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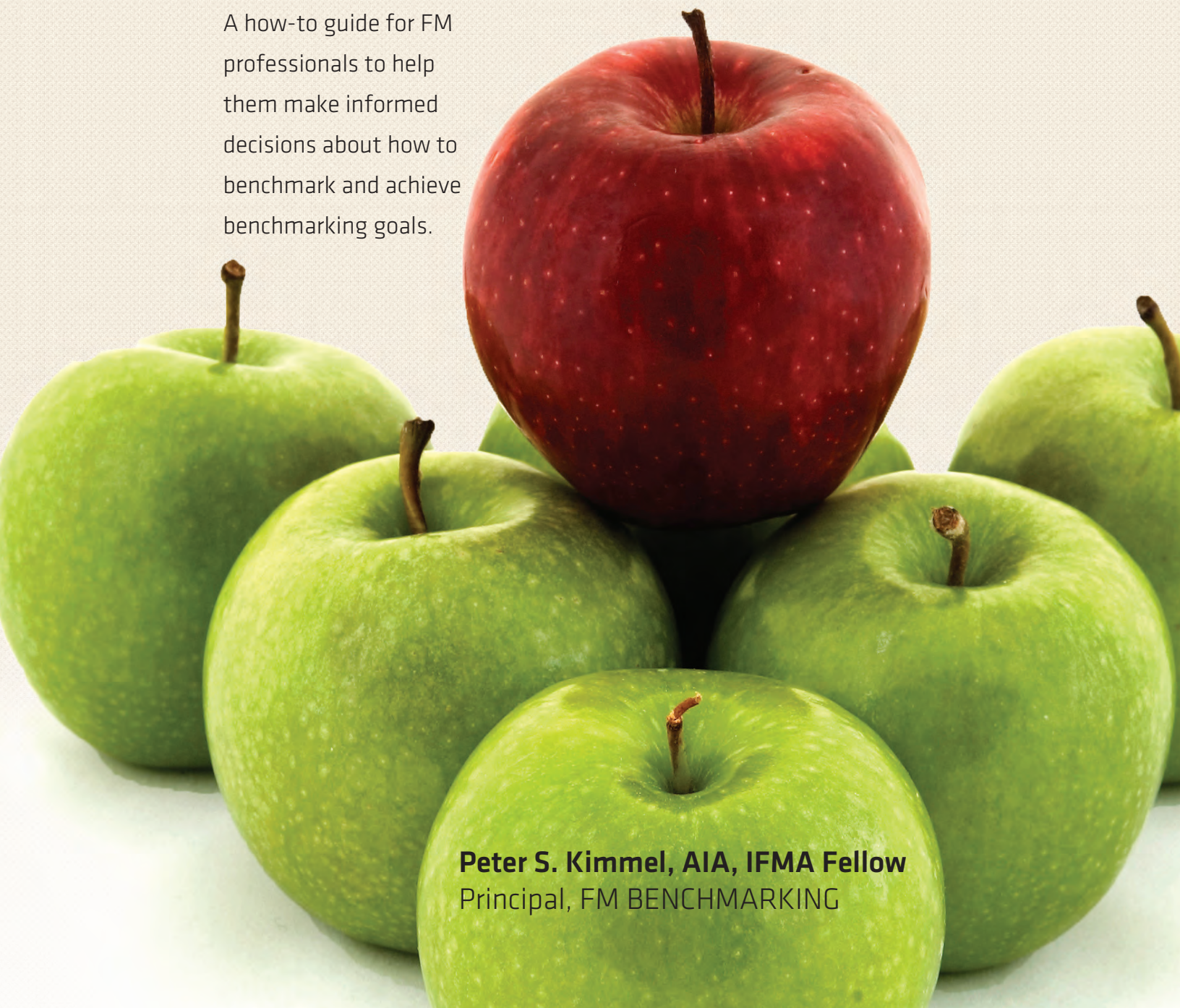
Benchmarking
for Facility Professionals

A how-to guide for FM professionals to help them make informed decisions about how to benchmark and achieve benchmarking goals.



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HOW TO GUIDE: BENCHMARKING FOR FACILITY PROFESSIONALS

Understanding today's benchmarking: The impact of automation on the art and science of benchmarking for facility professionals—a way to reduce operating expenses and improve sustainability

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ISS is delighted to sponsor this how to guide because we see a groundswell for benchmarking solutions building real pressure and momentum in the industry. Benchmarkings potential value to clients and outsourcing providers means that it's critical to develop effective solutions now.

ISS has the ambition of becoming the market leader in facility management by listening to our clients' needs and by innovating and delivering solutions which meet and exceed their requirements. Working professionally with benchmarking is a key aspect of realizing this ambition. At ISS, we have grown our portfolio of regional and global clients, and we realize these clients have a fundamental need for visibility of performance across their regional or global property portfolios.

Many large organizations have invested heavily in IT for data management, which provides an ocean of information. However, this data is not useful until it is organized in a coherent way that is relevant for the business. These organizations now expect to see a bigger return on their investment in data—they want information that empowers them to make the right decisions. Data and information provide the power; benchmarking solutions provide the controls necessary to harness this power and drive the business forward.

In our services to clients, ISS implements our CAFM system and mobile technology to automate workflows and provide the information needed to manage service delivery with high levels of efficiency. This is our leveraged data environment and our clients like it. We saw the potential for it to evolve to the next logical level and we developed our own benchmarking solution, Insight@ISS. This draws data from every service delivered to each of the client's sites and, in real time, aggregates it into site, cluster, country, regional and global information on trends relating to costs and service performance levels.

This is the magic of an effective benchmarking tool—to give clients visibility of what they spend and the service performance carried out at site level, right up to the global account level, and back down again through the granular levels to the organization, to give real insight into exactly what's happening across their asset portfolios. No doubt the value of benchmarking lies within:

- Transparency of operating cost at the granular level
- Facts and statistics to support decision-making processes
- Agility and speed in making decisions which can save money and improve outcomes
- Business intelligence across sectors, to compare performance, analyze the impact of investments and leverage innovations

We recommend this how to guide because benchmarking is moving rapidly from being an optional benefit for clients to becoming a primary requirement. The more we can optimize benchmarking to help our clients run their businesses effectively, the better service providers we will be.

Peter Ankerstjerne
ISS Group Marketing Director

Acknowledgements

Many people have been involved in the creation of this paper. It has truly been amazing how much support and expertise exist and how all voluntarily participated in bringing this paper to life. I cannot begin to name all those who played a role, but I do wish to call out a few.

In the beginning, in Spring 2010, there was Eric Teicholz, IFMA Fellow, who had invited me to begin writing what I thought would be a short paper to be done over the next few months. Angela Lewis, now with Facility Engineering Associates, assisted Eric and played a big role in reviewing the initial outlines and direction of the paper.

Over the next year or so, many people had a hand in the paper's evolution, and it started to take a new direction. There were many discussions not only between IFMA and myself, but within IFMA about this new direction. Out of all this surfaced the dedication, perseverance, professionalism and commitment of Mike Schley, IFMA Fellow (FM:Systems and IFMA Foundation) and Jeffrey Tafel (IFMA Foundation), who became the main champions of the paper from within the IFMA Community, and gave me encouragement through all the changes in direction that were evolving. Jeff then stayed with this project right through the present time, ensuring that it would become a reality.

In retrospect, these changes made the paper much more relevant and meaningful. As the paper then migrated close to its current state, the IFMA Foundation assigned several SMEs (Subject Matter Experts) to review the paper. Two of them took particular interest in working with me through the next phase of development: Dave Hewett (consultant, former Chair of BOMA) and John Serri (Manhattan Software). Their time, energy and conscientiousness provided me with the final touches to make the paper complete and deliver maximum value to its facility management audience.

I cannot forget to mention Keith McClanahan, who is responsible for bringing me full-throttle into the world of benchmarking. We had started to work together many years ago when he began writing the regular benchmarking column for the online publication, FMLink. I have learned so much from Keith throughout the years. He is not only a close friend, but a fellow Principal of FM BENCHMARKING. Keith also is the leader of the globally-recognized benchmarking firm, Facility Issues.

My appreciation cannot be complete without mention of my friends and especially my family, who put up with my hiding behind the computer to work on this paper. Their support and encouragement throughout this process has been extraordinary. The road over this past two-and-a-half years has been long, but very rewarding to me. I now hope that I can share some of the insight I have gained with you, the readers.

Peter S. Kimmel, IFMA Fellow

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CHAPTER 1: INTRODUCTION

Do you think that you could save a lot a space for your company, but just don't have a way to prove it? Have you thought your facility could save a lot of energy (and money) by installing lighting sensors in the rest rooms, but want some evidence? Do you believe your facility is spending much more on electricity than other similar facilities? Do you think your maintenance expenditures are considerably less than those of many other buildings and wish there were a way for you to get recognized for how well you've been managing your maintenance program? Do you think you could save money by outsourcing more of your operations?

A good benchmarking tool can help you come up with what you need to address all those questions.

What if instead of being an in-house facility professional, you work for an outsourcing or property management company. Do you think you are managing your clients' buildings more effectively than others are and would you like to show that to prospective clients? Or should you be implementing a daytime cleaning program for your janitorial clients, but don't know how to justify it? Or have you heard that you have lost a few clients because they think you are costing them more than your competitors?

Yes, a benchmarking tool can help your company too!

Are you a consultant looking for ways to expand your services and help your clients manage their facilities more efficiently? Do you run an IWMS software company and are looking for an edge over your competitors by seamlessly incorporating your clients' data into a benchmarking program so they can manage their space better?

Benchmarking is an untapped resource for both facility managers and those who service the building community. This paper will identify how benchmarking can provide solutions to the questions posed above, and lead you through the process to determine which forms of benchmarking will work best for you and how to select the proper tools to satisfy your goals.

The stakes are high. The savings can be great. Consider:

a) The median company in one benchmarking database was able to reduce its operating expenses by 31 percent over 10 years of benchmarking[1].

b) The median company in the same benchmarking database was able to reduce its energy consumption by 40 percent over 10 years of benchmarking.

These companies applied the techniques described in this guide. They can work for you too.

WHAT THIS GUIDE **IS** MEANT TO BE

This guide will show you a variety of forms of benchmarking, helping you to identify which will make the most sense for your specific type of organization and building, as well as for your role in your

[1] Source: Facility Issues, www.facilityissues.com.

organization. It then will show you how to select the most appropriate benchmarking tool as well as how to apply it.

WHAT THIS GUIDE **IS NOT** MEANT TO BE

This guide will not show you which benchmarking tool is "the best." Even if it could, what is best today may not be best tomorrow—technology is changing too rapidly. The guide's purpose is to show you how to go about benchmarking so you will be able to make informed decisions about how to benchmark for your organization and achieve your benchmarking goals. It will be up to you to apply what you learn to find the best tool for you today.

DEFINITIONS

Before starting, a definition of *benchmarking* is in order. There are many ways to define benchmarking, as would make sense given that the term was originally derived in the 19th century in a totally different context than what is applied today.

The original term, bench mark, was used in surveying and referred to a mark cut into a stone or a wall to establish the altitude (height) for a tract of land being measured.

Today, the most commonly accepted definition of a benchmark is, "A standard by which a metric can be measured or judged." Thus, benchmarking is the determination of benchmarks that are appropriate to a given situation in order to generate knowledge and information to evaluate to the original metrics.

In the facility management and corporate real estate arenas, there are lots of metrics that are measured. Each of these can have a benchmark. Of course, for a benchmark to be of value, it is important that all measurements for a given metric are made the same way and apply to the same set of circumstances. For example, a common metric for a baseball hitter is his batting average, which is a decimal formed by dividing the batter's number of hits by his number of at-bats, where a perfect number would be 1.000 (i.e., one hit every time the batter batted).

Since the advent of computers, many of us who listen to a baseball game will hear announcers stating a hitter's batting average, but the announcer also may say the hitter bats much better against right-handed pitchers than left-handed ones; or he hits better in the daytime than the nighttime. Computers make it easy to look at the same metric in many ways. In benchmarking, these are called filters—they are ways to ensure metrics are compared under the same set of circumstances. As with baseball, in benchmarking there are many metrics available for one to measure—the key is to determine which ones are most applicable to our specific building and building portfolio.

In facility management and corporate real estate, a metric such as square feet per person or Euros per square meter for electricity costs may be looked at. Once the benchmark value is obtained, one can ask to see the above area metric only for manufacturing facilities (which often have a higher utilization rate than office buildings) or for smaller facilities (which often have less support space than larger ones and thus a lower utilization rate). In this way, building type and size become filters for benchmarking facilities. Computers enable us to look at many more metrics and filters than ever before.

On the other hand, considering all the possible metrics related to buildings that can be stored in computers, one can see that benchmarking for facilities can become a daunting task, and it can be quite easy to get overwhelmed by the myriad of generated statistics. By the time you have completed this guide, it will be clear how you can navigate through the benchmarking process, recognizing it is both an art and a science.

CONVENTIONS USED IN THIS GUIDE

This guide is intended for both facility managers (FMs) and corporate real estate executives (CREs). Where both are intended, the term facility professionals is used.

In this guide, we use some very common words (e.g., metric, filter) with very specialized meanings. With any benchmarking system, it is critical to standardize what and how we measure. Similarly, it is important to use the same nomenclature. Although we describe each word when first used, you may find it helpful to refer at times to the Glossary at the end of this guide.

Benchmarking is global—it is not limited to any one country. Yet, many parts of the world employ different units of measure and have different currencies. In this guide, whenever a currency (dollar, Euro, etc.) or a measure (square foot, pound, etc.) is used, it should be interpreted to mean any currency (pound, ruple, etc.) or any measure (square meter, kilo, etc.). A good benchmarking tool will enable the user to convert any currency or measure to any other. When you come across a chart measuring dollars per square foot, it instead could have been expressed in Euros per square meter. In other words, the lessons described in this guide will apply to anyone, regardless of where they are located and what their preferred units may be.

Many examples are used to illustrate concepts. The reader is encouraged to focus on understanding the concept of each example, and not on which brand of benchmarking tool was used for the illustration. Illustrations were selected for two reasons: their ability to illustrate the concept being described, and the ease in which the examples could be located by the author. They are not intended to imply they are the only solutions in the benchmarking world or they are an endorsement of any benchmarking solution.

A BENCHMARKING SOLUTION—THE BASIC REQUIREMENTS

Benchmarking, when looked at from a bird's eye view, has only two requirements:

a) A lot of quality data.
b) A way of getting the data into a system, and then getting it out (today, most systems are automated).

However, there is quite a lot of work needed to satisfy those requirements. Obviously, no matter how good a system may be, without its having a lot of data, it loses most or all of its value. The Guide will identify what goes into a good system.

Quality data is very difficult to come by. First, the system must specify consistent definitions of the data; second, the user has to be willing to apply those definitions.

This guide will:

a) Identify how to establish your benchmarking goals.
b) Show you the different ways to benchmark.
c) Determine which benchmarking method will best fit your benchmarking goals.

Some benchmarking methods are very basic and will not take much time on your part (see Chapter 3, Quick Start to Benchmarking) while others will be more involved. The Guide will help steer you to where on the "benchmarking spectrum" you best fit and help you find your solution. This will lead to the type of benchmarking tool you select.

THE BENCHMARKING PROCESS—OVERVIEW

Since benchmarking is dependent on data, it means you will be dependent on others to provide you with the data in a systemized way that is functional and easy to use. The guide will show you parameters of what to look for in these systems and how to evaluate them as well as tips on what to avoid.

Many examples and scenarios are provided, so regardless of the type of facility you have, you will be able to see how to make benchmarking work for your situation. You also will learn how it is possible to gradually get your feet wet with benchmarking—in other words, what you can do when one doesn't have the time or data readily accessible to do everything all at once, so you can get up-and-running with the advantages of benchmarking in minimal time (see Chapter 3, Quick Start to Benchmarking).

Once a benchmarking tool is selected, you only are partway there. We now get into the critical area of data interpretation—the way that you convert data into information that can be applied to facility professionals' decision-making processes. Benchmarking is both an art and a science, and is much more than parroting back numbers to an executive.

After the initial data are analyzed and recommendations are made, you will learn that benchmarking is a continuous improvement process and why. Each year that you benchmark, if done properly, your building performance should improve. The improvements exhibited by those who have benchmarked for many years are truly dramatic.

Beyond showing you how to benchmark, if you would prefer to have a contractor conduct benchmarking for you:

a) You will learn what to expect from that relationship.
b) The contractor will see how to take advantage of having multiple benchmarking clients, thereby maximizing the value of the benchmarking services conducted.

Finally, the guide looks to the future of benchmarking. If you are an outside contractor or consultant, benchmarking will open doors for new contractor services; if you work for an association or university, it will lead to avenues for significant research. It also can become a great teaching tool for students to learn about the intricacies of real world management of facilities.

BENCHMARKING IS BOTH AN ART AND A SCIENCE

The data that get input into a benchmarking system are very specifically defined. The reports that generated also are very specifically defined. However, there are many ways to interpret the reports. Often, it will make sense for the user to change some of the parameters that define the report (e.g., add or remove some of the filters, such as a climate filter) and then regenerate the report. With the ensuing different results from the newly generated report, the user may very well refine the conclusion drawn and the resultant action to take. Considerable skill is required to know how to modify the reports and then to interpret them. This guide will give you the basics to get you started. You will learn that the benchmarking process (which includes not just looking up data but interpreting it and then applying it to your facility) is not only a science, but an art as well. This concept will be referred to often in this guide, especially in Chapter 6, Putting It All Together: The Benchmarking Process.

Ten tips to get the most out of benchmarking your facilities

1. Understand your benchmarking goals. Do you want only to compare facilities or also to improve them? If the former, then Chapter 3's Quick Start *may be adequate.*

2. Be sure the way you measure area is the same as others in the benchmarking database.

3. Understand the differences between medians *and* averages*; medians are more meaningful for benchmarking.*

4. Identify the types of reports you wish to obtain before selecting a benchmarking tool.

5. Identify the filters to generate comparison reports (age, size, climate, industry, etc.).

6. Know when the comparison data was captured and what error-checks were employed.

7. Know how to identify whether the comparison database is large enough, diverse enough and has enough growth potential.

8. Know what to do when there are not enough buildings in the comparison database to generate a meaningful report.

9. Make sure the system is very user friendly and easy to use.

10. Know how to apply judgment and draw accurate conclusions from the data.

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This guide reviews all the above and much more to get you on your way to being successful and productive with benchmarking.

CHAPTER 2: BENCHMARKING GOALS

WHERE TO BEGIN?

Often, when facility professionals express interest in benchmarking, they will start by saying what they want to measure. Among the most popular examples are space utilization and energy consumption or costs.

When asked how they would like to see these metrics reported, many facility professionals respond, "I'd like to see a chart showing all the buildings' space utilization rates" or energy metrics expressed as metric per unit area. When asked if they would like to see this for all building types or a specific one, they then answer based on their own building type.

If they then are asked would they like any other subsets of the database (e.g., filters), they may say that's enough. But if they are prompted by names of other filters, such as building size or climate type, they usually say yes.

Once they get the hang of it, the professionals then go to the other extreme and start to ask for too many filters. Once this happens, the only real match becomes their own building.

This can be complicated! So how does one get a handle on the benchmarking process? To answer that question, one needs to ask another: "Why is that information important to you?" By forcing facility professionals to engage in this type of analysis, they are able to think through why they are interested in benchmarking in the first place. Perhaps an even better question is, "What information would be important to your stakeholders?" The answer to this question will lead to your organization's benchmarking goals.

DEVELOPING BENCHMARKING GOALS

Following are the most common reasons facility professionals want to benchmark. Sometimes, the reason for a given professional may be based on a preconceived notion of what benchmarking is or it may be based on having studied what benchmarking can do. Often, the initial goal may evolve over time into one more valuable to the stakeholder.

These reasons become the possible goals for the benchmarking system:

1. **Identify in which areas each building is over-performing or under-performing other similar buildings.**
   This goal will tell you whether you are doing well or should consider making some changes in your buildings, but it won't tell you what to do to get better. Many FMs, when they first consider benchmarking, make this the key objective for their benchmarking—they just want to see how they're doing. They often have not thought through what they will do once they find out the results. So this knowledge can be very helpful for recognizing potential problems, but not identifying the solutions leading to improvement.

2. **Identify actions to be taken to improve building performance and justify them.**
   This is an extension of the first goal. Once you've identified where you may be under-performing, the question becomes, "What are the better-performing buildings doing that my building is not?" Often, this will involve a second level of benchmarking—the benchmarking of best practices. In addition, the benchmarking tool will give you evidence to justify to management their implementation (see the next goal).

   Some benchmarking tools benchmark not only physical attributes of buildings, but operating procedures, such as, "Do you request a proposal whenever a contract is up for renewal, or do you just glance it over and renew it if everything appears in order?" You may find that for buildings such as yours, companies that re-compete renewals are spending 20 percent less than you are. Result: Benchmarking can be used not only to make building improvements, but also changes to operating procedures.

3. **Justify my budget.**
   Many FMs are able to identify best practices to implement that will make their facilities run better. But many will be hard-pressed to "prove" the potential benefit of implementing that practice. Without that proof, it may be difficult for the expenditure to be approved. However, through benchmarking, one might find, for example, that the facilities which have implemented occupancy sensors were able to reduce their utility bill by at least "*x per square foot*."

   When many FMs who benchmark discover that similar organizations are spending less than they are, they try to find out what the others are doing differently to be better. What is less obvious is the FM who discovers that her organization is spending much *less* than others—believe it or not, this can be a negative finding; for example, it can be a sign that one is not doing enough preventive maintenance or is underpaying staff. Discovering that one is paying much less may be a justification to spend more.

4. **Justify my staff.**
   This is very similar to the previous goal, except that it is for staff rather than just a budget. It is a separate goal because staff is so important to successful facility management.

5. **Know when to outsource.**
   You may find out that all similar buildings have similar budgets for maintenance and janitorial, but only those who are running these programs with in-house maintenance and janitorial staff. If you then apply a filter that looks at those who are outsourcing similar

buildings and find they are spending less than you, you might consider outsourcing these functions in your buildings.

For contractors, there may be some additional goals[2]:

6. **Demonstrate that your clients are doing better than the norm.**
   If you are a contractor and find your clients are performing in the top half of all buildings, you then will have good, quantifiable data to use in your marketing materials to help attract new clients.

7. **Show your clients how to improve.**
   Conversely, if you discover your clients (or perhaps just certain buildings) are underperforming most similar buildings, through benchmarking, you will be able to identify why and what your buildings may need to do differently to become best-in-class.

8. **Justify your pricing to clients.**
   Many contractors spend a lot of time negotiating with their potential clients. Through benchmarking, a contractor can prove which services being offered are priced competitively and thus save a lot of time in negotiations.

9. **Provide additional services to clients.**
   Many facility clients want to know how their buildings are doing compared to those of other facility professionals. Not only is it likely the contractor has access to the key benchmarking data, but the client may have staff who could input the data and analyze it. If the time becomes extensive, the benchmarking can become a very valuable service for the contractor to offer to clients. The ability to offer this service can become a big differentiator when potential clients are determining which contractor to engage.

Each of the concepts mentioned above, such as filter selection and best practices will be described in depth later in this guide.

[2] In most of the world, it is typical that contractors oversee most of the FM functions, including maintenance, janitorial, security, landscaping and similar FM functions. The goals from benchmarking not only can help the contractors take care of their clients' space more effectively, but also can provide them with excellent marketing materials to obtain additional clients. The trend toward outsourcing is increasing worldwide.

What Do Most FMs Initially Think Benchmarking Is All About?

During a conference presentation on benchmarking, I asked the audience of facility professionals what they believed their benchmarking goal was, based on the above list. In other words, what were they hoping to get out of the presentation? Just over half selected the first choice—to be able to compare their buildings to others. Nearly one quarter said they wanted to improve their building performance, and most of the rest wanted to justify their budget.

Thirty minutes later, after the audience had learned a bit more about benchmarking and what it could achieve, I asked them the same question. This time, 92 percent said they wanted to improve their building performance. This guide will show you the way, if indeed that is your goal. It also will show you how to achieve the other goals as well, but if one of your objectives is to reduce operating costs, then building performance improvement is essential.

WHAT KIND OF COMMITMENT WILL IT TAKE FOR ME TO BENCHMARK MY FACILITY?

After determining your goals for your organization, your first task will be to identify the metrics you wish to benchmark. This is a one-time task.

Assuming you will want to not only look up what other buildings are spending and consuming, but also compare that to what you are spending and consuming, you will need to collect the data representing the metrics you wish to compare. These most often include your annual utility bills as well as a summary of what you spent for the year on maintenance, janitorial services, security, landscaping, etc. You may use totals or break everything down into individual tasks, depending on how much detail you wish to use in your benchmarking comparisons. For some organizations, this information can be retrieved instantly, as it already is in accounting and work management systems. For others, the worst case is they may have to retrieve individual invoices from their suppliers.

For most benchmarking applications, you will need to input year-end data; there will be no need to break it down into monthly or quarterly data.

If you only are doing the Quick Start to Benchmarking mentioned in Chapter 3, you just need to have your summary data printed on a piece of paper or accessible via a computer screen. If you are using an automated benchmarking tool, you then simply look up what others are doing.

If in addition you want your building to appear on a comparison chart alongside other buildings in the system, you will need to input your data into the benchmarking system. This should take you no longer than 30-60 minutes for all the basic charts, once you have your building data at hand.

If you want to input a moderate amount of data to generate more than the basic charts, it will take an additional 60-90 minutes, or 90-150 minutes total after the building data has been gathered.

It is not likely that you will want to put in more data, unless it is to probe why one of your numbers is markedly different from your comparison filter set (your peer group of buildings). For example, if your maintenance costs are significantly higher than most others, you may want to break down your maintenance costs by crafts.

At this point, you will be ready to generate as many reports as you need. These should take you very little time, depending on the benchmarking system you are using.

Since most facilities already have most data somewhat accessible, the biggest time factor for the facility professional is data inputting. This is determined totally by the level of data one wants to benchmark. Many factors lead to that level of data, starting with your benchmarking goals; these factors are discussed in their own sections of this guide.

Many people start benchmarking along the lines outlined in the Quick Start section as this tells them quickly and easily how they compare to their peer groups. Once they identify where they may be lagging their peer groups, they frequently want to go into more depth. Although the time expended will increase in these situations, the potential resultant savings will make the expense quite worthwhile.

Once the benchmarking reports are analyzed, most facility professionals will develop an action plan to address any areas where their buildings are weak. Then, at the end of the next year, there will be more data available. The organizations that have implemented successful benchmarking programs will continue to benchmark each year, as benchmarking is a continuous improvement process. Thus, the facility professional will need to collect and input the data all over again; as a rule, it is much easier the second and subsequent times.

HOW FACILITY PROFESSIONALS APPROACH BENCHMARKING DIFFERENTLY

The key facility professionals who may benchmark may be summarized as follows (there are others, but these are the major ones):

a) The **corporate real estate executive** usually will want summary information, often for a company's entire real estate portfolio. The CRE will use this data to make sure that all is within budget. Usually, the numbers will be summarized for all the buildings in the company's portfolio. At times, the numbers may be presented in terms of total operating costs per unit area for an entire building, but rarely will the numbers be broken down into the various facility units (e.g., maintenance, utilities, etc.). Yet without that breakdown, it is impossible to determine how the expenditures can be reduced. One of the key purposes of the benchmarking data for the CRE will be to present it to top corporate management in terminology used by the C-Suite; often, this terminology is the type that may be seen in a corporate annual report and is far removed from what a facility manager uses. But much of it is based on what the FM tracks, so it is critical that the benchmarking system provide a way to translate the facility metrics into the types of metrics that interest the C-Suite the most.

b) The **facility manager** is the professional who will break down the data into as much detail as is necessary to learn where the budget can be reduced. Analogy: Think of the CRE as the administrator of a trust to manage a 20-year-old's household budget; the most detail that person may want would be the total annual cost of groceries, or perhaps even at a more macro level than that. The facility manager would be the 20-year-old who needs to understand the breakdown of the groceries. Without that level of detail, if the administrator believed the total annual grocery expenditures to be too high, the 20-year-old would not be able to determine where to reduce that amount.

c) The **outsourcing company** that manages or operates a facility for its client usually serves one of two roles or a combination of both. If the focus is on what the CRE does, the benchmarking needs for the outsourcing company are very similar to those of the exec; similarly, if the focus is on the day-to-day operations of a building, whether for the entire building or for just one aspect of it (such as maintenance), the benchmarking needs are similar to those of the FM. In addition, the outsourcing company will require the ability to study the buildings for just one client at a time, or, when conducting a company-wide analysis, the buildings for multiple clients at once. The outsourcing company may be interested in all operating costs for a facility or just one area (e.g., janitorial), depending on what the company is doing for its client.

d) The FM **consultant** can wear many hats. When the consultant is interested in benchmarking, it usually will be so the client can better understand the metrics related to the facility. The consultant can come at benchmarking from either the CRE or FM perspective, and the use of benchmarking will parallel that orientation. In both cases, the consultant usually will conduct the benchmarking, including the inputting of the data. The consultant then will analyze and interpret the data, making any ensuing recommendations as part of the consulting service.

Special requirements for the outsourcing company and consultant will be discussed in Chapter 8, Beyond In-House Benchmarking.

