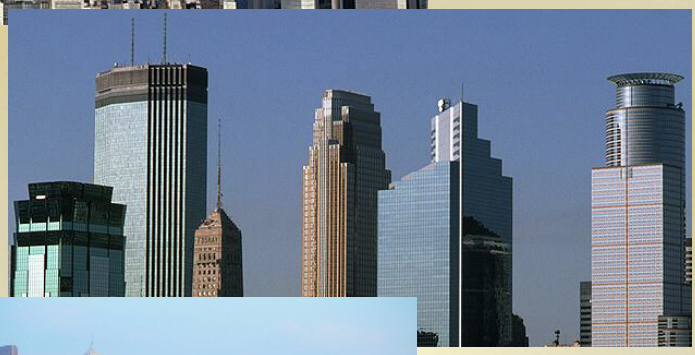
Defining and Rating Commercial Building Performance



A White Paper by

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INTRODUCTION

Commercial buildings are those designed, built, and operated for any use other than residential, manufacturing, or agriculture, including everything from schools to hospitals, offices to grocery stores. These buildings can be dedicated to a single, homogeneous use such as a corporate headquarters, or they can be a complex combination of rooms for public interaction, space for commercial activity, classrooms, workspaces, cooking and dining facilities, and even living quarters, such as those found in dormitories (taken from the V01 draft of the Technology Roadmap for High-Performance Commercial Buildings, June 2000).

The U.S. Department of Energy's Office of Building Technology, State and Community (BTS) Programs is facilitating an industry-led initiative to develop a series of technology roadmaps. The roadmaps identify key goals and strategies for different areas of the building and equipment industry. The High-Performance Commercial Buildings technology roadmap (Roadmap, CBI 2000) identifies a plan for integrating research, development, and deployment on improved systems, processes, and operation of commercial buildings in the future in the United States to improve the performance of these buildings.

U.S. DEPARTMENT OF ENERGY
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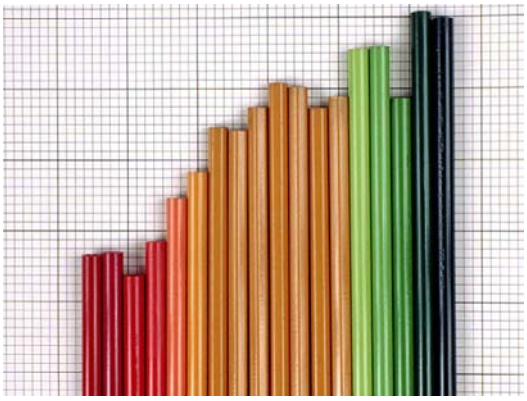
A major issue that has arisen in the quest to help improve the performance, including energy and environmental performance, of commercial buildings, is to actually define what constitutes high performance. There are certainly many other issues related to improving buildings in the future, but this issue of being able to define what a high performance building is, as well as rate its performance and benefits for being a high performer, is the central topic discussed here.



Since commercial buildings are so diverse, some diversity in the configuration of methods used to rate different types of buildings may be required. A church will not be rated as an office would, and a church may not even have owners who wish to be rated at all. For those who wish to celebrate diversity, commercial buildings provide ample opportunity.

Regardless of what transpires as to the benefits of particular approaches or technologies for commercial buildings in the future, the ability to define and measure building performance has potentially important long-lasting benefits related to valuation of buildings, understanding how to improve buildings, and achieving specific performance goals that may be formulated by private companies, public organizations, or governments. This ability is also crucial to the activities envisioned in the Roadmap.

The potential benefits of an improved ability to rate commercial building performance must be considered within the current context of many existing awards, benchmarking methods, and performance measurement practices. Given the wide range of existing methods that rate performance relative to or give awards for certain aspects of commercial building ownership or operation, acknowledgement and some linkage to these existing methods and award procedures must occur, at least to a limited degree. The pursuit of a method to measure overall performance of commercial buildings, with flexibility to adapt where needed, should be viewed as growing from existing methods and helping to bring a more comprehensive picture of building performance to light.

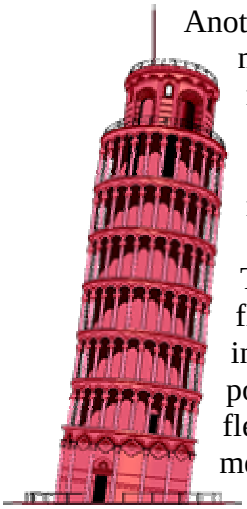
This paper presents a high-level view of issues related to development of methods for defining and rating commercial building performance. A proposed strawman is thrown out for discussion at a high categorical level, with suggested category weightings.

