Original: 2554

LAWRENCE G. SPIELVOGEL, INC. CONSULTING ENGINEERS

21506 VALLEY FORGE CIRCLE KING OF PRUSSIA, PA 19406 PHONE 610-783-6350 FAX 610-783-6349 EMAIL spielvogel@comcast.net

COMMENTS OF LAWRENCE G. SPIELVOGEL, PE
ON PENNSYLVANIA DEPARTMENT OF COMMUNITY AND ECONOMIC DEVELOPMENT
PROPOSED UCC IMPLEMENTATION
July 24, 2006

Following please find my comments on the proposed changes to 12 PA. CODE CH. 145 as published on page 3820 in the July 22, 2006 Pennsylvania Bulletin.

My name is Larry Spielvogel, and I am an independent Registered Professional Engineer practicing in Pennsylvania, with offices in King of Prussia. Thus, all Pennsylvania citizens and I will be subject to these rules. I am commenting on my own behalf and at my own expense. For the last 30 years, I have participated in building code development and adoption hearings, served on, commented on, and chaired the national committees that write, maintain, and revise the codes and standards used for buildings, including those being proposed for adoption in Pennsylvania.

Paragraph 145.42 (1) (ii) allows compliance with the Code by using "Pennsylvania's Alternative Residential Energy Provisions" (PHRC) and published by the Pennsylvania Housing Research/Resource Center at Pennsylvania State University, as an alternative to Chapter 11 of the 2003 International Residential Code of the International Code Council, including the International Energy Conservation Code (IECC). It allows grossly substandard energy performance for new houses.

PHRC is essentially identical to the December 2001 PHRC version, which referred to the 2000 International Residential Code (IRC), except that the February 2003 version of PHRC deletes all references to the year of the IRC. While it is clear that the 2001 PHRC version referred to and is based on the 2000 IRC and the 2000 IECC, the 2003 PHRC version has the identical requirements and references to the 2003 IRC. However, the energy-related requirements in the 2003 IRC and 2003 IECC are not identical to the 2000 IRC and IECC.

Every other code and standard referenced and adopted in this rulemaking is consensus based, and has readily available procedures for proposing changes, conducting public hearings, and getting both formal and informal interpretations. None of these procedures and provisions are available for PHRC. No public notices were ever provided, nor were any public hearings held to receive public comment. Since it was not, is not, and will not be possible to comment or testify in the development of the PHRC, due process has been denied.

Most of the standards and references in the 2003 PHRC have since been superseded, revised, and updated. Yet, the requirements in the 2003 PHRC are based on the obsolete and out of print standards and references. Thus, in many instances, it is not possible to purchase products meeting the standards in PHRC, because manufacturers are testing and rating their products to the requirements in the current standards.

The provisions of PHRC are not nearly as stringent or as energy efficient as the IRC or the IECC. Therefore, by allowing PHRC as an option, Pennsylvania will not be in compliance with the requirements of the 1992 Federal Energy Policy Act, 42 USCA 6833, and the subsequent Federal Regulations, the latest being 67 FR 46464. Besides not complying with Federal Law and Regulations, allowing the use of PHRC does a disservice to the citizens of Pennsylvania, and intentionally wastes our precious energy and money, compared with the provisions of the International Codes and Federal Law. No other state has adopted anything like this.

The trade-offs allowed by PHRC make a bad situation even worse. Besides encouraging additional energy waste, they preclude the use of the most energy efficient coal, oil, and propane heating equipment and even gas fired boilers.

I could not find any other building or energy codes, or portions thereof, developed, written, or administered by PHRC, or any staff members, in Pennsylvania, or anywhere else. Nor is there any evidence that PHRC or its staff has ever regularly served on or participated in the national codes or standards committees or development process.

If the Department allowed the Pennsylvania Builders Association to sponsor the development and adoption of the PHRC alternative, so too should any other trade association or organization be allowed to sponsor the development and adoption of alternatives. The rules should make provisions for these alternatives to be considered and adopted, but only after the due process of public review and comment.

There are no references in PHRC, so it is not possible to determine the source of the information presented. The technical and economic basis for the requirements in PHRC is not shown or described, nor can they be independently verified. Thus, it is not possible to check PHRC for errors and inconsistencies in the requirements.

There is no indication that any software for PHRC is being prepared or will be available. Thus, homeowners, designers, builders, and code officials will not be able to use REScheck or any other software to determine compliance with PHRC.

