

Standard 90.1 R: Issues and Answers

The committee revising *ANSI/ASHRAE/IESNA Standard 90.1-1989, Energy Efficient Design New Buildings Except Low-Rise Residential Buildings*, received 19,008 comments during the first public review that ended June, 1996. The committee has responded to the comments and has approved a second draft for public review.

To update members on the committee's work, *ASHRAE Journal* organized a symposium-style interview with four members or former members of Standing Standard Project Committee (SSPC) 90.1. The interview was conducted at the ASHRAE Winter Meeting in Philadelphia with:

Ron Jarnagin, Member ASHRAE, staff scientist at the Pacific Northwest National Laboratory. Jarnagin is the current chairman of SSPC 90.1, the committee revising the standard. He has served on the committee since 1990.

Merle McBride, Ph.D., P.E., Member ASHRAE. McBride is the former chairman of SSPC 90.1 and has served on SSPC 90.1 since 1984 in various capacities.

Richard E. Ertinger, director of engineering for Commercial Applied Equipment and Services, Carrier Corporation. Ertinger was asked to participate to provide the perspective of the manufacturing sector. He served on the committee from 1992 to 1996.

Frank Stanonik, Associate Member ASHRAE, director of technical services for the Gas Appliance Manufacturers Association. Stanonik was asked to participate to provide the perspective of a previously unresolved commenter on Standard 90.1-1989. He has served on the committee since 1992.

What issues prompted the decision to revise Standard 90.1? What does the committee hope to accomplish? What are some of the benefits?

Merle McBride: The public review of the existing Standard 90.1 identified several areas for possible improvement. Standard 90.1-1989 is primarily based on professional judgment and we got a lot of questions and challenges regarding cost-effectiveness. So we thought if we used economics to set the criteria, we'd have a solid foundation.

Another major concern was what I've characterized as balance or consistency between the various sections of the standard. There's some question in the current standard that the stringency is too high for the envelope and not high enough for other sections. What we want is consistency in terms of stringency so that one area doesn't go too far and another area doesn't go far enough. Economics was another vehicle that

helped achieve this balance because the criteria was meeting the same level of economic hurdles.

We also wanted to make sure the criteria are technically feasible, so we limited ourselves to technology that is currently available. We also wanted to expand from inch pound (I-P) units and include SI. We had also been challenged to answer the question: If ASHRAE wants to do something better than the minimum, can the committee provide guidance? So we proposed multiple tiers.

What did we hope to accomplish with the standard? First, we want to save energy. That, I think, is everybody's overriding concern. We also want the standard to be easy to understand, simple to use, and easy to update. If we achieve all of this, the standard will have a tremendous benefit to society.

Ron Jarnagin: I think Merle has done a good job of characterizing what we set out to do. He was the chairman during that time and provided a lot of the guidance to the committee and helped keep us focused through this thought process. I think it's real important to underscore that the committee spent a lot of time debating the basic approach to developing a standard. The discussion led to a consensus on the approach. What you saw in the first public review draft represented the culmination of efforts that started at the New York meeting in 1990. I think it's important, as one looks back historically, to realize that the first public review draft essentially manifested a number of decisions that were made in the early 1990s.

Richard E. Ertinger: This is from the perspective of the air-conditioning product manufacturers. Like a lot of things in life, timing is everything. When the current version of the Standard 90.1-1989 came out, our industry was just getting involved with the changes that would be needed as a result of all the pending regulations on refrigerants. We knew the provisions of the Montreal Protocol. We knew that the industry was slated to begin regulation. But we were unsure of all the technology and product changes required for the use of non-chlorine-based refrigerants. When 90.1-89 went out, there was a last-minute concession to the fact that refrigerants would be changing. That concession provided minor relief on the required minimum efficiencies for chillers that were using non-CFC-based refrigerants.

But there was a lot of concern in the industry during the early 90s over the lack of knowledge about which refrigerants will be used for various product lines in the future. There was some concern regarding the new standard that we might not be able to even meet even the efficiency levels required for 90.1-



Ron Jarnagin

89, and more concern that if new efficiency standards are more stringent, it might be even more difficult. So manufacturers are greatly interested in making sure that we get new efficiency tables that allow for the use of possible new refrigerants.

What are the major changes in the review draft?

Ron Jarnagin: I think Merle outlined many of the areas that differ from the existing standard. One of the most important changes is the use of the code language or enforceable language.