THE DIFFERENT LEVELS OF BENCHMARKING USERS

The light user. Think of facility professionals as being arranged on a benchmarking spectrum. First, there are those who want only a general number to know their building is in the right ballpark. As a rule, light users are managing just one small building (or renting space within one building); they are satisfied with their facility's budgets and staffing levels; and their management is satisfied with them, rarely looking at budget details. For these people, having access to some general rules-of-thumb may be adequate. They won't need to know much about comparing to similar buildings either—just knowing they are in line with most other office buildings, regardless of size and climate, is good enough for them.

The moderate user. These facility professionals want to know how their buildings are doing compared to similar buildings. Their primary goal is not to improve, and often their budgets are pre-determined by last year's budgets. Making changes that will cost money is not something they are encouraged to do. However, if they find out their buildings are seriously underperforming other similar buildings, they may become a power benchmarking user, at least for the metric where they are underperforming.

The power user. The power user is the moderate user who wants to benchmark in more depth the facilities operating areas where this person sees the organization's buildings underperforming those of others. This person wants to improve the buildings' performance in these areas and will benchmark best practices in order to do it. As these facility professionals apply best practices analysis to more and more facility metrics, they will become complete power users.

A good benchmarking tool will enable the facility professional to migrate from the light to power user, as the facility professional's needs change. A system with such flexibility is ideal.

Orientation of the Guide

Differences between types of users will be addressed throughout the Guide. From a benchmarking perspective, the needs of the light user are a subset of the needs of the moderate user, which, in turn, are a subset of the most detailed needs of the power user. The same principles that apply to benchmarking as a power user apply to benchmarking as a lighter user. This guide will focus on the entire package, leaving it to the facility professional to see which parts will apply to a given situation.

Regardless of the situation, if the benchmarking analysis uncovers a facility that is underperforming, delve into it in more detail. At some point, the facility professional likely will benefit from the more heavy-duty form of benchmarking that is described below. This will help the user determine which FM practices the better performing buildings are doing that the subject building is not.

THE DIFFERENT TYPES OF BENCHMARKING TOOLS

The facilities arena has a variety of tools that can be considered benchmarking. Some are more comprehensive than others; some address just one aspect of benchmarking or of facility operations; and some are in related fields such as construction. The reader is cautioned that many tools get refined frequently—the purpose of this guide is not to identify the best benchmarking tool, as the best tool is defined by each user and situation. This guide strives to lead the reader through the process so cogent decisions can be made in terms of which type of benchmarking will serve an organization the best, and how to go about applying that tool. Appendix I identifies many of the benchmarking tools used today.

This guide focuses on the tools that are designed to be comprehensive and fit most aspects of a facility professional's benchmarking needs. If there is a need to benchmark only one part of a facility, there may be more choices. IFollow the principles in this guide and you will end up with a solution that satisfies your requirements, regardless of where on the benchmarking spectrum they fall.

The comprehensive benchmarking tools enable you to track and generate reports for most cost and consumption metrics, as well as those relating to personnel and space utilization. As a rule, they generate reports that enable you to compare your building to similar ones.

Some tools have been developed by outsourcing companies. As aforementioned, in these cases, their reports will be limited somewhat by their own clients' data. Their value can be quite high when comparing how your building is doing to others managed by that outsourcing company; but that also is their weakness—the comparison set of buildings is limited in quantity, and also to the way in which that company manages its buildings. For example, if a company uses the same subcontractor for much of its

work, or does not conduct as much preventive maintenance as many others do, the system will not show it.

Some of these comprehensive benchmarking tools will take facility professionals one step further—they will identify which best practices are being done by the better performing buildings in your comparison set of buildings. You then can see how to improve.

Most of the benchmarking tools tend to specialize in one aspect of buildings. For example, there are some that are designed primarily for leased buildings where comparisons between rental rates can be made. Obviously, this type of benchmarking is not designed to improve your building performance, but to enable you to compare your expenses to those of others.

Some tools focus on real estate. These generally focus on specific markets and submarkets, usually within one country. They often contain vacancy rates and sales data, as well as lists of comparables.

Some tools rely heavily on data extrapolation—these systems have some input, and then a variety of algorithms are applied to enable the systems to project costs in cities for which they may have little or no data. Construction cost and building cost indexes frequently are compiled monthly and can be used for projecting building costs. These tools generally do not work as well for facility professionals looking to pinpoint specific costs for a specific building, but can be fine to project costs for building to be constructed or a building to be acquired.

Most tools today are automated—for the most part, it appears the days of reading a hard copy report is past. At a minimum, today's automated tools enable facility professionals to click on a report type and select its filters as desired. Automation also makes it easier for users to input data.

Some systems require data to be input annually; some require monthly data to be input (the monthly data often can be input for an entire year at once); and some are updated only once every few years for each major FM component. Some require you to input data in order to participate; others ask you to volunteer to input data; and others will charge you different amounts depending on whether you input data. The sections below go through these options in more depth as you need to be aware of which type you are looking at before you select a system.

The systems vary not only in whether they track data annually or monthly, but also in when one may input data. Some systems allow one to input data at any time, and then to modify it at any time; others only will have a limited window (usually two or three months) during the year in which you may input data. The former method accommodates those on different fiscal years better, as well as those who may wish to modify data during the year, or who find a need to input data in more depth during the year. The latter makes it easier for the benchmarking company to validate data before it becomes "official;" the former's benchmarking database is dynamic, providing a snapshot in time that can vary from day to day.

For systems that track data annually, some will allow comparison reports from year-to-year, so you can track your building's performance over time.

Pricing also will vary considerably between systems, not just in terms of how much they cost, but the basis of the costs. Charges may be based on annual fees, per report accessed, per user and/or per building. A as mentioned previously, some will lower their fees if you contribute data to their system.

The bottom line is that with all these differences between systems, it is critical that you start by establishing your benchmarking goals. This will lead you to the type of system that will work best for you. Then you can select the metrics you wish to track, which filters are most important for you and which reports you will need to run.

WHAT SHOULD YOU BENCHMARK, AND HOW FREQUENTLY?

As can be seen, there are a lot of possible metrics to be collected and input. Are they all necessary? In all likelihood, the level of detail needed for any one facility component (e.g., maintenance, utilities, security) will depend on your benchmarking goals as well as on whether you are underperforming your peers in that area.

If you are underperforming, you will want to know more information. For example, if you are spending more on maintenance, you likely will benefit from knowing what is spent on corrective versus preventive maintenance. If that is in-line with others, you may benefit from breaking out the maintenance tasks. At some point, you hopefully will identify what the culprit is.

So do you need to put in all the data broken down by each craft on Day One? If you have time, it only can help and not hurt. But if you don't have the time (and most facility professionals these days don't have a lot of this), you probably can wait until the benchmarking comparisons indicate you need a greater breakdown of the data.

Research has shown that facilities that are benchmarked annually will improve each year (see Figure 24 and Figure 26, which summarize savings over a 10-year period in total operating costs and utility consumption, respectively). This is because benchmarking is considered a continuous improvement process. Until one has a perfect facility, there always will be something that can be improved; benchmarking not only will identify it, but will show which of the improvements will have the most impact on the bottom line. Even if a facility were perfect, each year new technology delivers new tools that can help your facility operate more efficiently. The first year of benchmarking will identify the areas where the greatest improvement is possible (once recommendations are implemented), but there still will be value each and every year that you benchmark.

Some benchmarking tools for utilities enable data to be input monthly. While this can add to the data entry time, it can be helpful when making comparisons to other buildings in your area (with the same microclimate) where you may want to track the impact of local conditions in your building performance. For example, if your building is in an area that has major temperature changes, by tracking how other buildings in your area performed during February, you'll be able to see whether the sudden February improvement in your building was caused by the improvements you made to your building or because this February happened to be particularly warm.

DO YOU NEED TO COLLECT AND INPUT DATA?

The system selected will dictate your data entry requirements. Some benchmarking tools give you an option to use them without your having to input data (usually with those systems, if you decide to input

data, you would pay less for the tool or not at all). Other tools provide fewer features unless you input data. Others require you to input data.

Therefore, your first priority is to determine your goals, and let them dictate what system you use. All systems today are quite different, and you likely will find one system that is a better match for you than the others. You then can determine whether that system requires that you input data. All benchmarking systems require data in order to provide value to their users; for facility professionals to take advantage of the tool, they should be willing to input data. No benchmarking system ever can have enough data, so all who benchmark are encouraged to share their data with a benchmarking system where feasible.

There will be times when one isn't able to input data. If that becomes the determining factor for you, your choices of systems will be limited and you likely will need to sacrifice some functionality—you either may use a system that doesn't have all the features you want or not enough data (buildings), or you may end up with a system that doesn't include best practices analysis, which will prevent you from using benchmarking to identify ways to improve your building performance.

CHAPTER 3: QUICK START TO BENCHMARKING

Many facility professionals just beginning to benchmark start with the quest of looking at a key facilities statistic (e.g., KwH/square foot) and wonder how other buildings compare to their own building. Another common starting point for office-type buildings is the space utilization rate (e.g., sq. meters/person).

These professionals often will be satisfied by finding a chart that contains their key statistic (whether via hard copy, a search engine or a benchmarking tool that enables them to perform their query). The result may not be a perfect apples-to-apples comparison, but hopefully the source states enough about the assumptions made so the facility professional will know more than was known before starting the benchmarking process. Ideally, the source provides enough filters so the subject building will be in the right ballpark. Filters will enable the benchmarker to know, for example, that the comparison buildings are the same building type, in the same climate, of a similar age, etc.

This type of benchmarking takes very little time and often costs little-to-nothing. For some facility professionals, this is all that is needed. To see if this may be for you, look at the benchmarking goals you established for your building and organization.

This type of benchmarking will work well for an organization that simply is trying to determine if they are in the right ballpark for whatever metric(s) they are studying. If the statistic doesn't permit the facility professional to establish enough filters, the facility professional will not be able to determine more than the ballpark.

If the facility professional finds out the subject facility is spending considerably more than the rest of the comparison peer group, it may be a good idea to find out why. If it isn't necessary to find out why, this Quick Start to Benchmarking will work well; however, if the facility professional wants to see what better-performing buildings are doing, it usually will be necessary to do a more comprehensive and accurate form of benchmarking.

This guide will give you all you need to do comprehensive benchmarking. Most of the ideas will apply to the Quick Start as well, but it will not be as critical to follow all the suggestions. Although the Quick Start user doesn't have to review much of this guide in depth, it still will be helpful to absorb as much as is feasible, as the same principles will apply to both types of benchmarking, and then the facility professional will have a better idea as to how to apply the Quick Start results, as well as recognize when to go into a bit more depth with benchmarking.

CHAPTER 4: COMPONENTS OF A BENCHMARKING SYSTEM

In this guide, the focus is on automated benchmarking systems as manual systems (e.g., static tables and report) do not provide the same level of functionality. The static table's primary value is to the facility professional who is trying just to see if he or she is in the right ballpark for his facility, such as the person for whom the Quick Start may be adequate.

The static tables, if used beyond the ballpark concept, can result in your losing the ability to:

a) Produce an idealized comparison set of buildings, to ensure an apples-to-apples comparison.

b) Conduct what-if scenarios to determine which filters are most appropriate for each metric in your facility's operations.

c) Apply best practices benchmarking to see how to go beyond comparison data and learn what can be done to improve your building's performance.

Many benchmarking tools today are automated or have automated versions and will satisfy the above abilities. The comments in this guide are applicable whether the benchmarking tool is software, an app, cloud- or server-based, or in any other automated form. There is more information in the next chapter where the impact of automation on benchmarking is described.

The key components of a benchmarking system are presented in four areas:

a) Data fields to be tracked
This ties in directly to which metrics you want to benchmark, such as utilities, maintenance, etc.

b) Reporting system
This comprises the types of output reports, charts and dashboards that are generated, and what kind-of content they include. This also includes the filters that may be applied to each report, to ensure it covers only buildings that are most similar to your own.

c) Data entry
There are many ways to get your data into a system; as aforementioned, there also are systems that do not require any data to be input.

d) Features
These determine whether a system is easy to use or not. It also includes units of measurement, system security, how much data (how many buildings) are in the database and whether the system allows for a hierarchy of data, so different users can have different access assigned for different buildings.

DATA FIELDS TO BE TRACKED (METRICS)

Metrics for this guide will be divided into five primary areas:

a) Buildings
b) Costs
c) Personnel and space utilization
d) Sustainability
e) Best practices

Each is handled a bit differently in benchmarking systems. Before you determine how and what you will benchmark, you need to study these areas in detail, as much of the true value of a benchmarking system will come from the details of the data it can track; if the system cannot track the data that is critical to your organization, it will not work for you.

In today's global economy, it is likely that some buildings for a company may need to be input in units of measure from one country, while it may be reviewed by another facility professional from a different country, who prefers a different units of measurement. For example, someone in the United States may be looking at a space utilization rate in square feet per person, while someone in the corporate headquarters in Germany reviewing all the company's real estate may prefer to look at all the buildings in square meters per person. Different units of measure apply not only to area, but also to consumption and costs (currencies). This important topic will be discussed in the Features section. All units of measure will require conversion within the benchmarking system.

BUILDINGS

Buildings have several attributes that must be measured for any benchmarking system. The common denominator is usually some form of area measurement, which enables other metrics to be normalized and be stated in terms of something per unit area (e.g., cost per sq. ft., KWH per sq. meter, etc.). Besides area metrics, there are several other attributes pertaining to the building that are critical for benchmarking. Many of these later become filters applied when generating a benchmarking report. Examples include:

- Building age
- Climate
- Geographic area
- Hours of operation
- Primary use (office, medical, academic, retail, etc.)
- Rental rate per unit area (if leased)
- Quality rating (building)
- Maintenance service quality
- Security clearance requirements (of employees)
- Number of staffed entry points
- Annual visitor count

COSTS

Costs are the metric most frequently tracked, especially operating costs, and are a key element of any benchmarking system. For the typical organization, about 95 percent of all operating costs tie into utilities, maintenance, janitorial and security, with about 70 percent to 75 percent of those in the first two areas, so those are the one most facility professionals like to track. Landscaping also is benchmarked, although not all buildings incur landscaping costs.

Following are examples of some of the most frequently benchmarked cost-related items. Some of these are not direct costs, but tie directly into costs (e.g., utility consumption):

- Utility consumption (each type of utility)
- Utility costs (each type of utility)
- Maintenance costs
  - Corrective
  - Scheduled
  - Exceptional
- Maintenance costs by craft
- Janitorial costs (internal, contractor)
- Janitorial cleaning frequencies
- Security costs (facility)
- Security costs (perimeter)
- Landscaping costs
- Administration and support services costs[3]
- Lease costs

Utilities consume a significant amount of energy. Because utility costs and consumption run in parallel, benchmarking tools that track one often track the other. Utility costs and consumption also tie into sustainability modules, as energy is a major component of most sustainability models.

For maintenance, the focus of this guide is on preventive/scheduled maintenance and corrective maintenance. Many companies today are cutting back on preventive maintenance in the name of immediate cost savings, even though this generally causes a significantly greater increase in corrective maintenance—most of them know better, but when they are told to cut spending immediately or not to spend on anything that isn't essential, preventive maintenance gets cut. Figure 1 shows that companies with a higher ratio of preventive maintenance spend less total dollars on maintenance; and Figure 2 shows that each year that one benchmarks, that ratio increases. So benchmarking can yield a lower maintenance spend and a higher preventive maintenance percentage. By presenting benchmarking data such as these to management, facility professionals can make a cogent argument for spending more on preventive maintenance.

Preventive maintenance not only will result in spending less on total maintenance, but equipment will run more efficiently and it will have a longer life. Besides preventive maintenance, a facility condition index has become a valuable benchmarking indicator to help determine which best practices are most likely to

[3] This is tracked by facility professionals more frequently in Asia and Europe than in the United States. These can include services such as mail distribution, reprographics, catering and food services, etc.

result in longer-lasting facilities. Not many companies collect this data yet, but this may start to be done more in the future, especially as few new facilities are being built.

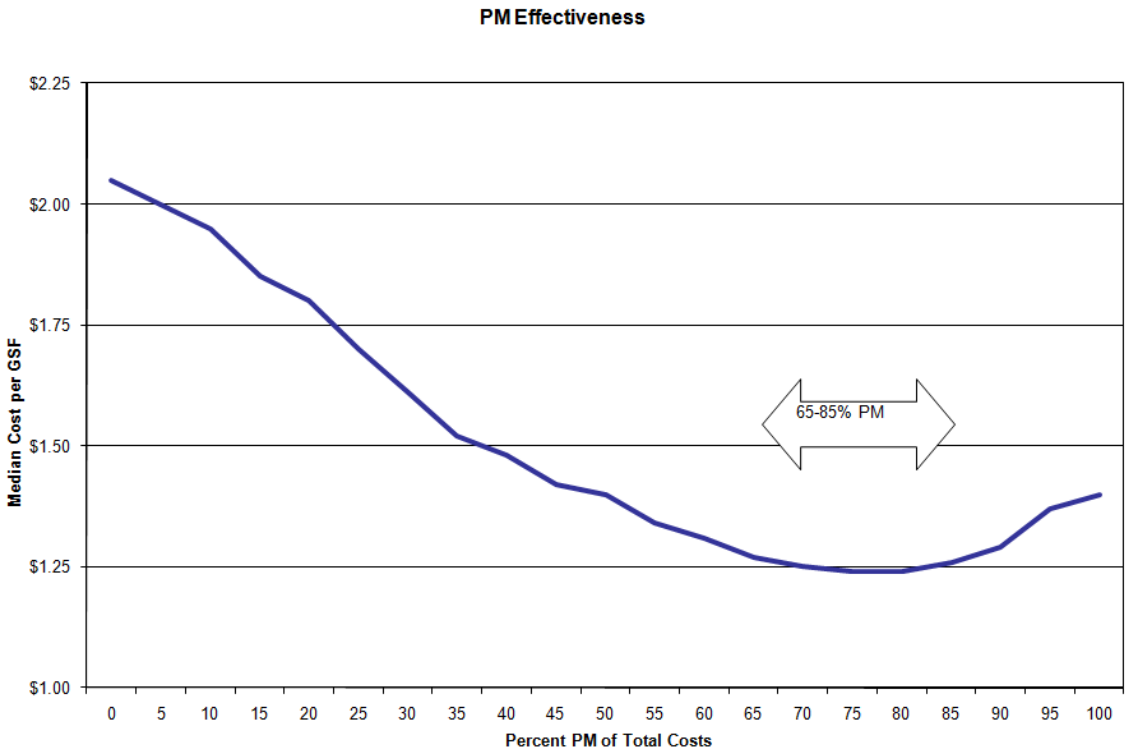


Figure 1. Higher percentage of preventive maintenance as a portion of total maintenance reduces total maintenance spend by 37 percent. Ideal percentage is 65 percent to-85 percent. Data was collected in 2009 by Facility Issues (www.facilityissues.com), an FM benchmarking consulting company. Reprinted with permission from Facility Issues.

For the janitorial area, most companies have more than their rentable space cleaned but less than their total gross area cleaned. It is critical that the benchmarking system track the number of cleaned square area, which often is the number stated in the janitorial contract.

Rental rates will vary all over a country and even a region. Thus, analysis of rental rates makes the most sense when benchmarking in a very finite geographic area. But that generally means there will be fewer similar buildings in the database, so it can become difficult to conduct meaningful benchmarking for multiple building types.

Not all costs need to be benchmarked as this can be very time consuming. Additionally, costs don't necessarily need to be tracked at fine levels of detail. Facility professionals should start by tracking the areas where they think they have problems or may be underperforming. If their suspicions are correct, they can them track in more detail. For those reasons, it can be important to select a benchmarking system that allows data to be input over time and not just on Day One); it also implies that a system should be selected that does not require all data to be input as this will save a lot of time.

Costs will be discussed much more in the Filters section as well as in the section below with examples.

PERSONNEL AND SPACE UTILIZATION

One of the largest factors impacting cost is space, which is benchmarked primarily by looking at space utilization. Because space is so expensive, people often want data on how efficiently their company is using it. This is expressed in terms of area per person.

While area per person is a very simple concept (i.e., area divided by personnel), there are many ways that each facility manager interprets each of the two numbers.

Area

With area, the problem is to determine what is included in the area. For example, is the area considered gross, rentable, net, occupiable, etc.? If you then look at any of these terms—take rentable for example—there are at least seven different ways to measure rentable space in the United States and in Europe, IPD uses another. In addition, many of the standards organizations frequently are studying ways to improve their standard related to area.

As if this weren't confusing enough, when looking at area per person, for this to be a most meaningful number, it might be advantageous to exclude support space. It can be argued that every-day support space should be included in the numbers, but how do you determine how to define which support space counts as every day. Support space may include areas such as conference space, filing rooms, break areas, bidding rooms, data center space, etc.

There are no conversion factors that can be applied to convert one of these numbers to another. The bottom line is that is no surefire way to have a number that is followed by everyone.

The method used can make a large difference. It is very easy for the same building to be measured to have an area as much as 15 percent or more greater by being measured by one rentable area method than another, depending on how the building was constructed. Clearly, that can throw off a space utilization measure by at least 15 percent. A 15 percent difference in space utilization is considered very large and worthy of a facility professional's attention to try to bring the number down for his/her building. But that 15 percent difference could be caused totally because of how the space was measured and not how it was being used.

With that said, some benchmarking tools ask users to use a specific type of area as the tools define it. Others identify all the types, and then ask each user to identify the type they used. The downside of specifying one type is it is a lot of work for one to remeasure building drawings, and most FMs do not have the time to do this, so the numbers they input may be inaccurate. The downside of providing a choice of types is the number of buildings for each type will be much less than if they were all combined, so it will be that much more difficult to have an adequate number of buildings in one's peer group for meaningful comparisons.

For this guide, gross areas as a basis of comparison are the lowest common denominator that will be used. First, most organizations globally measure gross space the same way—namely, it includes everything. Second, it works very well for utilities and maintenance costs, which are the two largest operating costs. Gross does not work as well for space utilization, so that is a place where one of the net areas can be of more value, but the numbers may be off for the reasons previously mentioned.

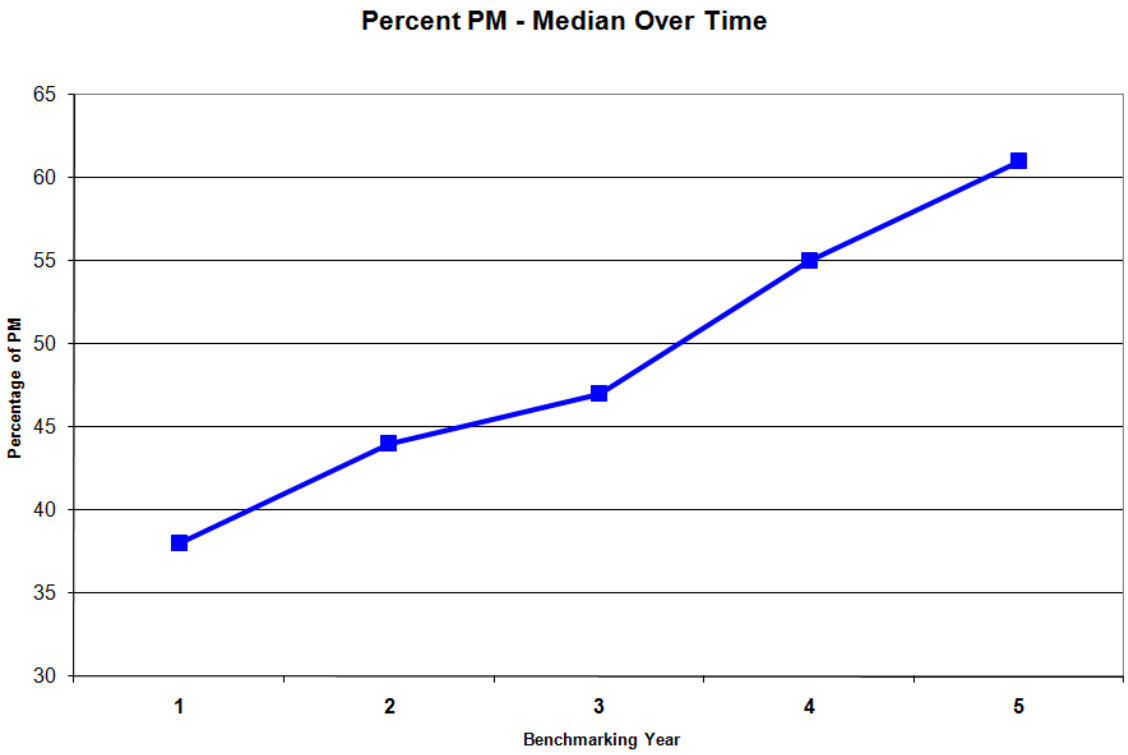


Figure 2. The percentage of preventive maintenance increases during each of the first five years that one benchmarks (this percentage is the amount spent on preventive maintenance divided by the amount spent on preventive plus corrective maintenance, expressed as a percentage). Note that the median company in the database increased its percentage from 38 percent one year after benchmarking to 61 percent five years later. Data was collected from 2004-2009 by Facility Issues (www.facilityissues.com), an FM benchmarking consulting company. Reprinted with permission from Facility Issues.

Personnel

As with area, personnel seems like a fairly simple measure—after all, someone is either a person or they are not! But as with area, there is much more to it than that, namely, the way that you count the people. Here are some questions for which there are not necessarily any correct answers:

a) Do the number of personnel in a building come from the Human Resources, Security or Telecommunications groups? Or is there a different count made by the Facilities group?
b) Do you use full-time equivalents (FTEs) for the number?
c) Do you count contractors?
d) How do you count temporary employees who occupy a desk?
e) If the company permits hoteling, where no one is assigned a permanent desk, how are the people counted?

It is clear that depending on how these questions are answered, you will get very different numbers. Even if a given company finds a standard that it prefers, if the company is participating in a benchmarking effort, you need to ascertain if the other participating companies are using the same standard.

For space utilization analysis, the cleanest number to use is not personnel at all, but workstations. A workstation is a place that can accommodate one worker, no matter whether the worker is full-time, present (versus absent) or any other category. And it is the workstation that takes up the space. This number can work well for other analyzes (e.g., maintenance, janitorial, etc.) as well, because it ties into the building size.

Vacant space

Before moving from area and space utilization, it is important to count the number of workstations that are unoccupied, as these tend to grow over time in many companies. What often happens is that when an employee leaves an organization, the manager of the group often chooses not to report the departure for fear the workstation will be taken away from the group. So the number of vacant spaces will grow. Over time, this can be a very large number. When you do space utilization analysis, one of the biggest culprits is not large workstations, but vacant space.

SUSTAINABILITY

Sustainability can overlap somewhat with several of the cost metrics (such as metrics relating to energy consumption and best practices), but it also has metrics that are independent. See *Figure 3* for examples of items that can be benchmarked related to sustainability.

Even LEED ratings can be benchmarked. For example, benchmarking can be used to see which sustainability best practices (including LEED credits) have been implemented by those in similar buildings who have a certain LEED rating. That information can provide one with ideas on which LEED credits may be the easiest for others in similar buildings to achieve.

***Figure 3*: Examples of Sustainability Metrics**		
• LEED EBOM rating • ENERGY STAR® rating • Energy consumption • Energy savings performance target • Energy savings initiatives • Percent renewable energy	• Percent water collected • Water savings performance target • Water savings initiatives	• Recycling quantities, by type of item • Percent of waste recycled • Recycling performance target • Recycling initiatives

BEST PRACTICES

Once the facility professional knows that a building is underperforming others that are similar, the next step is to understand what these better-performing buildings are doing that the subject building is not. The best way to accomplish this goal is through best practices analysis. Without this, the benchmarking facility professional can conclude only that a subject building is outperforming or underperforming similar buildings, but will have no idea as to why, and thus will not know how to apply the benchmarking system to improve the score.

By learning which best practices are being followed by similar better-performing buildings that are not being done in an under-performing building, the facility professional can have a basis to analyze which actions may be effective to implement in his or her building. It then is a matter of assessing the cost of implementing that best practice to determine if it is worthwhile and feasible.

Examples of best practices are listed below; most can be expressed in more detail—these are provided to give an idea of what types of best practices exist and can be benchmarked:

- Sensors in restrooms (general office area, conference rooms, etc.)
- Recommissioning frequency
- Tinted or filmed windows
- Solar or wind supplements
- Energy-efficient lighting
- CO_2 monitoring of make-up air
- CMMS or EAMS system
- Preventive maintenance program for >75 percent of equipment
- Electronic handheld devices to read equipment
- Energy management system
- Staff training program
- Re-competing of contracts at ends of term
- Daytime cleaning
- Major entrances monitored by CCTV

If you want a benchmarking system that can benchmark best practices, the first requirement is not only to select one that has best practices capabilities, but also one that focuses on only those best practices that are tried and true—otherwise, you may be spending a lot of time to benchmark best practices that will not make that much of a difference to your bottom line. There are many lists of industry best practices, including on government websites—but focus on those few that identify which are most cost effective for non-residential use. Once you find such a site, be sure it has a benchmarking tool with filters appropriate for your building. That is where a good benchmarking tool can be of greatest value—it will help you benchmark the best practices, and focus only on those that have a proven track record.

A second key to best practices from a benchmarking perspective is that the benchmarking tool must analyze the best practices with the same filters selected as were used to generate the initial building comparison report. Thus, you will study the best practices only for those buildings similar to the subject building.