I am inclined to believe that the assumptions that were made for PHRC favored the conclusions that were reached, without the opportunity for critical review or comment, or the possibility that another reasonable set of assumptions would have reached a different, less favorable conclusion. I also suspect that the basis for the conclusion was developed by PHRC, without competent responsible independent unbiased peer review.

The Federal Law also requires that any building energy code be "developed and updated through a consensus process among interested persons..." which was not done for the PHRC Alternative. Therefore, the PHRC Alternative does not meet the requirements of the Federal Law.

Every other code or standard proposed for adoption or reference by the Department have regular and routine provisions and means for the public to get interpretations, to review, propose changes, comment on proposals by others, and appeal to higher authority. There are no means available to the public for updating, interpreting, changing, challenging, or appealing the PHRC Alternative. Therefore, PHRC is

not comparable to the ICC Codes or other standards, which provide the public with the opportunity and ability to propose changes and deletions, and to appeal the content and requirements before they are adopted and enforced.

There are also no provisions for interpretations by the PHRC developer after adoption, such as those available from ICC. The Department has usurped the ability of the public to ever have any opportunity to change the PHRC document, or even to correct obvious errors and inconsistencies. The public has been denied due process.

Even the ICC has a requirement, with good reason, that they will not reference another standard unless it achieves consensus, and follows ANSI procedures for balance of interests, openness, and due process. The National Fire Protection Association (NFPA) has almost the same requirement. The PHRC Alternative would never even be considered for adoption or reference by ICC or NFPA or any other responsible code writing body. PHRC does not provide any balance of interests, openness, or due process in the development of their Alternative. The Department must reject and completely delete the PHRC Alternative on these grounds alone.

It is not possible to independently verify the analyses and conclusions used in the PHRC. While there may be some obscure PHRC reports and studies, they have not been subjected to peer or public review like those in IRC and IECC that serve as the basis for the requirements in the ICC Codes. The technical basis used by PHRC has not been published in any authoritative technical journal or presented at a recognized peer reviewed symposium. Therefore, due process was not provided for PHRC.

The alternative compliance described in Paragraph 1101.5 of PHRC does not have enough detail and information to permit technically accurate and correct alternatives to be demonstrated. For example, overall performance is not defined or described. Dòes that mean performance for heating, cooling, or both? The PHRC requirement is less stringent than both IRC and IECC.

In fact, there are no definitions for any of the terms in the entire document. Without precise definitions, it is not possible to determine compliance. For example, what is a mass wall? The PHRC requirement is less stringent than both IRC and IECC.

In 1102.3, there are requirements for certifications by installers. Only permit applicants and/or owners are responsible to the code official for compliance. If certifications are required, they must be made by the permit applicant and/or the owner, and should be in writing, signed and dated, to be enforceable.

In 1102.3, there are no requirements for markers every 300 square feet showing blown or sprayed insulation thickness for compliance, as are required by both the IRC and IECC. The PHRC requirement is less stringent than both IRC and IECC.

In 1102.4.1, compliance with the National Fenestration Rating Council (NFRC) Standard 100 is required. The U factor values for fenestration (glazing and/or windows) in PHRC are based on the methods in NFRC 100-97. Products in the marketplace are no longer rated to that Standard and to the criteria in that Standard. Thus, it will not be possible to buy and install complying fenestration unless separate tests are paid for and conducted using the 1997 Standard.

The default U factors in 1102.4.1.1 and Tables 1102.1 (a) and 1102.1 (b) are no longer current for the same reasons.

Both the IECC and IRC have glazing area limits when using the minimum requirements for envelope components using the simplified method of compliance. For one and two family houses, the limit is 15% glass, and in townhouses, it is 25% glass. If those limits are exceeded, more stringent envelope requirements are required. In IRC, if those limits are exceeded, the IECC requirements must be met. In IECC, if those limits are exceeded, the simplified methods can no longer be used, and either the component performance method or the systems analysis method must be used.

Even with the component performance method in IECC the glazing limits are 25% and 30%. However, PHRC has no limits on glazing area when using the minimum envelope requirements. Thus, PHRC allows a 100% glass house to comply. This provision alone disqualifies PHRC from even coming close to equaling the IRC or IECC. The PHRC requirement is less stringent than both IRC and IECC.

