Setting Up & Running a Building Maintenance System

By Joel Levitt

There are three steps to the process of running a maintenance department.

- The first step is to set up your filing systems, so you will have a place to put the stuff that's created.

- The second step is to do a physical survey and analyze each part of your property, or each property, or each type of equipment for its maintenance exposures.

- The third step is to start to incorporate your work orders and inspection tickets so that you build a comprehensive group of information – a "database" – which will provide you with convenient access to information about all of your assets.

In your database (no computer needed for this database!), you will have a file folder for each asset. Whenever you get a work order against that asset, you stick it into the file folder – that's what a database is. Whether the file folder is in your hands or in a computer is irrelevant, as long as it's in a place where you can get to it easily.

Obviously, if you have a larger environment, you will be forced to use a computer because it would be the only way to keep all the records of labor hours as they are received. The computer has no capabilities beyond that which people can do manually, given calculators and enough time. The fact is, however, if you have 1,000 assets, you won't have enough people to track all the work orders coming in and recap them to the correct places. If you have a small environment, it might be better not to use a computer. Computers in facilities are overkill in most situations.

The situations where computers are needed are:

- Where there are multi-shifts and people are working around the clock; or

- There are multiple buildings where you physically can't see everybody; or

- People are spread over two or more sites or two or more circumstances.

In those environments a computer makes sense. If you have only one building, even a rather large building, a computer can help with aspects of management.

Many building services departments have gotten buried by what the computer makes them do, and they don't have time to do their jobs.

Here is an example of a circumstance in which a computer can be useful: one maintenance administrator had charge of 13 nursing homes, and the local site managers put all their work orders in from their sites. The maintenance administrator was then able to look at each of the 13 sites, make comparisons, and then make some conclusions about how good or bad they were or if they were over-

or under-crewed. In that situation, the computer made a lot of sense, even though each individual site was not big enough to justify it.

Set Up

Set up a loose leaf binder or file folder for every property. If you have relatively small buildings, set them up with the following ten categories:

1. Grounds/Paving/Driveway/Garage
2. Exterior/Roof
3. Heat /Hot Water/Plumbing
4. Kitchen (Food Service)/Restrooms
5. Basement/Structure
6. Electric
7. Interior
8. Inspections/Log Sheets
9. Meter Readings
10. Other

If your buildings are larger, you'll need to set them up by *assets*. Setting up the file folders is easy. Look at your site, decide how you want to set it up – whether by *assets* or by *systems*.

Setup by *systems* for smaller buildings where there is less activity. Setup by *assets* if the building or buildings are too large and there is too much activity to manage by *systems*.

Conduct a Survey

The purpose of the survey is to create a picture of the property in a specific time frame -- a concise picture of every asset, including grounds and lawns -- catalogued and broken down by assets, so you can see in the future if something has changed.

The five items, if available, to include in a survey are:

1. Plans or surveys of each plot (with size of the building and lot), aerial photographs, any sets of blueprints, sketches (plan views) showing where utilities enter property, also locations of all shutoffs;

2. Ground level photos of the street views in both directions, where appropriate;

3. A filled-out *Building History Form* for each building

4. A filled-out *Asset Information Sheet* for every major asset (include equipment like heaters -- make, model, serial number), wall, floor, ceiling finish and materials, and manuals for equipment (they can be three-hole punched and added to the correct sections of the property book); large facilities could file books in their technical library, and

5. *Maintenance Write-ups* for all deficiencies, these would be placed into an "In-Box" on the appropriate person's desk.

Along with the *Asset Information Sheets*, record the condition of each asset, if it's possible to determine that information from a physical survey. For example, it may be possible to tell fairly accurately how long some roofs will last by simply going up and checking things out. On other roofs, you may not be able to see the problems.

In some areas of the country, the ballast on flat roofs (the gravel that holds the membrane down) consists of white stones the size of golf balls to baseballs. This is called "river stone," and the size of the stones makes it difficult to physically check the condition of a roof. In other areas, the ballast consists of smaller, softer stones, making it easier to see what is under there.

