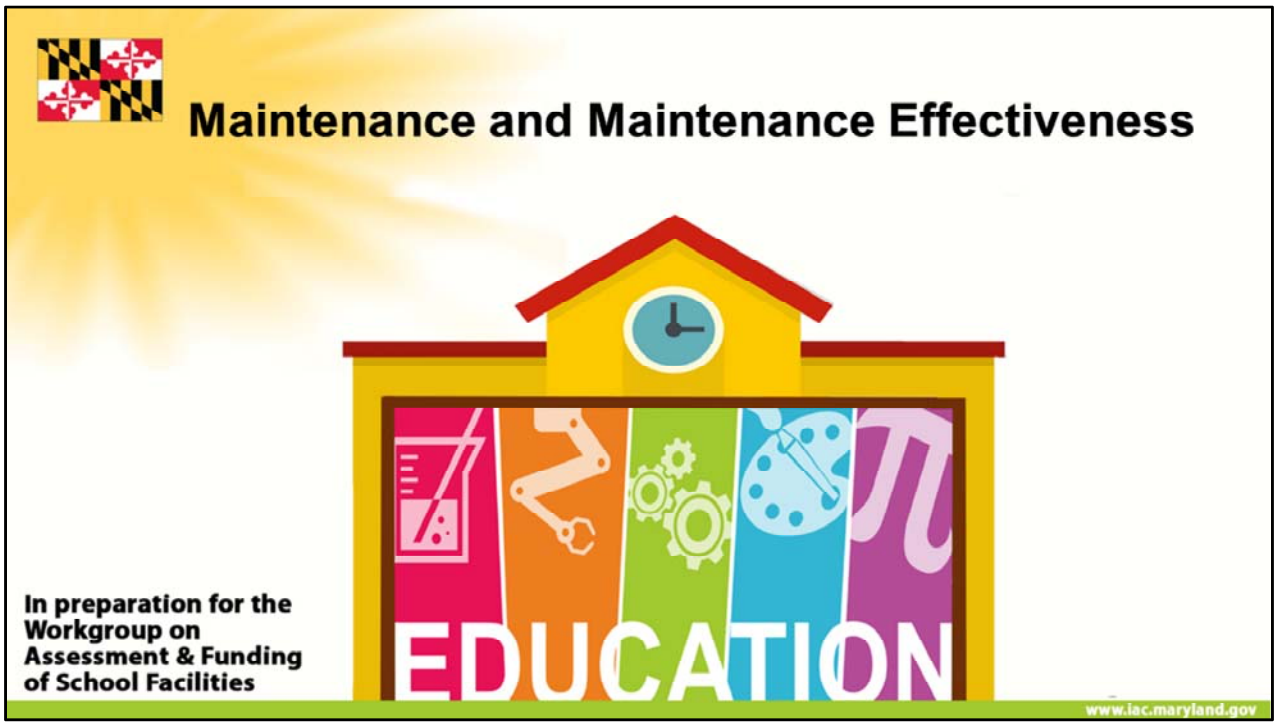
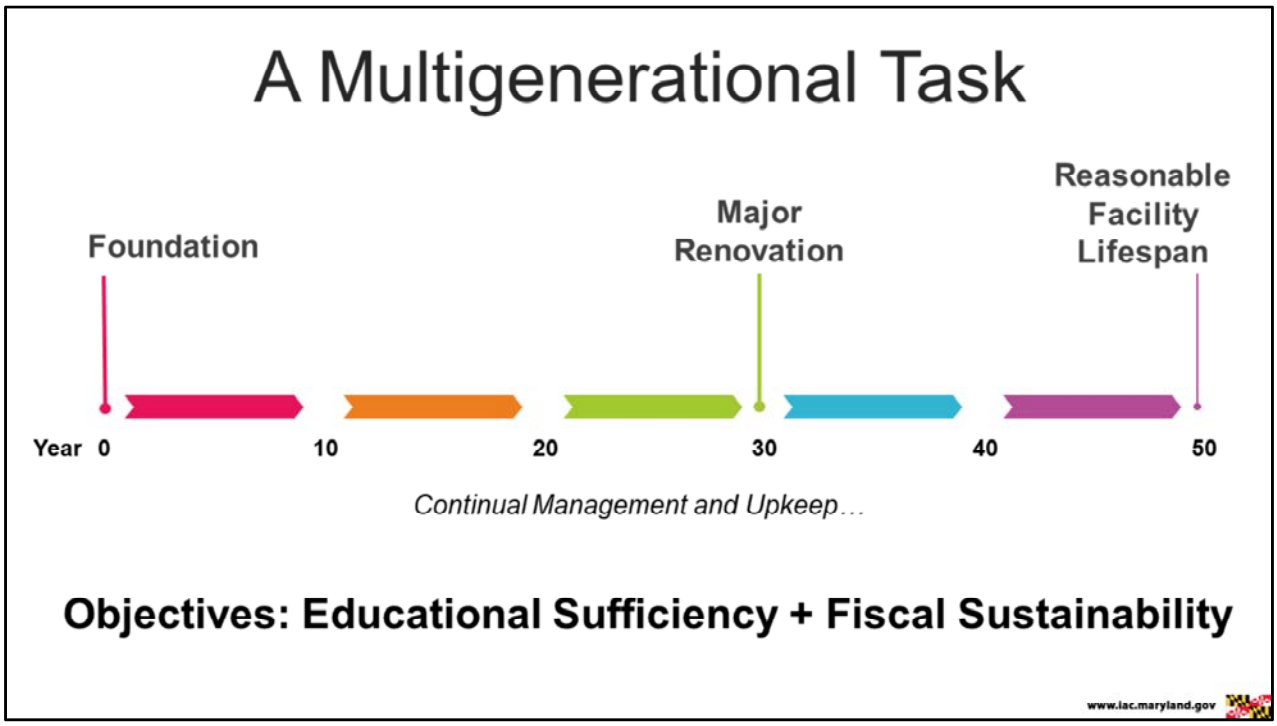