In 1103.1.1 of PHRC, the heat transmission requirements are set forth in Table 1103.1, with separate requirements for one and two family houses and for townhouses. The requirements for one and two family houses are similar to, but not the same as the requirements in IRC and IECC. However, the requirements for townhouses are considerably less stringent than those in IRC and IECC. The requirements for townhouses should at least be the same as those for one and two family houses, just as they are in IRC and IECC. The PHRC requirement is less stringent than both IRC and IECC.

The same is true for steel framed walls in 1103.2.4. The PHRC requirement is less stringent than both IRC and IECC.

In Exception 1 to 1103.2.1, insulation in walls exposed to unconditioned areas can be reduced to R-13, which is not allowed in either IRC or IECC. Thus, PHRC is less stringent than IRC or IECC.

In 1103.2.8, the insulating materials "shall be protected" without any means or methods described or required. The same provision in IECC requires "a rigid, opaque, and weather resistant protective covering." The PHRC requirement is less stringent than IECC.

In 1103.3, the maximum U factor allowed is 0.39, while the maximum allowed by IRC and IECC is a 0.35 U factor. The PHRC requirement is less stringent than both IRC and IECC.

In Tables 1103.3.1 and 1103.3.2 there are many requirements for insulation R-values for which there are no products available in the marketplace. For example, it is not possible to buy R-6.5 insulation board. Insulation products required should be readily available in the marketplace.

In 1103.4, a reduction to R-30 from R-38 or R-49 is allowed for cathedral ceilings, while not allowed in both IRC and IECC. The PHRC requirement is less stringent than both IRC and IECC.

In 1103.5.1, the insulation requirements for floors over a non-conditioned space are considerably lower and not nearly the same as in IRC and IECC. The PHRC requirements are much less stringent than both IRC and IECC.

For floors with other than wood structural members, the manufacturer's instructions must be followed, even if they have none. The PHRC requirements are much less stringent than both IRC and IECC.

In the exception to 1103.6, up to 4 square feet of glazing can be exempted from the minimum requirements. In both IRC and IECC, only up to 1 percent of glazing can be exempted. Thus, in most cases, the PHRC requirement is less stringent than both IRC and IECC.

In 1103.7, tradeoffs are allowed for air infiltration and high efficiency equipment. Thus, in addition to users of the rules having the ability to use PHRC instead of the comparable provisions in IRC or IECC, there are further options available in 1103.7.

In 1103.7.1, the ASTM E 779-87 Standard is discontinued and no longer available. Thus, it is not possible to determine compliance to be able to use this tradeoff.

If the low air infiltration tradeoff in 1103.7.1 is selected, and the blower door test shows less than 0.35 air changes due to infiltration, the applicant is then allowed to substantially reduce the energy conservation of the windows and walls, or foundations. The window U factors can be increased by 16 to 20%, and the wall insulation requirements can be reduced by 7 to 11%. Neither IRC nor IECC has any comparable provisions for whole house air infiltration or for reductions in window, wall, or foundation thermal requirements. The PHRC requirements are much less stringent than both IRC and IECC.

I understand that Federal Law preempts any other efficiency standards for covered equipment, so states cannot set higher efficiencies than those in NAECA for covered equipment without a specific exemption from the Secretary of DOE. Thus, Pennsylvania may be in violation of Federal Law by setting the requirements in Table 1103.6 if this rule is adopted.

If the high efficiency equipment tradeoff in 1103.7.2 and Table 1103.6 is selected, the applicant is then allowed to substantially reduce the energy conservation of the windows and walls, or foundations, or basements. Thus, the window U factors can be increased by 16 to 20%, and the wall insulation requirements can be reduced by 7 to 11%. Neither IRC nor IECC has any comparable provisions for high efficiency equipment or for reductions in window, wall, or foundation thermal requirements. The PHRC requirements are much less stringent than both IRC and IECC. This option in PHRC encourages wasting large quantities of energy efficiently with high efficiency equipment.

In Table 1103.6, there are no tests or measurement standards included or referenced, against which the efficiency requirements are to be measured. Thus, a manufacturer or contractor could use any set of criteria they wanted to meet these efficiency requirements. Without providing industry standards in this Table, the efficiency requirements are not meaningful.

If the option of using Table 1103.6 is chosen with a gas or oil furnace or boiler, there is no minimum cooling efficiency required. Thus, it is possible to use air conditioning equipment with the lowest possible efficiency and still comply. This is hardly the "High Efficiency Equipment Trade-off" that the title of the Table implies.

