ADVOCACY GROUP
Federal Regulatory & Housing Policy

January 10, 2007

Chief, Management and Organization Division
National Institute of Standards and Technology
100 Bureau Drive, Mail Stop 3220
Gaithersburg, MD 20899-3220
(Sent by postal mail and e-mail, info.quality@nist.gov)

Office of the Chief Information Officer
Attention: DOE Quality Guidelines
U.S. Department of Energy,
Forrestal Building -- Room 8H-089
1000 Independence Avenue N.W.
Washington, D.C. 20585
(Sent by e-mail and fax)

Request for Correction of Information not Subject to Public Comment
No DOE-CIO keywords apply

To Whom It May Concern:

By this letter, the National Association of Home Builders (NAHB) requests correction of information disseminated by the National Institute of Standards and Technology (NIST), the U.S. Department of Energy (DOE) and its Element, the Energy Efficiency and Renewable Energy Office (EERE). Because NIST is an agency of the U.S. Department of Commerce, this request is also made of the Commerce Department through NIST. This request is made pursuant to Section 515 of Public Law 106-554, also known as the Information Quality Act. This request is also made pursuant to "National Institute of Standards and Technology Guidelines, Information Quality Standards, And Administrative Mechanism,"(NIST guidelines)[1] "Final Report to the Office of Management and Budget on Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by the Department of Energy,"(DOE guidelines)[2] "Guidelines for Ensuring and maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies,"

[1] http://www.nist.gov/director/quality_standards.htm, accessed August 28, 2006.
[2] http://cio.doe.gov/informationquality/finalinfoqualityguidelines.pdf, October 1, 2002, accessed August 28, 2006.

1201 15th Street, NW • Washington, DC 20005-2800
(202) 266-8305 • (800) 386-5242 x8305• Fax: (202) 266-8056
aholliday@nahb.com

(OMB guidelines),"[3] and Public Law 104-13, also known as the "Paperwork Reduction Act of 1995." [4]

The National Association of Home Builders is a Washington-based trade association representing more than 225,000 members involved in home building, remodeling, multifamily construction, property management, subcontracting, design, housing finance, building product manufacturing and other aspects of residential and light commercial construction. Known as "the voice of the housing industry," NAHB is affiliated with more than 800 state and local home builders associations around the country. NAHB's builder members will construct about 80 percent of the more than 1.6 million new housing units projected for 2007, making housing one of the largest engines of economic growth in the country. NAHB asks for this data correction in order to address the misleading and erroneous statements in a dissemination of information by NIST, DOE, EERE, and the Commerce Department. The dissemination is erroneous in fact, and it does not follow the method it purports to follow. As a result, it will tend to inflate the cost of construction without an offsetting saving of energy, and it will not be useful for its intended audience.

The information dissemination is a Report NIST prepared for DOE in June, 2005, "Investigation of the Impact of Commercial Building Envelope Airtightness on HVAC Energy Use," also identified as NISTIR 7238, by Steven J. Emmerich, Timothy P. McDowell, and Wagdy Anis (hereinafter, "the Report"). NIST continues to disseminate the Report on its website, at dozens of URLs.[5] The Report also continues to be disseminated by the EERE) on the EERE website.[6] EERE is an Element of DOE as defined by DOE guidelines, thus the EERE guidelines apply to DOE.[7] There is no disclaimer by either agency that the Report is the opinion of the authors only. There is every evidence that the Report constitutes the opinions, policy, or findings of each of the agencies.

Dissemination by NIST

According to the NIST guidelines, dissemination "means any agency initiated or sponsored distribution of information to the public."

1. The Report is information.

According to the NIST guidelines, "Information means any communication or representation of knowledge such as facts or data, in any medium or form, including textual, numeric, cartographic, narrative, or audiovisual forms." The Report is a combination of text, charts, graphs, and drawings. Obviously, it is within the class of media embraced by the definition of "communication or representation." What the Report discusses is a set of mathematical simulations, rather than a set of empirical data.