BOB: Welcome. I'm Bob Gorrell, Executive Director of the Maryland Interagency Commission on School Construction. I will be joined in presenting this webinar by IAC staff members Alex Donahue and David Freese, as well as Clarence Felder from the Department of General Services.

Today, it is our privilege to present foundational information to the public and to Maryland's stakeholders that we believe will strengthen the understanding of many concepts that will be discussed at length in the upcoming meetings of the Workgroup on the Assessment and Funding of K-12 School Facilities. This webinar is the third of four and describes why and how Maryland is measuring the effectiveness of the maintenance of our public K-12 school facilities to maximize the utility of those facilities and stretch Marylanders' tax dollars as far as they can be stretched.

QUESTIONS: We encourage your questions and you may submit them throughout the presentation. You will see a white box to the right of your screen with Q&A at the top. Please enter your questions there and we will attempt to answer them with the presentation material, or we will try to consolidate similar questions and answer them at the end of the presentation. We will continue answer your questions until we have addressed them all or up to 1:00PM at which time we will

hard stop.



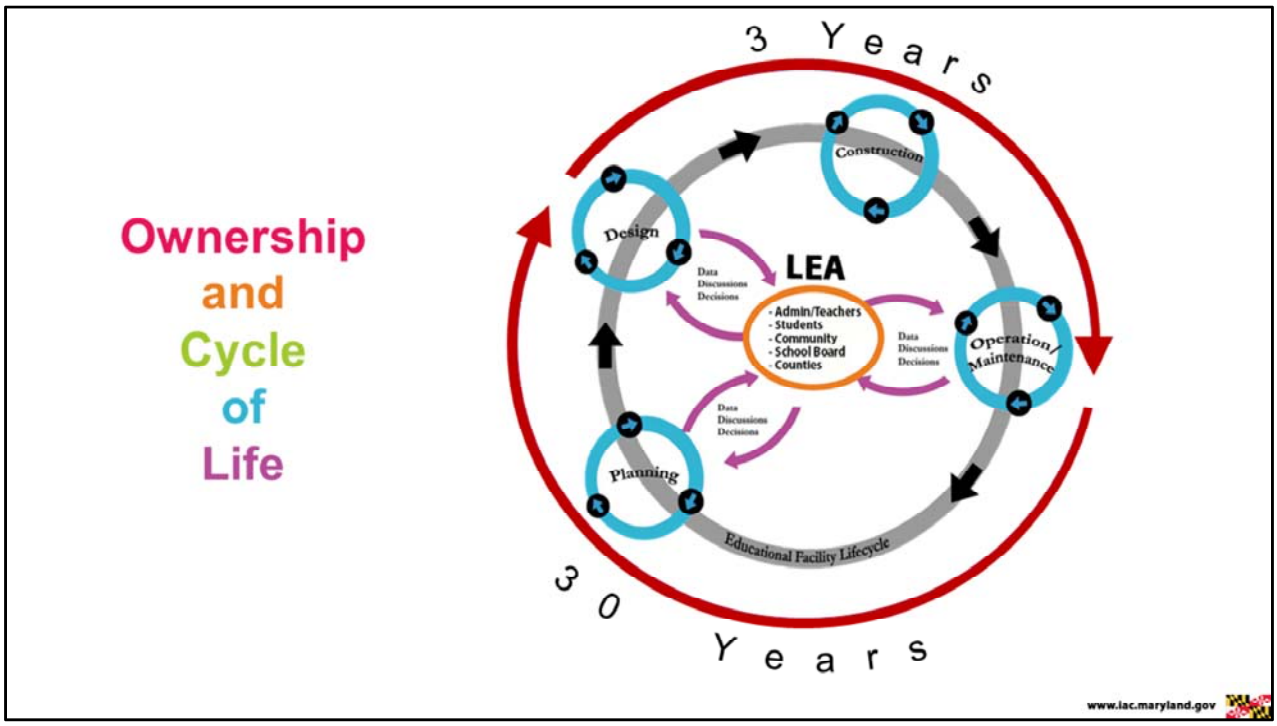
BOB: Teachers and the public are quick to remind us how important facilities are when they don't work. This is appropriate, and we want to prevent school facility failures and so we have ask a lot of why questions to get to the root causes. Facility maintenance is very complex, not easy, and accordingly not cheap, but it can be quite cost effective if planned and implemented correctly. In today's webinar, we are discussing some of these opportunities.

When building systems such as roofs, walls, lighting, heating, ventilation and air conditioning are not functioning reliably, learning cannot take place and, in some instances, facility issues can even expose our children to unsafe conditions. A facility requires constant tending to work properly, and the larger or more complex a facility is, the more tending is required, and the more expensive the facility will be to own.