DEVELOPMENT ISSUES

Attempts to develop a definition of what a high performance building is, without also developing the metrics and approaches for assigning a performance rating, will probably lead to quite protracted development efforts that eventually may disintegrate. Both the definition or definition process and the metrics or performance rating process must be developed in tandem to keep a grip on reality, since it is quite easy to postulate definitions that would be very unworkable in practice and also quite easy to develop rating methods that are out of line with definitional requirements. Also, the process of developing the actual metrics and approach for obtaining a rating usually leads to insights into how performance should be defined. If the definition and metrics

approach are not handled in tandem, serious problems with eventual use are likely to develop.

Since commercial buildings are so diverse, serving many different types of occupancies or functions and with many different types of owner and owner objectives desired, any attempt to develop a single system to define and rate performance of these buildings will not be perfect and will even be unsatisfactory for many potential users. One strategy for dealing with the issues created by the diversity is to at least define a flexible system that can have many possible configurations.



Another option for handling diversity is to have a cascading system, which might evaluate performance at a high level for all buildings using one method or set of criteria, and use more tailored, specific methods or criteria to evaluate specific building types or uses. In this way, schools, offices, groceries, and other diverse building types could be evaluated relative to their function using tailored criteria appropriate to the use.

The ability for a commercial building performance rating system to be flexible is probably crucial for providing initial insight by a wide audience into the possibilities for such a system. However, flexibility also leads to potential chaos relative to understanding and interpreting results, so initial flexibility must eventually give way to fixed settings and approaches for meaningful performance comparisons to be made among buildings in any specific, set context.

Many more issues along these lines could be raised, but the intent here is to illustrate the highly probable need for flexibility, as well as the need to, eventually, reasonably fix the parameters and approach of any such rating system for use in specific contexts, possibly at different levels of detail.

Although some subjectivity is likely necessary for some contexts where an interest in rating performance exists, in general the methods should be as empirical as possible, and where subjective judgment is necessary, it should be limited by definition of specific categories that must be selected. Lacking sufficient empiricism, acceptance will falter.

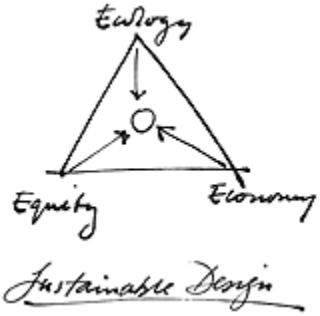
Major issues related to who will be the users of such a rating system, how any rating results will impact actions of building owners, operators, and other building industry actors, how such abilities will be deployed and maintained, and how quality will be assured also exist. These and other wide-ranging issues must be considered during development of performance definition and rating methods, although abilities to adequately address them all will likely be limited. Given the extent of such issues and the need to eventually address many if not most of them acceptably argues for quick development of prototype definition and rating procedures that can be tested by user groups. The testing process itself should be used to help identify the order and priority of addressing these wide-ranging issues, and the resolution of the testing process should be

expected to include the best possible resolution of the most important subset of such issues that arise. A 100% solution to rating commercial building performance is probably not possible, so expectations should be managed to gear potential users to acceptance of 75 to 90% solutions, possibly in a series of developments to increase quality of the methods from nominal 80% levels to nominal 90% levels over time.

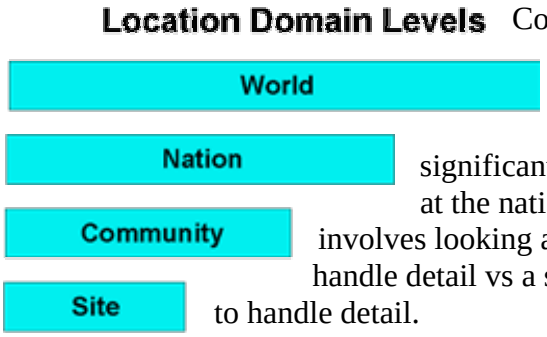
CONCEPTUAL BOUNDARIES

Rating the performance of buildings differs from rating a design or initial functioning of a building, and the meaning of performance discussed here relates to performance over time, which implies that a certain minimum time of use of a building is required before any performance can be evaluated. This does not mean that some means of rating building designs or expected performance based on initial testing should not be considered, but the difference between rating actual performance in use vs rating of designs and expected performance must be clearly recognized.