[3] 67 Federal Register 8452, February 22, 2002.
[4] 44 USC ch.35, especially but not limited to 44 USC 3504(d)(1) and 44 USC 3516.
[5] E.g., http://fire.nist.gov/bfrlpubs/, accessed August 28.
[6] http://www.eere.energy.gov/buildings/highperformance/pdfs/nist_infiltration_study2005.pdf, accessed August 28. and others.
[7] http://cio.doe.gov/informationquality/finalinfoqualityguidelines.pdf, p. 21.

However, it is clear from the Report itself that mathematical simulations are a commonly accepted technique in the field of energy conservation in buildings, and that NIST considered its models and modeling algorithms to be valid.[8] The authors state the objective of the study as "to investigate the impact of envelope airtightness on the energy consumption of typical office buildings." Clearly, they believe the results will apply to real buildings, even though the results are not based on actual observations in real buildings. Instead, the Report relies on reference works and numerical relationships that had already been determined in the industry literature. The authors are sufficiently convinced their work constitutes knowledge that they recommend it as a basis for important industry standards.[9]

2. NIST distributes the Report to the public.
The Report is available online at NIST by going to the NIST homepage and searching the "A-Z Subject Index" for ""Energy Use and Conservation," which is the only entry beginning with "Energy." Selecting that entry brings the searcher to a page containing a sub-heading "Home Energy Use and Conservation," within which is this paragraph:

> Building Environment Division -- develops data, measurement methods and modeling techniques for the performance of the building envelope, its insulation systems, building air leakage, and the release, movement and absorption of indoor air pollutants. Contact: George Kelly, (301) 975-5851.

Atop the Building Environment Division Page is a link for Publications. Entering the keywords "energy efficiency," "office buildings," "infiltrations," or "ventilation" will produce a list of publications including the Report. It is clear from the descriptive language introducing the Building Environment Division webpage that the Report is intended to be included among "data, measurement methods and modeling techniques for the performance of the building envelope, its insulation systems, building air leakage, and the release, movement and absorption of indoor air pollutants." Any member of the public has access to the Report, and anyone searching the NIST site for research on energy conservation in building structures is likely to find the Report. A searcher may also request a paper copy. There can be no doubt that the Report is a distribution of information to the public.

3. The Report is an agency initiated or sponsored distribution, initiated by NIST.
A distribution of information to the public is "agency initiated" if it reflects, represents, or forms part of the support for agency policy. More to the point, however, the NIST guidelines go on to say that if the agency distributes information in a way that suggests the agency agrees with the information, then the distribution is agency initiated. It becomes an agency dissemination because of the appearance of representing the agency's views. Such is the case here. On the cover page of the Report, NIST is the only agency named. Indeed, NIST is the only entity of any kind named, except for the three authors, whose affiliation is not disclosed there. On the inside cover (page ii), one can see that

[8] Report, p. 1
[9] Report, p. 2

two of the authors are not NIST employees, and the Report was prepared for DOE, but there is no disclaimer or even a suggestion that the Report did not represent the findings and position of NIST itself.

Agency sponsorship refers to the case where an agency hires third party contractors to do the research, or where the agency has the authority to approve and review the information before release. The latter appears to be the case here, as the Report bears the NIST imprimatur on its face and through its presentation on the NIST site as a NIST Report. The circumstances also suggest that NIST hired McDowell and Anis, the two authors who were not NIST employees. There is no statement to contrary, and nothing to divorce NIST from their conclusions.

4. Conclusion: The Report has been disseminated by to the public by NIST.
The preceding numbered paragraphs have established that the Report is information that NIST distributed and continues to distribute to the public, and the distribution was initiated or sponsored by NIST. At the very least, NIST holds itself out as initiating the distribution by making it appear to represent the views of the agency. Therefore, all the requirements of a dissemination are satisfied, and the Report is a dissemination by NIST. Therefore, the information quality criteria of NIST guidelines apply to the Report.