Condition and possible degradation of many other assets – cooling towers, for example -- are easily gauged visually. If you're skilled in such evaluations, approximate how much you will need to spend on each unit in the next couple of years. Of course, this would be an educated guess.

When you take over the care and maintenance of an existing building, one of the things you need to do is get all the *owners manuals*. However, it is unlikely you will get them all, even by sending away for them. They may not be available if the company has gone out of business or the asset is outdated; but, it would be to your benefit to make the attempt.

Are there any special conditions that would affect the *preventive maintenance* (PM) system? One famous situation occurred in Philadelphia at the Bellevue-Stratford Hotel where an outbreak of Legionnaire's disease resulted from an air intake situated next to the cooling tower. Pigeon droppings had accumulated in the water and caused specific bacteria to be sucked into the intakes. This was a special situation where the intakes were pulling in air that was not clean. Obviously, if you encounter any such special problems, you would schedule a re-build, which they did. Before something like that occurs, you could schedule more frequent and intensive preventive maintenance.

For an older building, much of the information is not always available. If the work has been done in the past 20 years, you should be able to find out about it. Survey information should cover the entire property for maintenance and liability exposure and should include:

- Access items, such as doors, windows, hatches
- ADA requirements (disabled/alternatively-abled access)
- Compressors and process equipment
- Computer rooms
- Control systems (such as thermostats)
- Elevators
- Electrical items (major)
- Exterior finishes, Exterior accessories
- Generators, pumps
- Grounds
- HVAC components (heating, ventilation, air condition, exhaust systems)
- Interior finish
- Kitchen equipment
- Laundry equipment
- Lighting
- Pavement, sidewalks, parking areas
- Production equipment

- Plumbing items (major)
- Restrooms
- Roofing
- Safety/security systems: Fire alarm, fire extinguisher, smoke detectors, security systems
- Street (how close do the busses, heavy traffic, big trucks, trains go to the foundation of your building)
- Physical structure of building
- Swimming pools
- Tanks (both underground and above ground), piping systems
- Trash compactors, trash handling systems

Inspectors should have the following tools for the initial survey:

- Binoculars (for visual inspection of soffits, gutters, etc.)
- Magnifying glass to examine paints, surfaces, sub-strata
- Folding knife
- Digital camera for recording problems or locations
- Step ladder, extension ladder
- Measuring tape
- Outlet tester (3-prong with adapter to check ground and polarity)
- Hand tools
- Good flashlight
- *Survey Forms* on which to write up deficiencies

Decide at some point how detailed you will go in separating and keeping track of your assets. Decide which assets to group, which to track; and divide them by categories that are logical to you.

Be wary of keeping track of assets by location. It is not practical because things get moved around. Be cautious in setting up your asset information. For example, doors that are all the same can be classified as one aggregate under a category of "Doors." This would allow for comparison to other kinds of doors for performance and wear. Tracking by type is certainly a possibility you might want to explore.

Asset Detail Sheet

Let's say there is a boiler system in the basement, and the boiler has some components to it that need to be tracked separately – the fuel pump, the nozzles or injection system, the circulating pump on a hot water system. The *Asset Detail Sheet* provides a place to capture all the detail information about the equipment. When it goes down, you'll know exactly where to find what you will need to buy to replace parts, rather than having to send someone out to crawl through the mechanical area to find the serial numbers. This could all be recorded ahead of time. This level of detail may take a couple of months or more depending on the size of the facility, but will be worth the effort and time in productivity

Once the file system has been built and the survey completed, you need to begin collecting *work orders* and *inspection tickets* and filing them by asset, either on a computer or manually. Every time someone works on an asset, that information needs to get into the filing system. Then, you can look back and see all the information needed for future construction.

