that additional information needs to be added to the proposed rule for narrow cavities as any such activities are rare in manufactured housing and when they do occur, they generally do not disrupt the air barrier and are insulated or gasketed. Finally, MHI does not believe that additional information needs to be added to the proposed rule for wiring and plumbing as most often these utilities are routed in the floor systems within the thermal envelope and larger vent piping is already caulked and sealed.

However, because the IECC essentially ignores all the construction aspects unique to manufactured housing, requiring the industry to comply with a building code that was developed without the benefit of our industry's knowledge or participation is not an appropriate solution. This is a perfect example of why the IECC is not the appropriate building code for manufactured housing. Further, holes in the floor, such as under bathtubs and showers, must be exempted from sealing to permit the installation of p-traps in 2x6 floor systems. These holes do not allow air intrusion from the exterior because the exterior floor air barrier is the bottom board and is not the floor itself. These are just a few examples why the most appropriate code to utilize to update energy standards for manufactured homes is the HUD Code. MHI does not believe any additional information needs to be added to the proposed rule to address recessed lighting, narrow cavities, and plumbing.

19. DOE requests comment on the proposal to require that total air leakage of duct systems for all manufactured homes is to be less than or equal to 4 cfm per 100 square feet of conditioned floor area.

The proposed rule limits "total air leakage" of the duct system whereas current testing, such as that done for Energy Star homes, is based on air leakage to the exterior. Testing leakage to the outside requires the use of a second machine used simultaneously. This would be a more extensive and costly test with increased failure rates while providing little benefit in terms of energy savings. Where ducts are in the floor, and contained within the bottom board, they typically do not leak to the exterior and should be exempt. Again, since no testing requirements are included in this proposal, it is impossible to know the costs or procedures of achieving such levels.

Although MHI supports efforts to limit duct leakage, we believe such tests should be limited to testing of duct systems in the factory only, where such test provides the best value to consumers. MHI encourages the DOE to clarify the testing requirements to encourage effective use of current processes to ensure supply duct systems maintain a leakage of less than 4 cfm per 100 square feet of conditioned floor area as installed and tested within the building facility.

20. DOE requests comment on DOE's interpretation of R403.1 and the proposed updates to the thermostat and controls requirements. In addition, DOE requests comments on whether there are any of the 2021 IECC updates relevant to manufactured housing that should be considered as part of this rulemaking.

MHI believes programmable thermostats should remain an option for the homebuyer. Programmable thermostats do not come preset as indicated within §460.202(b)(3) and requiring home manufacturers to program thermostats as proposed prior to the home being installed and powered would be overly burdensome, ineffective and unnecessary. Homeowners should be advised to program their thermostats. Moreover, the desire for programmable thermostats should be dependent on consumer-demand. Many consumers find programmable thermostats to be too complicated to use, and prefer a more traditional thermostat. Lastly, any pre-program requirements should be part of regulation requirements on thermostat manufacturers if deemed appropriate rather than on home manufacturers.

21. DOE requests comment on DOE's interpretation of R403.5 and the proposed updates to the service hot water requirements. In addition, DOE requests comments on whether there are any of the 2021 IECC updates relevant to manufactured housing that should be considered as part of this rulemaking. Specifically, DOE requests comment on whether the circulating hot water system temperature limit should be included as a requirement.

Circulating hot water systems are not typically used in manufactured homes. Further, 24 CFR 3280 already has provisions for scald prevention that limit the temperature of hot water. Additional requirements would be redundant and unnecessary.

22. DOE requests comment on the proposal to include the 2021 IECC fan efficacy standard requirements. DOE requests comment on whether any of the fan efficacy requirements are not applicable to manufactured homes.

The applicability of the increased efficacy standards would be dependent upon the additional costs associated, and the return on investment of the increased mechanical ventilation requirements, which the DOE did not take into account. Furthermore, the definition of "whole house fan" should be revised to align with the definition within the 2021 IECC which limits the fan efficacy requirements to fan used for "whole house ventilation" purposes rather than spot ventilation.

23. DOE requests comment on whether the HRV and ERV provisions under 2021 IECC for site-built homes are applicable to manufactured homes and whether they would be cost-effective. Specifically, DOE requests comment on costs for the HRV and ERV requirements as it applies to manufactured homes in all climate zones.

HRV and ERV provisions would add significantly to the cost of manufactured homes and 24 CFR 3280 already contains provisions for providing fresh air within a manufactured home. HRV and ERV are products mainly promoted by those appliance manufacturers and have been found in many cases to increase moisture related problems and increased energy usage, specifically in the southern climates.

24. DOE requests comment on the above ventilation strategies, including (but not limited to) cost, performance, noise, and any other important attributes that DOE should consider, including those related to mitigation measures. While the alternate ventilation approaches are not integrated into the analysis presented as part of this proposal, DOE is giving serious consideration as to whether it should incorporate one or more of these options as part of its final rule based on any additional data and public comments it receives.

HRV and ERV provisions would add significant construction costs. If implemented with the furnace, as most current ventilating systems are, significant redesign would be required to increase the size of the furnace compartment to accommodate the additional equipment and ductwork. Currently ventilation strategies in manufactured housing have proven to be efficient and effective for many years. In fact, the current IECC recognizes a process developed and commonly used by the manufactured housing industry as an accepted application in residential and commercial construction.

25. DOE requests comment on the cost-effectiveness and feasibility of requiring R-20+5 for the exterior wall insulation for climate zones 2 and 3 Tier 2/Untiered manufactured homes. DOE also requests comment on the sensitivity analysis for R-21 that would result in positive LCC savings for all cities.

The use of continuous insulation is problematic due to the required changes in design, associated costs, and need for products that don't exist. The increase in unit width due to the addition of continuous foam will require a reduction in the structural floor width equal to the thickness of the insulation. This will require redesign of the chassis system, trusses, and retooling of fixtures and jigs within the plant. Any reduction in interior width, due to increases in exterior width, will eliminate or require significant redesign of many single-wide models that incorporate a bathroom with adjacent hallway that are already at the minimum widths permitted under 24 CFR 3280. Furthermore, standard doors for manufactured homes are designed for overall wall thicknesses of 4- or 6-inches and increasing the thickness will require the use of extension jambs or the development of new products to accommodate increased wall widths. Permitting the use of R-21 only in lieu of R-20+5 is necessary.

26. DOE requests comment on the inputs to the conversion cost estimates.

Because the threshold cost is updated annually and because it is assumed that the list price must be updated, the cost to update model plans would be a reoccurring annual cost rather than a one-time cost. This must also be revised so that cost is not a consideration for Tier 2 homes. As currently proposed, the retail price must be determined for all homes to determine if it is above or under the threshold. The Tier 2 definition should not have a threshold price. Instead, a Tier 2 home should be defined as "A manufactured home that is not qualified as a Tier 1 home."

27. DOE requests comment on the shipment breakdown per tier and using a substitution effect of 20 percent on shipments to account for the shift in homes sold to the lower tiered standard. DOE requests comment on whether it should use a different substitution effect value for this analysis – and if so, why. (Please provide data in support of an alternative substitution effect value.)

Currently, very few homes are produced at the Tier 1 level of under $55,000. It is unlikely that additional homes will be manufactured at that level. Instead, MHI expects an overall reduction in the manufacturing and purchasing of manufactured homes across the board.

28. DOE requests comment on the calculation of deadweight loss presented above and the extent to which there are market failures in the no-standards case.

Deadweight loss will increase as a result of this proposal, as many potential consumers will be priced out of purchasing a manufactured home.

29. DOE requests comment on the number of manufacturers of manufactured housing producing home covered by this rulemaking.

As of September 2021, there are 138 plants and 33 corporations producing manufactured homes in the country. As a result of this proposed rulemaking, all manufacturers will be negatively impacted.

30. DOE requests comment on the cost to update model plans and the number of model plans to update as a result of the proposed rule; on the types of equipment and capital expenditures that would be necessitated by the proposal; and the total cost of updating product offerings and manufacturing facilities. DOE requests comment on how these values would differ for small manufacturers. DOE requests comment on its estimate of average annual revenues for small manufacturers of manufactured housing.

Because the threshold cost is updated annually and because it is assumed that the list price must be updated, the cost to update model plans would be a reoccurring annual cost rather than a one-time cost. This must also be revised so that cost is not a consideration for Tier 2 homes. As currently proposed, the retail price must be determined for all homes to determine if it is above or under the threshold. The Tier 2 definition should not have a threshold price. Instead, a Tier 2 home should be defined as "A manufactured home that is not qualified as a Tier 1 home."

Public Comments To The October, 2022 Manufactured Housing Consensus Committee Meeting

October 16, 2022

Philip W. Schulte

I. Updating the Energy Standards

Aligning the HUD and DOE energy and related standards and clarifying inconsistencies will be covered in these comments. Recommendations for harmonization of MHCSS with future DOE energy standard changes are covered in Section XVI below.

II. Changes to the Definitions in 24 CFR 3280.2

The DOE final rule has slightly different definitions from the existing HUD standards.

1. The Term "Equipment" defined in the HUD-code.

Note that the word "appliances" has been removed from the DOE definition of "equipment" along with the removal of the term "fire safety". There are also some small changes to the thermal protection area (heating, cooling vs. heat-producing as shown in the HUD code).

The word "appliance" is used almost 300 times in the HUD code so it would be necessary to search each of these references to determine the impact of using the DOE definition. 24 CFR 3280.703 contains a long list of "appliances" related to heating, cooling and cooking and some of these devices would normally be considered as equipment for the home.

Also, the smoke and carbon monoxide detectors would normally be thought of devices that are part of the equipment needed for fire safety in a home, in this case warning devices. The scope of the fire safety standards in Subpart C of the HUD code has been subject to differing interpretations and removal of the phrase "fire safety" could create an ambiguity. The DOE and HUD definitions can be harmonized as follows:

> *Equipment* includes materials, appliances, devices, fixtures, fittings or accessories both in the construction of, and in the fire safety, plumbing, heating, cooling ~~heat-producing~~ and electrical systems of manufactured homes.

2. Definition of a "Manufacturer"

The HUD code defines a manufacturer as a person "engaged in manufacturing or assembling manufactured homes. The DOE definition changes that to a person engaged in the factory construction or assembly of manufactured homes. The HUD definition is thus broader than just factory operations. Also, the HUD code now includes factory built or on-site constructed garages and carports (see 24 CFR 3280.212 and 3280.213.

More importantly, the term "manufacturer" is defined in the enabling statute (see 42 USC 5402(5). It is unlikely that Congress intended to change key terms like manufacturer and manufactured home when it passed the Energy Independence and Security (EISA) Act of 2007. Presumably, HUD would prefer to maintain the broader definition presently in the HUD code and thus the current HUD definition of a manufacturer should be used so it includes both factory and other construction of manufactured homes:

3. Definition of a “Manufactured Home”

There are also some differences between the DOE and HUD Code descriptions of measuring the size of the manufactured home. The DOE definition provides that the calculations will be based on the structure’s exterior dimensions while the current HUD code uses the text “will include the total of square feet for each transportable section comprising the completed structure “,

The HUD- code definition is more precise while the DOE term “based” could mean that deviations are possible from the numerical measurement of the total square footage. In its final and proposed rule, DOE takes the position that the word “based” in the EISA law allows for discretion in the development of a standard as opposed to the use of the words “will” or “shall”.

This is another term defined in the Manufactured Housing Construction and Safety Standards Act but the language concerning the proper method of measuring the exterior dimensions has been added by HUD. The use of the term based could be a source of confusion, especially since the size of a manufactured home is important for determining the jurisdiction of the HUD code. Therefore, to prevent misunderstandings, the more restrictive HUD code definition should be used.

4. The Definition of the word “State”

The HUD code definition and the enabling statute include the Canal Zone which is no longer a territory under US control. The DOE definition removes the Canal Zone.

Under 2 U.S.C. § 3602 - U.S. Code - Unannotated Title 22. Foreign Relations and Intercourse § 3602, a state is defined as “the areas and installations in the Republic of Panama made available to the United States pursuant to the Panama Canal Treaty of 1977 and related agreements”. It is unknown if removal of the Canal Zone would have any impact on existing HUD-code manufactured homes or any consumers. If not, the DOE definition of the word “State” might be appropriate,

III. Thermal Protection Definitions 24 CFR3280.502

The current HUD code in Subpart F (24 CFR 3280.500 et seq. has only definitions for “Pressure Envelope” and “Thermal Envelope Area”. The following definitions in the DOE final rule could be added to 24 CFR 32800.502 and thus would be restricted to only the thermal protection subpart of the HUD code:

2021 IECC means the 2021 version of the International Energy Conservation Code, issued by the International Code Council.

Access (to) means that which enables a device, appliance or equipment to be reached by ready access or by a means that first requires the removal or movement of a panel or similar obstruction.

Air barrier means one or more materials joined together in a continuous manner to restrict or prevent the passage of air through the building thermal envelope and its assemblies.

Automatic means self-acting or operating by its own mechanism when actuated by some impersonal influence.

Building thermal envelope means exterior walls, exterior floors, exterior ceiling, or roofs, and any other building element assemblies that enclose conditioned space or provide a boundary between conditioned space and unconditioned space.

Ceiling means an assembly that supports and forms the overhead interior surface of a building or room that covers its upper limit and is horizontal or tilted at an angle less than 60 degrees (1.05 rad) from horizontal.

Climate zone means a geographical region identified in §460.101.

Conditioned space means an area, room, or space that is enclosed within the building thermal envelope and that is directly or indirectly heated or cooled. Spaces are indirectly heated or cooled where they communicate through openings with conditioned space, where they are separated from conditioned spaces by uninsulated walls, floors or ceilings, or where they contain uninsulated ducts, piping, or other sources of heating or cooling.

Continuous air barrier means a combination of materials and assemblies that restrict or prevent the passage of air from conditioned space to unconditioned space.

Door means an operable barrier used to block or allow access to an entrance of a manufactured home. *Dropped ceiling* means a secondary nonstructural ceiling, hung below the exterior ceiling.

Dropped soffit means a secondary nonstructural ceiling that is hung below the exterior ceiling and that covers only a portion of the ceiling. *Duct* means a tube or conduit, except an air passage within a self-contained system, utilized for conveying air to or from heating, cooling, or ventilating equipment.

Duct system means a continuous passageway for the transmission of air that, in addition to ducts, includes duct fittings, dampers, plenums, fans, and accessory air- handling equipment and appliances.

Eave means the edge of the roof that overhangs the face of an exterior wall and normally projects beyond the side of the manufactured home.

Exterior ceiling means a ceiling that separates conditioned space from unconditioned space.

Exterior floor means a floor that separates conditioned space from unconditioned space.

Exterior wall means a wall, including a skylight well, that separates conditioned space from unconditioned space.

Fenestration means vertical fenestration and skylights.

Floor means a horizontal assembly that supports and forms the lower interior surface of a building or room upon which occupants can walk.

Glazed or glazing means an infill material, including glass, plastic, or other transparent or translucent material used in fenestration.

Heated water circulation system means a water distribution system in which one or more pumps are operated in the service hot water piping to circulate heated water from the water heating equipment to fixtures and back to the water heating equipment.

Insulation means material deemed to be insulation under 16 CFR 460.2.

Manual means capable of being operated by personal intervention.

Opaque door means a door that is not less than 50 percent opaque in surface area.

R-value (thermal resistance) means the inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unit area ($h \times ft^2 \times °F/Btu$).

Rough opening means an opening in the exterior wall or roof, sized for installation of fenestration.

Service hot water means supply of hot water for purposes other than comfort heating.

Skylight means glass or other transparent or translucent glazing material, including framing materials, installed at an angle less than 60 degrees (1.05 rad) from horizontal, including unit skylights, tubular daylighting devices, and glazing materials in solariums, sunrooms, roofs and sloped walls.

Skylight well means the exterior walls underneath a skylight that extend from the interior finished surface of the exterior ceiling to the exterior surface of the location to which the skylight is attached.

Solar heat gain coefficient (SHGC) means the ratio of the solar heat gain entering a space through a fenestration assembly to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation that is then reradiated, conducted, or convected into the space.

Thermostat means an automatic control device used to maintain temperature at a fixed or adjustable set point.

U-factor (thermal transmittance) means the coefficient of heat transmission (air to air) through a building component or assembly, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films (Btu/h × ft^2 × °F).

U_o (overall thermal transmittance) means the coefficient of heat transmission (air to air) through the building thermal envelope, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films (Btu/h × ft^2 × °F).

Ventilation means the natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, any space.

Vertical fenestration means windows (fixed or moveable), opaque doors, glazed doors, glazed block and combination opaque and glazed doors composed of glass or other transparent or translucent glazing materials and installed at a slope of greater than or equal to 60 degrees (1.05 rad) from horizontal.

Wall means an assembly that is vertical or tilted at an angle equal to greater than 60 degrees (1.05 rad) from horizontal that encloses or divides an area of a building or room.

Whole-house mechanical ventilation system means an exhaust system, supply system, or combination thereof that is designed to mechanically exchange indoor air with outdoor air when operating continuously or through a programmed intermittent schedule to satisfy the whole house ventilation rates.

Window means glass or other transparent or translucent glazing material, including framing materials, installed at an angle greater than 60 degrees (1.05 rad) from horizontal.

Zone means a space or group of spaces within a manufactured home with heating or cooling requirements that are sufficiently similar so that desired conditions can be maintained using a single controlling device.

IV. Materials Incorporated by Reference

1. Overall U Value and Heating and Cooling Loads Manual

The U values calculation manual Overall *U*-Values and Heating/Cooling Loads Manufactured Homes is already referenced in the HUD code (see 24 CFR 3280.508(b)). To harmonize the two regulations, the added text about availability of the document, contact information for HUD User shown in the Supplementary Information of the DOE final rule could be added to. Subsection .508(b)

2. ACCA Manuals

While the ANSI/ACCA Manual J, Residential Loan Calculations is not part of the HUD-code, HUD has included the ACCA Manual J calculation method for cooling loads for site installed air conditioners (see 24 CFR 3285.503 (a)(1)(i). So, ACCA Manual J is already part of the regulatory system in circumstances where the site of placement is known. Therefore, 24 CFR 3280.508 (b) could be expanded to include the following additional text:

> The industry standards: ANSI/ACCA 2 Manual J–2016 (ver 2.50) (“ACCA Manual J”), Manual J - Residential Load Calculations, Eight Edition, Version 2.50, Copyright 2016 and ANSI/ACCA 3 Manual S–2014 (“ACCA Manual S”), Manual S - Residential Equipment Selection, Second Edition, Version 1.00, Copyright 2014 can be used for the transmission of heat loss coefficients.
>
> Copies of Manual J and Manual S may be purchased from Air Conditioning Contractors of America Inc., (ACCA), 2800 S. Shirlington Road, Suite 300, Arlington, VA 22206, Telephone: 703-575-4477. *www.acca.org/*. HUD User No. 0005945,
>
> Overall U-Values and Heating/Cooling Loads– Manufactured Homes, February 1992. A copy of Overall *U*-Values and Heating/Cooling Loads–Manufactured Homes may be purchased from HUD User, 11491 Sunset Hills Road, Reston, VA 20190-5254 or *www.huduser.org/portal/publications/manufhsg/uvalue.html*. Telephone: 800-245-2691. See section V.M of this document for further discussion of these standards.

V. 10 CFR 460.4 Energy Conservation Standards:

The HUD code does not differentiate between single section and double section homes for the purpose of thermal protection standards. The DOE final rule uses the term “Tier 1” to refer to a single section homes and “Tier 2” to refer to double section homes. The terms “single wide and “double wide” only appear once in the HUD Code (24 CFR 3280.105) concerning the size of exit doors

The term “Tier 1” is used in multiple times in the final DOE rule and therefore, it should be defined in 24 CFR 500 as the following:

Tier 1 home is a single section manufactured home

Tier 2 home is a multi-section manufactured home.

The language in 10 CFR 460.4(b) and (c) is ambiguous since it requires that manufacturers comply with all applicable (emphasis added) requirements in Subparts B and C. HUD may wish to consult with DOE to clarify exactly which sections or subsections specifically apply to single section (Tier 1) and multi-section (Tier 2) homes. Also, if DOE wants to continue to use the Tier 1 and Tier 1 terms, the HUD Code should include the commonly used term in parentheses (e.g., Tier 1 (single section) home.

VI. Building Thermal Envelop: 240 CFR 3280,506 U/o Coefficient Changes

` Subpart F of the HUD code has four sections (3280.506-3280.511) which are affected by the DOE energy standards. A revised 3280.506 is shown in Appendix A. These changes are relatively straightforward in that they are merely establishing separate u/o requirements for these two classes of homes specified in Section 460.1 (a). DOE's final rule maintains the three climate zones in the HUD code.

VII. New Section 3280.507 Prescriptive Standards For Thermal Protection Standards

The current section 3280.507 covers only heat gain (cooling) with a brief sentence about transmission heat gains. That sentence could be moved to existing Section 3280.508 and this would leave 3280.507 to cover prescriptive standards for thermal protection. The revised text for this section is shown in Appendix B.

There are a number of specific allowances and prescriptive requirements in the DOE final rule for the following components:

- Batt insulation depths and minimum truss heal heights
- Skylights with a solar heat gain coefficient of less than .30 U factor
- Vertical fenestration U Factor requirements in climate zones 2 and 3.
- Weighted average skylight *U*-factor requirements in climate zones 2and 3.
- Authorization for windows, skylights and doors containing more than 50percent glazing by area to satisfy the solar heat gain coefficient (SHGC) requirements

A new Section (a) should be added to contain the prescriptive approach to compliance with the u/o standards established in Section 3280.506. The existing text would be labeled as Section (b) which would contain the performance standard and methods.

VIII. New Section 3280.512 Insulation Standards

The text of 10 CFR 460.103 should be added to this new section. By not renumbering Sections 3280.508-.511, correcting references throughout the HUD code can be avoided. Also, the heating and cooling certificate references are widely used and can remain the same merely by adding this new section. The new section is shown below:

3280.512 Installation of insulation.

Insulating materials must be installed according to the insulation manufacturer's installation instructions and the requirements set forth in table 1 to 3280.512, which is adapted from section R402 of the 2021 IECC.

Table 1 to § 3280.512 Installation of Insulation

COMPONENT	INSTALLATION REQUIREMENTS
General	Air-permeable insulation must not be used as a material to establish the air barrier.
Access hatches, panels, and doors	Access hatches, panels, and doors between conditioned space and unconditioned space, such as attics and crawlspaces, must be insulated to a level equivalent to the insulation of the surrounding surface, must provide access to all equipment that prevents damaging or compressing the insulation, and must provide a wood-framed or equivalent baffle or retainer when loose fill insulation is installed within an exterior ceiling assembly to retain the insulation both on the access hatch, panel, or door and within the building thermal envelope.
Baffles	For air-permeable insulations in vented attics, a baffle must be installed adjacent to soffit and eave vents. Baffles, when used in conjunction with eave venting, must be constructed using a solid material, maintain an opening equal or greater than the size of the vents, and extend over the top of the attic insulation.
Ceiling or attic	The insulation in any dropped ceiling or dropped soffit must be aligned with the air barrier.
Narrow cavities	Batts to be installed in narrow cavities must be cut to fit or narrow cavities must be filled with insulation that upon installation readily conforms to the available cavity space.
Rim joists	Rim joists must be insulated such that the insulation maintains permanent contact with the exterior rim board.
Shower or tub adjacent to exterior wall	Exterior walls adjacent to showers and tubs must be insulated.
Walls	Air permeable exterior building thermal envelope insulation for framed exterior walls must completely fill the cavity, including within stud bays caused by blocking lay flats or headers.

IX. New Section 3280.505 Air infiltration and Air Leakage

HUD Code section 3280.505 imposes standards for the envelope air infiltration along with envelope penetrations and joints between building components. DOE's section 460.104 has similar standards for Building Thermal Envelope Air Leakage and it appears to cover both infiltration and exfiltration. Also,, the HUD code allows for some exceptions to the air infiltration standards for penetrations of the pressure envelope made by electrical equipment, other than distribution panel boards and cable and conduit penetrations (see 240 CFR 3280.505 (a)(1).

Therefore, it would appear that alignment of the two standards would require the use of the DOE standard which is more restrictive. The amended text of 3280.505 is shown below:

§3280.505 Building thermal envelope air leakage.

Manufactured homes must be sealed against air leakage at all joints, seams, and penetrations associated with the building thermal envelope in accordance with the component manufacturer's installation instructions and the requirements set forth in table 1 to3280.505. Sealing methods between dissimilar materials must allow for differential expansion, contraction and mechanical vibration, and must establish a continuous air barrier upon installation of all opaque components of the building thermal envelope. All gaps and penetrations in the exterior ceiling, exterior floor, and exterior walls, including ducts, flue shafts, plumbing, piping, electrical wiring, utility penetrations, bathroom and kitchen exhaust fans, recessed lighting fixtures adjacent to unconditioned space, and light tubes adjacent to unconditioned space, must be sealed with caulk, foam, gasket or other suitable material. The air barrier installation criteria are adapted from section R402 of the 2021 IECC.

Table 1 to §3280.505 Air Barrier Installation Criteria

COMPONENT	AIR BARRIER CRITERIA
Ceiling or attic	The air barrier in any dropped ceiling or dropped soffit must be aligned with the insulation and any gaps in the air barrier must be sealed with caulk, foam, gasket, or other suitable material. Access hatches, panels, and doors, drop-down stairs, or knee wall doors to unconditioned attic spaces must be weather-stripped or equipped with a gasket to produce a continuous air barrier.
Duct system register boots	Duct system register boots that penetrate the building thermal envelope or the air barrier must be sealed to the subfloor, wall covering or ceiling penetrated by the boot, air barrier, or the interior finish materials with caulk, foam, gasket, or other suitable material
Electrical box or phone box on exterior walls	The air barrier must be installed behind electrical and communication boxes or the air barrier must be sealed around the box penetration with caulk, foam, gasket, or other suitable material.
Floors	The air barrier must be installed at any exposed edge of insulation. The bottom board may serve as the air barrier.
Mating line surfaces	Mating line surfaces must be equipped with a continuous and durable gasket.
Recessed lighting	Recessed light fixtures installed in the building thermal envelope must be sealed to the drywall with caulk, foam, gasket, or other suitable material.
Rim joists	The air barrier must enclose the rim joists. The junctions of the rim board and the subfloor must be air sealed.
Shower or tub adjacent to exterior wall	The air barrier must separate showers and tubs from exterior walls.
Walls	The junction of the top plate and the exterior ceiling, and the junction of the bottom plate and the exterior floor, along exterior walls must be sealed with caulk, foam, gasket, or other suitable material.
Windows, skylights, and exterior doors	The rough openings around windows, exterior doors, and skylights must be sealed with caulk or foam.

X. Subpart G –Plumbing Systems; Hot Water Heaters:

The DOE final rule includes new requirements for heated water circulation systems and the insulation of hot water pipes. The following text could be added to 3280.607 Plumbing Fixtures as section (b) (6) as follows:

(6) Service hot water.

(i) Service hot water systems installed by the manufacturer must be installed according to the service hot water manufacturer's installation instructions. Where service hot water systems are installed by the manufacturer, the manufacturer must ensure that any maintenance instructions received from the service hot water system manufacturer are provided with the manufactured home. The service hot water requirements are adapted from section R403 of the 2021 IECC.

(ii) Any automatic and manual controls, temperature sensors, pumps associated with service hot water systems must provide access.

(iii) Heated water circulation systems must–

(AA) Be provided with a circulation pump;

(BB) Ensure that the system return pipe is a dedicated return pipe or a cold water supply pipe;

(CC) Not include any gravity or thermosyphon circulation systems;

(DD) Ensure that controls for circulating heated water circulation pumps start the pump based on the identification of a demand for hot water within the occupancy; and

(EE) Ensure that the controls automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is no demand for hot water.

(iv) All hot water pipes– (1) Outside conditioned space must be insulated to a minimum *R*-value of *R*-3; and (2) From a service hot water system to a distribution manifold must be insulated to a minimum *R*-value of *R*-3.

XI. Duct Sizing

The HUD Code has duct supply and sizing requirements in 24 CFR 3280,715 including performance, minimum thickness, static pressures and duct sizing for heating and cooling. Supply system ducts are considered airtight when the static pressure is at least 80% of the static pressure as measured at the furnace casing. The DOE duct leakage standard shown below could be added as 24 CFR 3280,715 (a) (5) and then renumbering existing subsections (5)-(7),

(5) **Duct system**.

Each manufactured home equipped with a duct system, which may include air handlers and filter boxes, must be sealed to limit total air leakage to less than or equal to four (4) cubic feet per minute per 100 square feet of conditioned floor area at a pressure differential of 0.1 inch w.g. (25 Pascals) across the system. Building framing cavities must not be used as ducts or plenums when directly connected to mechanical systems. The duct total air leakage requirements are adapted from section R403 of the 2021 IECC.

XII. Thermostats

The present HUD code only includes a reference standard for thermostats (ANSI Z21.23-1993, Gas Appliance Thermostats, approved August 10, 1993, IBR approved for § 3280.703) and the same reference standard is shown in 24 CFR 3280,703 Minimum standards. Also, there is a new section that requires heat pumps with supplementary electric resistance heat to be provided with controls that, except during defrost, prevent supplemental heat operation when the pump compressor can meet the heating load. .A new Section could be added to Subpart H of the HUD-code as follows:

3280.716 Thermostats and controls:

(a) At least one thermostat must be provided for each separate heating and cooling system installed by the manufacturer. The thermostat and controls requirements are adapted from section R403 of the 2021 IECC.

(b) Any programmable thermostat installed by the manufacturer that controls the heating or cooling system must–

(1) Be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature set points at different times of the day and different days of the week;

(2) Include the capability to set back or temporarily operate the system to maintain zone temperatures down to 55 °F (13 °C) or up to 85 °F (29 °C); and

(3) Initially be programmed with a heating temperature set point no higher than 70 °F (21 °C) and a cooling temperature set point no lower than 78 °F (26 °C).

(c) Heat pumps with supplementary electric-resistance heat must be provided with controls that, except during defrost, prevent supplemental heat operation when the heat pump compressor can meet the heating load.

XIII. Mechanical Fan Ventilation

The existing HUD code has whole house ventilation standards in 24 CFR.103 (b) and that includes standards for ventilation which can consist of a mechanical, or mechanical and passive system. There is no standard for the minimum efficiency of the mechanical ventilation system. A new subsection (5) could be added to 3280.103(b) as follows with the existing subsections renumbered as (6)-(7):

(5) **Mechanical ventilation fan efficacy**.

(i) Whole-house mechanical ventilation system fans must meet the minimum efficacy requirements set forth in table 1 to 3280.103, except as provided in paragraph (b) of this section. The mechanical ventilation fan efficacy requirements are adapted from section R403 of the 2021 IECC.

Table 1 to §3280.103 Mechanical Ventilation System Fan Efficacy

Fan Type Description	Airflow rate minimum (cfm)	Minimum Efficacy (cfm/watt)
Heat recovery ventilator or energy recovery ventilator	Any	1.2
In-line supply or exhaust fans	Any	3.8
Other exhaust fan	<90	2.8
Other exhaust fan	≥90	3.5

(ii) Mechanical ventilation fans that are integral to heating, ventilating, and air conditioning equipment, including furnace fans as defined in 10 CFR 430.2 are not subject to the efficiency requirements in paragraph (a) of this section.

XIV Equipment Sizing

The HUD Code includes standards for heat producing appliances in 24 CFR 3280.707 and cooling equipment in 3280.511. Subsection (a)(3) should be added to 3280.707 and state as follows:

(3) **Equipment sizing**. Sizing of heating and cooling equipment installed by the manufacturer must be determined in accordance with ACCA Manual S (incorporated by reference based on building loads calculated in accordance with ACCA Manual J (incorporated by reference; see 24 CFR 3280.508). The equipment sizing criteria are adapted from section R403 of the 2021 IECC. A similar revision should be made to 24 CFR 3280.714(a) for cooling equipment.

XV. Suggestions for Updating the Manufactured Home Energy Standards

1. The Reality of Rulemaking Under the Administrative Procedures Act Involving Two Agencies

Given that the DOE energy standards will be effective in May of next year, it will be very difficult for HUD to issue a proposed rule, give the public an opportunity to comment, review and consider the public comments and then issue a final rule by that time. Since the minimum effective date for final changes to the HUD code is six months after publication of the final rule, there will be a lag period when the DOE and HUD energy standards will differ.

2. Coordination between HUD, DOE and EPA

This revision to the HUD code energy and other standards is also the start of a new period of shared responsibility between HUD and DOE. DOE will be revising manufactured home energy standards periodically as the IECC's International Energy Conservation Code triennial code update continues.

There is another major government organization which has a major impact on manufactured housing energy standards and that is the Environmental Protection Agency (EPA) through its Energy Star program. More than 1/3 of the manufactured homes are now being built to the Energy Star requirements. In the case of single section homes, the Energy Star requirements are more stringent than either the HUD-code or the new DOE thermal standards.

In the next several years, EPA will be issuing new energy standards based on the requirements of the recently passed Inflation Reduction Act of 2022. This law allows a $2,500 tax credit for manufactured homes constructed between 01/01/23 and 12/31/24 under the Energy Star Single Family New Homes Program, Version 3.1. Starting in 2025, the credit will be available based on Version 3.2 of the New Homes Program. So EPA will be likely to develop Version 3.2 about the same time as when the IECC will be issuing its updated energy standards in early 2024. Coordination of energy efficiency and other requirements could make the process much easier for manufacturers.

3. Forming an Inter-Agency Working Group on Energy Standards

One model of inter-agency cooperation is the Federal Financial institutions Examination Council (FFIEC) which establishes uniform standards for the finance industry. The FFIEC was established by Congress as was the Appraisal subcommittee/ HUD's Deputy Director of the Office of Single Family Program Development is the Vice-Chair of the Appraisal Subcommittee of the FFIEC.

A manufactured home energy standards council or MHESC could result in more uniform standards and uniform actions in the oversight of manufactured home production. Sharing information, developing uniform supervision and monitoring procedures, ensuring compliance with the standards and enhancing consumer education could be beneficial to manufacturers and home buyers.

4. An Example of an HUD Code Related Inter-agency Rulemaking

In 1996, HUD faced a similar inter-agency rulemaking challenge when it had to amend Chapter J Transportation to update the tire standards for manufactured homes which also impacted the Motor Carrier Act administered by the Department of Transportation's Federal Highway Administration. The process consisted of technical definition of the issue, examination of the alternatives, including cost and availability of the equipment and the particular sections of both DOT and HUD. Through coordination, it was possible to issue a joint rule that amended the Federal Motor Carrier Safety Regulations and a HUD Interpretative Bulletin (see https://www.govinfo.gov/content/pkg/FR-1996-04-23/pdf/96-9717.pdf).

Appendix A: **Section 3280.506 Thermal Standards**

(a) The manufactured home heat loss/heat gain shall be determined by methods outlined in §§ 3280.508 and 3280.509. The Uo (Coefficient of heat transmission) value zone for which the manufactured home is acceptable and the lowest outdoor temperature to which the installed heating equipment will maintain a temperature of 70 F shall be certified as specified in § 3280.510. The Uo value zone shall be determined from the map in figure 1 to this paragraph (a) for Tier One (single section) homes and for Tier 2 (multi-section homes). Figure 1

Tier 1 (Single Section) Home Thermal Zones And U/O Values

U/o for Zone 1: 0.110

U/o for Zone 2: 0.091

U/o for Zone 3: 0.074

ZONE 1	**Zone 2**	**Zone 3**	**Zone 3 con.**
Alabama	Arkansas	Alaska	New Hampshire
American Samoa	Arizona	Colorado	New Jersey
Florida	California	Connecticut	New York
Georgia	Kansas	Delaware	North Dakota
Guam	Kentucky	District of Columbia	Ohio
Hawaii	Missouri	Idaho	Oregon
Louisiana	New Mexico	Illinois	Pennsylvania
Mississippi	North Carolina	Indiana	Rhode Island
South Carolina	Oklahoma	Iowa	South Dakota
Texas	Tennessee	Maine	Utah
The Commonwealth of		Maryland	Vermont
Puerto Rico			Virginia
U.S. Virgin Islands		Massachusetts	Washington
		Michigan	West Virginia
		Minnesota	Wyoming
		Montana	
		Nebraska	
		Nevada	

Figure 2

Tier 2 (Multi Section) Home Thermal Zones and U/O Values

U/o for Zone 1: 0.082

U/o for Zone 2: 0.066

U/o for Zone 3: 0.055

Zone 1	**Zone 2**	**Zone 3**	**Zone 3 con.**
Alabama	Arkansas	Alaska	New Hampshire
American Samoa	Arizona	Colorado	New Jersey
Florida	California	Connecticut	New York
Georgia	Kansas	Delaware	North Dakota
Guam	Kentucky	District of Columbia	Ohio
Hawaii	Missouri	Idaho	Oregon
Louisiana	New Mexico	Illinois	Pennsylvania
Mississippi	North Carolina	Indiana	Rhode Island
South Carolina	Oklahoma	Iowa	South Dakota
Texas	Tennessee	Maine	Utah
The Commonwealth of		Maryland	Vermont
Puerto Rico			Virginia
U.S. Virgin Islands		Massachusetts	Washington
		Michigan	West Virginia
		Minnesota	Wyoming
		Montana	
		Nebraska	
		Nevada	

(b) (b) The overall coefficient of heat transmission (Uo) of the manufactured home for the respective zones and an indoor design temperature of 70 F, including internal and external ducts, and excluding infiltration, ventilation, and condensation control, shall not exceed the Btu/(hr.) (sq. ft.) (F) of the manufactured home envelope are as tabulated in the table to this paragraph (b):

Table 1 to Paragraph (b)

U/O Value Zone	Tier 1 (Single Section) Home	Tier 2 (Multi Section) Home
1	0.110 Btu/(hr.) (sq. ft.) (F).	0.82 Btu/(hr.) (sq. ft.) (F).
2	0.091 Btu/(hr.) (sq. ft.) (F).	0.66 Btu/(hr.) (sq. ft.) (F).
3	0.074 Btu/(hr.) (sq. ft.) (F).	0.55 Btu/(hr.) (sq. ft.) (F).

(c) To assure uniform heat transmission in manufactured homes, cavities in exterior walls, floors, and ceilings must be provided with thermal insulation. For insulation purposes, the fire separation wall between each single family attached manufactured home shall be considered an exterior wall (see subpart K of this part).

(d) Manufactured homes designed for Uo Value Zone 3 shall be factory equipped with storm windows or insulating glass.

Appendix B: **Section 3280.507 Prescriptive Requirements for Building Thermal Envelope**

§3280.507 Building thermal envelope requirements.

(a) *Compliance options*. The building thermal envelope must meet either the prescriptive requirements of paragraph (b) of this section or the performance requirements of paragraph (c) of this section.

(b) *Prescriptive requirements*. (1) The building thermal envelope must meet the applicable minimum *R*-value (nominal value of insulation), and the glazing maximum *U*- factor and SHGC, requirements set forth in table 1 to § 3280.507(b)(1) and table 2 to § 3280.507(b)(2) or component U-values set forth in table 3 to § 3280.507(b)(5) and table 4 to § 3280.507(b)(5).

Table 1 to § 3280.507(b)(1) Tier 1 Building Thermal Envelope Prescriptive Requirements

Climate Zone	Exterior Wall Insulation *R*-value	Exterior Ceiling Insulation *R*-value	Exterior Floor Insulation *R*-value	Window *U*-factor	Skylight *U*-factor	Door *U*-factor	Glazed Fenestration SHGC
1	13	22	22	1.08	0.75	0.40	0.7
2	13	22	19	0.5	0.55	0.40	0.6
3	19	22	22	0.35	0.55	0.40	Not applicable

Table 2 to § 3280.507(b)(1) Tier 2 Building Thermal Envelope Prescriptive Requirements

Climate Zone	Exterior Wall Insulation *R*-value	Exterior Ceiling Insulation *R*-value	Exterior Floor Insulation *R*-value	Window *U*-factor	Skylight *U*-factor	Door *U*-factor	Glazed Fenestration SHGC
1	13	30	13	0.32	0.75	0.40	0.33
2	21	30	19	0.30	0.55	0.40	0.25
3	21	38	30	0.30	0.55	0.40	Not applicable

(2) For the purpose of compliance with the exterior ceiling insulation *R*-value requirement of paragraph (b)(1) of this section, the truss heel height must be a minimum of 5.5 inches at the outside face of each exterior wall.

(3) A combination of *R*-21 batt insulation and *R*-14 blanket insulation may be used for the purpose of compliance with the floor insulation *R*-value requirement of table 2 to § 3280.507(b)(1)**,** Climate Zone 3.

(4) An individual skylight that has an SHGC that is less than or equal to 0.30 is not subject to the glazed fenestration SHGC requirements established in paragraph (b)(1) of this section. Adapted from section R402 of the 2021 IECC.

(5) *U*-factor alternatives to *R*-value requirements. Compliance with the applicable requirements in paragraph (b)(1) of this section may be determined using the applicable maximum *U*-factor values set

forth in table 3 to § 3280.507(b)(5) and table 4 to § 3280.507(b)(5), which reflect the thermal transmittance of the component, excluding fenestration, and not just the insulation of that component, as an alternative to the minimum nominal *R*-value requirements set forth in table 1 to § 3280.507(b)(1) and table 2 to § 3280.507(b)(1), respectively.

Table 3 to § 3280.507(b)(5) *U*-factor Alternatives to Tier 1 *R*-value Requirements

Climate Zone	Exterior Ceiling *U*-factor	Exterior Wall *U*-factor	Exterior Floor *U*-factor
1	0.061	0.094	0.049
2	0.061	0.094	0.056
3	0.061	0.068	0.049

Table 4 to § 3280.507(b)(5) *U*-factor Alternatives to Tier 2 R-value Requirements

Climate Zone	Exterior Ceiling *U*-factor	Exterior Wall *U*-factor	Exterior Floor *U*-factor
1	0.043	0.094	0.078
2	0.043	0.063	0.056
3	0.037	0.063	0.032

(c) *Performance requirements*. (1) The building thermal envelope must have a U_O that is less than or equal to the applicable value specified in table 5 to § 3280.507(c)(1) and table 6 to § 3280.507(c)(1).

Table 5 to § 3280.507(c)(1) Tier 1 Building Thermal Envelope Performance Requirements

Climate Zone	Single-Section U_o
1	0.110
2	0.091
3	0.074

Table 6 to § 3280.507(c)(1) Tier 2 Building Thermal Envelope Performance Requirements

Climate Zone	Multi-Section U_o
1	0.082
2	0.066
3	0.055

(2) Area-weighted average vertical fenestration *U*-factor must not exceed 0.48 in Climate Zone 2 or 0.40 in Climate Zone 3. Adapted from section R402 of the 2021 IECC.

(3) Area-weighted average skylight *U*-factor must not exceed 0.75 in Climate Zone 2 and Climate Zone 3. Adapted from section R402 of the 2021 IECC. (4) Windows, skylights and doors containing more than 50

percent glazing by area must satisfy the SHGC requirements established in paragraph (b)(1) of this section on the basis of an area-weighted average. Adapted from section R402 of the 2021 IECC.

(d) [Reserved].

(e) *Determination of compliance with paragraph (c) of this section*.

(1) U_O must be determined in accordance with Overall *U*-Values and Heating/Cooling Loads – Manufactured Homes (incorporated by reference; see §3280.3)

(2) [Reserved]

Manufactured Housing Institute

November 9, 2022

The Honorable Marcia Fudge
Secretary
U.S. Department of Housing and Urban Development
451 7th Street, S.W.
Washington, DC 20410

RE: Notice of Federal Advisory Committee Meetings: Manufactured Housing Consensus Committee (FR-6348-N-01)

Dear Secretary Fudge,

The Manufactured Housing Institute (MHI) is pleased to provide feedback to the Manufactured Housing Consensus Committee (MHCC) regarding the Notice of Federal Advisory Committee Meetings; Manufactured Housing Consensus Committee ahead of the MHCC's meeting scheduled for November 15-17, 2022. In addition to MHI's comment letter produced before the October 18-20, 2022 MHCC meeting, this will serve as MHI's comments and supporting documentation to the second MHCC meeting. Ahead of the November 15-17, 2022 MHCC meeting, MHI intends to provide additional and supplemental supporting documentation to the committee that will support the proposals of MHI.

As MHI has stated in its previous comment letters dated November 12, 2021, February 28, 2022, and October 10, 2022 attached hereto for reference, the United States is in the midst of an affordable housing crisis. For this and other reasons, the Department of Energy's (DOE) Energy Conservation Standards for Manufactured Housing based on the 2021 International Energy Conservation Code (IECC), and codified at 10 C.F.R. § 460 (the Energy Rule), are not appropriate for adoption by HUD.

By imposing a set of standards different than the Manufactured Home Construction Safety Standards (MHCSS) without consultation with HUD, without proper consideration of cost, and without any consideration of testing and certification, the Energy Rule creates an almost impossible challenge to the industry that constructs the nation's only form of unsubsidized affordable housing. The manufactured housing industry has always supported energy conservation efforts and other reasonable environmental protection initiatives and will continue to do so.

MHI has previously expressed that DOE did not abide by its statutory requirements to consult with HUD or implement standards that are cost effective when considering the primary purpose of manufactured housing as the only unsubsidized form of affordable housing in the United States. In its previous comment letters and during the public comments at the October MHCC meeting, MHI pointed out substantial flaws in DOE's costing analysis and offered cost analysis of its own.

Ahead of the October 2022 MHCC meeting, HUD circulated a Predecisional Draft to the MHCC that did not seek to "align" the MHCSS with the Energy Rule, but rather sought to wholesale adopt and incorporate the Energy Rule by reference, while simultaneously deleting any corresponding section of the MHCSS that dealt with the same subject matter. As previously stated, MHI strongly disagrees with the Predecisional Draft's suggestion that HUD should merely adopt and incorporate by reference the Energy Rule into the MHCSS while deleting corresponding sections of the MHCSS. Combined with a complete lack of testing and compliance methods, there are several provisions of the Energy Rule that impose ambiguous, unworkable, or redundant standards when merely adopted by reference into the MHCSS. The Predecisional Draft's wholesale adoption of the Energy Rule into the MHCSS and its corresponding deletion of MHCSS provisions will result in confusion and unintended negative consequences.

To prevent the adoption of unreasonable and unworkable standards on the industry, MHI presented the MHCC its own proposal regarding the Energy Rule for the October 2022 MHCC meeting. MHI's recommendations included an incremental approach to increased energy efficiency that balanced efficiency with affordability and took into account the specific design and construction standards of today's manufactured homes. This included, among other things, specific changes to the R-values and U-values regarding Tier 2 Building Thermal Envelope Performance Requirements. At the October 2022 MHCC meeting, some members of the MHCC requested that MHI present the documentation that shows how MHI reached its proposed R-values and U-values reflected in its proposal.

In an effort to demonstrate the benefits from adopting MHI's proposal versus wholesale adopting the DOE's Energy Rule, MHI intends to produce to the MHCC three supporting presentations ahead of the November 2022 meeting in supplemental correspondence. MHI is working diligently to finalize its presentations and is committed to providing the MHCC with this supporting documentation for the November meeting. Specifically, MHI plans to provide to the MHCC the following support documents in additional correspondence:

1. **Economic Impact Analysis chart based on the Energy Rule and updated data regarding MHI's proposed thermal requirements.** As will be shown in this chart, we have used the same assumed prototypical house size as used by DOE in its analysis for multi-section houses. Based on those assumptions, we have reviewed several different scenarios to determine whether MHI's proposed thermal requirements will still result in energy cost savings but at a much lower incremental purchase increase to consumers. This model uses the DOE's cost assumptions for incremental energy efficiency measures from DOE's technical support document. This model exemplifies the benefit of the cost savings to the consumer under MHI's proposal as compared to the Energy Rule.

2. **Analysis of DOE's Energy Conservation Standards for Manufactured Housing:** MHI plans on providing a presentation to the committee ahead of the November meeting that will show that DOE's conclusions on cost effectiveness disregard or do not sufficiently consider variation in key cost inputs over time and across groups for buyers and suppliers. Below is a summary of the preliminary conclusions included in the presentation:

- ***Inflation and Cost Increases:*** DOE failed to consider the impact of considerable cost increases and supply chain constraints because of the pandemic and related economic disruptions. *(See Appendixes 1, 2 & 3)*
  - DOE's cost/benefit or life-cycle cost ("LCC") model took cost estimates from 2014 and applied a nominal cost increase of **2.3% annually** from 2014-2023. However, beginning with the Covid-19 pandemic, actual costs for construction materials have grown substantially, and the actual cost increase for construction materials from 2014-2021 is **6.5% annually.** Manufactured housing construction costs may be even higher.
  - DOE assumed a 5% interest rate for land-home deals and a 9% interest rate for home-only deals. The current 30-year fixed mortgage rate is now approximately 7%.
  - Fixing only these two inputs to reflect actual cost inflation and actual interest rates for land/home loans, **based on DOE's own LCC model for Tier 2 homes, approximately 95% of shipments will have a negative 10-year LCC**. That is, for Tier 2 homes, it will take customers 12.6 years for energy savings to offset the increase in purchase price for their home. In geographic terms, of the 19 "representative" cities

chosen by the DOE, 16 of those representative cities will have a negative 10-year LCC for Tier 2 homes. This data accounts for the increased energy savings that result from inflation as well.

- Assuming Tier 2 homes represent 55% of the industry producing approximately 120,000 homes annually, this means that approximately **63,000 homes would have a negative 10-year LCC based on the Energy Rule.**

- ***Disparate Impact:*** DOE has failed to consider disparate impacts on low-income and minority homebuyers.

  - The Energy Rule will disparately impact minority communities even without accounting for actual cost increases. Black or African American manufactured home purchasers are approximately 22.5% more likely to finance their purchase with a home-only loan as compared with a land-home loan. Likewise, Hispanic manufactured home purchases are 11% more likely to finance their purchase with a home-only loan.

  - However, DOE's own LCC model demonstrates that for Tier 2 homes with a 9% home-only loan, **10% of all shipments will have a negative 10-year LCC.** With more realistic, current interest rates approaching 11% for home-only loans, **20% of all shipments will have a negative 10-year LCC.**

  - Thus, without changing DOE's assumptions, minority communities are more likely to finance Tier 2 homes with home-only loans, and **between 10% and 20% of Tier 2 homes with home-only loans with have a negative 10-year LCC (approximately 6,600 to 13,200 homes annually).**

  - The Biden Administration has prioritized housing affordability and racial equity: *"The Federal Government has a critical role to play in overcoming and redressing… [its role in declining to invest in communities of color and in failing to provide equitable access,] and in protecting against other forms of discrimination by applying and enforcing Federal civil rights and fair housing laws. It can help ensure that fair and equal access to housing opportunity exists for all throughout the United States."*

- ***Additional Costs:*** DOE has failed to consider potential costs of testing and compliance, transportation, and supply chain constraints.

  - The Energy Rule failed to account for significant compliance costs. Without limitation, in rural areas, it is estimated that in-field duct testing could cost over $1,000 per home. Many Tier 2, Zone 2 & Zone 3 homes will need 2x6 walls rather than 2x4 which will increase lumber and transportation costs (due to weight). Exclusive of lumber costs, an additional axle may be needed for weight which is another $200 to $250 per home. Transportation costs such as fuel have increased dramatically over the past year. And the industry is experiencing significant supply chain difficulties, especially for fiberglass insulation—a commodity for which supply must increase to comply with the DOE's Final Rule.

  - Before supply chains normalize, the cost for fiberglass insulation will increase drastically and home starts may be limited if there is not enough fiberglass insulation or if plants must use alternatives such as blown insulation. Many in the industry do not believe that there will be enough fiberglass insulation to meet the demand. As such, manufacturers will be forced to pivot to spray foam insulation, which is more costly and labor-intensive. Additionally, the process for the installation of spray foam insulation requires a cooling off period, which will increase the amount of time of the home on the line, decreasing the thru-put, and will inevitably cause fewer home to be built. All of this will inevitably increase the overall cost of the homes to the consumer, none of which has been calculated by DOE.

  - **These unaccounted-for costs will easily subsume the DOE's projected 10-year LCC savings for all manufactured homes.** For Tier 1 homes, DOE projected a national average of $720 10-year LCC savings and for Tier 2 homes, DOE projected a national average of $743 10-year LCC savings. If, for example, in-field duct testing is required which costs approximately $1,000 per home, then all 10-year LCC savings are eliminated.

- ***Affordability and Credit Access:*** DOE has underestimated potential impacts on credit access and lost sales.

  - These additional costs will make home ownership unaffordable for thousands of Americans. To estimate the impact on affordability, the DOE relied upon a 2007 economic study. This study predated the Great Recession, predated the Covid-19 pandemic and the following inflation period, predated the current rise in interest rates, and predated the recent increases in retail prices for manufactured homes which may make potential customers even more price sensitive.

  - **DOE's Final Rule conceded with its sensitivity analysis that over 5,000 families annually will not be able to afford a manufactured home,** and this number is almost certainly understated for the reasons described above. Based on industry information, it is likely that the realistic impact of the implementation of the Energy Rule could actually affect twice as many families.

3. **Architectural drawings and/or data of how the Energy Rule will generally impact the design of manufactured homes as opposed to the design elements of manufactured homes based on current standards.** This presentation of architectural drawings and data will show several different scenarios of how the adoption of the DOE's standards and calculations will negatively impact the aesthetic appearance of manufactured homes. Specifically, the proposed changes to the multi section home energy code (Tier 2) are more severe than the proposed changes for single section homes (Tier 1). The architectural modifications to multisection homes to be in compliance with the Energy Rule will either be more difficult and less appealing, or, in some cases, could be prohibitive.

The above-referenced documentation that MHI will provide ahead of the November MHCC meeting supports its reasoning behind the specific proposed changes to the Energy Rule as contained in MHI's proposal previously supplied to this committee.

MHI does not oppose increased standards for energy efficiency in manufactured homes. MHI supports energy conservation efforts, and our manufacturer members are leading the way in "green" manufacturing - designing and manufacturing homes that save energy and save homebuyers energy costs, with 30% of new homes in 2020 exceeding Energy Star Standards. However, DOE did not abide by its statutory requirements to consult with HUD or implement standards that are cost effective when considering the primary purpose of manufactured housing as the only unsubsidized form of affordable housing in the United States. MHI applauds HUD's efforts to proceed with rulemaking to align the MHCSS with the Energy Rule in an effort to manage the challenges posed by the Energy Rule. HUD has a statutory duty to consider cost when making any changes to the HUD Code and we believe that our recommendations will help ensure energy efficiency improvements do not impact the attainability of manufactured housing.

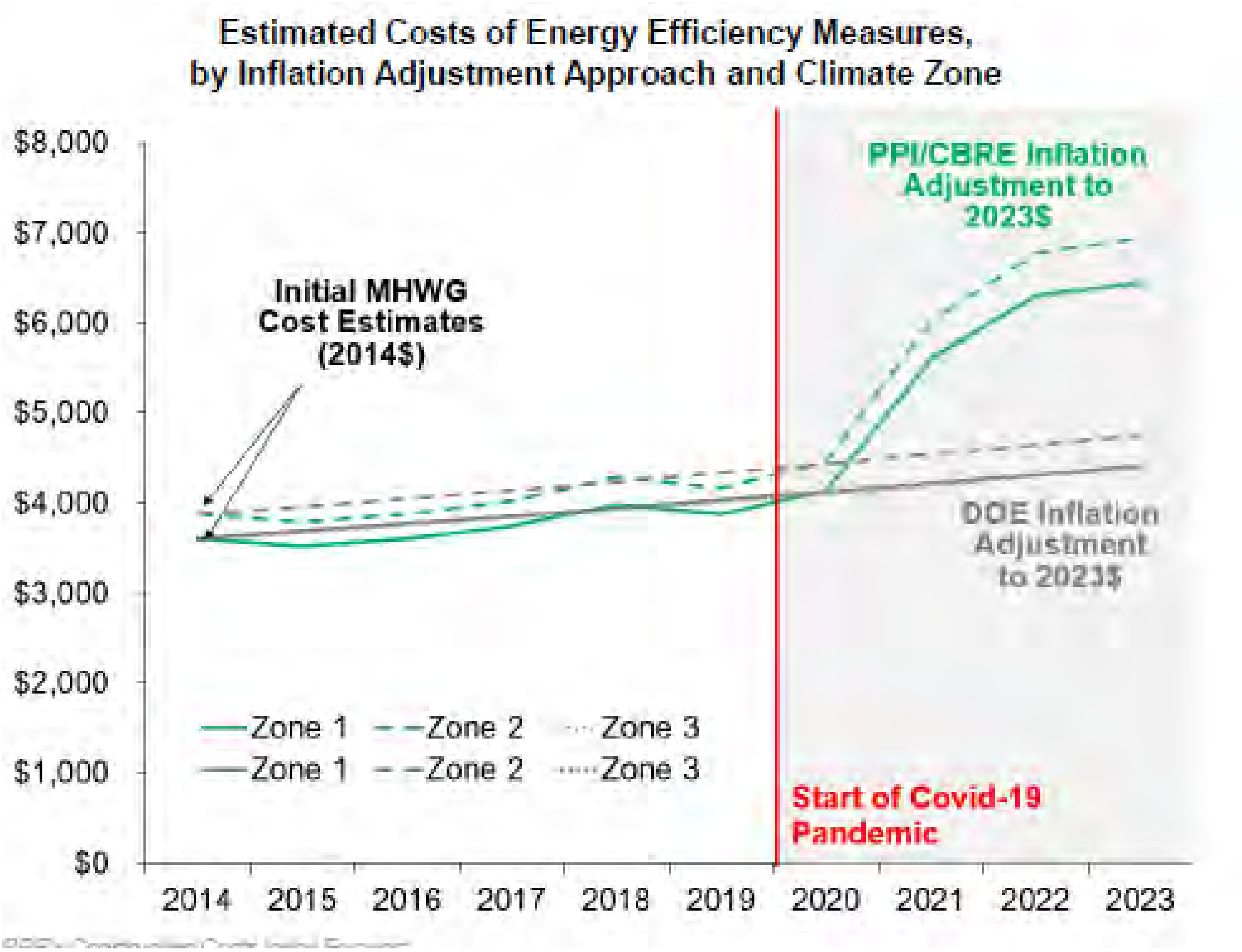
MHI appreciates the opportunity to work with the MHCC, HUD and DOE to realistically improve energy efficiency that not only encourages innovation and conservation but also eliminates regulatory barriers that impede consumer access to safe, affordable manufactured housing. We look forward to sharing the aforementioned information with you as soon as possible.

Sincerely,

Lesli Gooch, Ph.D.
Chief Executive Officer

Enclosures

Appendix 1

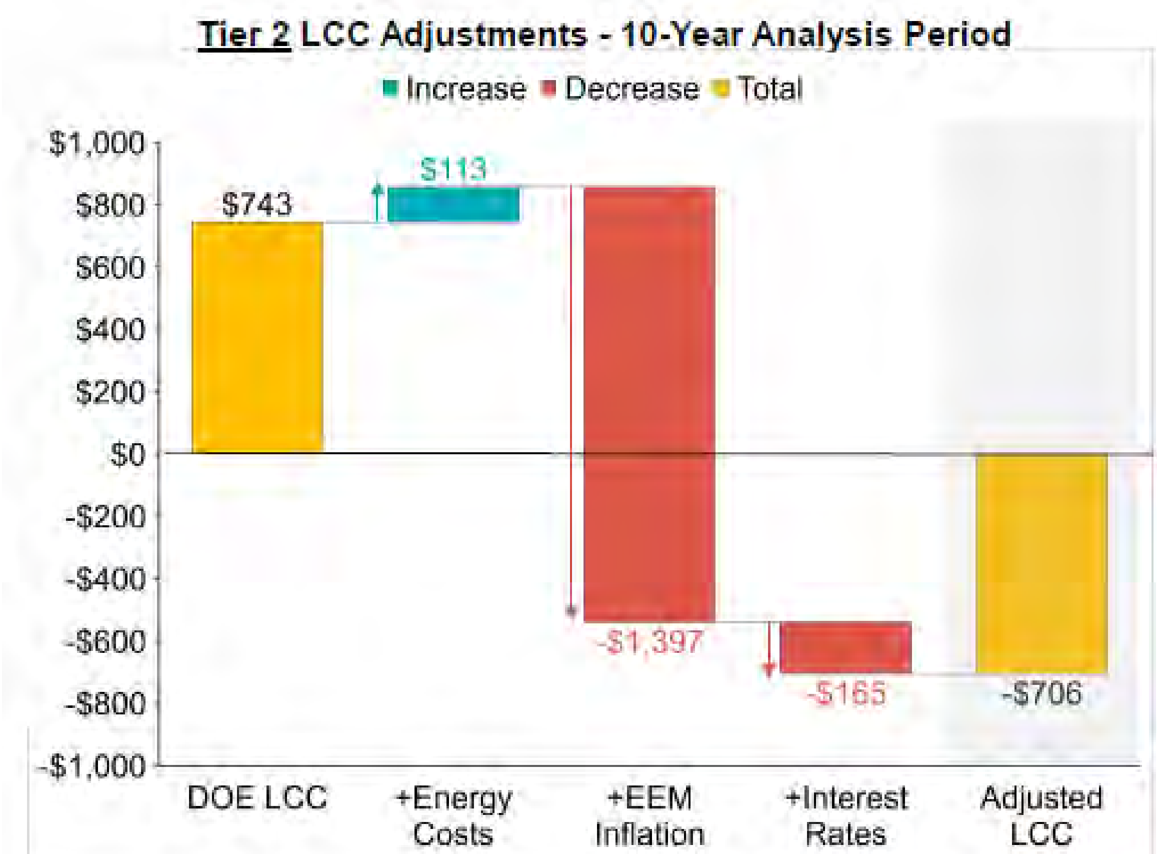


Estimated Costs of Energy Efficiency Measures, by Inflation Adjustment Approach and Climate Zone
$8,000
$7,000
$6,000
$5,000
$4,000
$3,000
$2,000
$1,000
$0
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Initial MHWG Cost Estimates (2014$)
PPI/CBRE Inflation Adjustment to 2023$
DOE Inflation Adjustment to 2023$
Start of Covid-19 Pandemic
Zone 1
Zone 2
Zone 3
Zone 1
Zone 2
Zone 3

Appendix 2


30-Year Fixed Rate Mortgage Average in the United States
January 2014 – November 2022
8%
7%
6%
5%
4%
3%
2%
1%
0%
2014
2015
2016
2017
2018
2019
2020
2021
2022
DOE assumption: 5%
Nov. 3, 2022:
6.95%
Dec. 30, 2021
3.11%

Appendix 3


Tier 2 LCC Adjustments - 10-Year Analysis Period
Increase
Decrease
Total
$1,000
$800
$600
$400
$200
$0
-$200
-$400
-$600
-$800
-$1,000
$743
$113
-$1,397
-$165
-$706
DOE LCC
+Energy Costs
+EEM Inflation
+Interest Rates
Adjusted LCC

October 12, 2022

The Honorable Marcia Fudge
Secretary
U.S. Department of Housing and Urban Development
451 7th Street, S.W.
Washington, DC 20410

RE: Notice of Federal Advisory Committee Meetings: Manufactured Housing Consensus Committee (FR-6348-N-01)

Dear Secretary Fudge,

The Manufactured Housing Institute (MHI) is pleased to provide feedback to the Manufactured Housing Consensus Committee (MHCC) regarding the "Notice of Federal Advisory Committee Meetings: Manufactured Housing Consensus Committee" providing notice of the MHCC's meetings scheduled for October 18-20, 2022 and November 15-17, 2022 for the "the MHCC to propose recommended changes to the Manufactured Home Construction and Safety Standards that align with the Department of Energy's Energy Conservation Standards for Manufactured Housing." This will serve as MHI's comments to the first meeting scheduled for October 18-20, 2022. MHI intends to provide additional and supplemental comments leading up to the second meeting scheduled for November 15-17, 2022.

MHI is the only national trade association that represents every segment of the factory-built housing industry. Our members include builders, suppliers, retail sellers, lenders, installers, community owners, community managers, and others who serve our industry, as well as 48 affiliated state organizations. In 2021, our industry produced nearly 106,000 homes, accounting for approximately nine percent of new single-family home starts. These homes are produced by 35 U.S. corporations in 144 homebuilding facilities located across the country. Today, MHI members represent over 85 percent of all manufactured homes produced and we are pleased to submit the following comments on behalf of this important industry.

The United States is in the midst of an affordable housing shortage crisis. Median home sales prices increased 17 percent in 2021. The average sale price for a new home was $511,000 in 2022. As of the fourth quarter of 2020, the United States had a housing deficit of 3,800,000 units. The share of entry-level homes in overall construction declined from 40 percent in the early 1980s to around seven percent in 2019. By comparison to these figures, the average price of a new manufactured home is $108,100. Today, approximately 22 million people live in manufactured homes, and the average homeowner's median household income is approximately $35,000 per year, far below the national average, and nearly one-third of the average income of all new homebuyers. It is for this reason that many government officials are heralding manufactured housing as the most attainable solution to the nation's affordable housing crisis. Because most manufactured home homeowners have modest incomes, regulations that increase the cost to purchase or maintain a home—even modest cost increases—puts homeownership out of reach for many financially vulnerable consumers. Minorities and the lowest-income consumers are particularly impacted by regulations that increase the price of manufactured homes.

The manufactured housing industry has always supported energy conservation efforts and other reasonable environmental protection initiatives, and will continue to do so. In 2020, more than 30 percent of new manufactured homes were built to meet or exceed Energy Star standards. Moreover, today's manufactured homes already consume significantly less energy than site-built homes. A study of residential energy

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consumption showed that manufactured homes consume the least energy of all types of homes, at 59.8 million BTUs per household, compared to 94.6 million BTUs for single-family detached homes and 70 million BTUs for townhomes. For this and other reasons, the Department of Energy's (DOE) Energy Conservation Standards for Manufactured Housing codified at 10 C.F.R. § 460 (the Energy Rule) based on the 2021 International Energy Conservation Code (IECC), a site-built code not adopted by the vast majority of state and local building departments governing site-built residential construction, is not appropriate for use in manufactured homes.

Through comment letters dated November 12, 2021, and February 28, 2022, attached hereto for reference, MHI provided substantial comments to the Energy Rule. In those comments, MHI expressed that DOE did not abide by its statutory requirements to consult with HUD or implement standards that are cost effective when considering the primary purpose of manufactured housing as the only unsubsidized form of affordable housing in the United States. MHI pointed out substantial flaws in DOE's cost analysis and offered a cost analysis of its own. MHI proposed revisions to the Energy Rule, including an incremental approach to increased energy efficiency that balanced efficiency with affordability and took into account the specific design and construction standards of today's manufactured homes. DOE rejected MHI's analysis and its proposed incremental approach to increased energy efficiency standards.

By imposing a set of standards different than the Manufactured Home Construction Safety Standards (MHCSS) without consultation with HUD, without proper consideration of cost, and without any consideration of testing and certification, the Energy Rule creates an almost impossible challenge to the industry that constructs the nation's only form of unsubsidized affordable housing. The impact of the challenge created by the Energy Rule ultimately will be suffered by the hundreds of thousands of households, particularly those comprised of minorities and the lowest-income consumers, that will be priced out of the ability to obtain homeownership. The Predecisional Draft circulated by HUD to the MHCC does not seek to "align" the MHCSS with the Energy Rule, but rather seeks to wholesale adopt and incorporate the Energy Rule by reference, while simultaneously deleting any corresponding section of the MHCSS that deals with the same subject matter. MHI strongly disagrees with the Predecisional Draft's suggestion that HUD should merely adopt and incorporate by reference the Energy Rule into the MHCSS while deleting corresponding sections of the MHCSS. MHI recommends that HUD revise the MHCSS to comply with HUD's mandate to balance energy efficiency with affordability of manufactured homes so that HUD can maintain preemptive authority over construction and energy efficiency of manufactured homes and align the Energy Rule with the realities of manufactured housing.

1. The Energy Rule is Based on Flawed Calculations and Methodologies, Fails to Consider Design and Construction Standards of Today's Manufactured Homes, Does Not Include Testing and Compliance Requirements, and Will Price Tens of Thousands of Households Out of Homeownership.

DOE's own analysis showed that the Energy Rule will increase costs for homebuyers without reciprocal energy savings. Moreover, DOE used artificial benchmarks of savings to a consumer accumulated over 30 years based on the standards imposed by the Energy Rule compared to the minimum energy efficiency standards of the MHCSS. These benchmarks are flawed for two reasons. First, buyers usually sell their homes within seven to ten years of purchase, and it is highly unlikely that a manufactured homebuyer financing the purchase of a new manufactured home would recover the increased upfront costs of the Energy Rule at a future sale. Second, DOE failed to consider that most manufactured homes today are constructed to energy efficiency standards well above the minimum standards of the MHCSS.[1] Based on these flawed assumptions, DOE determined that the Energy Rule would result in an average cost increase of approximately $700 for a single-section home and $4,100 to $4,500 for a multi-section home. A cost-benefit analysis performed by MHI[2] and

[1] In 2020, over thirty percent of new manufactured homes were built to meet or exceed Energy Star standards.
[2] MHI utilized much more realistic, but still conservative, assumptions of a 20-year loan term and a tenancy period of 10 years.

provided to the DOE demonstrated that the Energy Rule would result in a net loss of up to $5,500 to a consumer for a single-section home and up to $6,800 for a multi-section home depending on the location.

The National Association of Home Builders (NAHB) published a study in 2021 estimating that a $1,000 increase in the median new home price would price 153,967 households out of the market. Based on this study, even under DOE's flawed analysis, hundreds of thousands of households will be unable to obtain homeownership through manufactured housing as a result of the Energy Rule. If DOE had performed a proper cost calculation, then the number of households would be closer to or exceed 1,000,000 households priced out of homeownership. This is particularly so given that interest rates have increased substantially since the publishing of the 2021 NAHB study and close to 80 percent of manufactured home loans are personal property (i.e., chattel) loans that carry higher interest rates than site-built homes affixed to land. It must also be noted that DOE's analysis was based solely on purchase price, not the ability of a homeowner to obtain financing based on debt-to-income ratios and other factors.

The Energy Rule readily admits that DOE "has also not included any potential associated costs of testing, compliance or enforcement at this time."[3] Testing, compliance, and enforcement are integral to energy standards and will materially increase construction costs of manufactured homes and thereby the purchase price for such homes. For example, testing for duct system compliance under the Energy Rule could cost more than $600 per home for single-section homes and more than $1,000 for multi-section homes. If DOE had accounted for the cost of testing procedures related to only this one standard of the Energy Rule, then the average incremental price increase would be 46 percent greater than estimated by DOE for single-section homes and 18 percent greater for multi-section homes. Again, referencing NAHB's 2021 study, this substantial cost not considered by DOE will result in over 100,000 additional households unable to obtain homeownership.

The Energy Rule based on the 2021 IECC, a site-built code, will require vast changes to construction methods not suited for manufactured homes. Most notably, the Energy Rule will require up to 30 percent more insulation in climate zones 2 and 3, which will essentially eliminate construction of 2" x 4" wall framing in these zones in order to make room for increased insulation. It also will require increased roof pitches in these climate zones to make room for increased insulation. Every step in making homes more energy efficient costs more and saves less. Most cost savings come from the first few measures that improve performance. In seeking to optimize investment (i.e., find the best combination of increase costs to savings and efficiency), one must analyze each incremental improvement in efficiency individually. Once an energy measure begins to result in negative cost terms on a specific component, no additional measures to that component should be added. DOE did not perform this analysis, even though it has developed and promotes a Building Optimization Tool that uses this incremental approach to find the optimum investment. MHI proposed an incremental approach to increased energy efficiency standards to be adopted into the Energy Rule, but DOE rejected it.

Finally, the Energy Rule imposed an arbitrary and capricious one-year compliance deadline in contravention of its typical compliance deadline of three to five years for single appliance standards. The Energy Rule will require manufacturers across the manufactured housing industry to redesign and have reapproved by HUD every home design, of which there are thousands, in a one-year period. Manufacturers must then source the new materials required to comply with the Energy Rule during a global supply chain crisis. Of particular note, most manufacturers are currently unable to obtain more fiberglass insulation from suppliers than they already receive. Therefore, they will be forced to reduce production of homes to account for the nearly 30 percent increase in insulation requirements under the Energy Rule. Here again, DOE did not consider this issue in its haste to promulgate the Energy Rule.

[3] 87 Fed. Reg. 32758

2. *Because the MHCSS and the Energy Rule Have Profoundly Different Statutory Mandates, Wholesale Adoption By Reference of the Energy Rule into the MHCSS is Not Appropriate.*

While the MHCSS and the Energy Rule both deal with energy efficiency in manufactured housing, they are created under fundamentally different statutory mandates and are therefore substantially different codes. The Manufactured Home Construction and Safety Standards Act (the Act) expresses the following purpose of the MHCSS[4]:

(1) to protect the quality, durability, safety, and affordability of manufactured homes;
(2) to facilitate the availability of affordable manufactured homes and to increase homeownership for all Americans;
(3) to provide for the establishment of practical, uniform, and to the extent possible, performance-based Federal construction standards for manufactured homes;
(4) to encourage innovative and cost-effective construction techniques for manufactured homes;
(5) to protect residents of manufactured homes with respect to personal injuries and the amount of insurance costs and property damage in manufactured housing, consistent with the purposes of this section;
(6) to establish a balanced consensus process for development, revision, and interpretation of Federal construction and safety standards for manufactured homes and related regulations for the enforcement of such standards;
(7) to ensure uniform and effective enforcement of Federal construction and safety standards for manufactured homes; and
(8) to ensure the public interest in, and need for, affordable housing is duly considered in all determinations relating to the Federal standards and their enforcement.

With regard to energy efficiency of manufactured homes, the Act states that energy conservation standards in the MHCSS "shall take into consideration the design and factory construction techniques of manufactured homes and shall provide for alternative practices that result in net estimated energy consumption equal to or less than the specified standards."[5] The MHCSS itself requires energy efficiency construction methods to be "within the limits of reasonable economics."[6]

In contrast, the Energy Independence and Safety Act (EISA) requires that the Energy Rule "shall be based on the most recent version of the [IECC], except in cases in which the Secretary finds that the code is not cost-effective . . ."[7] In DOE's rulemaking, it expressly stated that "It is important to note that the statutory authority for DOE's rulemaking effort is different from the statutory authority underlying the [MHCSS]."[8] It is worth noting here that DOE failed for years to satisfy EISA's mandate to implement the Energy Rule by December 2011, and only promulgated the Energy Rule in 2022 after Sierra Club filed a lawsuit against it in 2017. As discussed below, DOE's hurried approach to the Energy Rule is evident through its purposeful refusal to include any testing or certification methods.

In sum, the MHCSS and the Energy Rule have fundamentally different statutory mandates. Under the Act, the MHCSS must balance energy efficiency with other critical goals of affordability and increased homeownership. Under EISA, the Energy Rule must start with the IECC, and only may deviate in the limited circumstance where the Secretary of DOE determines the IECC is not "cost effective." DOE acknowledges that it has a separate statutory mandate than HUD, and only carried out that mandate after being sued. DOE

[4] 54 U.S.C. § 5401(b)(underline added)
[5] 54 U.S.C. § 5403(g)
[6] 24 C.F.R. § 3280.505(a)("The goal of the infiltration control criteria is to reduce heat loss/heat gain due to infiltration as much as possible without impinging on health and comfort and within the limits of reasonable economics.")
[7] 42 U.S.C. § 17071(b)(2)(underline added)
[8] 81 FR 39756 (June 17, 2016)

promulgated the Energy Rule without formal rulemaking from HUD involving the MHCC, so the goals of the MHCSS were not considered in promulgating the Energy Rule. Because the MHCSS and Energy Rule have profoundly different statutory mandates, wholesale adoption by reference of the Energy Rule into the MHCSS is not appropriate.