Facilities, like almost anything built by people, require continual management and upkeep. School facilities pose an additional management burden in that the requirements are constantly changing such as variations in populations or revisions required to support programmatic changes. Enrollment changes, either growth or decline, have to be managed, and an unused facility costs just about the same to maintain and operate as a fully utilized facility in constant use. Even a mothballed facility has a cost.

With proper care, the functional lifespan of a facility can be 50 years or more. Facility ownership is therefore multigenerational—not only because each facility will serve multiple generations, but also because facility ownership is never-ending. The champions involved in the acquisition of a school facility are usually long gone and unaware of the struggles to sustain that facility decades later.

So long as there are new generations of children and an expectation that they be educated, there will always be a need for school facilities. We must properly first plan and then care for these complex and expensive capital assets. The two guiding principles for facility stewardship are **educational sufficiency,** such that every seat in every classroom provides a sufficient learning environment; and **fiscal sustainability,** so that we can afford to keep every learning environment sufficient over time. Maintenance is ongoing and an investment in the future..



ALEX: You have seen this model of the four major phases in the never-ending life cycle of a school facility: Planning, Design, Construction, and Operation and Maintenance. In today's webinar we focus on maintenance because maintenance and operations costs together represent more than half of the total cost of owning a school facility. Effective maintenance is essential to achieving Fiscal Sustainability and is linked over time to planning. An effective maintenance program provides not only functional and safe learning environments, but should provide continuous data for planning so that the facilities portfolio's owner can constantly improve its management of the portfolio. Planning and maintenance are the two bookends of good facility stewardship, they are ongoing over the life of the facility, and essential to fiscal sustainability.

Maintenance is so powerful because it is essential to getting a full expected lifespan out of so many parts of a facility and to ensuring that every learning space remains educationally sufficient. Maintenance is also essential to ensuring the resiliency of Maryland's Critical Infrastructure. Because education directly supports economic competitiveness, and K-12 facilities often support disaster-relief efforts, our school facilities are unquestionably critical infrastructure.

CLARENCE: Maintenance is "The work required to keep a facility (plant, building, structure, ground facility, utility system, or other real property) in such condition that it may be fully functional and continuously utilized for its expected lifespan, for its intended purpose, and at its maximum energy efficiency". Said another way, maintenance is the work required to fully support the original intended purpose and function over the time expected of the school facility which—typically--is about 30 years before the first renewal or major renovation is needed.

There are two types of maintenance: Routine Maintenance and Capital Maintenance. Many people understand the concept of Routine Maintenance, however, not many understand the concept of Capital Maintenance, which is one of the largest costs of facility ownership and so is generally underfunded.

CLARENCE: Proper maintenance includes Capital Maintenance. Owners must plan for and be able to afford replacement of many of a facility's building systems over time. For instance, if we want our facilities to last 50 years or more before replacement, a 4-ply 20-year roof will need to be replaced twice. At the current average of $30 per square foot, the cost of this building system alone represents 15% of the original cost of construction which today is about $395 per square foot. Then there is lighting, ventilation, air-conditioning, heating, windows, floor and wall finishes, parking lots, doors, locks, playing fields, and all the many building systems of a facility – all of which will require replacement during the expected life of the facility. Foundations and structures are the exception as they generally can last 100 years or more or twice the minimum expected life of 50-years and three times the typical 30-year period between renewal or major renovation generally necessary to preserve full functionality and operational efficiencies.

Capital maintenance is defined as "Major repair, alteration, and replacement of systems, equipment, finishes, and components, including their removal and disposal". So, capital maintenance covers the cost of replacement of everything that reaches the end of its life including equipment and furniture. Funding from the sale of bonds is normally restricted to those items that will have an expected life that is longer than the retirement period of the bond. Although some furniture or equipment may not meet this test, this does not mean that they will not need to be replaced over the life of a facility.

Unfortunately, the older a facility is, the greater will be the need for replacement or renewal of building systems, components, fixtures, and furniture. Replacing building systems when needed will not only sustain the functional reliability and extend the useful life of the facility, but will also keep down the cost of routine maintenance.