This boundary has special significance relative to "Sustainable Design" and other such topics considered to offer sustainability. Sustainability is often treated in a way that negates possibilities for making existing buildings "sustainable," even though the greatest impact to sustainability goals for the buildings sectors of national economies is likely to come from existing buildings. This paradox will also be seen in the following section on Building Performance Rating System Frameworks used to rate environmental performance.



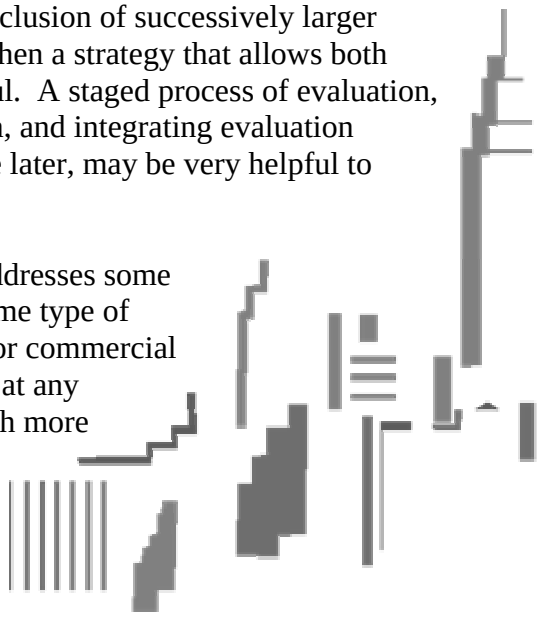
Sustainability is often considered in the context of contributions to global needs or as addressing issues of importance to the whole world. There are many ranges of domains that can be considered relative to buildings and building performance, from location to political / economic to business. These domain ranges can act to define specific contexts or as filters to consider only certain aspects of a complicated set of issues. As an example, discussions of building performance often include mention of issues related to the site a building occupies and performance criteria for the site. Issues related to how a building and its site affect the community where they reside are also often a topic. Interrelationships exist between domain levels for a range such as location. These interrelationships cannot be ignored, but they can be segregated, even if only partially, in order to improve the ease of understanding of issues at only one level of a domain.



Consider the range of location domains shown here from the building level up to the entire world level. Each additional level raises the complexity of issues and interactions significantly. Although one may wish to consider issues at the national or international level, the major tradeoff involves looking at a large location domain with less ability to handle detail vs a smaller location domain with increased ability to handle detail.

Decisions about buildings are often tied into the site the building occupies, and actors in the buildings industry are comfortable dealing with the mix of issues and considerations that arise with both the building and site domains treated together. Many community issues are also considered and dealt with relative to buildings and their use. Although the three domains are often considered together in practical use situations, the level of interactive consideration is often limited to a specific set of issues pertinent to the specific situation, and these issues often change from case to case. The reader is asked to recognize here that the inclusion of each successive domain level in combination with another level increases the complexity of potential issues and interactions by a significant degree, possibly an order of magnitude or more for each.

If we recognize that it is often desirable and useful to integrate consideration of the location domains of building and site, and also that inclusion of successively larger domains reduces our ability to handle all the details, then a strategy that allows both some level of integration and separation may be useful. A staged process of evaluation, segregating location domains during initial evaluation, and integrating evaluation results to obtain an overall rating for building and site later, may be very helpful to consider.



This approach of staging segregation to integration addresses some important concerns for anyone wishing to develop some type of performance definition and/or measurement system for commercial buildings. One is that raising the level of complexity at any given location domain makes a very difficult job much more difficult, and the second is that it is easier to be confused about which domain you are in if the building domain is retained in the larger domain of the site and/or the community during evaluation of building performance.

Although there is a risk of less than optimal integration with such an approach, staged segregation-integration of such issues should greatly benefit both the progress and ease of developing the definition and measurement methods for building performance, and may also significantly enhance the approach to evaluating performance relative to the site and

community domains, as only the most important site and community issues have to be included initially, but there is flexibility to later add other issues as needed.

Similar perusal of the economic / political or business spheres would lead to other possible ranges of domains that could be considered for buildings and building performance, but in the interest of limiting discussion now that the basic point has been made, these other spheres will not be examined in any significant manner here.