3. There is Precedent For HUD to Draft Specific Language Imposing Standards of Other Regulations Without Wholesale Incorporation.

There is recent precedent for HUD drafting specific language in the MHCSS to be consistent with standards from other regulations rather than adopt other regulations into the MHCSS by wholesale reference. In 2010, Congress passed the Formaldehyde Standards for Composite Wood Products Act (CWPA), which added Title VI to the Toxic Substances Control Act (TSCA), and established formaldehyde emissions standards for all hardwood, plywood, medium-density fiberboard, and particleboard, including when incorporated into finish goods such as manufactured homes.[9] The CWPA required HUD to update its regulations addressing formaldehyde emission standards to ensure consistency with the CWPA standards not later than 180 days after the Environmental Protection Agency (EPA) promulgated regulations under the CWPA.[10] In complying with this requirement, HUD did not merely adopt and incorporate by reference the standards set forth in regulations promulgated under CWPA into the MHCSS. Consistent with its requirement, HUD passed a final rule including specific language applying the standards of EPA regulations in the MHCSS and incorporating only the test methods from these regulations into the MHCSS.

The same result is warranted here but to a greater degree. Unlike CWPA, EISA requires that DOE update the Energy Rule within one year after any revision to the IECC, which typically takes place every three years. Therefore, if HUD adopts by wholesale reference the Energy Rule, then regular future changes to the MHCSS will occur automatically without any consultation or involvement from HUD or the MHCC. A primary example of this is seen in the Predecisional Draft that seeks to delete the climate zone map at 24 C.F.R. § 3280.506 and replace it with the identical climate zone map at 10 C.F.R. § 460.101. If the MHCSS refers only to the climate zone map at 10 C.F.R. § 460.101, then any change by DOE to the climate zone map at 10 C.F.R. § 460.101 would automatically result in substantial changes to the MHCSS without consultation with HUD or the MHCC. The MHCC should follow the precedent set by HUD in relation to the EPA formaldehyde standards in order to ensure that future changes to the Energy Rule do not result in changes to the MHCSS without any consultation with HUD or the MHCC. Specifically, in attempting to align the MHCC with the Energy Rule, HUD must make specific revisions to the MHCC to balance energy efficiency with affordability of manufactured homes as required by the Act rather than adopt the Energy Rule by wholesale reference.

4. Drafting Specific Language Incorporating the Energy Rule Provides the Opportunity to Implement Testing Methods Left Out of the Energy Rule and Align the Energy Rule With the Realities of Manufactured Home Construction.

As described above, the Act requires the MHCC to balance energy efficiency with affordability and increased homeownership. In promulgating the Energy Rule, DOE expressly declined to establish testing, compliance, or enforcement provisions and stated that it wished to "leverage the current HUD inspection and enforcement process."[11] The refusal to include any testing or certification procedures or consider the cost of testing or certification violates DOE's statutory mandate and creates substantial confusion that will increase costs and decrease affordability. Nevertheless, HUD should consider adopting testing methods that determine compliance with its standards.

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[9] 85 FR 5562
[10] *Id.*
[11] 87 Fed. Reg. 32758

Combined with a complete lack of testing and compliance methods, there are several provisions of the Energy Rule that impose ambiguous, unworkable, or redundant standards when merely adopted by reference into the MHCSS. As outlined by the non-exhaustive list of specific examples below, the Predecisional Draft's wholesale adoption of the Energy Rule into the MHCSS and its corresponding deletion of MHCSS provisions will result in confusion and unintended negative consequences.

First, the Predecisional Draft seeks to include a new section at 24 C.F.R. § 3280.716 adopting 10 C.F.R. § 460.205 that requires that sizing of heating and cooling equipment installed by the manufacturer be determined in accordance with ACCA Manual S. ACCA Manual S calculations are determined by the specific municipality in which the home will be sited. While this is feasible for site-built and modular construction where the site is predetermined in advance, it is not feasible for manufactured homes that are constructed to climate zones that are several hundred miles in diameter. Strict requirement of a ACCA Manual S calculation would make it substantially more difficult and expensive for manufacturers to size heating and cooling equipment of stock model homes to be used as inventory, which are the most efficient to manufacture and affordable to purchase. It also would run counter to the goal of the MHCSS to establish uniform performance-based standards where possible.[12] This is another instance where the Energy Rule would make manufactured home construction, that is intended to be the most affordable type of construction, more akin to more expensive modular or site-built construction without any substantial energy efficiency benefit. This unintended consequence could be avoided by, among other things, making ACCA Manual S calculation permissive if feasible or apply only to special orders with a predetermined site.

Second, the Predecisional Draft seeks to delete the current language of 24 C.F.R. § 3280.506 in its entirety and replace it with a reference to 10 C.F.R. §460.101. However, HUD recently revised the MHCSS to include Subpart K at 24 C.F.R. § 3280.1001 *et seq.* pertaining to construction of multi-unit manufactured homes. 24 C.F.R. § 3280.506(c) in its current form applies the heat loss/heat gain provisions to multi-unit manufactured homes by referencing Subpart K and its requirement for fire separation. The Energy Rule has no corresponding application to multi-unit construction. As such, the Predecisional Draft would remove the current application of the heat loss/heat gain requirements to multi-unit construction under Subpart K of the MHCSS. Therefore, in order to give effect to HUD's recent changes to the MHCSS and continue to include requirements for heat loss/heat gain in multi-unit manufactured home construction, HUD should draft specific language aligning 24 C.F.R. § 3280.506 with 10 C.F.R. §460.101 instead of deleting the current MHCSS provision and incorporating by reference the Energy Rule.

Third, the Predecisional Draft seeks to delete 24 C.F.R. § 3280.508 and replace it with a reference to 10 C.F.R. § 460.103 which, among other things, requires that baffles used in conjunction with eave venting be constructed using a solid material "and extend over the top of attic insulation." MHI and several manufacturers commented to DOE that the requirement that baffles "extend over the top of insulation" is somewhat ambiguous as applied to manufactured home construction. This ambiguity can be clarified by, among other things, adding simple language that the baffles must "extend over the top of attic insulation where the insulation is restricted."

Fourth, the Predecisional Draft seeks to delete 24 C.F.R. § 3280.505 and replace it with a reference to 10 C.F.R. § 460.104. When prescribing sealing methods of air barriers around electrical boxes and showers/tubs, 10 C.F.R. § 460.104 merely refers to the "air barrier." However, because manufactured homes use a variety of components as "air barriers," this reference is somewhat ambiguous. This ambiguity can be rectified by, among other things, adding simple language clarifying that "When the interior wall surface acts as an air barrier, "[t]he air barrier must . . ."

[12] 54 U.S.C. § 5401(b)(3)

Fifth, the Predecisional Draft seeks to delete the definitions at 24 C.F.R. § 3280.502 and incorporate the definitions of 10 C.F.R. § 460.2. However, the definition of "window" at 10 C.F.R. § 460.2 has a plain typographical error stating that "Window means win (sic) or other transparent or translucent glazing material. . ." This typographical error can be rectified by drafting language in 24 C.F.R. § 3280.502 stating that "Window means glass or other transparent or translucent material . . ." It cannot be rectified by wholesale incorporation by reference of the Energy Rule.

Because of these and other conflicts, ambiguities, and impossibilities of the Energy Rule when applied to manufactured home construction, wholesale adoption of the Energy Rule into the MHCSS is not appropriate. Because of DOE's refusal to consider these issues, HUD drafting specific revisionary language to the MHCSS is the only way to attempt to clarify and resolve them and make the challenges posed by the Energy Rule more workable to the industry.

Conclusion

Manufactured homes remain the most affordable homeownership option available in the United States today. The Energy Rule is an overly burdensome regulation that will price thousands of consumers out of homeownership in the midst of an affordable housing crisis. The Energy Rule will have a disproportionate impact on minority communities, who face the most significant burden in obtaining affordable homeownership.

The Energy Rule was passed under questionable legal auspices pursuant to a statutory mandate of EISA very different than HUD's mandate under the Act. While MHI and its members will always support sensible energy conservation initiatives, the Predecisional Draft sets a dangerous and unworkable precedent. Moreover, the Predecisional Draft misses numerous opportunities to truly align the Energy Rule to the realities of manufactured home construction and make the challenge presented by the Energy Rule less burdensome on the industry and therefore on consumers. Therefore, MHI urges the MHCC to reject the framework of the Predecisional Draft and advocate to HUD to draft specific language in the MHCSS imposing energy standards that adhere to the realities of manufactured home construction instead of adopting and incorporating wholesale the Energy Rule by reference to the exclusion of existing MHCSS provisions.

Sincerely,

Lesli Gooch

Lesli Gooch, Ph.D.
Chief Executive Officer

Attachment: MHI Letter to DOE about Draft Environmental Impact Statement for Proposed Energy Conservation Standards for Manufactured Housing (EERE-2009-BT-BC-0021).

February 28, 2022

The Honorable Jennifer M. Granholm
Secretary
U.S. Department of Energy
1000 Independence Ave, SW
Washington, DC 20585

Re: Draft Environmental Impact Statement for Proposed Energy Conservation Standards for Manufactured Housing (EERE-2009-BT-BC-0021)

Dear Secretary Granholm,

The Manufactured Housing Institute (MHI) is pleased to provide comments to the Department of Energy (DOE) in response to the draft Environmental Impact Statement (EIS) associated with the proposed rulemaking about energy conservation standards for manufactured housing. We intend this letter to supplement our November 23, 2021, comment letter (Appendix II) on the proposed rule itself.

MHI is the only national trade association that represents every segment of the factory-built housing industry. As a result, our organization is uniquely qualified to provide detailed analysis of the proposed energy standards and to submit recommendations to fix problems in the proposed rule. Our members include home builders, suppliers, retail sellers, lenders, installers, community owners, community operators, and others who serve the industry, as well as 48 affiliated state organizations. In 2021, our industry produced more than 105,000 homes, accounting for approximately nine percent of new single-family home starts. These homes are produced by 33 U.S. corporations in 139 plants located across the country. MHI's members are responsible for close to 85 percent of the manufactured homes produced each year.

With regard to the narrow focus of this request for comment, the EIS, the proposed standards do not take into consideration current construction methods and transportation requirements or testing or compliance requirements. Therefore, the impact of the proposal on consumers and the industry is clearly and significantly underestimated in the EIS both with respect to the expected increase in costs and overall feasibility.

More broadly, we would point out that, to date, the rulemaking process implementing the underlying legislation has been plagued by legal issues, and the proposed rule raises a wide range of legal, policy, environmental, and implementation questions. In an effort to resolve those questions, MHI has attached to this letter specific technical recommendations (see Appendix I) that would address these concerns.

If adopted, these recommendations would result in a final rule that achieves the legislative goal of increased energy efficiency, without threatening low- and moderate-income families with losing the most affordable homeownership option in America, manufactured housing, as a result of excessive cost increases and feasibility challenges in the proposed standard.

Significant Problems with the Proposed Rule

Following is a short summary of the most significant legal, policy, environmental, and implementation questions regarding the proposed rule, which, if left unresolved, would undermine the adoption of a final rule:

1. **Court Injunction.** On February 11, 2022, in *Louisiana v. Biden,* the court adopted an injunction preventing the DOE, among other agencies, from "adopting, employing, treating, as binding, or relying upon" the findings of the Interagency Working Group, the calculations of Social Cost of Greenhouse Gas estimates based on global effects rather than national effects, or otherwise relying upon or

implementing Executive Order 13990 in any manner. It would appear that this injunction applies to the proposed rule since it expressly references Executive Order 13990 and "interim estimates issued in February 2021" based thereon where it states: DOE calculates the value of the reduced emissions of CO2, CH4, and N2O (collectively, greenhouse gases or GHGs) using a range of values per metric ton of pollutant, consistent with the interim estimates issued in February 2021 under Executive Order 13990. Thus, at a minimum, this injunction and the underlying legal issues cast a serious legal cloud on the proposed rule.

2. **Failure to Comply with the Statutory Requirement to be Cost Effective.** As noted in MHI's November comment letter, "The proposed energy standards fail the Energy Independence and Security Act of 2007 (EISA) statutory requirement to use the International Energy Conservation Code (IECC) **"except in cases in which the code is not cost effective** . . ., based on the impact of the Code on the purchase price of manufactured housing and on total life-cycle construction and operation costs." The result is manufactured housing will be less affordable, due to large increases in home sale prices and operating cost increases that exceed energy savings."

3. **Failure to Comply with the Statutory Requirement to Adopt a More Stringent Standard when it would be Cost Effective.** As noted in MHI's November comment letter, "The proposed energy standards fail the Energy Independence and Security Act of 2007 (EISA) statutory requirement to use the International Energy Conservation Code (IECC) **"except in cases in which** . . . **a more stringent standard would be more effective,** based on the impact of the code on the purchase price of manufactured housing and on total life-cycle construction and operation costs." Per this statutory requirement, the rule should have – but was not – developed by incrementally adding more and more efficiency improvements, such as thicker insulation levels, until the next incremental improvement would not be cost-effective.

4. **Failure to Address Legal Issues Regarding Primacy of the HUD Code and the Manufactured Housing Consensus Committee's role in establishing safety and construction standards.** As noted in MHI's November comment letter, in its proposed rule, DOE completely avoided discussion of the primacy of the Manufactured Housing Consensus Committee (MHCC,) with regard to the establishment of manufactured housing safety and construction standards. The proposed rule would propose standards that are inconsistent with existing energy standards as promulgated by the MHCC. We assume the rule's energy requirements would not take effect unless and until the MHCC adopts them, and further that the MHCC could make changes to the proposed requirements. However, these critical legal issues are not addressed in the proposed rule.

5. **Failure to Adequately Consult with HUD, as Required by the Statute.** As noted in MHI's November comment letter, "The proposed energy standards were developed without complying in any meaningful way with the EISA statutory requirement to consult with HUD, resulting in proposed standards that ignore the construction aspects unique to manufactured housing or the negative impact on homebuyer affordability." As a result, the proposal lacks the input of valuable expertise that HUD could have provided with respect to low- and moderate-income family housing affordability issues and the number of homebuyers that would no longer qualify for a mortgage loan because of cost increases and therefore would not achieve homeownership.

6. **Problems with the Environmental Impact Statement.** As noted in the introduction of this letter, the proposed standards do not take into consideration current construction methods and transportation requirements or testing or compliance requirements. Therefore, the impact of the proposal on consumers and the industry is clearly and significantly underestimated in the EIS both with respect to the expected increase in costs and overall feasibility.

Energy Efficiency and Manufactured Housing

MHI and its members have always supported energy conservation efforts and other reasonable environmental protection initiatives, and we will continue to do so. In fact, the vast majority of today's manufactured homes are constructed well above the required energy efficiency standards contained in the HUD Code. Not only are new factory-built homes as efficient as their site-built counterparts, but in 2020, more than 30 percent of new manufactured homes were built to meet or exceed Energy Star standards. Further, the industry is developing programming to engage all stakeholders, from manufacturers to retailers to consumers and energy providers to significantly grow the share of Energy Star.

Today's manufacturers understand the unique aspects associated with building manufactured homes and the downside the DOE's proposal will have in terms of hampering production in an industry that is operating at near capacity and driving up the costs of the only affordable housing solution in the country. The industry is continuously working on projects to improve energy efficiency and currently has four significant energy initiatives underway for manufactured housing. One with the state of California, two projects with the DOE, including one concentrating on developing a "Zero Energy Ready" manufactured home, and one with HUD to re-engineer the design and fabrication of the HVAC system in manufactured homes with all components installed in the plant under HUD's quality control regime.

Manufactured Housing as an Affordable Housing Solution

Any increase in construction costs, even modest increases in response to a new energy conservation standard, could jeopardize homeownership for hundreds of thousands of Americans at time when there is an affordable housing shortage in the country.

In the draft EIS, the DOE acknowledges this by stating that "manufactured home purchases and residents are disproportionately from lower-income and minority populations…. Increase purchase price and up-front costs might reduce access to affordable homeownership for some low-income consumers." The Energy Independence and Security Act (EISA) requires that "energy conservation standards established under this section shall be based on the most recent version of the International Energy Conservation Code (including supplements), except in cases in which the Secretary finds that the code is not cost effective…based on the impact of the code on the purchase price of manufactured housing and on total life-cycle construction and operating costs."

First, the higher home cost associated with the proposed standards will make manufactured housing far more expensive excluding potential buyers and reducing total manufactured housing sales, the latter hurting the industry and contributing to the lack of affordable housing. Second, if households are fortunate enough to qualify for a home that meets the new standards, the home they get will be more, not less, expensive to own.

As shown in DOE's proposal, using sample homes (single- and multi-section), DOE estimated energy savings by comparing homes, in select locations, built to the current HUD energy standards with homes meeting the IECC. As expected, there is a huge difference in energy use (and estimated energy costs) between these benchmarks. The large savings suggests that a whole lot of investment in energy measures can be justified, particularly if the savings are accumulated over 30 years which is an artificial construct. However, the EIS cites American Community Survey data that only "7 percent of manufactured home residents had lived in their home at least 30 years." This demonstrates that the proposal is not cost-effective for consumers and will raise the barrier for entry-level homeownership for millions of Americans at a time when there is an affordable housing shortage in the country.

Further, neither the draft EIS nor the proposed rule includes testing, compliance, or enforcement provisions which DOE says it will address at a later date. Estimating the costs of the proposed changes to consumers, without including these components is impossible, as these could significantly add to costs. Testing requirements for each of the systems being modified in the proposal must be addressed before any rule is finalized, and the costs associated with these must be included in any analysis. Additionally, it is unnecessary for the DOE to develop a new enforcement mechanism with any proposed manufactured housing energy conservation standard because HUD already has an established enforcement mechanism that mandates a uniform standard for design, construction, and installation, including federal requirements for safety, durability, and energy efficiency. Failure to partner with HUD would result in complicated, overlapping requirements that will only increase manufacturing costs, hurting existing homeowners and prospective homebuyers.

Reliance on the International Energy Conservation Code

Utilizing the 2021 International Energy Conservation Code (IECC) – a standard that was designed for site-built homes and NOT manufactured homes – as recommended in the EIS is the wrong standard to utilize. Given that the IECC essentially ignores all the construction aspects unique to manufactured housing, it is an inappropriate code for attempted enforcement upon the manufactured housing industry and could potentially cause factory closures, the loss of thousands of jobs, and an immediate affordable housing crisis for one of the largest sectors in the housing market.

As just one example, the proposed requirements adapted from the IECC will require foam insulation throughout the walls in homes in thermal zone three, in addition to batt insulation which is currently used. Foam insulation is difficult to utilize in a factory setting, expensive and will slow down the production line. Further, adding foam insulation between the studs and siding of a home, could result in separation of the siding during transport and require more on-site labor work to address the issues. Additionally, by increasing the truss heel height, increasing floor joist depth, and adding insulation outside of the studs, as these proposed requirements will require, the overall shipping envelope will change which could prevent shipping a home into an area of the country with low bridges resulting in consumers having to settle for a different style of home, or more than likely, being forced out of the housing market due to a lack of affordable housing.

Implementation Period

In the draft EIS, the DOE proposes a one-year implementation period. However, when the DOE makes changes to appliance standards there is at least a five-year compliance period. For example, on January 6, 2017, the DOE published a final rule to establish energy conservation standards for residential central air conditioners and heat pumps with a compliance date of January 1, 2023 (Docket Number EERE-2014-BT-STD-0048-0200). Additionally, on April 16, 2010, the DOE published amendments to the existing energy conservation standards for residential water heaters, gas-fired direct heating equipment, and gas-fired pool heaters. While the effective date of the rule was June 15, 2010, compliance with the standards was not required until April 16, 2015 (Docket Number EE–2006–BT–STD–0129).

Given that the process for manufactured homes is at least as complex as appliances, a minimum of five years for compliance should apply. If the proposed rulemaking is finalized as written, implementing the changes would require manufacturing plants to completely overhaul their systems and processes. Further, every home design currently being utilized – of which there are thousands – would need to be redesigned and reapproved, further slowing down the production process. Using a one-year implementation will simply stop all manufactured housing production for a significant period of time, taking approximately nine percent of new housing out of the market, at a time when the demand for affordable housing is at its highest.

Conclusion

Efforts to improve energy efficiency should not have the unintended consequence of denying a hardworking family the opportunity to achieve the American Dream of homeownership. If the proposed standards are enacted, there is no question that it will have a negative impact on the ability of entry-level homebuyers to achieve homeownership through manufactured housing. MHI stands ready to work with DOE and HUD on the development of realistic and achievable energy standards, which the industry's proposal reflects, that not only encourages innovation and conservation but also eliminates regulatory barriers that impede consumer access to safe, affordable manufactured housing.

Sincerely,

Lesli Gooch

Lesli Gooch, Ph.D.
Chief Executive Officer

APPENDIX I
Industry's Proposal for Energy Efficiency Standards for Manufactured Housing

MHI and the industry's goal in in developing this alternative manufactured housing energy standard was to provide a concrete example showing how a judicious increase in energy requirements can result in substantially improved energy efficiency *and* greater affordability. In balancing these two considerations, the financial impact of increased efficiency is measured from the homebuyer's perspective. The technical recommendations were developed by incrementally adding more and more efficiency improvements, such as thicker insulation levels, until the next incremental improvement would not be cost effective. The result is a standard that can be implemented without requiring factories to retool or use unproven technologies yet would result in dramatic reductions in energy use that financially benefit buyers of new manufactured homes.

Authority: 42 U.S.C. 17071; 42 U.S.C. 7101 *et seq*.

Subpart A – General

§ 460.1 Scope.

This subpart establishes energy conservation standards for manufactured homes as manufactured at the factory, prior to distribution in commerce for sale or installation in the field. A manufactured home that is manufactured on or after the [DATE ~~1~~ 5 YEAR AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER] must comply with all applicable requirements of this part.

§ 460.2 Definitions.

Adapted from Section R202 of the 2021 IECC and as used in this part–

Access (to) means that which enables a device, appliance or equipment to be reached by ready access or by a means that first requires the removal or movement of a panel or similar obstruction.

Air barrier means one or more materials joined together in a continuous manner to restrict or prevent the passage of air through the building thermal envelope and its assemblies.

Automatic means self-acting or operating by its own mechanism when actuated by some impersonal influence

Building thermal envelope means exterior walls, exterior floors, exterior ceiling,or roofs, and any other building element assemblies that enclose conditioned space or provide a boundary between conditioned space and unconditioned space.

Ceiling means an assembly that supports and forms the overhead interior surface of a building or room that covers its upper limit and is horizontal or tilted at an angle less than 60 degrees (1.05 rad) from horizontal.

Climate zone means a geographical region identified in §460.101.

Conditioned space means an area, room, or space that is enclosed within the building thermal envelope and that is directly or indirectly heated or cooled. Spaces are indirectly heated or cooled where they communicate through openings with conditionedspace, where they are separated from conditioned spaces by uninsulated walls, floors orceilings, or where they contain uninsulated ducts, piping, or other sources of heating or cooling.

Continuous air barrier means a combination of materials and assemblies thatrestrict or prevent the passage of air from conditioned space to unconditioned space.

Door means an operable barrier used to block or allow access to an entrance of a manufactured home.

Dropped ceiling means a secondary nonstructural ceiling, hung below the exterior ceiling.

Dropped soffit means a secondary nonstructural ceiling that is hung below the exterior ceiling and that covers only a portion of the ceiling.

Duct means a tube or conduit, except an air passage within a self-contained system, utilized for conveying air to or from heating, cooling, or ventilating equipment.

Duct system means a continuous passageway for the transmission of air that, in addition to ducts, includes duct fittings, dampers, plenums, fans, and accessory air-handling equipment and appliances.

Eave means the edge of the roof that overhangs the face of an exterior wall and normally projects beyond the side of the manufactured home.

Equipment includes material, devices, fixtures, fittings, or accessories both in the construction of, and in the plumbing, heating, cooling, and electrical systems of a manufactured home.

Exterior ceiling means a ceiling that separates conditioned space from unconditioned space.

Exterior floor means a floor that separates conditioned space from unconditioned space.

Exterior wall means a wall, including a skylight well, that separates conditioned space from unconditioned space.

Fenestration means vertical fenestration and skylights.

Floor means a horizontal assembly that supports and forms the lower interior surface of a building or room upon which occupants can walk.

Glazed or glazing means an infill material, including glass, plastic, or other transparent or translucent material used in fenestration.

Heated water circulation system means a water distribution system in which one or more pumps are operated in the service hot water piping to circulate heated water fromthe water heating equipment to fixtures and back to the water heating equipment.

2021 IECC means the 2021 version of the International Energy

ConservationCode, issued by the International Code Council.

Insulation means material deemed to be insulation under 16 CFR 460.2.

Manufactured home means a structure, transportable in one or more sections, which in the traveling mode is 8 body feet or more in width or 40 body feet or more in length or which when erected onsite is 320 or more square feet, and which is built on a permanent chassis and designed to be used as a dwelling with or without a permanent foundation when connected to the required utilities, and includes the plumbing, heating, air conditioning, and electrical systems contained in the structure. This term includes all structures that meet the above requirements except the size requirements and with respect to which the manufacturer voluntarily files a certification pursuant to 24 CFR 3282.13 and complies with the construction and safety standards set forth in 24 CFR part 3280.
The term does not include any self-propelled recreational vehicle. Calculations used to determine the number of square feet in a structure will be based on the structure's exterior dimensions, measured at the largest horizontal projections when erected on site. These dimensions will include all expandable rooms, cabinets, and other projections containing interior space, but do not include bay windows. Nothing in this definition should be interpreted to mean that a manufactured home necessarily meets the requirements of the U.S. Department of Housing and Urban Development Minimum Property Standards (HUD Handbook 4900.1) or that it is automatically eligible for financing under 12 U.S.C. 1709(b).

Manufacturer means any person engaged in the factory construction or assemblyof a manufactured home, including any person engaged in importing manufactured homes for resale.

Manual means capable of being operated by personal intervention.

Opaque door means a door that is not less than 50 percent opaque in surface area.

R-value (thermal resistance) means the inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unitarea (h × ft^2 × °F/Btu).

Rough opening means an opening in the exterior wall or roof, sized for installation of fenestration.

Service hot water means supply of hot water for purposes other than comfort heating.

Skylight means glass or other transparent or translucent glazing material, including framing materials, installed at an angle less than 60 degrees (1.05 rad) from horizontal, including unit skylights, tubular daylighting devices, and glazing materials insolariums, sunrooms, roofs and sloped walls.

Skylight well means the exterior walls underneath a skylight that extend from the interior finished surface of the exterior ceiling to the exterior surface of the location to which the skylight is attached.

Solar heat gain coefficient (SHGC) means the ratio of the solar heat gain enteringa space through a fenestration assembly to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation that is then reradiated, conducted, or convected into the space.

State means each of the 50 states, the District of Columbia, the Commonwealth of Puerto Rico, Guam, the U.S. Virgin Islands, and American Samoa.

Thermostat means an automatic control device used to maintain temperature at a fixed or adjustable set point.

U-factor (thermal transmittance) means the coefficient of heat transmission (air toair) through a building component or assembly, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films (Btu/h × ft^2 × °F).

Uo (overall thermal transmittance) means the coefficient of heat transmission (air to air) through the building thermal envelope, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films (Btu/h × ft^2 × °F).

Ventilation means the natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, any space.

Vertical fenestration means windows (fixed or moveable), opaque doors, glazed doors, glazed block and combination opaque and glazed doors composed of glass or other transparent or translucent glazing materials and installed at a slope of greater than or equal to 60 degrees (1.05 rad) from horizontal.

Wall means an assembly that is vertical or tilted at an angle equal to greater than60 degrees (1.05 rad) from horizontal that encloses or divides an area of a building or room.

Whole-house mechanical ventilation system means an exhaust system, supply system, or combination thereof that is designed to mechanically exchange indoor air withoutdoor air when operating continuously or through a programmed intermittent schedule to satisfy the whole house ventilation rates.

Window means glass or other transparent or translucent glazing material, including framing materials, installed at an angle greater than 60 degrees (1.05 rad) fromhorizontal.

Zone means a space or group of spaces within a manufactured home with heating or cooling requirements that are sufficiently similar so that desired conditions can be maintained using a single controlling device.

§ 460.3 Materials incorporated by reference.

(a) Certain material is incorporated by reference into this subpart with the approval of the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. To enforce any edition other than that specified in this section, DOE must publish a document in the Federal Register and the material must be available to the public. All approved material is available for inspection at the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, Sixth Floor, 950 L'Enfant Plaza SW., Washington, DC 20024, (202) 586–2945, *https://www.energy.gov/eere/buildings/appliance-and-equipment-standards-program*, and may be obtained from the other sources in this section. It is also available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, email: *fedreg.legal@nara.gov*,or go to: *www.archives.gov/federal-register/cfr/ibr-locations.html.*

(b) *ACCA*. Air Conditioning Contractors of America, Inc., 2800 S. ShirlingtonRoad, Suite 300, Arlington, VA 22206, 703-575-4477, *www.acca.org/*.

~~(1) ANSI/ACCA 2 Manual J–2016 ("ACCA Manual J"), *Manual J– Residential Load Calculation (8th edition)*, Copyright 2016. IBR approved for §460.205.~~

~~(2) ANSI/ACCA 3 Manual S–2014 ("ACCA Manual S"), *Manual S– Residential Equipment Selection (2nd Edition)*, Copyright 2014. IBR approved for §460.205.~~

(c) *PNL*. Pacific Northwest Laboratory, Richland, WA 99352, 800-245-2691, *www.huduser.org/portal/publications/manufhsg/uvalue.html.*

(1) PNL–8006, ("Overall *U*-values and Heating/Cooling Loads–ManufacturedHomes"), *Overall U-Values and Heating/Cooling Loads–Manufactured Homes*, C. C. Conner and Z. T. Taylor, February 1, 1992. IBR approved for §460.102(e)(1).

~~(2) [Reserved].~~

~~**§ 460.4 Energy conservation standards.**~~

~~(a) *General.* Energy conservation standard tier thresholds presented in paragraphs (b) and (c) of this section must be adjusted to the most recently available Annual Energy~~

~~Outlook (AEO) gross domestic product (GDP) time series.~~

~~(b) *Tier 1*. A manufactured home for which the manufacturer's retail list price is $55,000 or less in real 2019$ (*i.e.*, a Tier 1 manufactured home) must comply with all applicable requirements in subparts B and C of this part.~~

~~(c) *Tier 2*. A manufactured home for which the manufacturer retail list price is greater than $55,000 in real 2019$ (*i.e.*, a Tier 2 manufactured home) must comply with all applicable requirements in subparts B and C of this part.~~

Subpart B – Building Thermal Envelope

§ 460.101 Climate zones.

Manufactured homes subject to the requirements of this subpart must comply withthe requirements applicable to one or more of the climate zones set forth in Figure 460.101 and Table 460.101 of this section.

Figure 460.101 Climate Zones

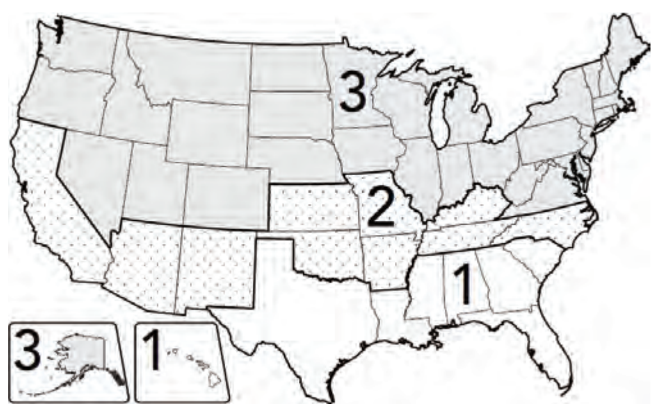

Table 460.101 U.S. States and Territories per Climate Zone

ZONE 1	ZONE 2	ZONE 3
Alabama	Arkansas	Alaska
American Samoa	Arizona	Colorado
Florida	California	Connecticut
Georgia	Kansas	Delaware
Guam	Kentucky	District of Columbia
Hawaii	Missouri	Idaho
Louisiana	New Mexico	Illinois

Mississippi	North Carolina	Indiana
South Carolina	Oklahoma	Iowa
Texas	Tennessee	Maine
The Commonwealth of Puerto Rico		Maryland
U.S. Virgin Islands		Massachusetts
		Michigan
		Minnesota
		Montana
		Nebraska
		Nevada
		New Hampshire
		New Jersey
		New York
		North Dakota
		Ohio
		Oregon
		Pennsylvania
		Rhode Island
		South Dakota
		Utah
		Vermont
		Virginia
		Washington
		West Virginia
		Wisconsin
		Wyoming

§ 460.102 Building thermal envelope requirements.

(a) *Compliance options*. The building thermal envelope must meet either the prescriptive requirements of paragraph (b) of this section or the performance requirements of paragraph (c) of this section.

(b) *Prescriptive requirements*. (1) The building thermal envelope must meet the applicable minimum *R*-value (nominal value of insulation), and the glazing maximum *U*-factor and SHGC~~,~~ ~~requirementsset~~requirements set forth ~~forth~~ in Table~~s~~ 460.102-1 ~~and~~ or component U-value set forth in Table 406.102-2 ~~460.102-2~~ of this section.

~~**Table 460.102-1 Tier 1 Building Thermal Envelope Prescriptive Requirements**~~

~~Climate Zone~~	~~Exterior Wall Insulation *R*-value~~	~~Exterior Ceiling Insulation *R*-value~~	~~Exterior Floor Insulation *R*-value~~	~~Window *U*-factor~~	~~Skylight *U*-factor~~	~~Door *U*-factor~~	~~Glazed Fenestration SHGC~~
~~1~~	~~111 3~~	~~252 2~~	~~22~~	~~1.08~~	~~0.7 5~~	~~0.40~~	~~0.7~~
~~2~~	~~111 3~~	~~252 2~~	~~19~~	~~0.5~~	~~0.5 5~~	~~0.40~~	~~0.6~~
~~3~~	~~19~~	~~22~~	~~22~~	~~0.35~~	~~0.5 5~~	~~0.40~~	~~Not applicable~~

Table 460.102-~~2~~ 1 ~~Tier 2 Building Thermal~~ Envelope Prescriptive Requirements

Climate Zone	Exterior Wall Insulation *R*-value	Exterior Ceiling Insulation *R*-value	Exterior Floor Insulation *R*-value	Window *U*-factor	Skylight *U*-factor	Door *U*-factor	Glazed Fenestration SHGC
1	13	30	13	0.~~3~~ ~~2~~50	0.7 5	0.40	0.33
2	~~21 or 13+ 520 +5~~ 13	30	19	0.~~3~~ ~~0~~35	0.5 5	0.40	0.25

3	~~21 or 13+5 20+5~~15	38	~~30~~25	0.~~3~~ ~~0~~32	0.55	0.40	Not applicable

(2) For the purpose of compliance with the exterior ceiling insulation *R*-value requirement of paragraph (b)(1) of this section, the truss heel height must be a ~~minimum of~~minimum of5.5 inches at the outside face of each exterior wall.

(3) A combination of R-21 batt insulation and R-14 blanket insulation may be used for the purpose of compliance with the floor insulation R-value requirement of Table 460.102-~~2~~1, climate zone 3.

(4) An individual skylight that has an SHGC that is less than or equal to 0.30 is not subject to the glazed fenestration SHGC requirements established in paragraph (b)(1) of this section. ~~Adapted from section R402 of the 2021 IECC.~~

(5) *U*-factor alternatives to *R*-value requirements. Compliance with the applicable requirements in paragraph (b)(1) of this section may be determined using the maximum component *U*-factor values set forth in Tables 460.102-~~3~~ 2~~and 460.102-4~~, which reflect the thermal transmittance of the component, excluding fenestration, and not just the insulation of thatcomponent, as an alternative to the minimum nominal *R*-value requirements set forth in Tables 460.102-1~~ and 460.102-2, respectively~~.

- ~~[R402.3.3]~~ Glazed fenestration exemption. Not greater than 15 square feet (1.4 m2) of glazed fenestration per dwelling unit shall be exempt from the U-factor and SHGC requirements- (Table 460.120-1)~~in Section R402.1.2~~. This exemption shall not apply to the Total U~~A~~-value alternative ~~in Section R402.1.5~~(Table 460.120-2).
- ~~[R402.3.4]~~ Opaque door exemption. One side-hinged opaque door assembly

not greater than 24 square feet (2.22 m2) in area shall be exempt from the U-factor requirement (Table 460.120-1). This exemption shall not apply to the Total U-value alternative (Table 460.120-2).~~in Section R402.1.2. This exemption shall not apply to the Total UA alternative in Section R402.1.5.~~

~~**Table 460.102-3 *U*-factor Alternatives to Tier 1 *R*-value Requirements**~~

~~Climate Zone~~	~~Exterior Ceiling *U*-factor~~		~~Exterior Wall *U*-factor~~	~~Exterior Floor *U*-factor~~
	~~Single-section~~	~~Multi-section~~		
~~1~~	~~0.061~~	~~0.057~~	~~0.094~~	~~0.049~~
~~2~~	~~0.061~~	~~0.057~~	~~0.094~~	~~0.056~~
~~3~~	~~0.061~~	~~0.057~~	~~0.068~~	~~0.049~~

Table 460.102-~~4~~2 U-~~factor~~value Alternatives to ~~Tier 2~~ *R*-value Requirements

Climate Zone	Exterior Ceiling *U*-~~factor~~value		Exterior Wall *U*-~~factor~~value	Exterior Floor *U*-~~factor~~value
	Single-section	Multi-section		
1	0.045	0.043	0.094	0.078
2	0.045	0.043	0.09~~4~~~~47~~	0.056
3	0.038	0.037	0.07~~6~~~~47~~	0.~~032~~036

(c) *Performance requirements.* (1) The building thermal envelope must have a Uo-value that is less than or equal to the applicable value specified in Tables 460.102-~~5~~ 3~~and 460.102-6 of this section~~.

Table 460.102-3~~5~~ ~~Tier 1 Building Thermal& Multi-~~ Thermal Envelope Performance Requirements

Climate Zone	Single-Section Uo-value	Multi-Section Uo-value~~Multi-~~

		~~Section *Uo*~~
1	0.093~~0.110~~	0.090~~0.096~~
2	0.081~~0.091~~	0.076~~0.079~~
3	0.065~~0.074~~	0.061~~0.073~~

~~**Table 460.102-6 Tier 2 Building Thermal Envelope Performance Requirements**~~

~~Climate Zone~~	~~Single-Section *Uo*~~	~~Multi-Section *Uo*~~
~~1~~	~~0.086~~	~~0.082~~
~~2~~	~~0.0760.062~~	~~0.0730.063~~
~~3~~	~~0.0670.053~~	~~0.0640.052~~

(1) Area-weighted average vertical fenestration *U*~~-factor~~value must not exceed 0.48 inclimate zone 2 or 0.40 in climate zone 3.~~ Adapted from section R402 of the 2021 IECC.~~

(2) Area-weighted average skylight *U*-factor must not exceed 0.75 in climate zone 2 and climate zone 3.~~ Adapted from section R402 of the 2021 IECC.~~

(3) Windows, skylights and doors containing more than 50 percent glazing by area must satisfy the SHGC requirements established in paragraph (b)(1) of this section on the basis of an area-weighted average.~~ Adapted from section R402 of the 2021 IECC.~~

(d)) *Determination of compliance with paragraph (c) of this section*. (1) *Uo*~~- must~~value must be determined in accordance with Overall *U*-Values and Heating/Cooling Loads – Manufactured Homes (incorporated by reference; see §460.3)

~~(2) [Reserved]~~

§ 460.103 Installation of insulation.

Insulating materials must be installed according to the insulation manufacturer's installation instructions and the requirements set forth in Table 460.103 of this section, ~~which is adapted from section R402 of the 2021 IECC.~~

Table 460.103 Installation of Insulation

COMPONENT	INSTALLATION REQUIREMENTS
General	Air-permeable insulation must not be used as a material to establish the air barrier.
Access hatches, panels, and doors	Access hatches, panels, and doors between conditioned space and unconditioned space must be insulated to a level equivalent to the insulation of the surrounding surface, must provide access to all equipment that prevents damaging or compressing the insulation, and must provide a wood-framed or equivalent baffle or retainer when loose fill insulation is installed within an exterior ceiling assembly to retain the insulation both on the access hatch, panel, or door and within the building thermal envelope.
Baffles	Baffles must be constructed using a solid material, maintain an opening equal or greater than the size of the vents, and extend over the top of the attic insulation where insulation is restrained from full depth in order to maintain 1' minimum air space between insulation and roof decking~~.~~
Ceiling or attic	The insulation in any dropped ceiling or dropped soffit must be aligned with ~~the air~~the air barrier.
~~Eave vents~~	~~Air-permeable insulations in vented attics within the building Thermal envelope must be installed adjacent to eave vents.~~
Narrow cavities	Batts to be installed in narrow cavities must be cut to fit or narrow cavities must be filled with insulation that upon installation readily conforms to the available cavity space.
Rim joists	Rim joists must be insulated such that the insulation maintain permanent contact with the exterior rim board.
Shower or tub adjacent to exterior wall	Exterior walls adjacent to showers and tubs must be insulated.
Walls	Air permeable exterior building thermal envelope insulation for framed exterior walls must completely fill the cavity, including within stud bays caused by blocking lay flats or headers.

§ 460.104 Building thermal envelope air leakage.

Manufactured homes must be sealed against air leakage at all joints, seams, and penetrations associated with the building thermal envelope in accordance with the component manufacturer's installation instructions and the requirements set forth in Table 460.104 of this section. Sealing methods between dissimilar materials must allow for differential expansion, contraction and mechanical vibration, and must establish a continuous air barrier upon installation of all opaque components of the building thermal envelope. All gaps and penetrations in the exterior ceiling, exterior floor, and exterior walls, including ducts, flue shafts, plumbing, piping, electrical wiring, utility penetrations, bathroom and kitchen exhaust fans, recessed lighting fixtures adjacent to unconditioned space, and light tubes adjacent to unconditioned space, must be sealed with caulk, foam, gasket or other suitable material. ~~The air barrier installation criteria is adapted from section R402 of the 2021 IECC.~~

Table 460.104 Air Barrier Installation Criteria

COMPONENT	AIR BARRIER CRITERIA
Ceiling or attic	The air barrier in any dropped ceiling or dropped soffit must be aligned with the insulation and any gaps in the air barrier must be sealed with caulk, foam, gasket, or other suitable material. Access hatches, panels, and doors, drop-down stairs, or knee wall doors to unconditioned attic spaces must be weather-stripped or equipped with a gasket to produce a continuous air barrier.
Duct system register boots	Duct system register boots that penetrate the building thermal envelope or the air barrier must be sealed to the subfloor, wall covering or ceiling penetrated by the boot, air barrier, or the interior finish materials with caulk, foam, gasket, or other suitable material.
Electrical box or phone box on exterior walls	The air barrier must be installed behind electrical and communication boxes or the air barrier must be sealed around the box penetration with caulk, foam, gasket, or other suitable material.
Floors	The air barrier must be installed at any exposed edge of insulation. The bottom board may serve as the air barrier.
Mating line surfaces	Mating line surfaces must be equipped with a continuous and durable gasket.
~~Recessed lighting~~	~~Recessed light fixtures installed in the building thermal envelope must be sealed to the drywall with caulk, foam, gasket, or other suitable material.~~
Rim joists	The air barrier must enclose the rim joists. The junctions of the rim board ~~to the sill plate and the rim board~~ and the subfloor must be air sealed.
Shower or tub adjacent to exterior wall	The air barrier must separate showers and tubs from exterior Walls when interior wall surface is used as an air barrier~~.~~
Walls	The junction of the top plate and the exterior ceiling, and the junction of the bottom plate and the exterior floor, along exterior walls must be sealed with caulk, foam, gasket, or other suitable material.
Windows, skylights, and exterior	The rough openings around windows, exterior doors, and skylights must be sealed with caulk or foam.

COMPONENT	AIR BARRIER CRITERIA
doors	

Subpart C – HVAC, Service Hot Water, and Equipment Sizing

§460.201 Duct system.

Each manufactured home equipped with a duct system, which may include air handlers and filter boxes, must have supply ducts and be sealed to limit total air leakage to less than or equal tofour (4) cubic feet per minute per 100 square feet of conditioned floor area. Building framing cavities must not be used as ducts or plenums when directly connected to mechanical systems. ~~The duct total air leakage requirements are adapted from section R403 of the 2021 IECC.~~

Duct systems must be sealed against air leakage in accordance with the duct manufacturer's installation instructions and the following provisions:

- All metal ducts and fittings shall be sealed. For glass fiberboard ducts, the manufacturer's sealing instructions shall be followed. Sealants are in addition to mechanical fastening (if used).
- Connections and routing of manufacturer installed ductwork completed without kinks or sharp bends that would significantly impede air flow.
- Flexible ducts in unconditioned space not installed in cavities smaller than outer duct diameter; in conditioned space not installed in cavities smaller than inner duct diameter

§460.202 Thermostats and controls.

(a) At least one thermostat must be provided for each separate heating and coolingsystem installed by the manufacturer. The thermostat and controls requirements are adapted from section R403 of the 2021 IECC.

(b) Programmable thermostat. Any thermostat installed by the manufacturer that controls the heating or cooling system must–

(1) Be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature set points at different times of the day and different days of the week;

(2) Include the capability to set back or temporarily operate the system tomaintain zone temperatures down to 55 °F (13 °C) or up to 85 °F (29 °C); and

(3) ~~Initially be programmed with a heating temperature set point no higher than70 °F (21 °C) and a cooling temperature set point no lower than 78 °F (26 °C).~~ Homeowner manuals should include recommendation that homeowners program thermostat with a heating temperature set point no higher than 70 °F (21 °C) and a cooling temperature set point no lower than 78 °F (26 °C).

(c) Heat pumps with supplementary electric-resistance heat must be provided with controls that, except during defrost, prevent supplemental heat operation when the heat pump compressor can meet the heating load.

§ 460.203 Service hot water.

(a) Service hot water systems installed by the manufacturer must be installed according to the service hot water manufacturer's installation instructions. ~~Where service hot water systems are installed by the manufacturer, the manufacturer must ensure that any maintenance instructions received from the service hot water system manufacturer are provided with the manufactured home The service hot water requirements are adapted from section R403 of the 2021 IECC.~~

(b) Any automatic and manual controls, temperature sensors, pumps associatedwith service hot water systems must provide access.

(c) Heated water circulation systems must–

(1) Be provided with a circulation pump;

(2) Ensure that the system return pipe is a dedicated return pipe or a cold watersupply pipe;

(3) Not include any gravity or thermosyphon circulation systems;

(4) Ensure that controls for circulating heated water circulation pumps start thepump based on the identification of a demand for hot water within the occupancy; and

(5) Ensure that the controls automatically turn off the pump when the water in thecirculation loop is at the desired temperature and when there is no demand for hot water.

(d)) All hot water pipes–
~~(1)~~ Outside conditioned space must be insulated to a minimum *R*-value of *R*-3,~~;~~
~~(2)~~
and

~~(3)~~ From a service hot water system to a distribution manifold must be insulatedto a minimum *R*-value of *R*-3.

~~(4)~~

~~**§460.205 Equipment sizing.**~~

~~Sizing of heating and cooling equipment installed by the manufacturer must be determined in accordance with ACCA Manual S (incorporated by reference; see §460.3) based on building loads calculated in accordance with ACCA Manual J (incorporated by reference; see §460.3). The equipment sizing criteria are adapted from section R403 of the 2021 IECC.~~

Manufactured Housing Institute

November 23, 2021

The Honorable Jennifer M. Granholm
Secretary
U.S. Department of Energy
1000 Independence Ave. SW
Washington, DC 20585

Re: Energy Conservation Program: Energy Conservation Standards for Manufactured Housing (EERE-2009-BT-BC-0021)

Dear Secretary Granholm,

The Manufactured Housing Institute (MHI) is pleased to provide comments to the Department of Energy (DOE) in response to the supplemental notice of proposed rulemaking titled "Energy Conservation Program: Energy Conservation Standards for Manufactured Housing." While we appreciate DOE listening to the feedback it has received and providing updated data and analysis, as well as extending the comment deadline, the proposed rule is still not workable for the manufactured housing industry and homebuyers seeking affordable homeownership.

MHI is the only national trade association that represents every segment of the factory-built housing industry. Our members include home builders, suppliers, retail sellers, lenders, installers, community owners, community operators, and others who serve the industry, as well as 48 affiliated state organizations. In 2020, our industry produced nearly 95,000 homes, accounting for approximately nine percent of new single-family home starts. These homes are produced by 33 U.S. corporations in 138 plants located across the country. MHI's members are responsible for close to 85 percent of the manufactured homes produced each year.

To be clear, MHI and its members have always supported energy conservation efforts and other reasonable environmental protection initiatives, and we will continue to do so. Not only are new factory-built homes as efficient as their site-built counterparts, but in 2020, more than 30 percent of new manufactured homes were built to meet or exceed Energy Star standards. Further, today's manufactured homes already offer many energy efficient options. Just like site-built homes, manufactured homes are constructed and fitted with energy efficient features that are tailored to the climate demands of the region in which each home will be sited.

Today's manufactured homes already consume significantly less energy than site-built homes. According to the U.S. Energy Information Administration, "most energy end-uses are correlated with the size of the home. As square footage increases, the burden on heating and cooling equipment rises, lighting requirements increase, and the likelihood that the household uses more than one refrigerator increases. Square footage typically stays fixed over the life of a home and it is a characteristic that is expensive, even impractical to alter to reduce energy consumption."[1] According to the U.S. Census Bureau, the median size of a completed single-family house in 2020 was 2,261 square feet, while the median size of a manufactured home was 1,338 square feet. The significant difference is size correlates with a significant reduction in energy usage. A study of residential energy consumption showed that manufactured homes consume the least energy of all types of homes, at 59.8 million BTUs per household, compared to 94.6 million BTUs for single-family detached homes and 70 million BTUs for townhomes.[2]

[1] https://www.eia.gov/consumption/residential/reports/2009/square-footage.php

[2] ce1.1.xlsx (eia.gov)

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Further, the controlled environment of the factory-built process not only offers consumers unmatched quality and affordability due to technological advancements and other advantages, but the industry is a pioneer in the development of processes that value efficiency and reduce waste. Our in-factory home builder members are constantly developing new initiatives and technologies, such as comprehensive recycling programs, to reduce waste. The factory-built process utilizes exact dimensions and measurements for most building materials, eliminating waste. Today's modern manufacturing plants are so efficient that nearly everything is reused or recycled such as cardboard, plastic, carpet padding, vinyl siding, scrap wood and much more.

The proposal provided by the DOE will add significant costs to manufactured homes, which are currently the most affordable, unsubsidized homeownership option for American families. Any increase in construction costs, even modest increases in response to a new energy conservation standard, could jeopardize homeownership for hundreds of thousands of Americans at time when there is an affordable housing shortage in the country. As currently drafted, the proposed rule would:

- Contradict the objectives of the Administration's January Executive Order on "Advancing Racial Equity and Support for Underserved Communities" and undermine the Administration's September initiative to "Increase Affordable Housing Supply."

- Significantly raise the cost of new manufactured homes by an average of $3,914 to $5,200 for most new manufactured homes with an estimated cost increase of over $7,000 for a multi-section home located in climate zone 3 – without including the costs of energy testing or compliance (Tier 2 Standard) – thereby exacerbating homeownership affordability challenges in the wake of the recent escalation of home prices.

- Fail the statutory requirement of being cost effective, by increasing the cost of owning a new manufactured home by more than claimed energy savings.

Thus, MHI makes the following comments and recommendations regarding the proposed rule:

1. The proposed energy standards fail the Energy Independence and Security Act of 2007 (EISA) statutory requirement to use the International Energy Conservation Code (IECC) "except in cases in which the code is not cost effective or a more stringent standard would be more effective, based on the impact of the code on the purchase price of manufactured housing and on total life-cycle construction and operation costs." The result is manufactured housing will be less affordable, due to large increases in home sale prices and operating cost increases that exceed energy savings.

2. The $55,000 or $63,000 low-income price cap threshold for streamlined energy efficiency requirements should be eliminated or significantly increased to at least $110,260. Further, if the DOE proceeds with a tiered approach, the Department must seriously consider, as it did in its updated data and analysis, an alternative approach such as square footage or sections. Not doing this would result in DOE failing to accomplish its stated goal of protecting low-income homebuyers from steep price increases resulting from the new standards.

3. The proposed energy standards are inappropriate for the manufactured housing industry as they do not take into consideration the current construction methods, transportation demands and short on-site completion duration unique to manufactured housing. Further, they do not include testing requirements or compliance and enforcement provisions.

4. The proposed energy standards were developed without complying in any meaningful way with the EISA statutory requirement to consult with HUD, resulting in proposed standards that ignore the construction aspects unique to manufactured housing or the negative impact on homebuyer

affordability. Further, DOE ignored the primacy of manufactured housing construction standards established under the Manufactured Housing Improvement Act of 2000.

5. The proposed energy standards ignore the large number of homebuyers that will no longer be able to buy a manufactured home, because they no longer qualify for an FHA, GSE, or non-agency mortgage loan, due to the impact of increased mortgage payments on debt-to-income ratios.

Detailed below is a summary of MHI's recommendations, along with several Appendices that explain in more detail our concerns as follows:

- Appendix I – MHI's Cost Benefit Analysis
- Appendix II – MHI's Comments on the DOE Rule's Proposed Changes by Section
- Appendix III – MHI's Responses to Issues on Which the DOE Requests Comment

SUMMARY OF MHI'S RECOMMENDATIONS

1) The DOE Proposed Rule Fails Statutory Requirement Not to Use IECC When Not Cost Effective

One of the tenets of the National Manufactured Home Construction and Safety Standards Act (NMHCSS Act) is the importance of ensuring that manufactured housing remains an affordable housing option for all consumers considering homeownership. It also states that energy conservation standards for manufactured homes must "ensure the lowest total construction and operating costs" and be cost-effective. Echoing that language, EISA requires that "energy conservation standards established under this section shall be based on the most recent version of the International Energy Conservation Code (including supplements), except in cases in which the Secretary finds that the code is not cost effective, or a more stringent standard would be more cost effective, based on the impact of the code on the purchase price of manufactured housing and on total life-cycle construction and operating costs."

Increasing the costs of manufactured homes could jeopardize homeownership for millions of Americans at a time when there is an affordable housing shortage. This increase will have a disproportionate impact on minority communities, who face the most significant burden in obtaining affordable homeownership. This would be in direct contrast to the Administration's goal of achieving racial equity in homeownership.

Use of the IECC is Not Appropriate

While the IECC is respected in the construction industry, it was developed over many years for utilization in both site-built residential homes and commercial buildings. Although EISA directs the DOE to establish energy conservation standards for manufactured housing based on the most recent version of the IECC unless it is found to be not cost effective, to date no state has adopted the 2021 IECC standards and the vast majority of states are using amended versions of the 2009, 2012 or 2015 IECC.

The IECC was never intended nor designed to be implemented in the manufactured housing sector. Given that the IECC essentially ignores all the construction aspects unique to manufactured housing, it is an inappropriate code for attempted enforcement upon the manufactured housing industry and could potentially cause factory closures, the loss of thousands of jobs, and an immediate affordable housing crisis for one of the largest sectors in the housing market. Because the IECC was not designed for manufactured housing, it is NOT a cost-effective standard, which is why its use does not result in a cost-effective change to energy standards.

First, the higher home cost associated with the proposed standards will make manufactured housing far more expensive excluding potential buyers and reducing total manufactured housing sales, the latter hurting the industry and contributing to the lack of affordable housing. Second, if households are fortunate enough to qualify for a home that meets the new standards, the home they get will be more, not less, expensive to own. This is all but guaranteed by the method DOE used in conducting the Life Cycle Cost analysis which demonstrates why the IECC is not an appropriate building code for manufactured homes.

<u>DOE Proposal Uses Incorrect Calculations and Methodologies</u>

DOE's own analysis shows the proposal will increase costs for homebuyers without reciprocal energy savings, and many households will simply be priced out of homeownership due to this proposal. One of the major inputs to a Life Cycle Cost analysis is estimated cost savings. As noted in DOE's Technical Support Document, using sample homes (single- and multi-section), DOE estimated energy savings by comparing homes, in select locations, built to the current, relatively easy to meet HUD energy standards with homes meeting the IECC. As expected, there is a huge difference in energy use (and estimated energy costs) between these benchmarks. The large savings suggests that a whole lot of investment in energy measures can be justified, particularly if the savings are accumulated over 30 years which is an artificial construct. If, conversely, DOE had started with a baseline less than the current HUD standards (e.g., zero insulation, leaky building, etc.) a 30-year Life Cycle Cost would show enough savings to justify building such an energy efficient home. But that is because energy improvements have diminishing returns and today's manufactured homes are already energy efficient.

Every step in making homes more energy efficient costs more and saves less. Most of the savings comes from the first few measures to improve performance. For example, adding R-5 insulation to a wall that is R-10 saves more energy than adding the same amount of insulation to a wall that is already R-20, but costs the same. If you are aiming to optimize investment (i.e., find the lowest combination of construction and operating costs) the proper way to do the analysis is by examining each incremental improvement in efficiency, individually. Each improvement in performance must be cost justified and stand on its own. Once an energy measure begins to result in negative returns, you stop adding any additional measures. DOE did not do this in its analysis, even though the Department developed and promotes a Building Energy Optimization Tool that uses this incremental approach to find the optimum investment. By combining all the energy measures together into a single figure, the slim benefits of adding the last, least cost-efficient measures, is subsumed in and masked by the benefits of adding the first, most cost-effective measures. Even based on a 30-year perspective, the optimum investment, representing the minimum total of construction and operating cost, is less stringent than the 2021 IECC.

Further, the DOE's proposal is based on improper calculations and methodologies including underestimating the current costs of homes and the costs of the new materials to construct them, and not considering the cost of testing procedures and compliance. The DOE also significantly underestimates the fact that the first buyer of an energy efficient manufactured home would likely never reap the economic benefit. Based on MHI's industry data, buyers usually sell their homes within seven to ten years of purchase, and it is unlikely that a manufactured homebuyer financing the purchase of a new manufactured home would even recover these upfront costs at a future sale. Consequently, as result of the DOE's proposal, homeowners will not realize incremental value for energy features that increase a home's purchase or sale price.

At the efficiency levels proposed by the DOE in its recent rulemaking, MHI's survey of manufacturers found that it is unlikely that a buyer purchasing a new home and financing 90 percent of the purchase price would even recover these upfront costs at a future sale. Instead, the DOE's proposal would likely yield a negative return over the ownership period. While several reasons contribute to this, including purchase price and availability of financing options, the fact that homebuyers usually sell their homes within the first seven to ten years of purchase is the most relevant.

Using the DOE's assumptions of cost and location as outlined in the Technical Support Document, which assumes a 30-year mortgage which is not the norm for manufactured housing, MHI conducted a cost-benefit analysis using more realistic financing options that are being utilized in the market today. Assuming a downpayment of 10 percent, an interest rate of nine percent – which is at the high end of today's mortgage rates – a loan term of 20 years, and a tenancy period of 10 years, MHI's cost-benefit analysis found that the DOE's proposal would result in a net loss of between $890 to $5,500 for a single-section home and $1,300 to $6,800 for a multi-section home depending on location (See Appendix I). This would be financially devasting for homebuyers looking to finance the purchase of a manufactured home.

It is important to note that the only place that MHI's analysis shows a savings is in Fairbanks, Alaska, where the savings is only $369 after ten years. In 2020, Alaska had only 64 homes shipped to the state and as of September 2021 only six homes have been shipped there. Further, many of the locations selected by the DOE for its analysis are not locations where manufactured housing is prevalent.

Given these facts, any new energy conservation standard must avoid creating a scenario where the upfront increase to the purchase price of a home prices many consumers out of the market, even if those upfront costs could be amortized over the duration of the homeowner's tenancy and recouped over time.

2) <u>The DOE Proposal Fails to Accomplish its Stated Goal of Protecting Low-Income Homebuyers from Steep Price Increases</u>

Using a tiered system based on price shows a fundamental lack of understanding of the factory-built process. There is no manufacturer's suggested retail price for manufactured homes. Home price is determined by the retailer based on the home features selected by the consumer. The approval for floor design and layout with respect to HUD Code requirements are made regardless of those selections, and long before the consumer has made them. Requiring approval of every floorplan AFTER consumer choices are made determining the price, would mean each and every individual house would have to be approved separately – adding astronomical costs to the process and slowing down the production line so as to remove all efficiencies. If a tiered system based on price is used, the price point in Tier 1 must be significantly increased to better reflect the costs of today's manufactured homes.

According to the National Association of Homebuilders' data, new homebuyers have an average income of $101,811. In contrast, the median annual household income of a manufactured home buyer is only $33,000. Manufactured homes are clearly more affordable, serving homebuyers with much lower incomes.

The proposed rule creates two tiers, based on whether the manufacturer's retail list price is below $55,000/$63,000 or above. The rule estimates that the new energy requirements will raise prices in Tier 1 by an average of $663 for a single-section unit and $839 for a multi-section unit. The rule estimates that the average price increases for homes in Tier 2 are more than six times higher - $3,914 for a single-section unit and $5,289 for a multi-section unit.

In the section "Development of the Current Proposal," the rule states that Tier 1 was established to protect "low-income buyers." However, the $55,000/$63,000 threshold is arbitrary, and it excludes significant numbers of low income manufactured homebuyers, using HUD metrics. The result is that DOE completely failed in their stated goal of shielding low-income homebuyers from price increases.

The HUD national median income for a four-person family is $79,900. HUD defines a "low-income" family as a family making 80 percent or less of median income which would be $63,920. Further, HUD defines a "very low-income family" as a family making 50 percent or less of median income which would be $39,950.

Additionally, HUD defines housing for lower income families as "affordable" when the family pays no more than 30 percent of their income for housing. However, in practice, that ratio is much higher for most families. Nevertheless, consider a new home at $110,260 – more than twice DOE's proposed Tier 1 threshold. Assuming an eight percent mortgage rate on a typical 15-year manufactured home, the monthly cost for mortgage, property tax, and rent would be $1,236. Thus, a low-income family could buy a $110,260 manufactured home and only pay 23.6 percent of their income for housing – well below the HUD standard for being "affordable."

Second, consider a "very low-income family" at the top of that income range. On a $110,260 home, a very low-income family would pay 34 percent of their income for rent. This is only slightly above HUD's ideal benchmark of 30 percent. Moreover, it is well below FHA's 43 percent Debt to Income (DTI) requirement for a mortgage.

Thus, DOE's arbitrary $55,000/$63,000 cutoff – whose stated purpose is to protect low-income families – does not protect significant numbers of low-income families – or even significant numbers of very low-income families.

MHI's analysis for using $110,260 as the cutoff price for Tier 1 is based on an extensive rulemaking conducted by the Consumer Financial Protection Bureau (CFPB) on its Qualified Mortgage (QM) rule. The CFPB selected this $110,260 threshold to give loans below this level more protections including more flexibility on permissible points and fees. While this is not a perfect analogy, MHI is using this metric to illustrate how arbitrary and unreasonably low the $55,000/$63,000 Tier 1 level is.

MHI requests that if a tiered system by price is used, the Tier 1 threshold be raised to at least $110,260, and potentially higher, based on a more detailed analysis along the lines of what we presented. Further, it must be updated annually to reflect actual costs, which can change dramatically. For example, according to the Census Bureau's Manufactured Housing Survey the average price of a new manufactured home in June was $106,800 up from $95,000 in January.

3) **The DOE Proposal Fails to Consider the Design and Construction Standards of Today's Manufactured Homes and Does Not Include Testing and Compliance Requirements**

Manufactured housing is the only form of housing regulated by a federal building code. Unlike site-built homes, which are subject to different state and local regulations, manufactured homes are built to one uniform federal code, the Manufactured Home Construction and Safety Standards Act of 1974 (i.e., the HUD Code). The HUD Code's single regulatory framework for home design and construction includes standards for health, safety, energy efficiency, and durability.

DOE's proposed rule seeks to use the IECC to make changes related to the building thermal envelope; air sealing; installation of insulation; duct sealing; heating, ventilation, and air conditioning (HVAC); service hot water systems; mechanical ventilation fan efficacy; and heating and cooling equipment sizing for manufactured homes. As proposed, many of these changes conflict with current HUD Code requirements and no direction is given as to how the two differing standards should be integrated which will result in complicated, overlapping requirements that will only increase manufacturing costs, hurting existing homeowners and prospective homebuyers.

The proposed changes to the manufactured housing energy conservation standards contain requirements that raise potential issues with certain components and materials currently being used in the production of today's manufactured homes. Below are a few examples of how the proposed changes conflict with current manufacturing processes.

Insulation

Manufacturers are currently using R-11 for most of the insulation which is predominantly used in the walls and floors for Zones 1 and 2. Further, manufacturers typically prefer to use two layers of R-11 if they need more insulation in the floors. However, the current proposed changes do not use R-11, but rather the lowest insulation value used is R-13. Therefore, this may cause a supply issue for the manufacturers that have ramped up to supply large quantities of R-11. The same supply issue will be present for R-20 and R-19, which is currently not used in large quantities. Further, it will be difficult to source a material to use as the R-5 continuous exterior insulation that will meet the requirements of the proposed changes as well as the current HUD Code. Section 3280.504 has requirements for the perm rating of the exterior wall assemblies. The perm ratings of the rigid foam may also lead to redundant vapor barriers and stud cavities that may not breath properly. This is a potential area where the proposed changes and the current HUD Code may have a conflict.

Duct Systems

Section 460.104 of the proposed changes states that duct system register boots that penetrate the thermal envelope of the air barrier must be sealed to the subfloor. However, in manufactured homes with the heat ducts installed in the belly of the home, there is no need to seal the duct registers and boots to the subfloor because they are installed within the thermal envelope. Table 406.103 states that access hatches, panels, and doors between conditioned space and unconditioned space must be insulated to a level equivalent to the insulation of the surrounding surface. However, this requirement does not seem to be consistent with the discussion around exterior doors in the earlier section of the proposed standards.

Section 460.201 also states that total duct leakage must be limited to four cubic feet per minute. However, with homes where the duct system is installed in the belly, any duct leakage that may occur is still within the thermal envelope of the home. Further, the required testing for the duct leakage limitation is also unknown at this time and therefore has not been included in the DOE cost analysis.

Thermostats

Section 460.202 states that any thermostat installed by the manufacturer must be programmable. It has been the observation, that many of the current homeowners do not use these thermostats correctly or have them replaced with a simpler version. Based on current observations, the programmable thermostat is not perceived as "providing value" to the current consumer and should not be mandated.

ACCA Manual S and ACCA Manual J

Section 460.205 states that heating and cooling equipment shall be sized using the ACCA Manual S and the ACCA Manual J. ACCA Manual J analysis requires knowledge of the orientation of the home with respect to the sun for cooling load analysis. Because the orientation of the home is often unknown until installed, the proposed rule must establish a default orientation. ACCA Manual S establishes sizing limits for heating and cooling equipment and these limits presume that thermal loads are established for a specific location and specific building orientation. The variation in design parameters within a single thermal zone exceeds the sizing limits of ACCA Manual S. The proposed rule must establish alternate criteria for using ACCA Manual S where the design parameters vary within a thermal zone.

Transportation challenges

Several of the proposed changes in the rule focus on changes to the building thermal systems which will affect the overall shipping height and width of a home. By increasing the truss heel height, increasing floor joist depth, and adding insulation outside of the studs, the overall shipping envelope will change. In some cases, this change could be significant. For example, the additional height could prevent shipping a home into an area of the country with low bridges resulting in consumers having to settle for a different style of home, or more than likely, being forced out of the housing market due to a lack of affordable housing. Further, an additional escort or pole car may be required to accompany the home that goes beyond maximum width or height, which could add thousands of dollars to the price of the home for the consumer.

Current Construction Requirements and Climate Zones

As described in DOE's rulemaking, the proposed climate zones are consistent with the climate zones currently used in the HUD Code. Because the new and existing climate zones remained consistent, MHI was able to compare the current construction requirements and future construction requirements. While performing the thermal analysis of the prototypical homes that were presented in the Technical Support Document, MHI observed several issues in the four different categories as outlined below:

- **Tier I Prescriptive Requirements**
  Based on the calculations that MHI performed, it appears that the Tier I prescriptive requirements represent a modest upgrade to the current HUD Code requirements and would require only minor changes from homes currently being constructed today.

- **Tier 2 (Untiered) Prescriptive Requirements**
  The Tier II requirements represent significant changes over the current HUD Code and will be more of a challenge to implement in a cost-effective manner.

Tier 2, Zone 1

Table III.8 lists the exterior ceiling insulation as R-30. Due to the thicker insulation in the ceiling, the proposed code states that a 5.5-inch truss heel height would be required. This change in the truss profile will affect the overall shipping height of the home unless other conciliatory changes are made.

Tier 2, Zone 2

Table III.8 lists the exterior ceiling insulation as R-30, which is the same issue as Zone 1. Further, Table III.8 lists the exterior wall insulation as R-20+5, which represents R-20 in the walls and a continuous R-5 on the exterior of the studs. The requirement of R-20 in the exterior wall will force the sidewall to 2x6 construction resulting in the following:

- The installation of the exterior insulation will be more costly for manufacturers to install. The overall cost of the home will be higher from the increased material costs, but also the increased labor costs.
- The exterior insulation will also require most plants to re-work their production stations to allow time for this installation.
- The exterior insulation will also create an additional problem for fastening the exterior finish siding. The siding would now have to be fastened thru the exterior insulation, and currently there are no approved fasteners to penetrate thru the 1-inch exterior insulation. These fasteners would also have to support the siding during transportation.
- Windows and doors will need to be installed on framed extensions to pack out nailing surfaces to the thickness of the continuous R-5 insulation.
- Continuous flashing may be required at the bottom edge of the rigid insulation layer to protect from exposure to weather and infestation.
- The extra thickness of insulation on the exterior wall would either increase the shipping width or decrease the habitable space on the interior. For houses currently designed to maximize the legal shipping width, there is no additional width available on the exterior. Therefore, the space for the exterior insulation on these homes would have to be taken from the interior of the home.

Table III.8 also lists the exterior floor insulation as R-19. Currently, most manufacturers use a blanket insulation for the floors. However, the lack of availability of R-19 in the blanket style could cause issues for this requirement or force further production changes to accommodate other styles of insulation.

Tier 2, Zone 3

Table III.8 lists the exterior ceiling insulation as R-38. This depth of insulation will be difficult to achieve on lower sloped roofs and cathedral style truss profiles. This insulation requirement could cause some home options to become unavailable for the consumer.

Further, Table III.8 lists the exterior wall insulation as R-20+5 which is the same issue we expressed concerns about in Tier 2, Zone 2.

Table III.8 also lists the exterior floor insulation to be R-30. According to the Technical Support Document, the floor joist will need to be 2x8 when any insulation equal to or over R-30 is used. This change will be more costly than just the insulation if the entire floor system must go to 2x8. This increased joist depth would also further impact the transportation of the home by making it 2 inches taller. Further, the availability of R-30 insulation in a blanket style may be an issue in meeting this requirement or force further production changes to accommodate other styles of insulation.

- **<u>Tier 1 Performance Requirements</u>**
  Based on the calculations that MHI performed, it appears that the Tier 1 performance requirements represent a modest upgrade to the current HUD Code requirements and would require only minor changes from homes currently being constructed today.

- **<u>Tier 2 (Untiered) Performance Requirements</u>**
  The Tier 2 requirements represent significant changes over the current HUD Code and will be more of a challenge to implement in a cost-effective manner. These values will require many changes to the current home construction methodologies. Because this part of the changes is listed as "performance," there are multiple pathways to try and achieve the listed overall U-factor.

  <u>Tier 2, Zone 1</u>
  The overall U-factor listed in Table III.12 is 0.086 for single- and 0.082 for multi-section homes. Based on the calculations MHI performed on prototypical homes, the proposed Zone 1 requirements should be able to be met with upgraded insulation and upgraded windows.

  <u>Tier 2, Zone 2</u>
  The overall U-factor listed in Table III.12 is 0.062 for single- and 0.063 for multi-section homes. Based on the calculations MHI performed on the prototypical homes, the proposed Zone 2 requirements would require many changes such as upgraded insulation, 2x6 wall construction, upgraded windows, and taller truss heel. MHI also found that this overall U-factor requirement was more difficult to meet as the homes became smaller.

  <u>Tier 2, Zone 3</u>
  The overall U-factor listed in Table III.12 is 0.053 for singles and 0.052 for multi-section. Based on the calculations MHI performed on the proto-typical homes, we were not able to satisfy the overall U-factor requirements using common options that are available to most manufacturers. Further, MHI found this became even more difficult to achieve as the homes became smaller. Upgrading insulation, 2x6 exterior walls, deeper trusses, deeper floor joists, and upgraded windows did not lower the overall U-factor enough to meet the value in the Table III.12. For the calculations that MHI performed, we did not evaluate the addition of continuous exterior insulation due to the installation and transportation issues involved with this product.

<u>Compliance, Enforcement and Testing</u>

Testing requirements for each of the systems being modified in the proposal are not included and must be addressed before any rule is published. Determining the impact of a system change without knowing the testing parameters is impossible, especially in response to specific metrics like "§460.201 Duct system." For example, the proposed rule requires testing of air handlers and filter boxes. However, manufactured homes often utilize uncased evaporator coils (a-coils) that prevent the air handler from being readily tested. Oftentimes, it is necessary to temporarily remove the air handler in order to test the duct system for leakage due to the difficulty sealing the air handler.

For multi-sectional units where ductwork is installed on-site, the rule does not establish enforcement procedures for testing. More specifically, what qualifications are required for those performing the testing? Can installers certify their own work? What training is required for installer personnel performing this work? How are the test results documented? Is the installer responsible for any remedial work that may be required after the testing is performed? These questions must be answered in order to determine the additional costs which may be attached to such.

If testing is required to be performed by a third-party or in cases where the installer is not capable of performing the testing, the additional cost of testing could be $600 or more. For Tier 1 homes this nearly doubles the cost increase for single-section construction and increases the installed cost by more than 50-percent for multi-section homes. This cost was not considered in the DOE purchase price increase analysis performed. DOE must not propose a rule without including the required testing requirements, so any analysis can include the true cost impact.

Further, the proposed rule does not include compliance and enforcement provisions which DOE says it will address at a later date. MHI believes it is unnecessary for the DOE to develop a new enforcement mechanism with any proposed manufactured housing energy conservation standard because the HUD Code is an already-established enforcement mechanism that mandates a uniform standard for design, construction, and installation, including federal requirements for safety, durability, and energy efficiency. Failure to partner with HUD would result in complicated, overlapping requirements that will only increase manufacturing costs, hurting existing homeowners and prospective homebuyers.

4) The DOE Proposal Fails to Comply with the Statutory Requirement to Consult with HUD

Because the DOE has no real expertise, knowledge, or understanding of housing and home financing, EISA required the Department to consult with HUD in developing these new energy requirements. However, to our knowledge, DOE has made no discernible effort to consult with HUD, and by extension FHA and the Manufactured Housing Consensus Committee (MHCC), in any meaningful way. While DOE provided detailed justifications for the new energy requirements in the narrative for the proposed rule, the Department offered no evidence that it utilized any of HUD's housing expertise that could have led to a more informed rulemaking.