The Chapter Putting It All Together provides many examples to show how best practices can be integrated into the benchmarking process.[4]

[4] Although best practices are an integral part of the benchmarking process when the benchmarking goal is to improve one's operations, the subject of best practices is a discipline unto itself. The development of best practices is beyond the scope of this guide.

REPORTING SYSTEM

Each data type studied must have a way to be reported upon, or it will not serve the facility professional. The reporting system has two critical elements:

a) **Reports.** Usually these are graphs, charts or tables. They also can be presented through dashboards.

b) **Filters.** These enable the user to screen out certain buildings so each report focuses only on those buildings similar to the subject building.

As with data entry, the facility professional needs the ability to view the data reported in the appropriate units of measure, regardless of the units used to input the buildings in the filter set (see below for a description of filter set). For example, one may input data in square meters, but someone else may need to view the report in square feet.

REPORTS

Reports can be in several formats, depending on the type of report. A common benchmarking report is a graph showing all buildings satisfying the criteria defined by the selected filters (see Filters below). Figure 4 shows a schematic for such a graph.

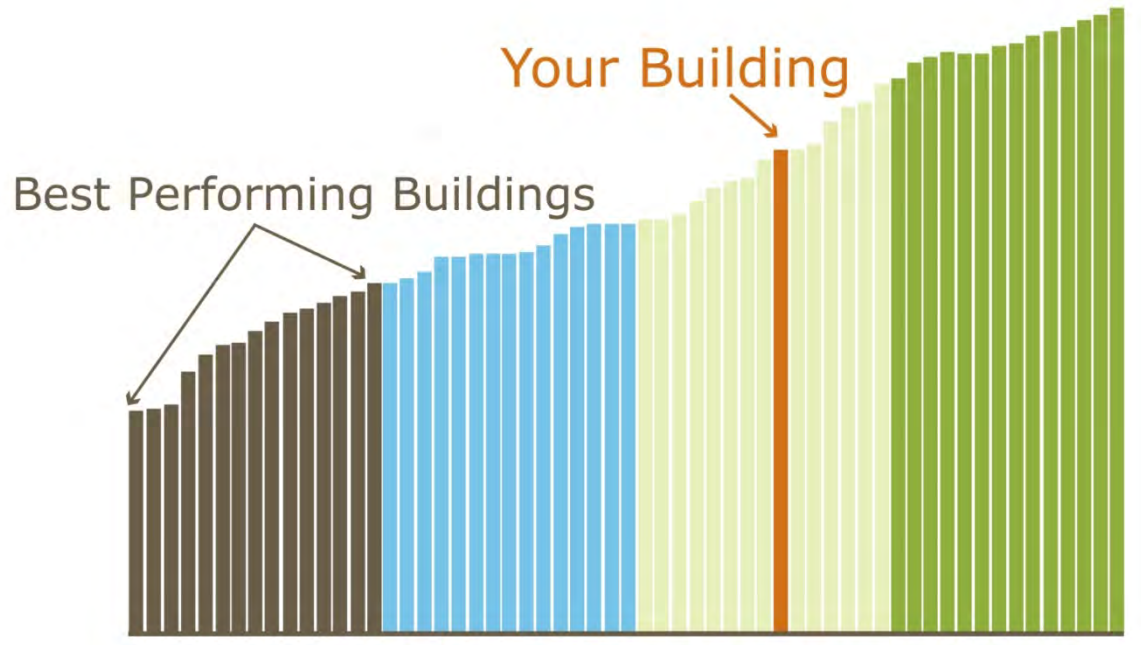


Figure 4. Example of typical benchmarking chart showing subject building as well as other similar ones from the database. Reprinted with permission from FM BENCHMARKING.

On Figure 4, the vertical axis would be a metric of what is being measured (e.g., square meters per person, energy consumption per square foot, etc.). Each vertical line represents one building in the

selected filter set. Some systems may highlight your building(s), as is done in this example. The results can be divided into four performance quartiles, with the best-performing buildings on the left side of the graph; in this example, there are either 14 or 15 buildings in each quartile—if the filters were set differently, there would be a different number of buildings shown. The value of the metric dividing the second and third quartiles is considered the *median* for this filter set on that metric.

This type of graph is particularly useful in benchmarking, as it can be seen clearly where your building stands against other similar ones, including the median. Note that by working with medians instead of means (averages), the potential impact of a building that is an anomaly is eliminated (anomalies usually appear on the far left or far right of the graph, and have a value significantly less or greater than other buildings in the database). Such anomalies are also known as outliers; if your building is an outlier, there are several typical common causes:

- You have not selected an ideal filter set.
- You have misstated one of the values used to calculate the metric.
- You have a building that is very different from other similar facilities.

If a company has multiple buildings in the benchmarking system, the benchmarking tool should provide a way for you to see all those buildings at once, both with and without the buildings external to your company. There also should be reports that focus on roll-up data from a company's entire portfolio, or broken down by organizational unit or geography.

Some systems may show the data in Figure 4 in a line graph instead while others will give you a choice. What is best for you depends on the type of data being viewed as well as personal preferences.

Another way to represent data is in the form of a table, where key values for the metric are reported. Key values should include the medians for the first, second, third and fourth quartiles, or something similar. It is important to be able to specify the filter set being evaluated and then show it on the report.

Tabular reports can be used to present best practices data. They report back to you not only a summary of which best practices you have implemented, but also what percentages of those in better-performing similar buildings have implemented them. The chapter *Putting It All Together* illustrates what these reports look like and how they can be applied.

For those who have multiple years' worth of data in the system, each report should provide an option to show how the numbers have changed from year to year. These become trend reports.

The facility professional should be able to generate a report not only based on filters, but also by other organizational units, such as all those in a specified region, complete with averages for that region. As a rule, the CRE will be more interested in data rolled up at the macro-level, such as expenditures within a country or state, while the FM may be more focused on more detailed information at local levels. In some companies, the FM will wear both hats.

With any report, besides identifying the buildings, it is essential that the report identify the number of buildings being reported upon. All too often, benchmarking data is cited without disclosing it was based on just a handful of buildings. Putting It All Together discusses how many buildings should be in a filter set to provide meaningful comparisons.

There should be reports to cover each key area being benchmarked: e.g., space utilization, rental rates, utilities, maintenance, janitorial, security, landscaping, sustainability, etc.

Reports should normalize the data by looking at it through common measures, such as:

a) **Cost per unit area**
   This applies to each area being benchmarked, such as utilities and maintenance, with each area broken down into sub-areas as desired (for utilities, for electricity, water, etc.).

b) **Cost per occupant**
   This applies to each of the areas being benchmarked. This is a useful check against your cost per unit area metrics, but in general, you should not use this metric as the key performance indicator (KPI) unless you also can control the number of occupants in your facility. The danger of using this metric is when the company is growing, your building performance can look great, but in layoff situations, your performance may look terrible—in other words, this can be a misleading metric. However, these can be useful metrics when planning a new or different facility; also, many in the C-Suite seem to understand personnel counts more than building areas.

c) **Cost per worker**
   This applies to maintenance workers (broken down if desired), janitorial workers, security workers, etc.

d) **Cost per visitor**
   This applies to security costs.

e) **Workload analysis**
   This examines the operations staff productivity by measuring the area maintained (or cleaned, guarded, etc.) per worker.

f) **Rental rate per unit area**

g) **Space utilization rate**
   Typically, this is expressed in terms of one of the forms of rentable area and makes most sense when analyzed for a given building type (as different building types usually have very different quantities of support and other ancillary space). In some situations, space utilization rate can be expressed in terms of gross area.

h) **Vacant space analysis**
   This usually is presented in terms of the percentage of vacant area divided by the total area.

i) **Consumption per unit area**
   This typically is used to study energy and utility consumption, and often is broken down into electricity, total energy, water and other forms of energy, including alternative energy.

j) **Carbon footprint per unit area**
   Carbon footprint usually is measured in pounds (or kilos) per year. This can be broken down into

Scopes 1, 2 and 3 energy sources. Scopes 1 and 2 are usually within the purview of the facility professional.

k) **Best practice analysis**
This is usually a percentage, referring to the percent of buildings that have implemented a stated best practice.

Dashboards
Dashboards, a different form of report, are playing a larger role in many aspects of facility management and corporate real estate, and benchmarking is not an exception. In benchmarking, a dashboard is a software-based control panel for one or more benchmarking metrics. It usually will be the opening screen for the benchmarking tool; often, the user will be able to determine which metrics may appear on the screen; e.g., utility consumption per unit area, maintenance cost per unit area, area cleaned per janitorial worker, etc. There even may be dashboards within each area, such as one for utilities that shows several utility metrics.

Dashboards provide the facility professional or other workplace professionals with an instant view of the metrics that are most important to him or her; for example, a dashboard's contents for a CRE will show different metrics than the one for an FM; the one for a maintenance manager will be different than the one for a utilities manager. A good dashboard is printable and can be distributed to management to show key facility metrics. By customizing dashboards, the benchmarking system becomes a more valuable part of everyday life in the facilities and real estate portions of companies. When this happens, they take on a life far greater than a tool used solely for the basis of comparison—they will have evolved into a business analytic tool.

Dashboards continually are evolving and are expected to become more flexible and functional. See the Chapter, The Future of Benchmarking.

FILTERS

A filter set is a group of buildings that satisfy criteria specified by the facility professional, typically criteria other buildings possess to make them similar to the subject building being benchmarked. These may include buildings of a certain size, in a specific climate, from an industry, etc. The filters may different each time a report is generated.

A good benchmarking system contains a robust set of filters. They may be divided up into a variety of areas, comprising of the building itself and then the individual areas being benchmarked. Generally, each can be expressed as several ranges (for example, a filter on building size may include six or seven ranges of square feet or meters; one on climate may include as many as 16 climate types). Several examples for the building filters and for several of the individual area filters are:

a) **Building properties**
Gross area
Rentable area
Primary use of facility (office, manufacturing, hospitality, etc.)
Method used to measure gross area

Method used to measure rentable area
Building age
Climate type
Full-time equivalents (FTEs) occupying the building
Hours per day of operation (and days per week)
Setting (urban, suburban, rural, isolated)
Percent occupied by data center
Building quality rating

b) Utilities

Predominant heating energy source
ENERGY STAR® rating
Sub-metering
Re-commissioning frequency

c) Maintenance

Outsourcing of maintenance functions
Typical hourly rate for electrical workers in geographic locale of building
Use of union labor
Facility condition index
Use of CMMS or maintenance management system
Use of electronic handheld devices
Preventive maintenance to total maintenance ratio

d) Janitorial

Outsourcing of janitorial functions
Typical hourly rate for janitorial workers in geographic locale of building
Use of union labor
Frequency of janitorial tasks (for each one)
Green cleaning

e) Security

Outsourcing of security functions
Typical hourly rate for security workers in geographic locale of building
Use of union labor
Major entrances monitored by CCTV
Hours per day monitored by security staff
Use of badge card readers

The Chapter Putting It All Together shows how to apply the filters. There are many more filters possible than what appear above — you should determine which will be most important to your building and then select a benchmarking tool that contains those filters. The tendency for many new to benchmarking is to apply a lot of filters, which, of course, yields an excellent comparison; the downside of that approach is there usually will not be many other buildings in the resultant filter set, thereby yielding a non-statistically valid sample size. Putting It All Together will help you develop the proper balance of filters.

DATA ENTRY

Some benchmarking systems require data to be input while others do not. However, at some point, all systems need a way to get fresh data. Systems that do not do that must rely on extrapolated data, which has very different applications for facility professionals (see the section on Modeled Data in Biggest Pitfalls When Benchmarking).

The most basic form of data entry is the inputting of data for one building at a time. As with any software system, the interface must be one that is easy to use . If you have many buildings to input, it would be helpful if the benchmarking system has a spreadsheet or other means so the data for all the buildings can be input at one time and from one place.

If much of the data already resides in other systems (IWMS or CMMS systems, or ENERGY STAR®), it may be helpful if there were an interface between those systems and the benchmarking tool, so data does not have to be input twice. Even with this interface, it still is likely that some data will need to be input separately.

Required data fields. Most systems with data input require that a minimum amount of data be input. This is to ensure that one doesn't end up dividing by "0" or that the basics for each metric be input. For example, the building area is usually one of those fields as is the total energy cost and consumption. However, if too many data fields are required, the system can become too cumbersome and frustrating; frustrated users can lead to data entry errors, so it is best to find a system requiring minimal required data entry fields.

Data entry timing. Some systems allow users total flexibility as to when data may be entered, while others provide limited windows of time. The rationale behind the latter is that one will know how much data will be in the system and that it won't change for that time period being benchmarked; if the data will go through a validation phase before it goes live, this enables the providers of the tool a fixed time for this work to be done. The reason for total flexibility of when data are input is if one doesn't have all the data handy at once, one doesn't have to go and find it immediately—the data field may be left blank (as long it is not a required one), and the user can come back later to add more information; also, one may not want to take the time to provide data in more detail unless it turns out to be necessary to study why a building's performance is lagging others in the peer group. These flexible data entry types of systems often end up with more data in them, but it may take a bit of time to get there.

Error checking. Because of the quantity of data fields in most benchmarking systems, there are many opportunities for data entry errors, either through misinterpretation of what should be input (or that the error is simply a typo. If a system can provide error checking, it can cut down on these types of errors. Another type of error is when benchmarking for more than one year, one can identify possible errors based on differences in data values from one year to the next (ideally through use of automation, a capability that some benchmarking tools possess).

FEATURES

Most of what is described in this section applies to any software system; they can make or break the benchmarking system's value. How these features are handled by the benchmarking system usually will impact directly its effectiveness, even if the system contains all the desired data fields, reports and filters.

UNITS OF MEASURE

Each type of measure should have a way for the facility professional to input it in its appropriate unit and a way for the reports to be generated in those units. The benchmarking system also should accommodate buildings in multiple countries, where users from each country will want the identical report generated in different units, and where data may have been input in different units.

a) **Consumption**
   Consumption may include liquid volume (U.S. gallons, imperial gallons, liters), gas volume (therms, cubic feet, cubic meters), weight (pounds, kilograms) and energy (BTUs, kilowatt hours).
b) **Costs**
   Each country has its own currency with conversion rates varying over time. The benchmarking tool must track the rates and apply the appropriate rate for the year being evaluated.

c) **Area**
   These are square feet or square meters. We discuss differences between gross, rentable, usable, etc., as there is no standard conversion for these and they must be dealt with in a special way.

STANDARDS

When a benchmarking tool has data fields that have multiple standards (e.g., rentable area), it is critical for the tool to:

a) Define each data field so all users measure or count the units exactly the same way or
b) Allow users to select which method they are using.

If users select the method, the report generator must provide a way to specify which definition to include in the report. This, however, can reduce the amount of buildings included for each method of measurement.

The downside of dictating one definition is that many users will not remeasure or recount the units, so it cannot be known if the database has been compromised.

It is not the purpose of this guide to state which standard is the best for a given situation. The role of this guide is to state how standards can be dealt with when multiple ones may exist. In Appendix 3—Standards Organizations, the Guide identifies some of the key standards organizations that relate to benchmarking for facility professionals.

SOURCE OF COMPARISON DATA

Before identifying the specific data to be tracked and then discussing how it may be displayed and analyzed, one needs to understand the source of the comparison data in the benchmarking system. There are three general types of data to which one's own data may be compared:

a) A company's own buildings
b) The outsourcing company's clients' buildings (if the benchmarking organization is an outsourcing company)
c) A universe of buildings from many organizations with no common ties

A company's own buildings
Contrary to many people's initial thoughts, there can be tremendous value in making comparisons within one's own building inventory, as long as there are enough buildings to form a meaningful comparison. This could be a necessity when there are not enough buildings in one's "peer group" in a good benchmarking tool (a peer group is a group of comparable buildings). When making the comparison, you will see which of the buildings in your inventory stands out from the others, and this can lead to determining which measures can be implemented to improve either the buildings that stand out or the rest of your buildings.

The outsourcing company's own buildings
Many outsourcing companies already have data on their clients' buildings. These can be benchmarked, so the outsourcing company can determine which buildings are running at peak efficiency and what can be done to improve the lesser-performing buildings. Of course, some clients will demand to see how the outsourcing company's buildings compare to other buildings outside of its own universe, but the initial internal comparison is still of value.

A universe of buildings from many organizations with no common ties
This is the ideal source of data, as there are no biases within it. However, this may not always be an option if you have a very specialized building type or you cannot find a good benchmarking tool that has enough buildings for your building type.

No matter which option apply to you, you will be able to do some benchmarking. Any of these types will yield many more opportunities for achieving the benefits from benchmarking than not benchmarking at all.

SECURITY AND CONFIDENTIALITY

Because companies that input data will be sharing it with others, it is critical they be able to protect and hide the identity of their buildings and company from others. Nobody outside of that company should ever know that either the company participates in benchmarking or that a subject building is in the system. As a failsafe measure, it is possible for all building names and addresses to be assigned aliases by the client company; even the zip or postal code can be altered to be a neighboring one. Going to this length is rarely necessary, but it becomes an option for those companies requiring the most secret confidentiality.

Even within the benchmarking company, one often needs to control who accesses company data and who has permission to modify it. Sometimes, this will need to be done according to a level of hierarchy within the company. For example, let's take a company that has five divisions, with each in four regions, and with three cities in each region, and two buildings in each city. In such a situation, the director overseeing all the divisions will want access to the entire set of data, but each division head should have access only to the data in that division. This pattern can continue, all the way down to an individual building manager, who may warrant access only to the data in the subject building. Thus, a system should make possible an infinite number of levels of hierarchy. Each person with access to the system would have his or her own password assigned.

Many potential benchmarking organizations are concerned when they learn that a benchmarking tool maintains its data in a cloud, or even on its own computers. The key to whether the concerns are warranted is the data is secure and that no one without appropriate authorization should be able to view the data. The security of the data will depend on exactly what protocols were established by the benchmarking company. Different organizations require different levels of security. The best security approach, therefore, requires the information technology (IT) experts from the benchmarking client to speak with the IT experts from the benchmarking service and be sure the protocols are acceptable. In almost all cases, an acceptable solution should be attainable.

EXTENSIVE DATA FOR COMPARISONS

How often have you seen a benchmarking result and then asked yourself, "Yes, that seems interesting, but how many buildings were in the database that was described?" I read an article that reported that a subject laboratory's energy use was about 30 percent higher than that of the average laboratory, implying that the subject laboratory should make some major changes related to energy consumption. When I inquired of the author as to how many laboratories were in the sample, the author responded that there were 700 buildings in the study, and 25 were research facilities, and of those, two were laboratories. Nowhere had that been mentioned in the article! Would you want to base a possible major building renovation on numbers based on only two laboratories?

How many buildings are enough to have in a benchmarking system? The key to the answer is that it depends on the number and type of filters that you wish to employ. To make a report useful, I like to have at least 25-30 buildings in my comparison filter set (peer group). To get a filter set that size, if I apply just three filters, I have found that you often needs 2,000 buildings; if I want a fourth filter, I need 4,000 buildings (double); and for a fifth filter, I need 8,000 buildings. Not many databases contain this number of buildings, so it is a matter of using filters creatively. But you still need as large a database as possible, and I would highly caution anyone using a database that starts with fewer than 2,000 buildings.

The rules of thumb above are only basic guidelines. If you are looking at data that is fairly prevalent (e.g., office buildings, city locations), you will need fewer buildings. If you are benchmarking utility consumption for research laboratories in remote locations in cold dry climates, you will need many more buildings in the database.

In the chapter, Putting It All Together, you will see that there are certain ways to use the right filters (if a system has them) to allow you to have fewer buildings in the total database while still generating

meaningful reports. What is essential is that with whatever system you are using, you are aware of its strengths and weaknesses before you select it.

DATA ACCESSIBILITY

Most of today's systems are Web-based, which means they can be accessed from anywhere. This is important, as it is not only a matter of convenience, but enables the facility professional to present the reports to management at just a moment's notice, and without having to locate and then email multiple attachments.

EASE OF USE

Since the first software system became available many years ago, software developers have been touting their system as easy to use. But exactly what does that mean, and has it really changed all that much? Actually, the requirements that define a system as easy to use have not changed over the last 30 years, and now they apply to apps as well as to software. These guidelines to describe ease of use should help you select a good system and reduce the number of surprises in store for you.

a) Obviousness
This simply means, "Do you know what to do without have to go to a manual or click on a help button?" You will know the answer to this as soon as you look at a system for just a few minutes.

b) **Number of keystrokes (or mouse clicks)**
Even if what has to be done is obvious, you may have to go through several clicks and screens to get there. If the task at hand is a common one that you will do often, this can be frustrating.

c) **System speed**
How long does it take after you click the mouse for the next screen to come up?

CHAPTER 5: THE IMPACT OF AUTOMATION ON BENCHMARKING

In the old days, benchmarking reports were available in printed charts and tables. Users were dependent on looking only at reports their authors thought would be useful. Users also were dependent on the authors for which filters would be applied. If there weren't many buildings in the filter set, that was unfortunate. Sometimes, the data were three or more years old. Yet, these benchmarking reports were used because nothing else was available.

With the advent of automation applied to benchmarking, all that has changed. Even though there still are not as many benchmarking tools available as one would like, and certainly not as many buildings in any of the databases as the authors would like, there are solutions that can work better than ever before.

FILTERS

The biggest impact of automation on benchmarking is the ease in which filters can be turned on and off. This helps develop the best filter set for the ultimate benchmarking goal. First, from the perspective of defining the best comparison set of buildings (peer group) to our subject building, given that every subject building probably has several unique characteristics, it makes sense to think the filter set for the subject building will be somewhat unique. So a filter set can be created that works for just this building.

Once the filter set is developed, it may be determined there are not enough buildings in the database that satisfy all the filters. Thus, a limit needs to be set on how many filters are turned on at any time. This is often a method of trial and error, where a filter is turned on, seen whether it has a minor or major impact on results, and if it is minor, turned back off and then look for another filter to apply (examples of this process are shown in the chapter, Putting It All Together). It would not be feasible to try out multiple filters without automation. Yet, this process is critical to getting high quality information from the benchmarking tool.

BEST PRACTICES

For a long time, facility professionals have benchmarked by comparing buildings through a variety of metrics. And for a long time, they have studied industry best practices. But they have not been able to tie them together because it was never feasible to do so. Yet without implementing best practices, it is not possible to improve building performance. Best practices are equally as important as filter selection in terms of impact on benchmarking from automation.

Now, as a result of having automated tools available, through the use of filters, facility professionals can benchmark to identify the metrics where their buildings are lagging. Phase two can be applied to that analysis by benchmarking the same filter set to see which best practices the better performing buildings have implemented in the same filter set. This never could be done without automation.

REMOVAL OF GEOGRAPHIC BARRIERS

The Internet enables facility professionals to input data and generate reports from anywhere at any time. If facility professionals want to show something to their building managers, it can be done right on the spot; if they want to show reports to executives, this can be done instantly. And if a data error is detected, it can be fixed immediately from anywhere.

KEEPING DATA CURRENT

Before the use of automation for benchmarking, facility professionals collected their data, and then manually wrote down the data that were needed for the benchmarking system. They then would mail the compiled numbers to someone who would input the data into something like an Excel spreadsheet, which eventually would result in one of those tables used in a benchmarking report.

Now, the data can be input not only from anywhere, but at any time. If one notices a data error, it is easy to change its value right on the spot. The data processing time is no longer so cumbersome that it only could be accomplished once every so many years. In other words, data could remain current at all times.

CHAPTER 6: PUTTING IT ALL TOGETHER: THE BENCHMARKING PROCESS

This is the most important chapter in this guide. This Chapter takes you through the benchmarking process with many examples, showing you where you may need to adjust the process, and how to ensure that your benchmarking efforts will be successful.

You will learn that benchmarking is not only a science, but also an art. There is a lot of trial and error, and if you apply the rules successfully, you not only will have a comprehensive assessment of your building's performance, but also know what you should consider doing to improve the building's performance.

In the first section of this chapter, building metrics are examined, helping you understand which ones will be most important for you. Then, you will see how to select only the most relevant filters to your situation, and how to adapt them to fit reality and get the most out of the benchmarking database. The final part of the process is to incorporate best practice analysis, which will identify how you can improve your building performance (of course, if you only want to compare your building's performance to others, you don't need to do the best practice analysis).

Throughout examples with real data are presented—the purpose is not for you to apply the data to your building, but rather to understand how data needs to be analyzed so that when you see your own building's data in a benchmarking system, you will know what to do. Finally, you will see that benchmarking is a continuous process that needs to repeat each year, not just a one-time exercise.

METRICS

The building metrics you input will depend somewhat on what, if anything, makes your building unique. At the top of the list will be your building type—if it is not office, then what is it? You will want to input that into the benchmarking system. If a large portion of your building is a data center, even if your building is an office building, you will want to have a place to input that, since many operations as well as space utilization rate can be affected.

Besides inputting the gross area for your building as well as the cleanable area, you will want a place to input the basics for the entire year:

a) Total utilities costs, broken down into utility type (electric, gas, water, etc.)
b) Utilities consumption broken down into utility type
c) Total maintenance costs (ideally broken down by scheduled, corrective and exceptional)
d) Total janitorial costs
e) Total security costs

The utilities, maintenance, janitorial and security costs generally comprise 90 percent to 97 of annual operating costs. Besides these areas, some additional areas that some facility professional's benchmark are:

f) Total landscaping costs
g) Average rent rate
h) Waste management and recycling costs and quantities

In some countries, facility professionals track administrative and other costs as well.

If you suspect that you are spending more than most in any of the aforementioned areas, you will want to break them down further so you not only can pinpoint the source of the extraordinary spend, but also be able to show it your management. This eventually can lead to a justification to remedy the situation. For example, if you believe your maintenance costs to be high, you may want to break them down into the various crafts (electrician, carpenter, painter, plumber, etc.).

FILTERS AND SELECTION OF FILTERS

Filters ensure you are comparing apples-to-apples. For example, if you suspect that one of the reasons for your building's high utility bills is you operate your facility 24/7, but there is no way in the benchmarking system to look at those buildings independently of those that operate five days a week, you will not be getting what you need out of the system.

The first step in working with filters is to define those most critical for your building. You will want to narrow that list down to just those that are most essential. As mentioned previously, to apply many filters at the same time, you will need thousands (actually tens of thousands) of buildings. No benchmarking database is currently that large, so it is a matter of learning how to work with filters so they can come close to what you want to accomplish—a valid building comparison for benchmarking purposes. In this section, you will see how to do that with many examples given

Before beginning, consider substituting some filters for others that you most naturally may select. One of the first filters many facility professionals select is related to geography. That way, they believe they will be comparing buildings in similar climates with similar labor rates. Conceptually, that is very logical; however, in reality, even if the subject building is in a large city, it is not practical, as they likely will run out of buildings to compare much sooner than they wish; and if the subject building is not in a large city, or is in a country without a significant number of buildings in the database, they will run out of buildings as soon as they apply as few as one filter.

So what is the workaround? For each metric that you are evaluating, see if your benchmarking system has workaround filters available. Here are some examples:

- **Utility consumption.** See if the system has a climate-type filter. Ideally, this should address both temperature and humidity. For example, if your building is in Stockholm, look for a filter that separates buildings for very cold climates.

- **Utility costs.** See if the system has a way of categorizing electrical costs for that area. For example, if the system defines high electrical costs as anything over US$0.11 cents per kilowatt hour, then if you know you are paying more than that, you would indicate that to your system. Then if you compare your electric costs to those of others with high costs, you will see if there is some other cause as to why you may be paying more for electricity than your peer group (others in your filter set).

- **Maintenance labor costs.** The author has found that the cost of electricians per hour tend to mirror general maintenance labor costs for a given area. If electrician costs are high, then all

maintenance costs would be high, and you would note it as such in the system.

- **Janitorial labor costs.** This is handled the same way as maintenance costs, except by using the typical janitorial hourly rate instead of the electrician rate.

- **Security labor costs.** This is handled the same way as maintenance costs, except by using the typical security hourly rate instead of the electrician rate.

Although applying five filters to five different reports takes more time than just applying one filter to all five reports, if it enables you to apply additional filters that you need, it will be worth it, as you will have a more accurate peer group in your filter set.

A similar type of process can be applied when trying to match a unique building type. For example, if the building is a hotel, if there is a filter for the hospitality industry, it may make sense to apply it. Or it may be worthwhile to apply two or three other filters instead. Or, if you can't find any workarounds, you may need to make the most of your situation and benchmark with the data you have on hand, and then understand how those limitations may impact the interpretation of the results.

THE FILTERING PROCESS

Start with one of the metrics for which you would like to assess your building, such as its energy costs. Next, identify the report you want to run to assess your building's performance for this metric. Before you run the report, think of just one filter you think makes your building most unique for this metric. Then run the report, noting how your building does, as well as noting the median value for all buildings with that filter.

Then, while keeping the first filter turned on, apply the filter that you think next most important, and re-run the report. Again, see how your building does and also note the median. If your building's ranking or the median has changed a moderate amount[5] or higher, the second filter is likely a valuable one and should be retained; if they did not move much, you may conclude that this filter is not significant for this report (at least when combined with the first filter) and it may be turned off (by not using filters that are not significant, you will be able to identify more filters that may be more meaningful for this report).

Either way, you should move on to your third filter, repeating what you did for the second filter. Keep on going until either you have too few buildings remaining in your benchmarking filter set (to render the report invalid) or until there are no additional filters that you deem significant.