The ability to define and measure building performance is a stepping stone to many other important goals, including performance improvement and recognition of good performance. Like all good stepping stones, care must be taken to keep it in its place so it can serve its purpose. The desire to move on to accomplishing other important goals may cause confusion in the development of an ability to simply define and measure performance. The most difficulty is typically caused by the desire to be able to also diagnose causes of high or low performance. The process of developing building performance definition and metrics approaches should be guided by the need to put reasonable limits on what metrics are expected to accomplish, in order to keep this important ability distinct and able to serve its purpose and also to not retard its development.

BUILDING PERFORMANCE RATING SYSTEM FRAMEWORK EXAMPLES

Some important activity on rating the measured energy performance of existing buildings has occurred over the last few years, as witnessed by the work on energy benchmarking (Sharp 1996; 1998) and the advent of the Environmental Protection Agency's (EPA) Energy Star Label for office buildings and schools (see their website at http://www.epa.gov/buildings/label/). This author has developed a rating tool that can be used to rate the energy performance of any commercial building, with some cautions. The tool remains unpublished at present, but is available for constructive comment upon request and also available for specific application on a very limited basis.

In Europe, efforts have also started to do some types of emissions benchmarking and implement voluntary agreements between governments and large corporations or industry groups to reduce air emissions (often by increasing energy efficiency, see for example, OECD 1997). The term "voluntary agreement" or "voluntary approach" has been used to describe a wide range of actions, including covenants, negotiated agreements, self regulation, codes of conduct, and eco-contracts.

Concerning the issue of rating the energy performance of an existing building, the EPA ENERGY STAR® website states:

> [The] Benchmarking Tool is an online tool that evaluates building energy performance on a 0 to 100 scale using detailed data on your building's physical attributes, operating characteristics, and monthly energy consumption.
>
> Buildings that score a 75 or higher and maintain a healthy and productive indoor air environment, consistent with industry standards, are eligible to receive the ENERGY STAR Label for Buildings.

Energy performance rating systems focus on one part of building performance: energy. Rating systems have also been developed over the last decade that rate environmental performance of buildings. These environmental rating systems also typically include some type of energy component, as energy efficiency is often considered part of environmental performance.

The LEED Green Building Rating System (USGBC 2000), currently at version 2.0, is promulgated by the U. S. Green Building Council (see their website at http://www.usgbc.org/). LEED is targeted at improving the environmental and economic performance of commercial buildings by means of green and sustainable design.

In contrast to ENERGY STAR, which evaluates energy use in an existing building and sets required acceptable criteria for system and environmental performance, LEED primarily evaluates the proposed design of buildings using subcategories under major categories to achieve a score for each subcategory. Based on the total points scored, in ascending order of good accomplishment, a building may have achieved (plain vanilla) LEED certification, or Silver, Gold, or Platinum levels.

The major categories for LEED scoring are Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, and an add-on category (extra credit) for Innovation and Design Process. Details become somewhat involved, but these categories provide the conceptual framework for rating building designs (and presumably performance will follow), and this framework is the most important to consider relative to the topic at hand.

Achieving LEED certification becomes more difficult for an existing building, as many of the scoring points can typically only be addressed easily (or at all) when a building is to be built (which is in line with the goal of promoting green and sustainable design). LEED also mixes site and building issues, which is one of the important conceptual boundaries discussed above.

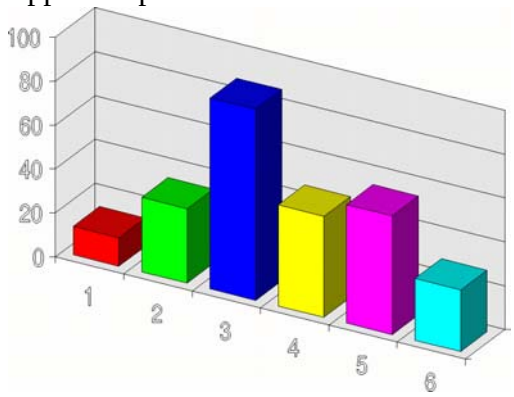
Another system for assessing the energy and environmental performance of commercial buildings is BREEAM (BRE Environmental Assessment Method). BREEAM was

originally developed in the United Kingdom by BRE, the Building Research Establishment, with partners in commercial real estate and the building industry.

BREEAM is claimed to be the most widely used international method for assessing building quality and performance in terms of energy, environmental impact, and health indicators (try checking the website at http://products.bre.co.uk/breeam/default.html and also the website at http://www.breeamcanada.ca/). BREEAM uses much broader assessment categories than LEED, which cover building envelope and other systems, as well as operation and maintenance. The two assessment stages, before and after, allow level of improvement to be quantified.