This is not an insignificant failure. This lack of consultation with HUD shows up in several critical areas that reflect a complete failure to consider the realities of buying and owning a manufactured home. First, the establishment of an artificially low $55,000/$63,000 Tier 1 price point for low-income families completely ignores the reality that much higher home prices are affordable to "low-income families" (as defined by HUD) – and even HUD-defined "very low-income families" qualify for a loan twice as large. The use of a three percent discount rate is wildly inappropriate for chattel manufactured home loans, which lack access to federal agency mortgage loans, and is measurably lower than actual mortgage and other price-related increased costs of real property manufactured home loans. This fatally undermines DOE's contention that the new requirements result in net savings to homeowners and results in a real-world impact that punctures any DOE contention that it complied with EISA's statutory cost effectiveness requirement. Further, failure to consult with FHA completely ignores the meaningful percentage of homebuyers that will no longer qualify for an FHA, Fannie Mae, Freddie Mac, or non-agency mortgage loan because of significantly increased home prices that even DOE acknowledges in the proposed rule will price consumers out of the housing market. Additionally, DOE's failure to consult with HUD also ignores the primacy of the HUD Code with respect to safety and construction standards.

The NMHCSS Act states "the Federal manufactured home construction and safety standards established by HUD shall include preemptive energy conservation standards."[3] Further, EISA mandates that the DOE must consult with HUD, which may seek further counsel from the MHCC, when it comes to developing energy conservation standards for manufactured housing.[4] Additionally, any updated energy conservation standard that the DOE proposes should take into consideration the unique design and factory construction techniques specific to manufactured housing.[5]

Because of these mandates, the DOE must first consult with HUD and the MHCC to assess the economic impact that a new energy conservation standard will have on manufactured housing homeownership. The DOE and HUD should then work together to develop the standard, as well as an efficient and practical implementation strategy that HUD will enforce.

Similar, to the 2016 proposed rule, the DOE did not work with HUD or the MHCC before it drafted its proposed rule. Further, the MHCC was only given a preview of a small portion of the proposed rule

[3] 42 U.S.C. § 5403(g)(1).
[4] *Id.* at 17071(a)(2)(B).
[5] *Id.* at1 7071(b)(2)(A).

approximately two months before it was published, which raised many concerns amongst its members and the public to both the affordability and feasibility of what was presented. Because DOE did not work with HUD on these proposed changes, the proposed rulemaking is resulting in complicated, overlapping requirements that will increase manufacturing costs, hurting existing homeowners and prospective homebuyers. Moreover, it demonstrates a fundamental lack of understanding of the factory-built process.

5) The DOE Proposal Does Not Consider How These Changes Will Make Homebuyers Unable to Obtain Financing

EISA requires that the energy standards be based on the most recent version of the IECC "except in cases in which the code is not cost effective or a more stringent standard would be more effective, based on the impact of the code on the purchase price of manufactured housing and on total life-cycle construction and operation costs."

Thus, the statute explicitly requires that the cost effectiveness standard be based on the impact on the purchase price. Yet, there is no consideration in the entire narrative of the proposed rule that any consideration was given to the impact of home price increases, which the rule acknowledges range from $3,914 to $5,289 for most homes in Tier 2, on a potential homebuyer's ability to buy a home in the first place. Put simply, all the pages and pages of theoretical savings in the rule are meaningless if the price increase causes the homebuyer to no longer qualify for a mortgage loan, because they no longer meet Debt to Income (DTI) underwriting requirements.

An increased home purchase price will result in a proportionate increase in the debt burden. FHA's customary DTI requirement is 43 percent. Therefore, any homebuyer at the edge of this 43 percent DTI requirement will no longer qualify for an FHA loan because of the higher price caused by the new energy standards. And, for example, a homebuyer at a 41 percent DTI ratio that would have more easily qualified for a loan, will now be just over the permitted DTI.

Additionally, the proposed rule includes no real consideration of the impact of the increased down payment that will result from the new energy requirements. Based on the average home price increases ranging from $3,914 to $5,289 that the rule projects for Tier 2 homes, and based on an assumption that a homebuyer must make a down payment of 10%, the energy requirements will raise down payment requirements on new manufactured homes by an average of $391 to $529. For the low- and moderate-income homebuyers that makes up the bulk of the manufactured home purchase market, with an average income of $33,000, this is a not insignificant amount.

Further, the analysis on the impact of the rule is fundamentally marred by a discount rate ranging of three percent to seven percent for computation of future projected energy savings. The impact of significantly understating the discount rate is that it significantly overstates the net savings to the manufactured homebuyer. Higher home prices (e.g., ranging on average from $3,914 to $5,200) for most manufactured homes that are in Tier 2 directly translates into higher mortgage amounts and higher property taxes related to the increased home purchase price.

Mortgage rates on personal property loans (i.e., chattel loans), where the manufactured home is not permanently attached to land, comprise 78 percent of new manufactured home purchases. These loans are currently in the nine percent range, and mortgage rates on real estate loans, where the manufactured home is attached to the land, are in the range of four percent. Assuming a one percent property tax rate on the higher cost, DOE should have used a much higher discount rate of around ten percent for personal property/chattel loans. This resulted in the DOE significantly overestimating the homebuyer benefits from the new energy requirements.

While it is difficult to quantify the percentage of individuals that will no longer qualify for a mortgage loan because of the higher purchase price resulting from the new energy standards, it will clearly result in some percentage of previously eligible homebuyers that will no longer be able to buy a home. It is disturbing that the DOE narrative on the rule did not even consider this factor in assessing compliance with the requirement to deviate from using the IECC based on whether standards are cost effective with respect to impact on purchase price.

Conclusion

While MHI and its members will always support sensible energy conservation efforts, the overly burdensome regulations proposed by DOE will price many consumers out of homeownership. This increase will have a disproportionate impact on minority communities, who face the most significant burden in obtaining affordable homeownership and would be in direct contrast to the Administration's goal of achieving racial equity in homeownership. It also contradicts the Administration's goal of increasing manufactured housing development in order to address the lack of affordable housing supply.

Further, the proposed rule demonstrates a profound lack of understanding of the factory-built process for constructing manufactured homes and a lack of knowledge about the existing HUD Code standards. It also lacks information about testing and enforcement, which makes any true cost analysis challenging and incomplete. All costs imposed by the proposed rule must be factored, and enforcement and testing are factors that must be included in the cost. Finally, the proposal has a fundamental misunderstanding of housing affordability and the fact that most manufactured homes are currently affordable for even low-income individuals.

MHI stands ready to work with DOE and HUD on the development of realistic and achievable energy standards that not only encourages innovation and conservation, but also eliminates regulatory barriers that impede consumer access to safe, affordable manufactured housing.

Sincerely,

Lesli Gooch

Lesli Gooch, Ph.D.
Chief Executive Officer

Appendix I – Cost Benefit Analysis

The tables below provides MHI's Life Cycle Cost results for the DOE proposed rule. The figures offer a glimpse of the benefits and costs for a homebuyer purchasing either a single- or multi-section home. The inputs for location selection, average home cost, increase in home cost related to the energy investment and resultant monthly energy savings match DOE's assumptions contained in the Technical Support Document (TSD). The table sums the major costs and benefits as experienced by the buyer over a ten-year, average occupancy period to yield a net benefit (cost) including incremental mortgage payment, added down payment and monthly energy savings. A negative value indicates that the buyer can expect to lose money on the energy investment making the home less affordable. For example, a purchaser of a single section home in Phoenix, AZ, can on average expect to experience a net cost of nearly $4,900 over the 10-year period of occupancy. Other assumptions made in generating the tables are provided below. Note: all figures are expressed in current dollars. Further, it is assumed that the buyer does not realize an incremental price increase associated with the energy measures at the time of sale, an assumption that is based on a lack of evidence that energy features can demand a higher home price.

Assumptions	
Down payment	10%
Principal	90%
Mort. interest rate	9%
Loan term (yrs)	20
Occupancy term (yrs)	10
Principal recapture rate	0%

			Single-Section Home								
HUD Standards Climate Zone	Sample Locations	Average home cost (DOE)	Increase in home cost (DOE)	Percent increase in cost	Down payment	Inc. in mortgage	Inc. monthly mort. pay.	Energy savings ($/mth) (DOE)	Net Mthly. Savings/ Cost	Principal repayment	Net benefit (cost)
1	Miami	$57,300	$2,574	**4.5%**	$257	$2,317	$21	$20	($1)	$1,646	**($2,010)**
1	Houston	$57,300	$2,574	**4.5%**	$257	$2,317	$21	$24	$3	$1,646	**($1,493)**
1	Atlanta	$57,300	$2,574	**4.5%**	$257	$2,317	$21	$29	$8	$1,646	**($891)**
1	Charleston	$57,300	$2,574	**4.5%**	$257	$2,317	$21	$26	$5	$1,646	**($1,340)**
1	Jackson	$57,300	$2,574	**4.5%**	$257	$2,317	$21	$28	$7	$1,646	**($1,048)**
1	Birmingham	$57,300	$2,574	**4.5%**	$257	$2,317	$21	$27	$7	$1,646	**($1,106)**
2	Phoenix	$57,300	$4,820	**8.4%**	$482	$4,338	$39	$28	($11)	$3,081	**($4,897)**
2	Memphis	$57,300	$4,820	**8.4%**	$482	$4,338	$39	$32	($7)	$3,081	**($4,432)**
2	El Paso	$57,300	$4,820	**8.4%**	$482	$4,338	$39	$30	($9)	$3,081	**($4,658)**
2	San Francisco	$57,300	$4,820	**8.4%**	$482	$4,338	$39	$23	($17)	$3,081	**($5,543)**
2	Albuquerque	$57,300	$4,820	**8.4%**	$482	$4,338	$39	$30	($9)	$3,081	**($4,666)**
3	Baltimore	$57,300	$4,659	**8.1%**	$466	$4,193	$38	$33	($4)	$2,978	**($3,967)**
3	Salem	$57,300	$4,659	**8.1%**	$466	$4,193	$38	$26	($12)	$2,978	**($4,892)**
3	Chicago	$57,300	$4,659	**8.1%**	$466	$4,193	$38	$34	($4)	$2,978	**($3,930)**
3	Boise	$57,300	$4,659	**8.1%**	$466	$4,193	$38	$28	($10)	$2,978	**($4,605)**
3	Burlington	$57,300	$4,659	**8.1%**	$466	$4,193	$38	$35	($3)	$2,978	**($3,812)**
3	Helena	$57,300	$4,659	**8.1%**	$466	$4,193	$38	$36	($2)	$2,978	**($3,686)**
3	Duluth	$57,300	$4,659	**8.1%**	$466	$4,193	$38	$49	$11	$2,978	**($2,144)**
3	Fairbanks	$57,300	$4,659	**8.1%**	$466	$4,193	$38	$69	$32	$2,978	**$369**

			Multi-Section Home								
HUD Standards Climate Zone	Sample Locations	Average home cost (DOE)	Increase in home cost (DOE)	Percent increase in cost	Down payment	Inc. in mortgage	Inc. monthly mort. pay.	Energy savings ($/mth) (DOE)	Net Mthly. Savings/ Cost	Principal repayment	Net benefit (cost)
1	Miami	$108,500	$4,143	3.8%	$414	$3,729	$34	$33	($1)	$2,648	**($3,134)**
1	Houston	$108,500	$4,143	3.8%	$414	$3,729	$34	$40	$6	$2,648	**($2,313)**
1	Atlanta	$108,500	$4,143	3.8%	$414	$3,729	$34	$48	$15	$2,648	**($1,306)**
1	Charleston	$108,500	$4,143	3.8%	$414	$3,729	$34	$42	$8	$2,648	**($2,065)**
1	Jackson	$108,500	$4,143	3.8%	$414	$3,729	$34	$46	$12	$2,648	**($1,597)**
1	Birmingham	$108,500	$4,143	3.8%	$414	$3,729	$34	$45	$11	$2,648	**($1,696)**
2	Phoenix	$108,500	$6,167	5.7%	$617	$5,550	$50	$40	($10)	$3,942	**($5,714)**
2	Memphis	$108,500	$6,167	5.7%	$617	$5,550	$50	$45	($5)	$3,942	**($5,170)**
2	El Paso	$108,500	$6,167	5.7%	$617	$5,550	$50	$42	($8)	$3,942	**($5,496)**
2	San Francisco	$108,500	$6,167	5.7%	$617	$5,550	$50	$31	($19)	$3,942	**($6,835)**
2	Albuquerque	$108,500	$6,167	5.7%	$617	$5,550	$50	$42	($8)	$3,942	**($5,535)**
3	Baltimore	$108,500	$5,839	5.4%	$584	$5,255	$47	$45	($2)	$3,732	**($4,584)**
3	Salem	$108,500	$5,839	5.4%	$584	$5,255	$47	$34	($14)	$3,732	**($5,949)**
3	Chicago	$108,500	$5,839	5.4%	$584	$5,255	$47	$46	($2)	$3,732	**($4,502)**
3	Boise	$108,500	$5,839	5.4%	$584	$5,255	$47	$37	($10)	$3,732	**($5,508)**
3	Burlington	$108,500	$5,839	5.4%	$584	$5,255	$47	$47	($0)	$3,732	**($4,364)**
3	Helena	$108,500	$5,839	5.4%	$584	$5,255	$47	$48	$0	$3,732	**($4,271)**
3	Duluth	$108,500	$5,839	5.4%	$584	$5,255	$47	$66	$18	$3,732	**($2,105)**
3	Fairbanks	$108,500	$5,839	5.4%	$584	$5,255	$47	$94	$47	$3,732	**$1,292**

Appendix II – MHI's Comments on the DOE Rule's Proposed Changes by Section

Subpart A – General

§ 460.1 Scope.

MHI Comments:
MHI has no comments to this section.

§ 460.2 Definitions.

MHI Comments:
Revise the following definition to include the addition of the underlined text to read as follows:

"Whole-house mechanical ventilation system" – Exhaust system, supply system, or combination thereof that is designed to mechanically exchange indoor air with outdoor air when operating continuously or through a programmed intermittent schedule to satisfy the whole house ventilation rates.

As currently proposed in the rule, this definition would include all exhaust fans, including bath fans and range hoods, which are systems MHI does not believe should be included. The suggested underlined change has been copied from the 2021 IECC.

§ 460.3 Materials incorporated by reference.

MHI Comments:
Incorporation of ACCA Manual J and ACCA Manual S are examples of trying to use a site-built code for manufactured housing that just does not work. See "§460.205 Equipment sizing" for more detailed information.

§ 460.4(a) Energy conservation standards.

MHI Comments:
The application of the Annual Energy Outlook (AEO) to the adjustment of home price needs to be standardized and established in the rule for the purposes of enforcement. The proposed rule must establish trigger points for reevaluating the "price" of a home. For example, would Tier 1 models need to be "limited approvals" that expire after a period of time? Or would it be based on a percentage increase in price? Further, the proposed rule must establish the monitoring mechanisms to be used by production inspection primary inspection agencies (IPIAS) and design approval primary inspection agencies (DAPIAS) for the purposes of prompting manufacturers to resubmit updated information for Tier 1 homes.

§ 460.4(b) and (c) Energy conservation standards.

MHI Comments:
Using a tiered system based on price shows a fundamental lack of understanding of the factory-built process and should be eliminated. There is no manufacturer's suggested retail price for manufactured homes. The use of "price" is unworkable from an enforcement standpoint as a standardized method for pricing does not exist and it would not be possible for a DAPIA to evaluate whether a price is "reasonable" or "correct." The methods used by manufactures to establish pricing constitute trade "secrets" and dissemination of pricing information in the form of Tier 1 and/or Tier 2 model plans would potentially lead to inappropriate price-fixing or price manipulation among manufacturers in violation of federal (including Sherman Act, Clayton Act, Federal Trade Commission Act, and

Robinson-Patman Act) and state antitrust/competition laws.

Further, the use of price as a threshold is overly simplistic and fails to account for regional variations in average housing cost and construction methods. For example, an "affordable" home in the southeastern U.S. is much less expensive and constructed differently than a home of relative affordability in the northeast and/or west. At a minimum, a distinct Tier 1 price point should be established for each thermal zone. Moreover, manufacturers do not set a "retail list price" so that measure is not applicable.

From an enforcement standpoint the regulation does not establish how the "price" would be conveyed to the enforcement bodies, such as the IPIA and/or DAPIA. Because the price of a home depends on options, such as interior finishes (e.g., board and batten verses finished drywall), each Tier 1 model plan submission would need to specifically define the finish attributes required to meet the Tier 1 price limit. Moreover, models that exist in both tiers, due to available options, would need to be submitted for review and approval in both "Tier 1" and "Tier 2."

If a tiered system based on price is used, the price point in Tier 1 must be significantly increased to at least $110,260 to better reflect the costs of today's manufactured homes.

Subpart B – Building Thermal Envelope

§ 460.101 Climate zones.

MHI Comments:
MHI appreciates DOE's use of the HUD Code zones to match manufacturing practices more appropriately. However, as written the proposed rule would require a home in southern Virginia, which would be in climate zone 3 under the IECC, to meet the same requirements as a home located in Fairbanks, Alaska, which would be located in climate zone 8 using the IECC. MHI encourages the DOE to lower proposed thermal envelopment requirements within zone 3 to align with IECC climate zone 3 requirements more closely.

§ 460.102 Building thermal envelope requirements.

MHI Comments:
MHI recommends deleting the following sentence and reference wherever it appears in this section: "Adapted from section R402 of the 2021 IECC."

Additionally, the R-20 wall insulation listed in Tier 2 for Zones 2 and 3 may not be readily available in roll form, as typically used in production. Having a continuous insulation on the outside of the studs may become problematic for siding installation due to transportation. The siding fasteners would have to penetrate through the continuous insulation which would pose an issue, especially for siding applications with more weight. MHI recommends revising exterior wall insulation to R-11 and increasing ceiling insulation to R-25 in Tier 1 for Zones 1 and 2. Allowing for R-11 would provide valuable flexibility in the current restricted fiberglass insulation market.

MHI also recommends revising 20+5 wall R values to 21 or 13+5. This is consistent with the 2015 IECC and would provide manufacturing options to avoid continuous insulation sheathing which would reduce home rigidity which could cause transportation issues.

In addition, MHI recommends adding the following language to this section:

- [R402.3.3] Glazed fenestration exemption. Not greater than 15 square feet (1.4 m2) of glazed fenestration per dwelling unit shall be exempt from the U-factor and SHGC requirements in

Section R402.1.2. This exemption shall not apply to the Total UA alternative in Section R402.1.5.

- [R402.3.4] Opaque door exemption. One side-hinged opaque door assembly not greater than 24 square feet (2.22 m2) in area shall be exempt from the U-factor requirement in Section R402.1.2. This exemption shall not apply to the Total UA alternative in Section R402.1.5.

For "Table 460.102-5 – Tier I Building Thermal Envelope Performance Requirements," MHI recommends the following changes:

> Change Zone 1 total Uo to 0.098 for single and 0.096 for multi-sectional, Zone 2 total Uo to 0.081 for single and 0.079 for multi-sectional, and the Zone 3 total Uo to 0.076 for singles and 0.073 for multi-sectional.

For "Table 460.102-6 – Tier 2 Building Thermal Envelope Performance Requirements," MHI recommends the following changes:

> Change Zone 2 total Uo to 0.076 for single and 0.073 for multi-sectional and the Zone 3 total Uo to 0.067 for single and 0.064 for multi-sectional.

These energy levels better align with current Energy Star requirements and provide an aggressive first step in enhancing energy conservation in manufactured homes. Further, these changes will reduce the pay off period and provide better value to homeowners.

§ 460.103 Installation of Insulation

<u>**MHI Comments:**</u>
The following strikethrough text should be deleted from this section:

"Insulating materials must be installed according to the insulation manufacturer's installation instructions and the requirements set forth in Table 460.103 of this section.~~, which is adapted from section R402 of the 2021 IECC~~."

In Table 460.103 the instructions should clarify the location where baffles are required by adding the following underlined text:

Component	Installation Requirements
Baffles	Baffles must be constructed using a solid material, maintain an opening equal or greater than the size of the vents, and extend over the top of the attic insulation <u>where insulation is restrained from full depth in order to maintain 1-inch minimum air space between insulation and roof decking.</u>

In Table 460.103 instructions for "eave vents" should be deleted. This requirement is not within the 2021 IECC nor does it provide insulation installation instructions. Furthermore, it should be acceptable to use nonpermeable insulation adjacent to ventilated soffits as long as required free air path is maintained.

§ 460.104 Building thermal envelope air leakage.

MHI Comments:
The following strikethrough text should be deleted from this section:

"Manufactured homes must be sealed against air leakage at all joints, seams, and penetrations associated with the building thermal envelope in accordance with the component manufacturer's installation instructions and the requirements set forth in Table 460.104 of this section. Sealing methods between dissimilar materials must allow for differential expansion, contraction and mechanical vibration, and must establish a continuous air barrier upon installation of all opaque components of the building thermal envelope. All gaps and penetrations in the exterior ceiling, exterior floor, and exterior walls, including ducts, flue shafts, plumbing, piping, electrical wiring, utility penetrations, bathroom and kitchen exhaust fans, recessed lighting fixtures adjacent to unconditioned space, and light tubes adjacent to unconditioned space, must be sealed with caulk, foam, gasket or other suitable material. ~~The air barrier installation criteria is adapted from section R402 of the 2021 IECC~~."

Table 460.104 should revise the "rim joists criteria" by deleting the following strikethrough text. Mud sill plates are not typically used in manufactured housing and, if used, would be installed on-site by others outside the scope of this rule.

Component	Air Barrier Criteria
Rim joists	The air barrier must enclose the rim joists. The junctions of the rim board ~~to the sill plate and the rim board~~ and the subfloor must be air sealed.

In Table 460.104 the component "Shower or tub adjacent to exterior wall" should be deleted or clarified to apply only when interior wall surface is used as an air barrier. Exterior sheathing or house wrap products are often used as home air barrier and these products are not installed between shower walls.

Subpart C – HVAC, Service Hot Water, and Equipment Sizing

§460.201 Duct systems.

MHI Comments:
The following underlined text and strikethrough text changes must be made to the following section:

"Each manufactured home equipped with a duct system, which may include air handlers and filter boxes, must <u>have supply ducts</u> be sealed to limit total air leakage to less than or equal to four (4) cubic feet per minute per 100 square feet of conditioned floor area. Building framing cavities must not be used as ducts or plenums when directly connected to mechanical systems. <u>Multi-section homes may have each home section isolated and tested separately.</u> ~~The duct total air leakage requirements are adapted from section R403 of the 2021 IECC."~~

MHI also recommends revising this section based on R403.3.6 of the 2021 IECC as follows:

- <u>Rough-in test:</u> The total leakage shall be less than or equal to 4.0 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m2) of conditioned floor area where the air handler is installed at the time of the test. Where the air handler is not installed at the time of the test, the total leakage shall be less than or equal to 3.0 cubic feet per minute (85 L/min) per 100 square feet (9.29 m2) of conditioned floor area.

- Postconstruction test: Total leakage shall be less than or equal to 4.0 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m2) of conditioned floor area.
- Test for ducts within thermal envelope: Where all ducts and air handlers are located entirely within the building thermal envelope, total leakage shall be less than or equal to 8.0 cubic feet per minute (226.6 L/min) per 100 square feet (9.29 m2) of conditioned floor area.

MHI also has significant concerns that testing was not included in this proposal and these concerns are demonstrated in this section which requires testing of air handlers and filter boxes. However, manufactured homes often utilize uncased evaporator coils (a-coils) that prevent the air handler from being readily tested. Oftentimes, it is necessary to temporarily remove the air handler in order to test the duct system for leakage due to the difficulty sealing the air handler.

For multi-sectional units where ductwork is installed on-site, the rule does not establish enforcement procedures for testing. More specifically, what qualifications are required for those performing the testing? Can installers certify their own work? What training is required for installer personnel performing this work? How are the test results documented? Is the installer responsible for any remedial work that may be required after the testing is performed?

If testing is required to be performed by a third-party or in cases where the installer is not capable of performing the testing, the additional cost of testing could be $600 or more. For Tier 1 homes this nearly doubles the cost increase for single-section homes and increases the installed cost by more than 50 percent for multi-section homes. This cost was not considered in the DOE purchase price increase analysis performed. DOE must not propose a rule without including the required testing requirements, so any analysis can include the true impact.

§460.202 Thermostats and controls.

MHI Comments:
MHI recommends deleting the following sentence and reference wherever it appears in this section: "Adapted from section R403 of the 2021 IECC."

MHI also recommends revising §460.202 (b)(3) to the following:

"Homeowner manuals should include recommendation that homeowners program thermostat with a heating temperature set point no higher than 70 °F (21 °C) and a cooling temperature set point no lower than 78 °F (26 °C)."

§ 460.203 Service hot water.

MHI Comments:
MHI recommends deleting the strikethrough text from "section (a)" as typical water heater instructions do not include maintenance instructions and such when available are readily available on-line. Further, this information is already accommodated in 24 CFR Part 3280.

"(a) Service hot water systems installed by the manufacturer must be installed according to the service hot water manufacturer's installation instructions. ~~Where service hot water systems are installed by the manufacturer, the manufacturer must ensure that any maintenance instructions received from the service hot water system manufacturer are provided with the manufactured home. The service hot water requirements are adapted from section R403 of the 2021 IECC.~~"

§460.204 Mechanical ventilation fan efficacy.

MHI Comments:
MHI recommends deleting the following sentence and reference wherever it appears in this section: "Adapted from section R403 of the 2021 IECC."

As referenced in § 460.2 Definitions, the definition of "whole-house mechanical ventilation system" must be revised to include the addition of the underlined text as shown below. Further, this section must clarify it does not apply to bath fans and range hoods.

"Whole-house mechanical ventilation system" – Exhaust system, supply system, or combination thereof that is designed to mechanically exchange indoor air with outdoor air when operating continuously or through a programmed intermittent schedule <u>to satisfy the whole house ventilation rates</u>.

§460.205 Equipment sizing.

<u>MHI Comments:</u>
Incorporation of these manuals is an example of trying to use a site-built code for manufactured housing that just does not work as outlined below.

The design parameters provided in ACCA Manual J are location specific rather than based on zones in the proposed rule. The proposed rule must provide the required design parameters to perform an ACCA Manual J analysis within the context of the three thermal zones in the proposed rule.

ACCA Manual J analysis requires knowledge of the orientation of the home with respect to the sun for cooling load analysis. Because the orientation of the home is often unknown until installed, the proposed rule must establish a default orientation, such as the front door is assumed to face south.

ACCA Manual S establishes sizing limits for heating and cooling equipment, these limits presume that thermal loads are established for a specific location and specific building orientation. The variation in design parameters within a single thermal zone exceeds the sizing limits of ACCA Manual S. The proposed rule must establish alternate criteria for using ACCA Manual S where the design parameters vary within a thermal zone.

Current equipment sizing methods are not based on Manual J or Manual S. The use of this software, as proposed, will add additional time and cost for each model plan submission.

The rule must establish a threshold for requiring a revised Manual J or Manual S analysis. For example, where a home model has options that affect the glazing area or insulation value, are distinct Manual J and Manual S analysis required for each possible option?

If equipment sizing is limited by Manual S, homes can only be placed in their respective thermal zones under the proposed rule because placing a home in a zone for which it was not designed would violate the sizing limits of Manual S. For example, under the current standard a Zone II home can be placed in Zone I, as Zone II is considered more restrictive. However, under the new standard, this common practice would not be permitted because equipment sized for Zone II would be oversized for Zone I and would violate the proposed rule. This would restrict current sales practices in the industry especially for retailers located near the Zone boundaries.

Appendix III – MHI's Responses to Issues on Which the DOE Requests Comment

1. DOE invites comment on whether (1) the manufacturer's retail list price threshold for Tier 1 under the tiered proposal is appropriate, (2) the untiered proposal in this SNOPR is cost-effective, generally, and (3) the untiered proposal is cost-effective for low-income consumers.

Using a tiered system based on price shows a fundamental lack of understanding of the factory-built process. There is no manufacturer's suggested retail price for manufactured homes. Home price is determined by the retailer based on the home features selected by the consumer. The approval for floor design and layout with respect to HUD Code requirements are made regardless of those selections, and long before the consumer has made them. Requiring approval of every floorplan AFTER consumer choices are made determining the price, would mean each and every individual house would have to be approved separately – adding astronomical costs to the process and slowing down the line so as to remove all efficiencies.

Moreover, the setting of either $55,000/$63,000 as the threshold for Tier 1 is arbitrary and relates affordable housing ONLY to the manufactured housing market. To determine if a home is affordable, it is necessary to consider the entire housing market. Manufactured homes at any price point provide a significant source of affordable housing – with the average price of a new manufactured home being $87,000 compared to $308,597 for a new site-built home not including land.[6] Furthermore, recent labor and supply shortages have increased those prices significantly (as they have also done in the site-built home industry). According to the Census Bureau's Manufactured Housing Survey the average price of a new manufactured home in June was $106,800 up from $95,000 in January.

2. DOE welcomes comment on approaches for testing, compliance and enforcement provisions for the proposed standards and alternative proposal. DOE also welcomes comments and information related to potential testing, compliance and enforcement under the current HUD inspection and enforcement process, and potential costs of testing, compliance and enforcement of the proposed standards and alternative proposal in this document.

MHI has significant concerns that testing was not included in this proposal, and finds it challenging to consider the costs and impacts of a number of the proposed changes without knowing what the testing protocols will be. All costs imposed by the proposed rule must be factored, and enforcement and testing are parts of that cost. For example, will the duct testing require every unit to be tested thus requiring each manufacturer to hire one individual to test the ducts in line? Additionally, each multi-section home will need to be tested on-site which will cost around $1,000 per unit, assuming the duct system passes the first time. If a duct system fails the testing on-site, additional costs will be incurred with bringing the duct system into compliance and then another site test will be required.

Furthermore, it is unnecessary for the DOE to develop a new enforcement mechanism because the HUD Code is an already-established enforcement mechanism that mandates a uniform standard for design, construction, and installation, including federal requirements for safety, durability, and energy efficiency. While MHI recognizes that the DOE has the authority to develop an energy conservation standard for manufactured housing, it should be developed in coordination with HUD to ensure that any proposed rules are integrated into the HUD Code for enforcement.

3. DOE requests comment on the use of a tiered approach to address affordability and PBP concerns from HUD, other stakeholders, and the policies outlined in Executive Order 13985. DOE also requests comment regarding whether the price point boundary between the proposed tiers is appropriate, and if not, at what price point should it be set and the basis for any alternative price points. DOE also requests comment on its assumptions regarding the use of high-priced loans (*e.g.,* chattel loans) by low-income purchasers, or other purchasers, of manufactured housing.

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[6] 2020 U.S. Census Bureau's Manufactured Housing Survey.

Manufactured housing is a critical component of the success of Executive Order 13985, officially titled "Advancing Racial Equity and Support for Underserved Communities." According to the Urban Institute, "the gap in the homeownership rate between black and white families in the U.S. is bigger today than it was when it was legal to refuse to sell someone a home because of the color of their skin." Addressing systemic barriers to minority homeownership is imperative and increasing the supply of quality affordable housing must be an integral part of the effort. This is where manufactured housing comes in. With the average cost of a new manufactured home itself being around $87,000, it is common for the purchase of a manufactured home to be a less expensive option than renting.[7] Unlike other affordable homeownership options, which are often aging housing stock in need of extensive improvements and rehabilitation, a family can attain homeownership in a brand-new home that has the latest innovations, energy efficient features, and modern floor plans and amenities. Any federal regulations that impact the affordability of housing could make it even harder for minority homeowners to access homeownership.

4. DOE also requests comment on alternate thresholds (besides price point) to consider for the tiered approach, including a size-based threshold (*e.g.,* square footage or whether a home is single- or multisection). DOE requests comment on the square footage and region versus sales price data provided in the notice (from MHS PUF 2019) and how that data (or more recent versions of that data) could be used to create either a size-based or region-based threshold instead. DOE further requests input on whether there should be single national threshold as proposed, or whether it should vary based on geography or other factors, and if so, what factors should be considered.

The Department must seriously consider, as it did in its updated data and analysis, an alternative approach such as square footage or sections. Thresholds must be established differently for different regions of the country because the features and amenities in an "affordable" home vary geographically. Further, the pricing for a manufactured home can differ greatly depending on the location of where the home will be sited. For example, below are the 2020 average prices of a manufactured home in several states across the country[8]:

- Arizona - $106,800
- California - $118,700
- Colorado - $88,200
- Florida - $89,200
- Texas - $88,200

Further, from an approval and enforcement standpoint, it is not clear how designs of varying levels of affordability would be distinguished by production inspection primary inspection agencies (IPIAS) and design approval primary inspection agencies (DAPIAS).

5. DOE requests comment on using the AEO GDP deflator series to adjust the manufacturer's retail list price threshold for inflation. DOE requests comment on whether other time series, including those that account for regional variability, should be used to adjust manufacturer's retail list price.

While MHI does not believe a price threshold is at all appropriate, if used there absolutely needs to be an index to increase the price over time if a price tier is used. The proposed rule should establish the Federal agency tasked with providing the annually adjusted threshold values. Whether it is HUD or the DOE, a single adjusted value must be provided to ensure consistency across the industry.

6. DOE requests comment on whether a one-year lead time would be sufficient given potential constraints that compliance with the DOE standards may initially place on the HUD certification process, and whether a longer lead time (e.g., a three-year lead time) or some other alternative lead-

[7] 2020 U.S. Census Bureau's Manufactured Housing Survey.
[8] *Id.*

time for this first set of standards (e.g., phased-in over three years, with one-year lead-times thereafter) should be provided.

When DOE makes changes to appliance standards there is generally a five-year compliance period. Given that the process for manufacturing homes is at least as complex as appliances, the same time period should apply. If the proposed rulemaking is finalized as written, implementing the changes would require manufacturing plants to completely overhaul their systems and processes. Further, every home design currently being utilized – of which there are thousands – would need to be redesigned and reapproved, further slowing down the process.

7. DOE requests comment on its understanding of the definitional changes in the 2018 IECC and the 2021 IECC. DOE also requests comments on its changes to the proposed definitions as compared to those proposed in the June 2016 NOPR.

MHI recommends revising the definition of whole-house mechanical ventilation system to: "Exhaust system, supply system, or combination thereof that is designed to mechanically exchange indoor air with outdoor air when operating continuously or through a programmed intermittent schedule to satisfy the whole house ventilation rates." As currently proposed, the definition would include all exhaust fans including bath and range hoods – systems we do not believe are intended to be included.

8. DOE requests comment on incorporating by reference ACCA Manual J, ACCA Manual S, and "Overall U-Values and Heating/Cooling Loads–Manufactured Homes" by Conner and Taylor.

Incorporation of these manuals is an example of trying to use a site-built code for manufactured housing that just does not work as outlined below.

ACCA Manual J analysis requires knowledge of the orientation of the home with respect to the sun for cooling load analysis. Because the orientation of the home is often unknown until installed, the proposed rule must establish a default orientation, such as the front door is assumed to face south.

ACCA Manual S establishes sizing limits for heating and cooling equipment, these limits presume that thermal loads are established for a specific location and specific building orientation. The variation in design parameters within a single thermal zone exceeds the sizing limits of ACCA Manual S. The proposed rule must establish alternate criteria for using ACCA Manual S where the design parameters vary within a thermal zone.

Current equipment sizing methods are not based on Manual J or Manual S. The use of this software, as proposed, will add additional time and cost for each model plan submission.

The rule must establish a threshold for requiring a revised Manual J or Manual S analysis. For example, where a home model has options that affect the glazing area or insulation value, are distinct Manual J and Manual S analysis required for each possible option?

If equipment sizing is limited by Manual S, under the proposed rule homes can only be placed in their respective thermal zones because placing a home in a zone for which it was not designed would violate the sizing limits of Manual S. For example, under the current standard a Zone II home can be placed in Zone I, as Zone II is considered more restrictive. However, under the new standard, this common practice would not be permitted because equipment sized for Zone II would be oversized for Zone I and violate the proposed rule. This would restrict current sales practices in the industry especially for retailers located near the Zone boundaries.

9. DOE requests comment on basing the climate zones on the three HUD zones instead of the June 2016 NOPR-proposed four climate zones, or other configuration of climate zones. DOE further requests input on whether energy efficiency requirements should be based on smaller geographic areas than provided with the 3 or 4 zone model.

MHI supports utilizing the current HUD climate zones for the purpose of this rulemaking. However, as written the proposed rule would require a home in southern Virginia, which would be in climate zone 3 under the IECC, to meet the same requirements as a home located in Fairbanks, Alaska, which would be located in climate zone 8 using the IECC. MHI encourages the DOE to lower proposed thermal envelopment requirements within zone 3 to align with IECC climate zone 3 requirements more closely

10. DOE requests comment on the Tier 1 energy conservation standards, which would be applicable to manufactured homes with a manufacturer's retail list price of $55,000 or less. DOE also requests comment on the proposed energy conservation standards based on the most recent version of the IECC for the Tier 2 and untiered standards and the consideration of R-21 sensitivity for exterior wall insulation for climate zones 2 and 3.

Per our response to Question 1, MHI does not support a tiered approach based on retail price.

11. DOE requests comment on the additional energy efficiency requirements from the 2021 IECC and whether they should apply to manufactured homes, including those that DOE has initially considered as not applicable to manufactured homes. If so, DOE requests comment on how these requirements would apply and the costs and savings associated with these requirements.

While the IECC is respected in the construction industry, it was introduced as a standard specific to commercial and site-built residential housing with no input from the manufactured housing industry. Given that the IECC essentially ignores all the construction aspects unique to manufactured housing, requiring the industry to comply with a building code that was developed without the benefit of our industry's knowledge or participation is not an appropriate solution. Thus, an integration process of individual evaluation and strategic merging of any increased energy standards would be a much more prudent approach rather than attempting a "broad scale, one size fits all" approach as is currently being suggested. For that to work, the most appropriate code to utilize to update energy standards for manufactured homes is the HUD Code.

12. DOE requests comment on the proposal to not require that exterior ceiling insulation must have uniform thickness or a uniform density.

MHI agrees that manufactured homes should NOT have to require uniform thickness of installation. Installing insulation with a nonuniform thickness is required to construct most manufactured homes due to shipping height restrictions and the need to minimize truss heel height. Below is further supporting information as to why MHI supports not requiring uniform thickness based on the DOE proposal.

- The loose fill spray applied ceiling insulation was assumed to be R-31 per inch in the DOE analysis. Therefore, as the required R-value for the ceiling insulation is increased the required depth will also increase.
- Due to shipping restrictions across the U.S., most manufacturers limit the truss heel height to allow the most conservative shipping heights.
- When the heel height is less than the depth of insulation required, a compressed area of insulation occurs at the eave areas. The deeper the required insulation, the further the compressed area extends toward the center of the home.
- Because of the compressed area at the eave, the manufacturers typically increase the depth toward the center of the home to provide an average depth that meets the requirements.
- Approximately 30 percent of homes produced have a "vaulted" ceiling instead of "flat" ceiling as assumed in the DOE proposal. The insulation depths that are being proposed for Tier 2 prescriptive requirements would eliminate the production of homes with vaulted ceilings unless the trusses are redesigned with higher heel heights or steeper exterior roof slopes. These changes will then increase the shipping height and require truss re-designs.

- The DOE proposal includes assumptions that heel heights will increase as the required depth of insulation increases to minimize the compressed area. The DOE document states that the truss heel height is assumed to be 2.5 inches for ceilings using less than or equal to R-22, 5.5 inches for insulation between R-22 and R-30, and 7.5 inches for over R-38. This increased heel height assumption will require the trusses to be re-designed and will increase shipping heights. Homes with increased shipping heights will be more costly to ship based on state-by-state restrictions.

13. DOE requests comment on the proposal not to limit the total area of glazed fenestration.

MHI agrees that the DOE should not limit the amount of glazed fenestration. The 2021 IECC already includes exemptions that must also be included in this proposed rule. Further, MHI recommends adding the following language to this section of the proposal:

"(6) [R402.3.3] Glazed fenestration exemption. Not greater than 15 square feet (1.4 m2) of glazed fenestration per dwelling unit shall be exempt from the U-factor and SHGC requirements in Section R402.1.2. This exemption shall not apply to the Total UA alternative in Section R402.1.5."

14. DOE requests comment on removing the proposed requirement that exterior floor insulation installed must maintain permanent contact with the underside of the rough floor decking.

MHI supports exempting manufactured housing from this requirement. In manufactured home construction, the floor insulation between the I-beams is inherently not in contact with the underside of the floor decking. This must be exempted to permit standard construction practices as outlined below.

The typical insulation used in the production environment is blanket style insulation that is installed between the bottom of the floor and the chassis frame which keeps the HVAC supply duct system inside the thermal boundary of the building. Changing this method of installation would effectively remove the HVAC supply duct system from inside the thermal boundary of the building and would cause an increased heat gain and heat loss, effectively decreasing energy efficiency. This would be contradictory to the purpose and scope of the IECC. For this reason, most manufacturers do not currently install floor insulation between the floor joists that would be in contact with the underside of the floor decking. Therefore, production facilities are not set-up to efficiently install insulation that is contact with the underside of the floor decking. However, interior perimeter rim joist insulation is a common practice.

Installing insulation between the floor joists will also increase the production labor to install the insulation. This additional labor will add around 20 minutes of production time to each floor produced. For a plant producing eight floors per day, the increased production time will be around 160 minutes per day. At that rate of production, the line will have to move about every 50 minutes. Therefore, the increased labor required will either slow production or require new additional labor resources. Whether production is reduced, or additional labor is required, the overall cost of the home will be increased, but these costs were not considered in the DOE analysis.

Further, the DOE analysis assumes that the floor joists are 2x6 with insulation up to and including R-22, and 2x8 floor joists insulated to R-30 and above. Currently, 90 percent of floors produced use 2x6 floor joists. Therefore, the increased joists depth will add approximately a 33 percent material cost increase which will be around $200 per 14x76 floor. This 2-inch floor joist change will also increase the shipping height. This additional 2 inches only compounds the issue discussed about the truss changes.

15. DOE requests comment on the proposed updates to the installation of insulation criteria as it applies to manufactured homes construction only.

In Table 460.103 the instructions should clarify the location where baffles are required by adding the following underlined text:

Component	Installation Requirements
Baffles	Baffles must be constructed using a solid material, maintain an opening equal or greater than the size of the vents, and extend over the top of the attic insulation where insulation is restrained from full depth in order to maintain 1-inch minimum air space between insulation and roof decking.

In Table 460.103 instructions for "eave vents" should be deleted. This requirement is not within the 2021 IECC nor does it provide insulation installation instructions. Furthermore, it should be acceptable to use nonpermeable insulation adjacent to ventilated soffits as long as required free air path is maintained.

16. DOE requests comments on whether there are any of the 2021 IECC updates relevant to manufactured housing that should be considered as part of this rulemaking. Specifically, DOE requests comment on whether the 2021 IECC updates for installation criteria for access hatches and doors, baffles and shafts are applicable to manufactured housing and should be considered in this rulemaking.

While the IECC is respected in the construction industry, it was introduced as a standard specific to commercial and site-built residential housing with no input from the manufactured housing industry. Given that the IECC essentially ignores all the construction aspects unique to manufactured housing, requiring the industry to comply with a building code that was developed without the benefit of our industry's knowledge or participation is not an appropriate solution. For example, the baffle requirements included in the proposal will not work because the closest you can get to the rim rail is inside the face and not the outside edge. That simply will not work for manufactured homes.

17. DOE requests comment on the proposed updates to the air barrier criteria as it applies to manufactured homes construction only. Further, DOE requests comment whether the SNOPR proposal continues to be designed to achieve air leakage sealing requirements of 5 ACH.

There is substantial evidence that the prescriptive building thermal envelope air leakage standards incorporated within the rule are adequate to ensure homes achieve an air leakage rate of 5ACH. Further, MHI believes that whole house air leakage testing is unnecessary.

18. DOE requests comments on whether there are any of the 2021 IECC updates relevant to manufactured housing that should be considered as part of this rulemaking. Specifically, DOE requests comment on whether the 2021 IECC updates for air barrier criteria for recessed lighting, narrow cavities and plumbing are applicable to manufactured housing and should be considered in this rulemaking. If so, DOE requests comment on whether the requirements would alter the 5 ACH designation.

MHI does not believe that recessed lighting needs specification on air leakage rates as these fixtures are usually IC rate and significantly airtight. Further, MHI does not believe that additional information needs to be added to the proposed rule for narrow cavities as any such activities are rare in manufactured housing and when they do occur, they generally do not disrupt the air barrier and are insulated or gasketed. Finally, MHI does not believe that additional information needs to be added to the proposed rule for wiring and plumbing as most often these utilities are routed in the floor systems within the thermal envelope and larger vent piping is already caulked and sealed.

However, because the IECC essentially ignores all the construction aspects unique to manufactured housing, requiring the industry to comply with a building code that was developed without the benefit of our industry's knowledge or participation is not an appropriate solution. This is a perfect example of why the IECC is not the appropriate building code for manufactured housing. Further, holes in the floor, such as under bathtubs and showers, must be exempted from sealing to permit the installation of p-traps in 2x6 floor systems. These holes do not allow air intrusion from the exterior because the exterior floor air barrier is the bottom board and is not the floor itself. These are just a few examples why the most appropriate code to utilize to update energy standards for manufactured homes is the HUD Code. MHI does not believe any additional information needs to be added to the proposed rule to address recessed lighting, narrow cavities, and plumbing.

19. DOE requests comment on the proposal to require that total air leakage of duct systems for all manufactured homes is to be less than or equal to 4 cfm per 100 square feet of conditioned floor area.

The proposed rule limits "total air leakage" of the duct system whereas current testing, such as that done for Energy Star homes, is based on air leakage to the exterior. Testing leakage to the outside requires the use of a second machine used simultaneously. This would be a more extensive and costly test with increased failure rates while providing little benefit in terms of energy savings. Where ducts are in the floor, and contained within the bottom board, they typically do not leak to the exterior and should be exempt. Again, since no testing requirements are included in this proposal, it is impossible to know the costs or procedures of achieving such levels.

Although MHI supports efforts to limit duct leakage, we believe such tests should be limited to testing of duct systems in the factory only, where such test provides the best value to consumers. MHI encourages the DOE to clarify the testing requirements to encourage effective use of current processes to ensure supply duct systems maintain a leakage of less than 4 cfm per 100 square feet of conditioned floor area as installed and tested within the building facility.

20. DOE requests comment on DOE's interpretation of R403.1 and the proposed updates to the thermostat and controls requirements. In addition, DOE requests comments on whether there are any of the 2021 IECC updates relevant to manufactured housing that should be considered as part of this rulemaking.

MHI believes programmable thermostats should remain an option for the homebuyer. Programmable thermostats do not come preset as indicated within §460.202(b)(3) and requiring home manufacturers to program thermostats as proposed prior to the home being installed and powered would be overly burdensome, ineffective and unnecessary. Homeowners should be advised to program their thermostats. Moreover, the desire for programmable thermostats should be dependent on consumer-demand. Many consumers find programmable thermostats to be too complicated to use, and prefer a more traditional thermostat. Lastly, any pre-program requirements should be part of regulation requirements on thermostat manufacturers if deemed appropriate rather than on home manufacturers.

21. DOE requests comment on DOE's interpretation of R403.5 and the proposed updates to the service hot water requirements. In addition, DOE requests comments on whether there are any of the 2021 IECC updates relevant to manufactured housing that should be considered as part of this rulemaking. Specifically, DOE requests comment on whether the circulating hot water system temperature limit should be included as a requirement.

Circulating hot water systems are not typically used in manufactured homes. Further, 24 CFR 3280 already has provisions for scald prevention that limit the temperature of hot water. Additional requirements would be redundant and unnecessary.

22. DOE requests comment on the proposal to include the 2021 IECC fan efficacy standard requirements. DOE requests comment on whether any of the fan efficacy requirements are not applicable to manufactured homes.

The applicability of the increased efficacy standards would be dependent upon the additional costs associated, and the return on investment of the increased mechanical ventilation requirements, which the DOE did not take into account. Furthermore, the definition of "whole house fan" should be revised to align with the definition within the 2021 IECC which limits the fan efficacy requirements to fan used for "whole house ventilation" purposes rather than spot ventilation.

23. DOE requests comment on whether the HRV and ERV provisions under 2021 IECC for site-built homes are applicable to manufactured homes and whether they would be cost-effective. Specifically, DOE requests comment on costs for the HRV and ERV requirements as it applies to manufactured homes in all climate zones.

HRV and ERV provisions would add significantly to the cost of manufactured homes and 24 CFR 3280 already contains provisions for providing fresh air within a manufactured home. HRV and ERV are products mainly promoted by those appliance manufacturers and have been found in many cases to increase moisture related problems and increased energy usage, specifically in the southern climates.

24. DOE requests comment on the above ventilation strategies, including (but not limited to) cost, performance, noise, and any other important attributes that DOE should consider, including those related to mitigation measures. While the alternate ventilation approaches are not integrated into the analysis presented as part of this proposal, DOE is giving serious consideration as to whether it should incorporate one or more of these options as part of its final rule based on any additional data and public comments it receives.

HRV and ERV provisions would add significant construction costs. If implemented with the furnace, as most current ventilating systems are, significant redesign would be required to increase the size of the furnace compartment to accommodate the additional equipment and ductwork. Currently ventilation strategies in manufactured housing have proven to be efficient and effective for many years. In fact, the current IECC recognizes a process developed and commonly used by the manufactured housing industry as an accepted application in residential and commercial construction.

25. DOE requests comment on the cost-effectiveness and feasibility of requiring R-20+5 for the exterior wall insulation for climate zones 2 and 3 Tier 2/Untiered manufactured homes. DOE also requests comment on the sensitivity analysis for R-21 that would result in positive LCC savings for all cities.

The use of continuous insulation is problematic due to the required changes in design, associated costs, and need for products that don't exist. The increase in unit width due to the addition of continuous foam will require a reduction in the structural floor width equal to the thickness of the insulation. This will require redesign of the chassis system, trusses, and retooling of fixtures and jigs within the plant. Any reduction in interior width, due to increases in exterior width, will eliminate or require significant redesign of many single-wide models that incorporate a bathroom with adjacent hallway that are already at the minimum widths permitted under 24 CFR 3280. Furthermore, standard doors for manufactured homes are designed for overall wall thicknesses of 4- or 6-inches and increasing the thickness will require the use of extension jambs or the development of new products to accommodate increased wall widths. Permitting the use of R-21 only in lieu of R-20+5 is necessary.

26. DOE requests comment on the inputs to the conversion cost estimates.

Because the threshold cost is updated annually and because it is assumed that the list price must be updated, the cost to update model plans would be a reoccurring annual cost rather than a one-time cost. This must also be revised so that cost is not a consideration for Tier 2 homes. As currently proposed, the retail price must be determined for all homes to determine if it is above or under the threshold. The Tier 2 definition should not have a threshold price. Instead, a Tier 2 home should be defined as "A manufactured home that is not qualified as a Tier 1 home."

27. DOE requests comment on the shipment breakdown per tier and using a substitution effect of 20 percent on shipments to account for the shift in homes sold to the lower tiered standard. DOE requests comment on whether it should use a different substitution effect value for this analysis – and if so, why. (Please provide data in support of an alternative substitution effect value.)

Currently, very few homes are produced at the Tier 1 level of under $55,000. It is unlikely that additional homes will be manufactured at that level. Instead, MHI expects an overall reduction in the manufacturing and purchasing of manufactured homes across the board.

28. DOE requests comment on the calculation of deadweight loss presented above and the extent to which there are market failures in the no-standards case.

Deadweight loss will increase as a result of this proposal, as many potential consumers will be priced out of purchasing a manufactured home.

29. DOE requests comment on the number of manufacturers of manufactured housing producing home covered by this rulemaking.

As of September 2021, there are 138 plants and 33 corporations producing manufactured homes in the country. As a result of this proposed rulemaking, all manufacturers will be negatively impacted.

30. DOE requests comment on the cost to update model plans and the number of model plans to update as a result of the proposed rule; on the types of equipment and capital expenditures that would be necessitated by the proposal; and the total cost of updating product offerings and manufacturing facilities. DOE requests comment on how these values would differ for small manufacturers. DOE requests comment on its estimate of average annual revenues for small manufacturers of manufactured housing.

Because the threshold cost is updated annually and because it is assumed that the list price must be updated, the cost to update model plans would be a reoccurring annual cost rather than a one-time cost. This must also be revised so that cost is not a consideration for Tier 2 homes. As currently proposed, the retail price must be determined for all homes to determine if it is above or under the threshold. The Tier 2 definition should not have a threshold price. Instead, a Tier 2 home should be defined as "A manufactured home that is not qualified as a Tier 1 home."

November 11, 2022

The Honorable Marcia Fudge
Secretary
U.S. Department of Housing and Urban Development
451 7th Street, S.W.
Washington, DC 20410

RE: Notice of Federal Advisory Committee Meetings: Manufactured Housing Consensus Committee (FR-6348-N-01)

Dear Secretary Fudge,

As promised in its previous correspondence, the Manufactured Housing Institute (MHI) committed to providing supporting documentation to its proposal to the Manufactured Housing Consensus Committee (MHCC). As a supplement to its November 9th, 2022 Comment Letter, MHI is pleased to submit the following presentations to the MHCC for consideration ahead of the MHCC's meeting scheduled for November 15-17, 2022. The three presentations, attached as exhibits to this supplemental correspondence, further demonstrate the benefits of adopting MHI's proposal versus a wholesale adoption the DOE's Energy Rule. Such materials also provide supporting analysis behind MHI's proposal. Below, you will find a brief summary of the contents of each presentation:

1. **Economic Impact Analysis chart based on the Energy Rule and updated data regarding MHI's proposed thermal requirements (Attached hereto as Exhibit A):** The first presentation is the Economic Impact Analysis which is based upon the Energy Rule and supporting data regarding MHI's proposed thermal requirements. This analysis demonstrates the advantages and the cost savings that will benefit the consumer under MHI's proposal as compared to the greater economic impact on the consumer under the Energy Rule. The Economic Impact Analysis, which compares the current HUD standard with the proposals of MHI and DOE, establishes the following:

- DOE's Technical Support Document provided incremental cost increases for step-ups in energy efficiency measures using the HUD Code as a baseline. For example, the incremental cost increase of going from R11 to R13 to R21 insulation in the walls. Using the DOE's own data, this analysis calculates the incremental cost increase for the Energy Rule and MHI's proposal.

- Using validated energy simulation software, this analysis calculates the marginal energy savings achieved from the Energy Rule and MHI's proposal – that is– how much a consumer will save in energy costs on a monthly basis.

- This analysis further demonstrates that for all three Zones with Tier 2 homes, **MHI's proposal results in better 10-year outcomes for all consumers than the Energy Rule.** On average, consumers will experience a net cost that is less under MHI's proposal than under the Energy Rule.

2. **Analysis of DOE's Energy Conservation Standards for Manufactured Housing (Attached hereto as Exhibit B):** The second presentation demonstrates the DOE's failure to consider key cost inputs which will negatively impact both consumers and suppliers. As provided in greater detail in the attached presentation, this analysis demonstrates the DOE's failure to sufficiently consider the following factors in

formulating its conclusions and the cumulative effect of such factors:

- ***Inflation and Cost Increases***: DOE failed to consider the impact of considerable cost increases and supply chain constraints because of the pandemic and related economic disruptions.
    - DOE's cost/benefit or life-cycle cost ("LCC") model took cost estimates from 2014 and applied a nominal cost increase of **2.3% annually** from 2014-2023. However, beginning with the Covid-19 pandemic, actual costs for construction materials have grown substantially, and the actual cost increase for construction materials from 2014-2021 is **6.5% annually**. Manufactured housing construction costs may be even higher.
    - DOE assumed a 5% interest rate for land-home deals and a 9% interest rate for home-only deals. The current 30-year fixed mortgage rate is now approximately 7%.
    - Fixing only these two inputs to reflect actual cost inflation and actual interest rates for land/home loans, **based on DOE's own LCC model for Tier 2 homes, approximately 95% of shipments will have a negative 10-year LCC**. In geographic terms, of the 19 "representative" cities chosen by the DOE, 16 of those representative cities will have a negative 10-year LCC for Tier 2 homes. This data accounts for the increased energy savings that result from inflation as well.
    - Assuming Tier 2 homes represent 55% of the industry producing approximately 120,000 homes annually, this means that approximately **63,000 homes would have a negative 10-year LCC based on the Energy Rule.**
- ***Negative Impact***: DOE failed to consider negative impacts on low-income and minority homebuyers.
    - The Energy Rule will disparately impact minority communities even without accounting for actual cost increases. Black or African American manufactured home purchasers are approximately 22.5% more likely to finance their purchase with a home-only loan as compared with a land-home loan. Likewise, Hispanic manufactured home purchases are 11% more likely to finance their purchase with a home-only loan.
    - At a 9.5% home-only interest rate, 37% of Tier 2 shipments will have a negative 10-year LCC based on DOE's own model. Using a 11% home-only interest rate, 86% of Tier 2 shipments will have a negative 10-year LLC based on DOE's own model.
    - The Biden Administration has prioritized housing affordability and racial equity: *"The Federal Government has a critical role to play in overcoming and redressing… [its role in declining to invest in communities of color and in failing to provide equitable access,] and in protecting against other forms of discrimination by applying and enforcing Federal civil rights and fair housing laws. It can help ensure that fair and equal access to housing opportunity exists for all throughout the United States."*
- ***Additional Costs.*** DOE failed to consider potential costs of testing and compliance, transportation, and supply chain constraints.

- The Energy Rule failed to account for significant compliance costs. Without limitation, in rural areas, it is estimated that in-field duct testing could cost over $1,000 per home. Many Tier 2, Zone 2 & Zone 3 homes will need 2x6 walls rather than 2x4 which will increase lumber and transportation costs (due to weight). Exclusive of lumber costs, an additional axle may be needed for weight which is another $200 to $250 per floor, $400 to $500 per multisection homes. Transportation costs such as fuel have increased dramatically over the past year. And the industry is experiencing significant supply chain difficulties, especially for fiberglass insulation—a commodity for which supply must increase to comply with the DOE's Final Rule.

- Before supply chains normalize, the cost for fiberglass insulation will increase drastically and home starts may be limited if there is not enough fiberglass insulation or if plants must use alternatives such as blown insulation. Many in the industry do not believe that there will be enough fiberglass insulation to meet the demand. As such, manufacturers will be forced to pivot to spray foam insulation, which is more costly and labor-intensive. Additionally, the process for the installation of spray foam insulation requires a cooling off period, which will increase the amount of time of the home on the line, decreasing the thru-put, and will inevitably cause fewer home to be built. All of this will inevitably increase the overall cost of the homes to the consumer, none of which has been calculated by DOE.

- **These unaccounted-for costs will easily subsume the DOE's projected 10-year LCC savings for all manufactured homes.** For Tier 1 homes, DOE projected a national average of $720 10-year LCC savings and for Tier 2 homes, DOE projected a national average of $743 10-year LCC savings. If, for example, in-field duct testing is required which costs approximately $1,000 per home, then all 10-year LCC savings are eliminated.

- ***Affordability and Credit Access.*** DOE underestimated potential impacts on credit access and lost sales.

  - These additional costs will make home ownership unaffordable for thousands of Americans. To estimate the impact on affordability, the DOE relied upon a 2007 economic study. This study predated the Great Recession, predated the Covid-19 pandemic and the following inflation period, predated the current rise in interest rates, and predated the recent increases in retail prices for manufactured homes which may make potential customers even more price sensitive.

  - **DOE's Final Rule conceded with its sensitivity analysis that over 5,000 families annually will not be able to afford a manufactured home,** and this number is almost certainly understated for the reasons described above. Based on industry information, it is likely that the realistic impact of the implementation of the Energy Rule could actually affect twice as many families.

3. **Architectural and Design Analysis of how the Energy Rule will generally impact the design of manufactured homes as opposed to the design elements of manufactured homes based on current standards (Attached hereto as Exhibit C):** DOE's standards will negatively impact the aesthetic appearance and the design of manufactured homes. As demonstrated in the attached presentation, significant architectural modifications will be required for manufacturers to stay in compliance with the Energy Rule which will result in less aesthetically pleasing homes. Most notably, multisection homes will face substantial architectural

modifications. To meet the DOE standards, the industry will have to consider a variety of tradeoffs, including, a reduction of windows and/or significant changes in home architecture to accommodate additional insulation. Consequently, such modifications will be either be more difficult to implement and less appealing, or even prohibitive.

- To meet the U-value performance requirements for Tier 2, Zone 3 homes, assuming the home has additional insulation added without altering the framing, the windows had to be eliminated completely. As a result of the reduced windows, the requirements for egress, light and ventilation are no longer met. **Therefore, it would not be possible to manufacture this home to be in compliance with code regulations and the Energy Rule.**
    - Additionally, even if this home could be constructed in a manner to comply with code regulations and the Energy Rule, there are not enough windows in the market today to meet the demand if a lower U-value is required.
- If a manufacturer were to construct a home that met the required Tier 2, Zone 3 U-value with an insulation package that met the value under the prescriptive section of the code, which would require substantial framing changes, it would still be very difficult to construct this home using materials currently available on the market. Specifically:
    - Most manufacturers do not currently use the floor insulation technique that would be required to construct this home to meet DOE requirements.
    - There is not enough supply of R-21 insulation in the market to meet the amount necessary to comply with DOE requirements to keep up with the current demand.
    - It will be problematic to get the required insulation (R-38) in the roof cavity due to the required thickness and available attic space.
    - **To have almost the same amount of windows in the home as is allowed under current regulations, manufacturers would have to install windows that have a U-value equal to 0.30, which are not currently available on the market.**
- To construct a multi-section home in Zone 3, the shipping height will be increased due to the 5.5" heal height and the increased floor joist depth. **Because of the required insulation thickness under the Energy Rule, optional vaulted ceilings will no longer be available to the consumers.**

MHI supports energy conservation efforts, and our manufacturer members are committed to continue leading the way in energy efficient manufacturing. The analysis and presentations provided herein further demonstrate this commitment while providing a clear and conscientious basis for MHI's proposed changes to the Energy Rule. MHI remains committed to working with the MHCC, HUD and DOE to realistically improve energy efficiency that not only encourages innovation and conservation but also eliminates regulatory barriers that impede consumer access to safe, affordable manufactured housing.

Sincerely,

Lesli Gooch

Lesli Gooch, Ph.D.
Chief Executive Officer

Enclosures

Exhibit A

Economic Impact Analysis

Table 1. Net Benefit (Cost)of DOE Proposal for Multi-section Homes based on DOE Costs and SBRA Energy Savings Estimates

Multi-section Home													
HUD Standards Climate Zone	**Locations (heating equipment type)**	**Efficiency level**	**Level of efficiency (Uo-value)**	**Base average home cost (DOE TSD p. 6-2)**	**Marginal increase in home cost (DOE TSD)**	**Percent increase in cost**	**Marginal increase in down payment**	**Marginal increase in mortgage**	**Marginal increase in monthly mort. pay.**	**Marginal energy savings ($/mth)**	**Net Mthly. Savings (Cost)**	**Principal repayment**	**Net benefit (cost)**
1	Miami (Electric)	HUD standard	0.116	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.090	$108,500	$3,077	2.8%	$308	$2,770	$25	$10	($15)	$1,967	**($4,045)**
		DOE proposal	0.082	$108,500	$4,018	3.7%	$402	$3,616	$33	$19	($14)	$2,568	**($4,644)**
	Houston (Natural gas)	HUD standard	0.116	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.090	$108,500	$3,077	2.8%	$308	$2,770	$25	$12	($13)	$1,967	**($3,845)**
		DOE proposal	0.082	$108,500	$4,018	3.7%	$402	$3,616	$33	$18	($14)	$2,568	**($4,664)**
	Atlanta (Electric)	HUD standard	0.116	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.090	$108,500	$3,077	2.8%	$308	$2,770	$25	$34	$9	$1,967	**($1,135)**
		DOE proposal	0.082	$108,500	$4,018	3.7%	$402	$3,616	$33	$39	$7	$2,568	**($2,184)**
	Charleston (Electric)	HUD standard	0.116	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.090	$108,500	$3,077	2.8%	$308	$2,770	$25	$26	$1	$1,967	**($2,115)**
		DOE proposal	0.082	$108,500	$4,018	3.7%	$402	$3,616	$33	$31	($1)	$2,568	**($3,114)**
	Jackson (Electric)	HUD standard	0.116	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.090	$108,500	$3,077	2.8%	$308	$2,770	$25	$31	$6	$1,967	**($1,505)**
		DOE proposal	0.082	$108,500	$4,018	3.7%	$402	$3,616	$33	$38	$5	$2,568	**($2,344)**
	Birmingham (Electric)	HUD standard	0.116	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.090	$108,500	$3,077	2.8%	$308	$2,770	$25	$32	$7	$1,967	**($1,395)**

		DOE proposal	0.082	$108,500	$4,018	3.7%	$402	$3,616	$33	$37	$5	$1,967	**($1,783)**
2	Phoenix (Natural gas)	HUD standard	0.096	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.076	$108,500	$2,404	2.2%	$240	$2,163	$19	$15	($4)	$1,537	**($2,303)**
		DOE proposal	0.066	$108,500	$4,317	4.0%	$432	$3,885	$35	$22	($13)	$2,759	**($4,796)**
	Memphis (Electric)	HUD standard	0.096	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.076	$108,500	$2,404	2.2%	$240	$2,163	$19	$23	$3	$1,537	**($1,413)**
		DOE proposal	0.066	$108,500	$4,317	4.0%	$432	$3,885	$35	$32	($3)	$2,759	**($3,536)**
	El Paso (Natural Gas)	HUD standard	0.096	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.076	$108,500	$2,404	2.2%	$240	$2,163	$19	$10	($9)	$1,537	**($2,903)**
		DOE proposal	0.066	$108,500	$4,317	4.0%	$432	$3,885	$35	$14	($21)	$2,759	**($5,656)**
	San Francisco (Natural Gas)	HUD standard	0.096	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.076	$108,500	$2,404	2.2%	$240	$2,163	$19	$4	($15)	$1,537	**($3,583)**
		DOE proposal	0.066	$108,500	$4,317	4.0%	$432	$3,885	$35	$7	($28)	$2,759	**($6,606)**
	Albuquerque (Electric)	HUD standard	0.096	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.076	$108,500	$2,404	2.2%	$240	$2,163	$19	$21	$2	$1,537	**($1,593)**
		DOE proposal	0.066	$108,500	$4,317	4.0%	$432	$3,885	$35	$31	($4)	$2,759	**($3,656)**
	Baltimore (Natural Gas)	HUD standard	0.079	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.061	$108,500	$2,557	2.4%	$256	$2,302	$21	$13	($7)	$1,635	**($2,765)**
		DOE proposal	0.055	$108,500	$3,997	3.7%	$400	$3,598	$32	$16	($16)	$2,555	**($4,899)**
	Salem (Electric)	HUD standard	0.079	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.061	$108,500	$2,557	2.4%	$256	$2,302	$21	$51	$30	$1,635	**$1,765**

3		DOE proposal	0.055	$108,500	$3,997	3.7%	$400	$3,598	$32	$59	$27	$2,555	**$231**
	Chicago (Natural Gas)	HUD standard	0.079	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.061	$108,500	$2,557	2.4%	$256	$2,302	$21	$19	($2)	$1,635	**($2,105)**
		DOE proposal	0.055	$108,500	$3,997	3.7%	$400	$3,598	$32	$22	($10)	$2,555	**($4,149)**
	Boise (Electric)	HUD standard	0.079	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.061	$108,500	$2,557	2.4%	$256	$2,302	$21	$38	$17	$1,635	**$135**
		DOE proposal	0.055	$108,500	$3,997	3.7%	$400	$3,598	$32	$44	$12	$2,555	**($1,549)**
	Burlington (Natural gas)	HUD standard	0.079	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.061	$108,500	$2,557	2.4%	$256	$2,302	$21	$21	$1	$1,635	**($1,815)**
		DOE proposal	0.055	$108,500	$3,997	3.7%	$400	$3,598	$32	$25	($7)	$2,555	**($3,849)**
	Helena (Electric)	HUD standard	0.079	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.061	$108,500	$2,557	2.4%	$256	$2,302	$21	$53	$32	$1,635	**$1,945**
		DOE proposal	0.055	$108,500	$3,997	3.7%	$400	$3,598	$32	$62	$29	$2,555	**$551**
	Duluth (Natural Gas)	HUD standard	0.079	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.061	$108,500	$2,557	2.4%	$256	$2,302	$21	$29	$9	$1,635	**($865)**
		DOE proposal	0.055	$108,500	$3,997	3.7%	$400	$3,598	$32	$34	$1	$2,555	**($2,789)**
	Fairbanks (Natural Gas)	HUD standard	0.079	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.061	$108,500	$2,557	2.4%	$256	$2,302	$21	$39	$19	$1,635	**$335**
		DOE proposal	0.055	$108,500	$3,997	3.7%	$400	$3,598	$32	$46	$14	$2,555	**($1,279)**

Assumptions	
Down payment	10%
Principal	90%
Mort. interest rate	9%
Loan term (yrs)	20
Occupancy term (yrs)	10
Principal recapture rate	0%

Average Benefit (Cost)		MHI	DOE
Zone	**1**	**($2,340.08)**	**($3,122.03)**
	2	**($2,358.84)**	**($4,849.82)**
	3	**($421.72)**	**($2,216.82)**

Ref.: TECHNICAL SUPPORT DOCUMENT: SUPPLEMENTAL NOTICE OF PROPOSED RULEMAKING PROPOSING ENERGY CONSERVATION STANDARDS FOR MANUFACTURED HOUSING
Estimates of energy savings provided by Ekotrope software.

Exhibit B

Analysis of DOE's Energy Conservation Standards

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Analysis of DOE's Energy Conservation Standards for Manufactured Housing

Identification of Potential Issues and Sensitivity Analyses

November 11, 2022

Executive Summary

- Assignment
  - DOE relied upon a cost-benefit analysis for consumers of manufactured homes
  - Analysis Group assessed this cost-benefit analysis with particular focus on **important inputs that have changed** since DOE's original analysis
- Summary of Preliminary Conclusions
  1. Adjusting DOE's assumptions for recent inflation and interest rate increases invalidates DOE's conclusion that its proposed rule is cost-effective for consumers
  2. DOE's rule will have particularly negative impacts on minority and low-income homebuyers, who tend to face higher borrowing costs
  3. DOE has underestimated the number of households that will no longer be able to afford a manufactured home as a result of the rule
  4. DOE has failed to consider additional costs of compliance, such as duct testing and transportation costs, which could further negate any anticipated savings for consumers

Qualifications

Pavel Darling, Vice President (*MBA, MIT Sloan School of Management; B.A. in Economics, Middlebury College)*

Mr. Darling is an expert on energy matters, and often consults to utilities, state and regional organizations, and global companies in his work. He focuses on projects related to cost/benefit analyses of new construction and resource retirements; environmental effects of emissions and pollution controls; economic impacts of energy projects, mergers and policies; and natural gas, biomass, and other market studies. Mr. Darling also has extensive experience working on various climate change projects, including assessments of decarbonization policy proposals and quantification of greenhouse gas emissions impacts.

He has also submitted and supported expert testimony across different venues, including state utility commissions, siting boards, the Federal Energy Regulatory Commission and the Environmental Protection Agency. Mr. Darling's prior experience working at a utility involved preparing annual filings and working with stakeholders to assess bill impacts of proposed energy efficiency changes. He has also coauthored a number of published reports and journal articles.

About Analysis Group

Analysis Group is one of the largest international economics consulting firms, with more than 1,000 professionals across 14 offices in North America, Europe, and Asia. Since 1981, we have provided expertise in economics, finance, health care analytics, and strategy to top law firms, Fortune Global 500 companies, and government agencies worldwide. Our internal experts, together with our network of affiliated experts from academia, industry, and government, offer our clients exceptional breadth and depth of expertise.

Analysis Group's Energy & Environment practice is distinguished by our deep expertise in economics, finance, regulatory issues, and public policy, as well as significant experience in environmental economics and energy infrastructure development. We have worked on energy issues for a wide variety of clients, including energy producers, energy customers, regulatory commissions and government agencies, system operators, foundations, and nongovernmental institutions.

Background on DOE's Energy Efficiency Standards for Manufactured Housing

- Key Dates:
  - Aug. 26, 2021 — DOE issued Supplemental Notice of Proposed Rulemaking (SNOPR)
  - May 31, 2022 — Final rule and cost-benefit analyses released, relying on data from 2021 and earlier
  - May 31, 2023 — Expected compliance date

- By statute, DOE must consider cost effectiveness (42 U.S.C 17071(b)(1))
  - "The energy conservation standards established under this section shall be based on the most recent version of the International Energy Conservation Code (including supplements), **except in cases in which the Secretary finds that the code is not cost-effective**, or a more stringent standard would be more cost-effective, based on the impact of the code on the purchase price of manufactured housing and on total life-cycle construction and operating costs."

Summary of Preliminary Conclusions

DOE's conclusions on cost effectiveness disregard or do not sufficiently consider variation in key cost inputs over time and across groups for buyers and suppliers

1	**Inflation and Cost Increases**	DOE has failed to consider the impacts of considerable cost increases and supply chain constraints. Taking these into account, DOE's conclusion is invalid and the rule has a net cost to consumers rather than a benefit.
2	**Negative and Inequitable Impacts**	DOE has failed to consider negative impacts on low-income and minority homebuyers.
3	**Affordability and Credit Access**	DOE has underestimated potential impacts on credit access and lost sales.
4	**Additional Costs**	DOE has failed to consider potential costs of testing and compliance, transportation, and supply chain constraints.