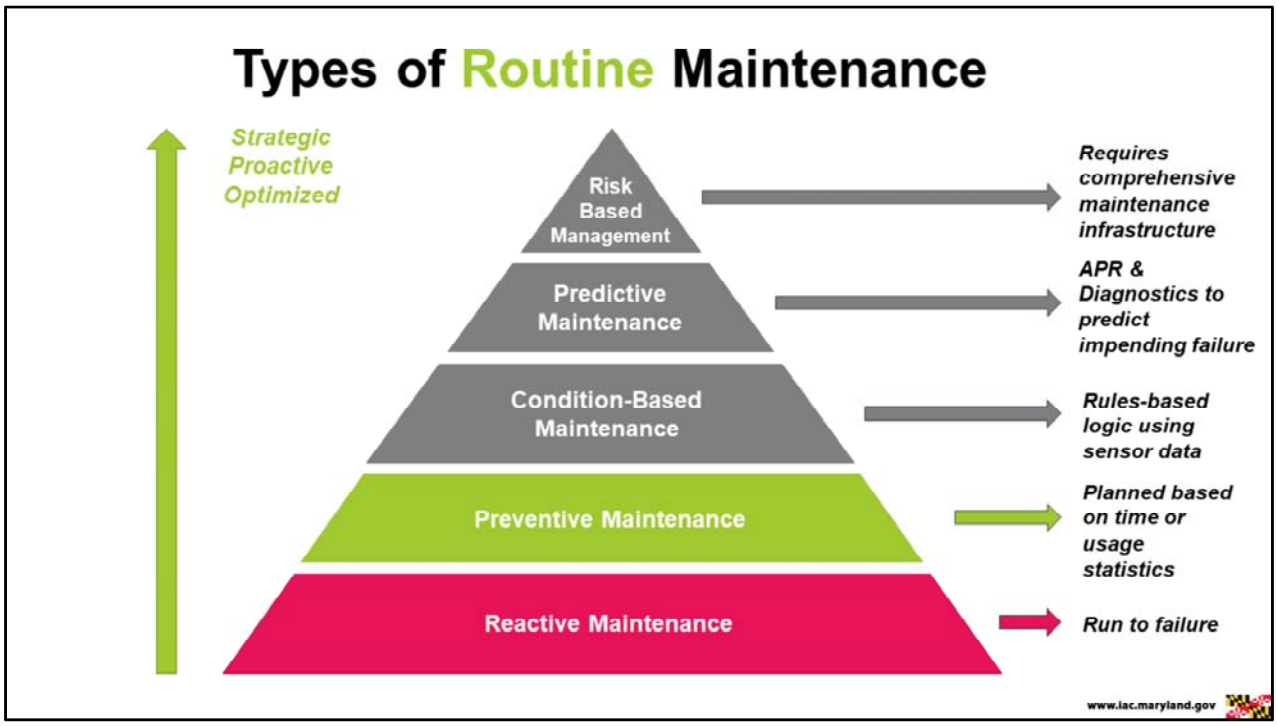
It is noteworthy that capital maintenance is an important job creator. Vertical construction, such as the construction or capital repair of school facilities, creates more than 14 direct jobs per million dollars spent while horizontal construction, such as of roads, creates only 9 direct jobs per $1M spent.

CLARENCE: Routine maintenance is what most people visualize when considering maintenance. **Routine Maintenance is defined as** "Preventive, predictive, and emergent unscheduled tasks and repairs required to ensure that a facility functions according to its design, as well as for its expected lifespan."

Routine maintenance includes scheduled inspections, record keeping, equipment servicing, replacement of lamps and filters, replacement of failed equipment components such as motors, pumps and switches, responding to calls for emergency repairs, patching holes, and repairing furniture and fixtures.

In our own lives, we drive a car for weeks or months without thinking about maintenance—until the car breaks down, that is. Yet we know that, when we change our car's engine oil regularly, we can get 150,000 miles out of the engine instead of perhaps 60,000 when we don't change the oil regularly. The cost of those regular oil changes equals 2 cents per mile. If we skip the oil changes, we are likely going to end up spending 4 times as much per mile for a replacement engine to get the same 150,000 miles out of the car. Which would you rather do? These same principles apply to a school facility, as for example, when the heating system has stopped working because it was run to early failure due to lack of routine

maintenance.