If you want to have a standard that has impact, you've got to have a document that will be picked up and adopted by states and local jurisdictions. That's when it starts to have the force of law, if you will, and when it functionally affects the design and construction of commercial buildings. One way to shorten the time to market is for ASHRAE to put that document in enforceable language so that jurisdictions don't have to codify a standard and then adopt it. Since ASHRAE is essentially taking that step, the time to market is shortened and the standard gets into use much more quickly.

Merle McBride: I think it's important to add that this codification was done in response to the 1992 Federal Energy Policy Act that referenced ASHRAE Standard 90.1-1989 as the base line. I think that provided the Society with the impetus to write standards in code language, I think it has certainly elevated the visibility, status and acceptance of this particular standard.

Ron Jarnagin: Another change addressed is the issue of dual systems of units, including both metric and I-P. This has relevance in the federal sector since the government has mandated use of SI, and also in other countries where SI is the prevailing system. That will provide an international gateway for the standard. I think this makes the standard more useful to a broader community of potential users.

Rich Ertinger: I think if we're going to talk about major changes in the current draft, it's important to note the substantial changes to title, purpose and scope of the proposed standard versus the existing standard. The existing standard only applies to new construction. The draft still covers new commercial buildings, but it also includes alterations and additions to those buildings. When you get down to a detail standpoint, the new standard also covers elements of those buildings that weren't covered before. For example, there are categories of HVAC equipment that weren't covered. For the first time we provide minimum efficiencies for cooling towers and absorption chillers. Those are just some examples of some of the categories.

Frank Stanonik: I think one other thing, at least from my perspective, is that the new tables of minimum efficiencies for equipment have a better defined method of determining those values. This involved an economic analysis, and manufacturers provided information that went into that analysis. In some cases, we have new minimum efficiency requirements. In some cases, no change was justified economically. But this certainly was a change in approach from previous editions.

Ron Jarnagin: When you first looked at the public review draft, you see a relatively large package. But the size almost

masks the significant efforts to make the standard simpler and easier to use.

One person commented that the review package was like a manufacturer's catalog of products. The entire catalog might be contained in a 3- or 4-inch binder. Yet a particular designer is interested in a particular model, so a cut-sheet from the catalog is removed and all the information is there on that one sheet.

If you look at the 90.1R proposal and you go into, for example, the envelope section, you can select an envelope criteria table that is appropriate for a given location, and other locations in the climate range. That's a major move in simplification since all requirements appear on single pages. You will also find on that same page a true prescriptive option for envelope, something that has never existed in the standard in the past. This is a no-calculation option, if you will.

The advantages for something like that occur both on the design side and the enforcement side. The code official knows what to look for and the designer, knowing the assembly type, can easily determine the insulation requirements. These are major steps forward in my opinion and it's easy for that to get lost in all of the things that one may see in the standard.

Another excellent example is in the mechanical section, the bread and butter of the Society. Again, it might be easy to lose one's self in the number of pages of requirements. Many are appropriate for the larger engineered systems. But if one looks at the first page of the section,

one will find an alternate approach for simple systems that is really meant to cover the large volume of small commercial buildings. This one page will likely cover as much as 75% of new commercial construction. One page, a dozen requirements, that's all that's needed. It's the essence of simplicity in a sense.

So the project committee has responded to the community that has asked for requirements on the larger, more complex systems, and also the vast majority who are concerned with the simpler systems.

Richard Ertinger: Let me add that a similar simplification is demonstrated in the lighting section. Our colleagues from IESNA have produced a single table that puts forth lighting criteria in 3 or 4 pages that allows you to probably handle most types of commercial construction covered by the standard.

The most controversial part of the review draft was the provision for separate requirements for buildings that use electric resistant heating. How has this issue been resolved?

Ron Jarnagin: I think it's important to understand why that requirement ended up in the standard, and go back to the discussion we had earlier when we were talking about the development phase and basic approach on economics. As a consequence of going through and analyzing the various requirements, we ended up in many cases with different requirements for equipment using electricity compared to equipment using natural gas since the prevailing prices of those fuels affects the economic decisions. The dual envelope was an outcome of the application of our assumptions and the basic decision to use economic criteria that we made at the very beginning.



Merle McBride

Obviously, a large number of commenters disagreed with our approach so the project committee has committed in the San Antonio meeting to a single set of envelope requirements. The requirements are based on a blended mix between gas and electric which is based on economics. As it currently exists, our working draft has a single set of requirements for building envelope.