Background: DOE’s Life-Cycle Cost (LCC) Model

- DOE estimated the **total customer cost** over the life of the manufactured home via the Life-Cycle Cost model, including:
  - **Purchase costs** (e.g., the price of additional energy efficiency measures), and
  - **Operating costs** (e.g., energy bill savings)
- Future costs and savings are discounted to their value in the present year
- Analysis occurs over both 10- and 30-year periods
- DOE also calculates a payback period, equal to the increase in upfront cost divided by the energy savings in first year

DOE’s Life-Cycle Cost Model

Purchase Cost Increases – **Operating Cost Savings**

Our Focus: Evaluating DOE's Cost-Benefit Analysis by Updating Key Inputs

Upfront Cost + **Monthly Mortgage** – **Annual Energy Savings**

Upfront Cost

Primary inputs

- Energy efficiency measure (EEM) costs and inflation

Other inputs

- Down payment
- Sales tax
- Loan fees

Monthly Mortgage

Primary inputs

- Interest rates, which vary by loan type (personal property, real estate)

Other inputs

- Down payment amount
- Property tax

Annual Energy Savings

Primary inputs

- Energy prices and inflation

Other inputs

- Regional energy consumption patterns
- Energy efficiency measure (EEM) efficacy
- Home energy source

Summary of Preliminary Conclusions

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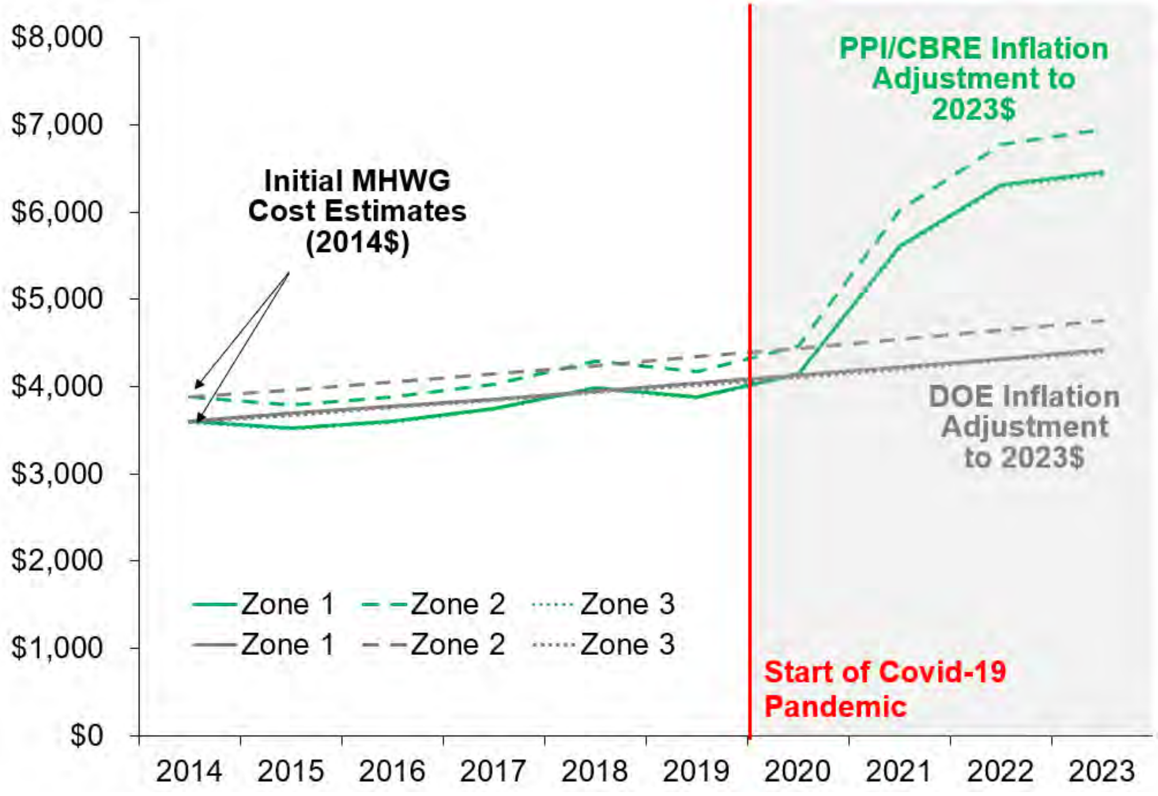
DOE Has Inadequately Adjusted EEM Cost Estimates for Inflation

- DOE calculated the costs of energy efficiency measures using cost estimates provided by the Manufactured Housing Working Group in **2014**
- To adjust for inflation, DOE assumes an annual nominal cost increase of **2.3 percent** between 2014-2023 (See gray lines)
- However, costs have increased substantially since the start of the Covid-19 pandemic. According to the BLS Producer Price Index for construction costs, materials costs have grown at an average annual rate of **6.5 percent** between 2014-2021, driven mostly by cost increases of **35.1 percent** from 2020-2021 (See green lines)
- Industry interviews suggest even higher recent increases beyond PPI, with costs at a new floor and unlikely to regress

Estimated Costs of Energy Efficiency Measures, by Inflation Adjustment Approach and Climate Zone



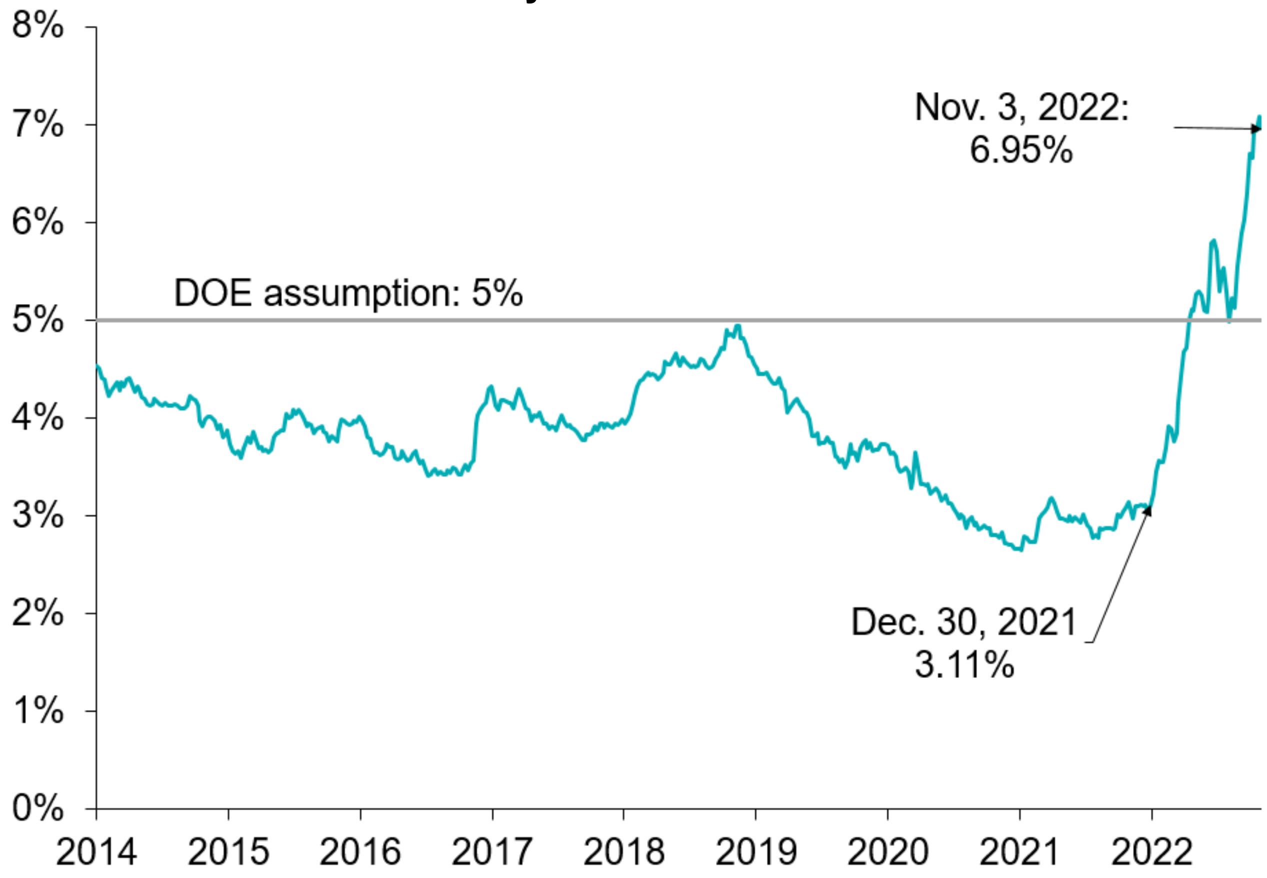
Note: Inflation estimates for PPI/CBRE series for 2022 and 2023 are from the "decreased demand" scenario of the CBRE's Construction Costs Index Forecast.

***Sources:** U.S. Bureau of Labor Statistics, Producer Price Index by Commodity: Special Indexes: Construction Materials [WPUSI012011], retrieved from FRED on October 30, 2022, Federal Reserve Bank of St. Louis, available at https://fred.stlouisfed.org/series/WPUSI012011; CBRE Research, "2022 U.S. Construction Cost Trends," July 2022, available at https://www.cbre.com/insights/books/2022-us-construction-cost-trends; U.S. Department of Energy, Manufactured Housing Life-Cycle Cost Analysis (LCC) Spreadsheet, May 18, 2022, available at https://www.regulations.gov/document/EERE-2009-BT-BC-0021-1996.*

Mortgage Interest Rates Have Increased Above DOE's Assumptions

- DOE assumed interest rates of **5 percent** for mortgage loans and **9 percent** for personal property loans
- These assumptions were arguably conservative at the time, but mortgage rates have increased from approximately 3 to **7 percent**
- Industry interviews have suggested that personal property loan interest rates may be as high as **11.5 percent** for some borrowers
  - Moreover, DOE's own review of available evidence suggests that personal property loan interest rates are typically between 0.5 percentage points and 5 percentage points higher than real estate loan interest rates

30-Year Fixed Rate Mortgage Average in the United States
January 2014 – November 2022



Sources: *Freddie Mac, 30-Year Fixed Rate Mortgage Average in the United States [MORTGAGE30US], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/MORTGAGE30US, November 3, 2022; U.S. Department of Energy, "2022-05 Technical Support Document: Final Rule Energy Conservation Standards for Manufactured Housing, May 18, 2022, available at https://www.regulations.gov/document/EERE-2009-BT-BC-0021-1999, p. 8-4.*

Energy Costs Have Increased As Well, Increasing Anticipated Savings

- Over the past year, energy costs have increased due to geopolitical and pandemic related disruptions
- The U.S. Energy Information Administration has increased its forecasted energy prices for 2023 and beyond based on its *Annual Energy Outlook* (AEO)
- The DOE LCC analysis relies on energy price forecasts from 2021

U.S. Energy Information Administration's Forecasted Energy Prices, by Forecast Year

	Nominal Energy Prices			
	AEO 2021 Assumptions	AEO 2022 Assumptions	Units	% Change
Natural Gas	$10.14	$11.70	$/Mbtu	+7.1%
Propane	$17.30	$21.49	$/Mbtu	+10.8%
Elec Heat	$0.13	$0.14	$/kWh	+1.9%
Elec Cool	$0.13	$0.14	$/kWh	+1.5%
Elec Other	$0.13	$0.14	$/kWh	+1.9%
Oil	$17.75	$21.71	$/Mbtu	+10.0%

Sources: *Annual Energy Outlook 2022, Table: Table 3. Energy Prices by Sector and Source, retrieved from U.S. Energy Information ; Short-Term Energy Outlook Data Browser, 2. Energy Prices, retrieved from U.S. Energy Information Administration on November 03, 2022, available at https://www.eia.gov/outlooks/steo/data/browser/#/?v=8.*

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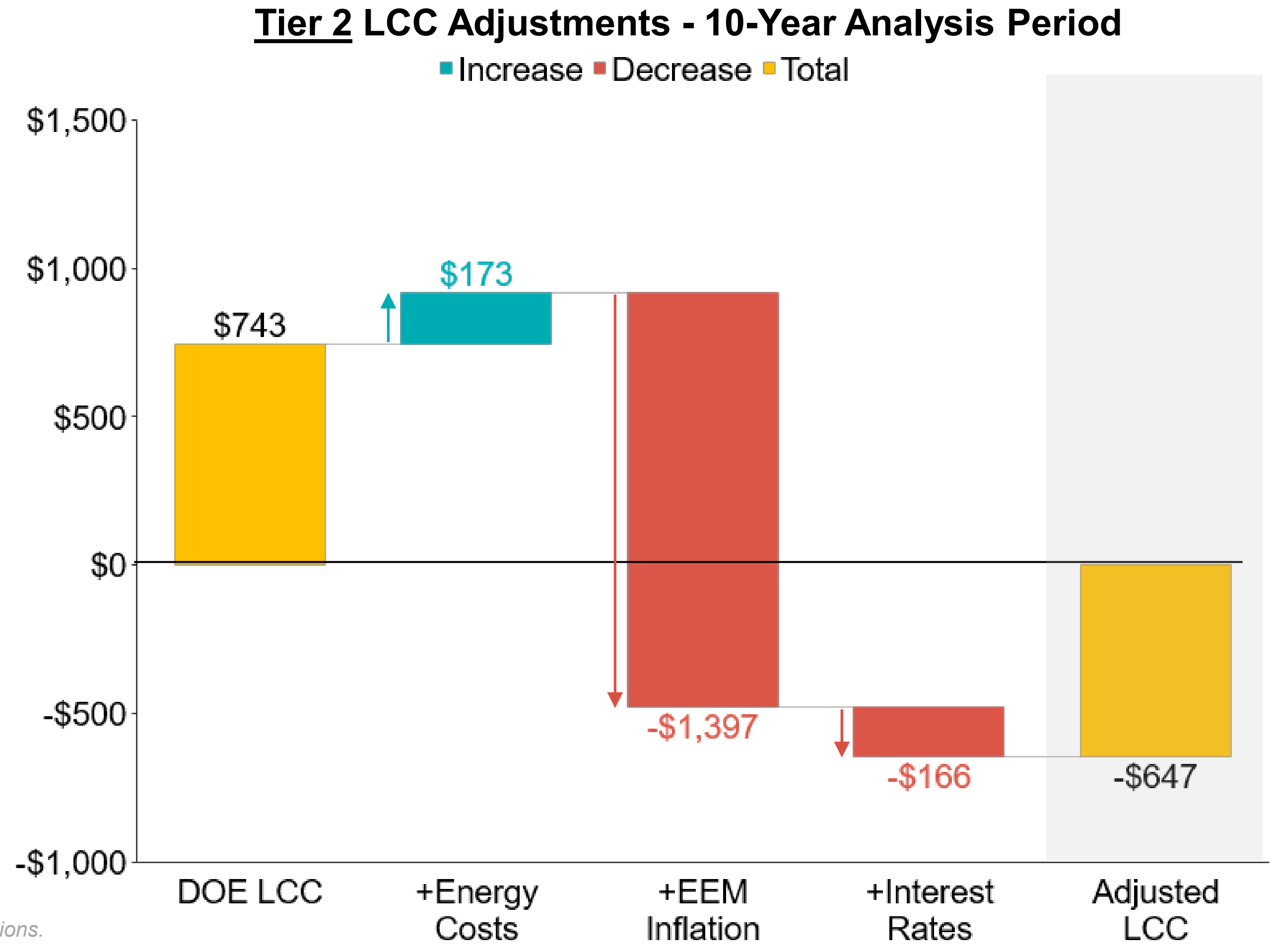
On Net, Changes in the Recent Economic Environment Have Reversed Expected Cost Savings from the DOE Rule

- While increased energy cost forecasts have increased expected savings from the rule, the large increase in construction material costs since 2022 far outweighs these gains
- Additionally, adjusting for higher interest rates adds to expected increased costs
  - Real estate loan interest rates have been adjusted from 5 percent to **7 percent**
  - Personal property loan interest rates have conservatively been left at DOE's assumption of **9 percent**



Sources: *U.S. Bureau of Labor Statistics, CBRE Research, Department of Energy, Freddie Mac, AG Calculations.*

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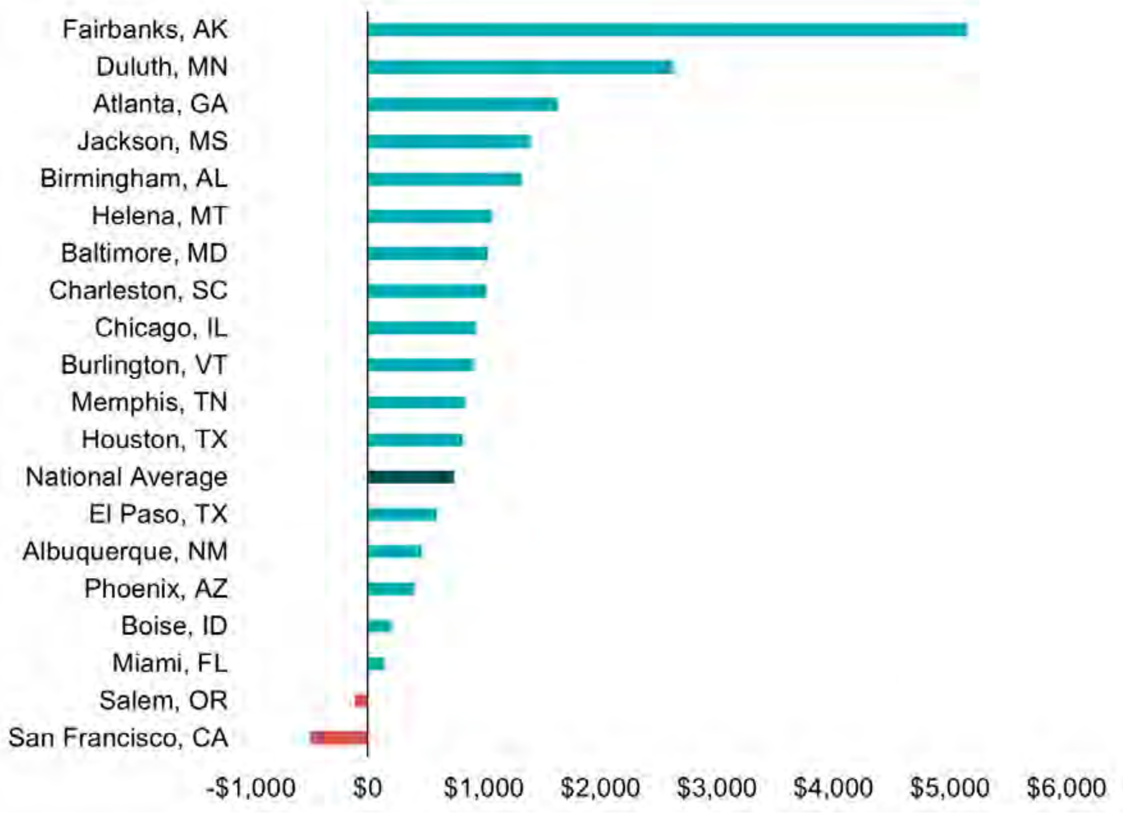
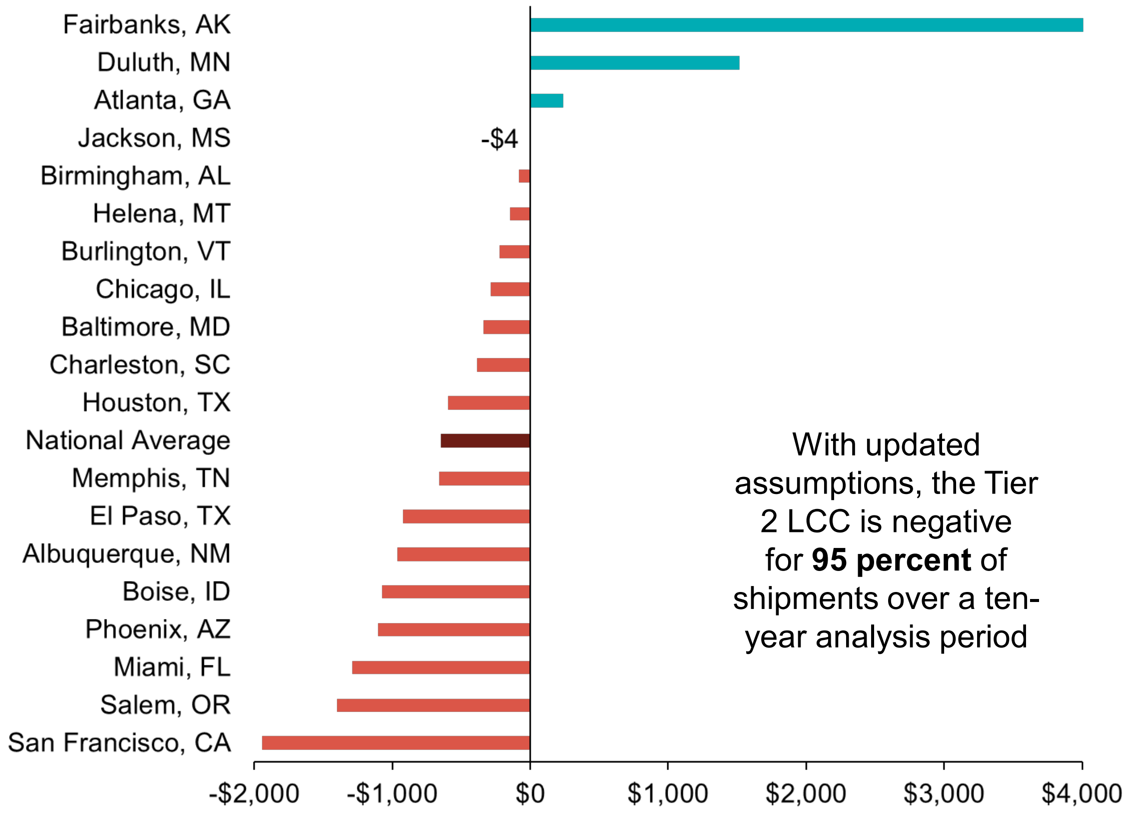
With Updated Costs, 10-Year Tier 2 LCC Negative For Most of the Country

Tier 2 LCC Adjustments, by City (10-Year Analysis Period)

DOE LCC Estimates



Adjusted LCC Estimates



With updated assumptions, the Tier 2 LCC is negative for **95 percent** of shipments over a ten-year analysis period

Sources: U.S. Bureau of Labor Statistics, CBRE Research, Department of Energy, Freddie Mac, AG Calculations.

Summary of Preliminary Conclusions

DOE's conclusions on cost effectiveness disregard or do not sufficiently consider variation in key cost inputs over time and across groups for buyers and suppliers

1	**Inflation and Cost Increases**	DOE has failed to consider the impacts of considerable cost increases and supply chain constraints. Taking these into account, DOE's conclusion is invalid and the rule has a net cost to consumers rather than a benefit.
2	**Negative and Inequitable Impacts**	DOE has failed to consider negative impacts on low-income and minority homebuyers.
3	**Affordability and Credit Access**	DOE has underestimated potential impacts on credit access and lost sales.
4	**Additional Costs**	DOE has failed to consider potential costs of testing and compliance, transportation, and supply chain constraints.

DOE's Average Buyer Analysis Masks Negative Outcomes for a Number of Subgroups

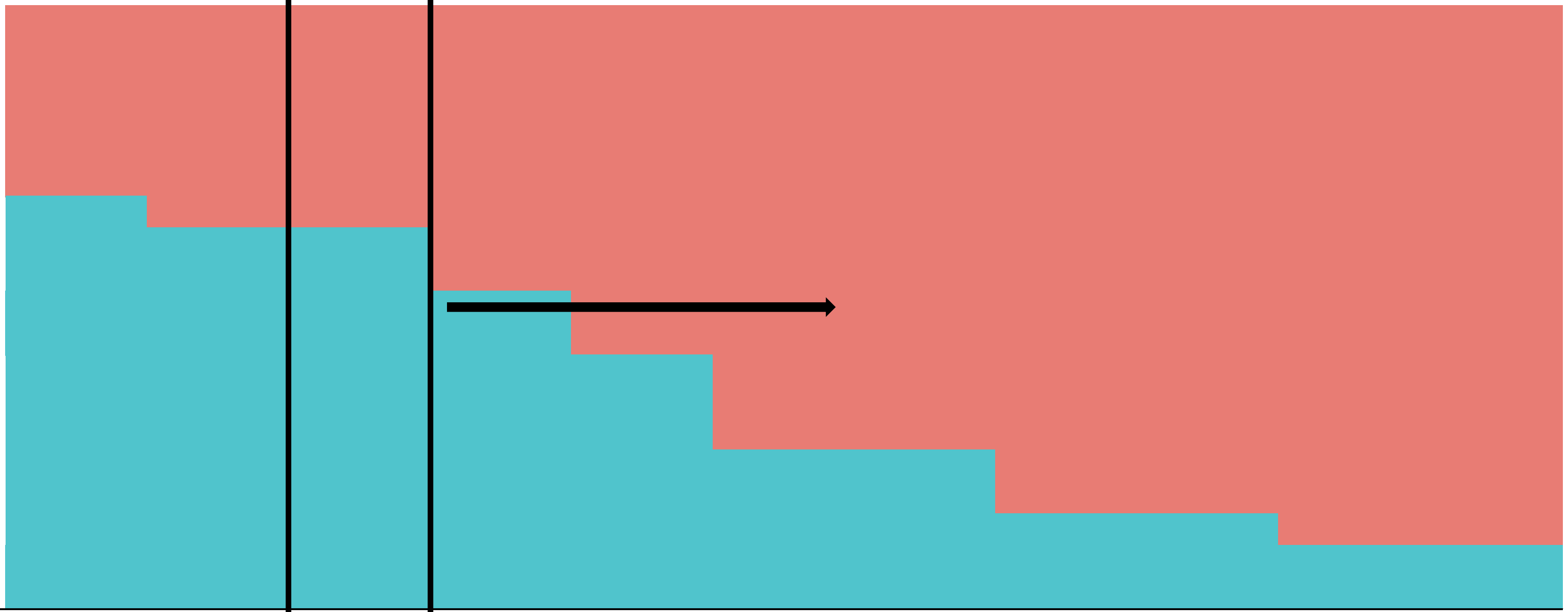
- DOE LCC calculation is an average of the LCCs for many types of buyers
- LCC estimates vary along many dimensions, including:
  - Loan type (personal property, real estate, cash)
  - Credit score
  - Home heating fuel type (e.g., natural gas, electric resistance, heat pump)
  - Climate zone/geography
- Ultimately, low-income and minority buyers are more likely to be negatively impacted by the rule
  - The Biden Administration has prioritized housing affordability and racial equity:

    "The Federal Government has a critical role to play in overcoming and redressing… [its role in declining to invest in communities of color and in failing to provide equitable access,] and in protecting against other forms of discrimination by applying and enforcing Federal civil rights and fair housing laws. It can help ensure that fair and equal access to housing opportunity exists for all throughout the United States."

Source: "Memorandum on Redressing Our Nation's and the Federal Government's History of Discriminatory Housing Practices and Policies," *The White House*, January 26, 2021, available at https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/26/memorandum-on-redressing-our-nations-and-the-federal-governments-history-of-discriminatory-housing-practices-and-policies/.

Under DOE's Original Assumptions, 10-Year LCC for Tier 2 Personal Property Loans is Negative

With Higher Interest Rates, LCC Becomes Negative for More Parts of the Country



	Personal Property Loan Interest Rate										
City	**8.0%**	**8.5%**	**9.0%**	**9.5%**	**10.0%**	**10.5%**	**11.0%**	**11.5%**	**12.0%**	**12.5%**	**13.0%**
San Francisco, CA											
Salem, OR											
Miami, FL											
Boise, ID											
Phoenix, AZ											
Albuquerque, NM											
El Paso, TX											
Memphis, TN											
Houston, TX											
Burlington, VT											
Chicago, IL											
Charleston, SC											
Baltimore, MD											
Helena, MT											
Birmingham, AL											
Jackson, MS											
Atlanta, GA											
Duluth, MN											
Fairbanks, AK											
Number of Cities with Negative LCC	6	7	7	9	11	14	14	16	16	17	17
Share of Shipments to Cities with Negative LCC	27%	37%	37%	60%	71%	86%	86%	95%	95%	98%	98%
Tier 2 LCC National Average	$ 211	$ 97	-$ 19	-$ 136	-$ 254	-$ 372	-$ 492	-$ 613	-$ 733	-$ 855	-$ 977

Note: Red indicates negative LCCs and blue indicates positive LCCs. Darker colors correspond with higher absolute values. ***Source:*** DOE LCC Model.

Minority Buyers Are Relatively More Likely to Rely on Higher-Cost Personal Property Loans to Finance Purchases

- Many borrowers such as those with low credit scores or residents of Manufactured Housing communities face interest rates as high as 11.5 percent
- Minority buyers finance MH purchases with personal property loans at especially high rates compared to non-minority buyers

Share of Manufactured Home Purchases Financed by Personal Property Loans (vs. Real Estate Only), by Demographic Cohort

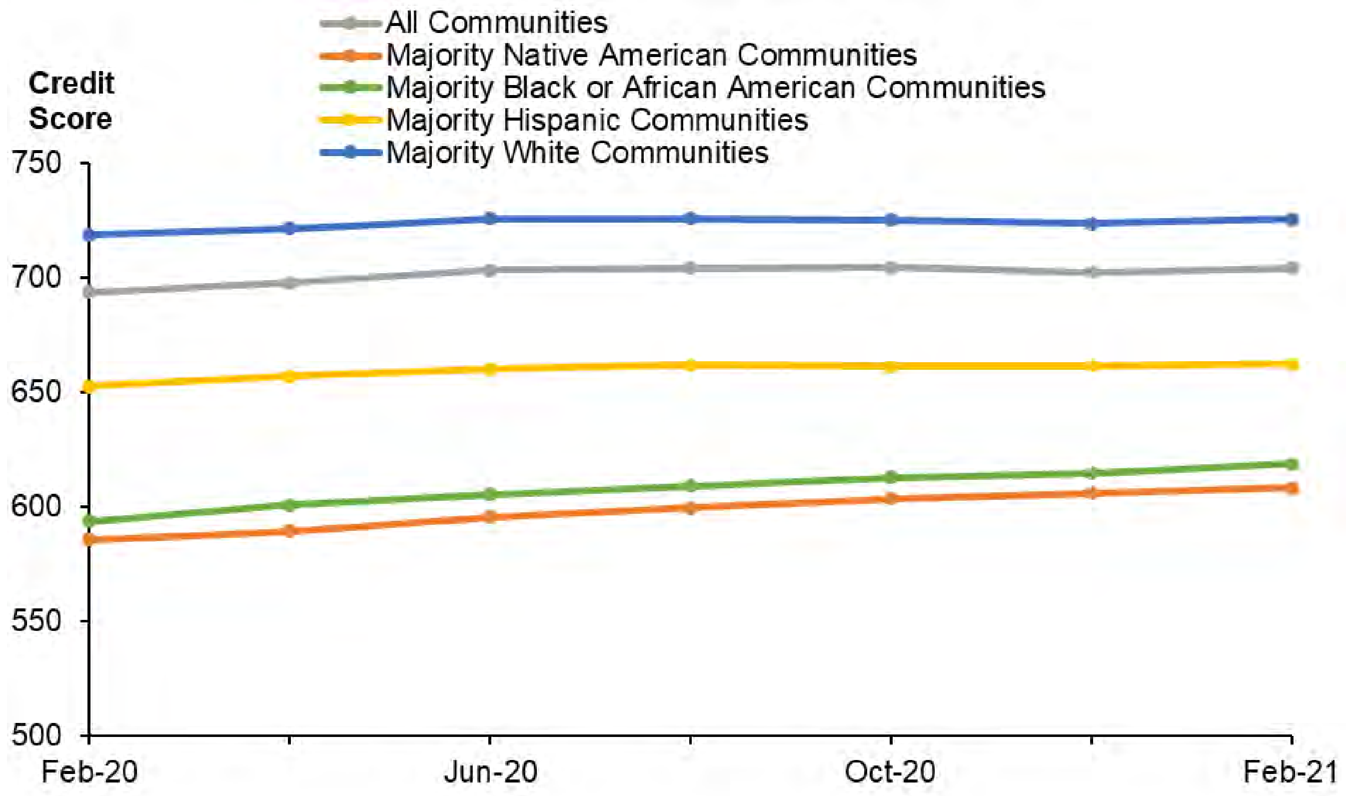
	Share of Personal Property Loans (vs Real Estate only)	Compared to All Households	Total Loans in Cohort (Personal Property and Real Estate)
All Households	42.8%	-	130,570
Low-Income Households	45.4%	*+2.6%*	65,583
Very Low-Income Households	45.1%	*+2.3%*	19,786
Hispanic	53.8%	*+11.0%*	16,224
Low-Income Hispanic Households	55.1%	*+12.3%*	8,406
Black or African American	65.1%	*+22.3%*	8,998
Low-Income Black or African American Households	66.7%	*+24.0%*	5,841
American Indian or Alaskan Native	54.7%	*+11.9%*	1,551
Low-Income American Indian or Alaskan Native Households	56.2%	*+13.4%*	840
Asian	48.6%	*+5.9%*	1,220

Sources: *2021 Home Mortgage Disclosure Act, United States Census Bureau.*

Low-Income and Minority Households Face Higher Borrowing Costs than the Median Household

- Residents of majority-minority communities tend to have lower credit scores than compared to white communities and the national average
- Low-income and minority buyers tend to face higher interest rates

Credit Scores of Residents in Majority-Minority Communities



Sources: Urban Institute Credit Bureau Data; 2021 Home Mortgage Disclosure Act.

The Negative Impact of DOE's Proposed Rule Can Be Illustrated With a Few Representative Borrowers

Quoted Rates from 21st Mortgage's Payment Estimator Help to Approximate Current Loan Terms

- The following slides illustrate several groups of representative borrowers, which differ according to the following characteristics:
  - City [E.g., Memphis, TN (Climate Zone 2)]
  - Credit Score [E.g., 650-680]
  - Home Cost [E.g., $100,000]
  - Down Payment [E.g., 10%]
  - Loan Type [E.g., Home-only (Private Land)]
- 21st Mortgage's "Payment Estimator" tool estimates interest rates and loan terms, given these characteristics, which we then use to calculate LCC values
  - 21st Mortgage is the largest manufactured-home lender in the country, so rates give a general sense of terms facing a current prospective manufactured homebuyer
- Credit score and energy consumption patterns by geography are key drivers of differences in anticipated savings for prospective multi-section home buyers

ANALYSIS GROUP

Geographic Energy Consumption Patterns Drive Considerable Differences Across Cities for Prospective Tier 2 Borrowers

Buyers with Good Credit Would Have Significantly Negative LCC in Most Cities

Profile	Memphis	Miami	El Paso	Houston	Phoenix	Baltimore
City	**Memphis (Climate Zone 2)**	**Miami (Climate Zone 1)**	**El Paso (Climate Zone 2)**	**Houston (Climate Zone 1)**	**Phoenix (Climate Zone 2)**	**Baltimore (Climate Zone 3)**
Credit score	650-680	650-680	650-680	650-680	650-680	650-680
Home cost	$110,000	$110,000	$110,000	$110,000	$110,000	$110,000
Down payment	10%	10%	10%	10%	10%	10%
Loan type	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)
Quoted rates (21st Mortgage)						
Interest rate	9.35%	9.35%	9.35%	9.35%	9.35%	8.60%
Term	25 years	25 years	25 years	25 years	25 years	25 years
10-year LCC						
Given DOE Assumptions	-$ 66	-$ 612	-$ 280	-$ 29	-$ 448	$ 366
Updated EEM Costs, Energy Prices	-$1,586	-$2,077	-$1,821	-$1,462	-$1,985	-$ 988
30-year LCC*						
Given DOE Assumptions	$1,712	$ 605	$1,323	$1,638	$1,052	$2,452
Updated EEM Costs, Energy Prices	-$ 143	-$1,206	-$ 565	-$ 119	-$ 837	$ 773

Notes: *Asterisk (*) indicates that estimates are from DOE's original model, i.e., without a correction for an error where loan payments after Year 15 are not included in the LCC calculation for personal property loans. Quoted rates are for a single applicant. From HMDA, roughly 58% of applications are from single applicants.* ***Source:*** *21st Mortgage Corporation, Payment Estimator, accessed November 7, 2022, available at https://www.21stmortgage.com/web/payment-estimator.nsf/q1.html; U.S. Department of Energy, Manufactured Housing Life-Cycle Cost Analysis (LCC) Spreadsheet, May 18, 2022, available at https://www.regulations.gov/document/EERE-2009-BT-BC-0021-1996.*

Excellent-Credit-Score Borrowers are the Only Credit Score Group with Positive Tier 2 10-Year LCCs (e.g., Memphis)

Based on Industry Interviews, Only 1/3 of MH Buyers Have Credit Scores Over 675

Profile	**Poor Credit**	**Average Credit**	**Good Credit**	**Good Credit**	**Excellent Credit**	**Excellent Credit**
City	Memphis	Memphis	Memphis	Memphis	Memphis	Memphis
Credit score	**Under 600**	**600-650**	**650-680**	**680-700**	**700-750**	**750+**
Home cost	$110,000	$110,000	$110,000	$110,000	$110,000	$110,000
Down payment	10%	10%	10%	10%	10%	10%
Loan type	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)
Quoted rates (21st Mortgage)						
Interest rate	11.45%	10.10%	9.35%	9.35%	8.35%	8.35%
Term	25 years	25 years	25 years	25 years	25 years	25 years
10-year LCC						
Given DOE Assumptions	-$ 578	-$ 259	-$ 66	-$ 66	$ 209	$ 209
Updated EEM Costs, Energy Prices	-$2,202	-$1,818	-$1,586	-$1,586	-$1,252	-$1,252
30-year LCC*						
Given DOE Assumptions	$ 630	$1,288	$1,712	$1,712	$2,355	$2,355
Updated EEM Costs, Energy Prices	-$1,255	-$ 578	-$ 143	-$ 143	$ 516	$ 516

Notes: *Asterisk (*) indicates that estimates are from DOE's original model, i.e., without a correction for an error where loan payments after Year 15 are not included in the LCC calculation for personal property loans. Quoted rates are for a single applicant. From HMDA, roughly 58% of applications are from single applicants.* ***Source:*** *21st Mortgage Corporation, Payment Estimator, accessed November 7, 2022, available at https://www.21stmortgage.com/web/payment-estimator.nsf/q1.html; U.S. Department of Energy, Manufactured Housing Life-Cycle Cost Analysis (LCC) Spreadsheet, May 18, 2022, available at https://www.regulations.gov/document/EERE-2009-BT-BC-0021-1996.*

Summary of Preliminary Conclusions

DOE's conclusions on cost effectiveness disregard or do not sufficiently consider variation in key cost inputs over time and across groups for buyers and suppliers

1 **Inflation and Cost Increases**

DOE has failed to consider the impacts of considerable cost increases and supply chain constraints. Taking these into account, DOE's conclusion is invalid and the rule has a net cost to consumers rather than a benefit.

2 **Negative and Inequitable Impacts**

DOE has failed to consider negative impacts on low-income and minority homebuyers.

3 **Affordability and Credit Access**

DOE has underestimated potential impacts on credit access and lost sales.

4 **Additional Costs**

DOE has failed to consider potential costs of testing and compliance, transportation, and supply chain constraints.

Increased Costs Will Likely Impact Ability to Qualify for Financing

- Debt-to-income ratio is one of the top reasons why potential buyers of manufactured homes are denied loans
  - In 2021, **42 percent** of denied loans for MH purchases listed the applicant's debt-to-income ratio as a reason for denial
- The cost of owning a new manufactured home has increased by over 40 percent since 2020, according to an industry source
  - Additionally, the cost of construction materials has increased by at least 35 percent since 2020, increasing the cost of compliance
  - Together, these two factors are likely to increase the debt-to-income ratio for potential applicants for manufactured home loans, increasing the likelihood of loan denial
- Minority buyers tend to have lower incomes, and therefore the impacts of the rule have the potential to fall disproportionately on historically marginalized communities
  - Low-income buyers are likely to be disproportionately impacted for similar reasons

Sources: *2021 Home Mortgage Disclosure Act, Industry Interviews.*

DOE's Reliance on Elasticity of Demand Estimates Understates Likely Impact on Affordability & Housing Access

- DOE has likely underestimated the affordability impact by assuming **relatively low price-sensitivity**
  - For example, AG's updated EEM cost estimates suggest that the cost of Tier 2 homes will increase by **6.1 percent**
    - Under DOE's assumption, a 6.1 percent increase in price leads to **2.9 percent fewer sales annually**
    - However, according to 2021 estimates of price sensitivity by the National Association of Home builders, the same 6.1 percent increase in price would lead to **6.4 percent fewer sales annually**
    - DOE's own sensitivity analysis, based on a study HUD has cited in prior rulemakings, suggests that this 6.1 percent price increase would lead to **14.6 percent fewer sales annually**
- Additionally, DOE has likely underestimated impacts on affordability due to:
  - DOE has arguably **underestimated compliance costs** and the expected increases in MH prices due to the rule
  - The **recent increase in retail prices** of MHs may have made ownership unaffordable for many consumers already
    - Consumers may be increasingly sensitive to price increases at higher baseline prices
- DOE's assumption understates the decreased demand by *thousands* of potential manufactured home buyers per year, all of whom would have to choose from worse alternatives

Sources: *DOE Technical Support Document, pp. 8-3, 10-7 – 10-9; NAHB (2021); EERE-2009-BT-BC-0021-1997_content, Sheet "Price Elasticity," Cells E3:E4; AG Calculations.*

Summary of Preliminary Conclusions

DOE's conclusions on cost effectiveness disregard or do not sufficiently consider variation in key cost inputs over time and across groups for buyers and suppliers

1 Inflation and Cost Increases	DOE has failed to consider the impacts of considerable cost increases and supply chain constraints. Taking these into account, DOE's conclusion is invalid and the rule has a net cost to consumers rather than a benefit.
2 Negative and Inequitable Impacts	DOE has failed to consider negative impacts on low-income and minority homebuyers.
3 Affordability and Credit Access	DOE has underestimated potential impacts on credit access and lost sales.
4 Additional Costs	DOE has failed to consider potential costs of testing and compliance, transportation, and supply chain constraints.

DOE Has Not Accounted for Costs of Testing and Compliance, Which Could Entirely Offset Anticipated Life-Cycle Cost Savings

- DOE has not specified requirements for duct system testing and air leakage testing, which are required by the IECC
- The costs of these possible testing requirements were also not included in DOE's LCC analyses
- Industry interviews have suggested that the costs of compliance may range up to and possibly **over $1,000/house** for in-field testing of homes in more remote locations
- A $1,000 testing cost could nearly wipe out anticipated savings across all tiers and analysis periods

DOE and Adjusted LCC Values, by Tier and Analysis Period

	10-Year LCC		30-Year LCC*	
	Tier 1	Tier 2	Tier 1	Tier 2
DOE LCC	$720	$743	$1,594	$3,573
Adjusted LCC	$549	-$647	$1,395	$1,361
Adjusted LCC, with $1,000 Testing Cost	-$194	-$1,330	$426	$338

Note: Asterisk (*) indicates that the 30-year LCC estimates rely on DOE's original model, which erroneously excludes mortgage payments after the 15th year of personal property loans and therefore overestimates anticipated savings.

Transportation Costs May Further Reduce or Negate Anticipated Savings

- Interviews with industry experts, as well as public comments submitted to DOE, have suggested that DOE has underestimated additional transportation costs due to additional height and weight required to comply with the rule
  - Additional insulation and framing requirements may increase the weight of manufactured homes, requiring an additional axle, which may cost **at least $400 to $500/multi-section house**
  - The rule may require homes in CZ2 and CZ3 to use 2' x 6' studs instead of standard 2' x 4' studs, which increases package height. Height increases may require re-routing deliveries around areas with height restrictions, such as in the Northeast
- Additionally, transportation costs have increased in general during the pandemic, e.g., as fuel and labor costs have increased
- Incremental transportation costs were not included in DOE’s LCC estimates

Pandemic-Related Supply Chain Shortages May Persist into 2023

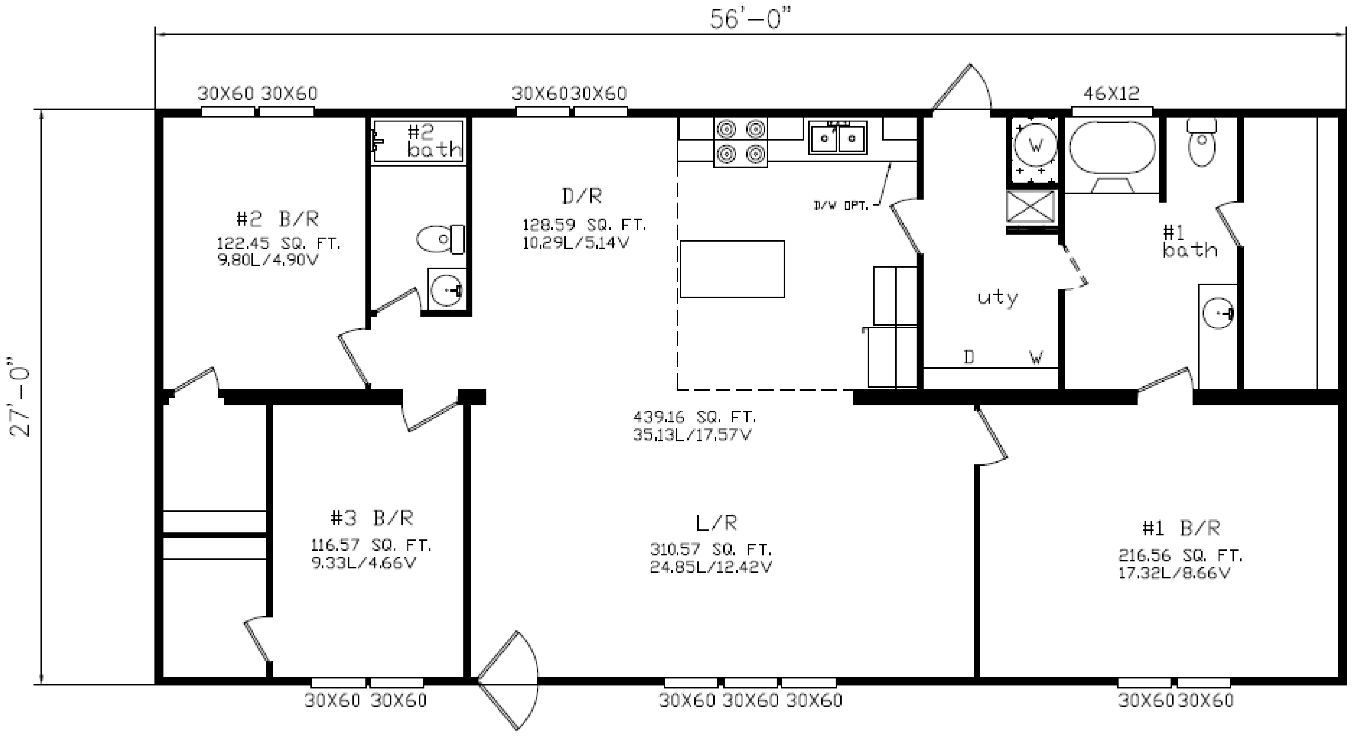
- Industry interviews have predicted that pandemic-related supply chain shortages are likely to persist into 2023
  - For example, one interview noted that there were already insulation shortages, with additional cost increases coming in January 2023
  - New fiberglass insulation plants are capital-intensive and take time to build, and therefore insulation shortages are likely to persist in the medium term
  - Therefore, increased demand from the manufactured housing sector due to the DOE rule may further exacerbate existing insulation shortages
  - Without sufficient fiberglass insulation, manufacturers may be forced to substitute to spray foam insulation for parts of the production process, increasing costs significantly and reducing the total number of homes that can be produced per day
- Additionally, CBRE has predicted that pandemic-related delays and labor shortages will continue in the short term

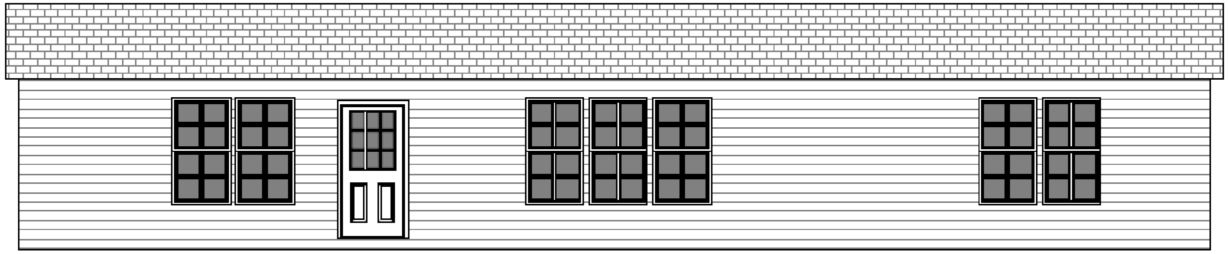
Exhibit C

Architectural Drawings

CURRENTLY BUILT MULTI WIDE – BOX SIZE 27x56

HEATED AREA – 1457 SQUARE FEET





<u>TYPICAL ZONE 3 CONSTRUCTION</u>

INSULATION – 22 FLOOR / 11 WALL / 28 CLG

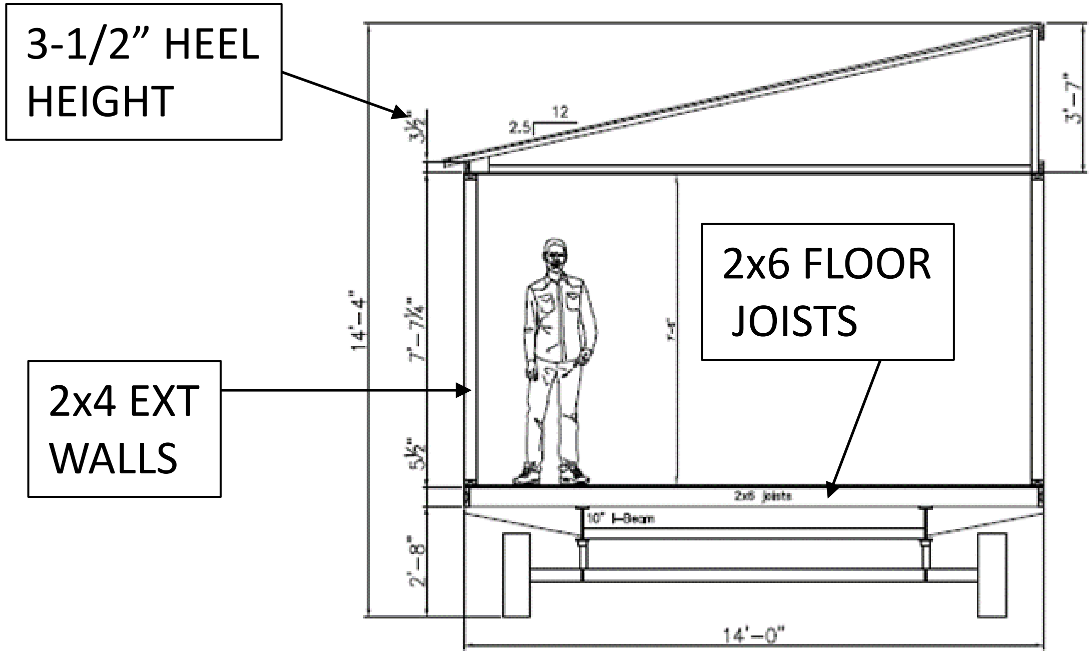
2x4 WALLS

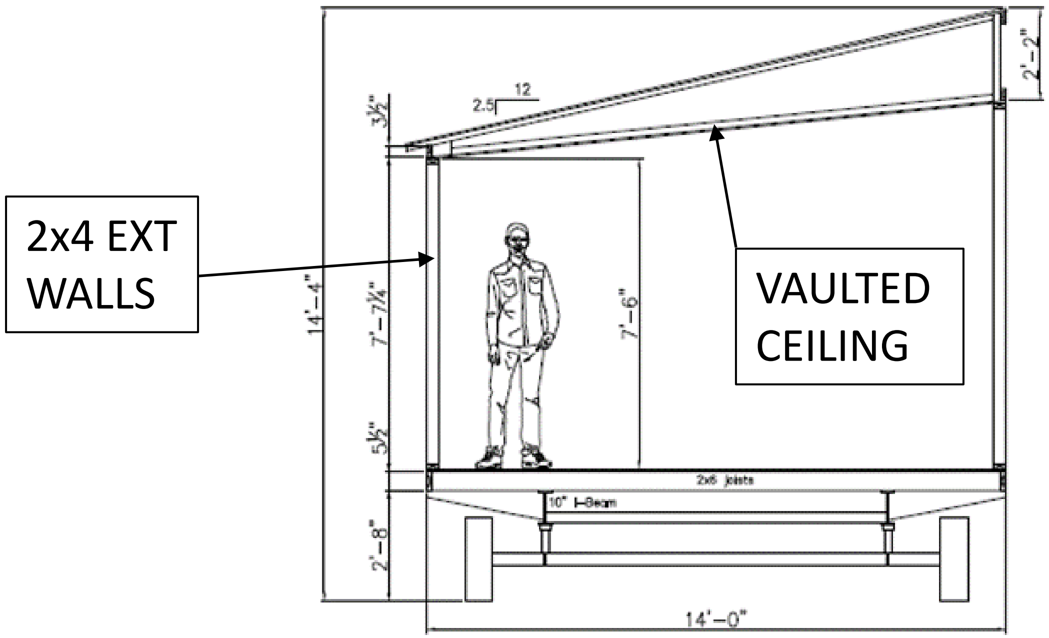
2x6 FLOOR JOISTS

142 SQUARE FEET OF WINDOWS

WINDOW U-VALUE = 0.34

CURRENT TYPICAL CROSS SECTIONS

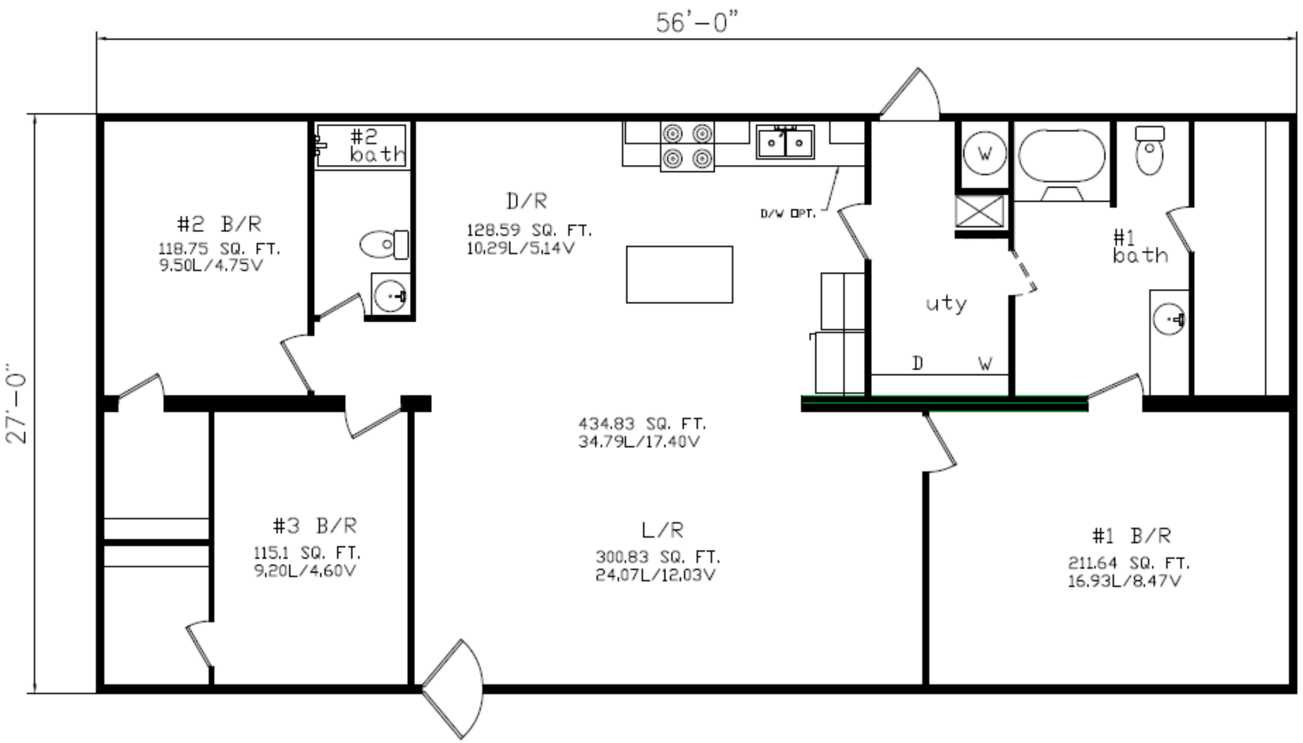


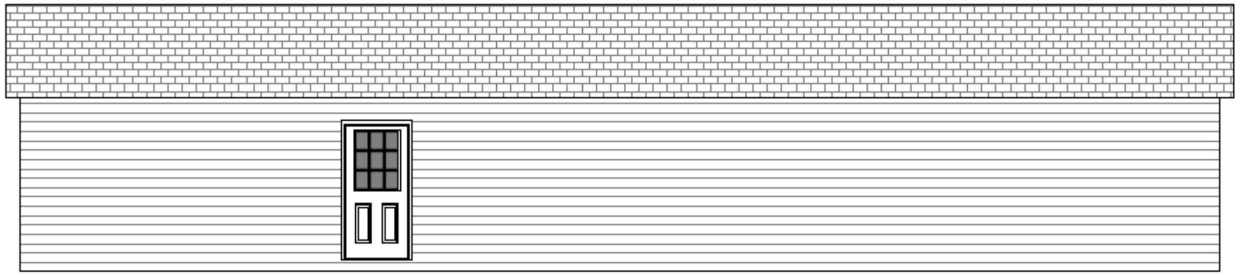


TYPICAL ZONE 3 CONSTRUCTION: SHIPPING HEIGHT 14’-4”
OPTIONAL VAULT CEILING
7’-6” SIDEWALL HEIGHT
3-1/2” TRUSS HEEL HEIGHT

IMPACT DUE TO DOE PROPOSED MULTI WIDE – BOX SIZE 27x56

HEATED AREA – 1457 SQUARE FEET





PROPOSED ZONE 3 CONSTRUCTION

INSULATION – 33 FLOOR / 15 WALL / 28 CEILING

2x4 WALLS

2x6 FLOOR JOISTS

ZERO WINDOWS

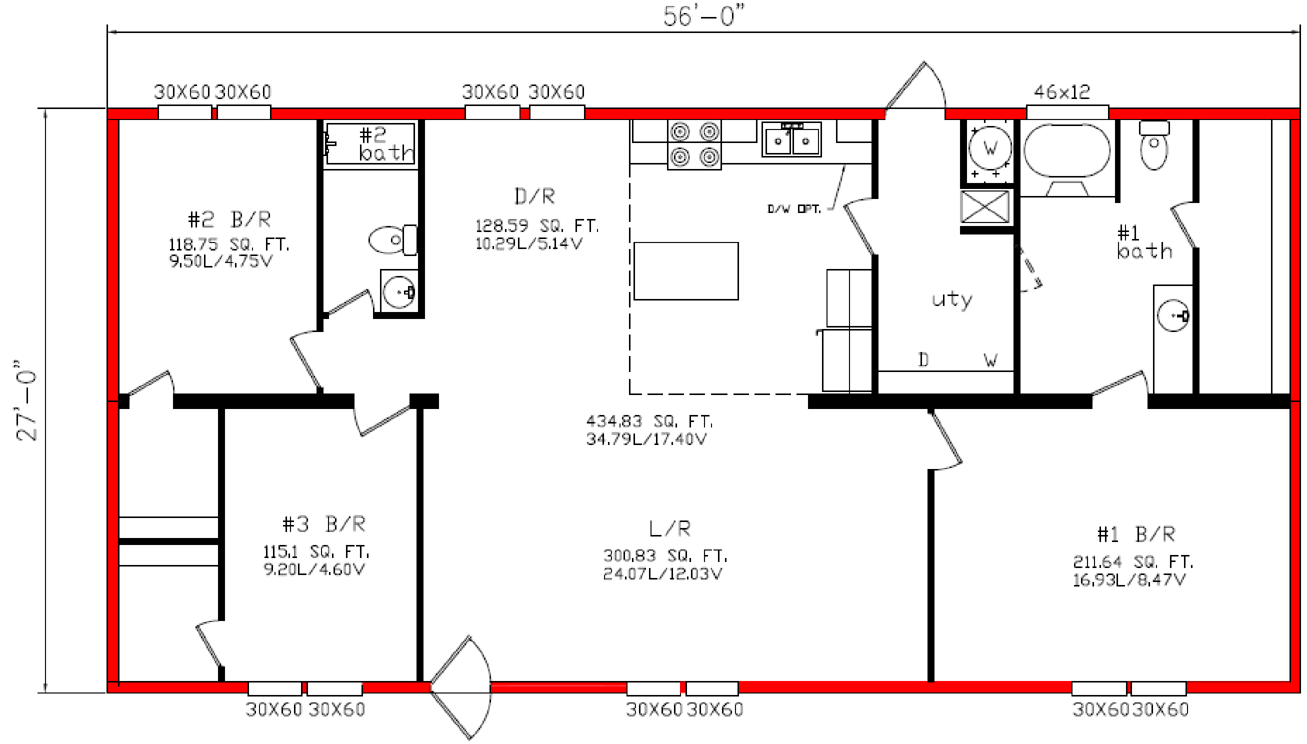
WINDOW U-VALUE = 0.32

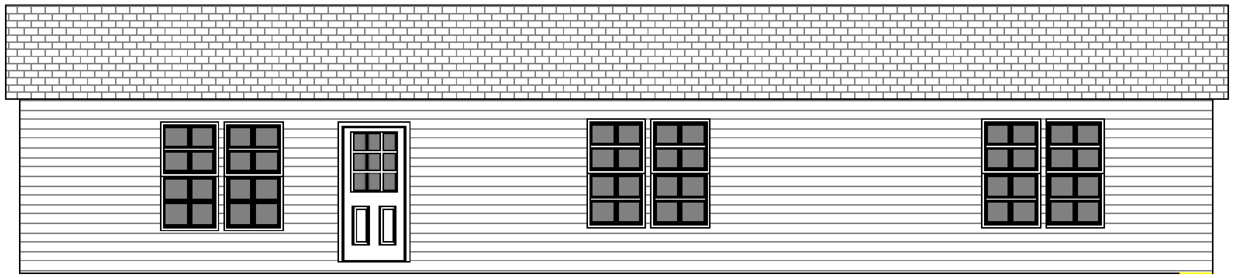
NOTES:

- THIS SLIDE SHOWS THE CHANGES REQUIRED IN ORDER TO REACH THE REQUIRED U-VALUE (0.055) WITHOUT CHANGING THE HOME CONSTRUCTION .
- FLOOR INSULATION WAS CHANGED TO R-33, WALL INSULATION WAS CHANGED TO R-15, AND CEILING INSULATION REMAINED R-28. THESE INSULATION VALUES ARE THE MAXIMUM POSSIBLE VALUES THAT CAN BE INSTALLED WITHOUT CHANGING THE HOME CONSTRUCTION FRAMING.
- WITH THIS CONSTRUCTION, I WAS ONLY ABLE TO GET THE OVERALL U-VALUE DOWN TO 0.055 IF ALL WINDOWS WERE REMOVED.
- PLEASE NOTE THAT IT IS NOT POSSIBLE TO CONSTRUCT A HOME WITHOUT WINDOWS DUE TO LIGHT, VENTILATION, and EGRESS REQUIREMENTS.

IMPACT DUE TO DOE PROPOSED MULTI WIDE – BOX SIZE 27x56

HEATED AREA – 1430 SQUARE FEET





PROPOSED ZONE 3 CONSTRUCTION

INSULATION – 30 FLOOR / 21 WALL / 38 CEILING

2x6 WALLS

2x8 FLOOR JOISTS

129 SQUARE FEET OF WINDOWS

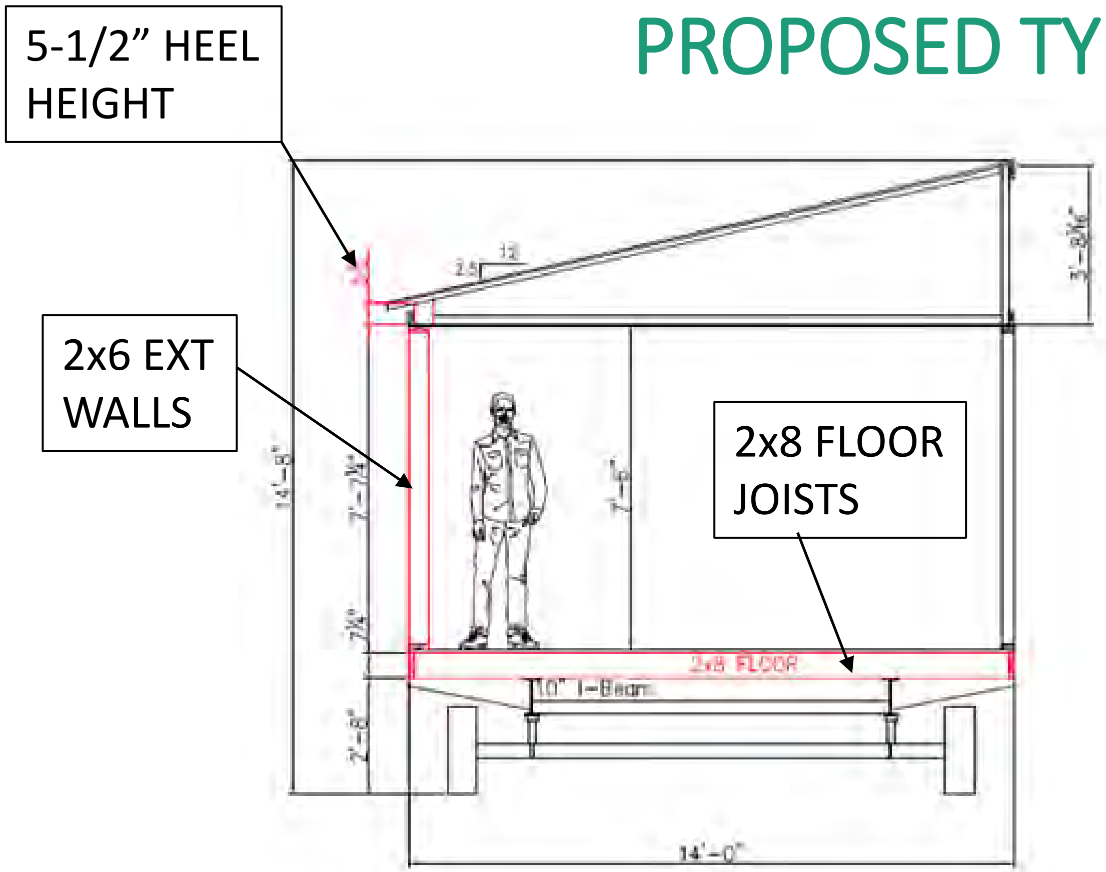
WINDOW U-VALUE = 0.30

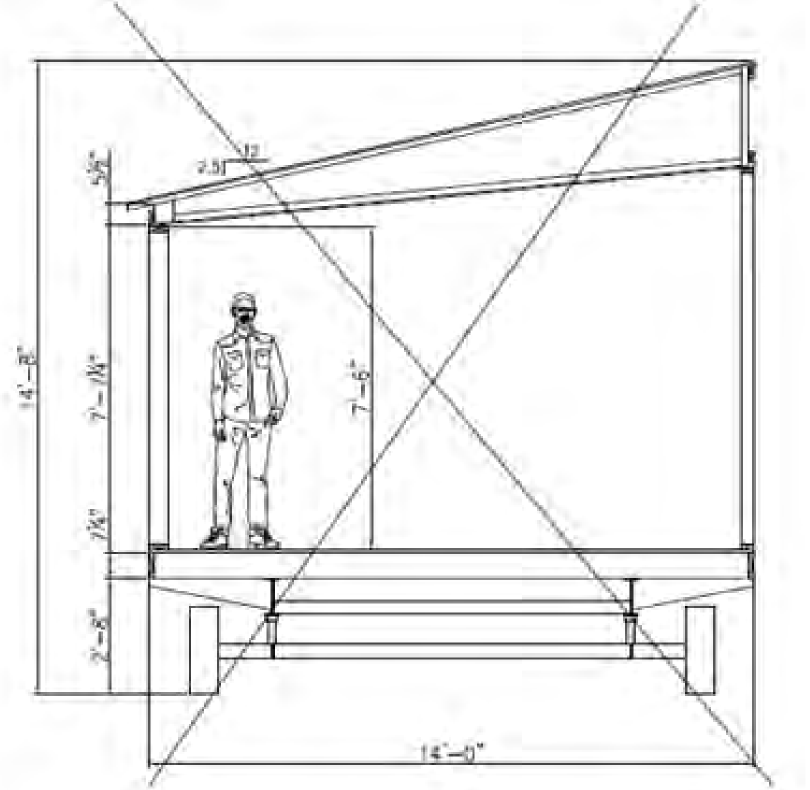
HEEL HEIGHT CHANGED TO 5.5 inches

NOTES:

- IN ORDER TO REACH THE REQUIRED U-VALUE (0.055) THE FLOORS WERE CHANGED TO 2x8 , THE WALLS WERE CHANGED TO 2x6 AND THE INSULATION PACKAGE WAS CHANGED TO THE VALUES LISTED IN THE PRESCRIPTIVE SECTION OF THE PROPOSED CODE. HOWEVER, IT WILL BE VERY DIFFICULT TO BUILD THE HOME WITH THIS INSULATION PACKAGE USING CURRENTLY AVAILABLE MATERIALS.
- HEATED AND COOLED INTERIOR SPACE REDUCED BY 27 SQUARE FEET DUE TO THE INCREASED WALL THICKNESS.
- R-30 IN THE FLOOR WILL REQUIRE BATT INSULATION TO BE INSTALLED BETWEEN THE FLOOR JOISTS COMBINED WITH A BLANKET BELOW THE JOISTS. CURRENTLY, MOST MANUFACTUER'S DO NOT USE THIS FLOOR INSULATION TECHNIQUE.
- R-21 IS AVAILABLE, BUT IN SMALL QUANTITIES
- R-38 WILL BE PROBLEMATIC TO GET INTO THE ROOF CAVITY DUE TO THE REQUIRED THICKNESS AND AVAILABLE SPACE IN THE ATTIC.
- ADDED BACK 11 OF THE PREVIOSULY REMOVED 12 WINDOWS. UPGRADED THE WINDOWS TO U-VALUE EQUAL TO 0.30. HOWEVER, IT SHOULD BE NOTED THAT THESE UPGRADED WINDOWS ARE NOT AVAILABLE IN THE MARKET TODAY.
- SHIPPING HEIGHTS WILL BE INCREASED DUE TO TALLER FLOORS AND TALLER HEEL HEIGHT TRUSS.
- THE OPTION FOR A VAULTED CEILING WILL NOT BE POSSIBLE DUE TO THE INCREASED INSULATION THCKNESS IN THE ATTIC.
- OPTIONS FOR 8 FEET OR 9 FEET WALL HEIGHTS AND TRANSOM WINDOW WILL ALSO BE IMPACTED.

PROPOSED TYPICAL CROSS SECTIONS





ZONE 3 CONSTRUCTION: SHIPPING HEIGHT INCREASED TO 14'-8"
OPTIONAL VAULT CEILING IS NO LONGER AVAILABE DUE TO INSULATION THICKNESS
7'-6" SIDEWALL HEIGHT
5-1/2" TRUSS HEEL HEIGHT
2x8 FLOORS

ADDITIONAL PROPOSED CHANGES

- PROPOSES USING ACCA MANUAL S AND ACCA MANUAL J FOR HEATING AND COOLING EQUIPMENT. HOWEVER, USING ACCA MANUAL J AND ACCA MANUAL S FOR THE DESIGN OF HEATING AND COOLING EQUIPMENT WILL BE PROBLEMATIC, ESPECIALLY IN THERMAL ZONE 3. ACCA MANUAL J REQUIRES KNOWLEDGE OF THE ORIENTATION OF THE HOME WITH RESPECT TO THE SUN FOR COOLING LOAD ANALYSIS. BECAUSE THE ORIENTATION OF THE HOME IS OFTEN UNKNOWN UNTIL INSTALLED, THE PROPOSED RULE MUST ESTABLISH A DEFAULT ORIENTATION. ACCA MANUAL S ESTABLISHES SIZING LIMITS FOR HEATING AND COOLING EQUIPMENT, THESE LIMITS PRESUME THAT THERMAL LOADS ARE ESTABLISHED FOR A SPECIFIC LOCATION AND SPECIFIC BUILDING ORIENTATION. THE VARIATION IN DESIGN PARAMETERS WITHIN A SINGLE THERMAL ZONE EXCEEDS THE SIZING LIMITS OF ACCA MANUAL S. ADDITIONAL GUIDANCE WILL BE REQUIRED TO PROPERLY USE ACCA MANUAL S AND ACCA MANUAL J.

Manufactured Housing Association for Regulatory Reform

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November 9, 2022

VIA ELECTRONIC SUBMISSION

Manufactured Housing Consensus Committee
C/O Home Innovation Research Labs
Administering Organization
400 Prince George's Boulevard
Upper Marlboro, Maryland 20774

Re: Energy Conservation Standards for Manufactured Housing

Dear Members of the Manufactured Housing Consensus Committee:

The following comments are submitted on behalf of the Manufactured Housing Association for Regulatory Reform (MHARR). MHARR represents independent producers of manufactured housing from all regions of the United States.

I. BACKGROUND

On September 21, 2022, the U.S. Department of Housing and Urban Development (HUD) published notice of Manufactured Housing Consensus Committee (MHCC) meetings in October and November 2022, to ostensibly develop recommendations to "align"[1] the Federal Manufactured Housing Construction and Safety Standards (FMHCSS) administered by HUD[2] with the energy conservation standards for manufactured housing adopted by the U.S. Department of Energy (DOE) on May 31, 2022.[3] For the following reasons, however, the final manufactured housing energy conservation final standard adopted by DOE cannot lawfully be incorporated within – or summarily "aligned" with – the HUD FMHCSS standards consistent with the law governing both those standards and the HUD manufactured housing program. As a result, the MHCC should adopt and submit to HUD resolutions which:

(1) Reject any such incorporation (or summary "alignment") of the DOE final standard into the HUD Part 3280 standards; and

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[1] See, 87 Federal Register, No. 182 (September 21, 2022), "Notice of Federal Advisory Committee Meeting; Manufactured Housing Consensus Committee," at p.57712, col. 2 ("Given that manufacturers have to comply with the Department of Energy's Energy Conservation Standards for Manufactured Housing and the [FMHCSS], and HUD's role in regulating the manufactured housing industry, HUD considers it imperative to promptly proceed with a rulemaking to align the [FMHCSS] with the Department of Energy's Energy Conservation Standards for Manufactured Housing.")

[2] See, 24 C.F.R. 3280.

[3] See, 87 Federal Register, No. 104 (May 31, 2022), "Energy Conservation Program; Energy Conservation Standards for Manufactured Housing," at p.32728, et seq.

(2) Affirm that any such DOE standard, which cannot lawfully be and is not incorporated within the FMHCSS standards, cannot be enforced pursuant to or subject to inspection or consumer complaint procedures applicable to FMHCSS standards under 24 C.F.R. 3282.

The bases for this position are set forth in greater detail below.

II. COMMENTS

A. THE DOE FINAL ENERGY STANDARD CANNOT LAWFULLY BE INCORPORATED WITHIN THE FMHCSS

As DOE recognized in a previous rulemaking, the statutory authority for the promulgation and adoption of its May 31, 2022 final energy standards for manufactured homes, is completely separate, distinct and independent from the statutory authority for the promulgation, adoption and enforcement of FMHCSS standards by HUD.[4] DOE thus developed, proposed and adopted the May 31, 2022 manufactured housing energy standards pursuant to section 413 of the Energy Independence and Security Act of 2007 (EISA).[5] In relevant part, that section directs the Secretary of DOE, "not later than four years after December 19, 2007," to establish, "by regulation, "standards for energy efficiency in manufactured housing." Section 413, however, by its express terms, does not mandate, direct, authorize or even *mention* the incorporation, adoption or "alignment" of any such DOE standards into or within the FMHCSS standards.[6] Nor does it establish an independent enforcement mechanism for DOE to investigate, ascertain, or determine compliance with those standards when they go into effect, stating only that "any manufacturer of manufactured housing that violates a provision of the" DOE energy standards, "is liable to the United States for a civil penalty in an amount not exceeding 1 percent of the manufacturer's retail list price of the manufactured housing."