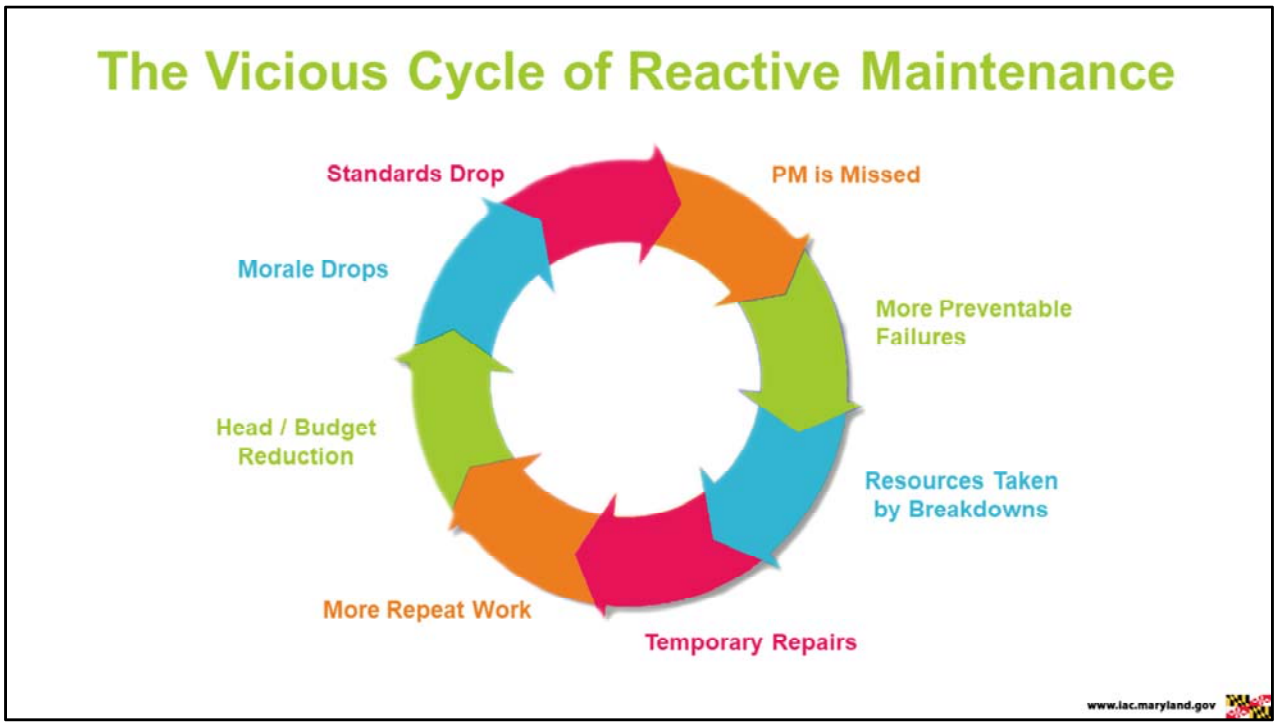


CLARENCE: This model, similar to Maslow's "Hierarchy of Needs", indicates levels of maintenance that we can aspire to achieve. Good maintenance, through a combination of appropriate Capital and Routine maintenance, is directly related to a facilities condition that can be reported using the Facility Condition Index and that we will discuss further in the next webinar, titled *"Measuring and Calculating a Deficiency Score for a Facility."*

The Facility Condition Index, or FCI, is a measure that reports the percentage of life that has been depleted of each major building system of a facility, or aggregated to represent a score for an entire facility. The lower the FCI percentage--and zero FCI is brand new--the better the condition and accordingly the functional reliability.

The FCI is very useful for predicting reliability and the higher the FCI the closer the building system or facility is to its end of expected life. How it is used pragmatically is in fact mostly to ensure reliability. For example, a newspaper company might require that its printer, which it depends upon for income, to be maintained to a very low FCI as compared to the facility which the printer is housed within. Another example is the Pentagon or hospitals, which require their entire facilities to have a low FCI because they must be reliable and functional as intended all of the time.

While we like to think that our schools should be as reliable as the Pentagon, we currently cannot afford the necessary capital expenditures by which building systems and equipment are replaced well in advance of possible failure. In the pyramid of "Types of Routine Maintenance" these are the top two levels. At least in the foreseeable future, for our school facilities, we need to concentrate on advancing our foundational routine maintenance effectiveness. We must focus on achieving--and measure to--effectiveness of preventive maintenance and aspire to condition-based maintenance. We cannot afford to be at the reactive-maintenance level.

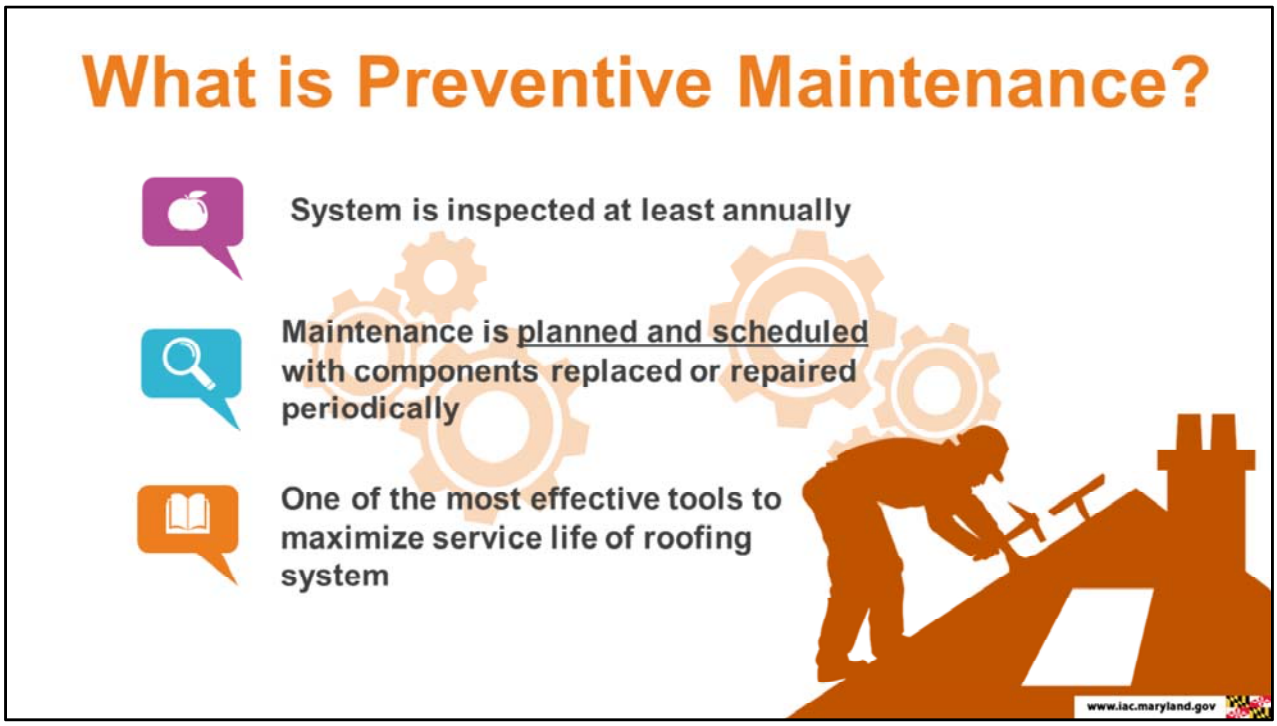


DAVID: Reactive maintenance, which is fixing things after they have broken, may be cheap in the short term but it is very expensive in the long run. To achieve financial affordability, preventive maintenance is the minimum level of effectiveness where we must operate our schools. The graphic on this slide depicts the vicious cycle of reactive maintenance.