BREEAM has apparently been applied to over a thousand buildings in Europe, Asia, and America. The approach used involves comparing the current conditions and practices with recognized and peer-reviewed "best practices" and conditions. A description of the BREEAM Canada method is probably most accessible to American readers (Skopek 1999). The BREEAM assessment procedure has three sets of issues in two parts: Building Envelope and Systems, and Operation and Management. The issues for both parts have the same major categories: Global Issues, Local Issues, and Indoor Issues.

The global issues include ozone impacts, carbon dioxide impacts, and recycling. Local issues include water conservation, transportation, and noise. Each issue has a certain number of points that can be earned for good performance. This method is well suited to use for existing buildings, and the before and after approach provides a baseline assessment as well as potential targets for improvement. The level of improvement is rated implicitly in the procedure as a result of the before and after approach. BREEAM recognizes the importance of location domains, with issues divided into Global, Local, and Indoor (Building) domains.



An example of a rating system that goes beyond energy and environment, from the International Energy Agency's (IEA) work on Integral Building Envelope Performance Assessment, Annex 32 of the Buildings and Community Systems program, uses several categories to assess building performance. Weights for each category are explored based on expert opinion of Annex 32 panel members and from a special experts group assembled in the Netherlands in October 1999.

The performance rating categories and their weights are shown in the table below. These categories come from a group having a special interest in energy. The categories are a good illustration of how boundaries between the building, site, and community can become hard to distinguish. Eco system impact could refer to a local ecosystem or to larger ecosystems, and these impacts extend beyond the location of the building itself. The other categories can, primarily, be considered specific to a building itself, although the weights from the Klankbord (experts group) on global warming potential appear to recognize a dependent relationship of this category to other categories.

Weights for a potential system to rate commercial building performance.

IEA Annex 32 aspect	Weighting from Annex 32	Weighting from 'Klankbord'
Building energy used	25	30
Comfort and productivity	14	15
Durability, maintenance, flexibility	16	20
Eco system impact	11	13
Embodied energy	4	2
Global warming potential	6	
Image and aesthetics	9	10
Indoor air quality	9	5
Re-use, recyclability	6	5
	100	100

Some adaptation of any of the procedures discussed in this section is necessary for use in a consistent building performance rating system, as approaches, scope, and procedures differ. With these frameworks as examples, a building performance framework strawman approach can be proposed for consideration.

BUILDING PERFORMANCE DEFINITION AND MEASUREMENT STRAWMAN

To facilitate conceptualization and discussion of an eventual approach and methods to define and measure commercial building performance, a strawman framework is suggested here. As with the examples of rating system frameworks presented above, the use of categories is recommended to accommodate both a range of interests and also the range of performance criteria expected to be needed. In line with the idea of keeping flexibility in the initial method, the categories have weights that can be adjusted according to user preferences, although for use in support of efforts such as envisioned for the Roadmap, specific weights are likely to be fixed based on industry recommendations for specific contexts.

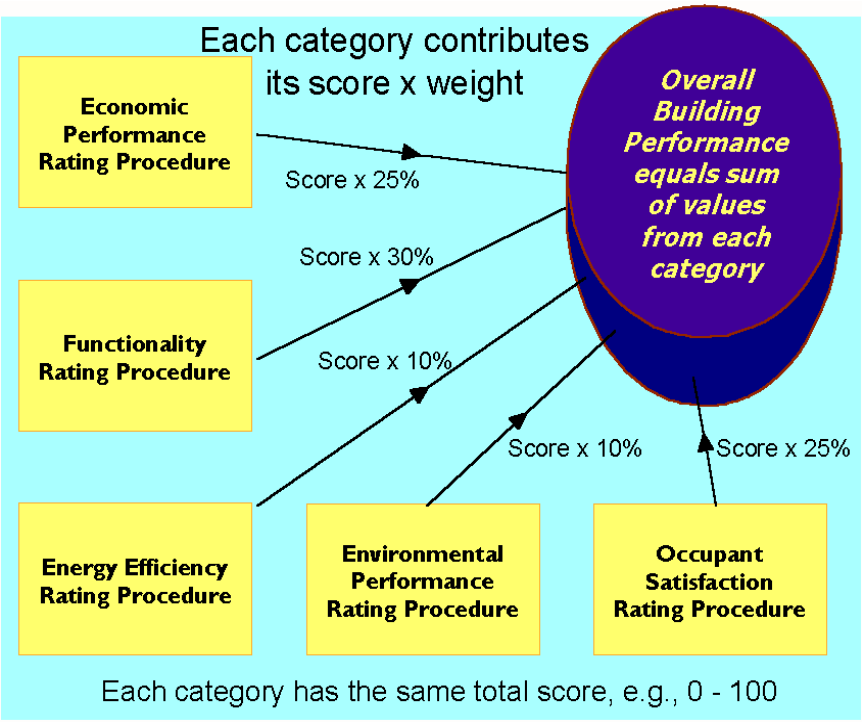
Only the top-level categories are presented here for the strawman, under the premise that a top-down approach will be the most useful for gaining agreement on a final method. A fixed set of weights for categories is also suggested. The weights can be adapted for other uses, but in the interest of promoting discussion for the Roadmap, weights are suggested as starting points of discussion for eventual use to support Roadmap goals for commercial buildings likely to be initial targets. These targets, or target occupancies, have NOT been selected, so an unfortunate vagueness will be present in the discussion following, but likely candidates may include office buildings, malls, lodging facilities, large or major chain retail, professional buildings, higher education, K-12 schools, hospitals and other medical facilities, food sales facilities, courthouses, museums, and warehouses. Restaurants may also be an important target, although they present some major challenges for rating (there are several categories of restaurant operation, and differences in operations between these types, e.g., fast food to limited seating to formal dining, are extensive).