In contrast to the DOE manufactured housing energy standard, FMHCSS standards are developed, promulgated, adopted and enforced pursuant to the National Manufactured Housing

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[4] C.f. 85 Federal Register, No. 31 (February 14, 2020), "Energy Conservation Program for Appliance Standards; Procedures for Use in New or Revised Energy Conservation Standards and Test Procedures for Consumer Products and Commercial/Industrial Equipment," at p. 8676, col. 1 ("With respect to MHARR's suggestion to apply the Process Rule's provisions to the separate rulemaking on manufactured housing [energy standards] that is currently underway ... we note that the statutory authorities for manufactured housing and the appliance [energy] standards that are addressed by this final rule are in separate chapters within Title 42 of the U.S. Code and have no relationship with each other....") (Emphasis added.)

[5] See, 42 U.S.C. 17071.

[6] Significantly, Congress could have statutorily directed the verbatim incorporation of the DOE standards within the FMHCSS standards – or the "alignment" of the FMHCSS standards with the DOE standards – if it had wanted to do so. For example, Congress, in the Formaldehyde Standards for Composite Wood Products Act of 2010 (P.L. 111-199), directed the Environmental Protection Agency (EPA) to develop and adopt enhanced formaldehyde emission standards for certain specified wood products. It further directed HUD "to update its regulation addressing formaldehyde emission standards" for manufactured homes "to ensure consistency with" the new EPA formaldehyde standards "not later than 180 days" after the promulgation of the EPA standards. See, 84 Federal Register, No. 56 (March 22, 2019) "Streamlining and Aligning Formaldehyde Emission Control Standards for Certain Wood Products in Manufactured Home Construction with Title VI of the Toxic Substance Control Act," at p. 10739, col. 1. No comparable directive, however, is contained within 42 U.S.C. 17071.

Construction and Safety Standards Act of 1974 (1974 Act), as amended by the Manufactured Housing Improvement Act of 2000 (2000 reform law). Those laws prescribe: (1) the subject areas that can be addressed by FMHCSS standards; (2) the criteria and considerations that relate to and govern the promulgation and adoption of such standards; (3) the procedures that must be followed to promulgate and adopt such standards; (4) a comprehensive mechanism for inspections to determine compliance with those standards; and (5) remediation and consumer protection provisions.

As one of their highest policy priorities, the laws governing the FMHCSS standards and the HUD manufactured housing program require that FMHCSS standards be cost effective and maintain the purchase price affordability of manufactured housing. The 1974 Act, as amended, therefore, affirmatively mandates that the MHCC in recommending FMHCSS standards and HUD, in adopting FMHCSS standards:

(1) "Facilitate the availability of affordable manufactured homes;"
(2) "Increase homeownership for all Americans;"
(3) "Ensure that the public interest in, and need for, affordable manufactured housing is duly considered in all determinations relating to the Federal standards and their enforcement;" and
(4) "Consider the probable effect of such standard on the cost of the manufactured home to the public;"

(Emphasis added). Applicable law, accordingly, unambiguously requires that each and every FMHCSS within the HUD Code meet these criteria, among others. This includes, moreover, outside or "foreign" standards incorporated within the Part 3280 FMHCSS standards, which must independently satisfy and comply with these and all other applicable statutory criteria.

As MHARR has previously demonstrated to the MHCC and in the DOE rulemaking, however, the DOE final manufactured housing energy standards do not and cannot satisfy the cost-effectiveness and cost-benefit balancing criteria of the 1974 Act as amended.[7] By DOE's own admission in the rulemaking process, the final energy standard would result in a retail-level price increase of nearly $6,000 for a double-section home in the most stringent thermal zone (and would actually be even higher, according to MHARR data). By contrast, according to DOE, the final standard would "save … $475 per year in multi-section homes on their utility bills."[8] At that rate, *even assuming DOE's figures are accurate*, a homeowner would have to wait nearly *13 years* to recoup the cost of the DOE energy standards, yet industry data indicates that the average ownership tenure of a manufactured home is significantly shorter. Moreover, and more importantly, however, the cost increase attributable to the energy standard, as calculated by DOE, *necessarily* understates its full cost in multiple respects, as MHARR has previously demonstrated. Thus, among other things, DOE's cost estimate:

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[7] See, detailed analysis set forth in MHCC comments submitted by MHARR dated September 15, 2021 and October 1, 2021. See also, MHARR comments to DOE dated February 25, 2022, among others.

[8] See, DOE News Release, May 18, 2022, "DOE Updates Mobile Home Efficiency Standards to Lower Household Energy Bills," at p. 2., attached hereto as Attachment 1.

(1) Fails to include the cost of enforcement, testing and regulatory compliance;[9]
(2) Fails to account for the full cost effect of rampant inflation;
(3) Fails to account for the cost impact of triennial International Energy Conservation Code (IECC) updates; and
(4) Fails to account for the cost of regulatory uncertainty related to such updates and arbitrary DOE modifications and alterations to IECC code provisions.

Thus, based on the cost data that exists, as well as the cost data that DOE has failed to develop but will obviously and substantially increase the cost of the DOE standard and simultaneously negate any conceivable cost-benefit that such a standard could have for any consumer anywhere in the United States, the DOE standard fails to meet the statutory criteria of the 1974 Act, as amended, for FMHCSS standards and, as a matter of law, cannot be incorporated, in its present form, within the FMHCSS standards.[10]

Moreover, in the absence of an express statutory directive mandating either the verbatim incorporation of the DOE standard within the HUD Code, or the "alignment" of the FMHCSS standards with the DOE standard -- as was the case with EPA formaldehyde standards noted above -- any altered or modified ("aligned") variant of the DOE final standard slated for incorporation within the FMHCSS standards, by law, would need to be published as a proposed rule, with substantiating cost-benefit calculations, and made available for public comment as with any other proposed FMHCSS standard.[11] Accordingly, any modification of the DOE standard recommended by the MHCC should and must be subject to further rulemaking proceedings in accordance with both the 1974 Act, as amended and the Administrative Procedure Act (APA).

Regardless of any further recommendation that it may make, however, the MHCC should go on record with a statement:

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[9] DOE has yet to propose an enforcement mechanism or system for its final manufactured housing standards, and has yet to fully account for the costs arising from such enforcement, despite asserting in another energy standards rulemaking, that "coverage determination[s], test procedure[s] and energy conservation standard rulemakings are interdependent." See, 86 Federal Register, No. 127 (July 7, 2021), "Energy Conservation Program for Appliance Standards; Procedures, Interpretations and Policies for Consideration in New or Revised Energy Conservation Standards and Test Procedures for Consumer Products and Commercial/Industrial Equipment," at p. 35672, col. 2.

[10] Any such wholesale incorporation, moreover, would be clearly inconsistent with Congress' intent in adopting EISA section 413. Obviously, with its standards and enforcement system for manufactured housing fully established, Congress, if it had wanted to, could have expressly provided for HUD enforcement of the DOE standards. It did not do that, however, or even hint at such a result. Consequently, HUD adoption and enforcement of the DOE standard, as published, would be inconsistent with EISA section 413 as written and similarly in violation of Congress' unambiguous intent.

[11] In accordance with the 1974 Act, as amended, full MHCC and notice and comment procedures apply to the promulgation and adoption of all FMHCSS standards, absent an "emergency" as defined by the Act. Under 42 U.S.C. 5403(b)(5). That section provides, in relevant part, "If the Secretary determines, in writing, that such action is necessary to address an issue on which the Secretary determines that the consensus committee has not made a timely recommendation following a request by the Secretary, or in order to respond to an emergency that jeopardizes the public health or safety, the Secretary may issue an order that is not developed under the procedures set forth in subsection (a) or in this subsection." There has been no such assertion, however, that the DOE energy conservation rule or any variant thereof addresses a matter which "jeopardizes the public health or safety," nor could any such claim be legitimately, validly, or plausibly asserted.

(1) Declaring that the May 31, 2022 final standard adopted by DOE is not appropriate for manufactured housing;
(2) Declaring that the May 31, 2022 DOE final standard is inconsistent with the construction of manufactured homes; and
(3) Declaring that the May 31, 2022 DOE final standard would not be cost-beneficial and would be destructive of the fundamental affordability of manufactured housing in violation of applicable federal law.

The MHCC offered similar comments with respect to the proposed DOE manufactured housing energy standard and should be consistent by reiterating its position with respect to the May 31, 2022 DOE final published standard.

B. UNINCORPORATED "FOREIGN" STANDARDS CANNOT BE ENFORCED BY HUD UNDER PART 3282

Further, HUD's Procedural and Enforcement Regulations (PER) – and the regulatory enforcement apparatus established by those regulations -- by law, pertain specifically and exclusively to the enforcement of FMHCSS standards. By contrast, the PER regulations are not an open warrant that can be applied to or used to enforce any standard, for any purpose, from any agency.

Specifically, 24 C.F.R. 3282.1 provides, in relevant part:

> "(b) The Secretary is also authorized by the Act to conduct inspections and investigations necessary to enforce the standards, to determine that a manufactured home fails to comply with an applicable standard or contains a defect or an imminent safety hazard, and to direct the manufacturer to furnish notification thereof, and in some cases, to remedy the defect or imminent safety hazard.

(Emphasis added). The PER regulations, in turn, define "standards" to include only FMHCSS standards adopted under authority of the 1974 Act, as amended. Thus, PER section 3282.7(hh) states:

> (hh) *Standards* means the Federal manufactured home construction and safety standards promulgated under section 604 of the Act, 42 U.S.C. 5403, as part 3280 of these regulations.

Based on these provisions, HUD and HUD's manufactured housing inspection, compliance and enforcement system cannot be used to implement the DOE May 31, 2022 final standard because the May 31, 2022 DOE final standard is not at present an FMHCSS standard and because the May 31, 2022 DOE final standard, as promulgated by DOE, cannot be adopted as an FMHCSS standard, insofar as it clearly violates that cost-benefit and other express affordability mandates of the 1974 Act, as amended. Nor can the HUD regulatory enforcement system be applied to any variant of the DOE energy standard unless and until any such variant is adopted as a final FMHCSS standard with full notice and comment rulemaking and the development and publication of full cost-benefit information and analyses.

III. CONCLUSION

For all the foregoing reasons, MHARR urges the MHCC to:

(1) Reject the incorporation of the DOE May 31, 2022 final manufactured housing energy standard within the FMHCSS;
(2) Adopt a statement rejecting the May 31, 2022 final DOE manufactured housing energy standard as being inappropriate for manufactured homes and destructive of the affordability of manufactured housing; and
(3) Assert that HUD adoption of <u>any</u> modified or altered DOE manufactured housing energy standard must be based on a <u>full and valid</u> analysis of all applicable costs and a finding of lawful cost-benefit in accordance with the 1974 Act, as amended, as well as compliance with all applicable procedural requirements of federal law.

Given the complexity of this matter, MHARR will further explain its position at the upcoming November 15-17, 2022 MHCC meeting.

Thank you in advance for your consideration of this matter.

Sincerely,

Mark Weiss
President and CEO

cc: Hon. Marcia Fudge
Hon. Jennifer Granholm
Hon. Julia Gordon
HUD Code Manufactured Housing Industry Members

Department of Energy

DOE Updates Mobile Home Efficiency Standards to Lower Household Energy Bills

MAY 18, 2022

Energy.gov » DOE Updates Mobile Home Efficiency Standards to Lower Household Energy Bills

New Initiative Will Save Owners and Renters $10 Billion on Utility Bills, Reduce Carbon Pollution, Ensure More Access to Affordable Mobile Homes

WASHINGTON, D.C. — The U.S. Department of Energy (DOE) today adopted new energy standards for manufactured housing — commonly referred to as single-section and multi-section mobile homes — that will help consumers save hundreds of dollars on their annual utility bills and slash carbon emissions by 80 million metric tons, which is equivalent to the energy use of over 10 million homes in one year. Once implemented, the new efficiency standards, which include updates to insulation and sealing requirements, will help bring the country closer to reaching President Biden's goal of net-zero emissions by 2050.

"DOE's new energy efficiency rules will help save the 17 million Americans residing in mobile homes up to $475 per year on average on their utility bills," said **U.S. Secretary of Energy Jennifer M. Granholm**. "The rules will hold manufacturers of these U.S. homes to cost-saving efficiency standards, giving residents more comfortable living environments and a much-needed break on their annual utility costs, while delivering cleaner air for their communities."

The new efficiency rules will require all new manufactured homes to meet standards for size and climate-dependent energy conservation measures based on the insulation and sealing requirements in the most recent version of the International Energy Conservation Code (IECC 2021). Compliance is required for new manufactured homes produced beginning one year after the rule is published in the Federal Register, approximately late May 2023. DOE was under a court order to update these standards by May 16, 2022.

According to DOE estimates from the final rule, individuals can expect to save on average $177 per year in single-section homes and $475 per year in multi-section homes on their utility bills. Cumulatively, consumers will save $551 million on utility bills each year and a total of $10 billion over the next 30 years. In the same 30-year window, DOE projects a reduction in carbon and methane emissions equivalent to the annual emissions of 11.7 million homes.

Purchasers of both single- and multi-section manufactured homes are expected to save more on their utility bills than the additional money that is added to their monthly mortgage, with single-section purchasers recouping the additional money purchasers put down up front to secure the loan (approximately $70) within 10 months. DOE adopted a tiered approach, with different standards for single- and multi-section manufactured homes, in order to balance the important objectives of energy efficiency, cost savings, upfront affordability, and housing supply challenges.

Additional Efficiency and Affordability Measures for Manufactured Homes

In addition to the new efficiency rules, DOE is supporting the establishment of credit-enhancement mechanisms, such as loan-loss reserves, to drive down the cost of financing for manufactured housing and increase access to affordable housing. DOE will provide technical assistance and guidance, facilitate outreach to lenders and agencies, and work with state partners to develop replicable state models that ensure access to affordable, efficient manufactured homes.

DOE, in collaboration with the National Association of State Energy Officials, is also launching the Manufactured Home Energy Efficiency and Affordability Initiative to work with states and other partners in improving access to energy efficient manufactured homes across the United States, including tribal lands. The California Energy Commission, Colorado Energy Office, Kentucky Office of Energy Policy, Maine Governor's Energy Office, Minnesota Department of Commerce Energy Division, Montana Energy Office, New York State Energy Research and Development Authority, North Carolina Department of Environmental Quality Energy Office, South Carolina Energy Office – Office of Regulatory Staff, and West Virginia Department of Economic Development's Office of Energy have already signed on to participate.

To increase transparency, DOE has created a **consumer-focused website** with information on energy efficient manufactured homes and financing options, including content on incentives, grants, and loan programs available through federal agencies, states, and others. The site includes links to resources for manufactured homebuyers who own or lease their land as well as those living in manufactured home communities, including resident owned cooperatives.

This action follows the release earlier this week of the **Administration's Housing Supply Action Plan**, which includes legislative and administrative policies to boost supply and reduce costs for a number of housing types, such as manufactured housing.

DOE adopted a tiered approach, with different standards for single and multi-section manufactured homes, in order to balance the important objectives of energy efficiency, cost savings, upfront affordability, and housing supply challenges.

DOE's Building Technologies Office implements minimum energy conservation standards for more than 60 categories of appliances and equipment. To learn more, visit the **Appliance and Equipment Standards Program homepage**.

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Media Inquiries

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MANUFACTURED HOUSING CONSENSUS COMMITTEE
1.888.602.4663 | MHCC@HUD.GOV | MHCC@HOMEINNOVATION.COM

Appendix D: Meeting Working Document: MHCC modifications to the Manufactured Home Construction and Safety Standards

October 18, 19, & 20, 2022 and November 15,16, & 17, 2022
MHCC Meetings

MANUFACTURED HOUSING CONSENSUS COMMITTEE

1.888.602.4663 | MHCC@HOMEINNOVATION.COM

MHCC Working Document from October 18-20, 2022 and November 15-17, 2022 MHCC Meetings

Showing changes made to HUD Code based on Department of Energy's (DOE) Energy Conservation Program: Energy Conservation Standards for Manufactured Housing

Changes shown in red indicate MHCC recommended changes to the HUD Code.

Text/changes shown in purple indicate MHCC approved changes made to text originating in Department of Energy's (DOE) Energy Conservation Program: Energy Conservation Standards for Manufactured Housing. Notes are included with each purple change indicating the reason for the modification.

MHCC General Comments:

- The MHCC agrees that the energy efficiency requirements need to be updated but believes the updates should be done incrementally. The recommended changes shown in this document accomplish this incremental approach.
- HUD, by statute, is the body responsible for the development and enforcement of manufactured housing standards.
- The MHCC has reviewed the DOE Final Rule and has determined DOE circumvented the standards development process prescribed in EISA which requires cost justification and consultation with HUD.
- DOE provided an energy conservation standard which was based on site-built construction and applied it to a performance-based national code. If adopted as written, the final rule would adversely impact the entire Manufactured Housing program and cost increases associated with compliance would reduce prospective purchasers (especially minorities and low-income consumers) from durable, safe, high quality and affordable housing.
- The MHCC reviewed the DOE Final Rule and is recommending modifications to the MHCSS based largely on the final rule. The recommended changes increase energy efficiency while maintaining affordability and consumer options.

- The MHCC previously recommended that DOE include the substantial cost of testing, enforcement, and regulatory compliance in its costing analysis. The final rule did not consider these costs. The recommended changes implemented into the MHCSS allow for testing, enforcement, and regulatory compliance within HUD's existing framework which helps minimize costs to manufacturers and ultimately consumers. However, there still may be a gap in enforcement between HUD's final standards and DOE's final rule, which may need to be resolved.
- The MHCC has a statutory obligation to consider the cost impacts of all recommended changes to the MHCSS and preserve affordability to increase American home ownership and this obligation is reflected in the recommended changes.
- The MHCC expects, in accordance with normal practice, the recommendations contained in this document will be subject, as required in 42 USC 5403, to publication as a proposed rule and full notice and comment rulemaking in accordance with the 1974 Act as amended.
- See Appendix A for information and data supporting recommended changes.
- The MHCC's recommendations (1) seek to align the HUD code with the DOE Energy Rule which is based on certain IECC sections, and (2) does not include certain sections as they were either not pertinent to manufactured housing or appropriate for these recommendations. The MHCC acknowledges that the International Energy Conservation Code (IECC) is a copyright protected document, published and owned by the International Code Council (ICC), and that reproduction or copying of the IECC requires written permission or license from the ICC. Copies of the IECC are available for purchase at *www.iccsafe.org*. They may also be viewed for free on ICC's public access website at: *https://codes.iccsafe.org/public/collections/I-Codes*.
  **ICC has requested that this or a similar statement be included in the preamble of the Proposed Rule.*

General Changes:

- 3280: Replace term "U_o Value Zone" with "Climate Zone"

Subpart A - General

§ 3280.1 Scope.

This standard covers all equipment and installations in the design, construction, transportation, fire safety, plumbing, heat-producing, cooling, and electrical systems of manufactured homes which are designed to be used as dwelling units. This standard seeks to the maximum extent possible to establish performance requirements.

In certain instances, however, the use of specific requirements is necessary.

§ 3280.2 Definitions.

Equipment includes materials, appliances, devices, fixtures, fittings or accessories both in the construction of, and in the fire safety, plumbing, heat-producing, cooling, and electrical systems of manufactured homes.

Subpart B - Planning Considerations

§ 3280.103 Light and ventilation.

(e) Mechanical ventilation fan efficacy

1. Whole-house mechanical ventilation system fans must meet the minimum efficacy requirements set forth in the following table except as provided in paragraph (2) of this section.

2. Mechanical ventilation fans that are integral to heating, ventilating, and air conditioning equipment, including furnace fans are not subject to the efficiency requirements in paragraph (1) of this section.

MECHANICAL VENTILATION SYSTEM FAN EFFICACY

Fan type description	Airflow rate minimum (cfm)	Minimum efficacy (cfm/watt)
Heat recovery ventilator or energy recovery Ventilator.	Any	1.2
In-line supply or exhaust fans.	Any	3.8
Other exhaust fan.	<90	2.8
Other exhaust fan.	^{3}90	3.5

SUBPART F – THERMAL PROTECTION

§ 3280.501 Scope.

This subpart sets forth the requirements for energy conservation, condensation control, air infiltration, thermal insulation and certification for heating and cooling.

§ 3280.502 Definitions.

~~(1) *Pressure envelope* means that primary air barrier surrounding the living space which serves to limit air leakage. In construction using ventilated cavities, the pressure envelope is the interior skin.~~

Note: Replace all instances of Pressure envelope with Air Barrier

~~(2) *Thermal envelope* area means the sum of the surface areas of outside walls, ceiling and floor, including all openings. The wall area is measured by multiplying outside wall lengths by the inside wall height from floor to ceiling. The floor and ceiling areas are considered as horizontal surfaces using exterior width and length.~~

Access (to) means that which enables a device, appliance or equipment to be reached by ready access or by a means that first requires the removal or movement of a panel or similar obstruction.

Air barrier means one or more materials joined together in a continuous manner to restrict or prevent the passage of air through the building thermal envelope and its assemblies.

Automatic means self-acting or operating by its own mechanism when actuated by some impersonal influence.

Building thermal envelope means exterior walls, exterior floors, exterior ceiling, or roofs, and any other building element assemblies that enclose conditioned space or provide a boundary between conditioned space and unconditioned space.

Ceiling means an assembly that supports and forms the overhead interior surface of a building or room that covers its upper limit and is horizontal or tilted at an angle less than 60 degrees (1.05 rad) from horizontal.

Climate zone means a geographical region identified in § 3280.506.

Conditioned space means an area, room, or space that is enclosed within the building thermal envelope and that is directly or indirectly heated or cooled. Spaces are indirectly heated or cooled where they communicate through openings with conditioned space, where they are separated from conditioned spaces by uninsulated walls, floors or ceilings, or where they contain uninsulated ducts, piping, or other sources of heating or cooling.

Door means an operable barrier used to block or allow access to an entrance of a manufactured home.

Dropped ceiling means a secondary nonstructural ceiling, hung below the exterior ceiling.

Dropped soffit means a secondary nonstructural ceiling that is hung below the exterior ceiling and that covers only a portion of the ceiling.

Duct means a tube or conduit, except an air passage within a self-contained system, utilized for conveying air to or from heating, cooling, or ventilating equipment.

Duct system means a continuous passageway for the transmission of air that, in addition to ducts, includes duct fittings, dampers, plenums, fans, and accessory air-handling equipment and appliances.

Eave means the edge of the roof that overhangs the face of an exterior wall and normally projects beyond the side of the manufactured home.

Exterior ceiling means a ceiling that separates conditioned space from unconditioned space.

Exterior floor means a floor that separates conditioned space from unconditioned space.

Exterior wall means a wall, including a skylight well, that separates conditioned space from unconditioned space.

Fenestration means vertical fenestration and skylights.

Floor means a horizontal assembly that supports and forms the lower interior surface of a building or room upon which occupants can walk.

Glazed or glazing means an infill material, including glass, plastic, or other transparent or translucent material used in fenestration.

Note: *MHCC only included a portion of the definition in 16 cfr 460.2 because that definition was specific to House insulation.*

Insulation means any material mainly used to slow heat flow. It may be mineral or organic, fibrous, cellular, or reflective. It may be in rigid, semirigid, flexible, or loose-fill form.

Manual means capable of being operated by personal intervention.

Opaque door means a door that is not less than 50 percent opaque in surface area.

R-value (thermal resistance) means the inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unit area ($h \times ft^2 \times °F/Btu$).

Rough opening means an opening in the exterior wall or roof, sized for installation of fenestration.

Skylight means glass or other transparent or translucent glazing material, including framing materials, installed at an angle less than 60 degrees (1.05 rad) from horizontal, including unit skylights, tubular daylighting devices, and glazing materials in solariums, sunrooms, roofs and sloped walls.

Skylight well means the exterior walls underneath a skylight that extend from the interior finished surface of the exterior ceiling to the exterior surface of the location to which the skylight is attached.

Solar heat gain coefficient (SHGC) means the ratio of the solar heat gain entering a space through a fenestration assembly to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation that is then reradiated, conducted, or convected into the space.

Thermostat means an automatic control device used to maintain temperature at a fixed or adjustable set point.

U-factor (thermal transmittance) means the coefficient of heat transmission (air to air) through a building component or assembly, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films (Btu/h × ft^2 × °F).

U_O (overall thermal transmittance) means the coefficient of heat transmission (air to air) through the building thermal envelope, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films (Btu/ h × ft^2 × °F).

Ventilation means the natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, any space.

Vertical fenestration means windows (fixed or moveable), opaque doors, glazed doors, glazed block and combination opaque and glazed doors composed of glass or other transparent or translucent glazing materials and installed at a slope of greater than or equal to 60 degrees (1.05 rad) from horizontal.

Wall means an assembly that is vertical or tilted at an angle equal to greater than 60 degrees (1.05 rad) from horizontal that encloses or divides an area of a building or room.

Whole-house mechanical ventilation system means an exhaust system, supply system, or combination thereof that is designed to mechanically exchange indoor air with outdoor air when operating continuously or through a programmed intermittent schedule to satisfy the whole house ventilation rates.

Window means glass or other transparent or translucent glazing material, including framing materials, installed at an angle greater than 60 degrees (1.05 rad) from horizontal.

Note: *MHCC did not include definition for "Zone" from DOE Rule.*
MHCC Reason: *Zone is a commonly used term in the industry, and only appears in this context once in the standard. The definition provided is typically used for HVAC zones. The term zone is used in many different places in the standard, typically referring to climate zone.*
~~*Zone means a space or group of spaces within a manufactured home with heating or cooling requirements that are sufficiently similar so that desired conditions can be maintained using a single controlling device.*~~

§ 3280.503 Materials.

(a) Installation of Insulation - Insulating materials must be installed according to the insulation manufacturer's installation instructions and the requirements set forth in table below

INSTALLATION OF INSULATION

Component	Installation requirements
General	Air-permeable insulation must not be used as a material to establish the air barrier.
Access hatches, panels, and doors	Access hatches, panels, and doors between conditioned space and unconditioned space, such as attics and crawlspaces, must be insulated to a level equivalent to the insulation of the surrounding surface, must provide access to all equipment that prevents damaging or compressing the insulation, and must provide a wood framed or equivalent baffle or retainer when loose fill insulation is installed within an exterior ceiling assembly to retain the insulation both on the access hatch, panel, or door and within the building thermal envelope.
Baffles	For air-permeable insulations in vented attics, a baffle must be installed adjacent to soffit and eave vents, when needed in order to maintain 1 inch minimum air space between insulation and roof decking. Baffles, when used in conjunction with eave venting, must be constructed using a solid material, maintain an opening equal or greater than the size of the vents, and extend over the top of the attic insulation
Ceiling or attic	The insulation in any dropped ceiling or dropped soffit must be aligned with the air barrier.

Narrow cavities	Batts to be installed in narrow cavities must be cut to fit or narrow cavities must be filled with insulation that upon installation readily conforms to the available cavity space.
Rim joists	Rim joists must be insulated such that the insulation maintains permanent contact with the exterior rim board.
Shower or tub adjacent to exterior wall	Exterior walls adjacent to showers and tubs must be insulated.
Walls	Air permeable exterior building thermal envelope insulation for framed exterior walls must completely fill the cavity, including within stud bays caused by blocking lay flats or headers.

§ 3280.505 Air infiltration.

(a) Envelope air infiltration. The opaque envelope shall be designed and constructed to limit air infiltration to the living area of the home. Any design, material, method or combination thereof which accomplishes this goal may be used. The goal of the infiltration control criteria is to reduce heat loss/heat gain due to infiltration as much as possible without impinging on health and comfort and within the limits of reasonable economics.

~~(1) Envelope penetrations. Plumbing, mechanical and electrical penetrations of the pressure envelope not exempted by this part, and installations of window and door frames shall be constructed or treated to limit air infiltration. Penetrations of the pressure envelope made by electrical equipment, other than distribution panel boards and cable and conduit penetrations, are exempt from this requirement. Cable penetrations through outlet boxes are considered exempt.~~
~~(2) Joints between major envelope elements. Joints not designed to limit air infiltration between wall-towall, wall-to-ceiling and wall-to-floor connections shall be caulked or otherwise sealed. When walls are constructed to form a pressure envelope on the outside of the wall cavity, they are deemed to meet this requirement.~~

(1) Manufactured homes must be sealed against air leakage at all joints, seams, and penetrations associated with the building thermal envelope in accordance with the component manufacturer's installation instructions and the requirements set forth in the table below Sealing methods between dissimilar materials must allow for differential expansion, contraction, and mechanical vibration, and must establish a continuous air barrier upon installation of all opaque components of the building thermal envelope. All gaps and penetrations in the exterior ceiling, exterior floor, and exterior walls, including ducts, flue shafts, plumbing, piping, electrical wiring, utility penetrations, bathroom and kitchen exhaust fans, recessed lighting fixtures adjacent to unconditioned space, and light tubes adjacent to unconditioned space, must be sealed with caulk, foam, gasket or other suitable material.

<table>
<tr><th colspan="2">AIR BARRIER INSTALLATION CRITERIA</th></tr>
<tr><th>Component</th><th>Air barrier criteria</th></tr>
<tr><td>Ceiling or attic</td><td>The air barrier in any dropped ceiling or dropped soffit must be aligned with the insulation and any gaps in the air barrier must be sealed with caulk, foam, gasket, or other suitable material. Access hatches, panels, and doors, drop-down stairs, or knee wall doors to unconditioned attic spaces must be weather- stripped or equipped with a gasket to produce a continuous air barrier.</td></tr>
<tr><td colspan="2">Note: MHCC changed the title of “Duct system register boots” from the DOE rule.
MHCC Reason: Change terminology to be consistent with terms used in the MH industry. Not changing the intent of the practice.</td></tr>
<tr><td>Supply and return ducts</td><td>Supply and return ducts that penetrate the building thermal envelope or the air barrier must be sealed to the subfloor, wall covering or ceiling penetrated by the duct, air barrier, or the interior finish materials with caulk, foam, gasket, or other suitable material.</td></tr>
<tr><td>Electrical box or phone box on exterior walls</td><td>The air barrier must be installed behind electrical and communication boxes or the air barrier must be sealed around the box penetration with caulk, foam, gasket, or other suitable material.</td></tr>
<tr><td>Floors</td><td>The air barrier must be installed at any exposed edge of insulation. The bottom board may serve as the air barrier.</td></tr>
<tr><td>Mating line surfaces</td><td>Mating line surfaces must be equipped with a continuous and durable gasket.</td></tr>
<tr><td>Recessed lighting</td><td>Recessed light fixtures installed in the building thermal envelope must be sealed to the drywall with caulk, foam, gasket, or other suitable material.</td></tr>
<tr><td>Rim joists</td><td>The air barrier must enclose the rim joist to subfloor interface.

Note: The MHCC replaced “The air barrier must enclose the rim joists. The junctions of the rim board and the subfloor must be air sealed.” From the DOE Rule with the language above.</td></tr>
</table>

	MHCC reason: *Proposed language provides more clarity.*
Shower or tub adjacent to exterior wall	The air barrier must separate showers and tubs from exterior walls when interior wall surface is used as an air barrier ***Note:*** *MHCC added additional language to clarify placement, location, and proper use of air barrier.*
Walls	The junction of the top plate and the exterior ceiling, and the junction of the bottom plate and the exterior floor, along exterior walls must be sealed with caulk, foam, gasket, or other suitable material.
Windows, skylights, and exterior doors	The rough openings around windows, exterior doors and skylights must be sealed with caulk or foam, or other suitable material. ***Note:*** *MHCC added ", or other suitable material to provide more flexibility in methods used to seal rough openings.*

§ 3280.506 ~~Heat loss/heat gain~~ Building Thermal Envelope and Climate Zones.

(a) Compliance options. The building thermal envelope must meet either the performance requirements of this section or the prescriptive requirements of section 3280.507. The climate zone shall be determined from the map in figure 1 and table XX.

Note: Rename title of Figure 1 U/o Value Zone Map to Climate Zone Map and remove U values from map. Add table "US states and territories per climate zone" below climate zone map.

U.S. STATES AND TERRITORIES PER CLIMATE ZONE

Zone 1	Zone 2	Zone 3
Alabama	Arkansas	Alaska
American Samoa	Arizona	Colorado
Florida	California	Connecticut
Georgia	Kansas	Delaware
Guam	Kentucky	District of Columbia
Hawaii	Missouri	Idaho
Louisiana	New Mexico	Illinois
Mississippi	North Carolina	Indiana
South Carolina	Oklahoma	Iowa
Texas	Tennessee	Maine

The Commonwealth of Puerto Rico U.S. Virgin Islands		Maryland Massachusetts Michigan Minnesota Montana Nebraska Nevada New Hampshire New Jersey New York North Dakota Ohio Oregon Pennsylvania Rhode Island South Dakota Utah Vermont Virginia Washington West Virginia Wisconsin Wyoming

(b) The manufactured home heat loss/heat gain shall be determined by methods outlined in §§ 3280.508 and 3280.509. The ~~Uo (Coefficient of heat transmission) value~~ climate zone for which the manufactured home is acceptable and the lowest outdoor temperature to which the installed heating equipment will maintain a temperature of 70 F shall be certified as specified in § 3280.510. ~~The Uo value zone shall be determined from the map in figure 1.~~

(c) The overall coefficient of heat transmission (Uo) of the manufactured home for the respective zones and an indoor design temperature of 70 F, including internal and external ducts, and excluding infiltration, ventilation, and condensation control, shall not exceed the Btu/(hr.) (sq. ft.) (F) of the manufactured home envelope are as tabulated in the table to this paragraph (b):

TIER 1 BUILDING THERMAL ENVELOPE PERFORMANCE REQUIREMENTS	
Climate zone	Single Section Uo
1	0.110
2	0.091
3	0.074

TIER 2 BUILDING THERMAL ENVELOPE PERFORMANCE REQUIREMENTS	
Climate zone	Single Section Uo
1	~~0.082~~ 0.090
2	~~0.066~~ 0.076
3	~~0.055~~ 0.061

MHCC Reason: *Consistent with Table 2 Tier 2 Building Thermal Envelope Prescriptive Requirements.*

(2) Area-weighted average vertical fenestration U-factor must not exceed 0.48 in Climate Zone 2 or 0.40 in Climate Zone 3.

(3) Area-weighted average skylight U-factor must not exceed 0.75 in Climate Zone 2 and Climate Zone 3. Windows, skylights and doors containing more than 50 percent glazing by area must satisfy the SHGC requirements established in Section XX on the basis of an area- weighted average.

~~Table 1 to Paragraph (b)~~

~~Uo value zone~~	~~Maximum coefficient of heat transmission~~
~~1~~	~~0.116 Btu/(hr.) (sq. ft.) (F).~~
~~2~~	~~0.096 Btu/(hr.) (sq. ft.) (F).~~
~~3~~	~~0.079 Btu/(hr.) (sq. ft.) (F).~~

~~d) Manufactured homes designed for Uo Value Zone 3 shall be factory equipped with storm windows or insulating glass.~~

§ 3280.507 ~~Comfort heat gain.~~ Prescriptive Compliance Path

~~Information necessary to calculate the home cooling load shall be provided as specified in this part.~~

~~*Transmission heat gains.* Homes complying with this section shall meet the minimum heat loss transmission coefficients specified in § 3280.506(a).~~

(a) The building thermal envelope must meet the applicable minimum R-value (nominal value of insulation), and the glazing maximum U-factor and SHGC, requirements set forth in table 1 and table 2 or component U-values set forth in table 3 and table 4

TABLE 1 TIER 1 (single section) BUILDING THERMAL ENVELOPE PRESCRIPTIVE REQUIREMENTS

Climate zone	Exterior wall insulation R-value	Exterior ceiling insulation R-value	Exterior floor insulation R-value	Window U-factor	Skylight U-factor	Door U-Factor	Glazed fenestration SHGC
1	13	22	19	~~1.08~~0.55	0.75	0.40	0.6
2	13	22	22	0.5	0.55	0.40	0.7
3	19	22	22	0.35	0.55	0.40	Not Applicable

Note: *Technical Correction: Exterior Floor Insulation R value and Glazed fenestration SHGC for climate zones 1 and 2.*

TABLE 2 TIER 2 (multi-section) BUILDING THERMAL ENVELOPE PRESCRIPTIVE REQUIREMENTS

Climate zone	Exterior wall insulation R-value	Exterior ceiling insulation R-value	Exterior floor insulation R-value	Window U-factor	Skylight U-factor	Door U-Factor	Glazed fenestration SHGC
1	13	30	13	~~0.32~~0.50	0.75	0.40	~~0.33~~0.60
2	~~21~~13	30	19	~~0.30~~0.35	0.55	0.40	~~0.25~~0.33
3	~~21~~15	38	~~30~~25	~~0.30~~0.32	0.55	0.40	Not Applicable

MHCC Reason: *Reduction in insulation requirements in walls leads to being able to continue building homes with 2x4 walls in all Climate Zones. Maintains more consumer options and amenities such as: cathedral ceilings, natural lighting, and material availability. Maintains transportation height for most industry designs. Additional transportation height leads to extra costs for additional transportation vehicles. These values are much more consistent with our statutory requirements to maintain affordability while improving energy efficiency. The values shown in the table would lead to an average increase in energy efficiency of 22%. The DOE values did not provide any payback to the consumer based on additional construction costs.*

MHCC Reason: *Additional language added for clarification of how to apply R-value requirements.*

1) *For the purpose of compliance with the exterior ceiling insulation R-value requirement of ~~paragraph of~~ this section, the R-value corresponds to the unrestricted insulation depth and the truss heel height must be a minimum of 5.5 inches at the outside face of each exterior wall.*

2) A combination of R-~~21~~ 19 batt insulation and R-~~14~~ 11 blanket insulation may be used for the purpose of compliance with the floor insulation R-value requirement of table 2 Climate Zone 3. Climate zones 1 and 2 may use blanket insulation with a minimum R 5 increase above tabulated values. Compression of the insulation in the cantilevered portion of the floor is acceptable.

Note: *MHCC added additional language to allow use of blanket insulation in all climate zones. Consistent with Table 2 Tier 2 Building Thermal Envelope Prescriptive Requirements.*

3) An individual skylight that has an SHGC that is less than or equal to 0.30 is not subject to the glazed fenestration SHGC requirements established in this section.

4) U-factor alternatives to R-value requirements. Compliance with the applicable requirements of this section may be determined using the applicable maximum U-factor values set forth in table 3-and table 4 which reflect the thermal transmittance of the component, excluding fenestration, and not just the insulation of that component, as an alternative to the minimum nominal R-value requirements set forth in table 1 and table 2 respectively.

TABLE 3 *U*-FACTOR ALTERNATIVES TO TIER 1 *R*-VALUE REQUIREMENTS

Climate Zone	Exterior ceiling U-factor	Exterior wall U-factor	Exterior floor U-factor
1	0.061	0.094	0.056
2	0.061	0.094	0.049
3	0.061	0.068	0.049

Note*: MHCC corrected climate zone locations (1 And 2) for Exterior floor U factor.*

TABLE 4 *U*-FACTOR ALTERNATIVES TO TIER 2 R-VALUE REQUIREMENTS

Climate Zone	Exterior ceiling U-factor	Exterior wall U-factor	Exterior floor U-factor
1	0.043	0.094	0.078
2	0.043	~~0.063~~ 0.094	0.056
3	0.037	~~0.063~~ 0.076	~~0.032~~ 0.036

MHCC Reason: *Consistent with Table 2 Tier 2 Building Thermal Envelope Prescriptive Requirements.*

Subpart G - Plumbing Systems

§ 3280.602 Definitions.

Distribution Manifold means a manufactured device that serves as a central control hub for a water distribution system.
Note: Additional definition based on requirements in 460.203d

Heated water circulation system means a water distribution system in which one or more pumps are operated in the ~~service~~ hot water supply ~~system~~ piping to circulate heated water from the water heating equipment to fixtures and back to the water heating equipment.

~~Service~~ hot water supply means supply of hot water for purposes other than comfort heating.
Note: *MHCC wishes to keep current terminology to avoid confusion.*

§ 3280.609 Water distribution systems.

§ 3280.609(a)(2) Hot water supply. Each manufactured home equipped with a kitchen sink, and bathtub and/or shower shall be provided with a hot water supply system including a listed water heater.

~~(a) Service hot water systems installed by the manufacturer must be installed according to the service hot water manufacturer's installation instructions. Where service hot water systems are installed by the manufacturer, the manufacturer must ensure that any maintenance instructions received from the service hot water system manufacturer are provided with the manufactured home. The service hot water requirements are adapted from R403 of the 2021 IECC.~~
Note: *3280.709(a) requires that all appliances are installed by product manufacturers' listing and installation instructions. This would be a redundant requirement.*

~~(b) Any automatic and manual controls, temperature sensors, pumps associated with service hot water systems must provide access.~~
Note: *3280.709(a) and 3280.713 require that all appliances are installed by product manufacturers' listing and installation instructions and requires access. This would be a redundant requirement.*

(i) When installed, a heated water circulation systems must—
Note: *Clarifying that heated water circulation systems are not mandatory.*

(1) Be provided with a circulation pump;
(2) Ensure that the system return pipe is a dedicated return pipe or a cold water supply pipe;
(3) Not include any gravity or thermosyphon circulation systems;
(4) Ensure that controls for circulating heated water circulation pumps start the pump based on the identification of a demand for hot water within the occupancy; and
(5) Ensure that the controls automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is no demand for hot water.

(ii) All hot water pipes—
(1) Outside conditioned space must be insulated to a minimum R-value of R-3; and
(2) From a ~~service~~ hot water supply to a distribution manifold must be insulated to a minimum R-value of R-3.
Note: *Uniform terminology.*

Subpart H - Heating, Cooling and Fuel Burning Systems

§ 3280.702 Definitions.

~~Air duct means conduits or passageways for conveying air to or from heating, cooling, air conditioning or ventilation equipment, but not including the plenum.~~

Duct means a tube or conduit, except an air passage within a self-contained system, utilized for conveying air to or from heating, cooling, or ventilating equipment.

Duct system means a continuous passageway for the transmission of air that, in addition to ducts, includes duct fittings, dampers, plenums, fans, and accessory air-handling equipment and appliances.

§ 3280.704 ~~[Reserved]~~ Thermostats and Controls

(a) At least one thermostat must be provided for each separate heating and cooling system installed by the manufacturer and shall be placed a minimum of 3 feet from the vertical edge of the appliance compartment door. Thermostats shall not be located on an exterior wall or on a wall separating the appliance compartment from a habitable room. ***Note:*** *Additional language was moved from 3280.707(e).*

(b) Any programmable thermostat installed by the manufacturer that controls the heating or cooling system must—

(1) Be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature set points at different times of the day and different days of the week;

(2) Include the capability to set back or temporarily operate the system to maintain zone temperatures down to 55F (13C) or up to 85F (29C)

(c) ~~(3) Initially be programmed with a heating temperature set point no higher than 70F (21C) and a cooling temperature set point no lower than 78F (26C)~~. Homeowner manual must include recommendation that homeowners set or program thermostat with a heating temperature set point no higher than 70F (21C) and a cooling temperature set point no lower than 78F (26C).

Note: *MHCC is modifying language of (3) because a programable thermostat is optional, so one preprogrammed from the factory is unnecessary and the MHCC believes adding the language to the homeowner's manual is a more effective method to influence homeowner behavior. Typically, power is not continuously connected to unit once its constructed and preprogrammed settings may be lost without power.*

~~(c) Heat pumps with supplementary electric-resistance heat must be provided with controls that, except during defrost, prevent supplemental heat operation when the heat pump~~

~~compressor can meet the heating load.~~

Note: *3280.709(a) requires that all appliances are installed by product manufacturers' listing and installation instructions. This would include controls.*

§ 3280.707 Heat producing appliances.

5) ~~Each space heating, cooling or combination heating and cooling system shall be provided with at least one readily adjustable automatic control for regulation of living space temperature. The control shall be placed a minimum of 3 feet from the vertical edge of the appliance compartment door. It shall not be located on an exterior wall or on a wall separating the appliance compartment from a habitable room.~~

§ 3280.714 Appliances, Cooling.

§3280.714(a)(1) (i) Electric motor-driven unitary air-cooled air conditioners and heat pumps in the cooling mode with rated capacity less than 65,000 BTU/hour (19,045 watts), when rated at ARI standard rating conditions in ARI Standard 210/240-89, Unitary Air-Conditioning and Air-Source Heat Pump Equipment, must have seasonal energy efficiency ratio (SEER2) values not less than as specified in 10 C.F.R. Part 430, Energy Conservation Program for Consumer Products: Central Air Conditioners and Heat Pumps Energy Conservation Standards.

Note: *Term updated from SEER to SEER2 to reflect EPA Final Rule 87 FR 18290 (10 CFR Part 430 Appendix M(1) Uniform Test Method for Testing for Measuring the Energy Consumption of Central Air Conditioners and Heat Pumps).*

§ 3280.715 Circulating air systems.

(a) *Supply system.*

(4)

(a) Factory installed supply ducts located partially or completely outside the building thermal envelope, with or without air handlers installed in the factory, shall demonstrate air leakage to the outside or total air leakage of less than or equal to 4 cfm per 100 ft2 of conditioned floor area when tested at a difference pressure of 0.1 inch w.g., (25pa).

(b) Factory installed supply ducts located completely inside the building thermal envelope, with or without air handlers installed in the factory, shall demonstrate air leakage to the outside or total air leakage of less than or equal to 8 cfm per 100 ft2 of conditioned floor area when tested at a difference pressure of 0.1 inch w.g., (25pa).

(c) Manufacturers must perform an IPIA witnessed duct leakage test at least once per month.

Note: *Original language from DOE rule* was modified to fit with previously approved language.

> *"Each manufactured home equipped with a duct system, which may include air handlers and filter boxes, must be sealed to limit total air leakage to less than or equal to four (4) cubic feet per minute per 100 square feet of conditioned floor area at a pressure differential of 0.1 inch w.g. (25 Pascals) across the system. Building framing cavities must not be used as ducts or plenums when*

directly connected to mechanical systems. The duct total air leakage requirements are adapted from section R403 of the 2021 IECC."

MHCC Reason: *The suggested DOE testing method is not practical for a factory-built home. This recommendation considered previously approved MHCC language for this section. The 8 cfm testing point in section (b) was added as this is an option for ducts entirely within the thermal envelope in IECC, which DOE failed to include. The MHCC believes that a minimum of 1 IPIA witnessed test a month would be sufficient due to the controlled environment of the manufacturing process in a factory compared to a site-built home. The MHCC has no reason to disagree with the DOE estimated cost of testing per 5.3.7 of the TSD.*

§ 3280.716 Equipment Sizing.

Note: *MHCC does not recommend adopting the language shown in 10 C.F.R. § 460.205.*

MHCC Reason:

1) *Manufactured housing is transportable and typically not built for a site-specific location. The ACCA Manual J and ACCA Manual S calculations are intended for site specific code and cannot be applied to a national performance-based code. The manufacturer cannot properly complete the ACCA Manual J and ACCA Manual S calculations without the specific geographical location and design criteria. The calculations should be completed by the local AC company who selects and installs the cooling system based on the location and information on the homes' heating and cooling certificate.*
2) *The current language in the MHCSS has an adequate process, based on reference standards similar to Manual J, to calculate building loads and sizing of equipment.*

~~10 C.F.R. § 460.205~~
~~Sizing of heating and cooling equipment installed by the manufacturer must be determined in accordance with ACCA Manual S incorporated by reference; see § 460.3) based on building loads calculated in accordance with ACCA Manual J (incorporated by reference; see § 460.3). The equipment sizing criteria are adapted from section R403 of the 2021 IECC.~~

Appendix A:
MHI Written Public Comments
November 11, 2022

November 11, 2022

The Honorable Marcia Fudge
Secretary
U.S. Department of Housing and Urban Development
451 7th Street, S.W.
Washington, DC 20410

RE: Notice of Federal Advisory Committee Meetings: Manufactured Housing Consensus Committee (FR-6348-N-01)

Dear Secretary Fudge,

As promised in its previous correspondence, the Manufactured Housing Institute (MHI) committed to providing supporting documentation to its proposal to the Manufactured Housing Consensus Committee (MHCC). As a supplement to its November 9th, 2022 Comment Letter, MHI is pleased to submit the following presentations to the MHCC for consideration ahead of the MHCC's meeting scheduled for November 15-17, 2022. The three presentations, attached as exhibits to this supplemental correspondence, further demonstrate the benefits of adopting MHI's proposal versus a wholesale adoption the DOE's Energy Rule. Such materials also provide supporting analysis behind MHI's proposal. Below, you will find a brief summary of the contents of each presentation:

1. **Economic Impact Analysis chart based on the Energy Rule and updated data regarding MHI's proposed thermal requirements (Attached hereto as Exhibit A):** The first presentation is the Economic Impact Analysis which is based upon the Energy Rule and supporting data regarding MHI's proposed thermal requirements. This analysis demonstrates the advantages and the cost savings that will benefit the consumer under MHI's proposal as compared to the greater economic impact on the consumer under the Energy Rule. The Economic Impact Analysis, which compares the current HUD standard with the proposals of MHI and DOE, establishes the following:

- DOE's Technical Support Document provided incremental cost increases for step-ups in energy efficiency measures using the HUD Code as a baseline. For example, the incremental cost increase of going from R11 to R13 to R21 insulation in the walls. Using the DOE's own data, this analysis calculates the incremental cost increase for the Energy Rule and MHI's proposal.

- Using validated energy simulation software, this analysis calculates the marginal energy savings achieved from the Energy Rule and MHI's proposal – that is– how much a consumer will save in energy costs on a monthly basis.

- This analysis further demonstrates that for all three Zones with Tier 2 homes, **MHI's proposal results in better 10-year outcomes for all consumers than the Energy Rule.** On average, consumers will experience a net cost that is less under MHI's proposal than under the Energy Rule.

2. **Analysis of DOE's Energy Conservation Standards for Manufactured Housing (Attached hereto as Exhibit B):** The second presentation demonstrates the DOE's failure to consider key cost inputs which will negatively impact both consumers and suppliers. As provided in greater detail in the attached presentation, this analysis demonstrates the DOE's failure to sufficiently consider the following factors in

formulating its conclusions and the cumulative effect of such factors:

- ***Inflation and Cost Increases***: DOE failed to consider the impact of considerable cost increases and supply chain constraints because of the pandemic and related economic disruptions.
    - DOE's cost/benefit or life-cycle cost ("LCC") model took cost estimates from 2014 and applied a nominal cost increase of **2.3% annually** from 2014-2023. However, beginning with the Covid-19 pandemic, actual costs for construction materials have grown substantially, and the actual cost increase for construction materials from 2014-2021 is **6.5% annually**. Manufactured housing construction costs may be even higher.
    - DOE assumed a 5% interest rate for land-home deals and a 9% interest rate for home-only deals. The current 30-year fixed mortgage rate is now approximately 7%.
    - Fixing only these two inputs to reflect actual cost inflation and actual interest rates for land/home loans, **based on DOE's own LCC model for Tier 2 homes, approximately 95% of shipments will have a negative 10-year LCC**. In geographic terms, of the 19 "representative" cities chosen by the DOE, 16 of those representative cities will have a negative 10-year LCC for Tier 2 homes. This data accounts for the increased energy savings that result from inflation as well.
    - Assuming Tier 2 homes represent 55% of the industry producing approximately 120,000 homes annually, this means that approximately **63,000 homes would have a negative 10-year LCC based on the Energy Rule.**
- ***Negative Impact***: DOE failed to consider negative impacts on low-income and minority homebuyers.
    - The Energy Rule will disparately impact minority communities even without accounting for actual cost increases. Black or African American manufactured home purchasers are approximately 22.5% more likely to finance their purchase with a home-only loan as compared with a land-home loan. Likewise, Hispanic manufactured home purchases are 11% more likely to finance their purchase with a home-only loan.
    - At a 9.5% home-only interest rate, 37% of Tier 2 shipments will have a negative 10-year LCC based on DOE's own model. Using a 11% home-only interest rate, 86% of Tier 2 shipments will have a negative 10-year LLC based on DOE's own model.
    - The Biden Administration has prioritized housing affordability and racial equity: *"The Federal Government has a critical role to play in overcoming and redressing… [its role in declining to invest in communities of color and in failing to provide equitable access,] and in protecting against other forms of discrimination by applying and enforcing Federal civil rights and fair housing laws. It can help ensure that fair and equal access to housing opportunity exists for all throughout the United States."*
- ***Additional Costs.*** DOE failed to consider potential costs of testing and compliance, transportation, and supply chain constraints.

- The Energy Rule failed to account for significant compliance costs. Without limitation, in rural areas, it is estimated that in-field duct testing could cost over $1,000 per home. Many Tier 2, Zone 2 & Zone 3 homes will need 2x6 walls rather than 2x4 which will increase lumber and transportation costs (due to weight). Exclusive of lumber costs, an additional axle may be needed for weight which is another $200 to $250 per floor, $400 to $500 per multisection homes. Transportation costs such as fuel have increased dramatically over the past year. And the industry is experiencing significant supply chain difficulties, especially for fiberglass insulation—a commodity for which supply must increase to comply with the DOE's Final Rule.

- Before supply chains normalize, the cost for fiberglass insulation will increase drastically and home starts may be limited if there is not enough fiberglass insulation or if plants must use alternatives such as blown insulation. Many in the industry do not believe that there will be enough fiberglass insulation to meet the demand. As such, manufacturers will be forced to pivot to spray foam insulation, which is more costly and labor-intensive. Additionally, the process for the installation of spray foam insulation requires a cooling off period, which will increase the amount of time of the home on the line, decreasing the thru-put, and will inevitably cause fewer home to be built. All of this will inevitably increase the overall cost of the homes to the consumer, none of which has been calculated by DOE.

- **These unaccounted-for costs will easily subsume the DOE's projected 10-year LCC savings for all manufactured homes.** For Tier 1 homes, DOE projected a national average of $720 10-year LCC savings and for Tier 2 homes, DOE projected a national average of $743 10-year LCC savings. If, for example, in-field duct testing is required which costs approximately $1,000 per home, then all 10-year LCC savings are eliminated.

- ***Affordability and Credit Access.*** DOE underestimated potential impacts on credit access and lost sales.

  - These additional costs will make home ownership unaffordable for thousands of Americans. To estimate the impact on affordability, the DOE relied upon a 2007 economic study. This study predated the Great Recession, predated the Covid-19 pandemic and the following inflation period, predated the current rise in interest rates, and predated the recent increases in retail prices for manufactured homes which may make potential customers even more price sensitive.

  - **DOE's Final Rule conceded with its sensitivity analysis that over 5,000 families annually will not be able to afford a manufactured home,** and this number is almost certainly understated for the reasons described above. Based on industry information, it is likely that the realistic impact of the implementation of the Energy Rule could actually affect twice as many families.

3. **Architectural and Design Analysis of how the Energy Rule will generally impact the design of manufactured homes as opposed to the design elements of manufactured homes based on current standards (Attached hereto as Exhibit C):** DOE's standards will negatively impact the aesthetic appearance and the design of manufactured homes. As demonstrated in the attached presentation, significant architectural modifications will be required for manufacturers to stay in compliance with the Energy Rule which will result in less aesthetically pleasing homes. Most notably, multisection homes will face substantial architectural

modifications. To meet the DOE standards, the industry will have to consider a variety of tradeoffs, including, a reduction of windows and/or significant changes in home architecture to accommodate additional insulation. Consequently, such modifications will be either be more difficult to implement and less appealing, or even prohibitive.

- To meet the U-value performance requirements for Tier 2, Zone 3 homes, assuming the home has additional insulation added without altering the framing, the windows had to be eliminated completely. As a result of the reduced windows, the requirements for egress, light and ventilation are no longer met. **Therefore, it would not be possible to manufacture this home to be in compliance with code regulations and the Energy Rule.**
    - Additionally, even if this home could be constructed in a manner to comply with code regulations and the Energy Rule, there are not enough windows in the market today to meet the demand if a lower U-value is required.
- If a manufacturer were to construct a home that met the required Tier 2, Zone 3 U-value with an insulation package that met the value under the prescriptive section of the code, which would require substantial framing changes, it would still be very difficult to construct this home using materials currently available on the market. Specifically:
    - Most manufacturers do not currently use the floor insulation technique that would be required to construct this home to meet DOE requirements.
    - There is not enough supply of R-21 insulation in the market to meet the amount necessary to comply with DOE requirements to keep up with the current demand.
    - It will be problematic to get the required insulation (R-38) in the roof cavity due to the required thickness and available attic space.
    - **To have almost the same amount of windows in the home as is allowed under current regulations, manufacturers would have to install windows that have a U-value equal to 0.30, which are not currently available on the market.**
- To construct a multi-section home in Zone 3, the shipping height will be increased due to the 5.5" heal height and the increased floor joist depth. **Because of the required insulation thickness under the Energy Rule, optional vaulted ceilings will no longer be available to the consumers.**

MHI supports energy conservation efforts, and our manufacturer members are committed to continue leading the way in energy efficient manufacturing. The analysis and presentations provided herein further demonstrate this commitment while providing a clear and conscientious basis for MHI's proposed changes to the Energy Rule. MHI remains committed to working with the MHCC, HUD and DOE to realistically improve energy efficiency that not only encourages innovation and conservation but also eliminates regulatory barriers that impede consumer access to safe, affordable manufactured housing.

Sincerely,

Lesli Gooch

Lesli Gooch, Ph.D.
Chief Executive Officer

Enclosures

Exhibit A

Economic Impact Analysis

Table 1. Net Benefit (Cost)of DOE Proposal for Multi-section Homes based on DOE Costs and SBRA Energy Savings Estimates

Multi-section Home													
HUD Standards Climate Zone	Locations (heating equipment type)	Efficiency level	Level of efficiency (Uo-value)	Base average home cost (DOE TSD p. 6-2)	Marginal increase in home cost (DOE TSD)	Percent increase in cost	Marginal increase in down payment	Marginal increase in mortgage	Marginal increase in monthly mort. pay.	Marginal energy savings ($/mth)	Net Mthly. Savings (Cost)	Principal repayment	Net benefit (cost)
1	Miami (Electric)	HUD standard	0.116	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.090	$108,500	$3,077	2.8%	$308	$2,770	$25	$10	($15)	$1,967	**($4,045)**
		DOE proposal	0.082	$108,500	$4,018	3.7%	$402	$3,616	$33	$19	($14)	$2,568	**($4,644)**
	Houston (Natural gas)	HUD standard	0.116	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.090	$108,500	$3,077	2.8%	$308	$2,770	$25	$12	($13)	$1,967	**($3,845)**
		DOE proposal	0.082	$108,500	$4,018	3.7%	$402	$3,616	$33	$18	($14)	$2,568	**($4,664)**
	Atlanta (Electric)	HUD standard	0.116	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.090	$108,500	$3,077	2.8%	$308	$2,770	$25	$34	$9	$1,967	**($1,135)**
		DOE proposal	0.082	$108,500	$4,018	3.7%	$402	$3,616	$33	$39	$7	$2,568	**($2,184)**
	Charleston (Electric)	HUD standard	0.116	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.090	$108,500	$3,077	2.8%	$308	$2,770	$25	$26	$1	$1,967	**($2,115)**
		DOE proposal	0.082	$108,500	$4,018	3.7%	$402	$3,616	$33	$31	($1)	$2,568	**($3,114)**
	Jackson (Electric)	HUD standard	0.116	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.090	$108,500	$3,077	2.8%	$308	$2,770	$25	$31	$6	$1,967	**($1,505)**
		DOE proposal	0.082	$108,500	$4,018	3.7%	$402	$3,616	$33	$38	$5	$2,568	**($2,344)**
	Birmingham (Electric)	HUD standard	0.116	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.090	$108,500	$3,077	2.8%	$308	$2,770	$25	$32	$7	$1,967	**($1,395)**

		DOE proposal	0.082	$108,500	$4,018	3.7%	$402	$3,616	$33	$37	$5	$1,967	**($1,783)**
2	Phoenix (Natural gas)	HUD standard	0.096	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.076	$108,500	$2,404	2.2%	$240	$2,163	$19	$15	($4)	$1,537	**($2,303)**
		DOE proposal	0.066	$108,500	$4,317	4.0%	$432	$3,885	$35	$22	($13)	$2,759	**($4,796)**
	Memphis (Electric)	HUD standard	0.096	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.076	$108,500	$2,404	2.2%	$240	$2,163	$19	$23	$3	$1,537	**($1,413)**
		DOE proposal	0.066	$108,500	$4,317	4.0%	$432	$3,885	$35	$32	($3)	$2,759	**($3,536)**
	El Paso (Natural Gas)	HUD standard	0.096	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.076	$108,500	$2,404	2.2%	$240	$2,163	$19	$10	($9)	$1,537	**($2,903)**
		DOE proposal	0.066	$108,500	$4,317	4.0%	$432	$3,885	$35	$14	($21)	$2,759	**($5,656)**
	San Francisco (Natural Gas)	HUD standard	0.096	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.076	$108,500	$2,404	2.2%	$240	$2,163	$19	$4	($15)	$1,537	**($3,583)**
		DOE proposal	0.066	$108,500	$4,317	4.0%	$432	$3,885	$35	$7	($28)	$2,759	**($6,606)**
	Albuquerque (Electric)	HUD standard	0.096	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.076	$108,500	$2,404	2.2%	$240	$2,163	$19	$21	$2	$1,537	**($1,593)**
		DOE proposal	0.066	$108,500	$4,317	4.0%	$432	$3,885	$35	$31	($4)	$2,759	**($3,656)**
	Baltimore (Natural Gas)	HUD standard	0.079	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.061	$108,500	$2,557	2.4%	$256	$2,302	$21	$13	($7)	$1,635	**($2,765)**
		DOE proposal	0.055	$108,500	$3,997	3.7%	$400	$3,598	$32	$16	($16)	$2,555	**($4,899)**
	Salem (Electric)	HUD standard	0.079	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.061	$108,500	$2,557	2.4%	$256	$2,302	$21	$51	$30	$1,635	**$1,765**

3		DOE proposal	0.055	$108,500	$3,997	3.7%	$400	$3,598	$32	$59	$27	$2,555	**$231**
	Chicago (Natural Gas)	HUD standard	0.079	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.061	$108,500	$2,557	2.4%	$256	$2,302	$21	$19	($2)	$1,635	**($2,105)**
		DOE proposal	0.055	$108,500	$3,997	3.7%	$400	$3,598	$32	$22	($10)	$2,555	**($4,149)**
	Boise (Electric)	HUD standard	0.079	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.061	$108,500	$2,557	2.4%	$256	$2,302	$21	$38	$17	$1,635	**$135**
		DOE proposal	0.055	$108,500	$3,997	3.7%	$400	$3,598	$32	$44	$12	$2,555	**($1,549)**
	Burlington (Natural gas)	HUD standard	0.079	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.061	$108,500	$2,557	2.4%	$256	$2,302	$21	$21	$1	$1,635	**($1,815)**
		DOE proposal	0.055	$108,500	$3,997	3.7%	$400	$3,598	$32	$25	($7)	$2,555	**($3,849)**
	Helena (Electric)	HUD standard	0.079	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.061	$108,500	$2,557	2.4%	$256	$2,302	$21	$53	$32	$1,635	**$1,945**
		DOE proposal	0.055	$108,500	$3,997	3.7%	$400	$3,598	$32	$62	$29	$2,555	**$551**
	Duluth (Natural Gas)	HUD standard	0.079	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.061	$108,500	$2,557	2.4%	$256	$2,302	$21	$29	$9	$1,635	**($865)**
		DOE proposal	0.055	$108,500	$3,997	3.7%	$400	$3,598	$32	$34	$1	$2,555	**($2,789)**
	Fairbanks (Natural Gas)	HUD standard	0.079	$108,500	$0	0.0%	$0	$0	$0	$0	$0	$0	**$0**
		MHI proposal	0.061	$108,500	$2,557	2.4%	$256	$2,302	$21	$39	$19	$1,635	**$335**
		DOE proposal	0.055	$108,500	$3,997	3.7%	$400	$3,598	$32	$46	$14	$2,555	**($1,279)**

Assumptions	
Down payment	10%
Principal	90%
Mort. interest rate	9%
Loan term (yrs)	20
Occupancy term (yrs)	10
Principal recapture rate	0%

Average Benefit (Cost)		MHI	DOE
Zone	**1**	**($2,340.08)**	**($3,122.03)**
	2	**($2,358.84)**	**($4,849.82)**
	3	**($421.72)**	**($2,216.82)**

Ref.: TECHNICAL SUPPORT DOCUMENT: SUPPLEMENTAL NOTICE OF PROPOSED RULEMAKING PROPOSING ENERGY CONSERVATION STANDARDS FOR MANUFACTURED HOUSING
Estimates of energy savings provided by Ekotrope software.

Exhibit B

Analysis of DOE’s Energy Conservation Standards

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Analysis of DOE's Energy Conservation Standards for Manufactured Housing

Identification of Potential Issues and Sensitivity Analyses

November 11, 2022

Executive Summary

- Assignment
  - DOE relied upon a cost-benefit analysis for consumers of manufactured homes
  - Analysis Group assessed this cost-benefit analysis with particular focus on **important inputs that have changed** since DOE's original analysis
- Summary of Preliminary Conclusions
  1. Adjusting DOE's assumptions for recent inflation and interest rate increases invalidates DOE's conclusion that its proposed rule is cost-effective for consumers
  2. DOE's rule will have particularly negative impacts on minority and low-income homebuyers, who tend to face higher borrowing costs
  3. DOE has underestimated the number of households that will no longer be able to afford a manufactured home as a result of the rule
  4. DOE has failed to consider additional costs of compliance, such as duct testing and transportation costs, which could further negate any anticipated savings for consumers

Qualifications

Pavel Darling, Vice President (*MBA, MIT Sloan School of Management; B.A. in Economics, Middlebury College)*

Mr. Darling is an expert on energy matters, and often consults to utilities, state and regional organizations, and global companies in his work. He focuses on projects related to cost/benefit analyses of new construction and resource retirements; environmental effects of emissions and pollution controls; economic impacts of energy projects, mergers and policies; and natural gas, biomass, and other market studies. Mr. Darling also has extensive experience working on various climate change projects, including assessments of decarbonization policy proposals and quantification of greenhouse gas emissions impacts.

He has also submitted and supported expert testimony across different venues, including state utility commissions, siting boards, the Federal Energy Regulatory Commission and the Environmental Protection Agency. Mr. Darling's prior experience working at a utility involved preparing annual filings and working with stakeholders to assess bill impacts of proposed energy efficiency changes. He has also coauthored a number of published reports and journal articles.

About Analysis Group

Analysis Group is one of the largest international economics consulting firms, with more than 1,000 professionals across 14 offices in North America, Europe, and Asia. Since 1981, we have provided expertise in economics, finance, health care analytics, and strategy to top law firms, Fortune Global 500 companies, and government agencies worldwide. Our internal experts, together with our network of affiliated experts from academia, industry, and government, offer our clients exceptional breadth and depth of expertise.

Analysis Group's Energy & Environment practice is distinguished by our deep expertise in economics, finance, regulatory issues, and public policy, as well as significant experience in environmental economics and energy infrastructure development. We have worked on energy issues for a wide variety of clients, including energy producers, energy customers, regulatory commissions and government agencies, system operators, foundations, and nongovernmental institutions.

Background on DOE's Energy Efficiency Standards for Manufactured Housing

- Key Dates:
  - Aug. 26, 2021 DOE issued Supplemental Notice of Proposed Rulemaking (SNOPR)
  - May 31, 2022 Final rule and cost-benefit analyses released, relying on data from 2021 and earlier
  - May 31, 2023 Expected compliance date

- By statute, DOE must consider cost effectiveness (42 U.S.C 17071(b)(1))
  - "The energy conservation standards established under this section shall be based on the most recent version of the International Energy Conservation Code (including supplements), **except in cases in which the Secretary finds that the code is not cost-effective**, or a more stringent standard would be more cost-effective, based on the impact of the code on the purchase price of manufactured housing and on total life-cycle construction and operating costs."

Summary of Preliminary Conclusions

DOE's conclusions on cost effectiveness disregard or do not sufficiently consider variation in key cost inputs over time and across groups for buyers and suppliers

1 **Inflation and Cost Increases**	DOE has failed to consider the impacts of considerable cost increases and supply chain constraints. Taking these into account, DOE's conclusion is invalid and the rule has a net cost to consumers rather than a benefit.
2 **Negative and Inequitable Impacts**	DOE has failed to consider negative impacts on low-income and minority homebuyers.
3 **Affordability and Credit Access**	DOE has underestimated potential impacts on credit access and lost sales.
4 **Additional Costs**	DOE has failed to consider potential costs of testing and compliance, transportation, and supply chain constraints.

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Background: DOE's Life-Cycle Cost (LCC) Model

- DOE estimated the **total customer cost** over the life of the manufactured home via the Life-Cycle Cost model, including:
  - **Purchase costs** (e.g., the price of additional energy efficiency measures), and
  - **Operating costs** (e.g., energy bill savings)
- Future costs and savings are discounted to their value in the present year
- Analysis occurs over both 10- and 30-year periods
- DOE also calculates a payback period, equal to the increase in upfront cost divided by the energy savings in first year

DOE's Life-Cycle Cost Model

Purchase Cost Increases – **Operating Cost Savings**

Our Focus: Evaluating DOE's Cost-Benefit Analysis by Updating Key Inputs

Upfront Cost + **Monthly Mortgage** – **Annual Energy Savings**

Upfront Cost

Primary inputs

- Energy efficiency measure (EEM) costs and inflation

Other inputs

- Down payment
- Sales tax
- Loan fees

Monthly Mortgage

Primary inputs

- Interest rates, which vary by loan type (personal property, real estate)

Other inputs

- Down payment amount
- Property tax

Annual Energy Savings

Primary inputs

- Energy prices and inflation

Other inputs

- Regional energy consumption patterns
- Energy efficiency measure (EEM) efficacy
- Home energy source

Summary of Preliminary Conclusions

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1 **Inflation and Cost Increases**

DOE has failed to consider the impacts of considerable cost increases and supply chain constraints. Taking these into account, DOE's conclusion is invalid and the rule has a net cost to consumers rather than a benefit.

2 **Negative and Inequitable Impacts**

DOE has failed to consider negative impacts on low-income and minority homebuyers.

3 **Affordability and Credit Access**

DOE has underestimated potential impacts on credit access and lost sales.

4 **Additional Costs**

DOE has failed to consider potential costs of testing and compliance, transportation, and supply chain constraints.

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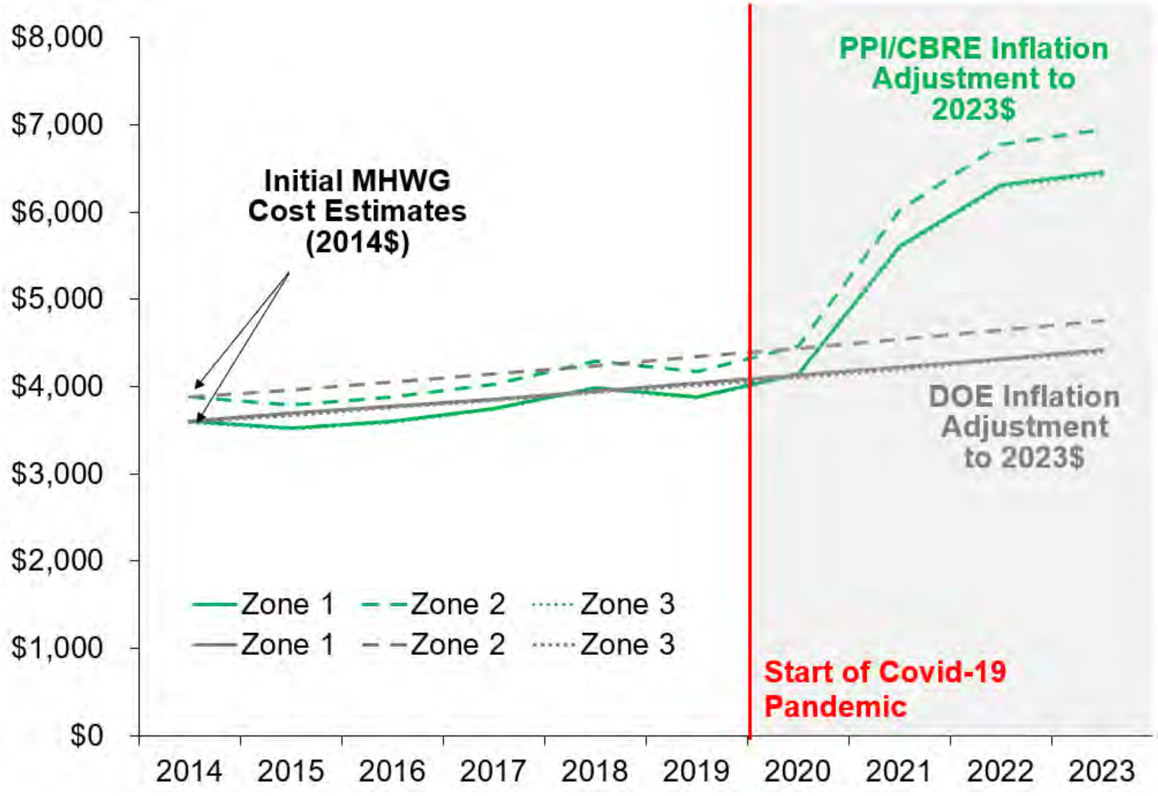
DOE Has Inadequately Adjusted EEM Cost Estimates for Inflation

- DOE calculated the costs of energy efficiency measures using cost estimates provided by the Manufactured Housing Working Group in **2014**
- To adjust for inflation, DOE assumes an annual nominal cost increase of **2.3 percent** between 2014-2023 (See gray lines)
- However, costs have increased substantially since the start of the Covid-19 pandemic. According to the BLS Producer Price Index for construction costs, materials costs have grown at an average annual rate of **6.5 percent** between 2014-2021, driven mostly by cost increases of **35.1 percent** from 2020-2021 (See green lines)
- Industry interviews suggest even higher recent increases beyond PPI, with costs at a new floor and unlikely to regress

Estimated Costs of Energy Efficiency Measures, by Inflation Adjustment Approach and Climate Zone



Note: Inflation estimates for PPI/CBRE series for 2022 and 2023 are from the "decreased demand" scenario of the CBRE's Construction Costs Index Forecast.

Sources: U.S. Bureau of Labor Statistics, Producer Price Index by Commodity: Special Indexes: Construction Materials [WPUSI012011], retrieved from FRED on October 30, 2022, Federal Reserve Bank of St. Louis, available at https://fred.stlouisfed.org/series/WPUSI012011; CBRE Research, "2022 U.S. Construction Cost Trends," July 2022, available at https://www.cbre.com/insights/books/2022-us-construction-cost-trends; U.S. Department of Energy, Manufactured Housing Life-Cycle Cost Analysis (LCC) Spreadsheet, May 18, 2022, available at https://www.regulations.gov/document/EERE-2009-BT-BC-0021-1996.