Dissemination by DOE

1. The Report is information.
The arguments made relating to NIST in *#1*, above, apply equally to DOE, because they are characteristics of the information. The DOE guidelines quote the OMB guidelines by defining information to be "any communication or representation of knowledge such as facts or data." DOE then says "information does not include opinions," which is a curious position for a research agency to take. Nonetheless, the Report is presented as fact, the conclusions are presented as true, they are presented as DOE viewpoints, and they are presented as the appropriate basis for action. Therefore, they amount to fact within the meaning of the DOE guidelines and the Information Quality Act.[10]

2. DOE distributes the Report to the public.
As mentioned above, the report may be found in more than one place or by more than one method on the EERE website. Searches of the EERE site on keywords of "building envelope," "airtightness," or "elastomeric" will all produce a link to the report. Anyone researching or investigating those concepts on the EERE site has a substantial likelihood of finding the Report and being misled by its content.

3. The Report is an agency initiated or sponsored distribution, sponsored by DOE.
The inside cover states expressly that the Report was prepared for DOE and its Office of Building Technologies, which is within EERE. DOE and EERE endorse that representation when they distribute it as part of the report without contradiction or comment. Furthermore, the DOE guidelines state, "if a DOE Element directs a Federally employed scientist or Federal grantee or contractor to disseminate information and retains

[10] PL 106-554 §515; 114 Stat. 2763.

authority to review and approve the information before release, then the DOE Element has sponsored the dissemination of the information."[11] DOE and EERE have held out that they have the authority to approve the information before release, because they have made the discretionary choice to publish the Report on the web. Therefore, the report fits squarely within DOE's definition of sponsoring the information.

Finally, on this point, DOE exempts information in public filings from its definition of "dissemination." However, that exemption itself has an exception: "except where the DOE Element distributes information submitted to it by a third party in a manner that suggests that the DOE Element endorses or adopts the information."[12] That carve-out indicates that DOE (and by delegation, its Elements) considers published information to come within the definition of dissemination if the Department or Element indicates adoption or approval of the information, which is the case here. The Report is freely available and easily found on the EERE website; one need not ask EERE whether the report exists, and no special request must be made to see it. DOE and EERE have put it out for all the world to see and rely on.

4. Conclusion: The Report has been disseminated to the public by DOE and EERE. As shown above, the Report constitutes information. It has been and continues to be distributed by DOE and EERE in a manner that indicates they sponsored the information and the report represents DOE and EERE views. Therefore, DOE and EERE have disseminated the Report, within the meaning of the DOE guidelines.

<u>The methodology of the Report commits a fundamental error.</u>

The Report investigates the energy lost by buildings by using computer software to simulate air leakage from three hypothetical buildings.[13] The Report purports to simulate the energy losses of these buildings in five different cities both with and without tighter building envelopes. In particular, it attempts to explain the effect of applying a liquid-applied elastomeric coating to the interior surface of a masonry back-up wall building, applying durable tape to the sheathing joints of frame buildings, or upgrading the wrapping the exterior of frame buildings from a residential grade weather/ air infiltration barrier to a commercial grade wrap.[14]

The Report then estimates the annual gas and electricity energy usage and the annual infiltration for the frame and masonry buildings in each of the five cities at baseline, target, and best achievable levels. However, when NIST simulated the leakage for the buildings, it used one average level of leakage for the whole building; it did not use separate leakage rates for the masonry and for the assemblies.[15] The simulation then assumes the elastomeric coating is applied to the entire building, reducing all of the

[11] DOE guidelines, p. 24.
[12] DOE guidelines, p. 25.
[13] Report, p. 3
[14] Report, p. 20
[15] Report, p. 16

envelope leakage to the target level and a best achievable level. This is where the fundamental error occurs; the coating was assumed to cover the entire building, not just the masonry walls to which it could be applied. No allowance was made for the presence of assemblies such as windows, nor for any joints, junctions, openings, or seams. The coating will not be applied to these building elements, so it will yield no savings there. Therefore, the leakage reduction cannot be applied to a building average; it must be applied only to the masonry portions of the walls.

The Report makes the gross assumption that if the elastomeric coating is applied to the walls of a masonry building or the building wrap is upgraded to commercial grade, then the entire building will go from an average air-tightness of a 20-40 year old building to the target air tightness (0.4 cfm/ft^2@75 Pa). This is a huge presumption on both sides- the starting point and the effort required to reach the target air leakage.