When an effective level of preventive maintenance is not maintained, more failures occur and reactive maintenance increases. This diverts scarce resources to temporary repairs to "just get the system working" and will eventually leave preventive maintenance underfunded. This can become a vicious cycle - as reactive maintenance increases, more temporary and repeat repairs are required, staff morale sinks, and any standards of maintenance best practices are dropped and forgotten. Once we slip into reactive maintenance, it can become a death spiral for facilities.

Reactive maintenance, or waiting until a system fails to do any maintenance, will necessarily waste some of the system's lifespan and therefore a significant piece of the investment that put the system in place. There simply isn't a way to get the full 50 or more years of potential utility out of a school facility if we don't maintain to extend life to its fullest and replace certain systems.

Insufficient capital spending will also lead to too much reactive maintenance. As building systems age significantly past their expected lives, preventive maintenance is less effective and failures will increase. Good maintenance, is a balanced and well planned combination of capital and routine maintenance, and is necessary not only for ensuring **educational sufficiency** but also for achieving **fiscal sustainability**. Good maintenance must be viewed both at the facility level and on the portfolio level.

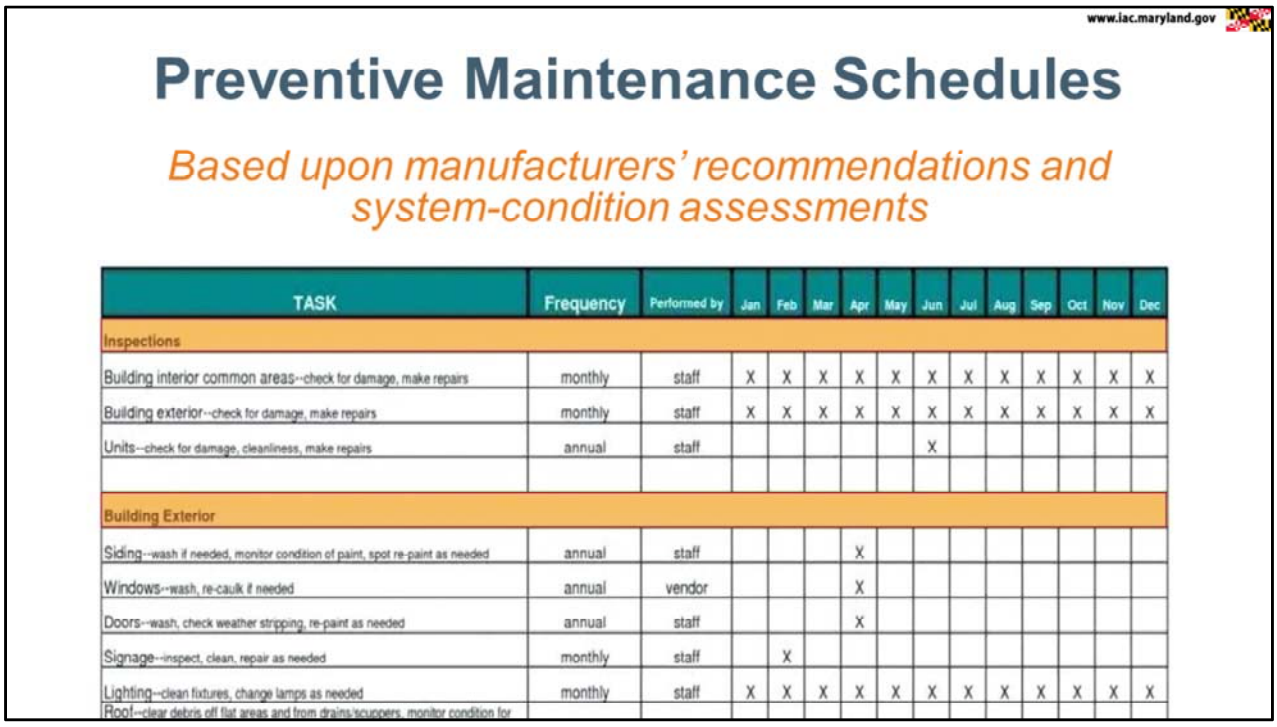


DAVID*:* Preventive maintenance is a range of actions that slow the deterioration of a building system. These actions include scheduled inspections to measure wear and identify developing problems; replacing fluids, filters, belts, and other consumable parts; and repairing or replacing components before they can cause damage to other parts of a system.

The effect of preventive maintenance on the life span of a building system can be huge. According to one industry source, good preventive maintenance versus reactive maintenance over a 20-year period can cut the total life cycle cost of ownership for that roof in half. (--RSI Magazine, Roof Maintenance, "Try the Math").