Table 1103.6 discriminates against certain types of fuels and heating systems. By requiring gas and oil fired furnaces and boilers to have 90% AFUE, tilts the fuel and heating system selection toward gas furnaces. However, gas is not available at all locations in Pennsylvania, so other fuels must be used.

Gas furnaces at 90% AFUE are readily available at reasonable premium prices. However, gas boilers and oil furnaces and boilers at 90% AFUE are scarce and have significantly higher prices. There are no gas steam boilers available in the marketplace that will meet the 90% AFUE requirement.

Only one Pennsylvania gas boiler manufacturer is even able to offer boilers that qualify. All other Pennsylvania gas boiler manufacturers cannot. Few gas boilers made anywhere, except foreign imports, can meet the required AFUE.

There are many gas boilers with AFUE's in the mid to upper 80's available, but they will likely not be used due to their higher prices, and the lowest price lowest efficiency boilers available will be selected. Thus, this provision will tend to discourage the use of gas boilers with efficiencies close to the 90% AFUE required by this option. That does not make common sense.

The situation for oil boilers is even worse. Oil boilers meeting the 90% AFUE requirement are only available in two capacities from only one manufacturer. No other boiler manufacturer anywhere in the country makes oil boilers, hot water or steam, of any capacity with AFUE of 90% or higher. Thus, a house with a requirement for more or less capacity will not be able to get a qualifying oil boiler from any manufacturer.

The situation for oil furnaces is impossible. There are not any oil furnaces on the market that meet the minimum requirement to qualify for this option. Many Pennsylvania houses are heated with propane. Yet, those houses will never be able to qualify for this option, since propane furnaces and boilers are not allowed.

In the Note for Table 1103.6, it is possible to average the efficiencies of gas furnaces or heat pumps, but not gas or oil boilers or oil furnaces or conventional air conditioners. This is discriminatory and does not even make common sense.

Worse still, just the ratings of the equipment in the marketplace will allow lesser efficient equipment to be used, when it would not ordinarily be used. To meet the requirements of any minimum standard with the capacity required, it is usually necessary to select equipment with ratings that are above the minimums, because equipment with ratings exactly matching the minimums is often not made or available. By allowing the averaging, the permit applicant can offset the premium cost of the units that exceed the minimum by using units that are below the minimum required efficiency.

The averaging allowed in Table 1103.6 is also not fair or equitable, since it does not consider the size or capacity of the units being averaged. For example, if there are 10 units that are required to meet a SEER of 12, then five of those units could be SEER 14 and five could be SEER 10. However, the five at SEER 14 could be one-ton units, and the five at SEER 10 could be five-ton units. However, the weighted or overall average SEER of all ten units would be below the minimum required. Thus, what may have been well intentioned can be easily and readily be subverted.

The tradeoff provision ignores other types of high efficiency HVAC equipment that should be encouraged and allowed for tradeoffs. Geothermal and ground source heat pumps are examples that should be included, since they are far more energy efficient than the equipment in Table 1103.6. High efficiency water heaters and solar water heaters are also readily available. With well-insulated and tight houses, the energy used for water heating can equal or exceed that used for space heating. By not including these more efficient types of equipment, you are further and intentionally discouraging their use, since there are no benefits or tradeoffs available. Therefore, the tradeoff provision deliberately puts some of the most efficient HVAC and water heating equipment that should be encouraged, at a distinct disadvantage.

US DOE has recently adopted mandatory higher minimum energy efficiency standards for HVAC equipment that equal or exceed those in Table 1103.6. Builders will automatically have to comply. Thus, the option to reduce the performance of windows and walls, or foundations will be a giveaway, and become the new lower minimum standard to meet. Do not allow that to happen.

Therefore, the PHRC tradeoff provisions must be deleted or completely revised, since they do not provide equivalent or better energy efficiency than even the other minimum requirements in PHRC, much less the minimum requirements of either IRC or IECC.

In 1104.1 of PHRC, any equipment covered by the National Appliance Energy Conservation Act (NAECA) under Federal Law is acceptable. However, other types of equipment not covered by NAECA are used in residential construction. Some examples of equipment not covered by NAECA are duct furnaces, large oil, gas, and propane fired boilers and furnaces, three phase air conditioning units and heat pumps, packaged terminal air conditioners, and ground and water source heat pumps. In IRC and IECC, these other types of equipment must meet the minimum requirements of the ASHRAE/IES Energy Code. However, in PHRC there are no requirements whatsoever. The PHRC requirement is less stringent than both IRC and IECC.