ASHRAE Standard 90.1-2004 *Energy Standard for Buildings Except for Low-Rise Residential Buildings*, (ASHRAE 90.1) Section 5.4.3 lists seven categories of joints or openings that must be caulked, gasketed, or sealed to achieve dramatic leakage reductions; let the aggregate leakage from that whole group be called J. Materials leakage can be labeled M, and Assemblies leakage labeled A. The whole building leakage B = J+A+M. Applying the elastomeric coating will only reduce M by a certain factor *x*, where $0<x<1$ (assuming the coating is a material). Since it does not affect joints or assemblies, J and M are unaffected, so building leakage B will only be reduced by a smaller factor *y*, where $0<y<x<1$. The Report's simulation is algebraically untenable. In a less technical, statement, you can't act on only a part of the structure and expect the whole structure to respond in the same way.

A related argument derives from Lstiburek, who found that materials account for about 1 percent of the air leakage in a building and assemblies account for 10 percent.[16] If the elastomeric coating is a material, it can affect no more than 1 percent of the leakage; if it is an assembly, it can affect no more than 10 percent. The Report claims a 75-90 percent reduction in leakage; that reduction cannot come from materials or assemblies, even in combination; it must come from sealing joints, junctions, and so forth. One might think that spreading or spraying a liquid coating would be effective at sealing joints in the process, but that is not an additional benefit of the air barrier; the sealed joints are already required by ASHRAE 90.1, so sealing them with the air barrier does not provide any reduction beyond the current standard.

The error is a simple one that is easy to make. The authors examined the effect of the barrier on one part of the building, then implicitly assumed the whole building would behave the same way. In fact, the parts of the building are different, and the elastomeric barrier would affect them in different ways.

<u>Consequences of the error.</u>

[16] Lstiburek, J., *et al*. "Understanding Air Barriers," *ASHRAE Journal*, July 2005.

The Report presents tables of energy savings that would be achieved by reducing total building leakage to the target level. This is done for each of the three types of buildings in each of the five cities, for both gas and electric consumption. NAHB raises no objection at this time to the calculation of the energy that would be saved *if* leakage of a building with the baseline leakage were reduced to the target leakage level; the Report's

error lies in attributing all the saving to the elastomeric barrier. Attached hereto and incorporated by reference herein is a Report by Martha VanGeem, PE, ASHRAE member and 90.1 committee voting member, in which she has allocated the hypothecated energy savings to the effect of the air barrier and the effect of tightening the joints and openings, based on the Lstiburek findings.[17] The maximum savings achieved by the air barrier was $368 per year, occurring in the office building in Minneapolis, assuming the coating is an assembly. The lowest saving was $7 per year for the office building in Phoenix, assuming the coating is a material. The VanGeem estimates are always 1 percent or 10 percent of the Report's savings, consistent with Lstiburek.

The Report also estimates scalars for application of the elastomeric coating, which are roughly similar to payback periods on the investment in the energy saving device, technique, or whatever. They are used by the ASHRAE 90.1 committee as a guide for cost-effectiveness. Low numbers are more cost effective than high ones, and a scalar generally must be below 8 in order for the technique to be considered cost effective.[18] The masonry wall scalars for the simulated one-story retail building are below 8 in all five cities, and they are below 8 in three cities for the simulated office building, according to the Report, which attributed all the energy savings to the barrier. However, once the energy savings of the target leakage rate are properly allocated, as Ms. VanGeem did, the scalars for installing the coating rise sharply. The lowest scalar associated with the barrier is 32; it rises as high as 1,618. To repeat, anything higher than 8 is not considered cost effective. Obviously, the Report has made a significant and substantial error in reporting the scalars and in concluding that the elastomeric barrier is a cost-effective method of saving energy in masonry office and retail buildings.

The Report makes the same qualitative error with regard to frame buildings. That is, it applies the air barrier effects to a whole building leakage rate, without taking joints or assemblies into account. As with masonry walls, the infiltration rate falls 75 percent or more, but as with masonry walls, 89 percent of the infiltration is dues to things other than materials or assemblies. The postulated savings are too high, and the scalars are too low. Since the change in infiltration rates was similar, and that's what drives the energy savings, one would expect the correct scalars to be similar to those Ms. VanGeem calculated for the elastomeric coating. Given that the masonry scalars were underestimated by at least a factor of four and as much as two orders of magnitude, one cannot be sanguine that the frame building scalars will be low enough to meet the acceptable level of cost effectiveness. NIST must recalculate the scalars based on leakage changes in the building elements that are changed, not on the whole building.