The four suggested major categories for defining and measuring commercial building performance of the expected contexts having initial priority for the commercial Roadmap, together with suggested weightings, are:

- Economic performance, 25%
- Functionality, 30%
- Energy efficiency / environmental performance, 20%
- Occupant satisfaction, 25%

TOTAL = 100%

Each category would have its own individual rating procedure or set of procedures to arrive at a total score for the category. A diagram is provided to indicate one possible method for arranging the categorical procedures and arriving at a combined rating. With a weighting approach, the score of each category is multiplied by its weight, and the weighted score of each is added to arrive at the total score for a building.



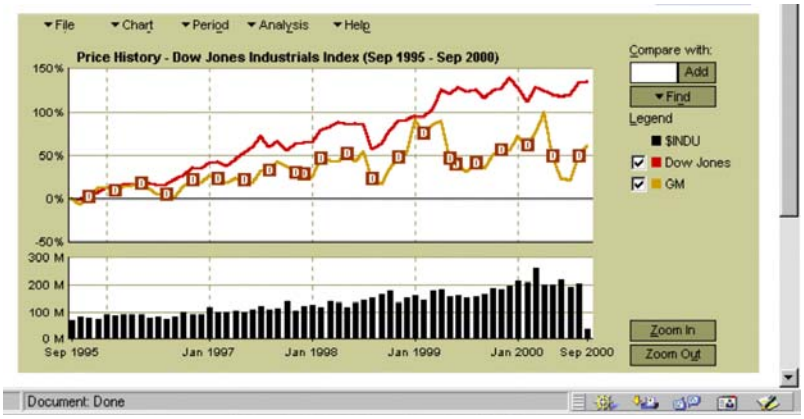
Although much has been written, spoken, and proposed regarding the holy grail of measuring occupant productivity, and although the ability to measure occupant productivity has many important benefits, this proposed framework does NOT address productivity directly. The reasons are many, but simply put, including productivity might delay development of a system for measuring building performance for decades, and for many types of buildings, productivity measurement is not an acceptable measure of building performance. The bottom line is that efforts to develop methods to measure office worker productivity should probably continue, but for more general commercial building contexts, it is not an acceptable performance indicator. In addition, productivity is a subset of economic performance and partially a reaction to occupant satisfaction.

The proposed strawman does NOT address site or community issues acceptably, and additional work is needed to develop strawman concepts for those location domains. Some means of integrating results from building, site, and community evaluations is also needed. This paper does not deal with this important additional effort, and readers are asked to remember the limits to what is presented here. The focus here has been narrowed to the building location only, which is fairly complicated of itself.

Some discussion of possibilities for each of the building rating categories follows. Under previous work sponsored by BTS, probably the most work has been conducted on empirical ranking procedures for energy efficiency performance, since that is a central area of work for BTS. Thus, most of the work of developing an empirical energy efficiency performance rating method has already been conducted, and an empirical performance ranking procedure is probably most appropriate.