In 1104, there are no provisions for properly determining the size of the HVAC systems, as in IECC. As a result, it is likely that most HVAC systems will be oversized, and therefore operate less efficiently and more wastefully than properly sized equipment required by IECC. The PHRC requirement is less stringent than IECC.

In 1104, there are no provisions for shower water flow limits or for heat traps on water heaters, as in IECC. The PHRC requirement is less stringent than IECC.

In 1104.2, there are no provisions for the range of temperature settings and deadbands on thermostats, as in IECC. Thus, homeowners can be restricted in how high or low they can set their thermostats when heating or cooling is not needed, and how far apart the heating and cooling settings can be. Not requiring and having these capabilities will restrict the ability of homeowners to conserve heating and cooling energy. The PHRC requirement is less stringent than IECC.

Strictly following the requirements of 1104.2 will prevent heat pumps from operating electric heat during the defrost cycles, which will usually occur when the heating load can be met by the heat pump alone. This will cause frequent complaints and great discomfort in the house, as the heat pump will

supply very cold air to the house when heat is required, commonly when the outdoor temperature is around freezing. While it is possible to accomplish this requirement, builders will likely not install heat pumps to avoid comfort complaints. Thus, electric resistance heat will likely by installed, which is not usually cost effective.

Indeed, the National Association of Home Builders "Residential Construction Performance Guidelines" published in 2000, requires heating systems to be capable of providing 70 degrees at all times, except when superseded by state or local codes. Operation of heat pumps in the defrost cycle without electric heat will almost certainly result in temperatures lower than 70 for at least some periods of time in the winter. There is not another building energy code in the world, even IRC, that prohibits the use of electric heat in the defrost cycle of heat pumps.

No limits are placed on humidification and dehumidification systems and humidistats, as in IECC. The PHRC requirement is less stringent than IECC.

While duct insulation is in 1104.3, there are no provisions for plenum insulation, as in IECC. The PHRC requirement is less stringent than IECC.

There are no provisions for duct construction and air leakage testing, as in IECC. Only the sealing of duct joints is covered in 1104.4. The PHRC requirement is less stringent than IECC.

In 1104.5 and Table 1104.5 the pipe insulation thicknesses are greater than IECC for some pipe sizes (and thus uneconomical) and less than IECC for other pipe sizes (and thus inefficient).

In addition, 1104.5 covers pipe insulation for all mechanical systems, including domestic hot water, and places those requirements in Table 1104.5. However, Table 1104.5 only covers HVAC piping insulation and not domestic hot water pipe insulation. Domestic hot water pipe insulation requirements, equal to those in IECC, must be added.

There are no provisions for mechanical ventilation systems and/or means for controlling their operation, as in IECC. The PHRC requirement is less stringent than IECC.

Since these provisions in PHRC also can be applied for repairs and replacements, when the type of equipment or system being repaired or replaced is not covered by PHRC, or there are no required industry standards against which performance and efficiency is to be measured, then there are no requirements to be complied with, contrary to IECC. Water heaters and HVAC systems are frequently repaired or replaced. Thus, very substantial energy savings will not be achieved with the PHRC Alternative. The PHRC requirement is less stringent than IECC.

PHRC Conclusions

If PHRC is the attempt to implement Section 301 (c) of Act 45, which requires "prescriptive methods to implement the energy-related standards of the Uniform Construction Code" it has failed miserably, due to the almost universal disregard for the minimum energy conservation requirements of the UCC, IRC, and IECC, Federal Law, and Federal Rules.

PHRC is an invitation to encourage lower quality and less energy efficient construction than in most surrounding states and across the country. For those Pennsylvania agencies and municipalities who are now using IECC or IRC or their predecessors, adoption of PHRC is a big step backwards.

Under Federal Law and regulations, the residential energy code adopted and enforced in Pennsylvania must equal or exceed the requirements of IECC. PHRC does not even come close. If these PHRC provisions are submitted to the Department of Energy for approval, it is a virtual certainty they will be rejected.

I am not aware of any other modern state energy code in the country that allows minimum requirements as low as those are in PHRC.