---

[17] VanGeem, Martha G, "Correction of Masonry Scalar Ratios in NISTIR 7238 on Commercial Building Air-Tightness and Continuous Air Barriers," CTLGroup Project No. 312078, CTLGroup, Skokie, Illinois. 2006.

[18] *ASHRAE Standard 90.1-2004, Energy Standard for Buildings Except Low-Rise Residential Buildings,* ASHRAE SSPC 90.1.

The Report's information lacks quality as defined by NIST.

The NIST guidelines define "quality" as "an encompassing term comprising utility, objectivity, and integrity."[19] The Report violates the NIST guidelines for Information Quality because its information lacks utility and objectivity.

The information lacks utility.
"Utility means that disseminated information is useful to its intended users."[20]

Given that the actual scalars for the elastomeric coating are so much higher than the Report states, that technique can never be cost effective, which is contrary to the conclusion of the Report.[21] Therefore, the errors in the Report make it unsuitable for its intended use, which is "[t]o provide input to the ASHRAE 90.1 Envelope Subcommittee in its consideration of the potential energy savings and cost effectiveness of an effective air barrier requirement."[22] The Report sheds no light on the utility of an effective air barrier, because the methodological errors disable the Report from addressing that question. It gives no help to the intended user, the ASHRAE 90.1 Envelope Subcommittee. It is also unusable by any other party who may want to study the effects of air barriers–including people who would like to propose changes in the International Energy Conservation Code or state or local building codes–for the same reasons it is unusable by the ASHRAE 90.1 Envelope Subcommittee.

The same methodological errors pollute the simulations for the frame buildings, so the Report's scalars are questionable, at best. Knowing the errors and the magnitude of the scalar change for masonry walls when calculated correctly, no reasonable researcher would rely on the Report's findings for frame buildings without independent confirmation. In that case, the confirming study would become the basis of the effectiveness conclusions anyway, and the Report would simply be irrelevant. The Report would be, at best, redundant, supplying no information that could not be had elsewhere if it were confirmed by independent study; at worst it would be just plain wrong, and it should not be disseminated to ASHRAE or the public for consideration.

The information lacks objectivity.
The objectivity criterion requires, *inter alia*, that the information be accurate and reliable in presentation and substance. The information in the Report is not reproducible without violating acceptable technique. As has been argued above, the information is wrong, it is unreliable, but it is presented in a fashion that claims it is accurate and reliable. That claim is erroneous. Therefore, neither the information nor its presentation is accurate or reliable, and the Report violates the objectivity criterion of quality.

[19] *Supra*, note 1.
[20] NIST Information Quality Bulletin, see n. 1.
[21] Report, p. 30
[22] Report, p. 2

Effect on home builders and the public.

The faulty information in the Report is intended for use by ASHRAE, a standards setting organization. Many building codes incorporate or mandate the use of ASHRAE standards. Thirty-one states reference ASHRAE 90.1 in their commercial energy codes,[23] and Congress mandated ASHRAE 90.1 as the minimum energy code standard for new federal buildings, authorizing the Secretary of DOE to upgrade the standards from the 1989 version of 90.1.[24] Thus 90.1 is effectively a proposed federal regulation, and it is proposed for state legislative or regulatory adoption. For federal construction, it is the basis of DOE regulation for energy conservation. It is significant that 62 percent of the states and federal government itself use 90.1 to regulate construction for purpose of energy conservation.

Obviously, the AHRAE recommendations are taken very seriously, and both NIST and EERE are quite aware of that fact. The extent of the cooperation between NIST and ASHRAE is shown dramatically by the fact that a search of the NIST website on the term "ASHRAE" returns 1,670 hits; there are that many references to ASHRAE on the NIST site. Many of those references deal with development of standards, including the arrangement of language so as to make the standards mandatory and enforceable, if those standards previously had been voluntary.