For example, keep track of the doors so you can decide if that kind of door should be used again for a particular application. Is there another kind of door that has been better? What's good about it? Is it easy to service, is it reliable, is it inexpensive, or does it have a low life-cycle cost? What exactly is advantageous about that door? How long does it take to fix when it breaks? What are the breakdown modes? Are any breakdowns such that you can engineer yourself out of them? Maybe a screw that pulls out can be prevented by simply installing a plate with the initial installation of the door, thereby making it a non-issue. You can determine all necessary information if you have maintained the filing system.

If you have the wrong information or no information in the file, there will be no advantage when maybe five years from now there is a problem. Capture the basic information; and make sure it's available when you need to make decisions down the line.

Organizing the flow: Clipboard Control System

How will the information flow into the filing system? The *Clipboard Control System* shows the steps your work orders need to take.

Step 1: In-Box

When the work comes in, it will go into an *In-Box* or a file folder on the desk of the person who will then determine if the work is authorized and if it is under the jurisdiction of the department that is requesting it. The work order may need special handling. Is there money available in the budget to do this job? Are the parts available, or do they need to be ordered? Is there planning that needs to be done?

Step 2: Backlog

Once you've checked it out, the work order goes into the *Backlog*. The backlog is divided into work waiting for something (parts, contractor labor, engineering, money, etc,) and work that's available to start (Ready Backlog). *Ready Backlog is the most important type of work to track and manage.* If the backlog falls too low, people sit around and/or stretch out other jobs because they're afraid there could be a layoff. If the backlog gets too long, employees get overwhelmed, and the customers wait. The longer customers have to wait, the higher they will make the priority on those things they've requested. This causes the priority system to get muddied because people are requesting simple things as high priorities.

For example, one particular steel mill had a 96-week active backlog. Even if no work orders came in, they would have had about two years worth of work on the books. How can you run an operation with two years worth of work on the books? What if you're a production supervisor in a steel mill and you need to get some hand railings put up around a machine? How do you get it done?

First of all, you could call it a "safety hazard," because the backlog on safety hazards is only about 16 weeks. Or, maybe you would block the way of any maintenance personnel as they walk through the area. Or, maybe you would have one of your own guys go into the welding shop and make the railings. You might even set up your own maintenance department and say, "Forget them, I'll do my own work." Maybe you would get plant management to authorize a contractor to do the work on-site.

There are all kinds of ways to get things done, but that's the worst possible scenario. People will put in multiple requests for the same work because nobody remembers what they requested six months ago --

when the issue comes up again, another work order is put in. You won't even know what jobs in the backlog are still valid.

Ideally, there should be *no less than a one-week* backlog per tradesperson, and *no more than three weeks*. This gives one to three weeks of backlog per person. If it goes much beyond that, there will be problems servicing the customers. If it goes much shorter than that, there will be employees who will walk out because they don't have enough materials to do the job.

Step 3: Pending

As soon as the work is issued to someone, the work goes from backlog into a state called *Pending*. Pending means the work order has been issued to a mechanic and it's in process, though the mechanic might not have physically started the work, but it will be started within a short period of time.

Once it's begun, pending work will need to be finished soon. Pending work gets a lot of departments into trouble because they jump from job to job, and nothing ever gets finished. That's always a symptom of a poorly organized effort. It means that there is a "knee-jerk" type of maintenance manager who jumps whenever someone makes a request. More appropriately, the maintenance manager will do whatever is necessary for public relations, but won't interrupt the current work unless it's really important. That way the pending work will stay relatively low. When the pending work is completed, it needs to be reviewed and *filed back into the system*. In smaller organizations, this can all be organized on four clipboards (therefore the name, *Clipboard Control System*).

Maintenance Cycle

The *Maintenance Cycle* includes five categories of incoming work

Category One

The first category is *the work initiated by the tenant, the user, or customer*. The customer calls you and tells you there's a problem of some kind. Maybe water is gushing out of a pipe, or the room is too hot or too cold, or there's too much or not enough air coming out. This is customer work. It could be a real emergency; there could be a real life and death situation. Or it could be routine and minor.