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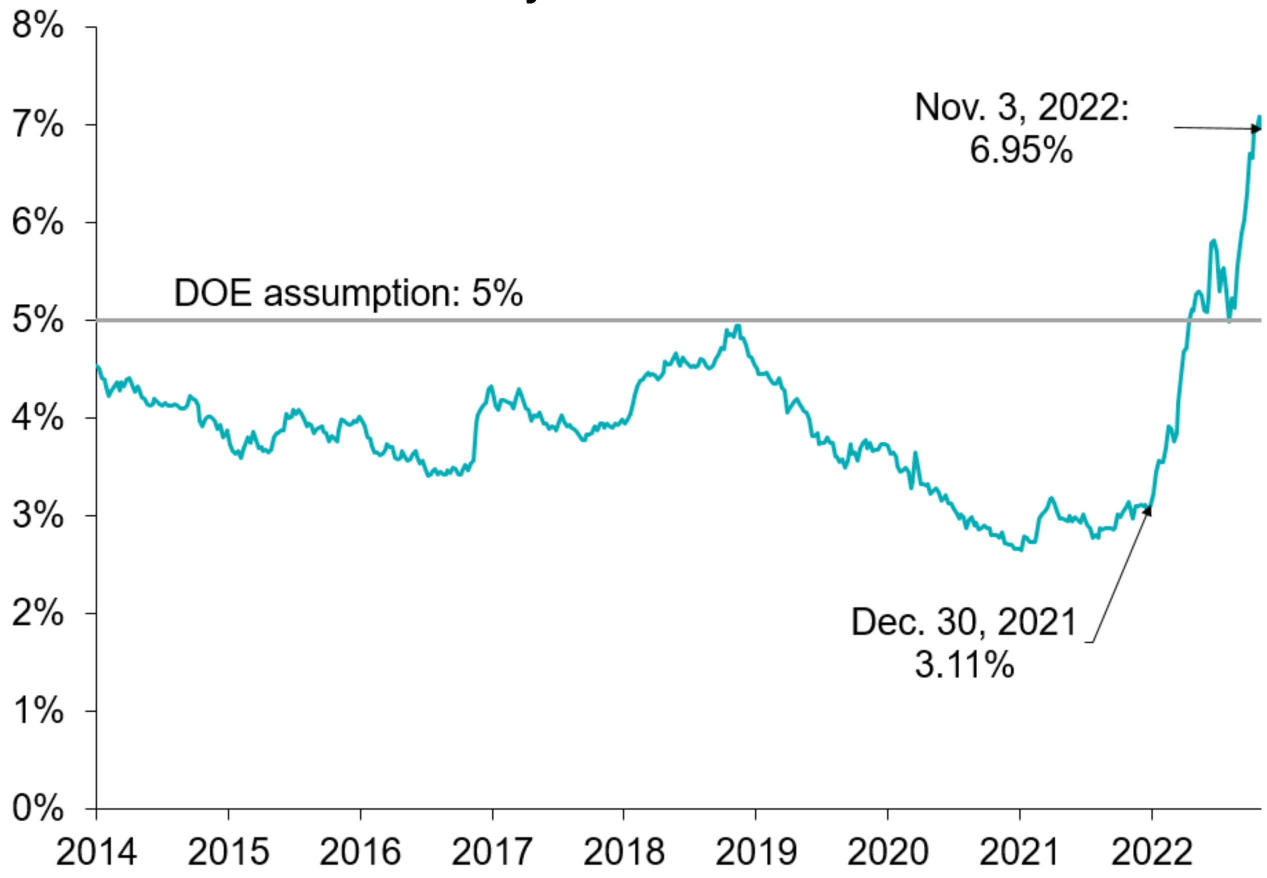
Mortgage Interest Rates Have Increased Above DOE's Assumptions

- DOE assumed interest rates of **5 percent** for mortgage loans and **9 percent** for personal property loans
- These assumptions were arguably conservative at the time, but mortgage rates have increased from approximately 3 to **7 percent**
- Industry interviews have suggested that personal property loan interest rates may be as high as **11.5 percent** for some borrowers
  - Moreover, DOE's own review of available evidence suggests that personal property loan interest rates are typically between 0.5 percentage points and 5 percentage points higher than real estate loan interest rates

30-Year Fixed Rate Mortgage Average in the United States
January 2014 – November 2022



__Sources:__ Freddie Mac, 30-Year Fixed Rate Mortgage Average in the United States [MORTGAGE30US], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/MORTGAGE30US, November 3, 2022; U.S. Department of Energy, "2022-05 Technical Support Document: Final Rule Energy Conservation Standards for Manufactured Housing, May 18, 2022, available at https://www.regulations.gov/document/EERE-2009-BT-BC-0021-1999, p. 8-4.

Energy Costs Have Increased As Well, Increasing Anticipated Savings

- Over the past year, energy costs have increased due to geopolitical and pandemic related disruptions
- The U.S. Energy Information Administration has increased its forecasted energy prices for 2023 and beyond based on its *Annual Energy Outlook* (AEO)
- The DOE LCC analysis relies on energy price forecasts from 2021

U.S. Energy Information Administration's Forecasted Energy Prices, by Forecast Year

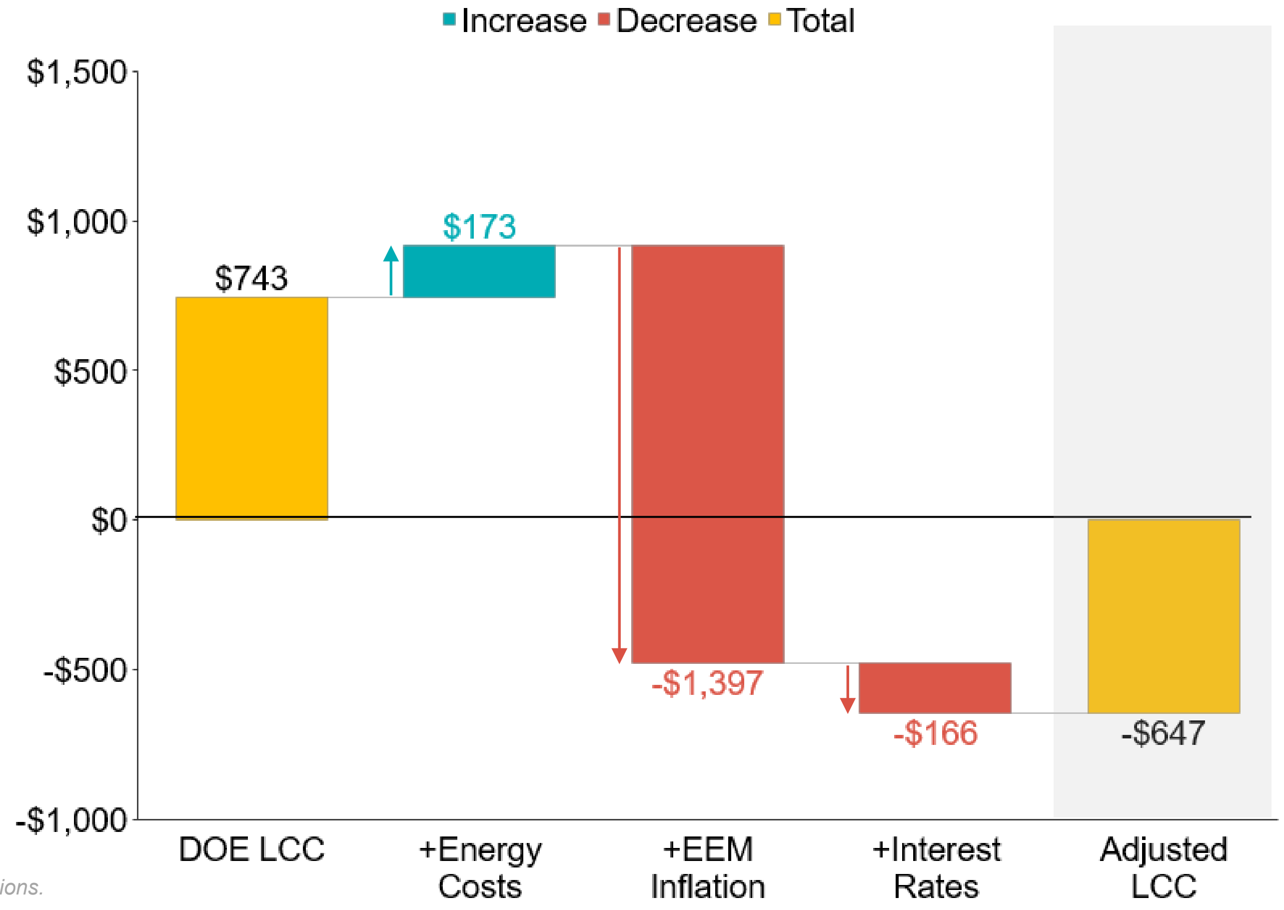
	Nominal Energy Prices			
	AEO 2021 Assumptions	AEO 2022 Assumptions	Units	% Change
Natural Gas	$10.14	$11.70	$/Mbtu	+7.1%
Propane	$17.30	$21.49	$/Mbtu	+10.8%
Elec Heat	$0.13	$0.14	$/kWh	+1.9%
Elec Cool	$0.13	$0.14	$/kWh	+1.5%
Elec Other	$0.13	$0.14	$/kWh	+1.9%
Oil	$17.75	$21.71	$/Mbtu	+10.0%

Sources: *Annual Energy Outlook 2022, Table: Table 3. Energy Prices by Sector and Source, retrieved from U.S. Energy Information ; Short-Term Energy Outlook Data Browser, 2. Energy Prices, retrieved from U.S. Energy Information Administration on November 03, 2022, available at https://www.eia.gov/outlooks/steo/data/browser/#/?v=8.*

On Net, Changes in the Recent Economic Environment Have Reversed Expected Cost Savings from the DOE Rule

- While increased energy cost forecasts have increased expected savings from the rule, the large increase in construction material costs since 2022 far outweighs these gains
- Additionally, adjusting for higher interest rates adds to expected increased costs
  - Real estate loan interest rates have been adjusted from 5 percent to **7 percent**
  - Personal property loan interest rates have conservatively been left at DOE's assumption of **9 percent**

Tier 2 LCC Adjustments - 10-Year Analysis Period

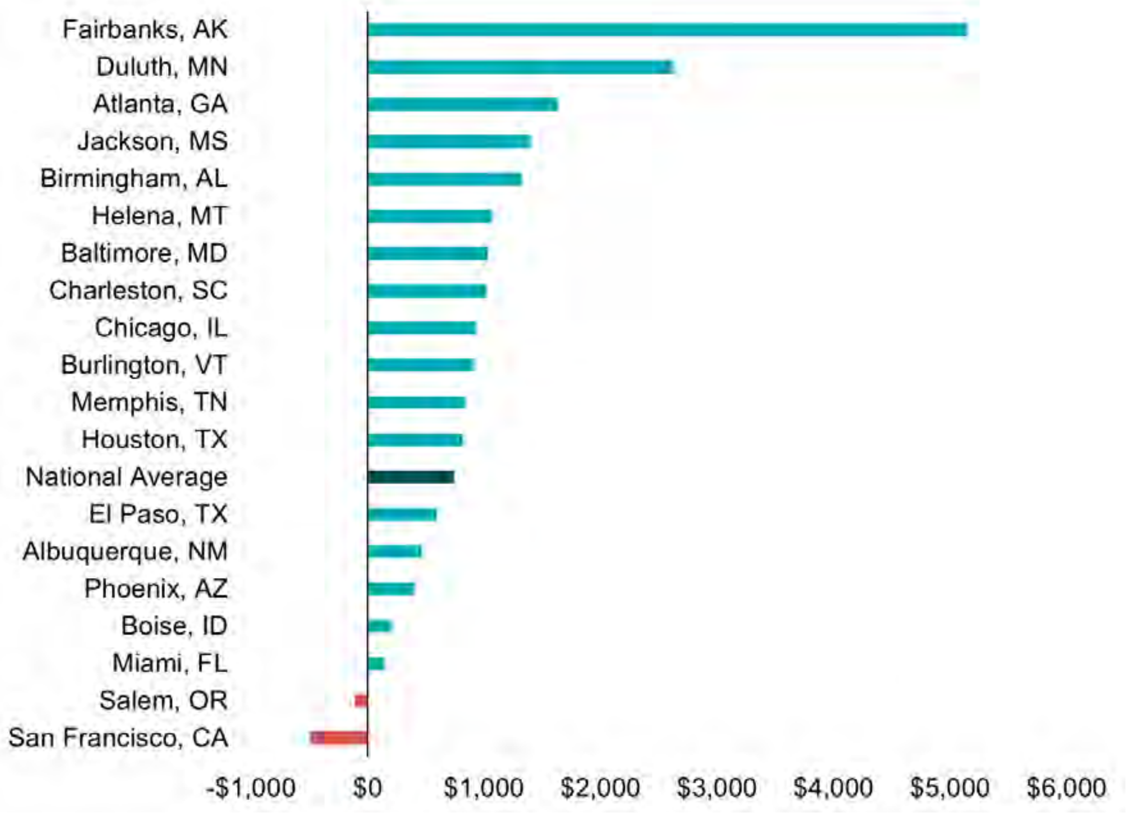


Sources: *U.S. Bureau of Labor Statistics, CBRE Research, Department of Energy, Freddie Mac, AG Calculations.*

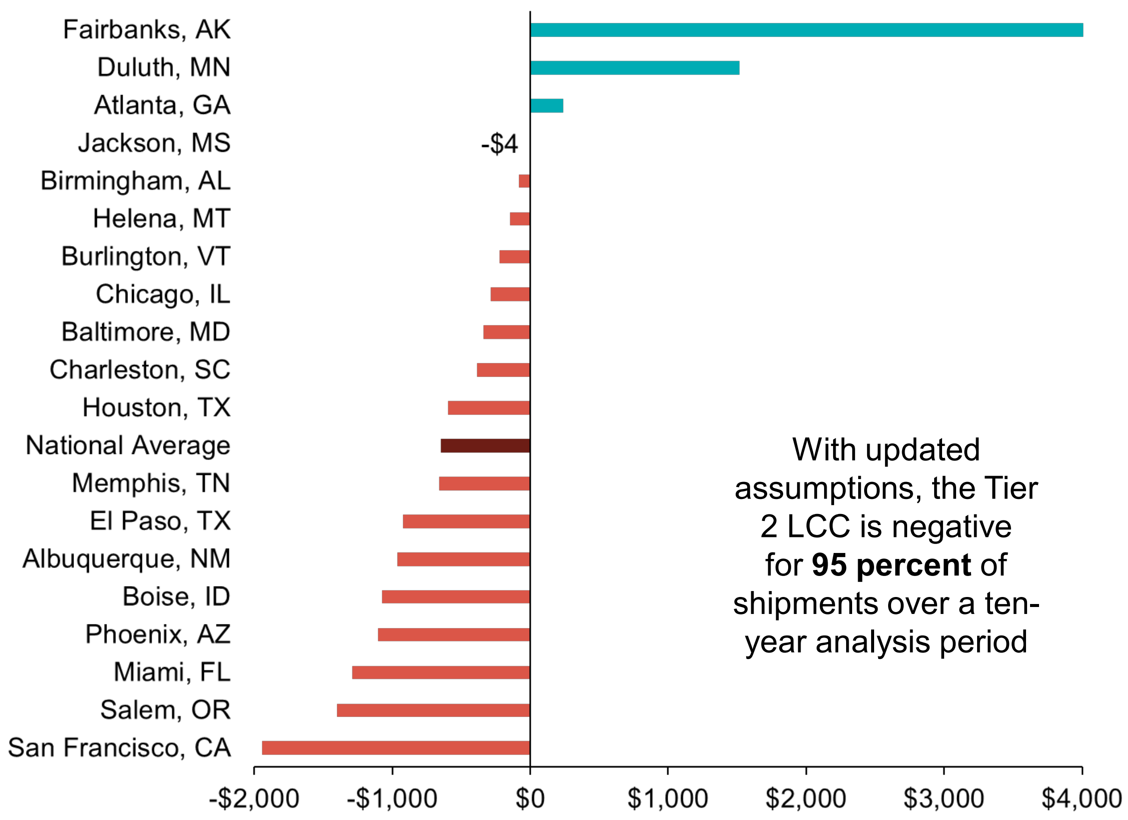
With Updated Costs, 10-Year Tier 2 LCC Negative For Most of the Country

Tier 2 LCC Adjustments, by City (10-Year Analysis Period)

DOE LCC Estimates



Adjusted LCC Estimates



With updated assumptions, the Tier 2 LCC is negative for **95 percent** of shipments over a ten-year analysis period

Sources: U.S. Bureau of Labor Statistics, CBRE Research, Department of Energy, Freddie Mac, AG Calculations.

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Summary of Preliminary Conclusions

DOE's conclusions on cost effectiveness disregard or do not sufficiently consider variation in key cost inputs over time and across groups for buyers and suppliers

1	**Inflation and Cost Increases**	DOE has failed to consider the impacts of considerable cost increases and supply chain constraints. Taking these into account, DOE's conclusion is invalid and the rule has a net cost to consumers rather than a benefit.
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4	**Additional Costs**	DOE has failed to consider potential costs of testing and compliance, transportation, and supply chain constraints.

DOE's Average Buyer Analysis Masks Negative Outcomes for a Number of Subgroups

- DOE LCC calculation is an average of the LCCs for many types of buyers
- LCC estimates vary along many dimensions, including:
  - Loan type (personal property, real estate, cash)
  - Credit score
  - Home heating fuel type (e.g., natural gas, electric resistance, heat pump)
  - Climate zone/geography
- Ultimately, low-income and minority buyers are more likely to be negatively impacted by the rule
  - The Biden Administration has prioritized housing affordability and racial equity:

    "The Federal Government has a critical role to play in overcoming and redressing… [its role in declining to invest in communities of color and in failing to provide equitable access,] and in protecting against other forms of discrimination by applying and enforcing Federal civil rights and fair housing laws. It can help ensure that fair and equal access to housing opportunity exists for all throughout the United States."

Source: "Memorandum on Redressing Our Nation's and the Federal Government's History of Discriminatory Housing Practices and Policies," *The White House*, January 26, 2021, available at https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/26/memorandum-on-redressing-our-nations-and-the-federal-governments-history-of-discriminatory-housing-practices-and-policies/.

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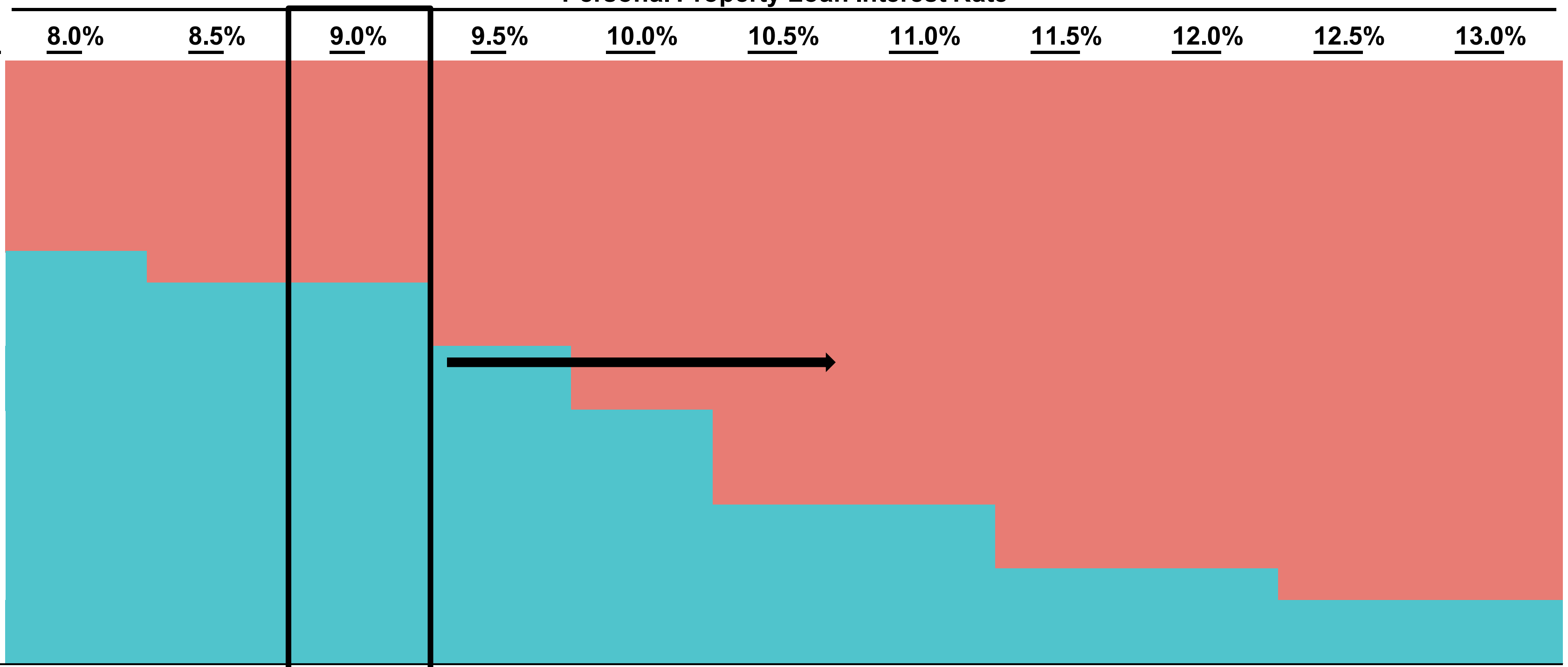
Under DOE's Original Assumptions, 10-Year LCC for Tier 2 Personal Property Loans is Negative

With Higher Interest Rates, LCC Becomes Negative for More Parts of the Country



City	8.0%	8.5%	9.0%	9.5%	10.0%	10.5%	11.0%	11.5%	12.0%	12.5%	13.0%
Number of Cities with Negative LCC	6	7	7	9	11	14	14	16	16	17	17
Share of Shipments to Cities with Negative LCC	27%	37%	37%	60%	71%	86%	86%	95%	95%	98%	98%
Tier 2 LCC National Average	$ 211	$ 97	-$ 19	-$ 136	-$ 254	-$ 372	-$ 492	-$ 613	-$ 733	-$ 855	-$ 977

Note: Red indicates negative LCCs and blue indicates positive LCCs. Darker colors correspond with higher absolute values. ***Source:*** DOE LCC Model.

Minority Buyers Are Relatively More Likely to Rely on Higher-Cost Personal Property Loans to Finance Purchases

- Many borrowers such as those with low credit scores or residents of Manufactured Housing communities face interest rates as high as 11.5 percent
- Minority buyers finance MH purchases with personal property loans at especially high rates compared to non-minority buyers

Share of Manufactured Home Purchases Financed by Personal Property Loans (vs. Real Estate Only), by Demographic Cohort

	Share of Personal Property Loans (vs Real Estate only)	Compared to All Households	Total Loans in Cohort (Personal Property and Real Estate)
All Households	42.8%	-	130,570
Low-Income Households	45.4%	*+2.6%*	65,583
Very Low-Income Households	45.1%	*+2.3%*	19,786
Hispanic	53.8%	*+11.0%*	16,224
Low-Income Hispanic Households	55.1%	*+12.3%*	8,406
Black or African American	65.1%	*+22.3%*	8,998
Low-Income Black or African American Households	66.7%	*+24.0%*	5,841
American Indian or Alaskan Native	54.7%	*+11.9%*	1,551
Low-Income American Indian or Alaskan Native Households	56.2%	*+13.4%*	840
Asian	48.6%	*+5.9%*	1,220

Sources: *2021 Home Mortgage Disclosure Act, United States Census Bureau.*

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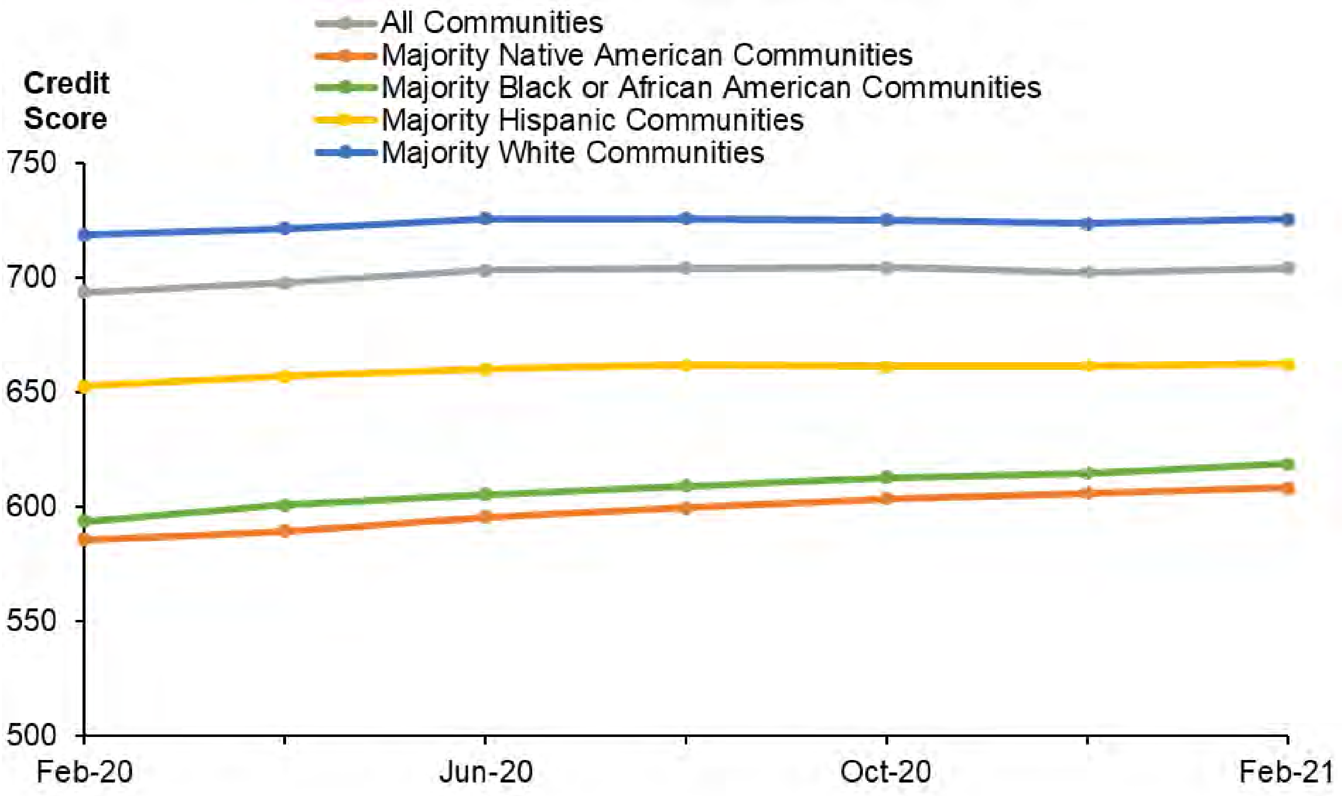
Low-Income and Minority Households Face Higher Borrowing Costs than the Median Household

- Residents of majority-minority communities tend to have lower credit scores than compared to white communities and the national average
- Low-income and minority buyers tend to face higher interest rates

Credit Scores of Residents in Majority-Minority Communities



Sources: *Urban Institute Credit Bureau Data; 2021 Home Mortgage Disclosure Act.*

The Negative Impact of DOE's Proposed Rule Can Be Illustrated With a Few Representative Borrowers

Quoted Rates from 21st Mortgage's Payment Estimator Help to Approximate Current Loan Terms

- The following slides illustrate several groups of representative borrowers, which differ according to the following characteristics:
  - City [E.g., Memphis, TN (Climate Zone 2)]
  - Credit Score [E.g., 650-680]
  - Home Cost [E.g., $100,000]
  - Down Payment [E.g., 10%]
  - Loan Type [E.g., Home-only (Private Land)]
- 21st Mortgage's "Payment Estimator" tool estimates interest rates and loan terms, given these characteristics, which we then use to calculate LCC values
  - 21st Mortgage is the largest manufactured-home lender in the country, so rates give a general sense of terms facing a current prospective manufactured homebuyer
- Credit score and energy consumption patterns by geography are key drivers of differences in anticipated savings for prospective multi-section home buyers

Geographic Energy Consumption Patterns Drive Considerable Differences Across Cities for Prospective Tier 2 Borrowers

Buyers with Good Credit Would Have Significantly Negative LCC in Most Cities

Profile	Memphis	Miami	El Paso	Houston	Phoenix	Baltimore
City	**Memphis (Climate Zone 2)**	**Miami (Climate Zone 1)**	**El Paso (Climate Zone 2)**	**Houston (Climate Zone 1)**	**Phoenix (Climate Zone 2)**	**Baltimore (Climate Zone 3)**
Credit score	650-680	650-680	650-680	650-680	650-680	650-680
Home cost	$110,000	$110,000	$110,000	$110,000	$110,000	$110,000
Down payment	10%	10%	10%	10%	10%	10%
Loan type	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)
Quoted rates (21st Mortgage)						
Interest rate	9.35%	9.35%	9.35%	9.35%	9.35%	8.60%
Term	25 years	25 years	25 years	25 years	25 years	25 years
10-year LCC						
Given DOE Assumptions	-$ 66	-$ 612	-$ 280	-$ 29	-$ 448	$ 366
Updated EEM Costs, Energy Prices	-$1,586	-$2,077	-$1,821	-$1,462	-$1,985	-$ 988
30-year LCC*						
Given DOE Assumptions	$1,712	$ 605	$1,323	$1,638	$1,052	$2,452
Updated EEM Costs, Energy Prices	-$ 143	-$1,206	-$ 565	-$ 119	-$ 837	$ 773

Notes: *Asterisk (*) indicates that estimates are from DOE's original model, i.e., without a correction for an error where loan payments after Year 15 are not included in the LCC calculation for personal property loans. Quoted rates are for a single applicant. From HMDA, roughly 58% of applications are from single applicants.* ***Source:*** *21st Mortgage Corporation, Payment Estimator, accessed November 7, 2022, available at https://www.21stmortgage.com/web/payment-estimator.nsf/q1.html; U.S. Department of Energy, Manufactured Housing Life-Cycle Cost Analysis (LCC) Spreadsheet, May 18, 2022, available at https://www.regulations.gov/document/EERE-2009-BT-BC-0021-1996.*

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Excellent-Credit-Score Borrowers are the Only Credit Score Group with Positive Tier 2 10-Year LCCs (e.g., Memphis)

Based on Industry Interviews, Only 1/3 of MH Buyers Have Credit Scores Over 675

Profile	**Poor Credit**	**Average Credit**	**Good Credit**	**Good Credit**	**Excellent Credit**	**Excellent Credit**
City	Memphis	Memphis	Memphis	Memphis	Memphis	Memphis
Credit score	**Under 600**	**600-650**	**650-680**	**680-700**	**700-750**	**750+**
Home cost	$110,000	$110,000	$110,000	$110,000	$110,000	$110,000
Down payment	10%	10%	10%	10%	10%	10%
Loan type	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)
Quoted rates (21st Mortgage)						
Interest rate	11.45%	10.10%	9.35%	9.35%	8.35%	8.35%
Term	25 years	25 years	25 years	25 years	25 years	25 years
10-year LCC						
Given DOE Assumptions	-$ 578	-$ 259	-$ 66	-$ 66	$ 209	$ 209
Updated EEM Costs, Energy Prices	-$2,202	-$1,818	-$1,586	-$1,586	-$1,252	-$1,252
30-year LCC*						
Given DOE Assumptions	$ 630	$1,288	$1,712	$1,712	$2,355	$2,355
Updated EEM Costs, Energy Prices	-$1,255	-$ 578	-$ 143	-$ 143	$ 516	$ 516

Notes: *Asterisk (*) indicates that estimates are from DOE's original model, i.e., without a correction for an error where loan payments after Year 15 are not included in the LCC calculation for personal property loans. Quoted rates are for a single applicant. From HMDA, roughly 58% of applications are from single applicants.* ***Source:*** *21st Mortgage Corporation, Payment Estimator, accessed November 7, 2022, available at https://www.21stmortgage.com/web/payment-estimator.nsf/q1.html; U.S. Department of Energy, Manufactured Housing Life-Cycle Cost Analysis (LCC) Spreadsheet, May 18, 2022, available at https://www.regulations.gov/document/EERE-2009-BT-BC-0021-1996.*

ANALYSIS GROUP

Summary of Preliminary Conclusions

DOE's conclusions on cost effectiveness disregard or do not sufficiently consider variation in key cost inputs over time and across groups for buyers and suppliers

1	**Inflation and Cost Increases**	DOE has failed to consider the impacts of considerable cost increases and supply chain constraints. Taking these into account, DOE's conclusion is invalid and the rule has a net cost to consumers rather than a benefit.
2	**Negative and Inequitable Impacts**	DOE has failed to consider negative impacts on low-income and minority homebuyers.
3	**Affordability and Credit Access**	DOE has underestimated potential impacts on credit access and lost sales.
4	**Additional Costs**	DOE has failed to consider potential costs of testing and compliance, transportation, and supply chain constraints.

Increased Costs Will Likely Impact Ability to Qualify for Financing

- Debt-to-income ratio is one of the top reasons why potential buyers of manufactured homes are denied loans
  - In 2021, **42 percent** of denied loans for MH purchases listed the applicant's debt-to-income ratio as a reason for denial
- The cost of owning a new manufactured home has increased by over 40 percent since 2020, according to an industry source
  - Additionally, the cost of construction materials has increased by at least 35 percent since 2020, increasing the cost of compliance
  - Together, these two factors are likely to increase the debt-to-income ratio for potential applicants for manufactured home loans, increasing the likelihood of loan denial
- Minority buyers tend to have lower incomes, and therefore the impacts of the rule have the potential to fall disproportionately on historically marginalized communities
  - Low-income buyers are likely to be disproportionately impacted for similar reasons

Sources: *2021 Home Mortgage Disclosure Act, Industry Interviews.*

DOE's Reliance on Elasticity of Demand Estimates Understates Likely Impact on Affordability & Housing Access

- DOE has likely underestimated the affordability impact by assuming **relatively low price-sensitivity**
  - For example, AG's updated EEM cost estimates suggest that the cost of Tier 2 homes will increase by **6.1 percent**
    - Under DOE's assumption, a 6.1 percent increase in price leads to **2.9 percent fewer sales annually**
    - However, according to 2021 estimates of price sensitivity by the National Association of Home builders, the same 6.1 percent increase in price would lead to **6.4 percent fewer sales annually**
    - DOE's own sensitivity analysis, based on a study HUD has cited in prior rulemakings, suggests that this 6.1 percent price increase would lead to **14.6 percent fewer sales annually**
- Additionally, DOE has likely underestimated impacts on affordability due to:
  - DOE has arguably **underestimated compliance costs** and the expected increases in MH prices due to the rule
  - The **recent increase in retail prices** of MHs may have made ownership unaffordable for many consumers already
    - Consumers may be increasingly sensitive to price increases at higher baseline prices
- DOE's assumption understates the decreased demand by *thousands* of potential manufactured home buyers per year, all of whom would have to choose from worse alternatives

Sources: *DOE Technical Support Document, pp. 8-3, 10-7 – 10-9; NAHB (2021); EERE-2009-BT-BC-0021-1997_content, Sheet "Price Elasticity," Cells E3:E4; AG Calculations.*

Summary of Preliminary Conclusions

DOE's conclusions on cost effectiveness disregard or do not sufficiently consider variation in key cost inputs over time and across groups for buyers and suppliers

1	**Inflation and Cost Increases**	DOE has failed to consider the impacts of considerable cost increases and supply chain constraints. Taking these into account, DOE's conclusion is invalid and the rule has a net cost to consumers rather than a benefit.
2	**Negative and Inequitable Impacts**	DOE has failed to consider negative impacts on low-income and minority homebuyers.
3	**Affordability and Credit Access**	DOE has underestimated potential impacts on credit access and lost sales.
4	**Additional Costs**	DOE has failed to consider potential costs of testing and compliance, transportation, and supply chain constraints.

DOE Has Not Accounted for Costs of Testing and Compliance, Which Could Entirely Offset Anticipated Life-Cycle Cost Savings

- DOE has not specified requirements for duct system testing and air leakage testing, which are required by the IECC
- The costs of these possible testing requirements were also not included in DOE's LCC analyses
- Industry interviews have suggested that the costs of compliance may range up to and possibly **over $1,000/house** for in-field testing of homes in more remote locations
- A $1,000 testing cost could nearly wipe out anticipated savings across all tiers and analysis periods

DOE and Adjusted LCC Values, by Tier and Analysis Period

	10-Year LCC		30-Year LCC*	
	Tier 1	Tier 2	Tier 1	Tier 2
DOE LCC	$720	$743	$1,594	$3,573
Adjusted LCC	$549	-$647	$1,395	$1,361
Adjusted LCC, with $1,000 Testing Cost	-$194	-$1,330	$426	$338

Note: Asterisk (*) indicates that the 30-year LCC estimates rely on DOE's original model, which erroneously excludes mortgage payments after the 15th year of personal property loans and therefore overestimates anticipated savings.

Transportation Costs May Further Reduce or Negate Anticipated Savings

- Interviews with industry experts, as well as public comments submitted to DOE, have suggested that DOE has underestimated additional transportation costs due to additional height and weight required to comply with the rule
  - Additional insulation and framing requirements may increase the weight of manufactured homes, requiring an additional axle, which may cost **at least $400 to $500/multi-section house**
  - The rule may require homes in CZ2 and CZ3 to use 2' x 6' studs instead of standard 2' x 4' studs, which increases package height. Height increases may require re-routing deliveries around areas with height restrictions, such as in the Northeast
- Additionally, transportation costs have increased in general during the pandemic, e.g., as fuel and labor costs have increased
- Incremental transportation costs were not included in DOE's LCC estimates

Pandemic-Related Supply Chain Shortages May Persist into 2023

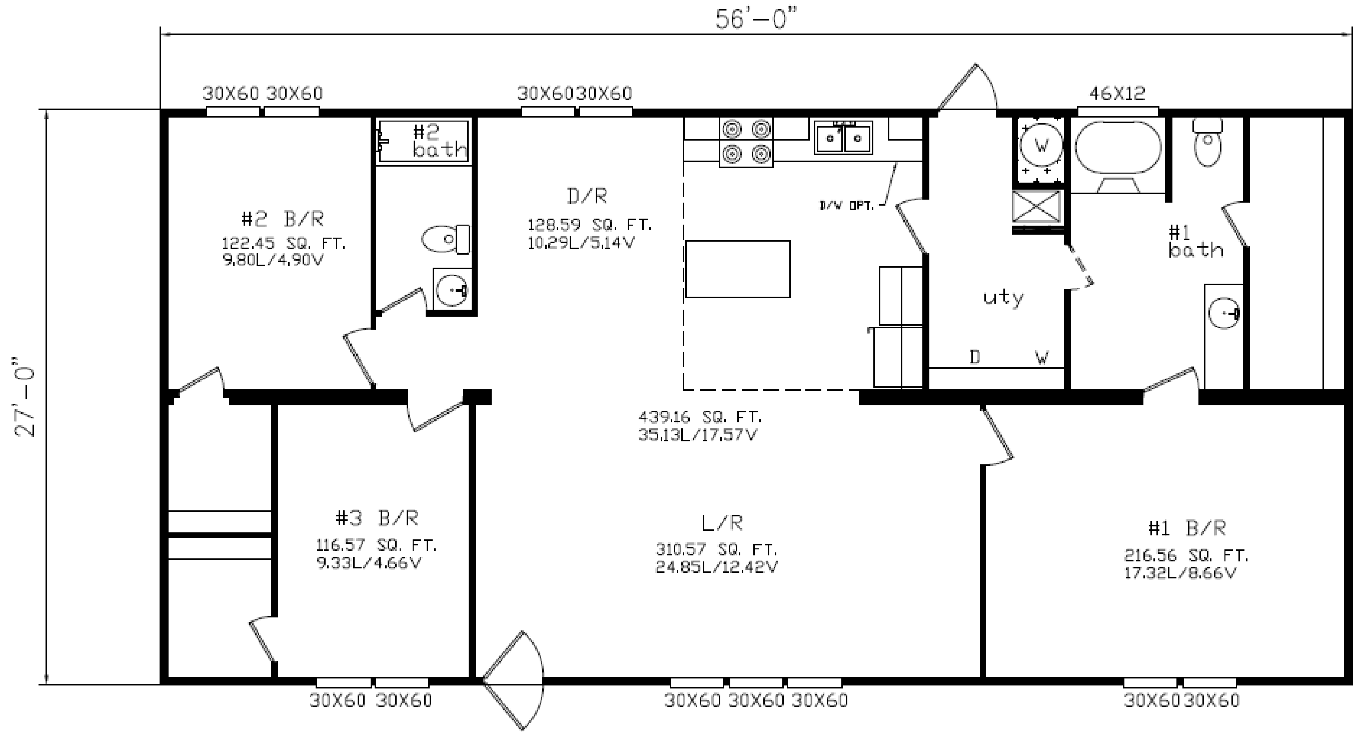
- Industry interviews have predicted that pandemic-related supply chain shortages are likely to persist into 2023
  - For example, one interview noted that there were already insulation shortages, with additional cost increases coming in January 2023
  - New fiberglass insulation plants are capital-intensive and take time to build, and therefore insulation shortages are likely to persist in the medium term
  - Therefore, increased demand from the manufactured housing sector due to the DOE rule may further exacerbate existing insulation shortages
  - Without sufficient fiberglass insulation, manufacturers may be forced to substitute to spray foam insulation for parts of the production process, increasing costs significantly and reducing the total number of homes that can be produced per day
- Additionally, CBRE has predicted that pandemic-related delays and labor shortages will continue in the short term

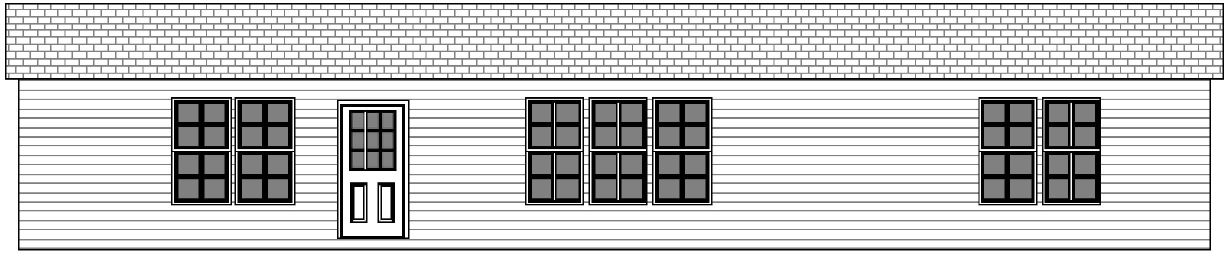
Exhibit C

Architectural Drawings

CURRENTLY BUILT MULTI WIDE – BOX SIZE 27x56

HEATED AREA – 1457 SQUARE FEET





TYPICAL ZONE 3 CONSTRUCTION

INSULATION – 22 FLOOR / 11 WALL / 28 CLG

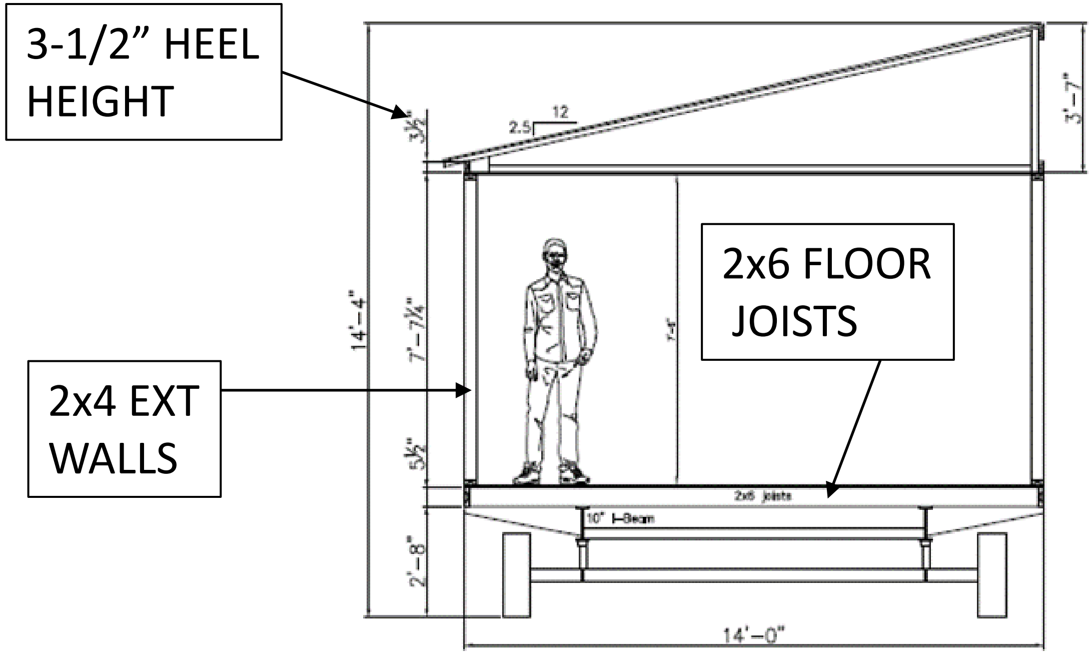
2x4 WALLS

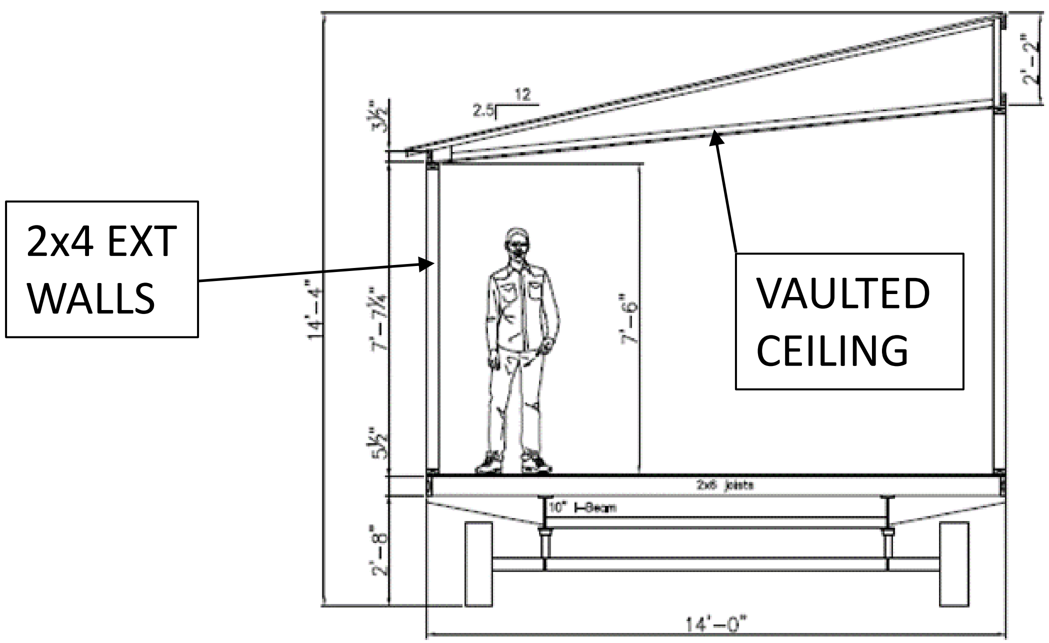
2x6 FLOOR JOISTS

142 SQUARE FEET OF WINDOWS

WINDOW U-VALUE = 0.34

CURRENT TYPICAL CROSS SECTIONS

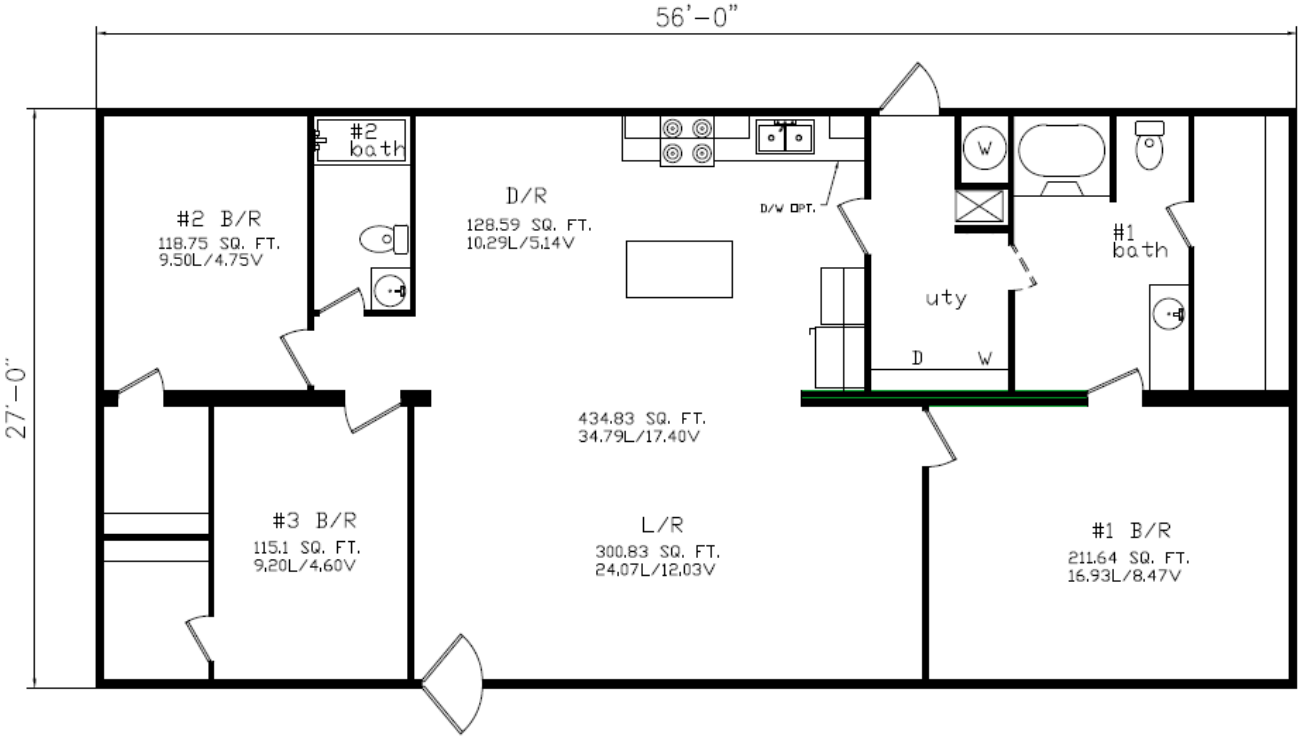


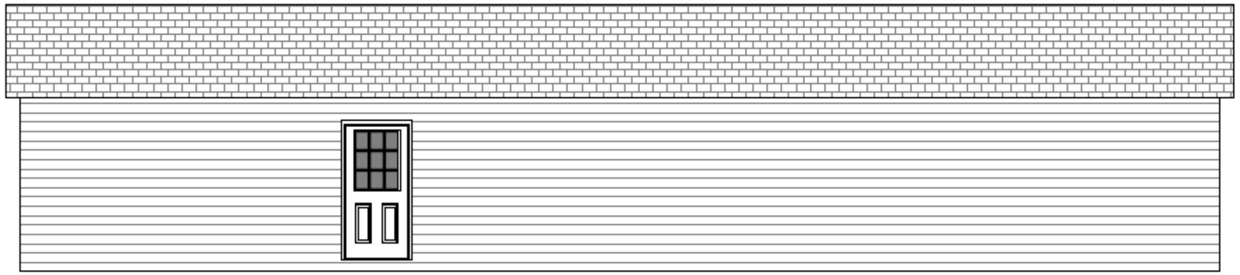


TYPICAL ZONE 3 CONSTRUCTION: SHIPPING HEIGHT 14'-4"
OPTIONAL VAULT CEILING
7'-6" SIDEWALL HEIGHT
3-1/2" TRUSS HEEL HEIGHT

IMPACT DUE TO DOE PROPOSED MULTI WIDE – BOX SIZE 27x56

HEATED AREA – 1457 SQUARE FEET





PROPOSED ZONE 3 CONSTRUCTION

INSULATION – 33 FLOOR / 15 WALL / 28 CEILING

2x4 WALLS

2x6 FLOOR JOISTS

ZERO WINDOWS

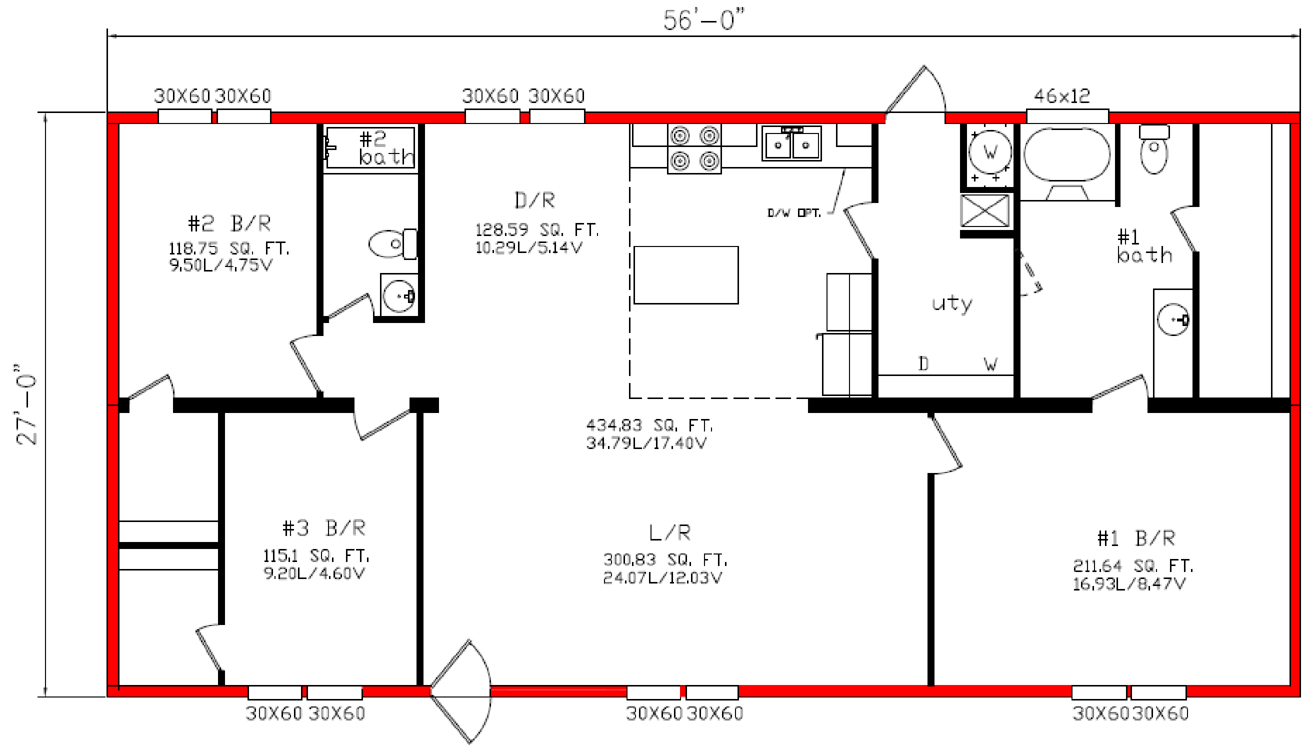
WINDOW U-VALUE = 0.32

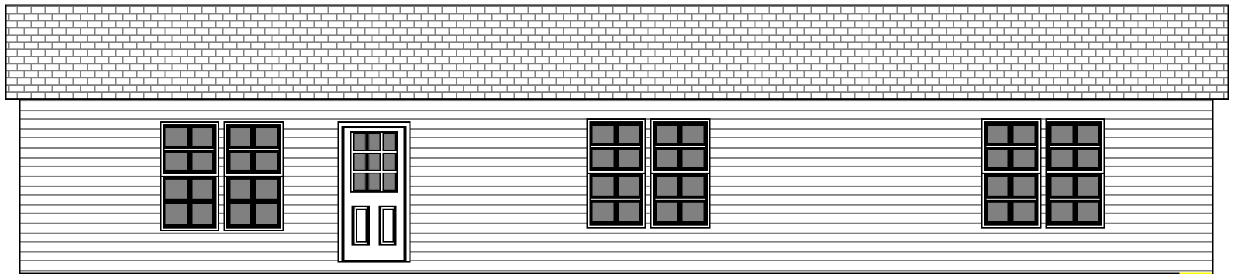
NOTES:

- THIS SLIDE SHOWS THE CHANGES REQUIRED IN ORDER TO REACH THE REQUIRED U-VALUE (0.055) WITHOUT CHANGING THE HOME CONSTRUCTION .
- FLOOR INSULATION WAS CHANGED TO R-33, WALL INSULATION WAS CHANGED TO R-15, AND CEILING INSULATION REMAINED R-28. THESE INSULATION VALUES ARE THE MAXIMUM POSSIBLE VALUES THAT CAN BE INSTALLED WITHOUT CHANGING THE HOME CONSTRUCTION FRAMING.
- WITH THIS CONSTRUCTION, I WAS ONLY ABLE TO GET THE OVERALL U-VALUE DOWN TO 0.055 IF ALL WINDOWS WERE REMOVED.
- PLEASE NOTE THAT IT IS NOT POSSIBLE TO CONSTRUCT A HOME WITHOUT WINDOWS DUE TO LIGHT, VENTILATION, and EGRESS REQUIREMENTS.

IMPACT DUE TO DOE PROPOSED MULTI WIDE – BOX SIZE 27x56

HEATED AREA – 1430 SQUARE FEET





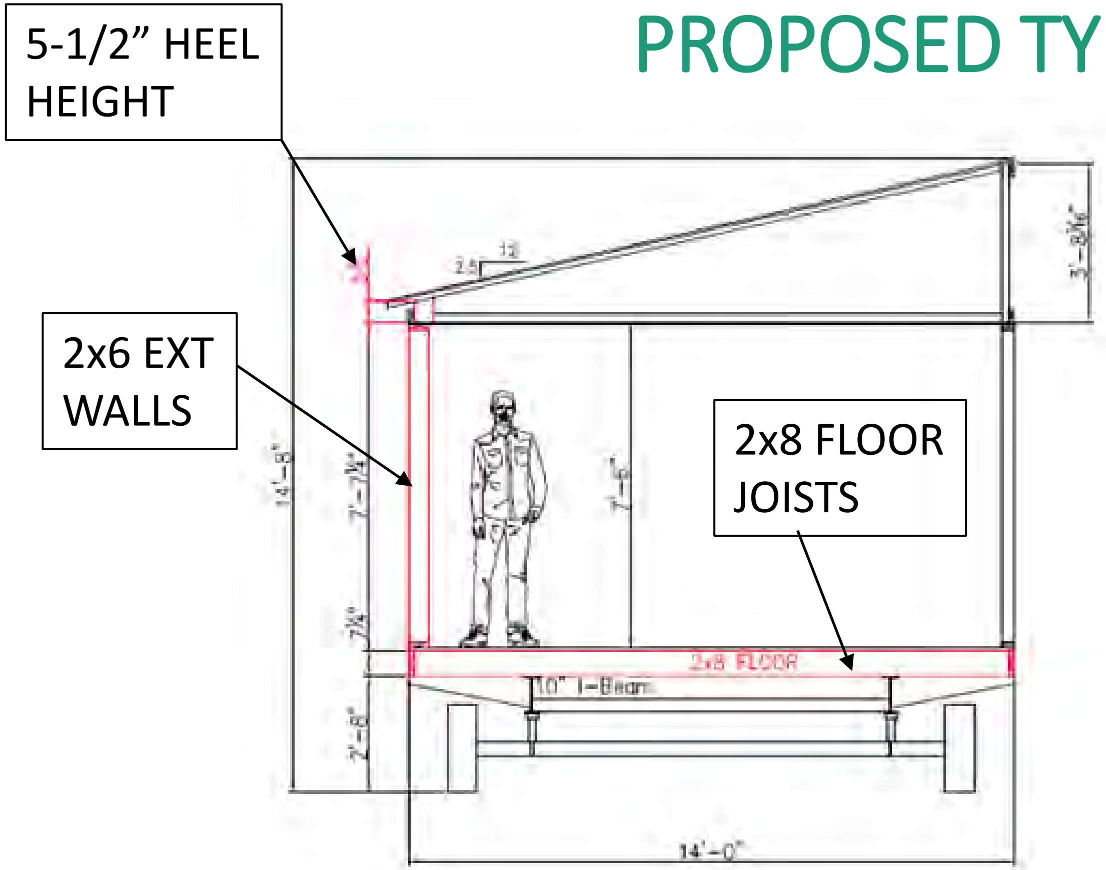
PROPOSED ZONE 3 CONSTRUCTION

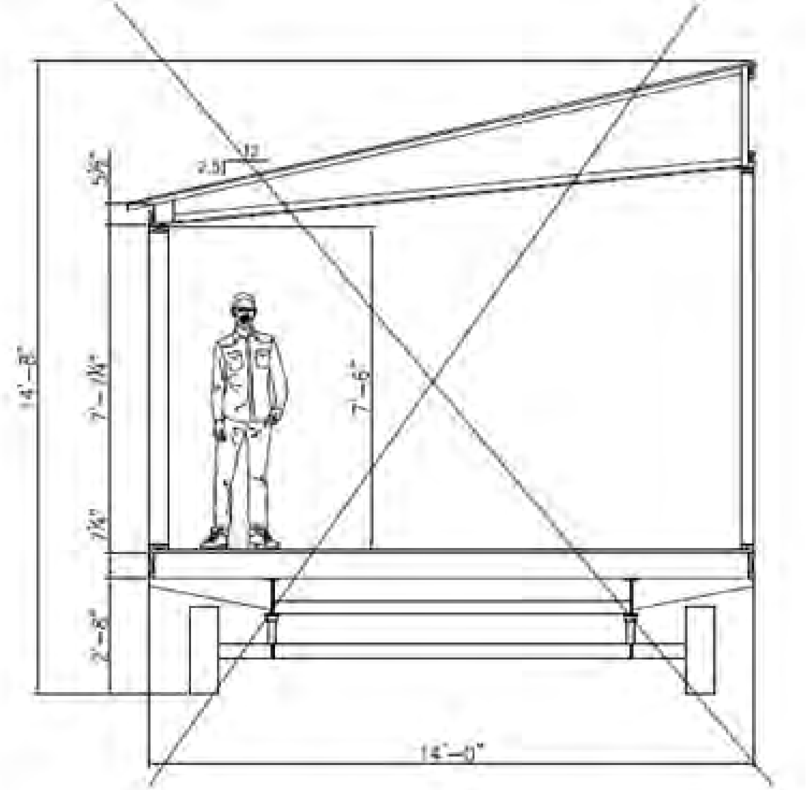
INSULATION – 30 FLOOR / 21 WALL / 38 CEILING
2x6 WALLS
2x8 FLOOR JOISTS
129 SQUARE FEET OF WINDOWS
WINDOW U-VALUE = 0.30
HEEL HEIGHT CHANGED TO 5.5 inches

NOTES:

- IN ORDER TO REACH THE REQUIRED U-VALUE (0.055) THE FLOORS WERE CHANGED TO 2x8 , THE WALLS WERE CHANGED TO 2x6 AND THE INSULATION PACKAGE WAS CHANGED TO THE VALUES LISTED IN THE PRESCRIPTIVE SECTION OF THE PROPOSED CODE. HOWEVER, IT WILL BE VERY DIFFICULT TO BUILD THE HOME WITH THIS INSULATION PACKAGE USING CURRENTLY AVAILABLE MATERIALS.
- HEATED AND COOLED INTERIOR SPACE REDUCED BY 27 SQUARE FEET DUE TO THE INCREASED WALL THICKNESS.
- R-30 IN THE FLOOR WILL REQUIRE BATT INSULATION TO BE INSTALLED BETWEEN THE FLOOR JOISTS COMBINED WITH A BLANKET BELOW THE JOISTS. CURRENTLY, MOST MANUFACTUER'S DO NOT USE THIS FLOOR INSULATION TECHNIQUE.
- R-21 IS AVAILABLE, BUT IN SMALL QUANTITIES
- R-38 WILL BE PROBLEMATIC TO GET INTO THE ROOF CAVITY DUE TO THE REQUIRED THICKNESS AND AVAILABLE SPACE IN THE ATTIC.
- ADDED BACK 11 OF THE PREVIOSULY REMOVED 12 WINDOWS. UPGRADED THE WINDOWS TO U-VALUE EQUAL TO 0.30. HOWEVER, IT SHOULD BE NOTED THAT THESE UPGRADED WINDOWS ARE NOT AVAILABLE IN THE MARKET TODAY.
- SHIPPING HEIGHTS WILL BE INCREASED DUE TO TALLER FLOORS AND TALLER HEEL HEIGHT TRUSS.
- THE OPTION FOR A VAULTED CEILING WILL NOT BE POSSIBLE DUE TO THE INCREASED INSULATION THCKNESS IN THE ATTIC.
- OPTIONS FOR 8 FEET OR 9 FEET WALL HEIGHTS AND TRANSOM WINDOW WILL ALSO BE IMPACTED.

PROPOSED TYPICAL CROSS SECTIONS





ZONE 3 CONSTRUCTION:

SHIPPING HEIGHT INCREASED TO 14'-8"
OPTIONAL VAULT CEILING IS NO LONGER AVAILABE DUE TO INSULATION THICKNESS
7'-6" SIDEWALL HEIGHT
5-1/2" TRUSS HEEL HEIGHT
2x8 FLOORS

ADDITIONAL PROPOSED CHANGES

- PROPOSES USING ACCA MANUAL S AND ACCA MANUAL J FOR HEATING AND COOLING EQUIPMENT. HOWEVER, USING ACCA MANUAL J AND ACCA MANUAL S FOR THE DESIGN OF HEATING AND COOLING EQUIPMENT WILL BE PROBLEMATIC, ESPECIALLY IN THERMAL ZONE 3. ACCA MANUAL J REQUIRES KNOWLEDGE OF THE ORIENTATION OF THE HOME WITH RESPECT TO THE SUN FOR COOLING LOAD ANALYSIS. BECAUSE THE ORIENTATION OF THE HOME IS OFTEN UNKNOWN UNTIL INSTALLED, THE PROPOSED RULE MUST ESTABLISH A DEFAULT ORIENTATION. ACCA MANUAL S ESTABLISHES SIZING LIMITS FOR HEATING AND COOLING EQUIPMENT, THESE LIMITS PRESUME THAT THERMAL LOADS ARE ESTABLISHED FOR A SPECIFIC LOCATION AND SPECIFIC BUILDING ORIENTATION. THE VARIATION IN DESIGN PARAMETERS WITHIN A SINGLE THERMAL ZONE EXCEEDS THE SIZING LIMITS OF ACCA MANUAL S. ADDITIONAL GUIDANCE WILL BE REQUIRED TO PROPERLY USE ACCA MANUAL S AND ACCA MANUAL J.

Appendix E: HUD's Proposed Revision of the Manufactured Home Construction and Safety Standards to Align with the Department of Energy's Energy Conservation Standards for Manufactured Housing - October 2022 MHCC Meeting.

Yellow highlighted text in this document is included in this draft is from the DOE Final Rule for 10 CFR Part 460 and included for ease of reference.

Subpart A - General

§ 3280.1 Scope.

This standard covers all equipment and installations in the design, construction, transportation, fire safety, plumbing, heat-producing, cooling, and electrical systems of manufactured homes which are designed to be used as dwelling units. This standard seeks to the maximum extent possible to establish performance requirements.

In certain instances, however, the use of specific requirements is necessary.

§ 3280.2 Definitions.

Equipment includes materials, appliances, devices, fixtures, fittings or accessories both in the construction of, and in the fire safety, plumbing, heat-producing, cooling, and electrical systems of manufactured homes.

§ 3280.4 Incorporation by reference.

(b) Air Conditioning & Refrigeration Institute (ARI), 4100 North Fairfax Drive, Suite 200, Arlington, VA 22203, telephone number 703-524-8800, fax number 703-528-3816, Web site: http://www.lightindustries.com/ARI/.

(1) ANSI/ARI Standard 210/240-89, Unitary Air-Conditioning and Air-Source Heat Pump Equipment, IBR approved for §§ ~~3280.511(b),~~ 3280.703, and 3280.714(a),

(d) ~~American Architectural Manufacturers Association (AAMA), 1827 Walden Office Square, Suite 550, Schaumburg, IL 60173, telephone number 847-303-5664, fax number 847-303-5774, Web site: http://www.aamanet.org.~~

~~(1) AAMA 1503.1-88, Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections, IBR approved for § 3280.508(e).~~
Reserved

(m) ~~American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), 1791 Tullie Circle NE., Atlanta, GA 30329, telephone number 404-636-8400, fax number 404-321-5478, Web site: https://www.ashrae.org/home/.~~

~~(1) 1997 ASHRAE Handbook of Fundamentals, Inch-Pound Edition (1997), chapters 22 through 27, (except for the following parts of this standard that are not incorporated by reference: 23.1 Steel Frame Construction; 23.2 Masonry Construction; 23.3 Foundations and Floor Systems; 23.15 Pipes; 23.17 Tanks, Vessels, and Equipment; 23.18 Refrigerated Rooms and Buildings; 24.18 Mechanical and Industrial Systems; 25.19 Commercial Building Envelope Leakage; 27.9~~

~~Calculation of Heat Loss from Crawl Spaces). IBR approved for §§ 3280.508(a), 3280.508(e), and 3280.511(a).~~ Reserved

(t) ~~HUD User, 11491 Sunset Hills Road, Reston, VA 20190-5254.~~

~~(1) HUD User No. 0005945, Overall U-values and Heating/Cooling Loads - Manufactured Homes, February 1992. IBR approved for § 3280.508(b).~~

~~(2) [Reserved]~~ Reserved

(z) ~~National Fenestration Rating Council (NFRC), 6305 Ivy Lane, Suite 140, Greenbelt, MD 20770, telephone number 301-589-1776, fax number 301-589-3884, Web site: http://www.nfrc.org.~~

~~(1) NFRC 100, Procedure for Determining Fenestration Product U-factors, 1997 Edition, IBR approved for § 3280.508(e).~~

~~(2) [Reserved]~~ Reserved

§ 3280.5 Data plate.

(g) Reference to the roof load zone and wind load zone for which the home is designed and duplicates of the maps as set forth in § 3280.305(c). This information may be combined with the ~~heating/cooling certificate and insulation zone map required by §§ 3280.510 and 3280.511.~~ climate zone map identified and cross referenced by § 3280.506. The Wind Zone Map on the Data Plate shall also contain the statement:

(k) The statement: The manufacturer certifies this home is design for location within Department of Energy Climate Zone ___, as defined in 10 C.F.R. § 460.101 (to be completed by the home manufacturer) and is compliant with 10 C.F.R. Part 460 ENERGY CONSERVATION STANDARDS FOR MANUFACTURED HOMES.

Subpart B - Planning Considerations

§ 3280.103 Light and ventilation.

(e) Mechanical ventilation fan efficacy must meet the requirements of 10 C.F.R. § 460.204.

10 C.F.R. § 460.204 Mechanical ventilation fan efficacy
(a) Whole-house mechanical ventilation system fans must meet the minimum efficacy requirements set forth in table 1 to 460.204(a), except as provided in paragraph (b) of this section. The mechanical ventilation fan efficacy requirements are adapted from section R403 of the 2021 IECC.

(b) Mechanical ventilation fans that are integral to heating, ventilating, and air conditioning equipment, including furnace fans as defined in §430.2 of this subchapter, are not subject to the efficiency requirements in paragraph (a) of this section.

TABLE 1 TO § 460.204(a)—MECHANICAL VENTILATION SYSTEM FAN EFFICACY

Fan type description	Airflow rate minimum (cfm)	Minimum efficacy (cfm/watt)
Heat recovery ventilator or energy recovery ventilator	Any	1.2
In-line supply or exhaust fans	Any	3.8
Other exhaust fan	<90	2.8
Other exhaust fan	^{3}90	3.5

SUBPART F – THERMAL PROTECTION

§ 3280.501 Scope.

This subpart sets forth the requirements for energy conservation, condensation control, air infiltration, thermal insulation and certification for heating and cooling.

10 C.F.R. § 460.1 Scope.
This subpart establishes energy conservation standards for manufactured homes as manufactured at the factory, prior to distribution in commerce for sale or installation in the field. A manufactured home that is manufactured on or after the May 31, 2023 must comply with all applicable requirements of this part.

(a) Manufactured homes must comply with the energy conservation standards for manufactured homes set forth at 10 C.F.R. § 460.4

10 C.F.R. § 460.4 Energy conservation standards.

- *(a)* *General*. A manufactured home must comply with the energy conservation standards specified for the applicable tier as presented in paragraphs (b) and (c) of this section.
- *(b)* *Tier 1*. A single-section manufactured home (*i.e.*, a Tier 1 manufactured home) must comply with all applicable requirements in subparts B and C of this part.
- *(c)* *Tier 2*. A multi-section manufactured home (*i.e.*, a Tier 2 manufactured home) must comply with all applicable requirements in subparts B and C of this part.

(b) The source standards are set forth at 10 C.F.R. § 460.3(a).

10 C.F.R. § 460.3 Materials incorporated by reference.
Certain material is incorporated by reference into this part with the approval of the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 C.F.R. part 51. To enforce any edition other than that specified in this section, the U.S. Department of Energy (DOE) must publish a document in the **Federal Register** and the material must be available to the public. All approved material is available for inspection at DOE and at the National Archives and Records Administration (NARA). Contact DOE at: The U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, Sixth Floor, 950 L'Enfant Plaza SW, Washington, DC 20024, (202) 586–9127, *Buildings@ee.doe.gov, https://www.energy.gov/eere/buildings/ building-technologies-office.* For information on the availability of this material at NARA, email: *fr.inspection@ nara.gov,* or go to: *www.archives.gov/ federal-register/cfr/ibr-locations.html.* The material may be obtained from the following sources:

(a) *ACCA.* Air Conditioning Contractors of America, Inc., 2800 S. Shirlington Road, Suite 300, Arlington, VA 22206, 703–575–4477; *www.acca.org/.*

(1) ANSI/ACCA 2 Manual J–2016 (ver 2.50) ("ACCA Manual J"), Manual J– Residential Load Calculations, Eight Edition, Version 2.50, Copyright 2016; IBR approved for § 460.205.

(2) ANSI/ACCA 3 Manual S–2014 ("ACCA Manual S"), Manual S– Residential Equipment Selection, Second Edition, Version 1.00, Copyright 2014; IBR approved for § 460.205.

(b) *HUD User,* 11491 Sunset Hills Road, Reston, VA 20190–5254; *www.huduser.gov/portal/publications/ pdrpubli.html.*

(1) HUD User No. 0005945, Overall U-Values and Heating/Cooling Loads— Manufactured Homes, February 1, 1992 (available from *www.huduser.org/ portal/publications/manufhsg/ uvalue.html);* IBR approved for § 460.102(e).

(2) [Reserved].

§ 3280.502 Definitions.

(a) ~~The following definitions are applicable to subpart F only:~~ The definitions set forth in 10 C.F.R. § 460.2 and following definitions are applicable to subpart F only:

(1) *Pressure envelope* means that primary air barrier surrounding the living space which serves to limit air leakage. In construction using ventilated cavities, the pressure envelope is the interior skin.

~~(2) *Thermal envelope* area means the sum of the surface areas of outside walls, ceiling and floor, including all openings. The wall area is measured by multiplying outside wall lengths by the inside wall height from floor to ceiling. The floor and ceiling areas are considered as horizontal surfaces using exterior width and length.~~

10 C.F.R. 460.2 Definitions.

Adapted from section R202 of the 2021 IECC and as used in this part—

2021 IECC means the 2021 version of the International Energy Conservation Code, issued by the International Code Council.

Access (to) means that which enables a device, appliance or equipment to be reached by ready access or by a means that first requires the removal or movement of a panel or similar obstruction.

Air barrier means one or more materials joined together in a continuous manner to restrict or prevent the passage of air through the building thermal envelope and its assemblies.

Automatic means self-acting or operating by its own mechanism when actuated by some impersonal influence.

Building thermal envelope means exterior walls, exterior floors, exterior ceiling, or roofs, and any other building element assemblies that enclose conditioned space or provide a boundary between conditioned space and unconditioned space.