Richard Ertinger: Let me add another point. I think one of the underlying reasons for the controversy resulted from our hope that the standard would be adopted nationally. So we decided to use U.S. average fuel prices for both electricity and gas. The calculations using average prices generated a lot of discussion and debate. Many people were able to show specific isolated cases where you might arrive at a different optimal solution for a particular building in a particular location with a particular application. But again, our goal was to develop a national standard and we tried to simplify the process by using national prices rather than individual local prices for every individual building.

Part of the concern here results from the fact that the industry is going through quite a bit of change right now, especially the electric industry. And I think there's every expectation that those changes will result in some kind of price changes to energy users. I know there's been a lot of questions about whether fuel prices that we decided on some time ago are going to be realistic in the future when the standard's in place and enforced.

You're going to a single set of building envelope requirements, based on a mixed fuel rate. How is this mixed rate determined?

Ron Jarnagin: I believe that the committee's decision was to take a blended rate between a mix of gas and electric as the representative fuel cost. The ratio reflects the proportion of buildings that are heated with gas versus the proportion of buildings heated with electricity. The actual split was meant to represent, as best we could, what's actually going on in the field. And much of the development was based on what the data sources told us was going on at the present time.

Merle McBride: If memory serves me correctly, the distribution the committee chose to look at was a 90/10 split. Ninety percent of the cost for natural gas and 10% of the cost for electricity, with the weighting factors based on construction. Those are the specific numbers that we used to get the revised envelope criteria.

Ron Jarnagin: This approach is based on the heating side only, and does not affect the cooling side.

Merle McBride: I think that the focus of the comments we've received was more in opposition to having dual requirements than to the actual fuel prices used. Having a single requirement was the preferred solution, and the price was secondary.

What are the other major issues? What has been resolved and what remains to be resolved?

Ron Jarnagin: I'll start and then some others can help me. There were several issues that the committee identified as what we called cross-cutting issues in the comments.

Obviously, the dual envelope issue was the largest and comments on this ranged from the definitions of electric resistance heated buildings to administration and enforcement. By resolving this issue, we believe we've take care of a large number of comments. You should note, however, that there were a number of comments that supported what the committee did in the first public review draft, and these are not likely to be easily resolved by the actions the committee has taken.

Other areas with significant comments included the fuel price issue. I agree with Merle that it is somewhat secondary to the dual fuel issue or dual envelope issue. I believe, by and large, we are addressing those concerns with the steps that we're taking.

Another area was including alterations and additions in the proposed. We got a number of comments on that section because it does represent a change from the previous scope of 90.1. In some cases, the commenters pointed out that we had not articulated our intent as clearly as we had intended. We've made a number of changes to make sure people are real clear that the standard applies to a component or system in an alteration only if you touch that component or system in the alteration. Our previous wording left that somewhat ambiguous, and that attracted a lot of comments.

Another significant area was the use of mandatory code language. There are some who disagree, but we have the expertise within the Society and we followed the ANSI (American National Standards Institute) consensus process to allow dissenters to express their opinions. We also have direction from the board to write these things in a mandatory code language, so we're following the direction that we believe the committee has been given. But that is a significant issue.

One other area pertains to the Tier II alternate set of requirements for designers who wanted to go beyond the minimums. At the current time, the committee has decided to remove the Tier II requirements for lighting and mechanical equipment from the draft standard. Those decisions were made at our most recent meetings. I believe the only Tier II requirements that remain in the draft are those that are related to envelope.

Richard Ertinger: To elaborate on the point Ron just brought up on expanding the scope to include alterations and additions to buildings as well as new construction. We had testimony from some who administer or enforce codes. One of the things that they said was that if we wanted to have impact on energy savings in the United States, we needed to address additions and alterations. I think they said that 95% or more of the building permits issued in the United States go for alterations and additions, and 5% or less for new construction. That convinced most of us these areas should be a category of the standard.

Ron Jarnagin: Rich makes a good point. We also learned that even though 90.1 was originally intended as a new building standard, some jurisdictions were applying the requirements to alterations and additions anyway. And the scope change may, in fact, simply reflect the state of the practice in many places.



Richard E. Ertinger

Frank Stanonik: I'm going to add another point about the codification issue. I think that one thing that Ron didn't mention is that some version of Standard 90 has been around since 1975, and has often been implemented in state and local codes. Whether you call it a code or standard, and I understand there are distinctions, it is being used as a code in some jurisdictions.