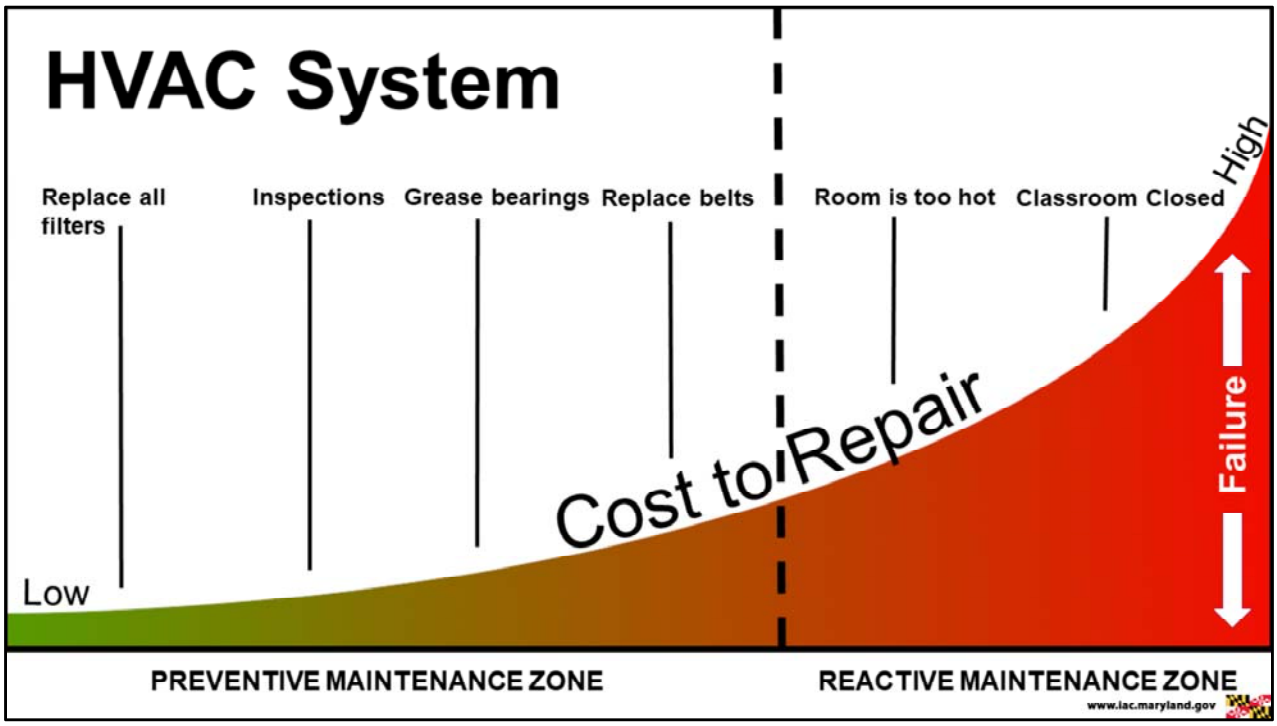
When roofs fail, there is consequential damage to ceilings, light fixtures, structure, and even severe health issues related to air quality. When an educational space is not sufficient so that teaching and learning can occur, a space must be closed to education and this cost is immeasurable. This is particularly relevant to us here in Maryland because we have many existing roofs approaching the end of their expected lifespans. There's no way to maintain usable facilities without putting in

the necessary capital maintenance.



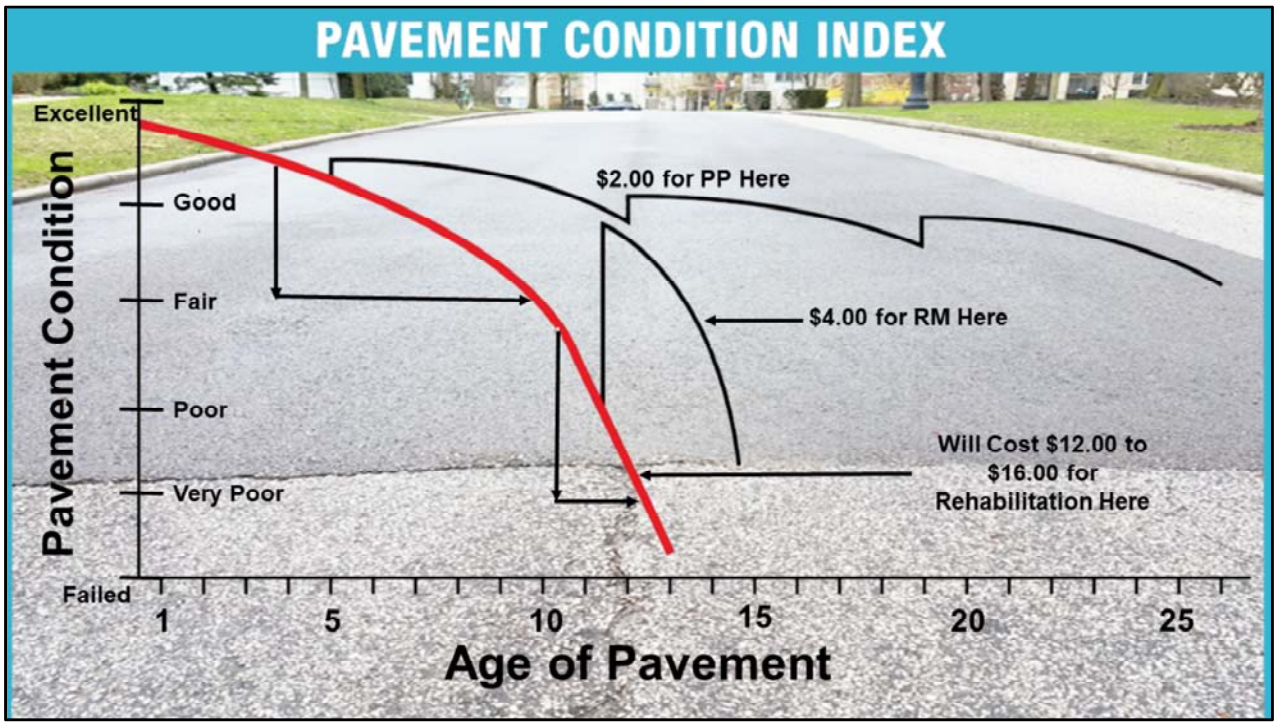
TASK	Frequency	Performed by	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Inspections														
Building interior common areas--check for damage, make repairs	monthly	staff	X	X	X	X	X	X	X	X	X	X	X	X
Building exterior--check for damage, make repairs	monthly	staff	X	X	X	X	X	X	X	X	X	X	X	X
Units--check for damage, cleanliness, make repairs	annual	staff						X						
Building Exterior														
Siding--wash if needed, monitor condition of paint, spot re-paint as needed	annual	staff				X								
Windows--wash, re-caulk if needed	annual	vendor				X								
Doors--wash, check weather stripping, re-paint as needed	annual	staff				X								
Signage--inspect, clean, repair as needed	monthly	staff		X										
Lighting--clean fixtures, change lamps as needed	monthly	staff	X	X	X	X	X	X	X	X	X	X	X	X
Roof--clear debris off flat areas and from drains/scuppers, monitor condition for														