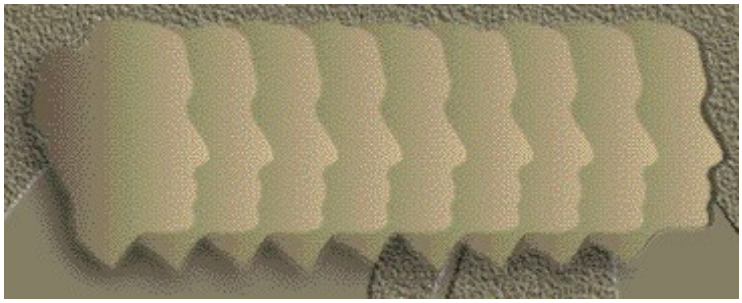
The significant development of procedures for ranking environmental performance, as discussed very briefly above, also offers rich material for developing a rating procedure that covers environmental performance. The energy portion of such procedures should be removed as notably inferior to the empirical energy efficiency performance ranking procedures already developed; and the issues related to the proposed staged segregation – integration approach to location domains will have to be addressed and acceptable methods defined. Much material already exists for this part of the proposed strawman, so development could start at a fairly advanced stage.

Many measures of economic performance of buildings already exist and are used as standard practice. Many empirical indicators of economic performance from an owner's or investor's perspective are tracked and reported at many geographic levels from national to local. The perspective from which to evaluate economic performance must be selected, as most existing indicators address the perspective of building owner or investor. A more global perspective would be possible, where not only owner or investor economic performance parameters would be considered, but also parameters indicating economic activity of the occupants could be included. Some significant research is probably needed to identify current approaches for different major building occupancies and to determine if a reasonably common approach can be developed that indicates overall building economic performance and addresses the major target occupancies. An empirical ranking method appears most appropriate.

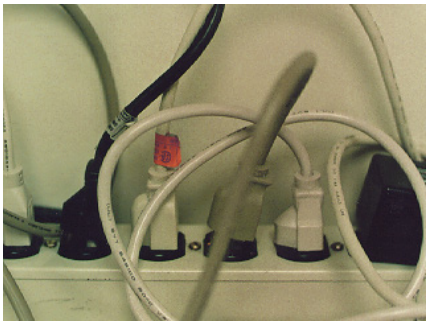


Some uncertainty exists over how economic performance of government buildings in the target occupancies can be measured, but there are money flows associated with government buildings, so some type of economic performance measurement seems at least possible. This raises the issue of whether a unified method of measuring economic performance can be developed that can accommodate both private and public sector occupancies.

Significant resources currently exist for determining satisfaction of building occupants. National awards are given for excellence in serving building occupants' needs (e.g., CEL & Associates National Real Estate "A List" Awards For Service Excellence). Once target occupancies are selected, some work will be required to determine whether existing resources for determining occupant satisfaction will meet the needs of any proposed rating system and also whether current proprietary methods might be prized loose for possible adaptation to more publicly available approaches and wider application to building performance rating.



Rating building functionality is fairly complicated and probably the largest challenge in the strawman framework. Assessment of functionality seeks to determine the quality of the performance interface between the purpose of a building and its features. What range of features should be considered? The need to address both the purpose a building serves and how well building features meet the needs for that purpose makes functionality quite difficult to treat if a wide variety of building purposes are considered.



Significant work by American and European experts on rating functionality has been documented partially in an International Energy Agency final report for Buildings and Community Systems Annex 32 Task A on Integral Building Envelope Performance Assessment. The report was released in late September 2000 (IEA 2000).

The rating system described in the IEA report is laid out to consider the following major areas when rating functionality: Functional Requirements, Image Expected, Internal Constraints, and External Constraints. Under Functional Requirements, major categories are: Use, Conditions, and Security / Safety. As further example, the main sub-categories under Use are: Space Requirements, Space Relationships, Logistics, Communications, Suitability / Workability, and Adaptability / Flexibility. The development work conducted for Annex 32 is valuable relative to rating functionality of a building, and the material available is an important resource for anyone trying to develop a method for rating building functionality. Since the purpose and image expected of the building from the owner or occupant probably will have to be considered, rating functionality will then involve several parties whose views must be coalesced.

The highest level categories of a strawman method for rating commercial building performance have been presented, together with limited high-level discussion of

resources available and issues related to these categories. Consideration of other possibilities, discussion of this strawman and alternatives, and consensus building on an eventual approach can now begin with at least some small level of boundary, issue, approach, and method definition presented.