EERE seems to regard 90.1 as a perfect substitute for the International Energy Conservation Code (IECC), thus making it clear that 90.1 has a compliance component, and duties are created by the standard.[25]

Therefore, NIST is knowingly and intentionally feeding information to regulatory and administrative bodies in order to have legal effect. DOE and EERE are collaborating in that information distribution, as well as being users of it.

NAHB has four objections to the costs reported by the Report. Two of those objections point to mistakes in calculating the costs, and two of them deal with the economic effect of those costs. If the Report is allowed to stand uncorrected, and if it has the intended legal affect through amendment of ASHRAE 90.1, the costs to home builders–and therefore, to home buyers–will be substantial. In addition, there will a deadweight loss to the economy since excessive materials are being consumed by this particular attempt at conservation, and the nation will not save as much energy as it could if the standards reflected actual fact rather than the mistakes in the well-intentioned Report.

Cost

Below, NAHB presents two approaches to analyzing the cost and efficiency of NIST's proposed method, but correcting NIST's mistakes. The resulting changes go to the heart of the utility of the report for energy conservation standards. First, costs are shown to be

[23] EERE at http://www.energycodes.gov/implement/state_codes/index.stm, accessed September 28, 2006.
[24] 42 USC 6834
[25] "Relationship Between Standard 90.1 and the IECC," *Setting the Standard*, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy. June, 2006.

underestimated, if one is to achieve the energy savings assumed by NIST. Then, changing assumptions, the specified methods are shown to be insufficient to achieve the stated conservation goals, showing that builders and owners will not realize the savings they had hoped for, and they has wasted their money on this energy conservation technique.

1. Cost to reach NIST's target energy savings.
The Report explains its estimate of the cost of the barrier on pages 19 and 20; they are summarized in Table 4. For ease of explanation, the costs will be explored here only for the four-story masonry veneer frame building, the last row of table 4. NIST estimates the cost of meeting the leakage requirements by taping joints ("Option 1") to be $5,317 above current code requirements for the whole building. Alternatively, NIST asserts that the same leakage could be achieved using upgraded housewrap for merely $370 per building above current costs (Option 2).

However, those cost calculations are incomplete. Mr. Ron Nickson of the National Multi-Housing Council has calculated the cost of each option by including items the Report ignores or excludes improperly. Then he calculates the implied scalars for each option in the five cities examined in the Report. Mr. Nickson's calculations are shown in ICR Table 1. That Table takes NIST's energy savings as given, but it calculates the cost of doing what NIST requires. The Report estimates the cost of Option 2 (the house wrap option) to be $307 for a four story building. However, the extra cost of the wrap alone would net more that $1,000 additional costs. The ceiling takes another $800 of wrap. In addition, a flexible flashing has to be added around the bottom of the wrap, and the metal flashing around doors and windows must be replaced with much more expensive flexible flashing, and more of those openings will need flashing. Finally, the builder would have to test the leakage rate, which is an intricate process for multi-level buildings with closed rooms and corridors.

What is more, the simulations in the Report assume the four-story building is thirty years old, or that it is built to thirty year old standards. Many changes must be made to bring such a building to present-day building code requirements. NIST did not estimate any of those costs, nor were they included in the analysis. Effectively, NIST assumed the leakage of a thirty year old building could be reduced to the hypothesized level solely by taping joints or adding the improved wrap. Mr. Nickson has provided a floor for the extra costs, addressing only the costs of the tape and wrap. For the wrap to be effective, however, the building would have to be brought to current code, first. Those costs are omitted from Table 1, and cost estimates are an absolute floor.

In short, an improvement that was supposed to cost $307 would actually cost at least $6,683. At this cost, Option 2 is uneconomical in 40 percent of the cities in the simulation contrary to the Report's statement that the Option 2 technology is economical in all five cities. All the scalars rise, even with the minimum cost estimate. A full cost estimate would make them rise much more.

For taped sheathing, the cost includes not only NIST's estimate of $5,317 for the taping, but also extra flashing and caulking. The resultant cost is not $5,317, but at least $16,043. The Option 1 technology becomes uneconomic in St. Louis, and barely economic in Bismarck and Minneapolis.