You then will have defined your filter set for the specific report you are studying. It now is time to move on to the next report, where you will repeat the exact same process. Keep in mind that it is likely that the

[5] *What is a moderate amount of change?* If your benchmarking tool places all the buildings into building quartiles (i.e., divides the buildings in the filter set into four equal quantities based on the value for each building for that metric), then any movement representing one-third to one-half of the position within a quartile would be considered significant enough to retain that filter; as you apply more filters, the "movement number" would shift down to one-quarter to one-third of the position within a quartile. If the benchmarking system does not have quartiles, consider 7 percent to 8 percent significant when there are just a few filters being applied, and 6 percent to 7 percent when there a several more.

filters you want to apply will be somewhat different for each report. For example, a filter on climate will be much more significant for benchmarking electrical consumption than for janitorial cost.

At this point, you will have completed the following:

- Determined the reports to run for each metric.
- Determined your filter set for each report.
- Run your reports.
- Analyzed your reports to learn for which metrics you are over- and under-performing similar buildings.

By now, you should realize the benchmarking process, and in particular, the filtering process, is both an art and a science. There is no magic formula for benchmarking. A benchmarking system can generate numbers, but it is up to you to make sense of them and figure out to which numbers you should pay most attention.

If you are satisfied with your results and don't wish to see how to apply benchmarking to improve your results, you may stop the benchmarking process here. If instead you would like to see what needs to be done to improve your building performance, you will need to go to the Best Practices section.

EXAMPLES: SELECTION OF FILTERS TO COMPARE BUILDINGS' PERFORMANCE

The examples that follow are of real buildings from a real benchmarking system. They will demonstrate how to determine your filter set for a subject building with specific characteristics.

The examples are from one benchmarking system. Each example not only demonstrates a different application used by facility professionals, but also illustrates one of the concepts introduced in this chapter. Focus on the logic presented, not on the benchmarking tool itself. For the examples, the actual software brand used to develop the examples is not important—it is used only to illustrate a concept. While the software changes each year, the concepts presented will be important for many years to come.

Also, the examples are using the units of square feet for area. This could have been square meters for a building in a different part of the world, and the benchmarking tool should have a conversion feature to display the charts this way.

EXAMPLE 1: SPACE UTILIZATION COMPARISONS—FILTER DETERMINATION

Let's assume the subject organization asks its various divisions if they can relinquish any of their space, as the company is trying to cut back on this major expense. If the divisions are typical, they respond they cannot turn back any space the present time.

What if you were to say to one of the divisions that other similar divisions are using 20 percent less space per person? So the key becomes to define similar divisions through the use of filters. For this example, only office space will be examined, eliminating manufacturing, retail, medical and anything else that is not office space. The results are shown in Figure 5, where you can see the median gross utilization rate is 455

sq. ft. per person. To be in the first performance quartile, the subject building would require a gross utilization rate of 315 sq. ft. per person or less (the boundary between the first two quartiles).

Assume in this example that the subject building's gross utilization rate is 470 sq. ft. per person, which is slightly into the third quartile. As this is barely worse than the median, the inclination is to leave the division alone.

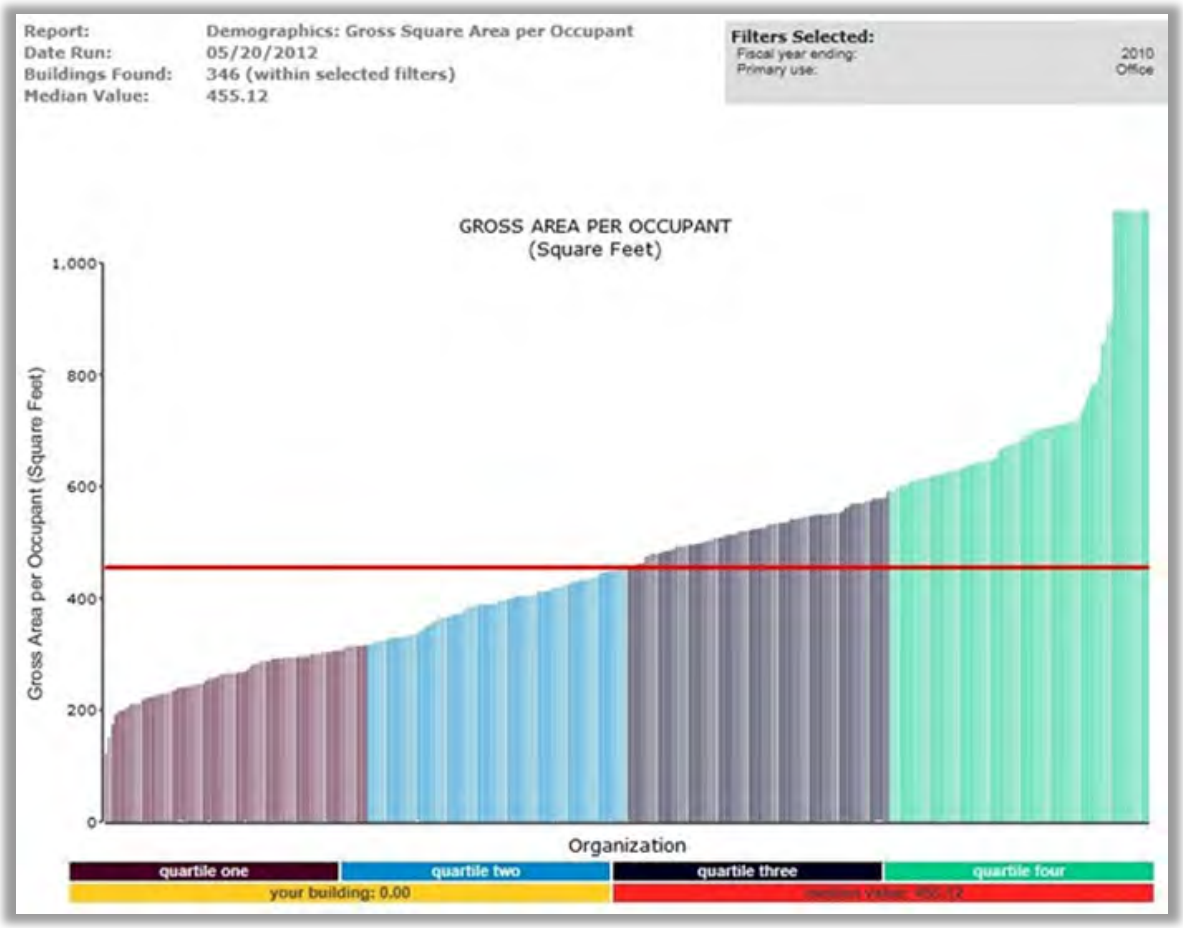


Figure 5. Space utilization rate for office buildings only. Median gross utilization rate (red line) is 455 sq. ft. per person. Reprinted with permission from FM BENCHMARKING.

What happens if a building size filter is added to the analysis? Larger buildings are often not as efficient as smaller ones as they have more penetrations for elevators, stairs and mechanical systems; often they may have more specialized types of support space as well. Since the subject building in this example is 160,000 sq. ft., a filter will be added for buildings that are 125,000 – 249,999 sq. ft.

As seen in Figure 6, the median has moved from 455 to 385 gross sq. ft. per person. The first quartile performance has moved from less than 315 to less than 306 gross sq. ft. per person—not quite as large a percentage decrease as the median performance experienced. These results indicate the building size doesn't have as significant an impact on first quartile performance for space utilization, but it does on median performance. The subject building is now close to the border between the third and fourth

quartiles instead of close to the median, so there is room for significant improvement.

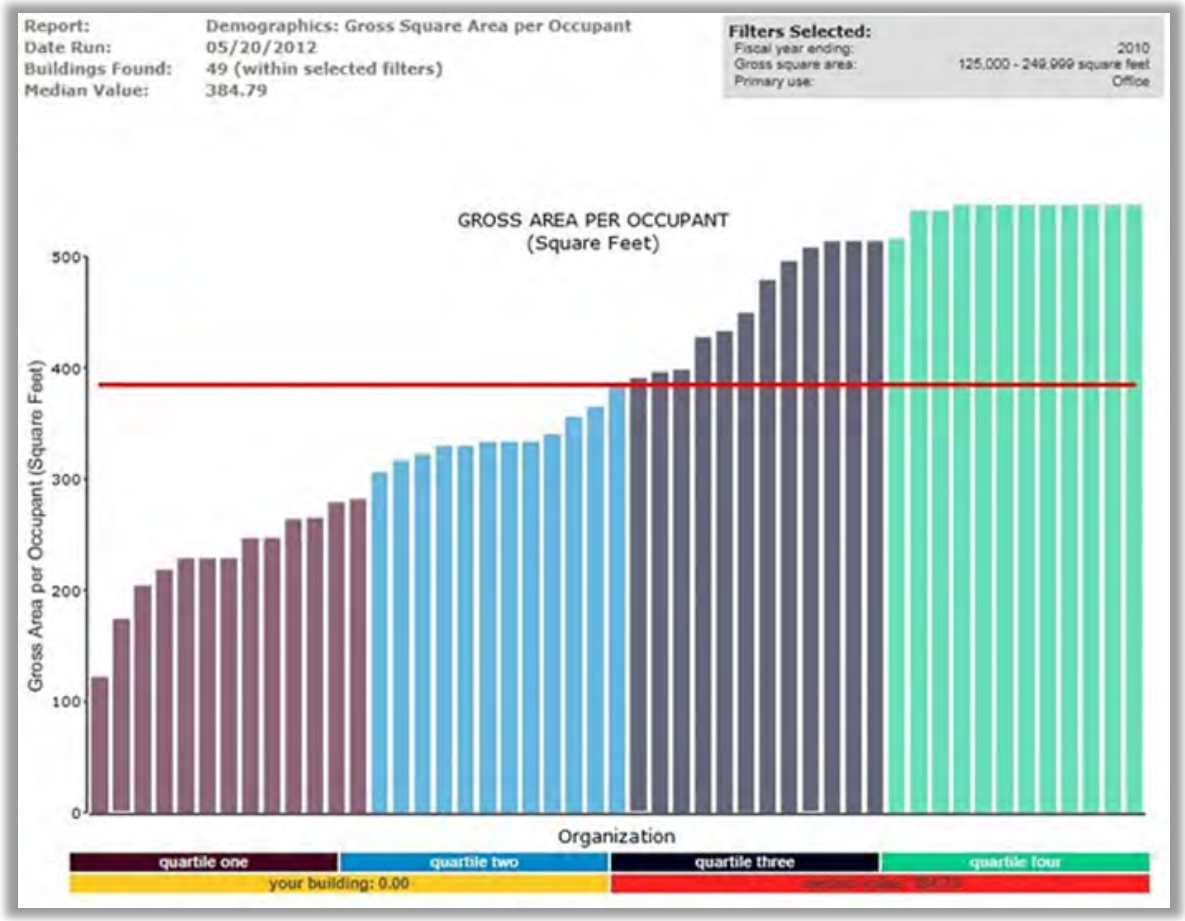


Figure 6. Space utilization rate for office buildings with gross area between 125,000 – 249,999 sq. ft. median utilization rate is 385 sq. ft. per person. Reprinted with permission from FM BENCHMARKING.

If the impact of any given filter is not significant and it is believed that additional filters may be worthwhile to study, turn the less significant filter back off, and try another filter instead. As long as there are at least 25-30 buildings or more in the filter set, there will be enough buildings (there are 49 shown in Figure 6).

Figure 6 illustrates one other concept that applies to benchmarking. Note that the gross area for the buildings in the filter set seem to reduce rather steadily as one goes deeper into the first quartile. However, the very first building in the filter set has an even steeper drop off than had been expected. What does this mean to the facility professional managing that building? There may be a bona fide reason for having significantly less area per person than anyone else, in which case it means nothing; however, it may mean that space has been cut by an unreasonable amount and it may be impacting employee performance and morale—if this is the case, an increase of space per person may be in order. Last, on the chart, note the buildings' values on the right side are truncated to print the graph in a more readable format; in the actual system, these buildings' values are shown.

EXAMPLE 2: UTILITY COMPARISONS—FILTER DETERMINATION

Utilities and maintenance are the two largest expenses in most facilities operating budgets. In this section, ~~we'll look at~~ electrical consumption is examined, which has a very wide range of building performance. This implies that it may be worthwhile to look at many filters. First, a filter for office facilities is turned on (see Figure 7). Note that median electrical consumption is 24.25 KWH/GSF, with a first quartile performance of less than 16.7 KWH/GSF.

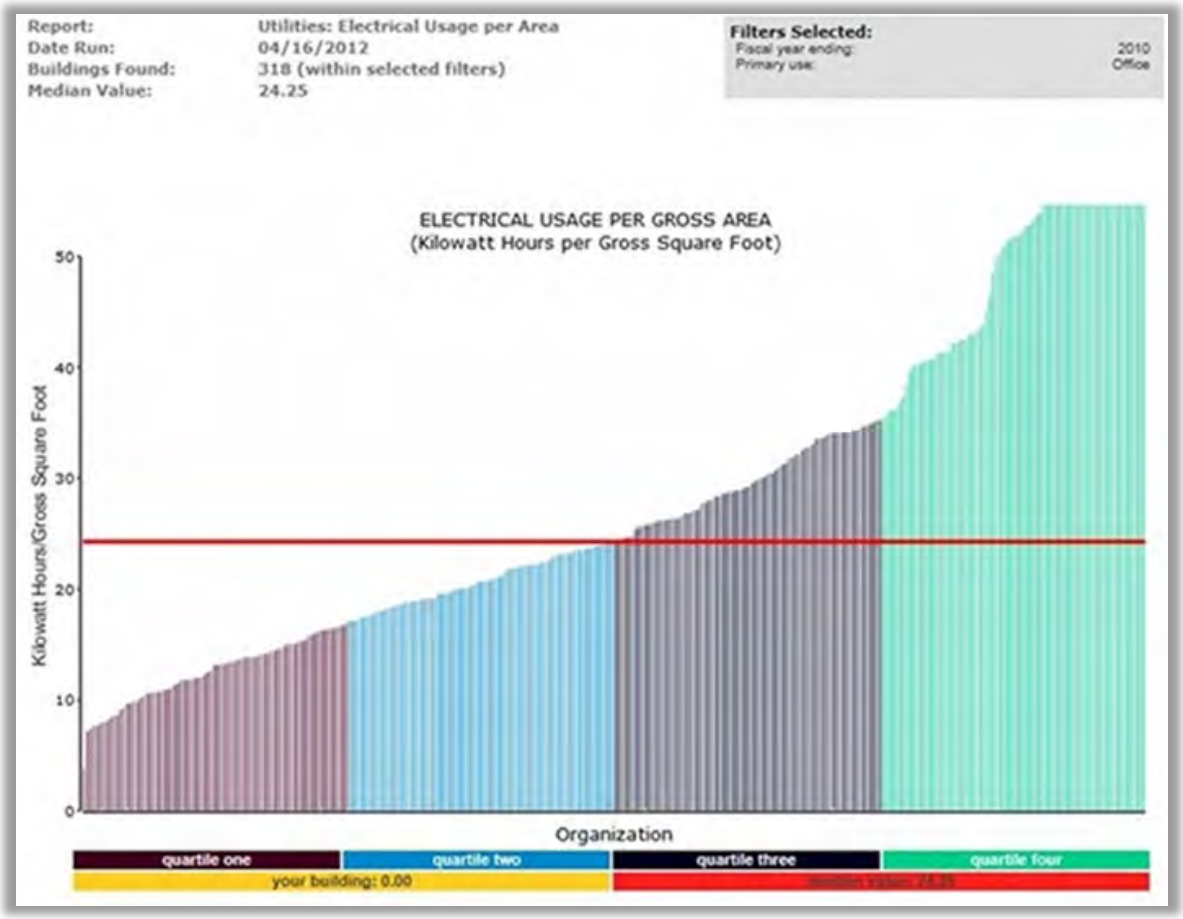


Figure 7. Electrical consumption for office buildings. Median consumption is 24.25 KWH per gross sq. ft. Reprinted with permission from FM BENCHMARKING.

Since the subject building is in a hot, dry climate, turn on a climate filter; the results are shown in Figure 8 where it can be seen that the median and first quartile performance have dropped to 20.72 KWH/GSF and 16.3 KWH/GSF, respectively. While the median dropped significantly, the first quartile performance remained about the same. With the new filter, only 25 buildings are contained, but that is still enough for meaningful comparisons.

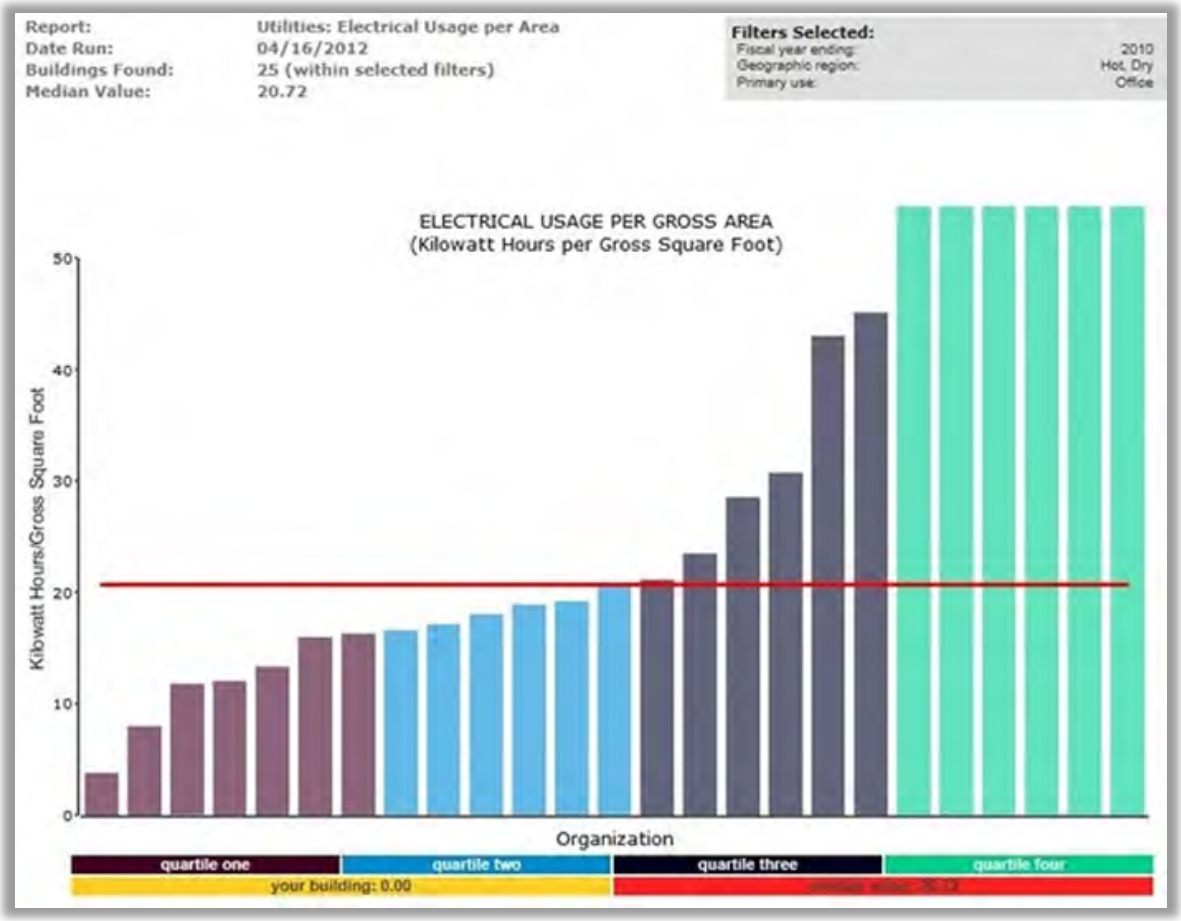


Figure 8. Electrical consumption for office buildings in hot, dry climates. Median consumption is 20.72 KWH per gross sq. ft. Reprinted with permission from FM BENCHMARKING.

While using filters to generate meaningful comparisons is a very useful exercise, it serves more to flag potential trouble spots. To see what actually improves building performance, benchmarking best practices for the same filter set needs to be conducted and will be demonstrated later in this chapter.

EXAMPLE 3: MAINTENANCE COMPARISONS—FILTER DETERMINATION

To compare maintenance operations, in this example benchmarking maintenance costs per unit area in large (greater than 600,000 gross sq. ft.) office buildings will be performed. In Figure 9, the median maintenance cost per gross square foot is US$2.23, and the first quartile performance is US$1.84.

As can be noted there are four-to-six buildings on the far left of the chart that really stand out, operating at a cost level that is not sustainable for any extended period of time. This may be because they are spending less than most on preventive maintenance, or possibly for one of the maintenance crafts—further analysis may be necessary, where the company can break down the maintenance costs more granularly into its components. For purposes of this discussion, assume an analysis was completed and it was discovered that the reason costs are much lower is because of lower budget for preventive maintenance.

At the analysis level presented in Figure 9, if they do continue at this level or reduced preventive maintenance, within a few years they may end up spending a lot to restore their facilities to a proper benchmarking condition. As previously mentioned, benchmarking can be used not only to see how one should reduce spending, but also to see if one is not spending enough.

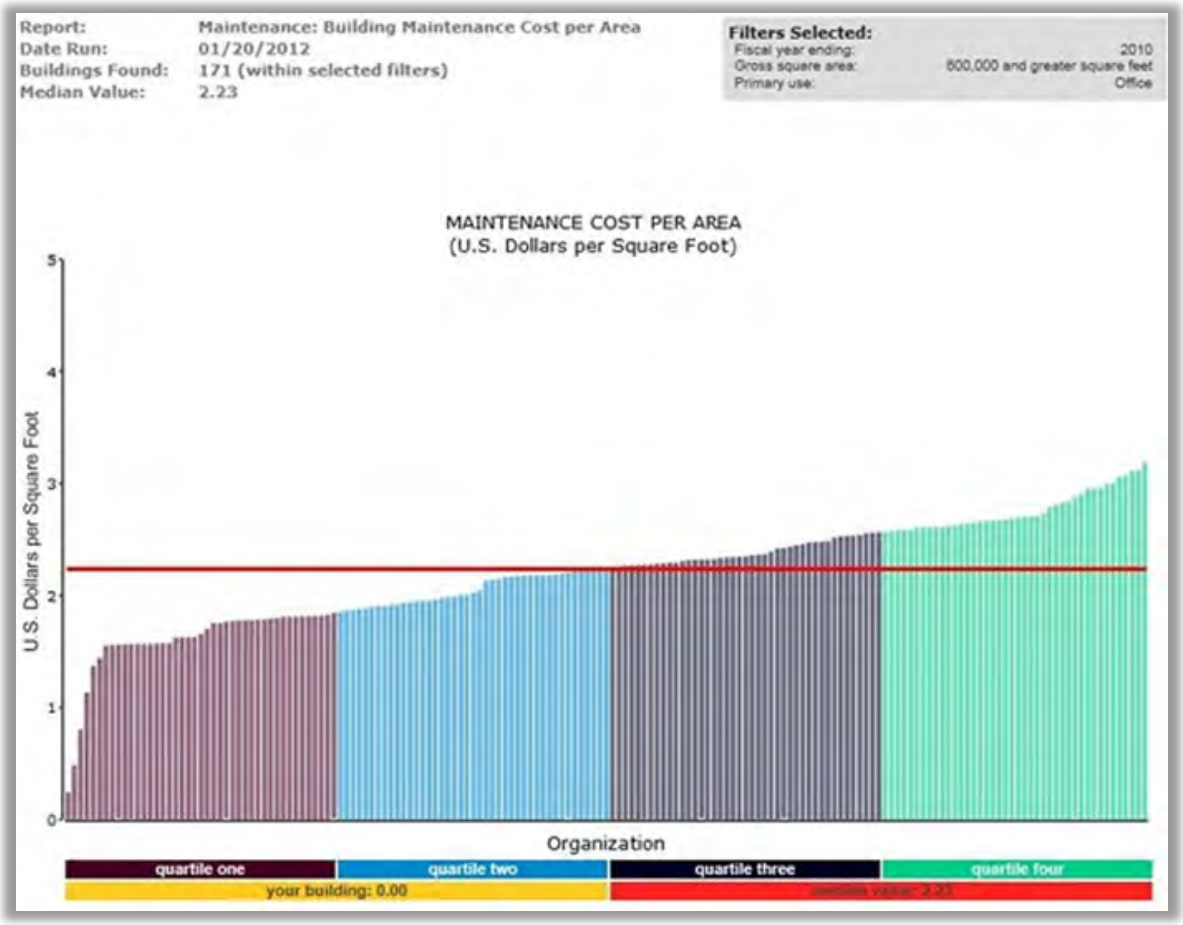


Figure 9. Maintenance cost for large (>600,000 sq. ft.) office facilities. Median maintenance cost is US$2.23 per gross sq. ft., whereas the first quarter maintenance cost is US$1.84 per gross sq. ft. Reprinted with permission from FM BENCHMARKING.

There are other ways to use filters to compare maintenance costs. One way is to study maintenance staffing levels by looking at area maintained per full-time maintenance worker (see Figure 10). If the same filter for large office buildings is used, you will see the median area maintained per worker is 61,538 GSF with a first quartile performance is 63,274 GSF. Other than a few exceptions on the far left and right sides of this chart, there is not much of a difference in area maintained by maintenance workers.

If it turns out there is a need for improvement, benchmarking best practices will be in order.

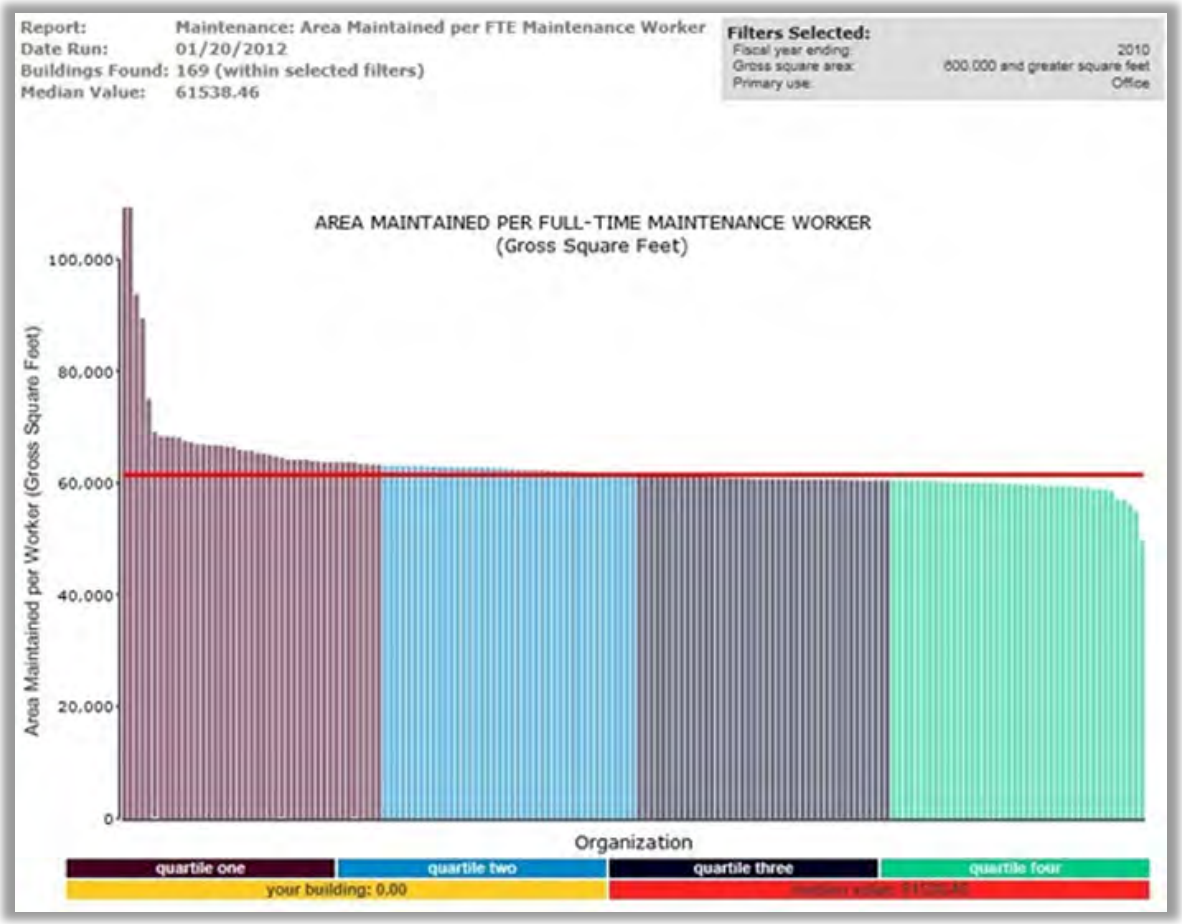


Figure 10. Area maintained per maintenance worker for large (>600,000 sq. ft.) office facilities. Median area maintained is 61,538 GSF, and the first quartile area is nearly the same: 63,274 GSF. Reprinted with permission from FM BENCHMARKING.

EXAMPLE 4: JANITORIAL COMPARISONS—FILTER DETERMINATION

To illustrate benchmarking for janitorial costs, the focus will be more on using the values that separate the quartiles instead of just the placement of the subject building; this type of quartile analysis is just another way to benchmark—it is not necessarily better or worse for any given metric, but a factor of your situation and the benchmarking tool you are using.