Ceiling means an assembly that supports and forms the overhead interior surface of a building or room that covers its upper limit and is horizontal or tilted at an angle less than 60 degrees (1.05 rad) from horizontal.

Climate zone means a geographical region identified in § 460.101.

Conditioned space means an area, room, or space that is enclosed within the building thermal envelope and that is directly or indirectly heated or cooled. Spaces are indirectly heated or cooled where they communicate through openings with conditioned space, where they are separated from conditioned spaces by uninsulated walls, floors or ceilings, or where they contain uninsulated ducts, piping, or other sources of heating or cooling.

Continuous air barrier means a combination of materials and assemblies that restrict or prevent the passage of air from conditioned space to unconditioned space.

Door means an operable barrier used to block or allow access to an entrance of a manufactured home.

Dropped ceiling means a secondary nonstructural ceiling, hung below the exterior ceiling.

Dropped soffit means a secondary nonstructural ceiling that is hung below the exterior ceiling and that covers only a portion of the ceiling.

Duct means a tube or conduit, except an air passage within a self-contained system, utilized for conveying air to or from heating, cooling, or ventilating equipment.

Duct system means a continuous passageway for the transmission of air that, in addition to ducts, includes duct fittings, dampers, plenums, fans, and accessory air-handling equipment and appliances.

Eave means the edge of the roof that overhangs the face of an exterior wall and normally projects beyond the side of the manufactured home.

Exterior ceiling means a ceiling that separates conditioned space from unconditioned space.

Exterior floor means a floor that separates conditioned space from unconditioned space.

Exterior wall means a wall, including a skylight well, that separates conditioned space from unconditioned space.

Fenestration means vertical fenestration and skylights.

Floor means a horizontal assembly that supports and forms the lower interior surface of a building or room upon which occupants can walk.

Glazed or glazing means an infill material, including glass, plastic, or other transparent or translucent material used in fenestration.
Heated water circulation system means a water distribution system in which one or more pumps are operated in the service hot water piping to circulate heated water from the water heating equipment to fixtures and back to the water heating equipment.
Insulation means material deemed to be insulation under 16 C.F.R. 460.2.
Manual means capable of being operated by personal intervention.
Manufactured home means a structure, transportable in one or more sections, which in the traveling mode is 8 body feet or more in width or 40 body feet or more in length or which when erected onsite is 320 or more square feet, and which is built on a permanent chassis and designed to be used as a dwelling with or without a permanent foundation when connected to the required utilities, and includes the plumbing, heating, air conditioning, and electrical systems contained in the structure. This term includes all structures that meet the above requirements except the size requirements and with respect to which the manufacturer voluntarily files a certification pursuant to 24 C.F.R. 3282.13 and complies with the construction and safety standards set forth in 24 C.F.R. part 3280. The term does not include any self-propelled recreational vehicle. Calculations used to determine the number of square feet in a structure will be based on the structure's exterior dimensions, measured at the largest horizontal projections when erected on site. These dimensions will include all expandable rooms, cabinets, and other projections containing interior space, but do not include bay windows. Nothing in this definition should be interpreted to mean that a manufactured home necessarily meets the requirements of the U.S. Department of Housing and Urban Development Minimum Property Standards (HUD Handbook 4900.1) or that it is automatically eligible for financing under 12 U.S.C. 1709(b).
Manufacturer means any person engaged in the factory construction or assembly of a manufactured home, including any person engaged in importing manufactured homes for resale.
Opaque door means a door that is not less than 50 percent opaque in surface area.
R-value (thermal resistance) means the inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unit area (h × ft^2 × °F/Btu).
Rough opening means an opening in the exterior wall or roof, sized for installation of fenestration.
Service hot water means supply of hot water for purposes other than comfort heating.
Skylight means glass or other transparent or translucent glazing material, including framing materials, installed at an angle less than 60 degrees (1.05 rad) from horizontal, including unit skylights, tubular daylighting devices, and glazing materials in solariums, sunrooms, roofs and sloped walls.
Skylight well means the exterior walls underneath a skylight that extend from the interior finished surface of the exterior ceiling to the exterior surface of the location to which the skylight is attached.
Solar heat gain coefficient (SHGC) means the ratio of the solar heat gain entering a space through a fenestration assembly to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation that is then reradiated, conducted, or convected into the space.
Thermostat means an automatic control device used to maintain temperature at a fixed or adjustable set point.
U-factor (thermal transmittance) means the coefficient of heat transmission (air to air) through a building component or assembly, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films (Btu/h × ft^2 × °F).
U_O (overall thermal transmittance) means the coefficient of heat transmission (air to air) through the building thermal envelope, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films (Btu/ h × ft^2 × °F).
Ventilation means the natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, any space.
Vertical fenestration means windows (fixed or moveable), opaque doors, glazed doors, glazed block and combination opaque and glazed doors composed of glass or other transparent or translucent glazing materials and installed at a slope of greater than or equal to 60 degrees (1.05 rad) from horizontal.
Wall means an assembly that is vertical or tilted at an angle equal to greater than 60 degrees (1.05 rad) from horizontal that encloses or divides an area of a building or room.

Whole-house mechanical ventilation system means an exhaust system, supply system, or combination thereof that is designed to mechanically exchange indoor air with outdoor air when operating continuously or through a programmed intermittent schedule to satisfy the whole house ventilation rates.
Window means win or other transparent or translucent glazing material, including framing materials, installed at an angle greater than 60 degrees (1.05 rad) from horizontal.
Zone means a space or group of spaces within a manufactured home with heating or cooling requirements that are sufficiently similar so that desired conditions can be maintained using a single controlling device.

§ 3280.503 Materials.

§ 3280.504 Condensation control and installation of vapor retarders.

§ 3280.505 ~~Air infiltration.~~ Building thermal envelope air leakage.

~~(a) Envelope air infiltration. The opaque envelope shall be designed and constructed to limit air infiltration to the living area of the home. Any design, material, method or combination thereof which accomplishes this goal may be used. The goal of the infiltration control criteria is to reduce heat loss/heat gain due to infiltration as much as possible without impinging on health and comfort and within the limits of reasonable economics.~~

~~(1) Envelope penetrations. Plumbing, mechanical and electrical penetrations of the pressure envelope not exempted by this part, and installations of window and door frames shall be constructed or treated to limit air infiltration. Penetrations of the pressure envelope made by electrical equipment, other than distribution panel boards and cable and conduit penetrations, are exempt from this requirement. Cable penetrations through outlet boxes are considered exempt.~~
~~(2) Joints between major envelope elements. Joints not designed to limit air infiltration between wall-towall, wall-to-ceiling and wall-to-floor connections shall be caulked or otherwise sealed. When walls are constructed to form a pressure envelope on the outside of the wall cavity, they are deemed to meet this requirement.~~

(a) Building thermal envelope air leakage must meet the requirements of 10 C.F.R. § 460.104.

10 C.F.R. § 460.104
(a) Manufactured homes must be sealed against air leakage at all joints, seams, and penetrations associated with the building thermal envelope in accordance with the component manufacturer's installation instructions and the requirements set forth in table 1 to § 460.104. Sealing methods between dissimilar materials must allow for differential expansion, contraction, and mechanical vibration, and must establish a continuous air barrier upon installation of all opaque components of the building thermal envelope. All gaps and penetrations in the exterior ceiling, exterior floor, and exterior walls, including ducts, flue shafts, plumbing, piping, electrical wiring, utility penetrations, bathroom and kitchen exhaust fans, recessed lighting fixtures adjacent to unconditioned space, and light tubes adjacent to unconditioned space, must be sealed with caulk, foam, gasket or other suitable material. The air barrier installation criteria are adapted from section R402 of the 2021 IECC.

TABLE 1 TO § 460.104—AIR BARRIER INSTALLATION CRITERIA

Component	Air barrier criteria
Ceiling or attic	The air barrier in any dropped ceiling or dropped soffit must be aligned with the insulation and any gaps in the air barrier must be sealed with caulk, foam, gasket, o other suitable material. Access hatches, panels, and doors, drop-down stairs, or knee wall doors to unconditioned attic spaces must be weather-stripped or equipped with a gasket to produce a continuous air barrier.

Duct system register boots	Duct system register boots that penetrate the building thermal envelope or the air barrier must be sealed to the subfloor, wall covering or ceiling penetrated by the boot, air barrier, or the interior finish materials with caulk, foam, gasket, or other suitable material.
Electrical box or phone box on exterior walls	The air barrier must be installed behind electrical and communication boxes or the air barrier must be sealed around the box penetration with caulk, foam, gasket, or other suitable material.
Floors	The air barrier must be installed at any exposed edge of insulation. The bottom board may serve as the air barrier.
Mating line surfaces	Mating line surfaces must be equipped with a continuous and durable gasket.
Recessed lighting	Recessed light fixtures installed in the building thermal envelope must be sealed to the drywall with caulk, foam, gasket, or other suitable material.
Rim joists	The air barrier must enclose the rim joists. The junctions of the rim board and the subfloor must be air sealed.
Shower or tub adjacent to exterior wall	The air barrier must separate showers and tubs from exterior walls.
Walls	The junction of the top plate and the exterior ceiling, and the junction of the bottom plate and the exterior floor, along exterior walls must be sealed with caulk, foam, gasket, or other suit-able material.
Windows, skylights, and exterior doors	The rough openings around windows, exterior doors and skylights must be sealed with caulk or foam.

§ 3280.506 ~~Heat loss/heat gain.~~ Building Thermal Envelope - Climate zones.

~~(a) The manufactured home heat loss/heat gain shall be determined by methods outlined in §§ 3280.508 and 3280.509. The Uo (Coefficient of heat transmission) value zone for which the manufactured home is acceptable and the lowest outdoor temperature to which the installed heating equipment will maintain a temperature of 70 F shall be certified as specified in § 3280.510. The Uo value zone shall be determined from the map in figure 1 to this paragraph (a).~~
~~Figure 1 to Paragraph (a~~
~~(b) The overall coefficient of heat transmission (Uo) of the manufactured home for the respective zones and an indoor design temperature of 70 F, including internal and external ducts, and excluding infiltration, ventilation, and condensation control, shall not exceed the Btu/(hr.) (sq. ft.) (F) of the manufactured home envelope are as tabulated in the table to this paragraph (b):~~

~~Table 1 to Paragraph (b)~~
~~Uo value zone Maximum coefficient of heat transmission~~
~~1 0.116 Btu/(hr.) (sq. ft.) (F).~~
~~2 0.096 Btu/(hr.) (sq. ft.) (F).~~
~~3 0.079 Btu/(hr.) (sq. ft.) (F).~~

~~(c) To assure uniform heat transmission in manufactured homes, cavities in exterior walls, floors, and ceilings must be provided with thermal insulation. For insulation purposes, the fire separation wall between each single family attached manufactured home shall be considered an exterior wall (see subpart K of this part).~~

~~(d) Manufactured homes designed for Uo Value Zone 3 shall be factory equipped with storm windows or~~
~~insulating glass.~~

The building thermal envelope of a manufactured home must be designed for one or more climate zones as set forth in 10 C.F.R. §460.101, as published on May 31, 2022 (87 FR 32818).

10 C.F.R. § 460.101 Climate zones.
Manufactured homes subject to the requirements of this subpart must comply with the requirements applicable to one or more of the climate zones set forth in figure 1 to § 460.101 and table 1 to § 460.101.

Figure 1 to § 460.101 Climate Zones

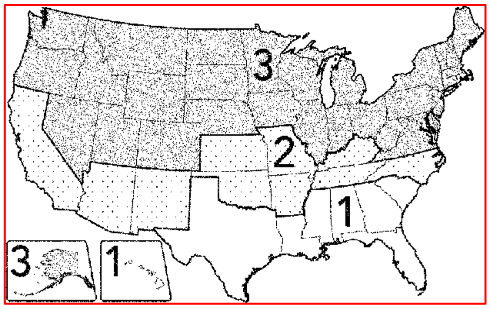


TABLE 1 TO § 460.101—U.S. STATES AND TERRITORIES PER CLIMATE ZONE

Zone 1	Zone 2	Zone 3
Alabama	Arkansas	Alaska
American Samoa	Arizona	Colorado
Florida	California	Connecticut
Georgia	Kansas	Delaware
Guam	Kentucky	District of Columbia
Hawaii	Missouri	Idaho
Louisiana	New Mexico	Illinois
Mississippi	North Carolina	Indiana
South Carolina	Oklahoma	Iowa
Texas	Tennessee	Maine
The Commonwealth of Puerto Rico		Maryland
U.S. Virgin Islands		Massachusetts
		Michigan
		Minnesota
		Montana
		Nebraska
		Nevada
		New Hampshire
		New Jersey
		New York
		North Dakota
		Ohio
		Oregon
		Pennsylvania
		Rhode Island
		South Dakota
		Utah
		Vermont
		Virginia
		Washington
		West Virginia
		Wisconsin
		Wyoming

§ 3280.507 ~~Comfort heat gain.~~ Building thermal envelope requirements.

~~Information necessary to calculate the home cooling load shall be provided as specified in this part.~~

(a) ~~Transmission heat gains. Homes complying with this section shall meet the minimum heat loss transmission coefficients specified in § 3280.506(a).~~ The Building Thermal envelope of a manufactured home must meet the requirements of 10 C.F.R. § 460.102.

10 C.F.R. 460.102 Building thermal envelope requirements

(a) Compliance options. The building thermal envelope must meet either the prescriptive requirements of paragraph (b) of this section or the performance requirements of paragraph (c) of this section.

(b) Prescriptive requirements. (1) The building thermal envelope must meet the applicable minimum R-value (nominal value of insulation), and the glazing maximum U-factor and SHGC, requirements set forth in table 1 to § 460.102(b)(1) and table 2 to § 460.102(b)(2) or component U-values set forth in table 3 to § 460.102(b)(5) and table 4 to § 460.102(b)(5).

TABLE 1 TO § 460.102(b)(1)—TIER 1 (single section) BUILDING THERMAL ENVELOPE PRESCRIPTIVE REQUIREMENTS

Climate zone	Exterior wall insulation *R*-value	Exterior ceiling insulation *R*-value	Exterior floor insulation *R*-value	Window *U*-factor	Skylight *U*-factor	Door *U*-factor	Glazed fenestration SHGC
1	13	22	22	1.08	0.75	0.40	0.7
2	13	22	19	0.5	0.55	0.40	0.6
3	19	22	22	0.35	0.55	0.40	Not applicable.

TABLE 2 TO § 460.102(b)(1)—TIER 2 (multi-section) BUILDING THERMAL ENVELOPE PRESCRIPTIVE REQUIREMENTS

Climate zone	Exterior wall insulation *R*-value	Exterior ceiling insulation *R*-value	Exterior floor insulation *R*-value	Window *U*-factor	Skylight *U*-factor	Door *U*-factor	Glazed fenestration SHGC
1	13	30	13	0.32	0.75	0.40	0.33
2	21	30	19	0.30	0.55	0.40	0.25
3	21	38	30	0.30	0.55	0.40	Not applicable.

(2) For the purpose of compliance with the exterior ceiling insulation R-value requirement of paragraph (b)(1) of this section, the truss heel height must be a minimum of 5.5 inches at the outside face of each exterior wall.

(3) A combination of R-21 batt insulation and R-14 blanket insulation may be used for the purpose of compliance with the floor insulation R-value requirement of table 2 to § 360.102(b)(1), Climate Zone 3.

(4) An individual skylight that has an SHGC that is less than or equal to 0.30 is not subject to the glazed fenestration SHGC requirements established in paragraph (b)(1) of this section. Adapted from section R402 of the 2021 IECC.

(5) U-factor alternatives to R-value requirements. Compliance with the applicable requirements in paragraph (b)(1) of this section may be determined using the applicable maximum U-factor values set forth in table 3 to § 460.102(b)(5) and table 4 to § 460.102(b)(5), which reflect the thermal transmittance of the component, excluding fenestration, and not just the insulation of that component, as an alternative to the minimum nominal R-value requirements set forth in table 1 to § 460.102(b)(1) and table 2 to § 460.102(b)(1), respectively.

TABLE 3 TO § 460.102(b)(5)—*U*-FACTOR ALTERNATIVES TO TIER 1 *R*-VALUE REQUIREMENTS

Climate zone	Exterior ceiling *U*-factor	Exterior wall *U*-factor	Exterior floor *U*-factor
1	0.061	0.094	0.049
2	0.061	0.094	0.056
3	0.061	0.068	0.049

TABLE 4 TO § 460.102(b)(5)—*U*-FACTOR ALTERNATIVES TO TIER 2 R-VALUE REQUIREMENTS

Climate zone	Exterior ceiling *U*-factor	Exterior wall *U*-factor	Exterior floor *U*-factor
1	0.043	0.094	0.078
2	0.043	0.063	0.056
3	0.037	0.063	0.032

(c) Performance requirements. (1) The building thermal envelope must have a Uo that is less than or equal to the applicable value specified in table 5 to § 460.102(c)(1) and table 6 to § 460.102(c)(1).

TABLE 5 TO § 460.102(c)(1)—TIER 1 BUILDING THERMAL ENVELOPE PERFORMANCE REQUIREMENTS

Climate zone	Single-section *Uo*
1	0.110
2	0.091
3	0.074

TABLE 6 TO § 460.102(c)(1)—TIER 2 BUILDING THERMAL ENVELOPE PERFORMANCE REQUIREMENTS

Climate zone	Multi-section *Uo*
1	0.082
2	0.066
3	0.055

(2) Area-weighted average vertical fenestration U-factor must not exceed 0.48 in Climate Zone 2 or 0.40 in Climate Zone 3. Adapted from section R402 of the 2021 IECC.
(3) Area-weighted average skylight U-factor must not exceed 0.75 in Climate Zone 2 and Climate Zone 3. Adapted from section R402 of the 2021 IECC. Windows, skylights and doors containing more than 50 percent glazing by area must satisfy the SHGC requirements established in paragraph (b)(1) of this section on the basis of an area-weighted average. Adapted from section R402 of the 2021 IECC.

(d) [Reserved].

(e) Determination of compliance with paragraph (c) of this section. (1) UO must be determined in accordance with Overall U-Values and Loads—Manufactured Homes (incorporated by reference; see § 3280.4). (2) Reserved

§ 3280.508 ~~Heat loss, heat gain and cooling load calculations.~~ Installation of insulation.

(a) ~~Information, values and data necessary for heat loss and heat gain determinations must be taken from the 1997 ASHRAE Handbook of Fundamentals, Inch-Pound Edition, chapters 22 through 27. The following portions of those chapters are not applicable:~~
~~23.1 Steel Frame Construction~~
~~23.2 Masonry Construction~~
~~23.3 Foundations and Floor Systems~~
~~23.15 Pipes~~
~~23.17 Tanks, Vessels, and Equipment~~
~~23.18 Refrigerated Rooms and Buildings~~
~~24.18 Mechanical and Industrial Systems~~
~~25.19 Commercial Building Envelope Leakage~~
~~27.9 Calculation of Heat Loss from Crawl Spaces~~

Installation of insulation must meet the requirements of 10 C.F.R. § 460.103.

~~(b) The calculation of the manufactured home's transmission heat loss coefficient (Uo) must be in accordance with the fundamental principles of the 1997 ASHRAE Handbook of Fundamentals, Inch-Pound Edition, and, at a minimum, must address all the heat loss or heat gain considerations in a manner consistent with the calculation procedures provided in the document, Overall U-values and Heating/Cooling Loads - Manufactured Homes - February 1992-PNL 8006, HUD User No. 0005945.~~

~~(c) Areas where the insulation does not fully cover a surface or is compressed shall be accounted for in the U-calculation (see § 3280.506). The effect of framing on the U-value must be included in the Uo calculation. Other low-R-value heat-flow paths ("thermal shorts") shall be explicitly accounted for in the calculation of the transmission heat loss coefficient if in the aggregate all types of low-R-value paths amount to more than 1% of the total exterior surface area. Areas are considered low-R-value heat-flow paths if:~~
~~(1) They separate conditioned and unconditioned space; and~~
~~(2) They are not insulated to a level that is at least one-half the nominal insulation level of the surrounding building component.~~
~~(d) High efficiency heating and cooling equipment credit. The calculated transmission heat loss coefficient (Uo) used for meeting the requirement in § 3280.506(a) may be adjusted for heating and cooling equipment above that required by the National Appliance Energy Conservation Act of 1987 (NAECA) by applying the following formula:~~
~~Uo adjusted = Uo standard × [1 + (0.6) (heating efficiency increase factor) + (cooling multiplier) (cooling efficiency increase factor)] where:~~
~~Uo standard = Maximum Uo for Uo Zone required by § 3280.506(a)~~
~~Uo adjusted = Maximum Uo standard adjusted for high efficiency HVAC equipment~~
~~Heating efficiency increase factor = The increase factor in heating equipment efficiency measured by the Annual Fuel Utilization Efficiency (AFUE), or the Heating Seasonal~~

~~Performance Factor (HSPF) for heat pumps, above that required by NAECA (indicated as "NAECA" in formula). The formula is heating efficiency increase factor = AFUE (HSPF) home – AFUE (or HSPF) NAECA divided by AFUE (HSPF) NAECA.~~

~~Cooling efficiency increase factor = the increase factor in the cooling equipment efficiency measured by the Seasonal Energy Efficiency Ratio (SEER) above that required by NAECA.~~

~~The formula being cooling equipment = SEER home - SEER NAECA divided by SEER NAECA.~~

~~The cooling multiplier for the Uo Zone is from the following table:~~

~~Uo zone~~	~~Cooling multiplier (Cm)~~
~~1~~	~~0.60 (Florida only).~~
~~1~~	~~0.20 (All other locations).~~
~~2~~	~~0.07.~~
~~3~~	~~0.03.~~

~~(e) U values for any glazing (e.g., windows, skylights, and the glazed portions of any door) must be based on tests using AAMA 1503.1-1988, Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections, or the National Fenestration Rating Council 100, 1997 Edition, Procedure for Determining Fenestration Product U-factors. In the absence of tests, manufacturers are to use the residential window U values contained in Chapter 29, Table 5 of the 1997 ASHRAE Handbook of Fundamentals, Inch-Pound Edition. In the event that the classification of the window type is indeterminate, the manufacturer must use the classification that gives the higher U value. Where a composite of materials from two different product types is used, the product is to be assigned the higher U value. For the purpose of calculating~~ ~~U_o~~ ~~values, storm windows are treated as an additional pane.~~

~~(f) Annual energy used based compliance. As an alternative, homes may demonstrate compliance with the annual energy used implicit in the coefficient of heat transmission (Uo) requirement. The annual energy use determination must be based on generally accepted engineering practices. The general requirement is to demonstrate that the home seeking compliance approval has a projected annual energy use, including both heating and cooling, less than or equal to a similar "base case" home that meets the standard. The energy use for both homes must be calculated based on the same assumptions; including assuming the same dimensions for all boundaries between conditioned and unconditioned spaces, site characteristics, usage patterns and climate.~~

10 C.F.R. § 460.103
Insulating materials must be installed according to the insulation manufacturer's installation instructions and the requirements set forth in table 1 to § 460.103, which is adapted from section R402 of the 2021 IECC.

TABLE 1 TO § 460.103 —INSTALLATION OF INSULATION

Component	Installation requirements
General	Air-permeable insulation must not be used as a material to establish the air barrier.

Access hatches, panels, and doors	Access hatches, panels, and doors between conditioned space and unconditioned space, such as attics and crawlspaces, must be insulated to a level equivalent to the insulation of the surrounding surface, must provide access to all equipment that prevents damaging or compressing the insulation, and must provide a wood framed or equivalent baffle or retainer when loose fill insulation is installed within an exterior ceiling assembly to retain the insulation both on the access hatch, panel, or door and within the building thermal envelope.
Baffles	For air-permeable insulations in vented attics, a baffle must be installed adjacent to soffit and eave vents. Baffles, when used in conjunction with eave venting, must be constructed using a solid material, maintain an opening equal or greater than the size of the vents, and extend over the top of the attic insulation.
Ceiling or attic	The insulation in any dropped ceiling or dropped soffit must be aligned with the air barrier.
Narrow cavaties	Batts to be installed in narrow cavities must be cut to fit or narrow cavities must be filled with insulation that upon installation readily conforms to the available cavity space.
Rim joists	Rim joists must be insulated such that the insulation maintain permanent contact with the exterior rim board.
Shower or tub adjacent to exterior wall	Exterior walls adjacent to showers and tubs must be insulated.
Walls	Air permeable exterior building thermal envelope insulation for framed exterior walls must completely fill the cavity, including within stud bays caused by blocking lay flats or headers.

~~**§ 3280.509 Criteria in absence of specific data.**~~

~~In the absence of specific data, for purposes of heat-loss/gain calculation, the following criteria shall be used:~~

(a) ~~***Infiltration heat loss.*** In the absence of measured infiltration heat loss data, the following formula shall be used to calculate heat loss due to infiltration and intermittently operated fans exhausting to the outdoors. The perimeter calculation shall be based on the dimensions of the pressure envelope.~~

~~Infiltration Heat-Loss = 0.7 (T) (ft. of perimeter), BTU/hr.~~

~~where: T = 70 minus the heating system capacity certification temperature stipulated in the Heating Certificate, in F.~~

~~(b) ***Framing areas.***~~

~~Wall 15 percent of wall area less windows and doors.~~

~~Floor and Ceiling 10 percent of the area.~~

~~(c) ***Insulation compression.*** Insulation compressed to less than nominal thickness and loose-fill insulation in sloping cavities must have its nominal R-values reduced in compressed areas in accordance with the following table:~~

~~Table to Paragraph (c) - Effect of Insulation Compression and Restriction on *R*-Values~~

~~Original thickness (%)~~	~~Non-uniform (a) restriction~~		~~Uniform (b) compression batt (%)~~
	~~Batt (%)~~	~~Blown (%)~~	
~~0~~	~~20~~	~~15~~	~~0~~
~~1~~	~~26~~	~~21~~	~~1~~
~~2~~	~~32~~	~~25~~	~~2~~
~~3~~	~~36~~	~~28~~	~~4~~
~~4~~	~~38~~	~~30~~	~~5~~
~~5~~	~~41~~	~~32~~	~~7~~
~~6~~	~~43~~	~~33~~	~~8~~

~~Original thickness (%)~~	~~Non-uniform (a) restriction~~		~~Uniform (b) compression batt (%)~~
	~~Batt (%)~~	~~Blown (%)~~	
~~7~~	~~45~~	~~35~~	~~10~~
~~8~~	~~46~~	~~36~~	~~11~~
~~9~~	~~48~~	~~38~~	~~13~~
~~10~~	~~49~~	~~39~~	~~14~~
~~11~~	~~51~~	~~40~~	~~15~~
~~12~~	~~52~~	~~42~~	~~17~~
~~13~~	~~53~~	~~43~~	~~18~~
~~14~~	~~54~~	~~44~~	~~20~~
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~~36~~	~~72~~	~~63~~	~~47~~
~~37~~	~~73~~	~~63~~	~~48~~
~~38~~	~~74~~	~~64~~	~~49~~
~~39~~	~~74~~	~~65~~	~~50~~

~~Original thickness (%)~~	~~Non-uniform (a) restriction~~		~~Uniform (b) compression batt (%)~~
	~~Batt (%)~~	~~Blown (%)~~	
~~40~~	~~75~~	~~65~~	~~51~~
~~41~~	~~75~~	~~66~~	~~52~~
~~42~~	~~76~~	~~67~~	~~53~~
~~43~~	~~76~~	~~68~~	~~54~~
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~~69~~	~~89~~	~~84~~	~~78~~
~~70~~	~~89~~	~~84~~	~~78~~
~~71~~	~~90~~	~~85~~	~~79~~
~~72~~	~~90~~	~~85~~	~~80~~

~~Original thickness (%)~~	~~Non-uniform (a) restriction~~		~~Uniform (b) compression batt (%)~~
	~~Batt (%)~~	~~Blown (%)~~	
~~73~~	~~90~~	~~86~~	~~81~~
~~74~~	~~91~~	~~86~~	~~82~~
~~75~~	~~91~~	~~87~~	~~82~~
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~~85~~	~~95~~	~~92~~	~~90~~
~~86~~	~~95~~	~~93~~	~~91~~
~~87~~	~~96~~	~~93~~	~~91~~
~~88~~	~~96~~	~~94~~	~~92~~
~~89~~	~~96~~	~~94~~	~~93~~
~~90~~	~~97~~	~~95~~	~~93~~
~~91~~	~~97~~	~~95~~	~~94~~
~~92~~	~~97~~	~~96~~	~~95~~
~~93~~	~~98~~	~~96~~	~~95~~
~~94~~	~~98~~	~~97~~	~~96~~
~~95~~	~~98~~	~~97~~	~~97~~
~~96~~	~~99~~	~~98~~	~~97~~
~~97~~	~~99~~	~~98~~	~~98~~
~~98~~	~~99~~	~~99~~	~~99~~
~~99~~	~~100~~	~~99~~	~~99~~
~~100~~	~~100~~	~~100~~	~~100~~

~~Note: To use this table, first compute the restricted insulation thickness as a fraction of the uncompressed (full) insulation thickness. Then look up the *R*-value remaining from the appropriate column (Non-uniform Restriction, Batt Non-uniform Restriction, Blown or Uniform Compression, Batt). Example: Assume a section of loose-fill ceiling insulation went from *R*-25 insulation at a height of 10 inches to a minimum height of 2 inches at the edge of the ceiling. The ratio of minimum to full thickness is 0.20 (2 divided by 10).~~

~~Look up 0.20 (20 percent), read across to column 3 (Non-uniform Restriction, Blown), and read 50 percent. Therefore, the *R*-value of the loose-fill insulation over the restricted area would be *R*-12.5 (50 percent of 25).~~

~~(a) Non-uniform restriction is that which occurs between non-parallel planes, such as in the ceiling near the eaves.~~

~~(b) Uniform compression is compression between parallel planes, such as that which occurs in a wall.~~

~~(d) ***Air supply ducts within floor cavity.*** Air supply ducts located within a floor cavity shall be assumed to be heating or cooling the floor cavity to living space temperatures unless the duct is structurally isolated by the framing system or thermally insulated from the rest of the floor cavity with a thermal insulation at least equal to R-4.~~

~~(e) ***Air supply ducts within ceiling cavity.*** Where supply ducts are located in ceiling cavities, the influence of the duct on cavity temperatures shall be considered in calculating envelope heat loss or heat gain.~~

~~(f) The supply duct loss (and/or heat gain where applicable - See § 3280.511) shall be calculated using the actual duct surface area and the actual thickness of insulation between the duct and outside of the manufactured home. If there is an air space of at least 1⁄2 inch between the duct and the insulation, heat loss/gain need not be calculated if the cavity in which the duct is located is assumed to be at living space temperature. The average temperature inside the supply duct, including ducts installed outside the manufactured home, shall be assumed to be 130 F for purposes of calculation of heat loss and 60 F for heat gain.~~

~~(g) ***Return air cavities.*** Cavities used as return air plenums shall be considered to be at living space temperature.~~

~~§ 3280.510 Heat loss certificate.~~

~~The manufactured home manufacturer shall permanently affix the following “Certificate” to an interior surface of the home that is readily visible to the homeowner. The “Certificate” shall specify the following:~~

~~(a) ***Heating zone certification.*** The design zone at which the manufactured home heat loss complies with § 3280.506(a).~~

~~(b) ***Outdoor certification temperature.*** The lowest outdoor temperature at which the installed heating equipment will maintain a 70 °F temperature inside the home without storm sash or insulating glass for Zones 1 and 2, and with storm sash or insulating glass for Zone 3 and complying with § 3280.508 and § 3280.509.~~

~~(c) ***Operating economy certification temperature.*** The temperature to be specified for operating economy and energy conservation shall be 20 °F or 30% of the design temperature difference, whichever is greater, added to the temperature specified as the heating system capacity certification temperature without storm windows or insulating glass in Zones 1 and 2 and with storm windows or insulating glass in Zone 3. Design temperature difference is 70° minus the heating system capacity certification temperature in degrees Fahrenheit.~~

~~HEATING CERTIFICATE~~

~~Home Manufacturer~~

~~Plant Location~~
~~Home Model~~
~~**(Include Uo Value Zone Map)**~~

~~This manufactured home has been thermally insulated to conform with the requirements of the Federal Manufactured Home Construction and Safety Standards for all locations within Uo Value Zone _____.~~
~~Heating Equipment Manufacturer~~
~~Heating Equipment Model~~
~~The above heating equipment has the capacity to maintain an average 70F temperature in this home at outdoor temperatures of [see paragraph (b) of this section] F. To maximize furnace operating economy and to conserve energy, it is recommended that this home be installed where the outdoor winter design temperature (97 1/2%) is not higher than [see paragraph (c) of this section] F degrees Fahrenheit.~~
~~The above information has been calculated assuming a maximum wind velocity of 15 MPH at standard atmospheric pressure.~~
~~(d) The following additional statement must be provided on the heating certificate and data plate required by § 3280.5 when the home is built with a vapor retarder of not greater than one perm (dry cup method) on the exterior side of the insulation: "This home is designed and constructed to be sited only in humid or fringe climate regions as shown on the Humid and Fringe Climate Map." A reproduction of the Humid and Fringe Climate Map in § 3280.504 is to be provided on the heating certificate and data plate. The map must be not less than 31⁄2 inch × 21⁄4 inch in size and may be combined with the Uo Value Zone Map for Manufactured Housing in § 3280.506.~~

~~**§ 3280.511 Comfort cooling certificate and information.**~~

~~(a) The manufactured home manufacturer shall permanently affix a "Comfort Cooling Certificate" to an interior surface of the home that is readily visible to the home owner. This certificate may be combined with the heating certificate required in § 3280.510. The manufacturer shall comply with one of the following three alternatives in providing the certificate and additional information concerning the cooling of the manufactured home:~~

~~(1) ***Alternative I.*** If a central air conditioning system is provided by the home manufacturer, the heat gain calculation necessary to properly size the air conditioning equipment shall be in accordance with procedures outlined in chapter 22 of the 1989 ASHRAE Handbook of Fundamentals, with an assumed location and orientation. The following shall be supplied in the Comfort Cooling Certificate:~~

~~Air Conditioner Manufacturer~~
~~Air Conditioner Model~~
~~Certified Capacity _______ BTU/Hr. in accordance with the appropriate Air Conditioning and Refrigeration Institute Standards~~
~~The central air conditioning system provided with this home has been sized, assuming an orientation of the front (hitch) end of the home facing _______ and is designed on the basis of a 75 °F indoor temperature and an outdoor temperature of __°F dry bulb and __°F wet bulb.~~

~~**Example Alternate I**~~

~~**COMFORT COOLING CERTIFICATE**~~

~~Manufactured Home Mfg~~
~~Plant Location~~
~~Manufactured Home Model~~
~~Air Conditioner Manufacturer~~
~~Certified Capacity _______ BTU/Hr. in accordance with the appropriate Air Conditioning and Refrigeration Institute Standards.~~
~~The central air conditioning system provided with this home has been sized assuming an orientation of the front (hitch end) of the home facing ______. On this basis, the system is designed to maintain an indoor temperature of 75 °F when outdoor temperatures are __°F dry bulb and __°F wet bulb.~~
~~The temperature to which this home can be cooled will change depending upon the amount of exposure of the windows to the sun's radiant heat. Therefore, the home's heat gains will vary dependent upon its orientation to the sun and any permanent shading provided. Information concerning the calculation of cooling loads at various locations, window exposures and shadings are provided in chapter 22 of the 1989 edition of the ASHRAE Handbook of Fundamentals.~~

~~(2) ***Alternative 2.*** For each home suitable for a central air cooling system, the manufacturer shall provide the following statement: "This air distribution system of this home is suitable for the installation of a central air conditioning system."~~

~~**Example Alternate 2**~~

~~**COMFORT COOLING CERTIFICATE**~~

~~Manufactured Home Manufacturer~~
~~Plant Location~~
~~Manufactured Home Model~~

~~This air distribution system of this home is suitable for the installation of central air conditioning.~~
~~The supply air distribution system installed in this home is sized for Manufactured Home Central Air Conditioning System of up to _______ B.T.U./Hr. rated capacity which are certified in accordance with the appropriate Air Conditioning and Refrigeration Institute Standards. When the air circulators of such air conditioners are rated at 0.3 inch water column static pressure or greater for the cooling air delivered to the manufactured home supply air duct system.~~
~~Information necessary to calculate cooling loads at various locations and orientations is provided in the special comfort cooling information provided with this manufactured home.~~

~~(3) ***Alternative 3.*** If the manufactured home is not equipped with an air supply duct system, or if the manufacturer elects not to designate the home as being suitable for the installation~~

~~of a central air conditioning system, the manufacturer shall provide the following statement: "This air distribution system of this home has not been designed in anticipation of its use with a central air conditioning system."~~

~~Example Alternate 3~~

~~COMFORT COOLING CERTIFICATE~~

~~Manufactured Home Mfg~~
~~Plant Location~~
~~Manufactured Home Model~~
~~The air distribution system of this home has not been designed in anticipation of its use with a central air conditioning system.~~

~~(b) For each home designated as suitable for central air conditioning the manufacturer shall provide the maximum central manufactured home air conditioning capacity certified in accordance with the ARI Standard 210/240-89 Unitary Air-Conditioning and Air-Source Heat Pump Equipment and in accordance with § 3280.715(a)(3). If the capacity information provided is based on entrances to the air supply duct at other than the furnace plenum, the manufacturer shall indicate the correct supply air entrance and return air exit locations.~~

~~(c)~~ ***~~Comfort cooling information.~~*** ~~For each manufactured home designated, either "suitable for" or "provided with" a central air conditioning system, the manufacturer shall provide comfort cooling information specific to the manufactured home necessary to complete the cooling load calculations. The comfort cooling information shall include a statement to read as follows:~~

> ~~To determine the required capacity of equipment to cool a home efficiently and economically, a cooling load (heat gain) calculation is required. The cooling load is dependent on the orientation, location and the structure of the home. Central air conditioners operate most efficiently and provide the greatest comfort when their capacity closely approximates the calculated cooling load. Each home's air conditioner should be sized in accordance with chapter 22 of the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Handbook of Fundamentals, 1989 Edition, once the location and orientation are known.~~

~~Information Provided by the Manufacturer Necessary To Calculate Sensible Heat Gain~~

~~Walls (without windows and doors)~~	~~U~~
~~Ceilings and roofs of light color~~	~~U~~
~~Ceilings and roofs of dark color~~	~~U~~
~~Floors~~	~~U~~
~~Air ducts in floor~~	~~U~~
~~Air ducts in ceiling~~	~~U~~
~~Air ducts installed outside the home~~	~~U~~

~~Information necessary to calculate duct areas.~~

Subpart G - Plumbing Systems

§ 3280.602 Definitions.

Heated water circulation system means a water distribution system in which one or more pumps are operated in the service hot water piping to circulate heated water from the water heating equipment to fixtures and back to the water heating equipment.

Service hot water means supply of hot water for purposes other than comfort heating.

§ 3280.609 Water distribution systems.

§ 3280.609(a)(2) Hot water supply. Each manufactured home equipped with a kitchen sink, and bathtub and/or shower shall be provided with a service hot water ~~supply~~ system that meets the requirements of 10 C.F.R. § 460.203.

10 C.F.R. § 460.203
(a) Service hot water systems installed by the manufacturer must be installed according to the service hot water manufacturer's installation instructions. Where service hot water systems are installed by the manufacturer, the manufacturer must ensure that any maintenance instructions received from the service hot water system manufacturer are provided with the manufactured home. The service hot water requirements are adapted from R403 of the 2021 IECC.

(b) Any automatic and manual controls, temperature sensors, pumps associated with service hot water systems must provide access.

(c) Heated water circulation systems must— (1) Be provided with a circulation pump;
(2) Ensure that the system return pipe is a dedicated return pipe or a cold water supply pipe;
(3) Not include any gravity or thermosyphon circulation systems;
(4) Ensure that controls for circulating heated water circulation pumps start the pump based on the identification of a demand for hot water within the occupancy; and
(5) Ensure that the controls automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is no demand for hot water.

(d) All hot water pipes—
(1) Outside conditioned space must be insulated to a minimum R-value of R-3; and
(2) From a service hot water system to a distribution manifold must be insulated to a minimum R-value of R-3.

Subpart H - Heating, Cooling and Fuel Burning Systems

§ 3280.702 Definitions.

~~Air duct means conduits or passageways for conveying air to or from heating, cooling, air conditioning or ventilation equipment, but not including the plenum.~~

Duct means a tube or conduit, except an air passage within a self-contained system, utilized for conveying air to or from heating, cooling, or ventilating equipment.

Duct system means a continuous passageway for the transmission of air that, in addition to ducts, includes duct fittings, dampers, plenums, fans, and accessory air-handling equipment and appliances.

§ 3280.707 Heat producing appliances.

(e) Thermostats and controls for each space heating, cooling or combination heating and cooling system must meet the requirements of 10 C.F.R. § 460.202. ~~Each space heating, cooling or combination heating and cooling system shall be provided with at least one readily adjustable automatic control for regulation of living space temperature.~~ The control shall be placed a minimum of 3 feet from the vertical edge of the appliance compartment door. It shall not be located on an exterior wall or on a wall separating the appliance compartment from a habitable room.

10 C.F.R. § 460.202

(a) At least one thermostat must be provided for each separate heating and cooling system installed by the manufacturer. The thermostat and controls requirements are adapted from section R403 of the 2021 IECC per 10 C.F.R. § 460.202 Thermostats and controls.

(b) Any programmable thermostat installed by the manufacturer that controls the heating or cooling system must—

(1) Be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature set points at different times of the day and different days of the week;

(2) Include the capability to set back or temporarily operate the system to maintain zone temperatures down to 55F (13C) or up to 85F (29C); and

(3) Initially be programmed with a heating temperature set point no higher than 70F (21C) and a cooling temperature set point no lower than 78F (26C).

(3) Heat pumps with supplementary electric-resistance heat must be provided with controls that, except during defrost, prevent supplemental heat operation when the heat pump compressor can meet the heating load.

§ 3280.709 Installation of appliances.

§ 2382.709(e)(4) An air conditioner evaporator section shall not be located in the air discharge duct or plenum of any forced-air furnace unless the manufactured home manufacturer has complied with ~~certification required in § 3280.511.~~ 10 C.F.R. § 460.205.

§ 3280.714 Appliances, cooling.

§3280.714(a)(1) (i) Electric motor-driven unitary air-cooled air conditioners and heat pumps in the cooling mode with rated capacity less than 65,000 BTU/hour (19,045 watts), when rated at ARI standard rating conditions in ARI Standard 210/240-89, Unitary Air-Conditioning and Air-Source Heat Pump Equipment, must have seasonal energy efficiency ratio (SEER2) values not less than as specified in 10 C.F.R. Part 430, Energy Conservation Program for Consumer Products: Central Air Conditioners and Heat Pumps Energy Conservation Standards.

~~(ii) Heat pumps must be certified to comply with all requirements of the ARI Standard 210/240-89, Unitary Air Conditioning and Air-Source Heat Pump Equipment. Electric motor-driven vapor compression heat pumps with supplemental electrical resistance heat must be sized to provide~~

~~by compression at least 60 percent of the calculated annual heating requirements for the manufactured home being served. A control must be provided and set to prevent operation of supplemental electrical resistance heat at outdoor temperatures above 40° F (4° C), except for defrost conditions. Electric motor-driven vapor compression heat pumps with supplemental electric resistance heat conforming to ARI Standard 210/240-89, Unitary Air-Conditioning and Air-Source Heat Pump Equipment, must have Heating Season Performance Factor (HSPF) efficiencies not less than as specified in the 10 CFR Part 430, Energy Conservation Program for Consumer Products: Central Air Conditioners and Heat Pumps Energy Conservation Standards.~~

§ 3280.715 Circulating air systems.

§3280.715(a)(3)(i) The manufactured home manufacturer shall certify the capacity of the air cooling supply duct system for the maximum allowable output of ARI certified central air conditioning systems. The certification shall be at operating static pressure of 0.3 inches of water or greater. ~~(See § 3280.511).~~

§ 3280.715(a)(4) ~~Airtightness~~ Sealing of supply duct systems must meet the requirements of 10 C.F.R. § 460.201. ~~A supply duct system shall be considered substantially airtight when the static pressure in the duct system, with all registers sealed and with the furnace air circulator at high speed, is at least 80 percent of the static pressure measured in the furnace casing, with its outlets sealed and the furnace air circulator operating at high speed. For the purpose of this paragraph and § 3280.715(b) pressures shall be measured with a water manometer or equivalent device calibrated to read in increments not greater than 1⁄10 inch water column.~~

10 C.F.R. § 460.201
Each manufactured home equipped with a duct system, which may include air handlers and filter boxes, must be sealed to limit total air leakage to less than or equal to four (4) cubic feet per minute per 100 square feet of conditioned floor area at a pressure differential of 0.1 inch w.g. (25 Pascals) across the system. Building framing cavities must not be used as ducts or plenums when directly connected to mechanical systems. The duct total air leakage requirements are adapted from section R403 of the 2021 IECC.

§ 3280.716 Equipment Sizing.

Heating and cooling equipment shall be sized in accordance with 10 C.F.R. § 460.205.

10 C.F.R. § 460.205
Sizing of heating and cooling equipment installed by the manufacturer must be determined in accordance with ACCA Manual S incorporated by reference; see § 460.3) based on building loads calculated in accordance with ACCA Manual J (incorporated by reference; see § 460.3). The equipment sizing criteria are adapted from section R403 of the 2021 IECC.

Subpart K - Attached Manufactured Homes and Special Construction Considerations

§ 3280.1004 Exterior walls.

(b) The requirements of Subpart F ~~§ 3280.506 for heat loss/gain insulation~~ apply to the fire separation wall on each attached manufactured home.

Appendix F:
MHI Proposal - October 2022 MHCC Meeting

Yellow Highlighted Text is included from the DOE Final Rule
Blue Highlighted text are changes made to the DOE Final Rule
Green highlighted text are changes to the HUD code

Title 24 - Housing and Urban Development
Subtitle B - Regulations Relating to Housing and Urban Development
Chapter XX - Office of Assistant Secretary for Housing - Federal Housing Commissioner, Department of Housing and Urban Development

§ 3280.2 Definitions.

Definitions in this subpart are those common to all subparts of the standard and are in addition to the definitions provided in individual parts. The definitions are as follows:

Equipment includes materials, appliances, devices, fixtures, fittings or accessories both in the construction of, and in the fire safety, plumbing, heat-producing cooling and electrical systems of manufactured homes.

§ 3280.103 Light and ventilation.

(e) Mechanical ventilation fan efficacy

1. Whole-house mechanical ventilation system fans must meet the minimum efficacy requirements set forth in the following table ~~1 to 460.204(a),~~ except as provided in paragraph ~~(b)~~ (2) of this section. ~~The mechanical ventilation fan efficacy requirements are adapted from section R403 of the 2021 IECC.~~

2. Mechanical ventilation fans that are integral to heating, ventilating, and air conditioning equipment, including furnace fans ~~as defined in §430.2 of this subchapter~~(need to add to definitions), are not subject to the efficiency requirements in paragraph ~~(a)~~ (1) of this section.

~~TABLE 1 TO § 460.204(a)—~~MECHANICAL VENTILATION SYSTEM FAN EFFICACY

Fan type description	Airflow rate minimum (cfm)	Minimum efficacy (cfm/watt)
Heat recovery ventilator or energy recovery ventilator	Any	1.2
In-line supply or exhaust fans	Any	3.8
Other exhaust fan	<90	2.8
Other exhaust fan	≥90	3.5

Subpart F - Thermal Protection

§ 3280.501 Scope.

This subpart sets forth the requirements for condensation control, air infiltration, thermal insulation and certification for heating and comfort cooling.

§ 3280.502 Definitions.

(a) The following definitions are applicable to subpart F only:

(1) ~~*Pressure envelope* means that primary air barrier surrounding the living space which serves to limit air leakage. In construction using ventilated cavities, the pressure envelope is the interior skin.~~(removed this in favor or air barrier definition)

(2) ~~*Thermal envelope area* means the sum of the surface areas of outside walls, ceiling and floor, including all openings. The wall area is measured by multiplying outside wall lengths by the inside wall height from floor to ceiling. The floor and ceiling areas are considered as horizontal surfaces using exterior width and length.~~

Access (to) means that which enables a device, appliance or equipment to be reached by ready access or by a means that first requires the removal or movement of a panel or similar obstruction.
Air barrier means one or more materials joined together in a continuous manner to restrict or prevent the passage of air through the building thermal envelope and its assemblies.
Automatic means self-acting or operating by its own mechanism when actuated by some imper sonal influence.
Building thermal envelope means exterior walls, exterior floors, exterior ceiling, or roofs, and any other building element assemblies that enclose conditioned space or provide a boundary between conditioned space and unconditioned space.
Ceiling means an assembly that supports and forms the overhead interior surface of a building or room that covers its upper limit and is horizontal or tilted at an angle less than 60 degrees (1.05 rad) from horizontal.
Conditioned space means an area, room, or space that is enclosed within the building thermal envelope and that is directly or indirectly heated or cooled. Spaces are indirectly heated or cooled where they communicate through openings with conditioned space, where they are separated from conditioned spaces by uninsulated walls, floors or ceilings, or where they contain uninsulated ducts, piping, or other sources of heating or cooling.
~~*Continuous air barrier* means a combination of materials and assemblies that restrict or prevent the passage of air from conditioned space to unconditioned space~~. (dropped this in favor of air barrier definition)
Door means an operable barrier used to block or allow access to an entrance of a manufactured home.
Dropped ceiling means a secondary nonstructural ceiling, hung below the exterior ceiling.
Dropped soffit means a secondary nonstructural ceiling that is hung below the exterior ceiling and that covers only a portion of the ceiling.
Duct means a tube or conduit, except an air passage within a self-contained system, utilized for conveying air to or from heating, cooling, or ventilating equipment.
Duct system means a continuous passageway for the transmission of air that, in addition to ducts, includes duct fittings, dampers, plenums, fans, and accessory air-handling equipment and appliances.
Eave means the edge of the roof that overhangs the face of an exterior wall and normally projects beyond the side of the manufactured home.
Exterior ceiling means a ceiling that separates conditioned space from unconditioned space.
Exterior floor means a floor that separates conditioned space from unconditioned space.
Exterior wall means a wall, including a skylight well, that separates conditioned space from unconditioned space.
Fenestration means vertical fenestration and skylights.
Floor means a horizontal assembly that supports and forms the lower interior surface of a building or room upon which occupants can walk.

Glazed or glazing means an infill material, including glass, plastic, or other transparent or translucent material used in fenestration.
Heated water circulation system means a water distribution system in which one or more pumps are operated in the service hot water piping to circulate heated water from the water heating equipment to fixtures and back to the water heating equipment.
Insulation means material deemed to be ~~insulation under 16 C.F.R. 460.2.~~(need definition of insulation)
Manual means capable of being operated by personal intervention.
Opaque door means a door that is not less than 50 percent opaque in surface area.
R-value (thermal resistance) means the inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unit area (h × ft^2 × °F/Btu).
Rough opening means an opening in the exterior wall or roof, sized for installation of fenestration.
Service hot water means supply of hot water for purposes other than comfort heating.
Skylight means glass or other transparent or translucent glazing material, including framing materials, installed at an angle less than 60 degrees (1.05 rad) from horizontal, including unit skylights, tubular daylighting devices, and glazing materials in solariums, sunrooms, roofs and sloped walls.
Skylight well means the exterior walls underneath a skylight that extend from the interior finished surface of the exterior ceiling to the exterior surface of the location to which the skylight is attached.
Solar heat gain coefficient (SHGC) means the ratio of the solar heat gain entering a space through a fenestration assembly to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation that is then reradiated, conducted, or convected into the space.

Thermostat means an automatic control device used to maintain temperature at a fixed or adjustable set point.

U-factor (thermal transmittance) means the coefficient of heat transmission (air to air) through a building component or assembly, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films (Btu/h × ft^2 × °F).

U_O *(overall thermal transmittance)* means the coefficient of heat transmission (air to air) through the building thermal envelope, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films (Btu/ h × ft^2 × °F).

Ventilation means the natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, any space.

Vertical fenestration means windows (fixed or moveable), opaque doors, glazed doors, glazed block and combination opaque and glazed doors composed of glass or other transparent or translucent glazing materials and installed at a slope of greater than or equal to 60 degrees (1.05 rad) from horizontal.

Wall means an assembly that is vertical or tilted at an angle equal to greater than 60 degrees (1.05 rad) from horizontal that encloses or divides an area of a building or room.

Whole-house mechanical ventilation system means an exhaust system, supply system, or combination thereof that is designed to mechanically exchange indoor air with outdoor air when operating continuously or through a programmed intermittent schedule to satisfy the whole house ventilation rates.

Window means glass or other transparent or translucent glazing material, including framing materials, installed at an angle greater than 60 degrees (1.05 rad) from horizontal.

Zone means a space or group of spaces within a manufactured home with heating or cooling requirements that are sufficiently similar so that desired conditions can be maintained using a single controlling device.

§ 3280.503 Materials.

Materials used for insulation shall be of proven effectiveness and adequate durability to assure that required design conditions concerning thermal transmission are attained.

(a) Installation of Insulation - Insulating materials must be installed according to the insulation manufacturer's installation instructions and the requirements set forth in table below ~~1 to § 460.103, which is adapted from section R402 of the 2021 IECC.~~

~~TABLE 1 TO § 460.103 —~~INSTALLATION OF INSULATION

Component	Installation requirements
General	Air-permeable insulation must not be used as a material to establish the air barrier.

Access hatches, panels, and doors	Access hatches, panels, and doors between conditioned space and unconditioned space, such as attics and crawlspaces, must be insulated to a level equivalent to the insulation of the surrounding surface, must provide access to all equipment that prevents damaging or compressing the insulation, and must provide a wood framed or equivalent baffle or retainer when loose fill insulation is installed within an exterior ceiling assembly to retain the insulation both on the access hatch, panel, or door and within the building thermal envelope.
Baffles	For air-permeable insulations in vented attics, a baffle must be installed adjacent to soffit and eave vents. Baffles, when used in conjunction with eave venting, must be constructed using a solid material, maintain an opening equal or greater than the size of the vents, and extend over the top of the attic insulation. where insulation is restrained from full depth in order to maintain 1 inch minimum air space between insulation and roof decking
Ceiling or attic	The insulation in any dropped ceiling or dropped soffit must be aligned with the air barrier.
Narrow cavaties	Batts to be installed in narrow cavities must be cut to fit or narrow cavities must be filled with insulation that upon installation readily conforms to the available cavity space.
Rim joists	Rim joists must be insulated such that the insulation maintain permanent contact with the exterior rim board.
Shower or tub adjacent to exterior wall	Exterior walls adjacent to showers and tubs must be insulated.
Walls	Air permeable exterior building thermal envelope insulation for framed exterior walls must completely fill the cavity, including within stud bays caused by blocking lay flats or headers.

§ 3280.504 Condensation control and installation of vapor retarders.

(b) *Exterior walls.*

(2) Unventilated wall cavities must have an external covering and/or sheathing that forms the ~~pressure envelope~~ air barrier. The covering and/or sheathing must have a combined permeance of not less than 5.0 perms. In the absence of test data, combined permeance is permitted to be computed using the following formula: P total = $(1/[(1/P_1) + (1/P_2)])$, where P_1 and P_2 are the permeance values of the exterior covering and sheathing in perms. Formed exterior siding applied in sections with joints not caulked or sealed, are not considered to restrict water vapor transmission; or

§ 3280.505 Air infiltration.

(a) *Envelope air infiltration.* The opaque envelope shall be designed and constructed to limit air infiltration to the living area of the home. Any design, material, method or combination thereof which accomplishes this goal may be used. The goal of the infiltration control criteria is to reduce heat loss/heat gain due to infiltration as much as possible without impinging on health and comfort and within the limits of reasonable economics.

(1) ~~*Envelope penetrations.* Plumbing, mechanical and electrical penetrations of the pressure envelope not exempted by this part, and installations of window and door frames shall be constructed or treated to limit air infiltration. Penetrations of the pressure envelope made by electrical equipment, other than distribution panel boards and cable and conduit penetrations, are exempt from this requirement. Cable penetrations through outlet boxes are considered exempt.~~

(2) ~~*Joints between major envelope elements.* Joints not designed to limit air infiltration between wall-to- wall, wall-to-ceiling and wall-to-floor connections shall be caulked or otherwise sealed. When walls are constructed to form a pressure envelope on the outside of the wall cavity, they are deemed to meet this requirement.~~

~~(a)~~ (1) Manufactured homes must be sealed against air leakage at all joints, seams, and penetrations associated with the building thermal envelope in accordance with the component manufacturer's installation instructions and the requirements set forth in the table below ~~table 1 to § 460.104~~. Sealing methods between dissimilar materials must allow for differential expansion, contraction, and mechanical vibration, and must establish a continuous air barrier upon installation of all opaque components of the building thermal envelope. All gaps and penetrations in the exterior ceiling, exterior floor, and exterior walls, including ducts, flue shafts, plumbing, piping, electrical wiring, utility penetrations, bathroom and kitchen exhaust fans, recessed lighting fixtures adjacent to unconditioned space, and light tubes adjacent to unconditioned space, must be sealed with caulk, foam, gasket or other suitable material. ~~The air barrier installation criteria are adapted from section R402 of the 2021 IECC.~~

~~TABLE 1 TO § 460.104—~~AIR BARRIER INSTALLATION CRITERIA

Component	Air barrier criteria
Ceiling or attic	The air barrier in any dropped ceiling or dropped soffit must be aligned with the insulation and any gaps in the air barrier must be sealed with caulk, foam, gasket, o other suitable material. Access hatches, panels, and doors, drop-down stairs, or knee wall doors to unconditioned attic spaces must be weather- stripped or equipped with a gasket to produce a continuous air barrier.
Duct system register boots	Duct system register boots that penetrate the building thermal envelope or the air barrier must be sealed to the subfloor, wall covering or ceiling penetrated by the boot, air barrier, or the interior finish materials with caulk, foam, gasket, or other suitable material.
Electrical box or phone box on exterior walls	The air barrier must be installed behind electrical and communication boxes or the air barrier must be sealed around the box penetration with caulk, foam, gasket, or other suitable material.
Floors	The air barrier must be installed at any exposed edge of insulation. The bottom board may serve as the air barrier.
Mating line surfaces	Mating line surfaces must be equipped with a continuous and durable gasket.
~~Recessed lighting~~	~~Recessed light fixtures installed in the building thermal envelope must be sealed to the drywall with caulk, foam, gasket, or other suitable material.~~
Rim joists	The air barrier must enclose the rim joists. The junctions of the rim board and the subfloor must be air sealed.
Shower or tub adjacent to exterior wall	The air barrier must separate showers and tubs from exterior walls when interior wall surface is used as an air barrier
Walls	The junction of the top plate and the exterior ceiling, and the junction of the bottom plate and the exterior floor, along exterior walls must be sealed with caulk, foam, gasket, or other suit-able material.
Windows, skylights, and exterior doors	The rough openings around windows, exterior doors and skylights must be sealed with caulk or foam.

§ 3280.506 Heat loss/heat gain.

(a) The manufactured home heat loss/heat gain shall be determined by methods outlined in §§ 3280.508 and 3280.509. The Uo (Coefficient of heat transmission) value zone for which the manufactured home is acceptable and the lowest outdoor temperature to which the installed heating equipment will maintain a temperature of 70 F shall be certified as specified in § 3280.510. The Uo value zone shall be determined from the map in figure 1 to this paragraph (a). An alternate prescriptive path is provided in §§ 3280.507

(b) The overall coefficient of heat transmission (Uo) of the manufactured home for the respective zones and an indoor design temperature of 70 F, including internal and external ducts, and excluding infiltration, ventilation, and condensation control, shall not exceed the Btu/(hr.) (sq. ft.) (F) of the manufactured home envelope are as tabulated in the table to this paragraph (b): An alternate prescriptive path is provided in §§ 3280.507

~~TABLE 5 TO § 460.102(e)(1)—~~TIER 1 BUILDING THERMAL ENVELOPE PERFORMANCE REQUIREMENTS

Climate zone	Single-section *Uo*
1	0.110
2	0.091
3	0.074

~~TABLE 6 TO § 460.102(e)(1)—~~TIER 2 BUILDING THERMAL ENVELOPE PERFORMANCE REQUIREMENTS

Climate zone	Multi-section *Uo*
1	~~0.082~~ 0.090
2	~~0.066~~ 0.076
3	~~0.055~~ 0.061

(2) Area-weighted average vertical fenestration U-factor must not exceed 0.48 in Climate Zone 2 or 0.40 in Climate Zone 3. ~~Adapted from section R402 of the 2021 IECC.~~
(3) Area-weighted average skylight U-factor must not exceed 0.75 in Climate Zone 2 and Climate Zone 3. ~~Adapted from section R402 of the 2021 IECC.~~ Windows, skylights and doors containing more than 50 percent glazing by area must satisfy the SHGC requirements established in paragraph (b)(1) of this section on the basis of an area- weighted average. ~~Adapted from section R402 of the 2021 IECC.~~

~~(b) [Reserved].~~

~~(c) Determination of compliance with paragraph (c) of this section. (1) UO must be determined in accordance with Overall U-Values and Loads—Manufactured Homes (incorporated by reference; see § 3280.4). (2) Reserved~~

~~Table 1 to Paragraph (b)~~

~~Uo value zone~~	~~Maximum coefficient of heat transmission~~
~~1~~	~~0.116 Btu/(hr.) (sq. ft.) (F).~~
~~2~~	~~0.096 Btu/(hr.) (sq. ft.) (F).~~
~~3~~	~~0.079 Btu/(hr.) (sq. ft.) (F).~~

(c) To assure uniform heat transmission in manufactured homes, cavities in exterior walls, floors, and ceilings must be provided with thermal insulation. For insulation purposes, the fire separation wall between each single family attached manufactured home shall be considered an exterior wall (see subpart K of this part).

(d) Manufactured homes designed for Uo Value Zone 3 shall be factory equipped with storm windows or insulating glass.

§ 3280.507 ~~Comfort heat gain.~~ Prescriptive Compliance Path

~~Information necessary to calculate the home cooling load shall be provided as specified in this part.~~

~~(a)~~ ~~*Transmission heat gains.* Homes complying with this section shall meet the minimum heat loss transmission coefficients specified in § 3280.506(a).~~

(a) Prescriptive requirements. (1) The building thermal envelope must meet the applicable minimum R-value (nominal value of insulation), and the glazing maximum U-factor and SHGC, requirements set forth in table 1 ~~to § 460.102(b)(1)~~ and table 2 ~~to § 460.102(b)(2)~~ or component U-values set forth in table 3 ~~to § 460.102(b)(5)~~ and table 4 ~~to § 460.102(b)(5).~~

TABLE 1 ~~TO § 460.102(b)(1)~~—TIER 1 (single section) BUILDING THERMAL ENVELOPE PRESCRIPTIVE REQUIREMENTS

Climate zone	Exterior wall insulation *R*-value	Exterior ceiling insulation *R*-value	Exterior floor insulation *R*-value	Window *U*-factor	Skylight *U*-factor	Door *U*-factor	Glazed fenestration SHGC
1	13	22	22	1.08	0.75	0.40	0.7
2	13	22	19	0.5	0.55	0.40	0.6
3	19	22	22	0.35	0.55	0.40	Not applicable.

TABLE 2 ~~TO § 460.102(b)(1)~~—TIER 2 (multi-section) BUILDING THERMAL ENVELOPE PRESCRIPTIVE REQUIREMENTS

Climate zone	Exterior wall insulation *R*-value	Exterior ceiling insulation *R*-value	Exterior floor insulation *R*-value	Window *U*-factor	Skylight *U*-factor	Door *U*-factor	Glazed fenestration SHGC
1.............	13	30	13	0.32	0.75	0.40	0.33
2.............	21	30	19	0.30	0.55	0.40	0.25
3.............	21	38	30	0.30	0.55	0.40	Not applicable.

(2) For the purpose of compliance with the exterior ceiling insulation R-value requirement ~~of paragraph (b)(1)~~ of this section, the truss heel height must be a minimum of 5.5 inches at the outside face of each exterior wall.

(3) A combination of R-21 batt insulation and R-14 blanket insulation may be used for the purpose of compliance with the floor insulation R-value requirement of table 2 ~~to § 360.102(b)(1),~~ Climate Zone 3.

(4) An individual skylight that has an SHGC that is less than or equal to 0.30 is not subject to the glazed fenestration SHGC requirements established in ~~paragraph (b)(1) of~~ this section. ~~Adapted from section R402 of the 2021 IECC.~~

(5) U-factor alternatives to R-value requirements. Compliance with the applicable requirements ~~in paragraph (b)(1)~~ of this section may be determined using the applicable maximum U-factor values set forth in table 3 ~~to § 460.102(b)(5)~~ and table 4 ~~to § 460.102(b)(5)~~, which reflect the thermal transmittance of the component, excluding fenestration, and not just the insulation of that component, as an alternative to the minimum nominal R-value requirements set forth in table 1 ~~to § 460.102(b)(1)~~ and table 2 ~~to § 460.102(b)(1)~~, respectively.

TABLE 3 ~~TO § 460.102(b)(5)~~—*U*-FACTOR ALTERNATIVES TO TIER 1 *R*-VALUE REQUIREMENTS

Climate zone	Exterior ceiling *U*-factor	Exterior wall *U*-factor	Exterior floor *U*-factor
1	0.061	0.094	0.049
2	0.061	0.094	0.056
3	0.061	0.068	0.049

TABLE 4 ~~TO § 460.102(b)(5)—~~*U*-FACTOR ALTERNATIVES TO TIER 2 R-VALUE REQUIREMENTS

Climate zone	Exterior ceiling *U*-factor	Exterior wall *U*-factor	Exterior floor *U*-factor
1	0.043	0.094	0.078
2	0.043	0.063	0.056
3	0.037	0.063	0.032

§ 3280.509 Criteria in absence of specific data.

In the absence of specific data, for purposes of heat-loss/gain calculation, the following criteria shall be used:

(a) *Infiltration heat loss.* In the absence of measured infiltration heat loss data, the following formula shall be used to calculate heat loss due to infiltration and intermittently operated fans exhausting to the outdoors. The perimeter calculation shall be based on the dimensions of the ~~pressure envelope~~ air barrier.

Subpart H - Heating, Cooling and Fuel Burning Systems

§ 3280.704 ~~[Reserved]~~ Thermostats and Controls

(a) At least one thermostat must be provided for each separate heating and cooling system installed by the manufacturer. ~~The thermostat and controls requirements are adapted from section R403 of the 2021 IECC per 10 C.F.R. § 460.202 Thermostats and controls.~~

(b) Any programmable thermostat installed by the manufacturer that controls the heating or cooling system must—

(1) Be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature set points at different times of the day and different days of the week;

(2) Include the capability to set back or temporarily operate the system to maintain zone temperatures down to 55F (13C) or up to 85F (29C); and

(3) ~~Initially be programmed with a heating temperature set point no higher than 70F (21C) and a cooling temperature set point no lower than 78F (26C)~~. Homeowner manual should include recommendation that homeowners program thermostat with a heating temperature set point no higher than 70F (21C) and a cooling temperature set point no lower than 78F (26C).

(3) Heat pumps with supplementary electric-resistance heat must be provided with controls that, except during defrost, prevent supplemental heat operation when the heat pump compressor can meet the heating load.

§ 3280.715 Circulating air systems.

(a) *Supply system.*

(4) ~~*Airtightness of supply duct systems.* A supply duct system shall be considered substantially airtight when the static pressure in the duct system, with all registers sealed and with the furnace air circulator at high speed, is at least 80 percent of the static pressure measured in the furnace casing, with its outlets sealed and the furnace air circulator operating at high speed. For the purpose of this paragraph and § 3280.715(b) pressures shall be measured with a water manometer or equivalent device calibrated to read in increments not greater than 1⁄10 inch water column.~~

Each manufactured home equipped with a duct system, which may include air handlers and filter boxes, must have supply ducts and be sealed to limit total air leakage to less than or equal to four (4) cubic feet per minute per 100 square feet of conditioned floor area at a pressure differential of 0.1 inch w.g. (25 Pascals) across the system. Building framing cavities must not be used as ducts or plenums when directly connected to mechanical systems. ~~The duct total air leakage requirements are adapted from section R403 of the 2021 IECC.~~

Duct systems must be sealed against air leakage in accordance with the duct manufacturer's installation instructions and the following provisions:

(1) All metal ducts and fittings shall be sealed. For glass fiberboard ducts, the manufacturer's sealing instructions shall be followed. Sealants are in addition to mechanical fastening (if used).

(2) Connections and routing of manufacturer installed ductwork completed without kinks or sharp bends that would significantly impede air flow.

(3) Flexible ducts in unconditioned space not installed in cavities smaller than outer duct diameter; in conditioned space not installed in cavities smaller than inner duct diameter

Appendix G:
MHI Handout - November 2022 Meeting

ANALYSIS GROUP

Analysis of DOE’s Energy Conservation Standards for Manufactured Housing

Identification of Potential Issues and Sensitivity Analyses

November 11, 2022

Executive Summary

- <u>Assignment</u>
  - DOE relied upon a cost-benefit analysis for consumers of manufactured homes
  - Analysis Group assessed this cost-benefit analysis with particular focus on **important inputs that have changed** since DOE's original analysis
- <u>Summary of Preliminary Conclusions</u>
  1. Adjusting DOE's assumptions for recent inflation and interest rate increases invalidates DOE's conclusion that its proposed rule is cost-effective for consumers
  2. DOE's rule will have particularly negative impacts on minority and low-income homebuyers, who tend to face higher borrowing costs
  3. DOE has underestimated the number of households that will no longer be able to afford a manufactured home as a result of the rule
  4. DOE has failed to consider additional costs of compliance, such as duct testing and transportation costs, which could further negate any anticipated savings for consumers

Qualifications

Pavel Darling, Vice President (*MBA, MIT Sloan School of Management; B.A. in Economics, Middlebury College)*

Mr. Darling is an expert on energy matters, and often consults to utilities, state and regional organizations, and global companies in his work. He focuses on projects related to cost/benefit analyses of new construction and resource retirements; environmental effects of emissions and pollution controls; economic impacts of energy projects, mergers and policies; and natural gas, biomass, and other market studies. Mr. Darling also has extensive experience working on various climate change projects, including assessments of decarbonization policy proposals and quantification of greenhouse gas emissions impacts.

He has also submitted and supported expert testimony across different venues, including state utility commissions, siting boards, the Federal Energy Regulatory Commission and the Environmental Protection Agency. Mr. Darling's prior experience working at a utility involved preparing annual filings and working with stakeholders to assess bill impacts of proposed energy efficiency changes. He has also coauthored a number of published reports and journal articles.

About Analysis Group

Analysis Group is one of the largest international economics consulting firms, with more than 1,000 professionals across 14 offices in North America, Europe, and Asia. Since 1981, we have provided expertise in economics, finance, health care analytics, and strategy to top law firms, Fortune Global 500 companies, and government agencies worldwide. Our internal experts, together with our network of affiliated experts from academia, industry, and government, offer our clients exceptional breadth and depth of expertise.

Analysis Group's Energy & Environment practice is distinguished by our deep expertise in economics, finance, regulatory issues, and public policy, as well as significant experience in environmental economics and energy infrastructure development. We have worked on energy issues for a wide variety of clients, including energy producers, energy customers, regulatory commissions and government agencies, system operators, foundations, and nongovernmental institutions.

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Background on DOE's Energy Efficiency Standards for Manufactured Housing

- Key Dates:
  - Aug. 26, 2021 DOE issued Supplemental Notice of Proposed Rulemaking (SNOPR)
  - May 31, 2022 Final rule and cost-benefit analyses released, relying on data from 2021 and earlier
  - May 31, 2023 Expected compliance date

- By statute, DOE must consider cost effectiveness (42 U.S.C 17071(b)(1))
  - "The energy conservation standards established under this section shall be based on the most recent version of the International Energy Conservation Code (including supplements), **except in cases in which the Secretary finds that the code is not cost-effective**, or a more stringent standard would be more cost-effective, based on the impact of the code on the purchase price of manufactured housing and on total life-cycle construction and operating costs."

Summary of Preliminary Conclusions

DOE's conclusions on cost effectiveness disregard or do not sufficiently consider variation in key cost inputs over time and across groups for buyers and suppliers

1 **Inflation and Cost Increases**	DOE has failed to consider the impacts of considerable cost increases and supply chain constraints. Taking these into account, DOE's conclusion is invalid and the rule has a net cost to consumers rather than a benefit.
2 **Negative and Inequitable Impacts**	DOE has failed to consider negative impacts on low-income and minority homebuyers.
3 **Affordability and Credit Access**	DOE has underestimated potential impacts on credit access and lost sales.
4 **Additional Costs**	DOE has failed to consider potential costs of testing and compliance, transportation, and supply chain constraints.

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Background: DOE's Life-Cycle Cost (LCC) Model

- DOE estimated the **total customer cost** over the life of the manufactured home via the Life-Cycle Cost model, including:
  - **Purchase costs** (e.g., the price of additional energy efficiency measures), and
  - **Operating costs** (e.g., energy bill savings)
- Future costs and savings are discounted to their value in the present year
- Analysis occurs over both 10- and 30-year periods
- DOE also calculates a payback period, equal to the increase in upfront cost divided by the energy savings in first year

DOE's Life-Cycle Cost Model

Purchase Cost Increases – **Operating Cost Savings**

Our Focus: Evaluating DOE's Cost-Benefit Analysis by Updating Key Inputs

Upfront Cost + **Monthly Mortgage** – **Annual Energy Savings**

Upfront Cost

Primary inputs

- Energy efficiency measure (EEM) costs and inflation

Other inputs

- Down payment
- Sales tax
- Loan fees

Monthly Mortgage

Primary inputs

- Interest rates, which vary by loan type (personal property, real estate)

Other inputs

- Down payment amount
- Property tax

Annual Energy Savings

Primary inputs

- Energy prices and inflation

Other inputs

- Regional energy consumption patterns
- Energy efficiency measure (EEM) efficacy
- Home energy source

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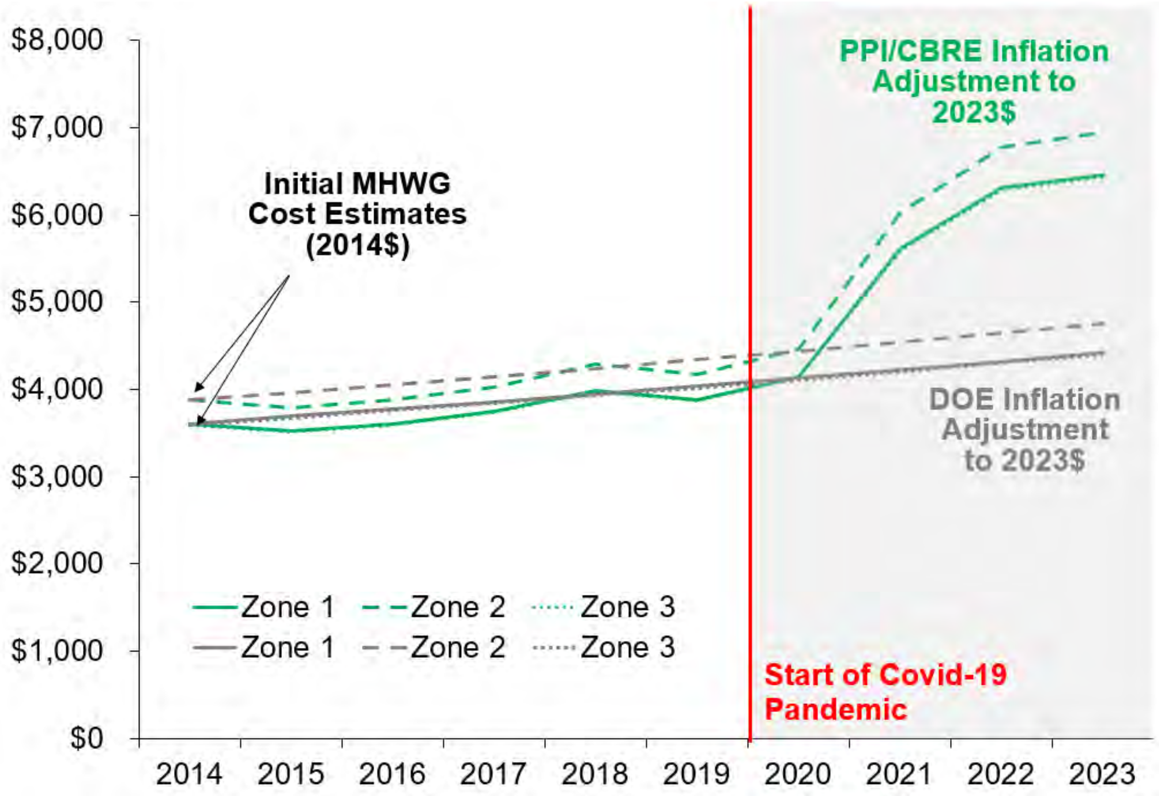
4 **Additional Costs**	DOE has failed to consider potential costs of testing and compliance, transportation, and supply chain constraints.