Therefore, since it can and probably will be used for most of the permits in Pennsylvania, the PHRC Alternative must be either completely deleted or completely rewritten and published again for public comment and public hearings. The PHRC Alternative is not equivalent to the IRC or IECC by any method of measurement or comparison. How anyone can claim the provisions are "equivalent to the provisions of the International Energy Conservation Code," as stated in the Preface of PHRC is simply unbelievable. Virtually every requirement in PHRC is less stringent and less energy conserving than those in both the IRC and IECC. With this many deviations from the minimum requirements in the IRC and IECC, the PHRC Alternative appears to be a deliberate and intentional subversion of nationally accepted energy conservation codes and standards.

Pennsylvania climates range from less than 5,000 heating degree-days to more than 7,000 heating degree-days, a variation of more than 40%. The PHRC Alternative provides only three climatic zones in Pennsylvania. Three zones are not sufficient to take into account climate variations this wide. Every national or regional building code, standard, and recommended practice for building design and energy conservation includes more than three zones for Pennsylvania. No explanation or justification for having only three zones is provided. More climatic zones must be provided.

Using the PHRC climate zones, two houses built almost across the street from each other will be required to have substantially different windows, walls, and ceiling insulation. For example, a house in the northern suburbs of Wilkes Barre requires a ceiling with R-38, while a house in the southern suburbs of Scranton, across the street, requires a ceiling with R-49 insulation, or 29% more insulation. Either the R-49 is economically justified and R-38 wastes energy, or the R-49 is not economically justified. There is no common or economic sense to such a wide difference in requirements. Therefore, if PHRC is to remain, more climate zones must be added to make common sense, economic sense, and to follow nationally accepted practices.

Paragraph 1103.7.2 and Table 1103.6 do not allow propane, Pennsylvania coal, or wood heating equipment to be used, the same as gas and oil. These omissions are discriminatory, anti competitive, and illegal, and must be rectified.

Paragraph 1103.7.2 and Table 1103.6 do not allow electric convective, electric radiant, or electric storage heating equipment to be used, the same as high efficiency heat pumps. Room by room electric heat, radiant electric heat, or electric heat storage systems can be just as energy efficient and

economically efficient as a heat pump, and more so in many instances. For example, most electric heating systems can be operated in only those rooms that are being occupied, while a heat pump must heat the entire house, even though it is not fully occupied. These omissions are discriminatory, anti competitive, and illegal, and must be rectified.

In addition, those types of electric heating do not automatically include cooling systems, as heat pumps do, so it is possible that cooling will not even be installed in many houses, saving even more energy and money. While heat pumps may be more theoretically efficient than other types of electric heat, they can end up using more energy than other types of electric heat. Thus, high efficiency electric heat pumps will waste energy efficiently.

Builders who elect to use the option in PHRC paragraph 1103.7.1 are likely to build houses that will threaten the health of the occupants. These houses may not have enough ventilation or infiltration to meet industry minimum standards. By having very low air infiltration, and no ventilation, there very well may not be sufficient outdoor air to dilute contaminants. Low air infiltration can also contribute to and aggravate higher indoor humidity conditions and the growth of mold and mildew, which further compromises the health of the occupants. Since there are no minimum ventilation requirements and no requirements for heat recovery ventilation systems in the proposed rules or referenced documents, no requirements are imposed to mitigate or minimize these potential health problems. Do not promulgate rules that threaten the health of building occupants.

Many insurance companies that offer homeowners insurance in Pennsylvania, including mine, are now drastically limiting coverage for mold, or are no longer providing any mold coverage at all. Do not allow building code requirements to increase the potential for the growth of mold, while at the same time insurance coverage for mold is being reduced or eliminated and/or the insurance premiums are being increased if mold coverage is available at all.

The description of the options in both PHRC 1103.7.1 and 1103.7.2 allow "The above-grade portions of the building's thermal envelope..." to comply with Table 1103.4. The building thermal envelope means all elements of the exterior of the building, including walls, roofs, ceilings, and floors exposed to exterior weather. However, the heading in that Table for thermal insulation limits the trade off only to the walls. Therefore, it is quite likely that people will not read the Table carefully enough, and they will use the R-values in the Table for all parts of the building thermal envelope, exactly as stated in the text of 1103.7.1 and 1103.7.2. The options must be more clearly described and consistent with the Table.

The PHRC Alternative must be deleted.

Respectfully submitted,

LAWRENCE G. SPIELVOGEL, INC.

L. G. Spielvogel

L. G. Spielvogel, P.E.
Pennsylvania License Number 13,834-E