Cleanable area will be used as the key performance indicator; cleanable area is usually different than the gross and rentable areas, and will be the number stated in your janitorial contract. The subject building's janitorial costs came in at US$1.14 per cleanable square foot; the building is a large manufacturing facility (greater than 600,000 sq. ft.) where workers are required to have security clearance.

On the left side of Figure 11, the first, second (median) and third quartile performances are shown (less than US$1.06, $1.20 and $1.35 per cleanable sq. ft., respectively); on the right side, you will see the same metric after applying a large building filter—this time, the costs come in practically the same for all three quartiles (US$1.06, $1.18, $1.32, respectively). This indicates that building size is not a critical factor for

this metric, so the filter setting can be kept larger by not turning on this filter, enabling more filters to be used as the analysis continues.

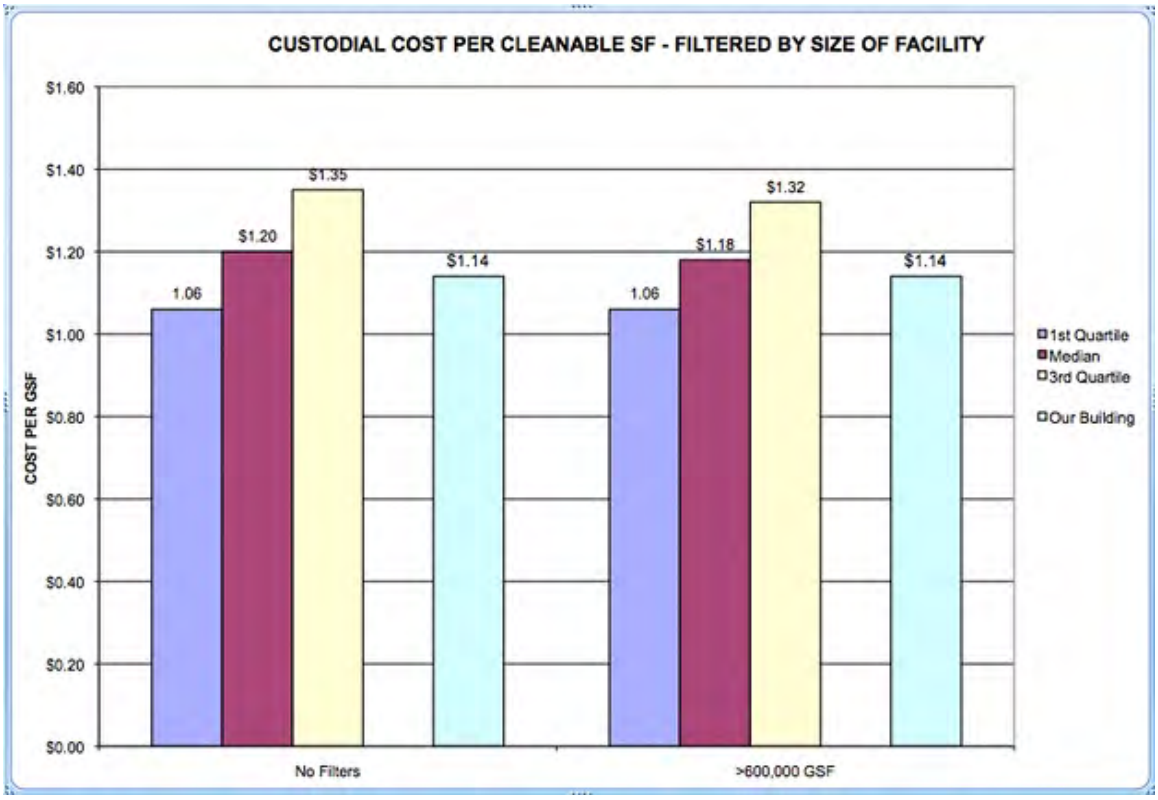


Figure 11: Janitorial costs with no filters (left side) and with a filter for large buildings (right side). There is not a significant difference between the two, implying that building size is not a large factor when benchmarking janitorial costs. Reprinted with permission from FM BENCHMARKING.

A similar analysis was done by looking at a filter for only manufacturing buildings, but this did not have much of an effect. Next a filter was added for buildings requiring high security clearance, which did have an impact (see Figure 12). Because there were enough buildings remaining in the database for this analysis, the other two filters were left on. A best practices analysis will show us how to improve.

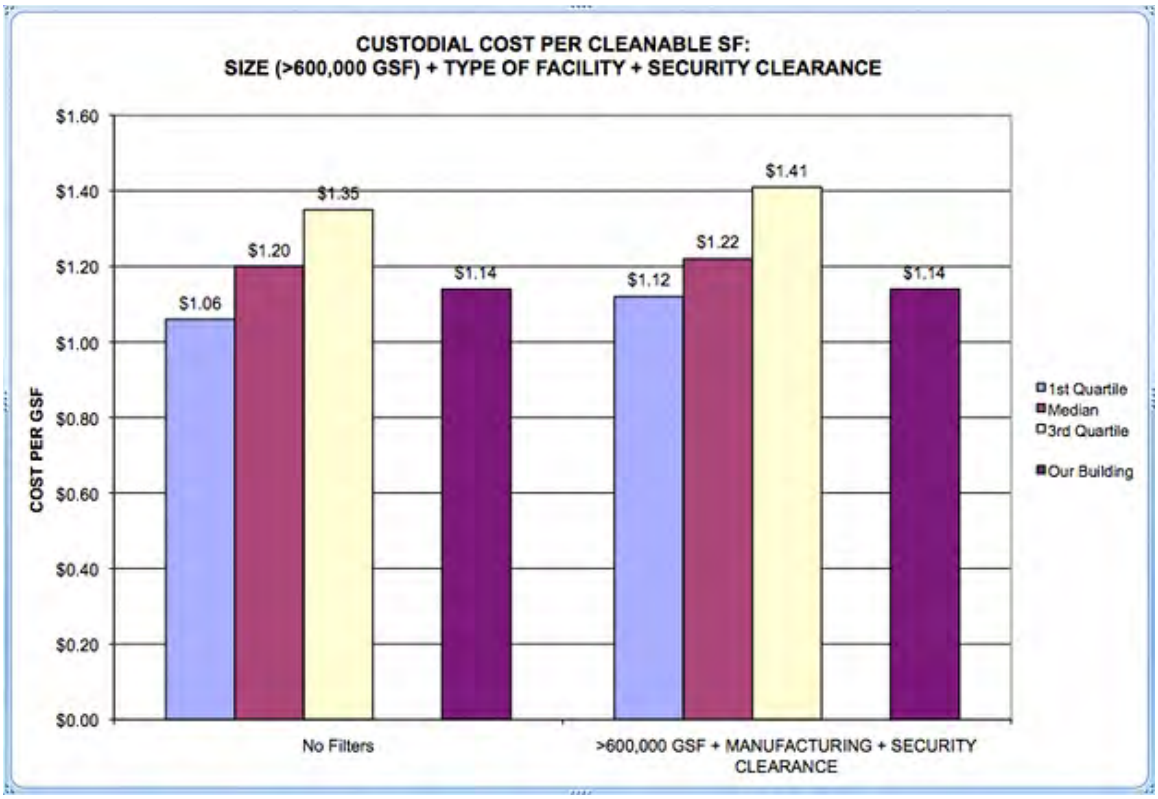


Figure 12: Janitorial costs with no filters (left side) and with a filter for large manufacturing buildings where worker security clearance is required (right side). The differences between the two are significant; since size and facility type had previously been shown not to make a big cost difference, we conclude that security clearance requirements do make a difference and we should include that filter in our final filter set. Reprinted with permission from FM BENCHMARKING.

EXAMPLE 5: SECURITY COMPARISONS—FILTER DETERMINATION

Many organizations receive requests to reduce budgets, and they often turn to the security budget. Unless a security breach occurs, money will have been saved. But is there a way to have more confidence in finding a way to spend less? Benchmarking security costs may provide an answer.

There are several metrics that can be studied when benchmarking security costs: cost per secured area, cost per on-site FTE employee and area secured per security worker are three examples. In addition to the typical filters about building type and size that can be applied, one may want to add a filter that relates to the number of points of entry, and another for the number of annual visitors. This next example illustrates how filters can be studied to help benchmark security costs.

Assume the subject facility is large (greater than 600,000 sq. ft.) and in a campus setting (multiple buildings). The results are shown in Figure 13, where we see the median cost of US$1.06 per secured square foot. To be in the first quartile, the subject facility would have to have a cost of less than US$0.95 per secured sq. ft. The subject facility happens to come in at US$1.35 per secured square foot, which means it is near the middle of the fourth (worst-performing) quartile. Clearly there is much room to improve.

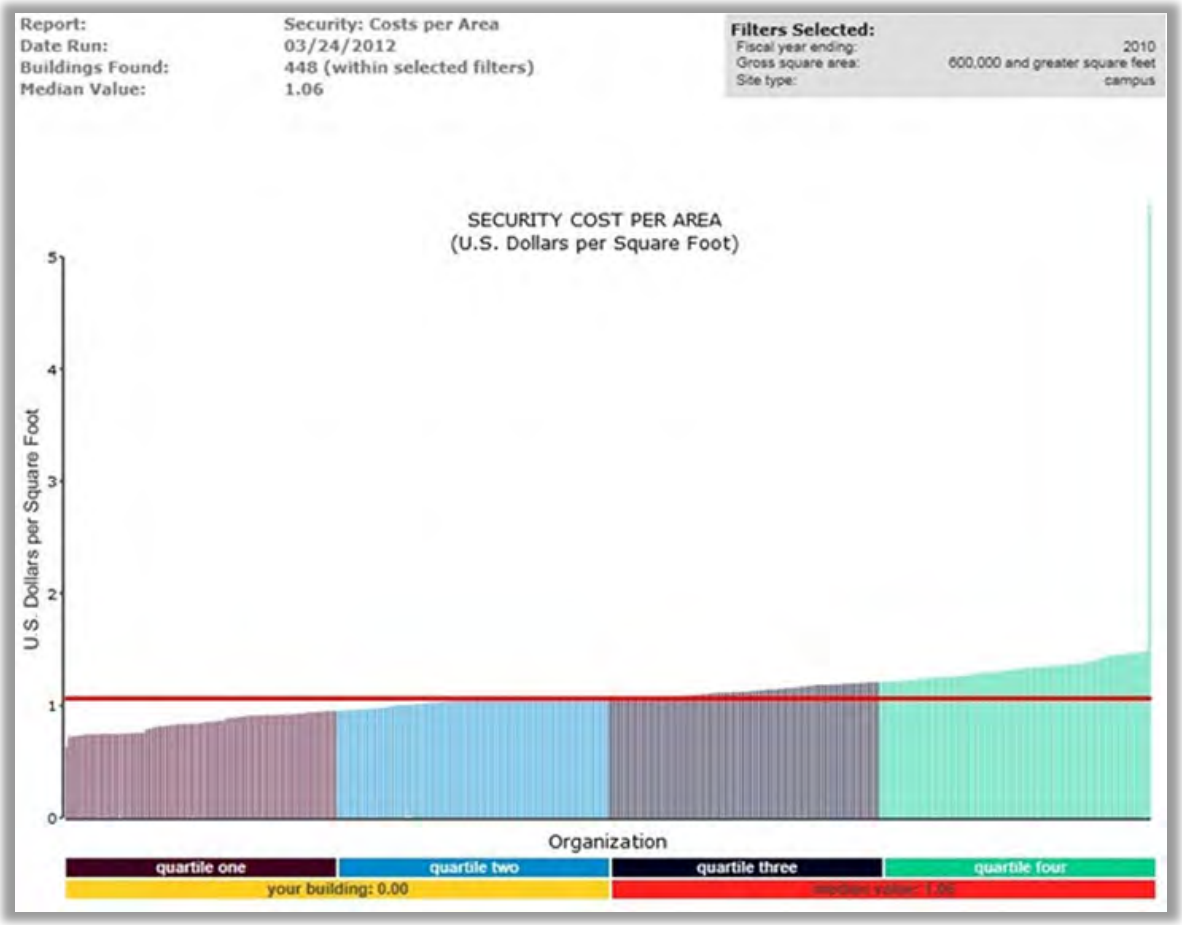


Figure 13. Security cost per unit area for large buildings (>600,000 sq. ft.) in a campus-setting (multiple buildings). Reprinted with permission from FM BENCHMARKING.

Before concluding, two other analyses need to be conducted. The first is to try different filters— a special situation may exist that skews our performance and others in the same situation may have significantly higher costs as well. The second type of analysis is to study the area secured per full-time security worker (see Figure 14).

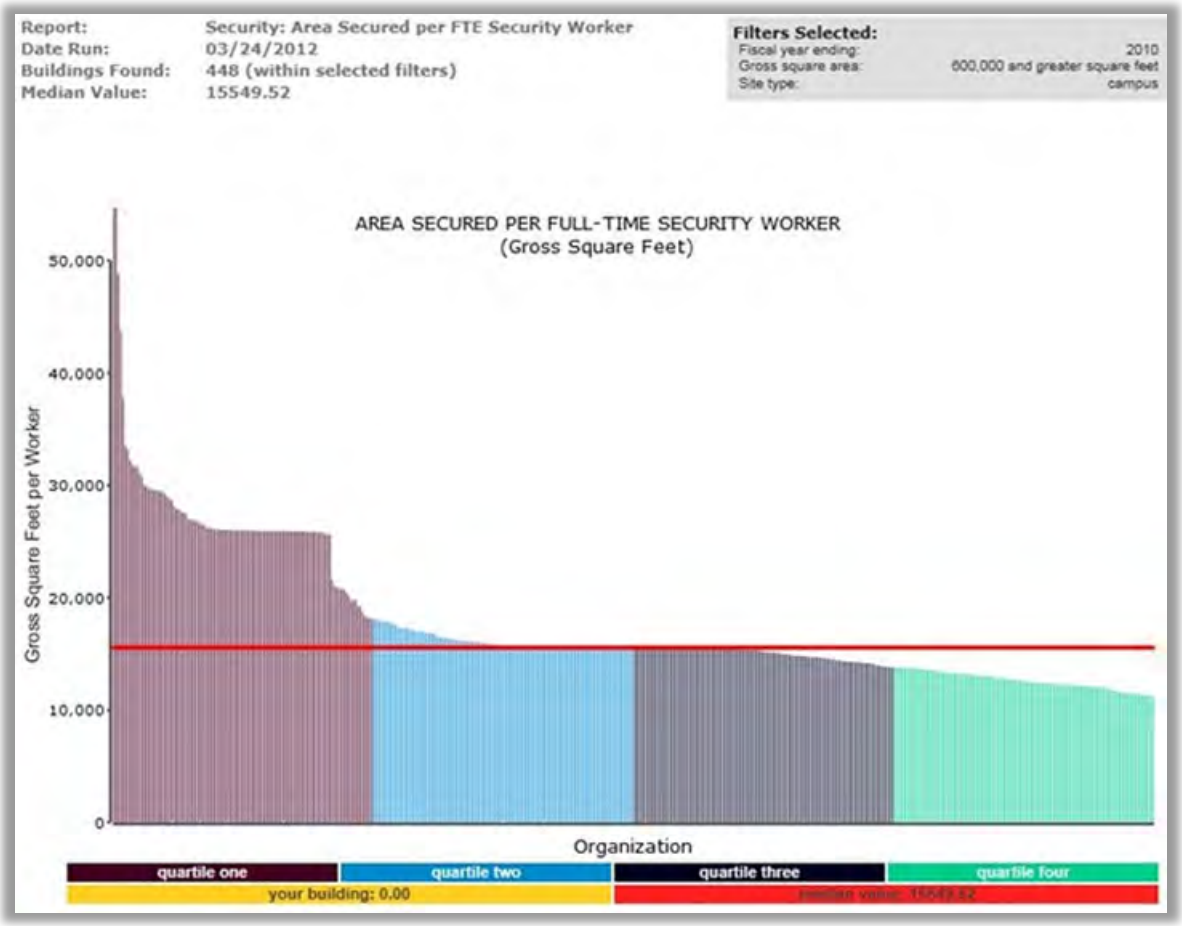


Figure 14. Area secured per full-time security worker for large buildings (>600,000 sq. ft.) in a campus-setting (multiple buildings). Reprinted with permission from FM BENCHMARKING.

In Figure 14, the median area secured per full-time office worker is 15,549 GSF; all buildings with areas maintained of 18,000 GSF or greater are in the first (best) performance quartile. Our facility has 14,310 GSF being maintained, which puts it at a high third quartile performance. This is significantly better than the mid-fourth quartile performance from the previous metric, but still not great. Improvement may be needed or continued study of the metrics through filters may further clarify what is happening.

If it turns out there is a need for improvement, a best practice analysis would be conducted. This type of analysis would eliminate conjecture from determining the reasons for the buildings poor performance.

BEST PRACTICES AND DETERMINATION OF BEST PRACTICES

Best practice analysis enables the identification of what better-performing similar buildings are doing to achieve their superior results that are not being done in your building in order. For example, in terms of the example in the last section where your building was in the third performance quartile, it would be important to study what those in the first and second quartiles are doing. If there are differences from your building, it may be feasible to implement them.

Of course, just because a best practice works for someone in a similar building does not necessarily mean that it will work in your building—there may be a unique situation that does not make the improvement feasible. Each decision must be examined independently. The benchmarking tool can identify what others are doing, but you will have to price out the improvement and determine whether it is feasible for you, or whether other identified improvements may make more sense.

THE BEST PRACTICES PROCESS

Here, you will want to apply the same filters that you applied in the previous section on filters. Thus, if you had separate filters for utilities, you will want to study buildings in the same filter set when you examine the utilities' best practices.

Ideally, your benchmarking system will enable you to identify best practices in the following ways for the subject building:

- **Best practices being followed by those in buildings performing similarly to yours**. If your benchmarking tool tracks buildings by quartile, it would be other buildings in your performance quartile.

- **Best practices being followed by those in buildings performing somewhat better than yours**. If your benchmarking tool tracks buildings by quartile, it would be buildings in the next better-performing quartile.

It is not essential to study the best practices being followed by those in buildings significantly better than yours (such as those two quartiles better than you)—it is much more advisable that you bring your building along more slowly and take care of the best practices that are most within reach, as identified by those who are in buildings performing similarly or slightly better than yours.

> *An analogy:* If you are a mediocre English student, you would improve better by fixing the problems of fellow "C" students and "B" students rather than those of "A-" students; in other words, you will need to fix the spelling mistakes and verb tenses before you are ready to worry about picking great vocabulary words and determining when to use alliteration to emphasize a point.

Once you identify the best practices that are most likely to achieve the results you are seeking for your facility, it is time to price out their implementation and decide which you want to implement. Then, you will remeasure your progress in a year.

EXAMPLES: BEST PRACTICES TO IMPROVE BUILDINGS' PERFORMANCE

The previous examples addressed the selection of filters to ensure the most appropriate filter set for building performance comparison purposes. This section illustrates how to take that to the next level—to improve building performance.

Focus your attention not on the benchmarking system that is used in these examples, but on the concepts being discussed. Each example illustrates not only a different building application, but a different concept. After this section, the lessons learned through each of the examples will be summarized.

EXAMPLE 6: UTILITY IMPROVEMENTS—BEST PRACTICES ANALYSIS

If the utility filter analysis indicates that the building's electrical consumption should be improved, the next question becomes, "What can be done to make things better?" To answer this question, look at the best practices that have not been implemented in the subject facility, and then determine which of them have been implemented by most others in better performing buildings.

This time, the focus is on buildings in hot, dry climates, regardless of building type. In addition, total utility costs will be studied. As in real life, you will benefit from analyses of costs and consumption. The utility costs are shown in Figure 15, which also shows the subject building in yellow; note the subject building is in the second performance quartile.

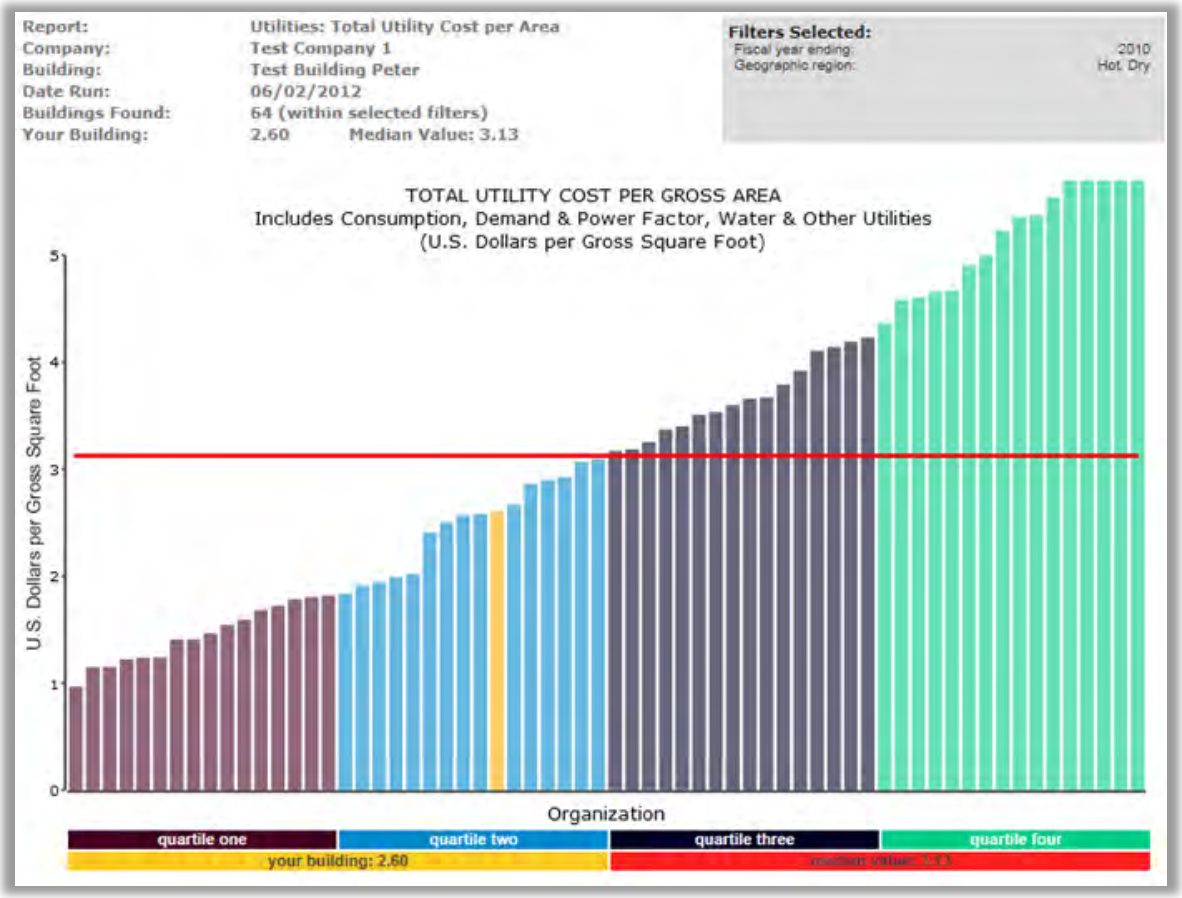


Figure 15. Total utility cost for facilities in hot, dry climates. Median total utility cost is $3.13 per gross sq. ft., whereas the subject building total utility cost is $2.60 per gross sq. ft. (yellow line). Reprinted with permission from FM BENCHMARKING.

Figure 16 shows examples of best practices for utilities (there are many more, which can be seen in a variety of benchmarking tools as well as the ENERGY STAR website). The column "Your Building" shows whether or not the best practice has been implemented in the subject building, while the last two columns indicate the percentage of benchmarking participants in this filter set (hot, dry climates) from both the subject building's quartile (second) and next better performing quartile (first) who have implemented the best practice.

At the subject manufacturing facility, there are neither tinted nor filmed windows (Line LU7) while 81 percent of the peer group's participants in the quartile have done so, and 88 percent of the first quartile participants have implemented this item. So this seems as if it may be a very good best practice to implement.

But there may be an even better opportunity. Note item LU8 (Additional insulation on vertical surfaces or air sealing). This has not been implemented in the subject facility, and only 56 percent of the peer group in the building's second quartile has done so. When the first quartile (Next Better Performing Quartile) is examined, it can be determined that 94 percent of the participants in this peer group have done so. This best practice seems to be a major difference between second and first quartile buildings.

Based on the above analyses, certain best practices are likely to be done by most in the first and second quartiles, while other best practices may be those that tend to move buildings from the second to the first performance quartile. Serious consideration should be given to implementing both types of best practices.

Looking a bit further down the list, note that 81 percent of the participants in both the subject building's quartile and the next better performing quartile have implemented light-colored reflective roofs (LU29). This practice matches the percentage for tinted windows and should be considered. Note that green roofs (LU30) haven't really taken hold in this sample—be careful if you are considering implementation as you may be the only one in your climate zone.

None of this analysis addresses the costs to implement the best practices, but it does tell which best practices are being done by others in similar buildings. At this point, cost out what it will take to implement each recommended best practice and determine whether it will be worthwhile. Sometimes, it may be necessary to hire a consultant or engineer to provide additional advice.

LEED ENERGY CONSERVATION INITIATIVES			% Responding YES	
		Your Building	Your Quartile	Next Better Performing Quartile
LU7	Tinted / filmed windows	no	81%	88%
LU8	Additional insulation on vertical services or air sealing	no	56%	94%
LU10	Daylight sensing to turn off lighting that isn't needed when ambient light is adequate	no	69%	88%
LU12	Building Management Systems or Energy Management Systems (BMS/EMS) for HVAC, interior lighting, exterior lighting, chilled water, etc.	yes	62%	88%
LU16	Initial commissioning	no	69%	75%
LU17	Minor repairs and or corrective maintenance (upgrading control sequences, sealing leaky ducts, fixing leaky hot water faucets, upgrading air-side economizer settings, etc.)	no	75%	88%
LU20	Energy efficient lighting, e.g. compact fluorescents, LEDs, T5 or T8, etc.	no	75%	75%
LU21	Variable frequency drives (VFDs) on motors	no	75%	81%
LU23	Economizer cycle	yes	75%	69%
LU24	Occupant training programs	no	62%	88%
LU28	CO2 monitoring of make-up air	no	62%	62%
LU29	Light colored (cool / reflective roofing)	no	81%	81%
LU30	Green roofs (Vegetated solutions)	no	0%	0%

Figure 16. Utilities best practice analysis for facilities in hot, dry climates. This shows which utility best practices have been implemented in the subject building and by others in the filter set. This is a partial list of utility best practices. Reprinted with permission from FM BENCHMARKING.

EXAMPLE 7: MAINTENANCE IMPROVEMENTS—BEST PRACTICES ANALYSIS

In Figure 17, the maintenance cost per unit area was studied. The subject building (a large, old manufacturing facility) costs US$2.25 per GSF to maintain, which is well into the first quartile, and well under the first quartile performance of US$2.50 per GSF. The median performance is US$2.78 per GSF. Even though this performance is excellent, benchmarking can be used to determine if there is room for any improvement.

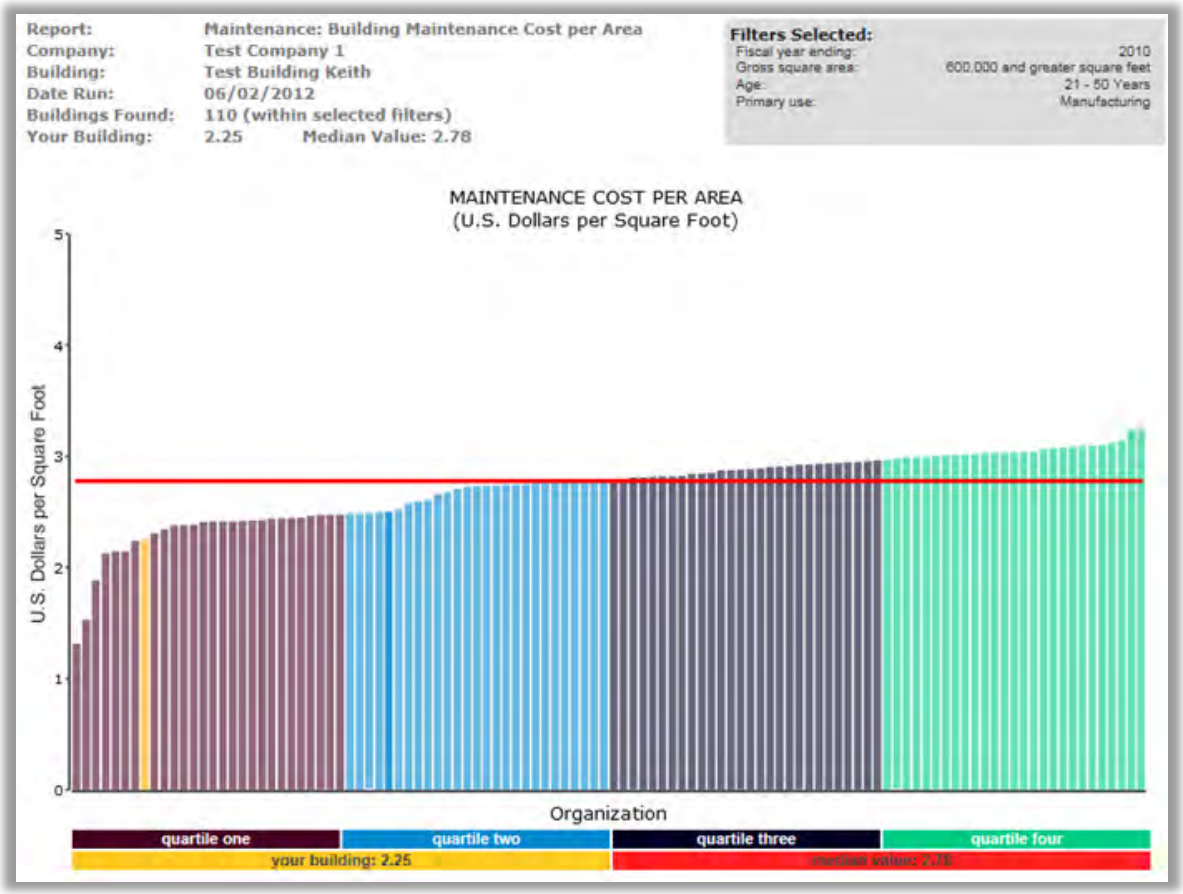


Figure 17. Maintenance cost per area for large (>600,000 sq. ft.) manufacturing facilities are between 21-50 years. Median maintenance cost is US$2.78 per gross square foot., whereas the subject building maintenance cost is US$2.25 per gross square foot (yellow line). Reprinted with permission from FM BENCHMARKING.