Interestingly, the company will judge you by your services to the customers, more than for anything else, not even on how good you are at running your maintenance department. So, it behooves you, even when the "emergency" is not important, to have good customer inquiry response systems in place.

Category Two

The second category is *work initiated by the PM system*. This should become the largest part of your work and, as the backlog goes down, customer complaints should drop. After six months to a year there should be far fewer customer complaints as the system becomes more effective.

Category Three

The third category is *routine work*. That's work that you do of a known quantity and duration. For example, if you have a manufacturing operation that shuts down each weekend, you might need to assign a maintenance mechanic for two hours every Monday morning to start the line up, or to start up the boiler or an air conditioning system. You would need somebody who is qualified to help start up on a regular basis -- and that becomes routine work for which two hours is allocated every Monday morning.

Another example of a routine job would be policing of an apartment complex or dorms. You might need to assign someone to go around on Monday mornings to pick up the broken glass and beer bottles from parties.

Category Four

The fourth category is *corrective maintenance initiated by the PM write-up*. Corrective maintenance is your best kind of work as far as efficiency goes. It can be planned and scheduled; this gives you a bit of time. It can be looked at and reviewed a bit more leisurely because *you* detected it rather than the customer.

Category Five

The fifth category is *work initiated from management decisions.* That would be remodeling, redecorating, rehabbing, security changes, energy efficiency changes, change of office use, etc.

Types of Work

There are four different kinds of work:

1) *Short repairs.* These are repairs that can be done in under an hour.

2) *Long repairs.* These are jobs that require planning, tools, materials, scheduling.

3) *Deferred maintenance.* This is stuff you "throw on the back burner" and hope it doesn't "start a fire."

4) *Jobs for outside contractors.* These are contracted out because of the size, skills, cost, situation, time of year, etc.

Outcome

The *outcome* is an essential component of any PM system. This is an *analysis of the root cause of the problem*. The maintenance staff has a lot of experience that can be utilized to figure out the root cause of the problem, and what they can do to change the engineering, or the economics, or some thing that can help the company or organization. This is where your experiments come in. This is where world class operations analyze why things happen so they can be fixed permanently. A world class maintenance operation doesn't wait for the same problem to happen again.

Do you know the difference between a maintenance worker who is a parts-changer and one who actually looks at the problem in order to solve it? There are many people who are qualified to change a

valve or a pump; but there are not many who are qualified to look at the dynamics of the operation and are able to analyze why the problem is happening in the first place.

You may not know that you have people on your crews who are able to do the analyzing. They will need to be motivated. You need to ask people on the maintenance crew *why* things happen. Be sure they know this is not done in order to "point a finger," and that your purpose is to analyze *why* the problem occurred, what part failed, why it failed, what was wrong with it, if there was a problem with materials or the way it was mounted.

Most maintenance departments will say they haven't the time to ask those questions, their schedule is too tight. Yet, there are huge amounts of money available to be recaptured if you get in the habit of asking "why." This is a dilemma. There is no time to ask the questions, but if the questions are asked, you can save much more than just time.

The questions are best asked by the technicians; they are the ones most available to do it. Supervisors are "up to their asses in alligators." Most managers don't even know what their families look like after a while.

If you add in a little bit of time to each job, that would allow a technician time to analyze. This would not be noticed so much as it would be if the supervisor or manager took the time. Everybody is "under the gun;" but, taking the time to analyze is far better than fixing the same problem over and over again.

In addition, it is worth your while to take the time to praise an employee who has worked especially hard at getting a problem resolved. Also, employees should be praised if a unit has not broken down in the first place. Their hard work and success should not go unnoticed by management, even when the praise is for *not* having problems. Showing a positive attitude most of the time, and being negative only on occasion, will surely get more attention than the other way around. What you reward is what you get. So, make sure you are rewarding the right thing.