Some have said that ASHRAE standards writing practices have not adequately solicited input from all concerned parties. How do you respond to that criticism? What steps are being taken during the current development process to involve affected parties?

Ron Jarnagin: I'll take first crack at that but we have others here who can add to this. I think that ASHRAE has done, by and large, a very good job in trying to solicit input and to allow that input to come forth. Not only is the standards process a consensus process, which allows people to have input, but it's a public process. Our standards actions or proposed actions are published in *ASHRAE Journal* and other venues. The Society maintains an "interested persons list" that includes the people who have previously commented on Standard 90 or who have served on the committee. And all notices of mailings and actions by the committee are sent to those folks.

I requested the list of publications and organizations that ASHRAE notifies when there's going to be something of significance and it was about 300 organizations and associations. The Society is now using the World Wide Web and the ASHRAE home page. It may be a passive notification process, but it's very clear from the growth of the Web that it is the method of choice for many people.

From the standpoint of our committee, we've tried everything that we can do. I think that the Society has done everything that it can do to provide notification and offers of involvement. More importantly, when we have found someone who, for whatever reason, seemed not to be knowledgeable or involved, we've specifically reached out to those people.

And I'll give you one specific example. Last April, Frank Stanonik and I went to Chicago to meet with the American Boiler Manufacturers' Association because they had some concerns over the public review draft. We spent several hours with them making a presentation on what was in the standard, explaining the intent of the committee and helping them understand how they can register appropriate input on the public review draft.

Rich Ertinger: I think we've carefully tried to maintain appropriate balance on the membership of the committee. One of the criticisms leveled at the current standard, 90.1-89, was that we didn't have very good balance between the various categories of manufacturers, users, code people, public and general interest, etc. So I think there's been a very conscious effort in maintaining balance, even with new people coming on and existing people rolling off. I think that's an important element of trying to get all interests involved, aware and recognized in this generation of the standard.

Merle McBride: Let me expand on Rich's comment. There has been a request and a decision to expand the size of the committee to incorporate more interests. But I think it's interesting that when you attend one of the meetings, there may be as many people sitting around the perimeter of the room as there are committee members at the table. So there's certainly this interest in people attending and participating in the meetings themselves.

As a further point, Ron had mentioned the presentation that he and Frank gave. That's just one of several that have been given at the local levels, and to the various ASHRAE chapters.

The committee also has given seminars at annual and winter meetings. There have been attempts to make this development process as open as possible and to solicit involvement and participation.

Frank Stanonik: I think that whenever the committee has learned of some interest, we've made the effort to contact that interest. There may be interests we're not aware of, but it's hard to know what you don't know about.

Another point is you (the interviewer) asked what steps are being taken to involve affected parties. Well, there is the other side of the coin. We've been talking about getting them information, which is what the committee needs to do, but it's then up to them to get involved. In fact, it helps the entire process when all the interests get involved, and it makes a better document if they are involved. But they can choose not to get involved and

the committee can't do anything about that.

How did the 19,008 comments to the review draft break down in terms of area? Did there appear to be a lot of misconceptions?

Ron Jarnagin: Of the 19,008 comments, 72% came from one source, actually one company. Only 17% of the comments came in as what we would characterize as individual comments. It's obvious from a statistic like that that the committee received some evidence of mail-in or letter-writing campaigns. I think the letter-writing campaigns reflect the significance of an issue to a particular industry or, in some cases, a particular company. It would be useful for those companies to understand that the committee takes all of the comments seriously, and we would tend to treat a large number of identical comments as one comment, but with more weight. And so in a sense, the 19,008 numbers represent a little bit of a misconception because most came from a few sources.

In terms of misconceptions, it's clear that in some places people did not understand, perhaps, what the standard said or what the standard implied. But it's not clear to me, in looking at the comments, that there are a lot of misconceptions. I think there are a large number of comments about some significant issues that we needed to deal with, and we have a process for doing that when we have the opportunity to engage commenters.

Frank Stanonik: I would just add that I don't think there were an unusual amount of misconceptions. There were some, but I think that's part of any public review. You know what you intend and try to convey that intent in the document. But try as you might, you can't assume correctly how all people will read those words.



Frank Stanonik

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Rich Ertinger: In some cases, it became obvious that we might have to make certain points more obvious or clearer to the readers and users.