ICR Table 1, Air Barrier Partial Cost Calculations

Cost Estimate for House-Wrap Air Barrier	**Quantity**	**Unit**	**Price**	**Cost**
House Wrap	14592	SF	$0.210	$3,064
Building Paper (Credit)	14592	SF	-$0.140	-$2,043
Seal Bottom of House Wrap (6" flexible flashing) - 384 LF	192	SF	$3.460	$664
Caulk Bottom Plate to Foundation	384	LF	$1.700	$653
House Wrap for 4th Floor Ceiling Air-Barrier Wall Connections (includes building interior apartment and room divider walls that penetrate the ceiling membrane on the fourth floor)	3840	SF	$0.210	$806
Window Sliding Door Flexible Flashing - 6" Wide (1 Sliding door, 2 double and 1 single window - 25% of wall area)	1264	SF	$3.460	$4,373
Metal Window Flashing (Credit)	272	SF	-$2.810	-$764
Seal Bathroom/Dryer Vents (2 per apartment)	64	Each	$1.700	$109
Total Air-Barrier				$6,863

4 Story Wood Frame Apart Building (Masonry Veneer)	Bismarck	Minneapolis	St. Louis	Phoenix	Miami
Cost of energy saved x Scalar 8	$16,486	$17,067	$12,326	$994	$3,286
Commercial Wrap (Option 2)					
First cost of the air barrier	$6,863	$6,863	$6,863	$6,863	$6,863
Calculated Scalar	**3.3**	**3.2**	**4.5**	**55.2**	**16.7**

Cost Estimate for Taped Sheathing Air Barrier	**Quantity**	**Unit**	**Price**	**Cost**
Cost Estimate for Taped Sheathing - NIST Report				$5,317
Caulking Sill/Top Plates (3.5 Floors)	2688	LF	$1.700	$4,570
Caulking Wall Panels and Corners (4 Floors)	960	LF	$1.700	$1,632
House Wrap for 4th Floor Ceiling Air-Barrier Wall Connections	3840	SF	$0.210	$806
Window/Sliding Door Flexible Flashing - 6" Wide	1264	SF	$3.460	$4,373
Metal Window Flashing (Credit)	272	SF	-$2.810	-$764
Seal Bathroom/Dryer Vents (2 per apartment)	64	Each	$1.700	$109
Total Air-Barrier				$16,043

4 Story Wood Frame Apart Building (Masonry Veneer)	Bismarck	Minneapolis	St. Louis	Phoenix	Miami
Cost of energy saved x Scalar 8	$16,486	$17,067	$12,326	$994	$3,286
Taped sheathing (Option 1)					
First cost of the air barrier	$16,043	$16,043	$16,043	$16,043	$16,043
Calculated Scalar	**7.8**	**7.5**	**10.4**	**129.1**	**39.1**

Calculations by Ron Nickson, National Multi-Housing Council, 2006.

2. Energy savings actually achieved by NIST's method

As noted earlier, the Report has been analyzed by Professional Engineer Martha van Geem, a member of the ASHRAE 90.1 subcommittee, and her report is attached hereto and incorporated herein by reference. Her method makes no changes to the suggested technology, but instead looks at the amount of energy saved in NIST's hypothetical building simply by bringing it up to code. NIST's simulations are not based on current construction practices or code requirements; they are based on a hypothetical thirty year old building on the unproven assumption that new buildings are just as leaky as older ones.[26] Therefore NIST compared the air leakage of a building that did not conform to code against a building that did conform to code AND had an elastomeric coating applied to the outside.

As discussed earlier, the work of Lstiburek[27] implies that 90 or 99 per cent of the energy saving must come from something other than sealing the masonry. (The difference in percentages derives from whether the coating is classified as a material or an assembly in the computer simulations that have generated the numbers.) It comes from sealing and caulking the joints, openings, and assemblies in the building. That sealing and caulking is already in ASHRAE 90.1, so it cannot be included in any calculation of leakage reduction by application of the elastomeric coating. Assuming the total energy savings to be what NIST calculated, the energy saved by the coating can only be 1 percent or 10 percent of the total. That is, after accounting for the other leakage reductions assumed by NIST, which are already in the ASHARE 90.1 standard, the actual contribution of the elastomeric coating is small. Ms. Van Geem calculated the scalars under this corrected attribution of saving, and she found the scalars all to be much higher than 8, frequently in the hundreds. If a building is assumed to be up to code, applying the elastomeric coating was never economic. In fact, the implicit payback periods exceeded reasonable expectations for the life of the building.