CONCLUSION

The BTS High-Performance Commercial Whole Buildings Roadmap has four major strategies, the first of which is termed Performance Metrics. The ability to define and rate the performance of commercial buildings has been identified as critical to the ability of the Roadmap effort to achieve High-Performance commercial buildings. Apart from the interests of the Roadmap, a serious look at methods to rate overall performance of commercial buildings appears highly worthwhile, although in most efforts such as this there are many critics who will suggest that everything we need to know is already known. Despite the likely criticism, this author's opinion is that important benefits will accrue to all actors in commercial buildings by bringing a more comprehensive view of commercial building performance to light.

Despite the recommendation to proceed with development of methods to define and measure overall commercial building performance, serious attention must be paid to existing performance rating methods and awards given based on those ratings. Strengths and weaknesses of existing methods must be understood, and strengths should be leveraged as much as possible.

Discussions of how to develop performance metrics for commercial buildings often dissolve into wide-ranging excursions on topics like sustainability, standards, recycling, solar energy, and other (somewhat generic) buzzword topics, which often induce a "buzz" but do not make progress on the performance metrics development task. Off-the-cuff efforts to develop performance metrics criteria often devolve into minutiae of building performance from a building physics or other viewpoint. The material presented here is intended to focus discussion on performance metrics into a reasonable enough framework that a good starting point is not far off and acceptable progress might be made toward an initial schema for defining and rating commercial building performance.

Strong consideration should be given to developing an approximately 80% solution for rating commercial building performance in the near term, so that testing of the methods may be conducted and recommendations for refinement or alteration developed.

Development teams for each major category of the rating schema will likely be needed for initial development work, and some members of each team should be part of an integration team that assures the eventual integration of the categories into one method.

The performance metrics rating methods will likely become a national standards activity at some time, but the initial work should NOT be approached in a national or international standards framework, in order to assure interim results that can be used for testing, as too much is new at this point. Once methods appear reasonably workable, pursuit of standards can follow.

This high-level overview of issues and possible ideas for how performance metrics development work might be started is offered as an initiator of discussion and more fruitful action. Some food for thought:

> "You can't build a reputation on what you are going to do."
> – Henry Ford
>
> "Change is one thing, progress is another."
> – Bertrand Russell
>
> "Education is when you read the fine print. Experience is what you get if you don't."
> – Pete Seeger
>
> "The art of progress is to preserve order amid change."
> – A. N. Whitehead

There is no fine print presented in this brief exposition, as much could be written, but it would take much longer and be harder to digest. The desire is for commercial performance metrics to provide true progress without leading to unruly disorder. All it takes is good resources, maintenance of clear vision, cooperation, hard work, and perseverance.

In Summary

- The ability to define and measure what constitutes high performance for a commercial building has been identified as a major issue in the discussions leading up to the promulgation of the High-Performance Commercial Buildings technology roadmap in October 2000

- This white paper was developed to facilitate conceptualization and discussion of an eventual approach and methods to define and measure commercial building performance

- The pursuit of a method to measure overall performance of commercial buildings, with flexibility to adapt where needed, should be viewed as growing from existing methods and helping to bring a more comprehensive picture of building performance to light

- Rating the performance of buildings should be based on real performance over time, so that designers can receive feedback on the real performance of their designs and design process and so that ongoing real-world performance can be understood

- A staged process of evaluation, segregating location domains during initial evaluation, and integrating evaluation results to obtain an overall rating for building and site later, may be very helpful to consider

- Performance definition and metrics approaches must be developed within reasonable limits, not asking metrics to accomplish too much

- A strawman framework is presented to facilitate conceptualization and initial discussion of an eventual approach and methods to define and measure commercial building performance

- Only the top-level categories are presented for the strawman, under the premise that a top-down approach will be the most useful for testing and for gaining agreement on a final method

- The proposed strawman does NOT address site or community issues acceptably, and additional work is needed to develop strawman concepts for those location domains and domain integration

- Although significant resources exist for certain aspects of defining and rating commercial building performance, important development work is probably also needed to achieve a workable definition framework and rating process

- Strong consideration should be given to developing an approximately 80% solution for rating commercial building performance in the near term, so that testing of the methods may be conducted and recommendations for refinement or alteration developed. A 100% solution to rating commercial building performance is probably not possible, so expectations should be managed to accept nominal 80% levels initially, rising to nominal 90% levels over time.

- Apart from the interests of the Roadmap, a serious look at methods to rate overall performance of commercial buildings appears highly worthwhile, with potentially important long-lasting benefits for the commercial buildings industry

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