An Example of Maintenance Failure

A housing authority administers funds that are sent out by the Department of Housing and Urban Development (HUD). Throughout the United States there are housing authorities that administer the money that's given to them by HUD for Section 8 and for other programs of subsidized housing. Every year HUD requires a housing quality assurance inspection of every single unit. This is required of private developers, public developers, housing authorities, redevelopment authorities, everybody has the same standard. It's a written standard, and you can read it and see what you have to supply.

An article appeared in *The Philadelphia Inquirer*, Wednesday, May 27, 1992, that described exactly what can happen when standards are not followed, when there is no work order system with job tracking. At the Philadelphia Housing Authority back in 1992, HUD inspected 87 residences and found that 86 of them failed the housing quality standard. This was to the point where a household of five was sleeping in one bedroom because two of the bedrooms were uninhabitable due to the fact that the ceiling fell down. The audit blamed "tenant abuse" – the housing authority said that the tenants had abused the property and that was why the ceiling fell down.

The auditors tracked 26 repair requests filed in November of the previous year, and all 45 work orders were outstanding 45 days later – not one had been done. It took 49 days to repair a bathroom sink pipe, and 33 days to repair a kitchen exhaust fan switch, and five days to replace a toilet seat.

What kind of work order control system would allow a situation like that? This was not a situation of scarcity. They had the money to do the job. If you had as many people as they had to do the amount of work that they had to do, you would have had no problem doing it. There was a maintenance crew of about 700 to 800 people. This was a control problem. People were sent out with the wrong instructions, to go to the wrong unit, with the wrong materials and the wrong tools.

How much time can you waste that way? It could take you three days to replace a toilet seat checking all the units to find out which one has a broken toilet seat when you've been sent to the wrong unit. One high-rise actually spent three years without hot water. It would be difficult to spend three years without hot water if you have a work order tracking system and accountability.

What went wrong? There was a full complement of maintenance workers there. The site was only 20 years old. For the amount of money that was being spent, it really makes you think about how your tax dollars are being spent. With a work order tracking system and accountability a lot of these problems would be eliminated. Three hours and 45 minutes should be sufficient to replace a toilet seat. Sadly, nobody had ever asked the question, "Why did it take so long?"

You need to know the amount of time each repair should normally take; and then question if you are outside of the deviation limit for that repair. When you have found there is an unacceptable deviation, you can go into the work order system and figure out answers.

What if a toilet seat normally takes three hours, and you are taking far longer? Maybe there's one central location where you get your toilet seats; but, because of politics, that location is in a councilmatic district which is nowhere near the projects that need the toilet seats, necessitating a time-consuming trip for each toilet seat request. Maybe someone with political influence wanted the warehouse in a location where they could distribute some patronage jobs. Whatever the story is, there are questions that need to be asked.

Maintenance Atrocities Scrapbook

Here's a recommendation: try keeping a scrapbook of *Maintenance Atrocities*. Whenever a story comes up in a newspaper about a catastrophe due to maintenance, or where it's clearly a case where something was not being tracked correctly, put it into a scrapbook. People do really well learning from stories. If you have copies of a couple of relevant catastrophe articles that you can send with your request for PM funds, you may find that people will not understand your numbers, but they will understand the articles. The importance of preventive maintenance will get through to them, how that would have saved the properties in the articles. You could even include your own notes on how PM would have avoided that catastrophe.

Managers, bureaucrats, accounting people, really want to avoid catastrophes, not only because they're a liability, but because of public relations. There are people who couldn't care less about maintenance, but when they hear that a kid got hurt in a town 400 miles away in this same situation – you might be able to get dollars to do an inspection program to make sure it doesn't happen in your place.

Your scrapbook doesn't need to be complicated, just rip out the articles that seem relevant and put them in a book. If it made it into the newspapers, and it has to do with maintenance, it is a catastrophe. If the machine ran normally it never would have made it into the newspapers. You'll be surprised how much people pay attention to those stories.

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