Therefore, because the authors changed assumptions in the middle of the project, they do not report the savings due to the coating. Instead, they report the savings due to bringing a building up to code and adding the coating, compared to an average building built in the manner of those built thirty years ago. The result is that the cost of each unit of energy saved by the coating is grossly underestimated.

3. The errors in the Report will impede energy conservation.

Because the report overstate the energy savings that would be produced by use of the elastomeric coating, the tighter house wrap, or the durable taping of seams, it exaggerates the amount of energy people will save if they incorporate these technologies in new buildings. Because these technologies appear so appealing, people will adopt them instead of other technologies that appear less cost effective. However, the cost effective

[26] See Persily, A.K., "Airtightness of Commercial and Institutional Buildings: Blowing Holes in the Myth of Tight Buildings." Conference paper, 1998. found at *http://fire.nist.gov/bfrlpubs/build99/art043.html*
[27] See Note 12, above.

appearance of these technologies is illusory because the mistakes in preparing the report. Other existing technologies may look less cost effective, but actually be more cost effective, once compared to the correct effectiveness of the report's technologies. Because of the Report's false information, people will bypass conservation methods that work and choose a method that doesn't work, reducing conservation and energy savings.

4. The errors in the report will cause economic inefficiency.

One reason that investing in the report's technologies is economically inefficient is because the costs exceed the benefits. The costs have been understated and benefits have been inflated. No builder could improve the well-being of a buyer by installing these technologies and adding their cost to the price; the buyer would always be better off buying the cheaper, less airtight building and using the money to installing or use other, cheaper, energy saving techniques.

The other reason for economic efficiency is related to Cost Impact # 3, above. Because of the errors in the Report, people will spend money on the report's technologies, far in excess of the benefits yielded. There is a use for those expenditures that would yield more benefits; the builders could spend money on an alternative technology that actually works. But they don't, if they rely on the report. Therefore, resources are not going to their highest and best uses, and the economy loses output it could have had. That lost output is the deadweight loss from the misinformation in the report.

Relief

NAHB respectfully requests that NIST withdraw the Report NISTIR 7238 from all NIST sites where it is available; place a statement with the list of NISTIR documents that NISTIR has been withdrawn due to technical errors; send written notice to all standards setting organizations that would have foreseeably relied on the Report, such as IECC, the International Residential Code, and especially ASHRAE SSPC 90.1 that NIST disavows the Report because of errors and recommends that no reliance be placed on it. NAHB further requests that DOE send similar written notices to such organizations, as well as federal government agencies concerned with energy conservation or building standards, and state and local energy conservation or building code authorities or organizations; remove the link to the Report on the EERE site, and replace it with a statement that the Report has fatal errors that make it unusable. This statement should be published in *Federal Register*. NAHB requests the Commerce Department to ensure that NIST fulfills this request.

In the alternative, NAHB requests that DOE, EERE, DOC and NIST issue a notice to ASHRAE and other interested parties, and publish in the *Federal Register*, a notice that the Report is withdrawn until a corrected Report is issued. The corrected report should compare a thirty year old building to a building built to current standards, then estimate any energy savings that result from applying the new technologies to that building, or it should compare the leakage of a thirty year old building to the leakage of a the same

building with only the new barrier technologies added, the technologies that are the subject of the Report. The comparison of old buildings should not assume any compliance with more recent codes. The effects of the elastomeric coating should be re-estimated making proper allowance for doors, windows, and other non-masonry surfaces, and without including the effects of improved caulking and sealing. Or, a comparison could be made between a building built to current code without the coating and an equivalent building with the elastomeric coating. In short, any research on the topic should compare buildings that are identical except for the technological change of interest.

If you have any questions or concerns, please contact the undersigned at 202-266-8305 or aholliday@nahb.

Sincerely,

Andrew Jackson Holliday
Regulatory Counsel
National Association of Home Builders