DOE Has Inadequately Adjusted EEM Cost Estimates for Inflation

- DOE calculated the costs of energy efficiency measures using cost estimates provided by the Manufactured Housing Working Group in **2014**
- To adjust for inflation, DOE assumes an annual nominal cost increase of **2.3 percent** between 2014-2023 (See gray lines)
- However, costs have increased substantially since the start of the Covid-19 pandemic. According to the BLS Producer Price Index for construction costs, materials costs have grown at an average annual rate of **6.5 percent** between 2014-2021, driven mostly by cost increases of **35.1 percent** from 2020-2021 (See green lines)
- Industry interviews suggest even higher recent increases beyond PPI, with costs at a new floor and unlikely to regress

Estimated Costs of Energy Efficiency Measures, by Inflation Adjustment Approach and Climate Zone



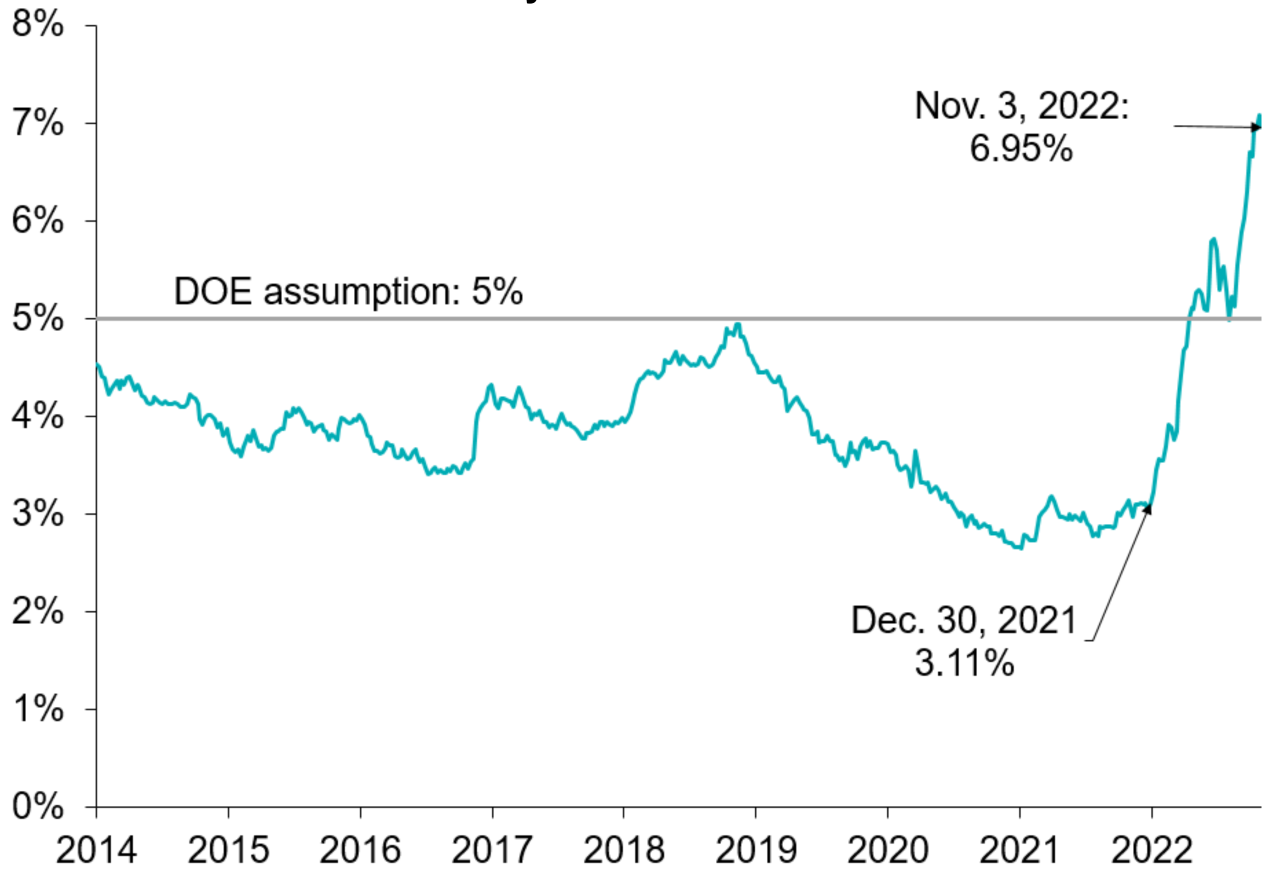
Note: Inflation estimates for PPI/CBRE series for 2022 and 2023 are from the "decreased demand" scenario of the CBRE's Construction Costs Index Forecast.

Sources: U.S. Bureau of Labor Statistics, Producer Price Index by Commodity: Special Indexes: Construction Materials [WPUSI012011], retrieved from FRED on October 30, 2022, Federal Reserve Bank of St. Louis, available at https://fred.stlouisfed.org/series/WPUSI012011; CBRE Research, "2022 U.S. Construction Cost Trends," July 2022, available at https://www.cbre.com/insights/books/2022-us-construction-cost-trends; U.S. Department of Energy, Manufactured Housing Life-Cycle Cost Analysis (LCC) Spreadsheet, May 18, 2022, available at https://www.regulations.gov/document/EERE-2009-BT-BC-0021-1996.

Mortgage Interest Rates Have Increased Above DOE's Assumptions

- DOE assumed interest rates of **5 percent** for mortgage loans and **9 percent** for personal property loans
- These assumptions were arguably conservative at the time, but mortgage rates have increased from approximately 3 to **7 percent**
- Industry interviews have suggested that personal property loan interest rates may be as high as **11.5 percent** for some borrowers
  - Moreover, DOE's own review of available evidence suggests that personal property loan interest rates are typically between 0.5 percentage points and 5 percentage points higher than real estate loan interest rates

30-Year Fixed Rate Mortgage Average in the United States
January 2014 – November 2022



__Sources:__ Freddie Mac, 30-Year Fixed Rate Mortgage Average in the United States [MORTGAGE30US], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/MORTGAGE30US, November 3, 2022; U.S. Department of Energy, "2022-05 Technical Support Document: Final Rule Energy Conservation Standards for Manufactured Housing, May 18, 2022, available at https://www.regulations.gov/document/EERE-2009-BT-BC-0021-1999, p. 8-4.

Energy Costs Have Increased As Well, Increasing Anticipated Savings

- Over the past year, energy costs have increased due to geopolitical and pandemic related disruptions
- The U.S. Energy Information Administration has increased its forecasted energy prices for 2023 and beyond based on its *Annual Energy Outlook* (AEO)
- The DOE LCC analysis relies on energy price forecasts from 2021

U.S. Energy Information Administration's Forecasted Energy Prices, by Forecast Year

	Nominal Energy Prices			
	AEO 2021 Assumptions	AEO 2022 Assumptions	Units	% Change
Natural Gas	$10.14	$11.70	$/Mbtu	+7.1%
Propane	$17.30	$21.49	$/Mbtu	+10.8%
Elec Heat	$0.13	$0.14	$/kWh	+1.9%
Elec Cool	$0.13	$0.14	$/kWh	+1.5%
Elec Other	$0.13	$0.14	$/kWh	+1.9%
Oil	$17.75	$21.71	$/Mbtu	+10.0%

Sources: *Annual Energy Outlook 2022, Table: Table 3. Energy Prices by Sector and Source, retrieved from U.S. Energy Information ; Short-Term Energy Outlook Data Browser, 2. Energy Prices, retrieved from U.S. Energy Information Administration on November 03, 2022, available at https://www.eia.gov/outlooks/steo/data/browser/#/?v=8.*

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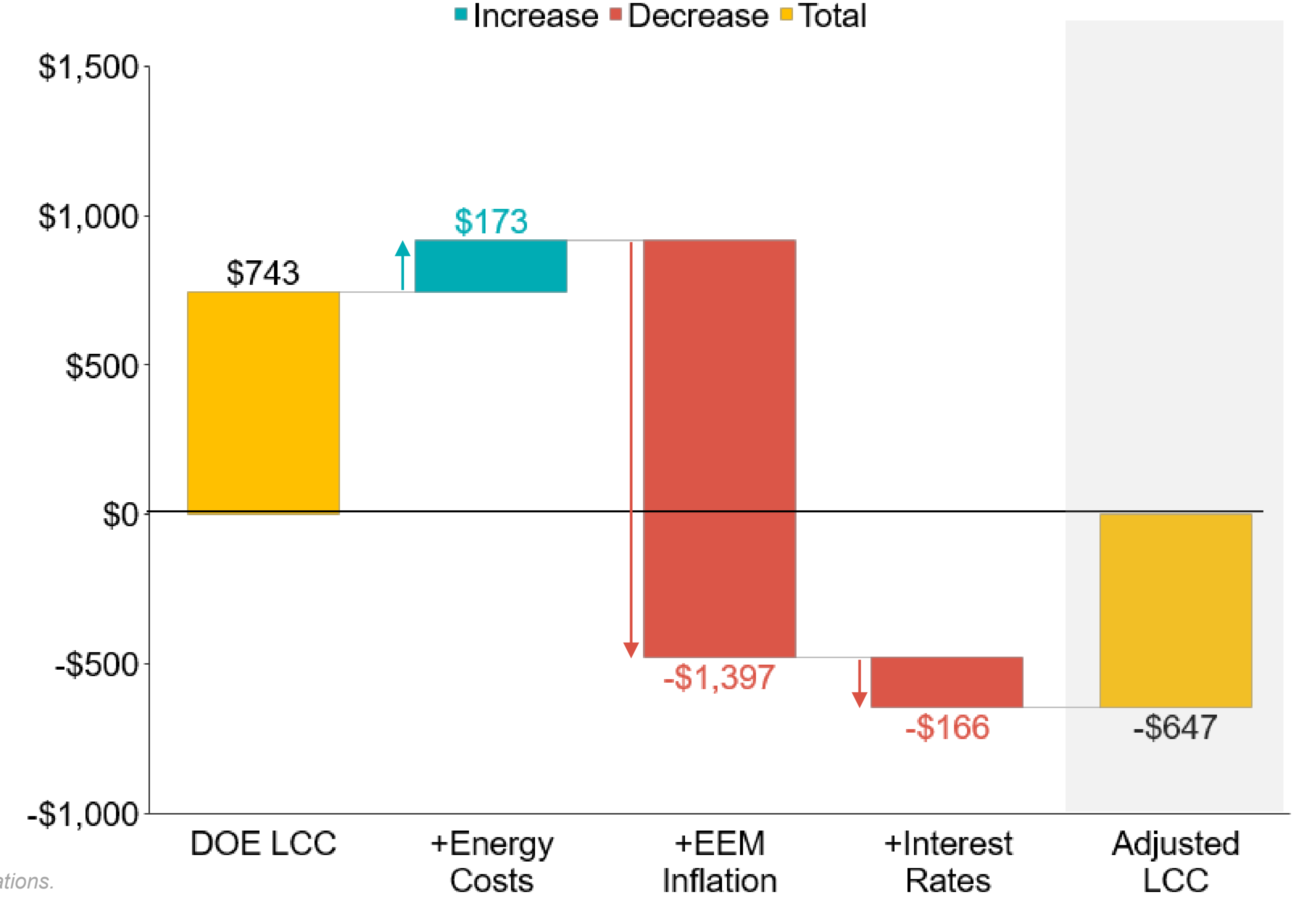
On Net, Changes in the Recent Economic Environment Have Reversed Expected Cost Savings from the DOE Rule

- While increased energy cost forecasts have increased expected savings from the rule, the large increase in construction material costs since 2022 far outweighs these gains
- Additionally, adjusting for higher interest rates adds to expected increased costs
  - Real estate loan interest rates have been adjusted from 5 percent to **7 percent**
  - Personal property loan interest rates have conservatively been left at DOE's assumption of **9 percent**

Tier 2 LCC Adjustments - 10-Year Analysis Period

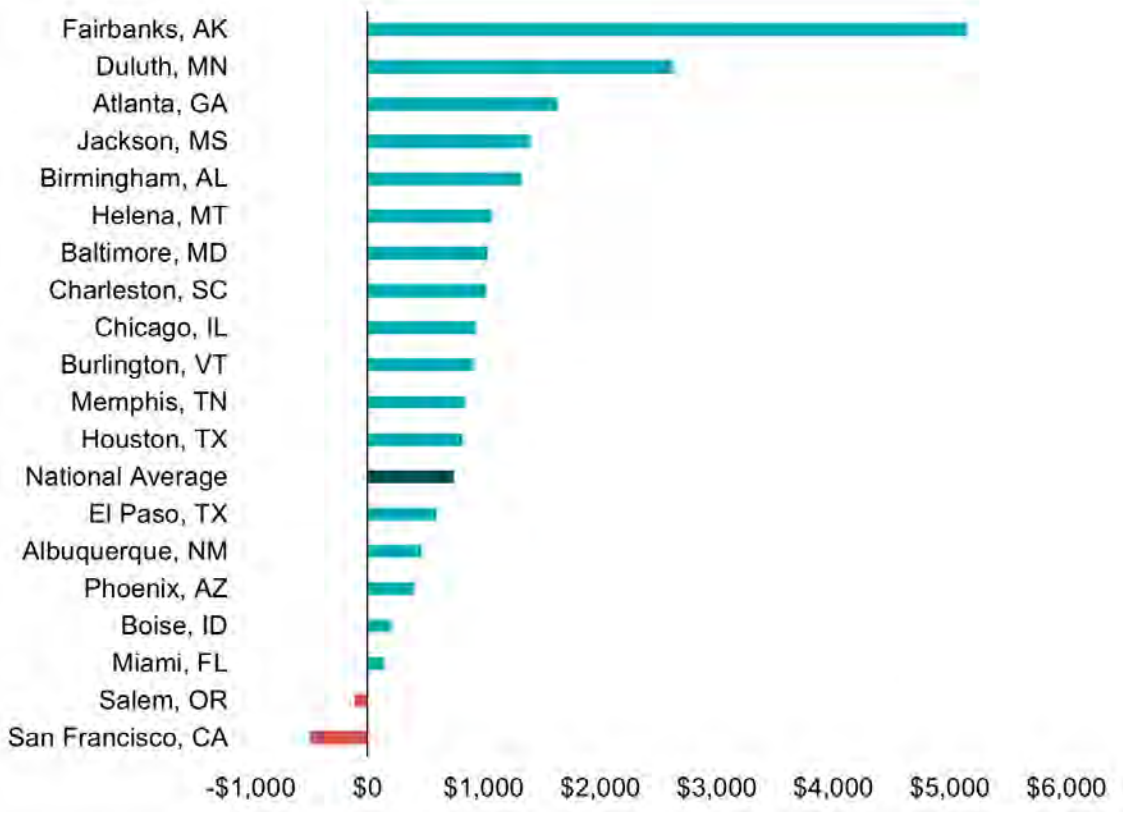


Sources: U.S. Bureau of Labor Statistics, CBRE Research, Department of Energy, Freddie Mac, AG Calculations.

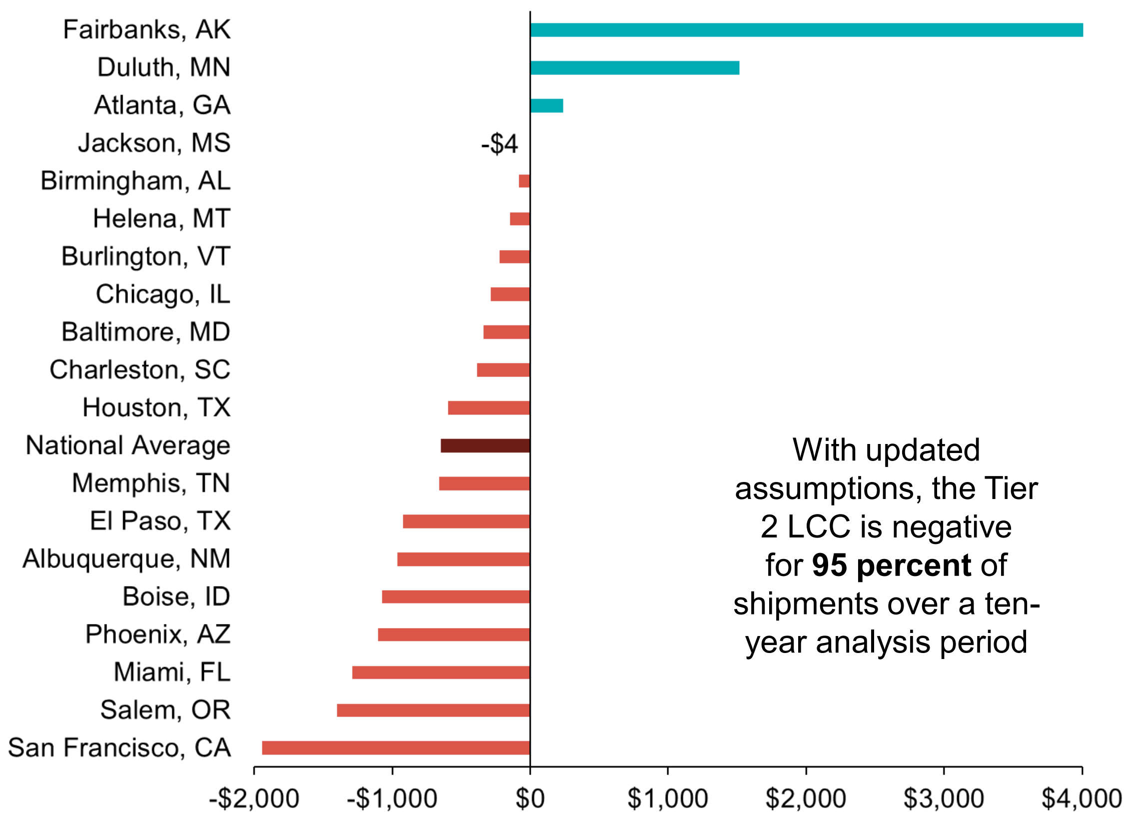
With Updated Costs, 10-Year Tier 2 LCC Negative For Most of the Country

Tier 2 LCC Adjustments, by City (10-Year Analysis Period)

DOE LCC Estimates



Adjusted LCC Estimates



With updated assumptions, the Tier 2 LCC is negative for **95 percent** of shipments over a ten-year analysis period

Sources: U.S. Bureau of Labor Statistics, CBRE Research, Department of Energy, Freddie Mac, AG Calculations.

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Summary of Preliminary Conclusions

DOE's conclusions on cost effectiveness disregard or do not sufficiently consider variation in key cost inputs over time and across groups for buyers and suppliers

1	**Inflation and Cost Increases**	DOE has failed to consider the impacts of considerable cost increases and supply chain constraints. Taking these into account, DOE's conclusion is invalid and the rule has a net cost to consumers rather than a benefit.
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3	**Affordability and Credit Access**	DOE has underestimated potential impacts on credit access and lost sales.
4	**Additional Costs**	DOE has failed to consider potential costs of testing and compliance, transportation, and supply chain constraints.

DOE's Average Buyer Analysis Masks Negative Outcomes for a Number of Subgroups

- DOE LCC calculation is an average of the LCCs for many types of buyers
- LCC estimates vary along many dimensions, including:
  - Loan type (personal property, real estate, cash)
  - Credit score
  - Home heating fuel type (e.g., natural gas, electric resistance, heat pump)
  - Climate zone/geography
- Ultimately, low-income and minority buyers are more likely to be negatively impacted by the rule
  - The Biden Administration has prioritized housing affordability and racial equity:

    "The Federal Government has a critical role to play in overcoming and redressing… [its role in declining to invest in communities of color and in failing to provide equitable access,] and in protecting against other forms of discrimination by applying and enforcing Federal civil rights and fair housing laws. It can help ensure that fair and equal access to housing opportunity exists for all throughout the United States."

Source: "Memorandum on Redressing Our Nation's and the Federal Government's History of Discriminatory Housing Practices and Policies," *The White House*, January 26, 2021, available at https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/26/memorandum-on-redressing-our-nations-and-the-federal-governments-history-of-discriminatory-housing-practices-and-policies/.

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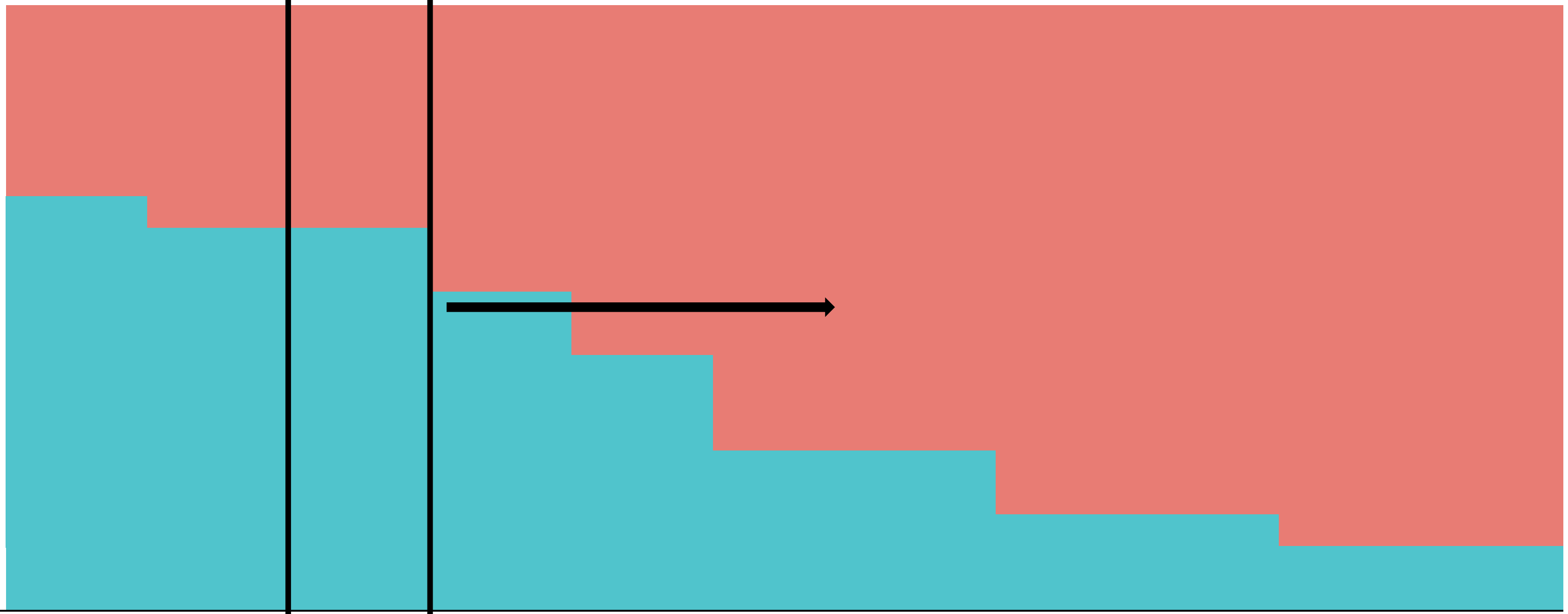
Under DOE's Original Assumptions, 10-Year LCC for Tier 2 Personal Property Loans is Negative

With Higher Interest Rates, LCC Becomes Negative for More Parts of the Country



	Personal Property Loan Interest Rate										
City	**8.0%**	**8.5%**	**9.0%**	**9.5%**	**10.0%**	**10.5%**	**11.0%**	**11.5%**	**12.0%**	**12.5%**	**13.0%**
San Francisco, CA											
Salem, OR											
Miami, FL											
Boise, ID											
Phoenix, AZ											
Albuquerque, NM											
El Paso, TX											
Memphis, TN											
Houston, TX											
Burlington, VT											
Chicago, IL											
Charleston, SC											
Baltimore, MD											
Helena, MT											
Birmingham, AL											
Jackson, MS											
Atlanta, GA											
Duluth, MN											
Fairbanks, AK											
Number of Cities with Negative LCC	6	7	7	9	11	14	14	16	16	17	17
Share of Shipments to Cities with Negative LCC	27%	37%	37%	60%	71%	86%	86%	95%	95%	98%	98%
Tier 2 LCC National Average	$ 211	$ 97	-$ 19	-$ 136	-$ 254	-$ 372	-$ 492	-$ 613	-$ 733	-$ 855	-$ 977

Note: Red indicates negative LCCs and blue indicates positive LCCs. Darker colors correspond with higher absolute values. ***Source:*** DOE LCC Model.

Minority Buyers Are Relatively More Likely to Rely on Higher-Cost Personal Property Loans to Finance Purchases

- Many borrowers such as those with low credit scores or residents of Manufactured Housing communities face interest rates as high as 11.5 percent
- Minority buyers finance MH purchases with personal property loans at especially high rates compared to non-minority buyers

Share of Manufactured Home Purchases Financed by Personal Property Loans (vs. Real Estate Only), by Demographic Cohort

	Share of Personal Property Loans (vs Real Estate only)	Compared to All Households	Total Loans in Cohort (Personal Property and Real Estate)
All Households	42.8%	-	130,570
Low-Income Households	45.4%	*+2.6%*	65,583
Very Low-Income Households	45.1%	*+2.3%*	19,786
Hispanic	53.8%	*+11.0%*	16,224
Low-Income Hispanic Households	55.1%	*+12.3%*	8,406
Black or African American	65.1%	*+22.3%*	8,998
Low-Income Black or African American Households	66.7%	*+24.0%*	5,841
American Indian or Alaskan Native	54.7%	*+11.9%*	1,551
Low-Income American Indian or Alaskan Native Households	56.2%	*+13.4%*	840
Asian	48.6%	*+5.9%*	1,220

Sources: *2021 Home Mortgage Disclosure Act, United States Census Bureau.*

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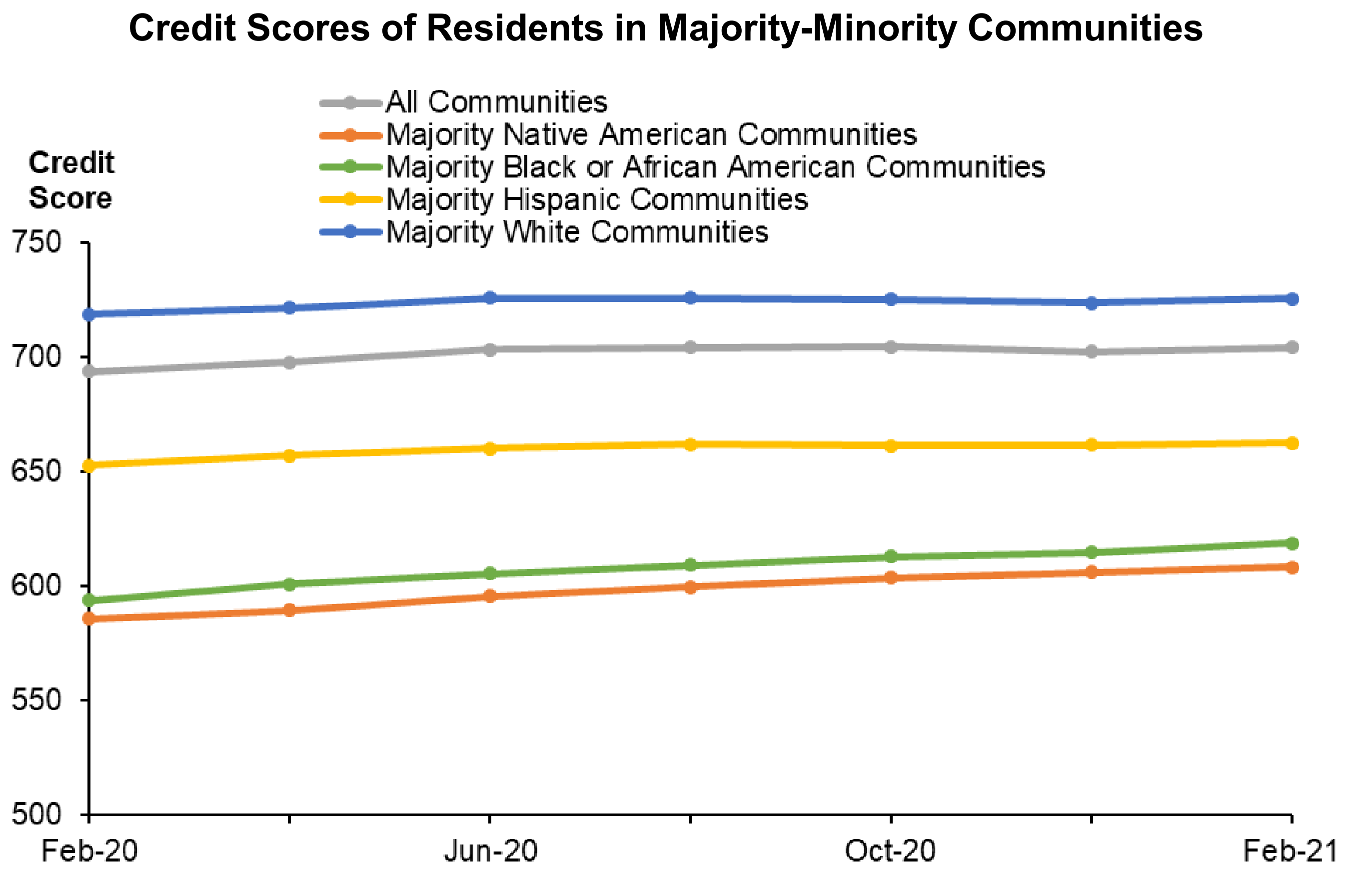
Low-Income and Minority Households Face Higher Borrowing Costs than the Median Household

- Residents of majority-minority communities tend to have lower credit scores than compared to white communities and the national average
- Low-income and minority buyers tend to face higher interest rates



Sources: Urban Institute Credit Bureau Data; 2021 Home Mortgage Disclosure Act.

The Negative Impact of DOE's Proposed Rule Can Be Illustrated With a Few Representative Borrowers

Quoted Rates from 21st Mortgage's Payment Estimator Help to Approximate Current Loan Terms

- The following slides illustrate several groups of representative borrowers, which differ according to the following characteristics:
  - City [E.g., Memphis, TN (Climate Zone 2)]
  - Credit Score [E.g., 650-680]
  - Home Cost [E.g., $100,000]
  - Down Payment [E.g., 10%]
  - Loan Type [E.g., Home-only (Private Land)]
- 21st Mortgage's "Payment Estimator" tool estimates interest rates and loan terms, given these characteristics, which we then use to calculate LCC values
  - 21st Mortgage is the largest manufactured-home lender in the country, so rates give a general sense of terms facing a current prospective manufactured homebuyer
- Credit score and energy consumption patterns by geography are key drivers of differences in anticipated savings for prospective multi-section home buyers

Geographic Energy Consumption Patterns Drive Considerable Differences Across Cities for Prospective Tier 2 Borrowers

Buyers with Good Credit Would Have Significantly Negative LCC in Most Cities

Profile	Memphis	Miami	El Paso	Houston	Phoenix	Baltimore
City	**Memphis (Climate Zone 2)**	**Miami (Climate Zone 1)**	**El Paso (Climate Zone 2)**	**Houston (Climate Zone 1)**	**Phoenix (Climate Zone 2)**	**Baltimore (Climate Zone 3)**
Credit score	650-680	650-680	650-680	650-680	650-680	650-680
Home cost	$110,000	$110,000	$110,000	$110,000	$110,000	$110,000
Down payment	10%	10%	10%	10%	10%	10%
Loan type	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)
Quoted rates (21st Mortgage)						
Interest rate	9.35%	9.35%	9.35%	9.35%	9.35%	8.60%
Term	25 years	25 years	25 years	25 years	25 years	25 years
10-year LCC						
Given DOE Assumptions	-$ 66	-$ 612	-$ 280	-$ 29	-$ 448	$ 366
Updated EEM Costs, Energy Prices	-$1,586	-$2,077	-$1,821	-$1,462	-$1,985	-$ 988
30-year LCC*						
Given DOE Assumptions	$1,712	$ 605	$1,323	$1,638	$1,052	$2,452
Updated EEM Costs, Energy Prices	-$ 143	-$1,206	-$ 565	-$ 119	-$ 837	$ 773

Notes: *Asterisk (*) indicates that estimates are from DOE's original model, i.e., without a correction for an error where loan payments after Year 15 are not included in the LCC calculation for personal property loans. Quoted rates are for a single applicant. From HMDA, roughly 58% of applications are from single applicants.* ***Source:*** *21st Mortgage Corporation, Payment Estimator, accessed November 7, 2022, available at https://www.21stmortgage.com/web/payment-estimator.nsf/q1.html; U.S. Department of Energy, Manufactured Housing Life-Cycle Cost Analysis (LCC) Spreadsheet, May 18, 2022, available at https://www.regulations.gov/document/EERE-2009-BT-BC-0021-1996.*

ANALYSIS GROUP

Excellent-Credit-Score Borrowers are the Only Credit Score Group with Positive Tier 2 10-Year LCCs (e.g., Memphis)

Based on Industry Interviews, Only 1/3 of MH Buyers Have Credit Scores Over 675

Profile	**Poor Credit**	**Average Credit**	**Good Credit**	**Good Credit**	**Excellent Credit**	**Excellent Credit**
City	Memphis	Memphis	Memphis	Memphis	Memphis	Memphis
Credit score	**Under 600**	**600-650**	**650-680**	**680-700**	**700-750**	**750+**
Home cost	$110,000	$110,000	$110,000	$110,000	$110,000	$110,000
Down payment	10%	10%	10%	10%	10%	10%
Loan type	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)	Home only (Private Land)
Quoted rates (21st Mortgage)						
Interest rate	11.45%	10.10%	9.35%	9.35%	8.35%	8.35%
Term	25 years	25 years	25 years	25 years	25 years	25 years
10-year LCC						
Given DOE Assumptions	-$ 578	-$ 259	-$ 66	-$ 66	$ 209	$ 209
Updated EEM Costs, Energy Prices	-$2,202	-$1,818	-$1,586	-$1,586	-$1,252	-$1,252
30-year LCC*						
Given DOE Assumptions	$ 630	$1,288	$1,712	$1,712	$2,355	$2,355
Updated EEM Costs, Energy Prices	-$1,255	-$ 578	-$ 143	-$ 143	$ 516	$ 516

Notes: *Asterisk (*) indicates that estimates are from DOE's original model, i.e., without a correction for an error where loan payments after Year 15 are not included in the LCC calculation for personal property loans. Quoted rates are for a single applicant. From HMDA, roughly 58% of applications are from single applicants.* ***Source:*** *21st Mortgage Corporation, Payment Estimator, accessed November 7, 2022, available at https://www.21stmortgage.com/web/payment-estimator.nsf/q1.html; U.S. Department of Energy, Manufactured Housing Life-Cycle Cost Analysis (LCC) Spreadsheet, May 18, 2022, available at https://www.regulations.gov/document/EERE-2009-BT-BC-0021-1996.*

ANALYSIS GROUP

Summary of Preliminary Conclusions

DOE's conclusions on cost effectiveness disregard or do not sufficiently consider variation in key cost inputs over time and across groups for buyers and suppliers

1	Inflation and Cost Increases	DOE has failed to consider the impacts of considerable cost increases and supply chain constraints. Taking these into account, DOE's conclusion is invalid and the rule has a net cost to consumers rather than a benefit.
2	Negative and Inequitable Impacts	DOE has failed to consider negative impacts on low-income and minority homebuyers.
3	**Affordability and Credit Access**	**DOE has underestimated potential impacts on credit access and lost sales.**
4	Additional Costs	DOE has failed to consider potential costs of testing and compliance, transportation, and supply chain constraints.

Increased Costs Will Likely Impact Ability to Qualify for Financing

- Debt-to-income ratio is one of the top reasons why potential buyers of manufactured homes are denied loans
  - In 2021, **42 percent** of denied loans for MH purchases listed the applicant's debt-to-income ratio as a reason for denial
- The cost of owning a new manufactured home has increased by over 40 percent since 2020, according to an industry source
  - Additionally, the cost of construction materials has increased by at least 35 percent since 2020, increasing the cost of compliance
  - Together, these two factors are likely to increase the debt-to-income ratio for potential applicants for manufactured home loans, increasing the likelihood of loan denial
- Minority buyers tend to have lower incomes, and therefore the impacts of the rule have the potential to fall disproportionately on historically marginalized communities
  - Low-income buyers are likely to be disproportionately impacted for similar reasons

Sources: *2021 Home Mortgage Disclosure Act, Industry Interviews.*

DOE’s Reliance on Elasticity of Demand Estimates Understates Likely Impact on Affordability & Housing Access

- DOE has likely underestimated the affordability impact by assuming **relatively low price-sensitivity**
  - For example, AG’s updated EEM cost estimates suggest that the cost of Tier 2 homes will increase by **6.1 percent**
    - Under DOE’s assumption, a 6.1 percent increase in price leads to **2.9 percent fewer sales annually**
    - However, according to 2021 estimates of price sensitivity by the National Association of Home builders, the same 6.1 percent increase in price would lead to **6.4 percent fewer sales annually**
    - DOE’s own sensitivity analysis, based on a study HUD has cited in prior rulemakings, suggests that this 6.1 percent price increase would lead to **14.6 percent fewer sales annually**
- Additionally, DOE has likely underestimated impacts on affordability due to:
  - DOE has arguably **underestimated compliance costs** and the expected increases in MH prices due to the rule
  - The **recent increase in retail prices** of MHs may have made ownership unaffordable for many consumers already
    - Consumers may be increasingly sensitive to price increases at higher baseline prices
- DOE's assumption understates the decreased demand by *thousands* of potential manufactured home buyers per year, all of whom would have to choose from worse alternatives

Sources: *DOE Technical Support Document, pp. 8-3, 10-7 – 10-9; NAHB (2021); EERE-2009-BT-BC-0021-1997_content, Sheet "Price Elasticity," Cells E3:E4; AG Calculations.*

ANALYSIS GROUP

Summary of Preliminary Conclusions

DOE's conclusions on cost effectiveness disregard or do not sufficiently consider variation in key cost inputs over time and across groups for buyers and suppliers

1	Inflation and Cost Increases	DOE has failed to consider the impacts of considerable cost increases and supply chain constraints. Taking these into account, DOE's conclusion is invalid and the rule has a net cost to consumers rather than a benefit.
2	Negative and Inequitable Impacts	DOE has failed to consider negative impacts on low-income and minority homebuyers.
3	Affordability and Credit Access	DOE has underestimated potential impacts on credit access and lost sales.
4	**Additional Costs**	DOE has failed to consider potential costs of testing and compliance, transportation, and supply chain constraints.

DOE Has Not Accounted for Costs of Testing and Compliance, Which Could Entirely Offset Anticipated Life-Cycle Cost Savings

- DOE has not specified requirements for duct system testing and air leakage testing, which are required by the IECC
- The costs of these possible testing requirements were also not included in DOE's LCC analyses
- Industry interviews have suggested that the costs of compliance may range up to and possibly **over $1,000/house** for in-field testing of homes in more remote locations
- A $1,000 testing cost could nearly wipe out anticipated savings across all tiers and analysis periods

DOE and Adjusted LCC Values, by Tier and Analysis Period

	10-Year LCC		30-Year LCC*	
	Tier 1	Tier 2	Tier 1	Tier 2
DOE LCC	$720	$743	$1,594	$3,573
Adjusted LCC	$549	-$647	$1,395	$1,361
Adjusted LCC, with $1,000 Testing Cost	-$194	-$1,330	$426	$338

Note: Asterisk (*) indicates that the 30-year LCC estimates rely on DOE's original model, which erroneously excludes mortgage payments after the 15th year of personal property loans and therefore overestimates anticipated savings.

Transportation Costs May Further Reduce or Negate Anticipated Savings

- Interviews with industry experts, as well as public comments submitted to DOE, have suggested that DOE has underestimated additional transportation costs due to additional height and weight required to comply with the rule
  - Additional insulation and framing requirements may increase the weight of manufactured homes, requiring an additional axle, which may cost **at least $400 to $500/multi-section house**
  - The rule may require homes in CZ2 and CZ3 to use 2' x 6' studs instead of standard 2' x 4' studs, which increases package height. Height increases may require re-routing deliveries around areas with height restrictions, such as in the Northeast
- Additionally, transportation costs have increased in general during the pandemic, e.g., as fuel and labor costs have increased
- Incremental transportation costs were not included in DOE's LCC estimates

Pandemic-Related Supply Chain Shortages May Persist into 2023

- Industry interviews have predicted that pandemic-related supply chain shortages are likely to persist into 2023
  - For example, one interview noted that there were already insulation shortages, with additional cost increases coming in January 2023
  - New fiberglass insulation plants are capital-intensive and take time to build, and therefore insulation shortages are likely to persist in the medium term
  - Therefore, increased demand from the manufactured housing sector due to the DOE rule may further exacerbate existing insulation shortages
  - Without sufficient fiberglass insulation, manufacturers may be forced to substitute to spray foam insulation for parts of the production process, increasing costs significantly and reducing the total number of homes that can be produced per day
- Additionally, CBRE has predicted that pandemic-related delays and labor shortages will continue in the short term

10-year LCC for DOE Rule and MHI Proposal Using Adjusted LCC Model, Updated for EEM Cost Inflation, Energy Price, Interest Rates, and Heating Type

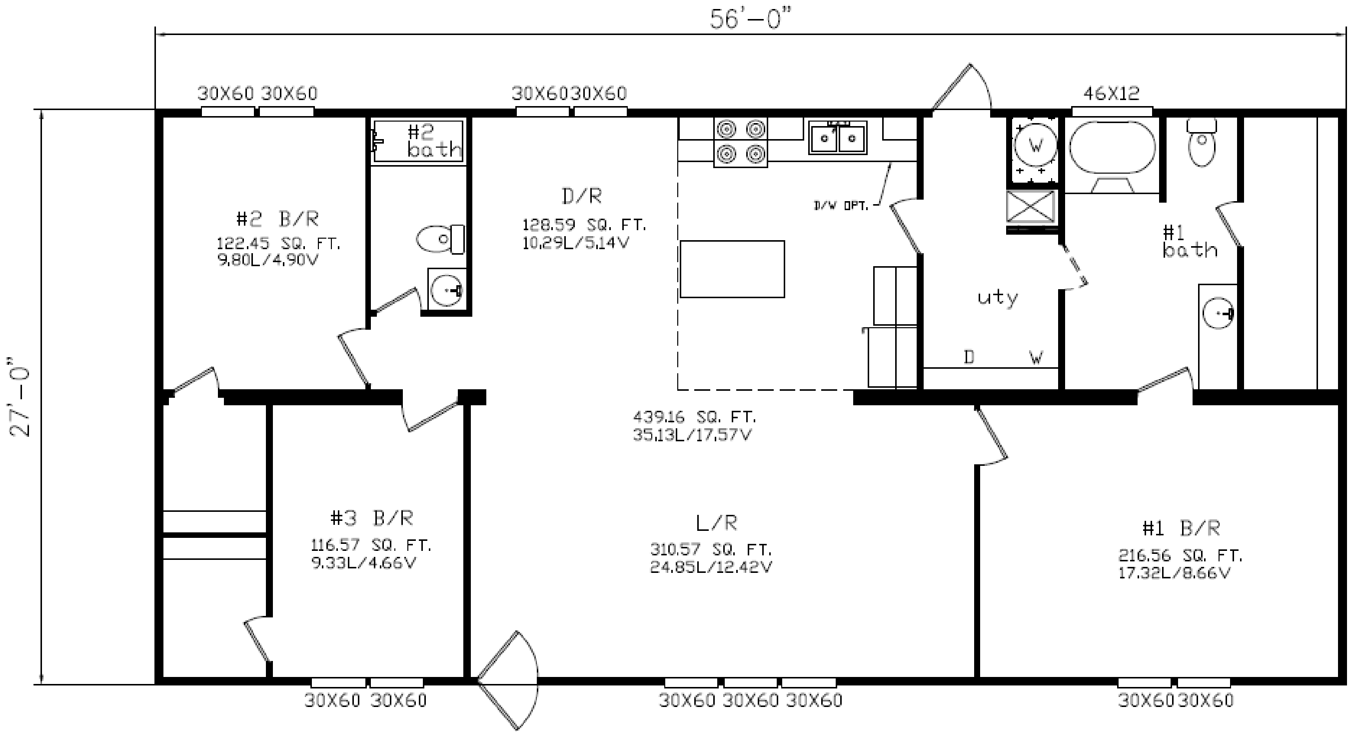
		DOE cost and savings estimates, based on Adjusted LCC Model and single heating type	MHI cost and savings estimates, based on SBRA inputs into Adjusted LCC Model and single heating type	
City	**Heating type**	**DOE rule**	**DOE rule**	**MHI proposal**
Miami	Electric	-$1,197	-$2,680	-$2,405
Houston	Natural Gas	-$1,455	-$2,688	-$2,256
Atlanta	Electric	$850	-$907	-$307
Charleston	Electric	$57	-$1,577	-$1,013
Jackson	Electric	$497	-$1,021	-$574
Birmingham	Electric	$445	-$1,050	-$494
Phoenix	Natural Gas	-$1,398	-$2,732	-$1,255
Memphis	Electric	-$16	-$1,831	-$619
El Paso	Natural Gas	-$1,927	-$3,355	-$1,690
San Francisco	Natural Gas	-$2,694	-$4,042	-$2,182
Albuquerque	Electric	$428	-$1,918	-$749
Baltimore	Natural Gas	-$2,403	-$2,862	-$1,564
Salem	Electric	$294	$831	$1,697
Chicago	Natural Gas	-$1,848	-$2,319	-$1,086
Boise	Electric	$742	-$452	$522
Burlington	Natural Gas	-$1,673	-$2,102	-$876
Helena	Electric	$2,225	$1,062	$1,827
Duluth	Natural Gas	-$860	-$1,335	-$189
Fairbanks	Natural Gas	$220	-$241	$680
National Average		-$934	-$2,132	-$1,154

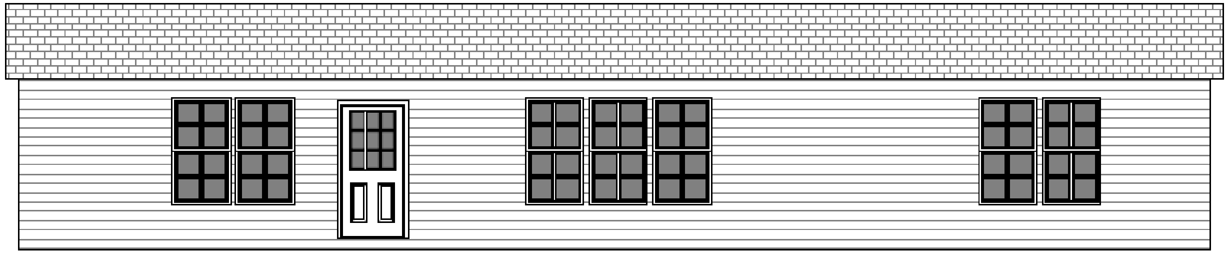
Note:
[1] All numbers begin with the Adjusted LCC Model, which reflects updated inflation rates used by DOE to estimate the incremental cost of the energy efficiency measures, energy prices from AEO 2022, a 7% interest rate for real estate loans, and a 9% interest rate for home-only loans. In addition, each calculation reflects the use of only a single heating type for each jurisdiction, as noted in the table.

Source:
[A] MHI cost and savings estimates from SBRA.

CURRENTLY BUILT MULTI WIDE – BOX SIZE 27x56

HEATED AREA – 1457 SQUARE FEET





<u>TYPICAL ZONE 3 CONSTRUCTION</u>

INSULATION – 22 FLOOR / 11 WALL / 28 CLG

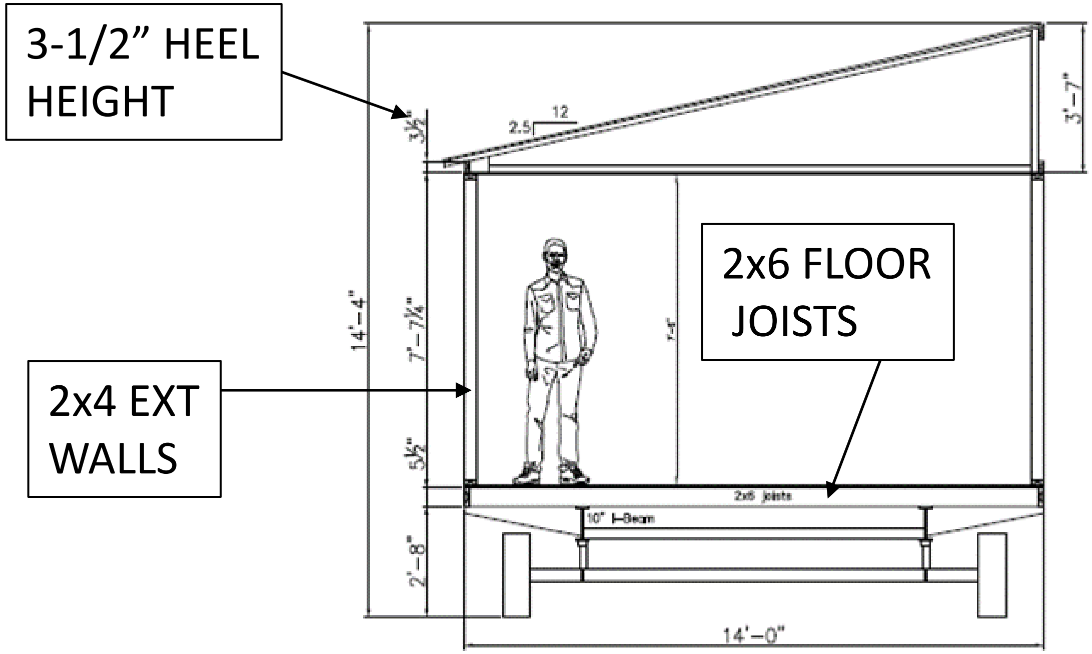
2x4 WALLS

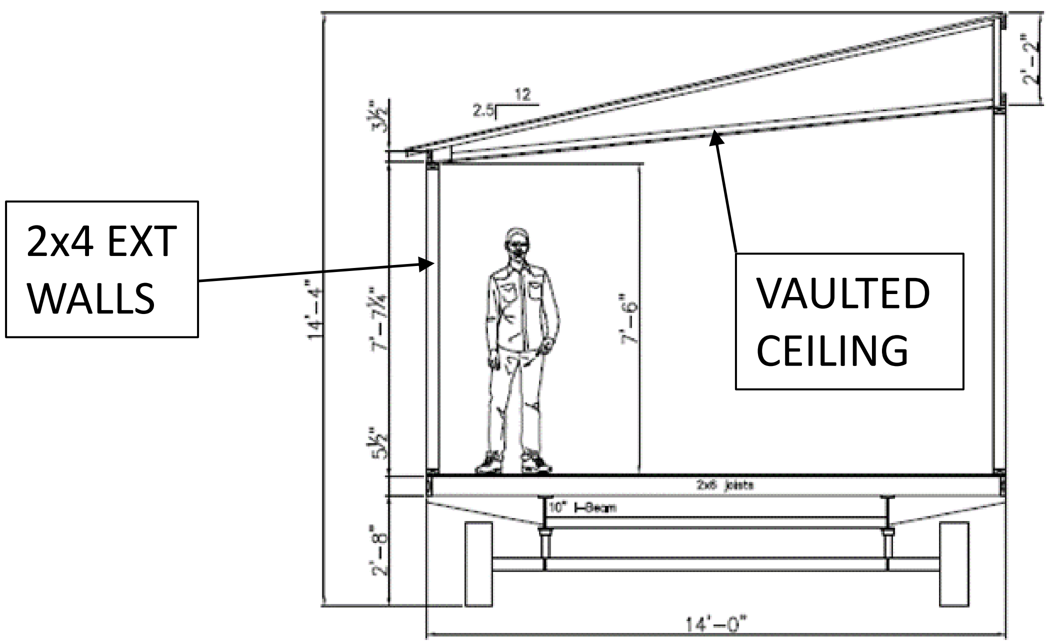
2x6 FLOOR JOISTS

142 SQUARE FEET OF WINDOWS

WINDOW U-VALUE = 0.34

CURRENT TYPICAL CROSS SECTIONS

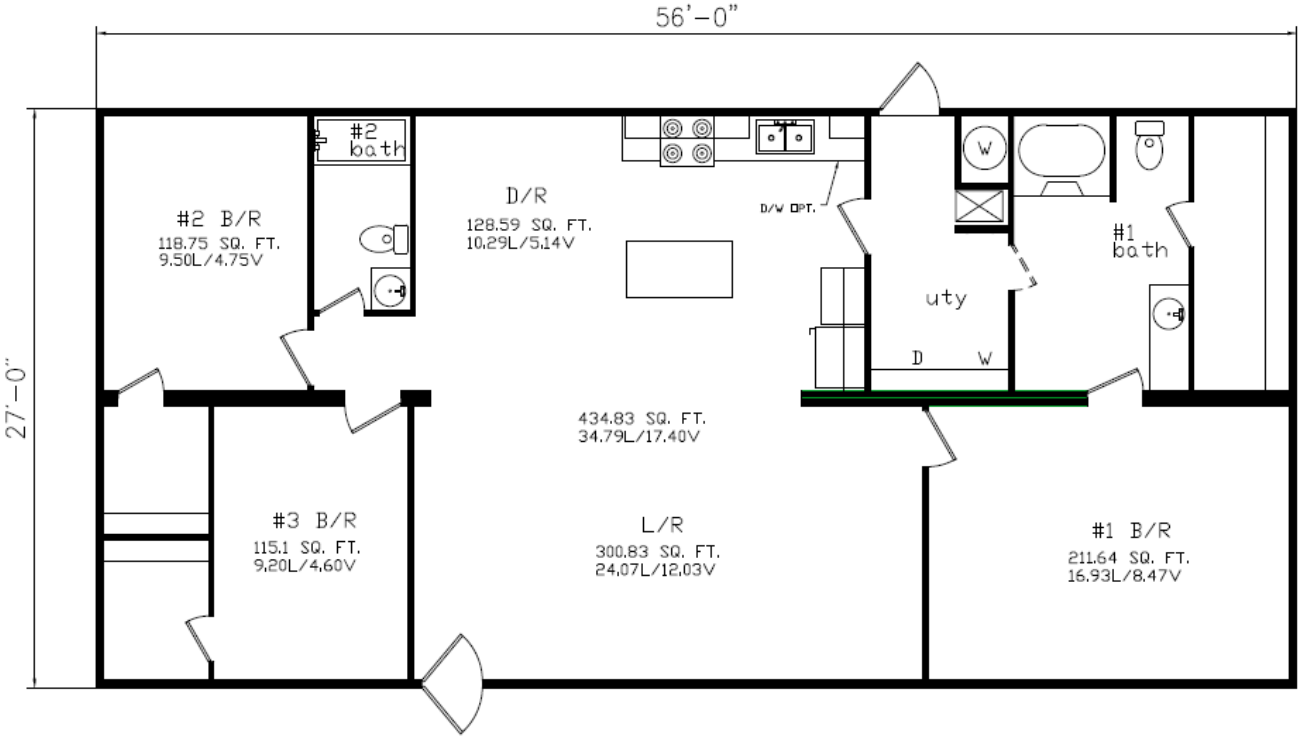


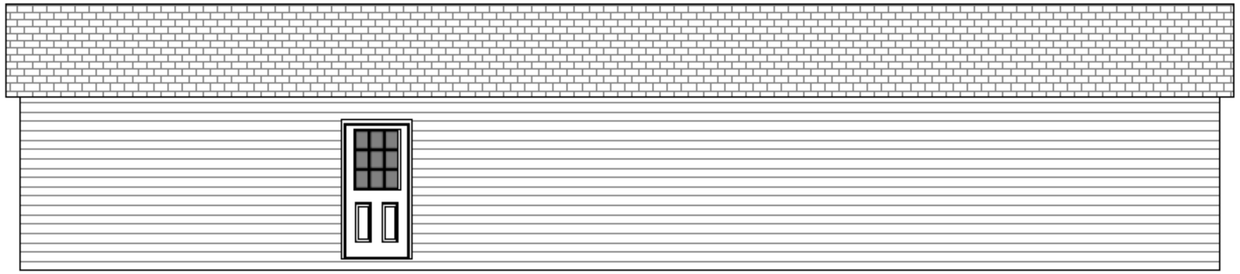


TYPICAL ZONE 3 CONSTRUCTION: SHIPPING HEIGHT 14'-4"
OPTIONAL VAULT CEILING
7'-6" SIDEWALL HEIGHT
3-1/2" TRUSS HEEL HEIGHT

IMPACT DUE TO DOE PROPOSED MULTI WIDE – BOX SIZE 27x56

HEATED AREA – 1457 SQUARE FEET





PROPOSED ZONE 3 CONSTRUCTION

INSULATION – 33 FLOOR / 15 WALL / 28 CEILING

2x4 WALLS

2x6 FLOOR JOISTS

ZERO WINDOWS

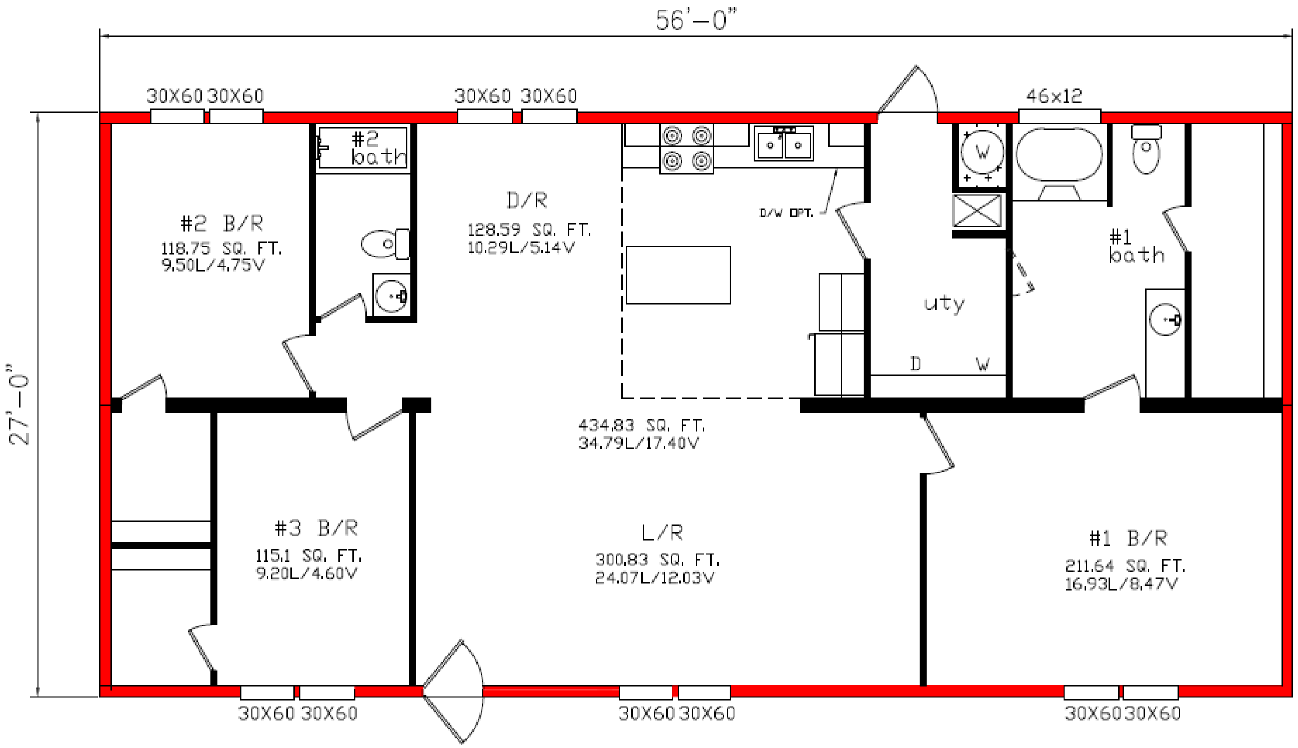
WINDOW U-VALUE = 0.32

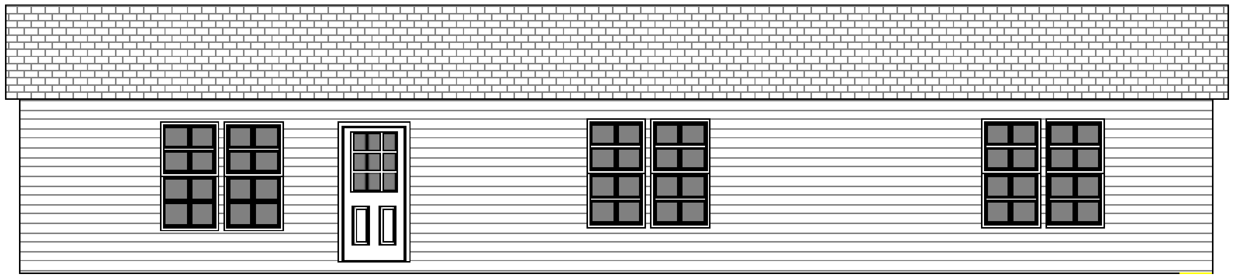
NOTES:

- THIS SLIDE SHOWS THE CHANGES REQUIRED IN ORDER TO REACH THE REQUIRED U-VALUE (0.55) WITHOUT CHANGING THE HOME CONSTRUCTION .
- FLOOR INSULATION WAS CHANGED TO R-33, WALL INSULATION WAS CHANGED TO R-15, AND CEILING INSULATION REMAINED R-28. THESE INSULATION VALUES ARE THE MAXIMUM POSSIBLE VALUES THAT CAN BE INSTALLED WITHOUT CHANGING THE HOME CONSTRUCTION FRAMING.
- WITH THIS CONSTRUCTION, I WAS ONLY ABLE TO GET THE OVERALL U-VALUE DOWN TO 0.55 IF ALL WINDOWS WERE REMOVED.
- PLEASE NOTE THAT IT IS NOT POSSIBLE TO CONSTRUCT A HOME WITHOUT WINDOWS DUE TO LIGHT, VENTILATION, and EGRESS REQUIREMENTS.

IMPACT DUE TO DOE PROPOSED MULTI WIDE – BOX SIZE 27x56

HEATED AREA – 1430 SQUARE FEET





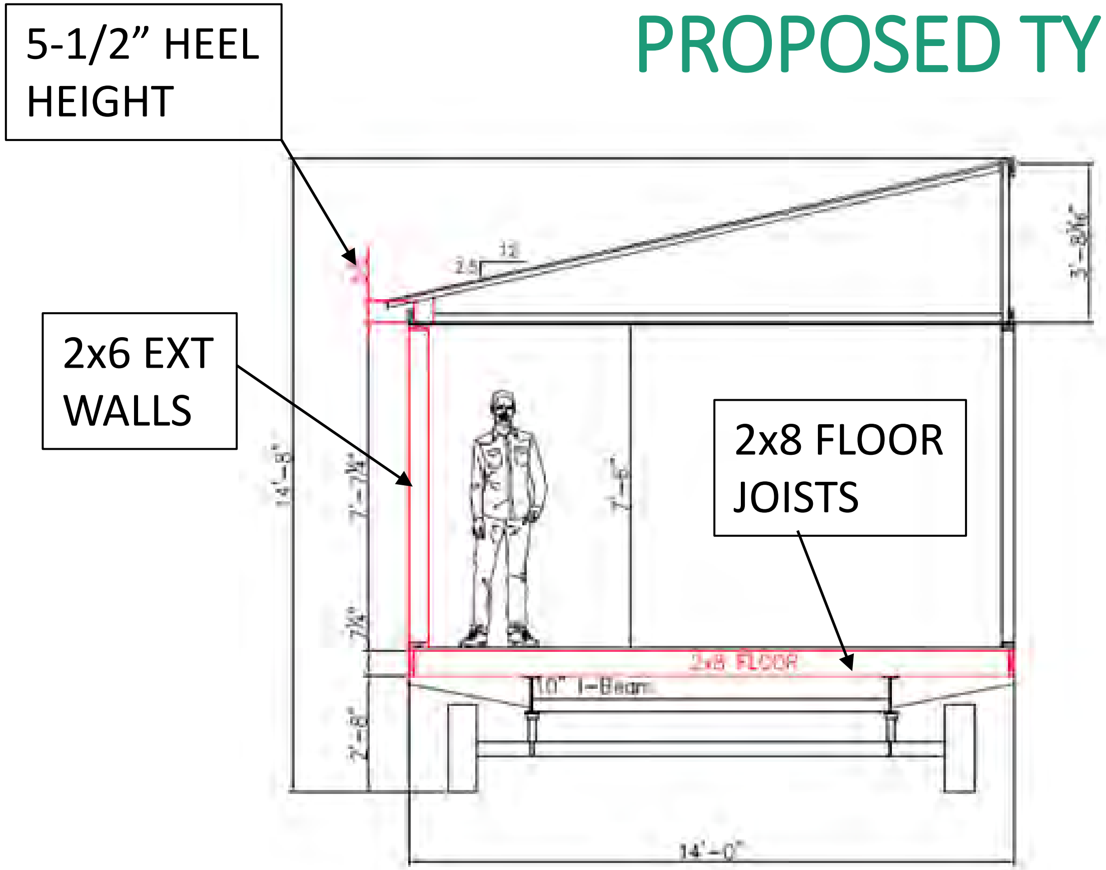
PROPOSED ZONE 3 CONSTRUCTION

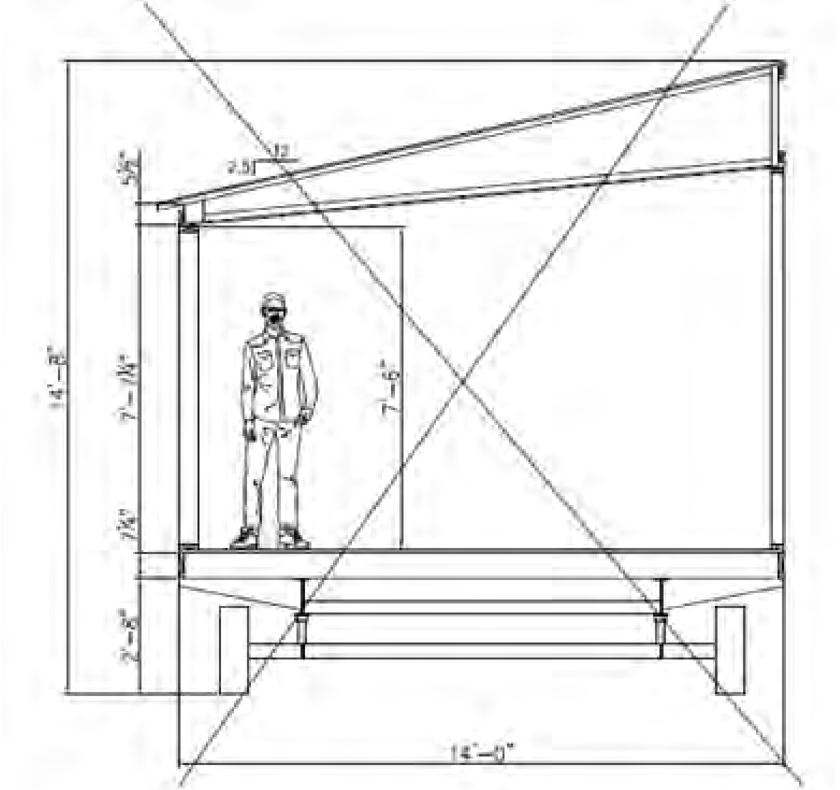
INSULATION – 30 FLOOR / 21 WALL / 38 CEILING
2x6 WALLS
2x8 FLOOR JOISTS
129 SQUARE FEET OF WINDOWS
WINDOW U-VALUE = 0.30
HEEL HEIGHT CHANGED TO 5.5 inches

NOTES:

- IN ORDER TO REACH THE REQUIRED U-VALUE (0.55) THE FLOORS WERE CHANGED TO 2x8 , THE WALLS WERE CHANGED TO 2x6 AND THE INSULATION PACKAGE WAS CHANGED TO THE VALUES LISTED IN THE PRESCRIPTIVE SECTION OF THE PROPOSED CODE. HOWEVER, IT WILL BE VERY DIFFICULT TO BUILD THE HOME WITH THIS INSULATION PACKAGE USING CURRENTLY AVAILABLE MATERIALS.
- HEATED AND COOLED INTERIOR SPACE REDUCED BY 27 SQUARE FEET DUE TO THE INCREASED WALL THICKNESS.
- R-30 IN THE FLOOR WILL REQUIRE BATT INSULATION TO BE INSTALLED BETWEEN THE FLOOR JOISTS COMBINED WITH A BLANKET BELOW THE JOISTS. CURRENTLY, MOST MANUFACTUER'S DO NOT USE THIS FLOOR INSULATION TECHNIQUE.
- R-21 IS AVAILABLE, BUT IN SMALL QUANTITIES
- R-38 WILL BE PROBLEMATIC TO GET INTO THE ROOF CAVITY DUE TO THE REQUIRED THICKNESS AND AVAILABLE SPACE IN THE ATTIC.
- ADDED BACK 11 OF THE PREVIOSULY REMOVED 12 WINDOWS. UPGRADED THE WINDOWS TO U-VALUE EQUAL TO 0.30. HOWEVER, IT SHOULD BE NOTED THAT THESE UPGRADED WINDOWS ARE NOT AVAILABLE IN THE MARKET TODAY.
- SHIPPING HEIGHTS WILL BE INCREASED DUE TO TALLER FLOORS AND TALLER HEEL HEIGHT TRUSS.
- THE OPTION FOR A VAULTED CEILING WILL NOT BE POSSIBLE DUE TO THE INCREASED INSULATION THCKNESS IN THE ATTIC.
- OPTIONS FOR 8 FEET OR 9 FEET WALL HEIGHTS AND TRANSOM WINDOW WILL ALSO BE IMPACTED.

PROPOSED TYPICAL CROSS SECTIONS





ZONE 3 CONSTRUCTION:

SHIPPING HEIGHT INCREASED TO 14’-8”
OPTIONAL VAULT CEILING IS NO LONGER AVAILABE DUE TO INSULATION THICKNESS
7’-6” SIDEWALL HEIGHT
5-1/2” TRUSS HEEL HEIGHT
2x8 FLOORS

ADDITIONAL PROPOSED CHANGES

- PROPOSES USING ACCA MANUAL S AND ACCA MANUAL J FOR HEATING AND COOLING EQUIPMENT. HOWEVER, USING ACCA MANUAL J AND ACCA MANUAL S FOR THE DESIGN OF HEATING AND COOLING EQUIPMENT WILL BE PROBLEMATIC, ESPECIALLY IN THERMAL ZONE 3. ACCA MANUAL J REQUIRES KNOWLEDGE OF THE ORIENTATION OF THE HOME WITH RESPECT TO THE SUN FOR COOLING LOAD ANALYSIS. BECAUSE THE ORIENTATION OF THE HOME IS OFTEN UNKNOWN UNTIL INSTALLED, THE PROPOSED RULE MUST ESTABLISH A DEFAULT ORIENTATION. ACCA MANUAL S ESTABLISHES SIZING LIMITS FOR HEATING AND COOLING EQUIPMENT, THESE LIMITS PRESUME THAT THERMAL LOADS ARE ESTABLISHED FOR A SPECIFIC LOCATION AND SPECIFIC BUILDING ORIENTATION. THE VARIATION IN DESIGN PARAMETERS WITHIN A SINGLE THERMAL ZONE EXCEEDS THE SIZING LIMITS OF ACCA MANUAL S. ADDITIONAL GUIDANCE WILL BE REQUIRED TO PROPERLY USE ACCA MANUAL S AND ACCA MANUAL J.

Appendix H:
HUD Proposal for Duct Leakage Testing - November 2022 MHCC Meeting

Pre-Decisional Draft
For MHCC review and discussion in its consideration of MHCSS changes based on the DOE Final Rule for Energy Conservation Standards for Manufactured Housing

HUD Proposal for Duct Leakage Testing (Strikethrough represents current draft of MHCC markup)

3280.715(b)(4)

(a) Factory installed supply ducts located partially or completely outside the building thermal envelope, with or without air handlers installed in the factory, shall demonstrate air leakage to the outside or total air leakage of less than or equal to 4 cfm per 100 ft2 of conditioned floor area when tested at a difference pressure of 0.1 inch w.g., (25pa). ~~Supply duct testing shall occur at a frequency determined by the manufacturer's quality assurance manual.~~

(b) Factory installed supply ducts located completely inside the building thermal envelope, with or without air handlers installed in the factory, shall demonstrate air leakage to the outside or total air leakage of less than or equal to 8 cfm per 100 ft2 of conditioned floor area when tested at a difference pressure of 0.1 inch w.g., (25pa). ~~Supply duct testing shall occur at a frequency determined by the manufacturer's quality assurance manual~~

(c) The total duct leakage shall be measured across the system, including the manufacturer's air handling enclosure, if it is installed at the time of the test, to ensure the duct leakage complies with the limits in paragraph (a) or (b) of this section. Registers must be taped or otherwise sealed at the time of the test. Multi-section manufactured homes may be tested at the manufacturing plant or at home sites. Multi-section homes may be temporarily joined for testing purposes in accordance with a testing protocol in the manufacturer's DAPIA-approved quality assurance manual.

(d) Manufacturers must perform a duct leakage test on every duct configuration at least once per month. However, a duct configuration built less frequently than once a month must be tested every time it is built. An IPIA may also request an additional test of a randomly selected system of the same duct configuration within that same month as a measure to ensure that the manufacturer continues to follow the quality control procedures set out in the DAPIA-approved quality assurance manual. Additionally, an IPIA may require an increase in the duct testing frequency based on its monthly service records reviews or based on the effectiveness of the manufacturer's ability to meet leakage limits and minimize retesting. The IPIA shall assure that any additional testing be conducted on randomly selected duct systems selected by the IPIA (not known beforehand to the manufacturer) to promote consistent quality of manufactured duct systems.

(e) To maintain quality and performance during the post-production process, the manufacturer's installation manual must outline procedures to seal and complete the duct crossover connections to minimize duct leakage.