To improve our performance, even though our building is in the first quartile, a best practices analysis will be undertaken, as shown in Figure 18, which identifies several best practices that have not been implemented in the subject facility.

The first best practice listed (using equipment standards to reduce parts inventories) was implemented by only 53 percent of the others in the subject building's performance quartile, so this one may not be worthwhile to implement. However, the third one listed (incorporation of a CMMS system to track work orders) was implemented by 88 percent of those in the building's performance quartile in the filter set. This one likely would be worthwhile to implement. The other two best practices were implemented by about three-quarters of the filter set, so they would be worthwhile to consider.

MAINTENANCE BEST PRACTICES INITIATIVES		% Responding YES	
		Your Building	Your Quartile
BPM4	Equipment standards for replacement components and new design are developed and followed to minimize spare parts storage and reduce training requirements.	no	53%
BPM5	JIT (just in time) material procurement has been implemented for PM work that maximizes worker productivity	no	75%
BPM6	Maintenance management system has been implemented to track work orders. All work is tracked to completion and closed out or reported on an exception basis.	no	88%
BPM8	Maintenance work is performed on an as needed basis as trouble calls develop.	no	78%

Figure 18. Maintenance best practice analysis for large (>600,000 sq. ft.) manufacturing facilities are between 21-50 years. This shows which maintenance best practices have not been implemented in the subject building but have been implemented by others in the filter set. This is a partial list of maintenance best practices. Reprinted with permission from FM BENCHMARKING.

EXAMPLE 8: JANITORIAL IMPROVEMENTS—BEST PRACTICES ANALYSIS

As noted in Figure 19 by the yellow line, the subject building's janitorial costs are quite poor when compared to others, coming out in the middle of the fourth (worst) performance quartile—US$2.28 per cleanable sq. ft. First quartile performance (less than US$1.13 per cleanable square foot) and the median value (US$1.19 per cleanable square foot) were both much better than the subject building's janitorial costs. After trying several other filters to see if there may be another cause for the poor performance, the conclusion was that the janitorial services could be done much better.

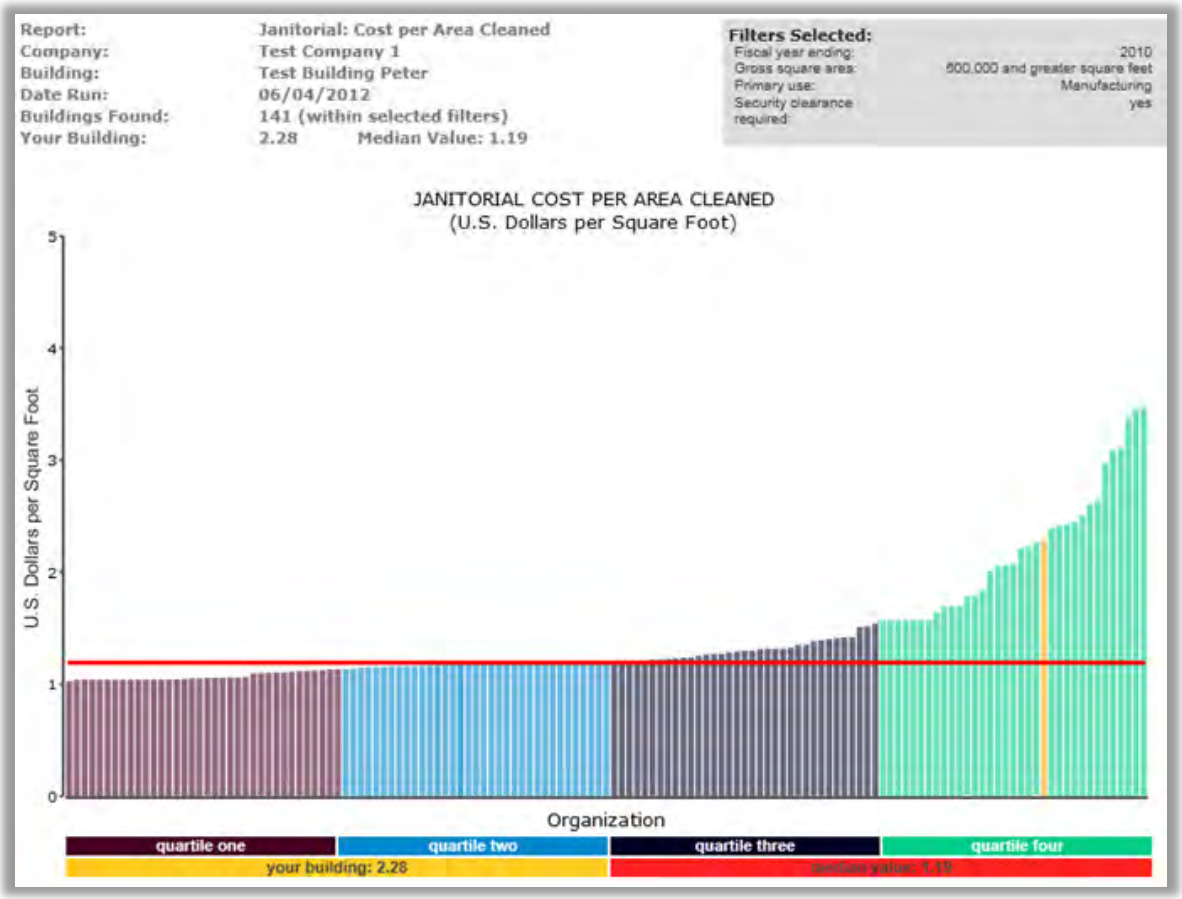


Figure 19. Janitorial cost per area for large (>600,000 sq. ft.) manufacturing facilities where security clearance is required. Median janitorial cost is US$1.19 per cleanable square foot, whereas the subject building maintenance cost is US$2.28 per gross square foot (yellow line). Reprinted with permission from FM BENCHMARKING.

Given that the subject building's performance can be improved, the next question becomes, "How?" To do that, study of the best practices of others in the subject building's filter set (similar buildings) will be done. First, when looking at cleaning frequency, it can be noted that the subject building has several tasks performed four or five times per week, while most others are having them done just once per week (these are dusting, trash removal and spot carpet cleaning).

Figure 20 illustrates janitorial best practices that have not yet been implemented in the subject building. For the first two best practices, there is not a great difference in the percentage of buildings that have implemented best practices in our subject building's quartile (fourth, the worst performing) and the next better quartile (third). Nonetheless, there is a high percentage (70 percent to 80 percent) of those in both quartiles who have implemented these best practices. It also is important to note that one of them, the cleaning frequencies, was flagged during the initial building comparison.

The last two best practices in Figure 20 are examples of what happens when not many in the subject building's quartile have implemented a best practice, but many in the next better-performing quartile have implemented the best practice. Both situations are examples of the types of best practices that should be considered for implementation in order to improve janitorial performance.

JANITORIAL BEST PRACTICES INITIATIVES		% Responding YES	
		Your (4th) Quartile	3rd Quartile
BPC4	Cleaning frequencies are regularly reviewed to determine if still appropriate	68%	78%
BPC5	Contract is rebid at regular intervals appropriate to the company and market conditions	74%	81%
BPC22	Skip cleaning is utilized where feasible	56%	81%
BPC23	Specialized functions, such as, carpet cleaning or window washing that are performed under specific contracts and not by the regular janitorial workforce	44%	86%

Figure 20. Janitorial best practice analysis for large (>600,000 sq. ft.) manufacturing facilities with security clearance required. This shows which janitorial best practices have not been implemented in the subject building but have been implemented by others in the filter set. This is a partial list of janitorial best practices. Reprinted with permission from FM BENCHMARKING.

EXAMPLE 9: SECURITY IMPROVEMENTS—BEST PRACTICES ANALYSIS

In this final example on security cost per area secured, the filter set will be large manufacturing facilities where security clearance is required of the workers. As with the janitorial metrics, the security metric also has lots of room for improvement, as shown in Figure 21—security costs per square foot. The subject building (US$1.03 per sq. ft.) is in the third quartile, just above the median (US$0.96 per sq. ft.).

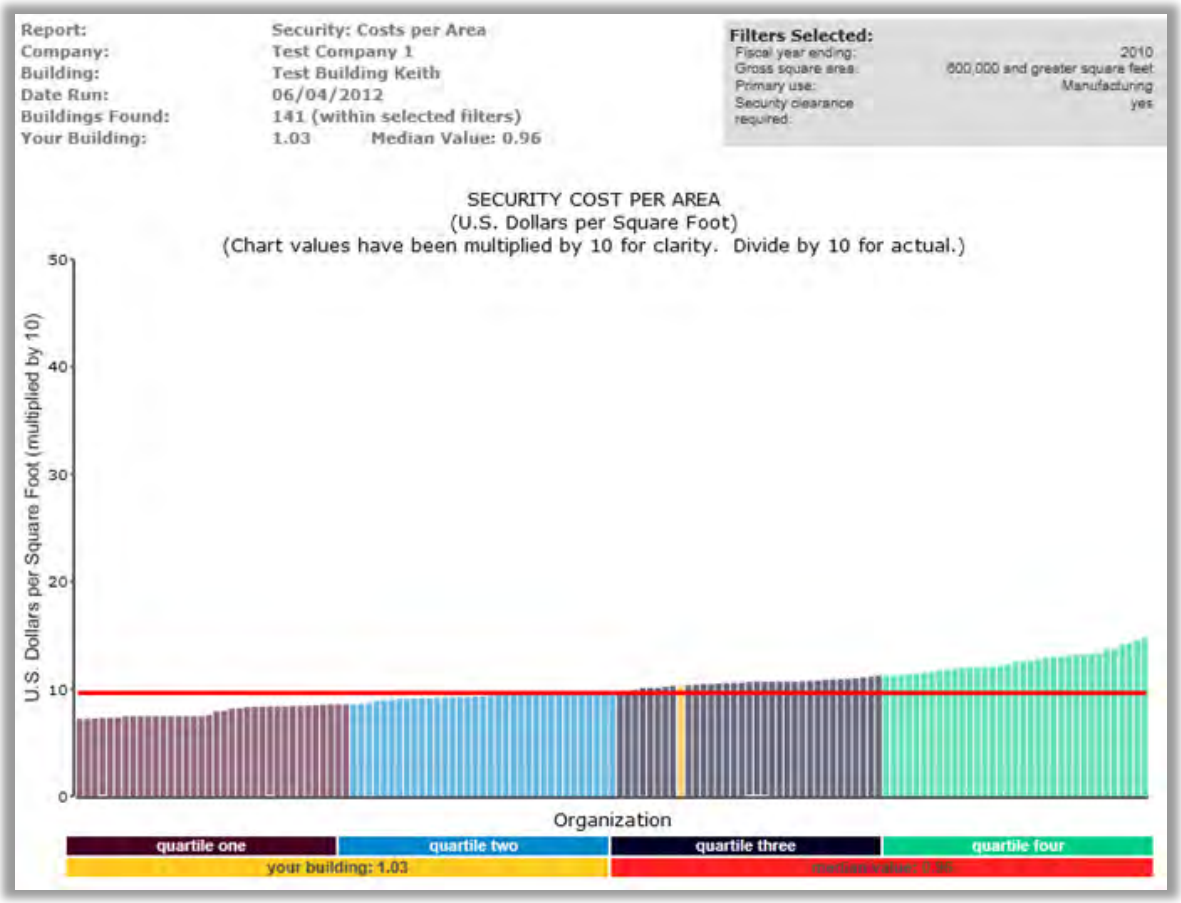


Figure 21. Security cost per area for large (>600,000 sq. ft.) manufacturing facilities where security clearance is required. Median security cost is US$0.96 per square foot., whereas the subject building security cost is US$1.03 per gross square foot (yellow line). Reprinted with permission from FM BENCHMARKING.

As with the janitorial analysis, security best practices are reviewed to see if there is a way to improve this performance. The objective is to go from the third to the second quartile. In Figure 22, there are four best practices that not only had a large differential between the second and third quartiles (indicating that these are key factors in improving one's performance), but they had very high percentages (greater than 90 percent) of the companies in the second quartile that have implemented those best practices. When a number is as high as 90 percent, it makes a compelling argument when it comes time to ask management for their blessings in implementing the best practice.

SECURITY BEST PRACTICES INITIATIVES		% Responding YES	
		Your (3rd) Quartile	2nd Quartile
BPS7	Major entrances and key access points are monitored by CCTV	72%	91%
BPS10	Security staff turnover is monitored on a regular basis and the contract manager can take actions to increase base pay if market conditions are adversely affecting the workforce	67%	94%
BPS11	Specialized events/ functions are performed under specific contracts and/or funding and are separate from the normal/routine security scope	69%	97%
BPS16	Unmanned revolving doors have been installed which eliminate tailgating as a problem	75%	94%

Figure 22. Security best practice analysis for large (>600,000 square feet.) manufacturing facilities with security clearance required. This shows which security best practices have not been implemented in the subject building but have been implemented by others in the filter set. This is a partial list of security best practices. Reprinted with permission from FM BENCHMARKING.

SUMMARY OF LESSONS LEARNED FROM THE EXAMPLES

Each example above illustrated different lessons. All are important if one is to benchmark successfully. The three key points made through the examples are:

1. The resulting benchmarks vary considerably, depending on the filters applied. While some filters do not make much of a difference for certain metrics, others do have quite an impact. So one should not take the filter analysis lightly.

2. There is an art to selecting the most appropriate filters, which in turn impacts the rest of the benchmarking process, including the ultimate determination of which best practices to apply.

3. The best practices analysis is critical to identifying ways to improve building performance.

In this section, these three points are reviewed, summarizing the lessons learned from the examples in the filter selection and best practice sections.

Example 1. The space utilization example demonstrated that some filters can impact the middle-performing buildings, but not the best performers. In addition, a given building's performance can look much better or worse depending on the filters applied. It is important to select the most appropriate ones.

Example 2. This utilities example echoes the themes from Example 1. It also was learned that the filter comparisons, while useful to knowing how the subject building compares to its peer group, does not show what to do in order to improve building performance—that is where best practice analysis will come into play.

Example 3. The maintenance example shows it is possible for some buildings to have too good a performance, and provides reason to believe it will not last. The user also learns how to recognize when there may be exceptions for other buildings in the database and what to do when these occur. In addition, there can be more than one metric to study for each building area (e.g., cost per unit area, area maintained per worker), and that a building can seem to perform better with some metrics than with others.

Example 4. The janitorial example analyzes the results through a quartile analysis instead of a graph showing all buildings. It also illustrates what can be done when addition of a filter has little impact, and how this enables one to apply more filters and thereby get more accurate results.

Example 5. The security example shows whether or not to can respond positively when the boss says to cut spending in an area by looking at what others are spending. Another illustration of looking at different metrics as a part of the analysis is provided.

Example 6. The utilities example is the first one to identify which best practices may result in the greatest improvement to our utility consumption. You learn how to apply what peers are doing when they are performing at a similar level, and also how to learn from the peers in better-performing buildings. It becomes apparent that certain best practices are done primarily by those in the top-performing quartiles, and not by those in many of the others.

Example 7. The best practices maintenance example demonstrates that even if a building is among the best performing, there are ways to identify what can be done to improve its performance.

Example 8. The janitorial best practices example shows that it is important to study a wide variety of best practices and filters to ensure you will identify those from which you will reap the highest benefit. It was determined what happens when most in our building's performance quartile and the next better one have implemented a best practice, and how to recognize when primarily those in the next better-performing quartile have implemented it.

Example 9. The final example on security best practices shows that one can get very compelling numbers to convince management to spend the money on implementing a best practice.

BENCHMARKING—A TRUE PROCESS

By now, readers hopefully have come to the conclusion that except in rare circumstances, benchmarking is a total process. It starts with determining one's filters that will lead to apples-to-apples comparisons. The facility professional then learns that different combinations of filters work best for different metrics. Finally, the facility professional will need to benchmark best practices to identify how to improve the subject building.

But the facility professional is still not done with the benchmarking exercise—because each year that one benchmarks, one will improve the subject building's performance. The additional savings and improvements will be a little less each year than from the year before, but when coupled with the previous year's savings, they will add up quite a bit over time. Typical cumulative savings after 10 years will be five times the savings from the first year.

All this can be seen quite readily in Figure 23, which shows that benchmarking is really a continuous improvement process. This is a process developed by Facility Issues, a consulting benchmarking firm, and now applied by several automated benchmarking companies.

The process starts on the top of the Figure 23, where you determine which building metrics you want to study for each of your buildings. In most cases, you will select an automated methodology for benchmarking, but if you have some special situations, you may want to bring on a specialist at an early stage. After you collect your data, you are ready to go through the iterative process of generating reports; this is done by turning on and off different filters, as explained earlier in this guide; you will go around this loop as many times as it takes to generate the information you want. At this point, you will have generated your comparison reports for each of your metrics for the subject building, with each report having its own defined filter set.

In Step 5, Phase Two of the benchmarking process is ready for implementation. In this step, benchmarking for each of the best practices for each key metric is done. This is followed by evaluation of the recommended improvements to see which should be implemented. Once they are implemented, track progress over the next year.

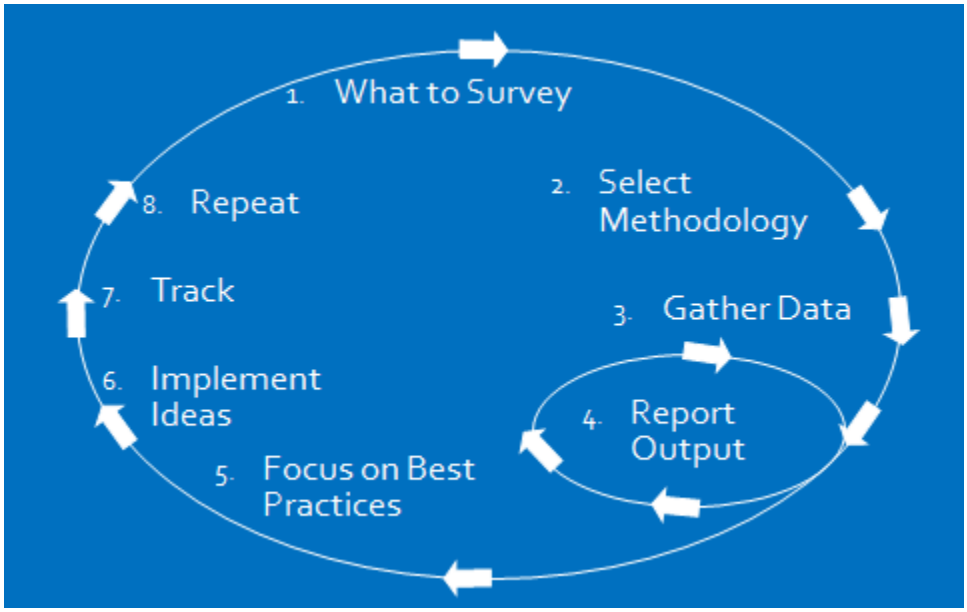


Figure 23. The Benchmarking Continuous Improvement Process. Reprinted with permission from Facility Issues (www.facilityissues.com).

At the end of the year (Step 8), it is time to benchmark again. Because things change over a year, both for the subject buildings and with others in the benchmarking database, different elements of the benchmarking process may need to be adjusted. By so doing, new best practices to implement may be discovered, and as a result, experience further improvement.

CHAPTER 7: SAVINGS REALIZED FROM BENCHMARKING

Most facility professionals who benchmark their buildings on an annual basis will realize at least some savings as a result, regardless of the system they use. This is because just by going through the process, no matter how rudimentary, they will be forced to be thinking about some key facilities variables and how well they are performing with them. The savings for such a rudimentary approach will not be great, but they will be better than not doing any benchmarking.

This chapter demonstrates actual savings achieved by facility professionals undertaking serious benchmarking for at least 5 years. They are rather impressive, especially considering these are from the median performers; i.e., half of the facility professionals did even better than what is being reported.

The results presented below are quite consistent from year to year, indicating conclusively that additional savings from benchmarking typically are realized each year that one benchmarks, even if one has been doing it for many years. This is because benchmarking is a continuous improvement process.

All the numbers are from the performance of a private benchmarking consulting company (Facility Issues), which has benchmarked its clients for more than 10 years, including members of the IFMA Utilities Council. The areas for savings include:

a) Operating costs
b) Energy consumption
c) Space utilization

OPERATING COST SAVINGS

Figure 24 shows the median benchmarking company reduced its operating costs 6 percent in the first year and 31 percent over 10 years (solid line in chart). The dashed line shows the additional savings each year above the previous year's savings; because this line is always above 0 percent, it means that positive savings were attained every year.

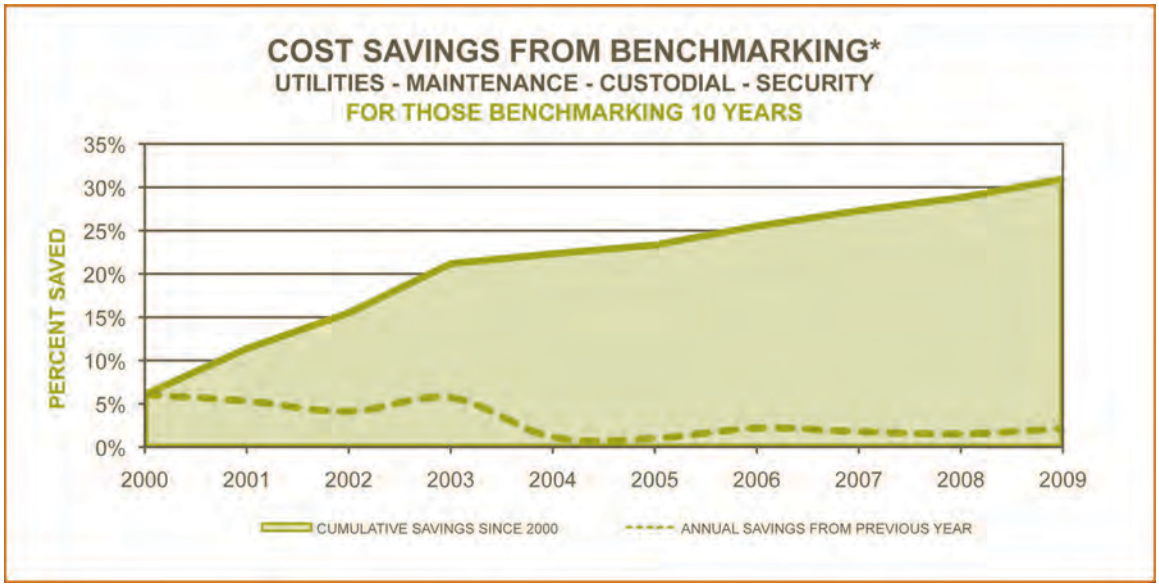


Figure 24. Operating Cost Savings are 31 percent for the median company after 10 years. Reprinted with permission from Facility Issues.

Figure 25 presents actual savings calculated for a 100,000 sq. ft. and 500,000 sq. ft. buildings, based on real companies' savings in the database. Data are shown over a five-year period.

Figure 25. Savings expressed in dollars for different sized buildings. Savings shown are based on actual, realized savings from buildings in the database. Reprinted with permission from Facility Issues.

ENERGY CONSUMPTION SAVINGS

Figure 26 shows that the median benchmarking company reduced its energy consumption 8 percent in the first year and 40 percent over 10 years (solid line in chart). The dashed line shows the additional savings each year above the previous year's savings; because this line is always above 0 percent, it means that positive savings were attained every year.

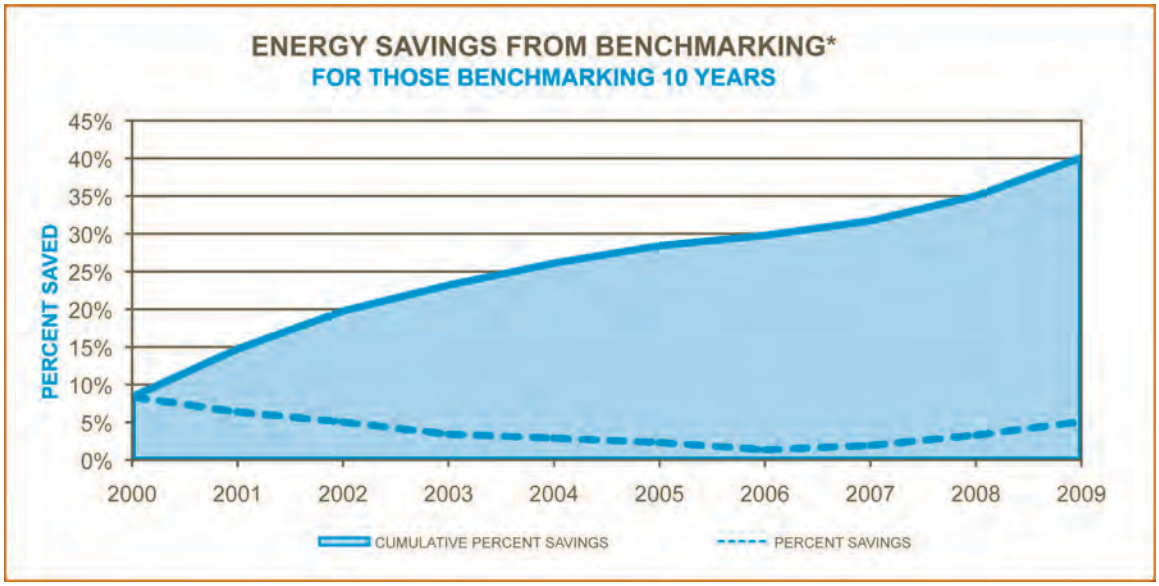


Figure 26. Energy consumption savings are 40 percent for the median company after 10 years. Savings shown are actual, realized savings. Reprinted with permission from Facility Issues.

SPACE SAVINGS

One of the largest costs for a company the space it occupies. Simply by knowing that a subject company is occupying more space per person than the typical similar company, the subject company can focus on finding opportunities to reduce space.

A big opportunity for space savings is using benchmarking to reduce underutilized space. Much underutilized space will come from pockets of vacant space throughout a building, often caused when an employee leaves a company and the position is not immediately filled. If this happens frequently, it may be worthwhile for the company to reclaim the space and rearrange what remains. Benchmarking will identify when a company's space utilization rate is much higher than that of similar buildings.

Other space savings can occur when a building has too much support space, more private offices than most other buildings, or larger office sizes than most others. The cause of the additional space utilization can be determined by benchmarking in more detail, or it may be obvious. The starting point is to determine whether the subject building's rate is much higher than that of the rest of its peer group.

The median company in the Facility Issues database reduced its space requirements by 6 percent after its first year of benchmarking, an additional 5 percent after its third year. If the space is leased and the

excess can be subleased, the savings will be realized. Even if the space is owned, maintenance and utility costs can be reduced by not using the space.

CHAPTER 8: BEYOND IN-HOUSE BENCHMARKING—WHO ELSE CAN BENEFIT FROM BENCHMARKING?

In-house facility professionals aren't the only ones who can benefit from benchmarking. Besides the facility professionals, others who can benefit from benchmarking include:

a) **Service organizations whose clients are facility professionals.** These include outsourcing companies and property management companies.

b) **Professional consultants.** These people work directly for facility professionals and help determine ways to improve building performance.

c) **Researchers.** Most frequently housed within universities or associations, researchers work with the data generated by the benchmarking systems and attempt to draw conclusions from them to help building performance.

d) **Universities.** Besides research, universities can benefit from benchmarking by incorporating it into their FM and real estate curriculums.

e) **Standards organizations.** There also is a major two-way impact between benchmarking organizations and standards organizations. Benchmarking systems need to work with standardized data, and standards organizations are striving to develop more universal standards. It is natural for them to work together.

SERVICE ORGANIZATIONS: OUTSOURCING COMPANIES, PROPERTY MANAGEMENT COMPANIES

As more and more FM functions are outsourced, the companies providing the services have identified a need to benchmark their clients' portfolios, at least for the services these companies offer. In many such instances, these companies have been doing the benchmarking internally, using just their own databases; more of these service companies not only are applying the information within their companies, but also are sharing it with their clients. Because each company's database often comprises thousands of buildings, it is quite possible for them to get valid results through benchmarking.