I'll give you an example. There are categories of HVAC equipment that we don't cover in the standard. The reason for not covering them is there's no accepted certification standard for that type of equipment to ensure performance. An example would be engine-driven chillers as opposed to electric motor-driven chillers, which are covered in the standard. Since we didn't specify mandatory minimum efficiency levels, we had a number of respondents who assumed they'd have to provide another compliance path through the standard that we call the energy cost budget method. This method requires a little more work than just ensuring you meet a minimum value.

We've proposed newer language that makes it clearer that those categories of equipment are not covered in the standards because we have no legitimate way to specify them, and they don't then have to go through a laborious process.

Ron Jarnagin: Perhaps one of the reasons that the number of misconceptions was relatively small was that this standard contained, for the purposes of public review, commentary that was inserted in the standard. It was set off from the rest of the requirements in italics so that hopefully it was clear that it was commentary. Most of the commentary attempted to explain intent and meaning, and probably reduced misconceptions.

The revision to 90.1 is written in code language. What are the advantages and what are the obstacles?

Merle McBride: Clearly, the primary advantage of writing in code language is to simplify the process so states can use the document directly. This avoids having to translate it from standards language to code language. This is an outstanding advantage.

It does provide some limitations or obstacles because we can only include the mandatory requirements as opposed to suggestions, recommendations, guidance or insight. Since it's written in code language, we're prohibited from putting that type of additional information in there. That's a disadvantage.

There's also a requirement that codes be supported and maintained on a periodic time table. That may be more stringent than what the Society has traditionally done with standards. So I think we're heading into an area of regulatory commitments in writing codes, and the Society needs to come to grips with how it wants to be involved and support that activity.

The 1989 version of the standard is also a federal energy standard and many states have adopted Standard 90.1 requirements in the energy code. Will this be the case with the revised standard?

Ron Jarnagin: I believe firmly it will be. The U.S. Department of Energy (DOE) watches the ASHRAE process very closely, and has a lot of confidence in the consensus process and ASHRAE as an organization. I believe it's likely the standard will be adopted by DOE so it can be mandatory for federal buildings. The states already have a mandate to implement ASHRAE 90.1 as a result of the 1992 Energy Policy Act. It's likely that mandate will apply to the revised 90.1.

Rich Ertinger: I'd like to mention that it's very important to manufacturers for the revised 90.1 become a federal energy standard. I think most people could understand how difficult it would

be from a business standpoint if every state or every municipality had its own code and required manufacturers to design and manufacture products just for that market. So achieving uniform standards across the country becomes very important. The provisions of the Energy Policy Act set federal standards for equipment efficiency and performance, and didn't allow states to preempt those values. One of the limitations of the Energy Policy Act is that it only covers air-conditioning and heat pump equipment up to 20 tons (70 kW). I know manufacturers would like to see that extended to cover the larger capacity equipment.

Merle McBride: I think it's important to recognize the tie-in of the standard with the Energy Policy Act. The DOE is essentially mandated to periodically review and evaluate the standard to ensure it meets DOE criteria. DOE then imposes the requirements on the states who have to evaluate their state criteria. So the Energy Policy Act has set up a procedure so that as the ASHRAE standard gets revised, it triggers in a whole set of revisions and upgrades right across the country.

Will the new Standard 90.1 have accompanying computer tools?

Ron Jarnagin: Absolutely. The current Standard 90.1 has computer tools that support compliance with the envelope and lighting sections. We've been working on a computer tool that will support, in an enhanced way I think, the envelope sections. It's the Envelope Standard Trade-off Program. History's told us that has been a very popular program by people who use the standard.

In the lighting case, it's unclear whether we'll have a computer tool or need a tool because we've made some simplifications in approach. In the energy cost budget there are simulation tools already on the market that can implement the energy cost budget.

Merle McBride: Just a couple of comments relative to Ron's discussion of the envelope software: The software for the current standard only addresses the walls of buildings. What we're proposing in the revision of the standard is software that covers the entire shell, so we've expanded the scope in terms of the envelope.

Rich Ertinger: This doesn't really fall in the category of tools but the standard itself is available or will be available electronically, as well as a hard copy manual for the users.

Realistically, when do you think a new Standard 90.1 will be approved?

Ron Jarnagin: I think the prevailing answer is probably in the (Year) 1999 to 2000 time frame.

At what point do you see the committee finishing its work?

Ron Jarnagin: I think that will depend on this next round of public review. The committee has committed to a second full public review cycle and we'll have to see how successful we've been in resolving comments and making changes in response to commenters, input. ■

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