There are two potential problems that may surface. The first is that with the possible exception of the very largest outsourcing companies, it would be difficult to justify the cost of developing the type of sophisticated benchmarking tool that has all the functionality described previously.

The second potential problem is many of these companies have clients who say they'd like to see the benchmarking results of their properties compared not only against the other properties managed by the outsourcing company, but also amongst others in the outside world. They feel this would give them more valid information.

Thus, many outsourcing companies are considering the use of external benchmarking tools. The more robust tools will incorporate a built-in interface to allow the outsourcing company to upload its data

seamlessly into the benchmarking database. This enables it to avoid duplicate data entry and save a lot of time and reduce data entry errors. This type of interface becomes critical for the benchmarking tool to have.

The property development company, although different from outsourced contractors in terms of function, is in a very similar situation when it comes to benchmarking. They too have many clients with lots of buildings, and many have benchmarked internally for years. For the same reasons as the outsourcing company, they can benefit from an external benchmarking tool.

Another benefit of benchmarking for these companies is that if their clients' performances are generally better, there can be some excellent marketing fodder. If the performances are worse, a good benchmarking tool can identify which best practices should be implemented to improve the performance. Either way, the company wins.

Benchmarking also can enable these companies to offer an additional service—namely, the benchmarking of clients' facilities. The service would include data collection and analysis for each area to be benchmarked.

PROFESSIONAL CONSULTANTS

One of the effects resulting from use of automated benchmarking tools is there are a lot data interpretation and analysis required. Most facility professionals should be able to navigate through the use of filters to select a filter set to benchmark one's facilities; most also should be able to identify the most appropriate best practices.

But how does one determine which best practices to implement, and which to implement first? To do this, one first needs to understand whether each recommended best practice is even feasible for the subject building. If it is, one needs to cost out its implementation in order to determine which should be implemented when.

These types of tasks can be beyond what the facility professional has time to do (and in some cases, beyond their expertise). In these situations, it may be useful to hire a consultant who can come and examine the building, look at the benchmarking results and develop a plan to implement the recommended best practices. Depending on the area of expertise required, it may be useful for the consultant to have an engineering background.

RESEARCHERS

There also is not as much quality research conducted in both the FM and CRE areas, especially when it is based on real building data. Much of that data is the type that can be tracked by benchmarking systems. If these systems are able to open themselves up and make their data available to those doing research (maintaining confidentiality of the facility professionals, of course), these two areas can move forward by giant strides. Much of this type of research can be done in universities or through associations.

UNIVERSITIES

Besides its value to research, benchmarking also has a dual value in the curricula of universities. The obvious one is to incorporate it into the coursework, both as its own course (to focus on the techniques of benchmarking) and as parts of other courses (to show how benchmarking relates to the various disciplines within facility professional curriculum).

The less obvious value is as an FM/CRE teaching tool in itself. Since comprehensive benchmarking incorporates nearly every major area of facility management and many of the ones of corporate real estate, by requiring students to benchmark an appropriate type of facility, the student will learn about every element of what makes that facility run, what it costs and what can break down; the student will learn how to assess what can be done to fix it and how to budget, evaluating both short- and long-term solutions. If the student has the opportunity to work with the building or facility manager of that building, the student will learn that much more. This would be an experience unlike any other, and the student will learn by doing instead of by reading and listening. This has been done successfully in individual courses at the Georgia Institute of Technology (Georgia Tech) and at the Civil Engineering School of the United States Air Force.

STANDARDS ORGANIZATIONS

Standards organizations are not end users of benchmarking tools, but they are groups that must work together with benchmarking developers. Benchmarking cannot be done successfully without standards; and standards for key metrics, if they cannot be measured efficiently, will not be used by those who benchmark.

Unless all who participate in a benchmarking system use the same nomenclature and definitions for each metric, filter and any other system elements, the benchmarking system cannot function as intended.

Because standards are so important for benchmarking, it is useful when standards are followed by that tool. Often, there can be discussions between standards organizations and the developers of the benchmarking tool. Many of these types of organizations are identified in Appendix 3—Standards Organizations.

The standards that will work best for benchmarking satisfy the following characteristics:

a) They must be easy to understand.
b) They must be useful for benchmarking purposes.
c) The measurement or count must be easy to determine.
d) They must require minimal time for the benchmarker to re-measure or recount existing data.

There must be some give-and-take between the benchmarking developers and the standards organizations. Should a standard be impractical to measure, it will not be used.

CHAPTER 9: BIGGEST PITFALLS WHEN BENCHMARKING

There have been instances when benchmarking results have been applied to achieve spectacular savings and improvements, and others when no results have been achieved. This chapter focuses on the biggest causes of not satisfying benchmarking goals.

Hastily-drawn conclusions. The most frequent cause of benchmarking's yielding false conclusions is when the facility professional is so happy to get his/her hands on some data that (s)he doesn't pay close enough attention to its quality or applicability. In other words, "having a number to share with others" becomes more important than not having a number at all; this often is even more prevalent when that number supports the desired conclusion. To prevent that from happening, these facility professionals should put themselves into the position of making a significant wager on the validity of their conclusion, and then ask themselves, "Would you still come up with the same findings?" Sometimes, it is better to ignore these benchmarking numbers and try to find more applicable data.

The most common causes of poor, hastily-drawn conclusions are either invalid data, using data from too small a sample size to be meaningful, and insufficient analysis. These are among the causes of many benchmarking challenges:

Invalid or inappropriate data. The two biggest issues with data validity and appropriateness are its age and whether it has error checking.

> For age, see whether the data in the benchmarking system is greater than 18 months old. If so, you may want to compare it to your previous year's data to get a more accurate benchmark. It always is best to work with current databases.
>
> Another question to ask is what type of error-checking does the benchmarking system incorporate, to ensure that people are inputting the intended numbers?
>
> a) Does the system warn the participant if a number being input is different from the typical number for that metric by a factor of 10 or so, indicating a possible typo?
>
> b) If the system is tracking data over multiple years, does it flag a number if it is more than 10 percent or 20 percent off from the previous year's number?

Misunderstanding the meaning of the data being input or in a report. Does the system carefully define the metric being used and what it includes? Is all this made clear to all benchmarking participants? Here are some common examples:

a) Is the area to be input gross or rentable? If it is rentable, which standard is being applied?

b) In the maintenance reports, what was considered maintenance? Landscaping? Janitorial? Does equipment replacement count as a maintenance cost, or a capital cost and outside of maintenance (or does it depend on what the equipment is)?

c) When working with a number, is it clear whether it is a mean or a median? Do you know how these impact your interpretation? For example, if an average is used, it is possible for a company that is off the charts on one extreme or the other to throw off all the data. It also

doesn't account for what happens when many of the buildings have similar metrics, except for just a few at one end of the continuum. That is why we prefer to use medians, but means still can be used, as long as their interpretation carefully is formulated.

Misunderstand the meaning of the results, insufficient analysis or misinterpreting the data. Besides misinterpreting the basis of the resultant numbers , one can misinterpret the results and then misapply them:

a) A common cause of misinterpreting the results is using results that are not applicable to your building. For example, say you are benchmarking electricity costs and your building is in a hot, dry climate. You filtered the other buildings to include only others in hot, dry climates. Your building is primarily an office building, so you turned that filter on too. But your building has 50 percent of it occupied by a data center, which has a huge demand on air conditioning—did you also use that as a filter? If not, your results likely will be off.

b) Another common misinterpretation comes when the results appear too good to be true. For example, let's say the median company in the filter set is spending US$2.10 per gross square foot on maintenance costs; say the first quartile performance is slightly less, say US$1.75 per GSF. Say also that your building's maintenance costs are US$1.05 per GSF, and that there are no other buildings under US$1.55 GSF. Rather than accepting your performance and boasting to others, you should consider whether the following may be true:
   - You are not spending enough money or assigning enough staff.
   - You have an anomaly you may need to account for via filters.
   - You've chosen inappropriate filters.
   - You've made a data entry error.

   Each of the above reasons happens more frequently than one may think, especially the first reason—not spending enough money. This happens often when one is cutting back on preventive maintenance. Unfortunately, in a year or two, the corrective maintenance costs start to skyrocket, costing much more than the preventive maintenance costs would have.

c) A third cause of misunderstanding the results is when there is not enough data for comparison.

Too small a sample size in the filter set; use of too many filters. There are those who will take any number available from a benchmarking system and try to apply it to their situation. If the number is based on just a handful of buildings, both common sense and standard statistical analysis should caution you to steer clear of thinking the data is meaningful. In the section, Extensive Data for Comparisons, in the chapter, Components of a Benchmarking System, it is stated that there should be a minimum of 25-30 buildings on one's filter set. Conclusions drawn on fewer than 25 buildings likely will be erroneous.

One of the most common causes of too small a sample size is the use of too many filters. No one knows how unique a building is as well as the facility professional who manages it. Often, the benchmarking facility professional wants to identify what is so unique through use of filters. The problem arises when one uses so many filters that the resultant number of buildings in the filter set becomes too small. When this happens, it is critical for the facility professional to use less filters, identifying those that are most important.

Mixing area measurement standards. What happens when participants in a benchmarking system measure their buildings' areas with different standards, whose area calculations often are based on how the building is constructed? In these cases, use of different standards can result in an area measurements as much as 15 percent different from each other. Surely, if one using a benchmarking system were to find that one building was consuming 15 percent more electricity per unit area than a different building with similar characteristics, that would be considered significant and worthy of finding out what can be done to bring down the electrical usage. However, the entire 15 percent difference may be caused by the way the space was measured. This means that you must know for sure that the benchmarking participants in your filter set are applying the same area measurement standard as you are—there is no way around it. If you don't do this, the differences caused by your mixing area measurement standards may be greater that the spread between the first and fourth quartiles of performance!

> **Caution!** Some benchmarking systems demand participants use a specific standard for area measurement. While this seems as if it will address the standards concern completely, the question becomes whether all benchmarking participants actually remeasured all the buildings they input into the benchmarking system.

Mixing employee count standards. Most benchmarking tools think about employee count in terms of full-time equivalent staff. This means that if two people each work half-time, they count the same as one full-time person. But what happens when an employee works from home part- or full-time? How is that person counted? The benchmarking system must have a clear way to count these people or the reports related to head-count will be useless.

Modeled versus real data. Some benchmarking tools use modeled (extrapolated) data instead of real data input by their participants. Usually, these systems have some real data, and then they apply a variety of indexes and algorithms to come up with their results. That is how they are able to provide reports for any building type in any city, even those with a very small population and very few buildings. One begins to question how they were able to benchmark, for example, public libraries in such a town, when at best, there may only be one there to begin with.

The problems with these systems are threefold:

a) They usually don't tell you how much data was real and how much was extrapolated.

b) They usually don't tell you the basis of their algorithm, so you don't know what assumptions went into the calculations.

c) One can rarely see a report with all the buildings that went into the findings (so one can see the spread of the data).

Nonetheless, there still can be considerable value of these systems to the facility professional:

a) When the facility professional wants to project the costs of a potential building in a different city, there is no real data with which to benchmark. And such extrapolated data is far better than nothing. It still behooves the facility professional to understand as much as possible what assumptions went into the system.

b) If there will be building information modeling (BIM) applied to a new facility, these systems can provide the data, which gradually will be supplanted by real data once the building is constructed.

CHAPTER 10: THE FUTURE OF BENCHMARKING

Where can benchmarking take us that we have not yet experienced? What does it enable us to do that we haven't done, or haven't done as fully as we can?

In actuality, the field of benchmarking for facility professionals is still in its infancy. Most facility professionals considering benchmarking still focus on just comparing data, rather than going to the next step and seeing how best practices can be integrated into the benchmarking system.

With the advent of more cloud-based applications, a plethora of possibilities has been opened up related to where benchmarking can go. Cloud-based apps enable facility professionals to take many more measurements than ever before (especially off of equipment and meters), and then download these data into our systems where they can be compiled with other data and lead to meaningful conclusions.

> Cloud-based means all the benchmarking source data is accessible on the Internet. This makes aggregation and processing much easier than having to deal with collecting data hosted by users in different places. The advantages are substantial in terms of time-savings and reducing the chances for human error.

At this time, the applications need to catch up and enable FMs to do more. Once this happens, more facility professionals than ever before will be benchmarking as it will be much easier to collect data. This will increase the size of the databases, enabling even more filters will be able to be applied. Analyses will become more rigorous.

Here are some of the sources where some benchmarking data currently exist, and where, someday, there will be electronic interfaces to benchmarking systems:

- IWMS, CAFM and CMMS systems
- HVAC equipment (with meters that read data from the equipment)
- Corporate systems (human resources, financial, etc.)

In addition, ENERGY STAR can use utility consumption data and feed data back so you can see how your building compares to other ENERGY STAR buildings.

Down the road, research will lead to ways of improving building performance that has never possible before. Research using benchmarking analytics is just getting started, and as it increases, this opens up many possibilities in terms of having buildings operate much more efficiently. This will be critical as a means to conserve energy and other natural resources.

It also seems as if many universities and associations are using benchmarking more for ongoing research; in addition, it will play a vital role in students' thesis work. Class projects will be required where students will benchmark real buildings, thereby not only helping improve the buildings, but also learning first-hand how buildings work. Thus benchmarking can become an integral part of a teaching tool for FMs and CREs.

Benchmarking best practices has just begun. In the past, facility professionals developed best practices, but did not tie them into benchmarking. Because this is just starting to happen, technology needs to be developed so real-world application can be a reality.

Benchmarking also will become more of a tool to use during the course of each year, and not just at the end of it. This will happen primarily through the use of dashboards. Customized dashboards will be made possible for each area within facilities and for executives who oversee all the areas. Once meters on equipment start feeding data into the benchmarking system, the dashboards could be updated automatically daily. The end result will be much better management of buildings and reduction of operating costs.

Other potential sources of data for benchmarking systems include direct sensor input, such as occupancy sensors. These are an easy way to measure vacant space or what percentage of time space is occupied. There is no reason why these cannot interface with a benchmarking system.

Building information modeling also can tie into benchmarking. An earlier chapter described how some benchmarking systems could be valuable to predict what costs will be in a building to be built. The BIM data, however, isn't just for a building before it is constructed; it can be of value throughout a building's life cycle. Thus, its data will need to be tracked over time and compared to other similar buildings. Clearly, there are some obvious tie-ins to benchmarking systems.

Social media also can come into play with benchmarking. Here comments made by building occupants could be input and geared toward a building's customer satisfaction index, which then may be feasible to measure.

Benchmarking also may strengthen the work of many standards organizations, and they will become more practical and real-world applicable, while the benchmarking tools will be more useful to more facility professionals. As more work integrating the building metric comparisons with recommended best practices gets under way, there will be more of a need to use automation to determine the costs of implementing the best practices. This will help consultants and facility professionals determine which improvements they should do first and which should be skipped.

Finally, look for more discussion groups relating to implementation of best practices and how benchmarking data are being used to improve building operations. This will be through a combination of conference sessions, user groups, and online discussion forums and blogs.

With it becoming more and more important to reduce operating costs, and with increased competition among facility professionals, benchmarking will provide a clear edge to those striving to stay on top of the curve.

Clearly, this field is just starting. Much of what has been done manually over the past 30 years will serve as the foundation, but the possibilities for what lies ahead are endless. To have a happy ending, one needs to apply the basic principles described in this guide, and then take advantage of new opportunities as they evolve.

APPENDIX 1—TODAY'S BENCHMARKING SYSTEMS

Originally, this guide was going to contain a large section that would go into exhaustive detail describing today's benchmarking systems, along with their strengths and weaknesses. As the Guide evolved, the realization was made that selecting a benchmarking system is similar to selecting a CAFM, IWMS or CMMS system:

a) The systems always are changing, and this guide would have to be updated three-to-four times per year for it to keep up.

b) What is most important for the facility professional is to understand the benchmarking process and how to identify solutions that will work for the specific needs of their organizations.

Thus, this Appendix identifies some of the most prominent systems that exist today for the facility professional. Each has its own focus: some are considered general for all applications, while some focus on one aspect of facilities or a specialized building type. The facility professional is encouraged to look into those from this Appendix that may be of value, and see if one of them can satisfy the critical benchmarking needs. Searching the Web for more applications is always advised, as this field is always evolving.

Several of the benchmarking systems submitted examples for use in this report. These are presented at the end of this appendix not as an endorsement, but rather to provide examples of the wide range of tools available to facility professionals.

To be successful in benchmarking, facility professionals will need not only to select a benchmarking system that will work for them, but also will need to understand the principles covered in this guide.

EXAMPLES OF BENCHMARKING SYSTEMS

BOMA's Experience Exchange Report
BOMA International is the Building Owners and Managers Association. The benchmarks that it tracks are those most relevant for that audience—the BOMA membership. Most of its members are in cities, and the focus is on office buildings. Because of the audience, rental rates are tracked very thoroughly, and many reports can be organized by city. For cities where there are enough buildings to have a valid filter set for comparison, it is possible to obtain more general results. Data are updated each year for all portions. Examples of the EER's reports are provided at the end of this Appendix.
www.boma.org/

CoreNet Global's BenchCoRE
Portfolio-wide benchmarking for a variety of real estate metrics. Product is designed for corporate real estate executives and is available to CoreNet Global members only.
www.corenetglobal.org

ENERGY STAR® Portfolio Manager
Portfolio Manager focuses on ways to benchmark energy and water consumption across an entire portfolio of buildings. For these areas, one receives a score, which tells you what percentage of buildings

is outperforming yours. Data are updated each year for all portions.
www.energystar.gov/

FM BENCHMARKING
FM BENCHMARKING is a benchmarking tool designed for facility managers and corporate real estate executives. Its cost components encompass more than 95 percent of facilities' operating expenses as well as space utilization. In addition to generating comparison reports through filters, it also benchmarks best practices. Data are updated each year for all portions. Examples of FM BENCHMARKING's reports are used in Chapter 6, *Putting It All Together: The Benchmarking Process*; examples of screen shots of filter selection and the report generator are provided at the end of this Appendix.
www.fmbenchmarking.com

IFMA's Benchmarks Exchange (BEX)
IFMA is upgrading its existing benchmarking tool, currently called BEX. It is expected to be fully automated, offering a series of filters and reports. It is expected to be available the beginning of 2014. In the meantime, it has produced a series of research reports—each reports covers one area of facilities (e.g., operations and maintenance, space and project management, etc.) and comes out once every three-to-four years. Examples of IFMA's most recent manual reports are provided at the end of this Appendix.
www.ifma.org

LoopNet
Large commercial real estate listing service for a variety of property types. Oriented toward commercial real estate brokers, investors, appraisers and other professionals. Includes sales comparables and property records. Updated frequently.
www.loopnet.com

ReisReports
Commercial real estate data by market, including sales, rent, new construction comparables and market trends. Updated frequently.
www.reisreports.com

RSMeans Online
Estimating tool for commercial and residential construction costs covering: construction materials, crew sizing, labor hours and rates, and equipment rental costs. Updated quarterly.
http://rsmeans.reedconstructiondata.com/RSMeans_Online.aspx

Whitestone CostLab
Provides detailed cost data for most facility cost centers and enables comparisons. Cost profiles may be generated from multiple Whitestone building models. Some data is extrapolated. Data are updated monthly.
www.whitestoneresearch.com

EXAMPLES: BOMA'S EXPRERIENCE EXCHANGE REPORT

The following graphics are excerpts from one of BOMA's reports. For this report, no filters were selected, so you are viewing the results from the entire BOMA database. The report is based on data for the year

2011. Individual captions describe the details of each excerpt. All excerpts are copyrighted and reprinted with permission from BOMA.

Income and Expense Overview - 2011

	Total Building Rentable Area					Total Office Rentable Area			
	5,444 Blds	845,745,024 Sq. Ft.				815,548,509 Sq. Ft.			
		Dollars/S.F.		Mid Range		Dollars/S.F.		Mid Range	
	# Blds	Avg	Mdn	Low	High	Avg	Mdn	Low	High
Income									
Total Rental Income	3,312	24.66	20.42	15.09	27.82	25.36	20.69	15.24	28.41
Total Income	3,311	26.04	20.97	15.47	29.07	26.78	21.29	15.67	29.64
Expense									
Total Oper Exp	4,544	7.80	6.73	5.33	8.36	8.01	6.83	5.39	8.57
Total Oper + Fixed Exp	4,625	11.27	9.15	7.03	11.42	11.59	9.28	7.14	11.61

Income and Expense Summary - 2011

Income									
Office Rent	3,339					25.02	20.43	15.16	27.79
Retail Rent	487	24.28	20.43	10.35	32.82				
Other Rent	194	7.78	9.50	3.95	16.63				
Telecom Income	917	0.12	0.06	0.02	0.18				
Miscellaneous Income	2,290	1.59	0.45	0.09	1.90				
Expense									
Cleaning	4,479	1.39	1.21	0.92	1.60	1.41	1.22	0.93	1.62
Repair / Maintenance	5,066	1.84	1.48	1.01	2.09	1.89	1.51	1.02	2.15
Utility	4,108	2.28	2.10	1.59	2.67	2.32	2.12	1.62	2.70
Roads / Grounds	4,688	0.21	0.26	0.11	0.48	0.21	0.27	0.12	0.49
Security	3,861	0.65	0.27	0.07	0.67	0.68	0.28	0.08	0.69
Administrative	4,848	1.40	1.21	0.74	1.71	1.43	1.22	0.75	1.74
Fixed	4,160	3.83	2.57	1.79	3.73	3.93	2.60	1.81	3.81
Directly Expensed Leasing	1,663	1.57	0.25	0.06	1.51	1.62	0.25	0.06	1.53
Amortized Leasing	1,214	3.23	1.97	0.78	3.99	3.33	2.00	0.80	4.04

Figure 27a. Note that the BOMA reports show both averages and medians for the selected buildings. Expenses are broken down by category. BOMA differentiates between total building and total office rentable areas.

Supplies / Materials	3,383	0.13	0.13	0.08	0.18	0.13	0.13	0.08	0.19
Trash Removal / Recycling	3,964	0.07	0.06	0.04	0.11	0.07	0.07	0.04	0.12
Miscellaneous / Other	1,557	0.06	0.03	0.01	0.08	0.06	0.03	0.01	0.08
Repair / Maintenance									
Payroll, Taxes, Fringes	3,262	0.81	0.63	0.40	0.93	0.82	0.64	0.40	0.95
Elevator	4,081	0.22	0.14	0.08	0.22	0.23	0.14	0.08	0.23
HVAC	4,966	0.32	0.26	0.15	0.47	0.33	0.26	0.15	0.47
Electrical	4,648	0.22	0.08	0.04	0.17	0.23	0.08	0.04	0.17
Structural / Roofing	2,766	0.05	0.02	0.01	0.05	0.05	0.02	0.01	0.05
Plumbing	4,379	0.06	0.04	0.02	0.08	0.06	0.04	0.02	0.08
Fire / Life Safety	4,430	0.10	0.08	0.04	0.13	0.10	0.08	0.04	0.13
General Building Interior	4,377	0.19	0.12	0.06	0.23	0.19	0.12	0.06	0.23
General Building Exterior	2,982	0.10	0.06	0.02	0.17	0.11	0.06	0.02	0.17
Parking Lot	1,983	0.14	0.05	0.02	0.14	0.14	0.05	0.02	0.14
Miscellaneous / Other	3,489	0.22	0.10	0.04	0.26	0.22	0.10	0.04	0.26
Utility									
Total Electricity	4,141	1.94	1.84	1.36	2.39	1.98	1.86	1.38	2.42
Gas	2,423	0.18	0.15	0.04	0.31	0.19	0.15	0.04	0.33
Fuel Oil	411	0.05	0.01	0.00	0.03	0.06	0.01	0.00	0.03
Steam	197	0.84	0.68	0.41	1.09	0.88	0.74	0.44	1.19
Chilled Water	153	0.66	0.48	0.08	0.98	0.69	0.49	0.08	1.11
Water / Sewer	4,517	0.17	0.16	0.10	0.24	0.17	0.16	0.10	0.25
Roads / Grounds									
Landscaping	4,298	0.14	0.19	0.09	0.32	0.14	0.19	0.10	0.32
Snow Removal	1,959	0.11	0.10	0.02	0.28	0.11	0.11	0.02	0.29
Miscellaneous / Other	1,523	0.07	0.04	0.02	0.12	0.07	0.04	0.02	0.12

Figure 27b. This excerpt from the BOMA EER provides a detailed breakdown of the expenses for repairs and maintenance, utilities, and roads and grounds.

Security									
Payroll, Taxes, Fringes	406	0.50	0.38	0.12	0.69	0.52	0.38	0.12	0.70
Contracts	2,849	0.62	0.34	0.09	0.69	0.63	0.34	0.09	0.71
Equipment	1,297	0.05	0.03	0.01	0.06	0.05	0.03	0.01	0.07
Miscellaneous / Other	1,215	0.06	0.02	0.01	0.06	0.06	0.03	0.01	0.06
Administrative									
Payroll, Taxes, Fringes	4,113	0.57	0.55	0.42	0.70	0.59	0.55	0.43	0.71
Management Fees	4,609	0.66	0.55	0.26	0.84	0.67	0.55	0.27	0.86
Professional Fees	2,768	0.09	0.03	0.01	0.09	0.10	0.03	0.01	0.09
General Office Expenses	3,787	0.20	0.11	0.04	0.23	0.21	0.11	0.04	0.23
Employee Expenses	2,060	0.04	0.02	0.01	0.04	0.04	0.02	0.01	0.04
Miscellaneous / Other	2,623	0.26	0.06	0.01	0.18	0.26	0.06	0.01	0.19
Fixed									
Real Estate Taxes	3,993	3.45	2.31	1.65	3.37	3.54	2.33	1.66	3.42
Personal Property Tax	640	0.06	0.00	0.00	0.02	0.06	0.00	0.00	0.02
Other Tax	950	0.24	0.11	0.04	0.23	0.25	0.11	0.04	0.23
Building Insurance	4,191	0.38	0.19	0.11	0.35	0.39	0.20	0.12	0.35
License / Fees / Permits	940	0.04	0.01	0.00	0.04	0.04	0.01	0.00	0.05
Directly Expensed Leasing									
Payroll	69	0.13	0.06	0.03	0.25	0.13	0.07	0.03	0.26
Commissions / Fees	750	1.11	0.56	0.14	1.33	1.14	0.57	0.15	1.39
Advertising / Promotion	1,291	0.06	0.04	0.01	0.10	0.06	0.04	0.01	0.10
Professional Fees	695	1.25	0.05	0.02	0.12	1.29	0.05	0.02	0.12
Tenant Improvements	587	2.56	1.36	0.41	3.19	2.63	1.38	0.41	3.22

Figure 27c. This excerpt from the BOMA EER provides a detailed breakdown of the lease costs, including security, administrative, fixed expenses (taxes, insurance, licenses), and directly expensed costs. There are additional breakdowns (not shown) for amortized leasing and parking costs.

EXAMPLES: FM BENCHMARKING

Many examples of FM BENCHMARKING's reports were presented in Chapter 6, Putting It All Together: The Benchmarking Process. Following are examples of its filter selection process and its report generator. All excerpts are copyrighted and reprinted with permission from FM BENCHMARKING.

Figure 28a. This figure shows how some of the demographic filters may be selected. FM BENCHMARKING has over 50 such filters. Filter selection is one of the key ways to select which buildings will be benchmarked in your "peer group" or comparable buildings.

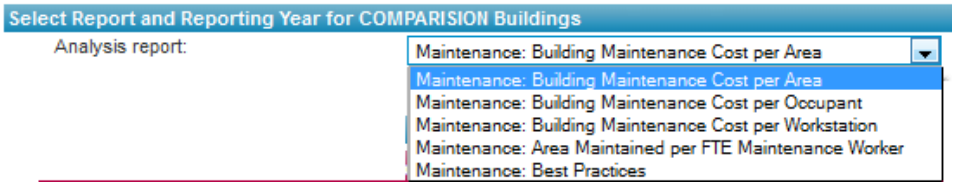
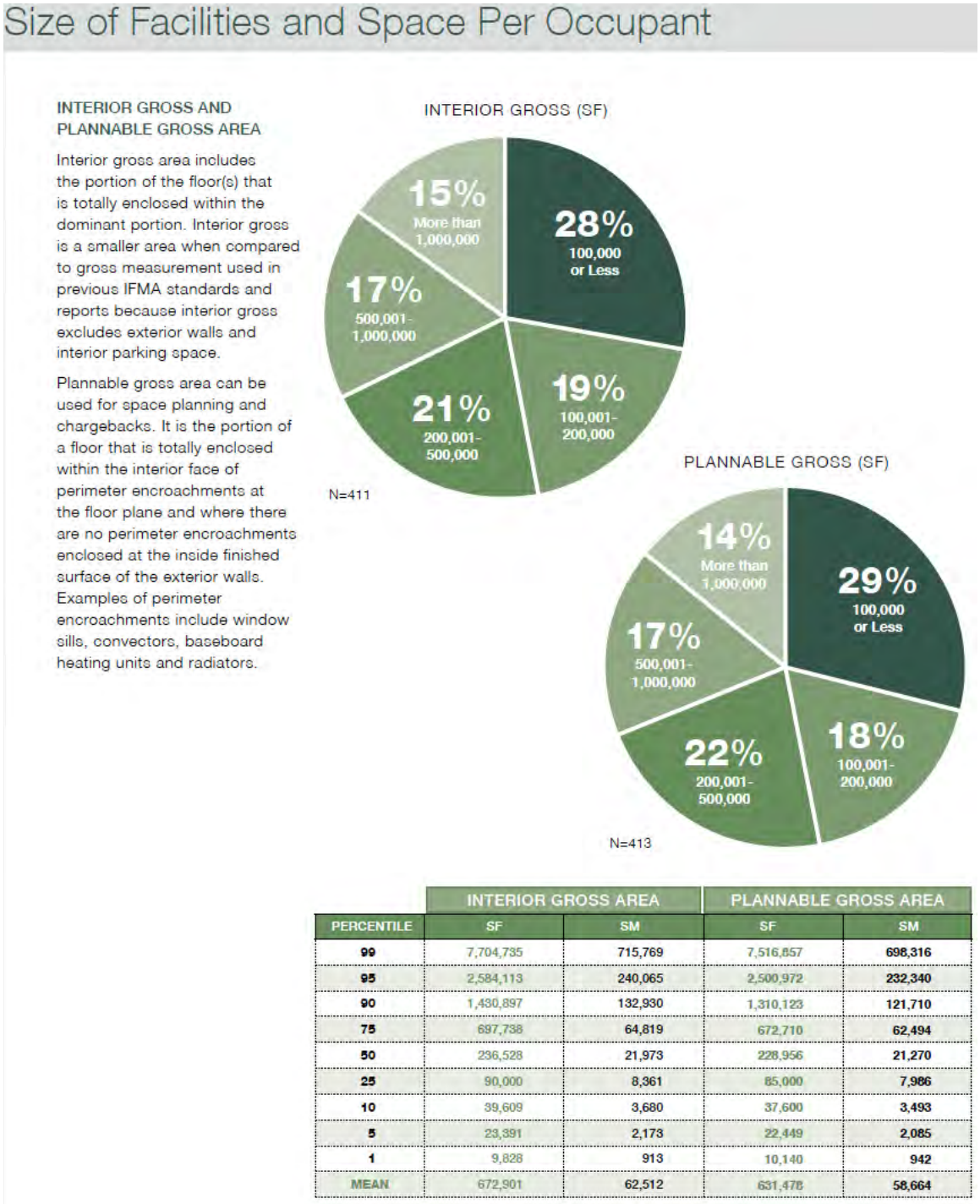


Figure 28b. This figure shows how maintenance reports may be selected.

EXAMPLES: IFMA SPACE AND PROJECT MANAGEMENT BENCHMARK REPORTS

IFMA's automated system is still under development and is expected to be released in early 2014. Below are several excerpts from its manual benchmark research report on space and project management, which has been updated approximately every three years. All excerpts are copyrighted and reprinted with permission from IFMA.



	INTERIOR GROSS AREA		PLANNABLE GROSS AREA	
PERCENTILE	SF	SM	SF	SM
99	7,704,735	715,769	7,516,857	698,316
95	2,584,113	240,065	2,500,972	232,340
90	1,430,897	132,930	1,310,123	121,710
75	697,738	64,819	672,710	62,494
50	236,528	21,973	228,956	21,270
25	90,000	8,361	85,000	7,986
10	39,609	3,680	37,600	3,493
5	23,391	2,173	22,449	2,085
1	9,828	913	10,140	942
MEAN	672,901	62,512	631,478	58,664

Figure 29a. Both pie charts and Tables are used to denote interior and gross plannable areas.

Size of Facilities and Space Per Occupant

INTERIOR GROSS AND PLANNABLE GROSS AREA BY INDUSTRY TYPE

		INTERIOR GROSS AREA				PLANNABLE GROSS AREA			
INDUSTRY TYPE	N	MEAN	MEAN	MEDIAN	MEDIAN	MEAN	MEAN	MEDIAN	MEDIAN
Services Sector	#	SF	SM	SF	SM	SF	SM	SF	SM
Banking	26	177,812	16,518.7	91,186	8,471.2	173,411	16,110.0	82,500	7,664.3
Health Care	18	451,962	41,987.3	282,500	26,244.3	416,613	38,703.4	255,000	23,690.0
Hospitality	9	432,791	40,206.4	379,400	35,246.3	403,280	37,464.7	370,000	34,373.0
Information Services	15	314,914	29,255.5	85,000	7,896.5	292,661	27,188.3	83,000	7,710.7
Insurance	37	675,985	62,799.0	517,600	48,085.0	661,687	61,470.7	494,585	45,946.9
Investment Services	10	695,312	64,594.5	449,000	41,712.1	689,537	64,058.0	447,682	41,589.6
Media	7	343,758	31,935.1	124,429	11,559.5	338,407	31,438.0	115,590	10,738.3
Professional Services	26	332,344	30,874.8	129,871	12,065.0	316,776	29,426.6	120,592	11,203.0
Trade	19	556,032	51,655.4	305,000	28,334.5	542,856	50,431.4	305,000	28,334.5
Transportation	5	271,902	25,259.7	226,000	20,995.4	265,357	24,651.7	224,296	20,837.0
Utilities	14	847,415	78,724.9	322,780	29,986.3	832,546	77,343.5	307,313	28,549.4
Other Services	3	136,500	12,680.9	77,500	7,199.8	133,106	12,365.6	76,725	7,127.7
Manufacturing Sector									
Aircraft/Industrial	10	1,586,701	147,404.5	938,599	87,195.9	1,531,312	142,258.9	927,795	86,192.2
Chemical/Pharmaceutical	19	459,363	42,674.8	160,940	14,951.3	442,003	41,062.1	159,250	14,794.3
Consumer Products	9	680,858	63,251.7	686,000	63,729.4	669,744	62,219.3	680,000	6,3172
Computer	27	758,024	70,420.5	405,000	37,624.5	731,972	68,000.2	393,194	36,527.7
Electronics	21	1,218,393	113,188.8	980,000	91,042.0	1,167,939	108,501.6	937,596	87,102.7
Energy	6	851,235	79,079.9	719,897	66,878.5	800,535	74,369.7	717,897	66,692.7
Medical Equipment	9	436,068	40,510.8	350,000	32,515.0	430,041	39,950.9	320,000	29,728.0
Other Manufacturing	5	136,030	12,637.2	103,010	9,569.6	132,380	12,298.2	100,626	9,348.2
Institutional Sector									
Association	5	104,431	9,701.7	110,000	10,219.0	96,254	9,127.8	96,000	8,918.4
Education	23	2,021,013	187,752.1	616,727	57,294.0	1,824,528	169,498.7	585,890	54,429.2
Federal	6	1,098,056	102,009.5	487,000	45,242.3	993,401	92,287.0	422,000	39,203.8
State/Provincial	7	106,704	9,912.9	118,000	10,962.2	99,560	9,249.2	89,000	8,268.1
City/County	34	408,219	37,923.6	146,247	13,586.3	375,927	34,923.7	141,102	13,108.4
Special District	3	599,145	55,660.6	518,680	48,185.4	597,241	55,483.7	516,687	48,000.2
Religious	17	249,315	23,161.4	92,500	8,593.3	226,711	21,061.5	90,000	8,361.0
Research	11	1,730,181	160,733.9	320,000	29,728.0	1,408,154	130,817.5	315,168	29,279.1

Figure 29b. This table illustrates both mean and median gross areas by industry type. This table also has a break down by industry type (not shown here).

OFFICE SIZE BY INDUSTRY

INDUSTRY TYPE	N	EXEC. MGMT.		SENIOR MGMT.		MIDDLE MGMT.		SENIOR PROF.		PROF. TECH.		SENIOR CLERICAL		GENERAL CLERICAL		CALL CENTER	
Services Sector	#	SF	SM	SF	SM	SF	SM	SF	SM	SF	SM	SF	SM	SF	SM	SF	SM
Banking	26	258	24.0	178	16.6	126	11.7	100	9.3	74	6.9	78	7.3	63	5.9	49	4.6
Health Care	14	294	27.3	182	16.9	137	12.8	88	8.1	75	7.0	79	7.3	76	7.0	51	4.8
Hospitality	8	258	24.0	167	15.6	107	10.0	67	6.2	67	6.2	69	6.5	58	5.4	39	3.7
Information Services	15	194	18.1	148	13.7	103	9.6	79	7.3	65	6.0	67	6.3	61	5.6	50	4.6
Insurance	37	255	23.7	164	15.3	115	10.6	78	7.3	59	5.5	66	6.2	56	5.2	44	4.1
Investment Services	10	204	19.0	133	12.4	79	7.3	57	5.3	57	5.3	50	4.7	49	4.5	46	4.3
Media	7	242	22.5	133	12.4	101	9.5	99	9.2	74	6.8	63	5.9	58	5.5	45	10.5
Professional Services	26	213	19.8	148	13.7	116	70.8	93	8.6	71	6.6	81	7.5	68	6.4	60	5.6
Trade	13	216	20.1	147	13.7	107	9.9	77	7.2	59	5.5	68	6.3	56	5.2	39	3.6
Transportation	5	302	28.1	189	17.6	117	10.9	100	9.4	80	7.5	68	6.3	61	5.7	48	4.4
Utilities	12	332	30.9	228	21.2	158	14.7	140	13.0	86	8.0	90	8.4	79	7.3	43	4.0
Manufacturing Sector																	
Aircraft/Industrial	10	254	23.5	171	15.9	118	10.9	97	9.0	70	6.5	101	9.4	75	6.9	66	6.1
Chemical/Pharmaceutical	18	212	19.7	149	13.	114	10.6	82	7.6	73	6.8	90	8.4	72	7.3	58	5.3
Consumer Products	8	268	24.9	176	16.3	119	11.0	113	10.5	78	7.2	82	7.6	74	6.9	67	6.2
Computer	24	239	22.2	163	15.1	106	9.9	88	8.2	74	6.8	89	8.3	73	6.8	51	4.8
Electronics	20	220	20.4	162	15.1	114	10.6	90	8.3	76	7.0	85	7.9	80	7.4	59	6.1
Energy	6	356	33.1	192	17.9	149	13.8	125	11.6	96	8.9	105	9.7	85	7.9	70	6.5
Medical Equipment	9	207	19.2	148	13.7	91	8.4	74	6.9	68	6.3	64	5.9	64	5.9	53	5.0
Other Manufacturing	5	278	25.9	152	14.2	111	10.3	80	7.4	69	6.4	59	5.4	61	5.6	70	6.5
Institutional Sector																	
Association	4	194	18.0	140	13.0	76	7.0	67	6.2	58	5.4	65	5.9	61	5.6	41	3.8
Education	19	262	24.3	193	17.9	145	13.5	125	11.6	115	10.6	113	11.2	100	9.3	85	7.9
Federal	5	272	25.3	191	17.7	138	12.8	136	12.7	94	8.8	113	10.5	87	8.1	75	7.0
State/Provincial	7	209	19.4	159	14.8	135	12.6	99	9.2	86	8.0	75	7.0	70	6.5	46	4.2
City/County	34	252	23.4	179	16.6	135	12.5	112	10.4	87	8.1	86	8.0	62	5.8	55	5.1
Special District	3	229	21.2	185	17.2	138	12.9	101	9.4	96	8.9	78	7.2	64	6.0	48	4.5
Religious	10	212	19.8	194	18.1	131	12.2	94	8.7	99	9.2	127	11.8	127	11.8	57	5.3
Research	11	320	29.7	223	20.8	160	14.8	130	12.0	85	7.9	97	9.0	75	7.0	54	5.0

Figure 29b. This table illustrates) office sizes by industry; caution is advised when applying results when the sample size is not very large (see other sections of this guide for more discussion on this important topic).

EXAMPLES: IFMA OPERATIONS AND MAINTENANCE BENCHMARKS

Below are several excerpts from IFMA's manual benchmark research report on operations and maintenance, which also has been updated approximately every three years. All excerpts are copyrighted and reprinted with permission from IFMA.

	$/RSF					
Percentile	Total Maintenance	External Building	Interior Systems	Roads and Grounds	Utility/ Central System	Process Treatment and Environmental Systems
99	$9.80	$2.76	$6.59	$2.37	$3.08	$0.74
95	$5.89	$1.11	$4.88	$1.26	$2.22	$0.66
90	$4.12	$0.59	$3.84	$0.85	$1.70	$0.54
75	$2.63	$0.22	$2.17	$0.45	$0.71	$0.22
50	$1.75	$0.10	$1.21	$0.18	$0.21	$0.08
25	$1.20	$0.04	$0.65	$0.06	$0.08	$0.03
10	$0.75	$0.03	$0.32	$0.03	$0.03	$0.01
5	$0.55	$0.02	$0.18	$0.02	$0.02	$0.01
1	$0.27	$0.01	$0.06	$0.01	$0.01	$0.00
Mean	$2.22	$0.25	$1.66	$0.35	$0.54	$0.16
N =	1,233	448	505	1,047	114	88

Best In Class

		$/RSF					
Facility Use	N	Total Maintenance	External Building	Interior Systems	Roads and Grounds	Utility/ Central System	Process Treatment and Environmental Systems
Headquarters	369	$2.28	$0.21	$1.69	$0.18	$0.24	$0.06
Courthouse	261	$1.91	$0.13	$1.17	$0.13	$0.64	—
Regional Office/Branch	253	$1.93	$0.10	$1.45	$0.26	$0.20	$0.07
Mixed Use - Office	100	$2.53	$0.19	$1.90	$0.26	$0.15	$0.13
Research Center	32	$3.19	$0.31	$2.38	$0.39	$0.74	$0.13
Education	28	$2.15	$0.41	$1.30	$0.30	$0.15	$0.23
Library	23	$2.15	$0.10	$1.20	$0.80	—	—
Manufacturing	19	$2.18	$0.18	$1.05	$0.22	$0.41	$0.38
Multi-Use	14	$2.51	$0.13	$1.68	$0.26	$0.34	$0.16
Post Office	14	$1.78	—	—	—	—	—
Hospital	11	$3.12	$0.32	$2.03	$0.35	$0.57	$0.13
Data Center	10	$2.05	$0.01	$2.01	$0.28	—	—
Call Center	9	$2.01	$0.13	$1.87	$0.52	—	—
Museum	8	$2.57	$0.19	$1.89	$0.78	—	—
Retail–Branch	8	$2.45	$0.39	$1.25	$0.55	—	—
Correctional	6	$2.11	$0.18	$1.66	$0.22	—	$0.05
Transportation	5	$3.96	—	—	—	—	—
Religious	5	$1.59	$0.06	$1.17	$0.13	—	—

Figure 29c. Maintenance costs per rentable square foot are broken down by several maintenance locations as well as by facility use; a break down by industry type is also available (not shown).

Electricians Staffing ratio–1 per 308,000 RSF						
Facility Size (RSF)	N	Number of FTEs	% in house	% contract	Number of shifts per day	Number days per week
Less than 50,000	24	0.25	47%	53%	1.0	5.0
50,000–100,000	39	0.80	48%	52%	1.0	5.0
100,001–250,000	70	1.18	58%	42%	1.0	5.0
250,001–500,000	84	1.28	70%	30%	1.0	5.0
500,001–750,000	40	2.47	48%	52%	1.0	5.0
750,001–1,000,000	19	2.89	43%	57%	1.3	5.0
1,000,001–1,500,000	21	4.48	66%	34%	1.2	5.0
1,500,001–2,000,000	12	5.35	55%	45%	1.2	5.0
2,000,001–3,000,000	10	5.75	77%	23%	1.0	5.3
More than 3,000,000	14	19.42	89%	21%	1.2	5.2

Plumbers Staffing ratio–1 per 380,000 RSF						
Facility Size (RSF)	N	Number of FTEs	% in house	% contract	Number of shifts per day	Number days per week
Less than 50,000	13	0.52	46%	54%	1.0	5.0
50,000–100,000	36	0.61	60%	40%	1.0	5.0
100,001–250,000	54	0.80	61%	39%	1.0	5.0
250,001–500,000	57	1.13	75%	25%	1.0	5.0
500,001–750,000	26	1.92	59%	61%	1.0	5.0
750,001–1,000,000	15	2.31	54%	46%	1.0	5.0
1,000,001–1,500,000	20	2.83	70%	30%	1.2	5.0
1,500,001–2,000,000	9	2.97	60%	40%	1.1	5.0
2,000,001–3,000,000	6	5.50	83%	17%	1.0	5.0
More than 3,000,000	14	14.1	88%	12%	1.2	5.0

Figure 29d. Staffing ratios are shown for electricians and plumbers at different sized facilities. The chart continues (not shown) for several other crafts.

APPENDIX 2—GLOSSARY

A variety of specialized terms are used throughout this guide. Many of them have multiple meanings in the English language, and some even have multiple meanings in the facilities arena. This guide has aimed to be consistent with how words have been used. The purpose of the glossary is to share the meaning of certain terms as they in this guide.

Benchmarking
The process of comparing a measure or metric to a norm by which something can be measured or judged.

Best practice
An established solution to achieve one's objective, whether the solution be a product or process; the solution must have been determined to be better than alternative solutions.

Corrective maintenance
See *Maintenance*.

Data field
A placeholder in an automated system into which a data value may be inserted; it may be a number or a series of words.

Data value
An alphanumeric entry (numbers, words, letters) representing the information described or called for by the data field.

Exceptional maintenance
See Maintenance.

Facility condition index
A ratio of the cost to repair all defective portions of a building divided by the cost to replace the entire building. The higher the number, the more likely the building is to be replaced. By definition, the worst possible score is 1.00 and the best is 0.00; scores less than 0.05 are considered good, and anything greater than 0.10 is considered poor.

Filter
This term is intended as a screen to group similar buildings together based on common characteristics that may be defined by the user, for purposes of an analysis of building metrics.

Filter set
A collection of buildings defined by one or more filters.

Key Performance Indicator (KPI)
Quantifiable measures that are critical to building performance success. Usually, the same indicators will be used each year. In a benchmarking system, these can be metrics.

Maintenance
The work required to ensure that a building and its components are operating as intended. There are multiple kinds of maintenance, and many of them are dealt with differently in benchmarking.

Corrective maintenance
Maintenance required to repair or remedy a product or portion of a building that is not working as intended. Also known as unplanned maintenance.

Exceptional maintenance
Maintenance that occurs no more frequently than once every five or more years, such as replacement of a chiller or a roof. Often, this type of maintenance is paid from a capital budget and is not considered an operating expense. This type of maintenance is often removed from benchmarking calculations.

Predictive maintenance
Maintenance that applies statistics and other historical measures and experiences to determine the ideal timing for maintenance of a piece of equipment. The objective of predictive maintenance is to maintain the equipment before it requires corrective maintenance, which usually is much more costly. Predictive maintenance is both a form of scheduled maintenance and proactive maintenance.

Preventive maintenance
Maintenance on a regular schedule, usually based on manufacturer's recommendations. As with predictive maintenance, the objective of preventive maintenance is maintain the equipment before it requires corrective maintenance, which usually is much more costly. Preventive maintenance is both a form of scheduled maintenanceand proactive maintenance.

Mean
The average of a set of numbers. For example, the mean of 1, 1, 1, 1, 1, 7 is 2 (the sum 12 divided by 6 entries); the median of 1, 1, 1, 1, 7, 7 is 3 (18/6).

Median
The middle number from a set of numbers when they are arranged in either ascending or descending order. For example, the median of 1, 1, 1, 1, 1, 7 is 1 (the middle number); the median of 1, 1, 1, 1, 7, 7 is still 1.

Metric
A measure that describes results. There are building metrics (measures of building variables such as square meters or feet, building climate, etc.), energy consumption metrics (e.g., KWH, BTUs, therms, etc.); cost metrics (costs for various measures) and more. Metrics are a fundamental component of all benchmarking systems.

Predictive maintenance
See Maintenanc*e*.

Preventive maintenance
See Maintenance.

Preventive maintenance percentage
The percentage calculated when dividing the cost of all scheduled maintenance by the cost of scheduled plus corrective maintenance. Most companies strive to have a ratio between 65 percent and 85 percent.

Quartile
Each of four equal groups into which a statistical sample may be divided. In benchmarking buildings, this will represent one-fourth of the buildings in the filter set being analyzed. The first quartile is the best performing, and the fourth is the worst. The median is the value on the border between the second and third quartiles (half of the buildings perform better than the median, and half perform worse).

Scheduled maintenance
Maintenance that is scheduled before a building component stops functioning properly. Usually refers to predictive and preventive maintenance.

Square area (square feet, square meters)
A measure to quantify the size of a building footprint. Square feet are one foot in each of two dimensions; square meters are one meter in each of two dimensions. There are multiple types of square area used in buildings:

> **Gross Area**
> Total area included within the outside faces of a building's exterior walls, including all vertical penetration areas. Does not include unenclosed space such as exterior or uncovered walkways, loading docks, etc.
>
> **Rentable area**
> Usable area plus a tenant's share of a building's common space.
>
> **Usable area**
> Area occupied by a tenant or occupant of a building.
>
> **Cleanable area**
> Area in a building that is cleaned by the janitorial staff.

Subject building
In discussing the benchmarking of one building against others in a filter set, the subject building is the one building being benchmarked.

Units of measurement
There are six common measures used for building metrics that have different units depending on the country of the building's location. Here are the variables for each measure:

> **Area**
> Square feet, square meters
>
> **Currency**
> Dollars, Euros, Pounds, etc.
>
> **Energy**
> Kilowatt hours (KWH), British Thermal Units (BTUs)
>
> **Gas Volume**
> Therms, cubic feet, cubic meters

Liquid Volume
Imperial gallon, liters, U.S. gallon

Weight
Pounds, kilograms

APPENDIX 3—STANDARDS ORGANIZATIONS

There are many organizations that have defined one or more standards, sometimes for the same measurement. This appendix identifies those who have defined some of the most important to facility professionals who benchmark.

Standards are very important to benchmarking: without a consistent way to measure a metric, benchmarking of that metric cannot be done accurately. Thus, it is very important for every benchmarking tool to determine which standard of measurement it applies to each metric, and to require its users to apply that standard consistently.

Over the past few years, there have been many discussions all over the world about how certain metrics should be measured. Often, there the split opinions are geographically based, such as between North America and Europe. Sometimes, there are several standards even in one country. For example, in the United States, there have been different definitions for rentable area established by BOMA (Building Owners and Managers Association) International, GSA (General Services Administration), IFMA (International Facility Management Association) and the New York Board of Realtors.

Rentable area is just one of many metrics for which there are multiple standards. Here are some of the most important for facility professionals for which there are several definitions, as identified in the OSCRE Occupancy Cost Exchange Users Guide (www.oscre.org):

a) Cost metrics (which costs comprise each of the three metrics in this section)
    a. Revenues
    b. Expenses (providing short-term value)
    c. Capital expenses (providing long-term value)
b) Building metrics
    a. Areas
        i. Gross
        ii. Rentable
        iii. Plannable
    b. Space use classification
    c. Business use classification
    d. Occupant use classification
    e. Occupant population
    f. Workstation count
    g. Building condition
    h. Geographic location (to support geo-referencing)
    i. Land classification

Following an inaugural meeting in May 2013, more than 20 leading economic and real estate organizations from around the world joined together to create the **International Property Measurement Standards Coalition (IPMSC)**, the first global standard for measuring property. The initial meeting was convened by the Royal Institution of Chartered Surveyors (RICS). Coalition members include:

- American Society of Farm Managers and Rural Appraisers (ASFMRA) – North America
- Appraisal Foundation – North America

- Appraisal Institute – North America
- Asia Pacific Real Estate Association (APREA) – Asia
- Associação Brasileira de Normas Técnicas (ABNT) – Brazil
- ASTM International – Global
- Australian Property Institute – Australia
- Building Owners and Managers Association International (BOMA) – Global
- China Institute of Real Estate Appraisers and Agents (CIREA) – China
- Council of European Geodetic Surveyors (CLGE) – Europe
- Commonwealth Association of Surveying and Land Economy (CASLE) – Commonwealth nations
- Confederation of Real Estate Developers Associations of India (CREDAI) – India
- CoreNet – Global
- Counselors of Real Estate (CRE) – North America
- Global FM – Global
- International Consortium of Real Estate Associations (ICREA) – Global
- International Facility Management Association (IFMA) – Global
- International Federation of Surveyors (FIG) – Global
- International Monetary Fund (IMF) – Global
- International Real Estate Federation (FIABCI) – Global
- International Valuation Standards Council (IVSC) – Global
- Open Standards Consortium for Real Estate (OSCRE) – Global
- Property Council of Australia (PCA) – Global
- Royal Institution of Chartered Surveyors (RICS) – Global

It is too early to tell how these standards will manifest themselves and will be adopted by facility professionals around the world, but it is the largest ever such coalition to have been formed.

It is not the purpose of this guide to determine which standard is the best for facility professionals—that is far beyond the scope of this guide. What the Guide states, however, is that it is essential that any one benchmarking tool follow a standard method of measurement for each metric.

With that said, here are some of the organizations who have developed standards that are important to facility professionals:

American National Standards Institute (ANSI)
Institute oversees the creation, promulgation and use of thousands of norms and guidelines that directly impact businesses in nearly every sector: from acoustical devices to construction equipment, from dairy and livestock production to energy distribution, and many more. ANSI is also actively engaged in accrediting programs that assess conformance to standards—including globally-recognized cross-sector programs such as ISO 9000 (quality) and ISO 14000 (environmental) management systems.
www.ansi.org

APPA
APPA is an international association of educational institutions and their facilities and physical plant departments, with members representing universities, colleges, private and public K-12 schools, museums, libraries, and other organizations dedicated to learning. APPA represents the

interests of educational institutions in the standards-setting process. These standards include: life safety and security, construction, electrical systems and HVAC systems.
www.appa.org

ASHRAE
ASHRAE is a building technology society that focuses on building systems, energy efficiency, indoor air quality, refrigeration and sustainability within the industry. ASHRAE has developed a wide range of standards about refrigeration processes and the design and maintenance of indoor environments.
www.ashrae.org

ASTM International
ASTM is a leader in the development and delivery of international voluntary consensus standards. Today, some 12,000 ASTM standards are used around the world to improve product quality, enhance safety, facilitate market access and trade, and build consumer confidence. It has several standards pertaining to facility management, including on building floor area measurements.
www.astm.org

Building Owners and Managers Association (BOMA) International
BOMA represents the owners and managers of all commercial property types including nearly 10 billion square feet of U.S. office space. Its mission is to advance the interests of the entire commercial real estate industry through advocacy, education, research, standards and information. BOMA is well known for its standards work in measuring buildings; the standard is revised periodically to reflect the changing needs of the real estate market and the evolution of office building design.
www.boma.org

British Standards Institute (BSI)
BSI serves as the United Kingdom's national standards body. It represents UK economic and social interests across all European and international standards organizations and in the development of business information solutions for British organizations.
www.bsigroup.com

European Committee for Standardisation (CEN)
CEN is an organization to foster the European economy in global trading, the welfare of its citizens and the environment. Through its services, it provides a platform for the development of European standards and other technical specifications. Included in the sectors on which CEN focuses are the areas of construction, energy, environment, facility management services, health and safety, HVAC and measurement.
www.cen.eu

European Standards for Real Estate and Facility Management
This organization is focused on the European community. This is a part of **IPD Occupiers** (www.ipdoccupiers.com), an independent property performance measurement organization. Besides IPD's framework for collecting property cost information, it has established frameworks for collecting property-related environmental and floor space information. IPD has provided

input to OSCRE.
www.ipd.com

General Services Administration (GSA)
GSA is a U.S. government agency responsible for delivering the best value in real estate, acquisition and technology services to the U.S. government. Because it is responsible for most of the federal building inventory in the executive branch, it has tremendous purchasing power and is very active in establishing policy not only for government agencies, but policies that are followed by others as well. Some of its work requires the development of standards, including those that measure space (area) and furniture.
www.gsa.gov

International Facility Management Association (IFMA)
Founded in 1980, IFMA is the world's largest and most widely recognized international association for facility management professionals, supporting more than 23,000 members in 85 countries. It has developed space standards to measure building areas in a way that is most meaningful to its membership.
www.ifma.org

International Organization for Standardization (ISO)
Develops international standards for many areas. Those with the strongest impact on facility professionals include those on quality (ISA 9000), environmental management (ISO 14000) and energy management (ISA 50001).
www.iso.org

IPD Occupiers
See European Standards for Real Estate and Facility Management.

ISSA
ISSA is a global cleaning association comprised of manufacturers, distributors, contractors, service providers, and manufacturer representative companies. It also is the developer of CIMS (Cleaning Industry Management Standard), which outlines the characteristics of a successful, quality cleaning organization.
www.issa.com

Open Standards Consortium for Real Estate (OSCRE)
A not-for-profit, membership funded, neutral consortium in the real estate industry that exists to facilitate collaboration on standardized data exchange. Among OSCRE's audience are facility managers, owners, appraisers, architects and designers, buildings, and benchmarking and reporting firms.
www.oscre.org

Royal Institute of Chartered Surveyors (RICS)
A global property professional body to provide guidance to enable its members to work at the highest levels of professionalism. Its developed standards relate to both codes of practice and guidance.
www.rics.org

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Kimmel speaks at a variety of conferences, and his writings have been published in most FM magazines including IFMA's *FMJ*. He is a three-time winner of IFMA's Distinguished Author Award. As the founding president of IFMA's Capital Chapter, he led it to IFMA's first Chapter-of-the-Year award in 1985. IFMA also has honored Kimmel with its award for Distinguished Service, and in 1997, he was named an IFMA Fellow. Kimmel is a registered architect and holds a master of architecture degree from the University of California.

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