DAVID: Appropriate preventive maintenance follows planned schedules that are largely based upon manufacturers' recommendations. A preventive-maintenance (PM) schedule is created for each building system within a facility that details the maintenance activities to be performed over time. A PM schedule can and should be adjusted to take into account the actual condition of the building system as determined through condition assessments.



DAVID: This slide depicts that application of scheduled preventive maintenance tasks on the cost of ownership of a heating, ventilation, and air-conditioning (HVAC) system. Of course, HVAC is an example of a building system critical to the support and delivery of education. In the graph, note the increasing cost of routine preventive maintenance over an HVAC system's life and before it is replaced. The dotted line is where a capital maintenance expenditure should be made to avoid the loss of the learning space and unnecessary routine maintenance costs.

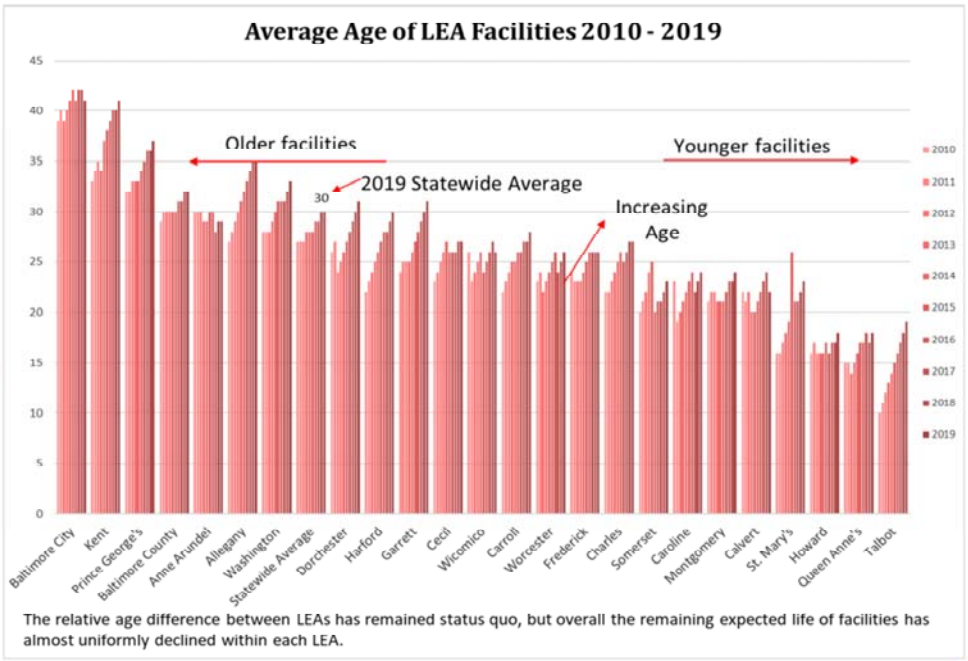
It is important to note that while there is a manufacturer's expected life span for every building system, that life span can be extended or shortened depending on the effectiveness of preventive maintenance. On average, every dollar spent in a timely fashion on preventive maintenance avoids nearly SIX dollars in later reactive maintenance costs. If the resulting five dollars saved are then spent on additional preventive maintenance, they will translate into $25 additional dollars of value! This is known as a virtuous cycle effective preventive maintenance and is the exact opposite of the vicious cycle of reactive maintenance. Effective preventive maintenance is so powerful that Maryland's K-12 facilities portfolio will not be fiscally sustainable, otherwise said affordable over time, without taking advantage of it.



DAVID: The flip side is that every dollar NOT spent on preventive maintenance can cause five dollars of reactive maintenance and/or accelerate the need for capital maintenance to replace the system. That five-dollar "savings" (dollars not spent when they should have been spent) can then cause $25 in additional dollars of reactive maintenance that then starves preventive maintenance! Again, this is known as a vicious cycle of reactive maintenance in which the condition of the facility (or portfolio) rapidly deteriorates and fiscal sustainability is lost.

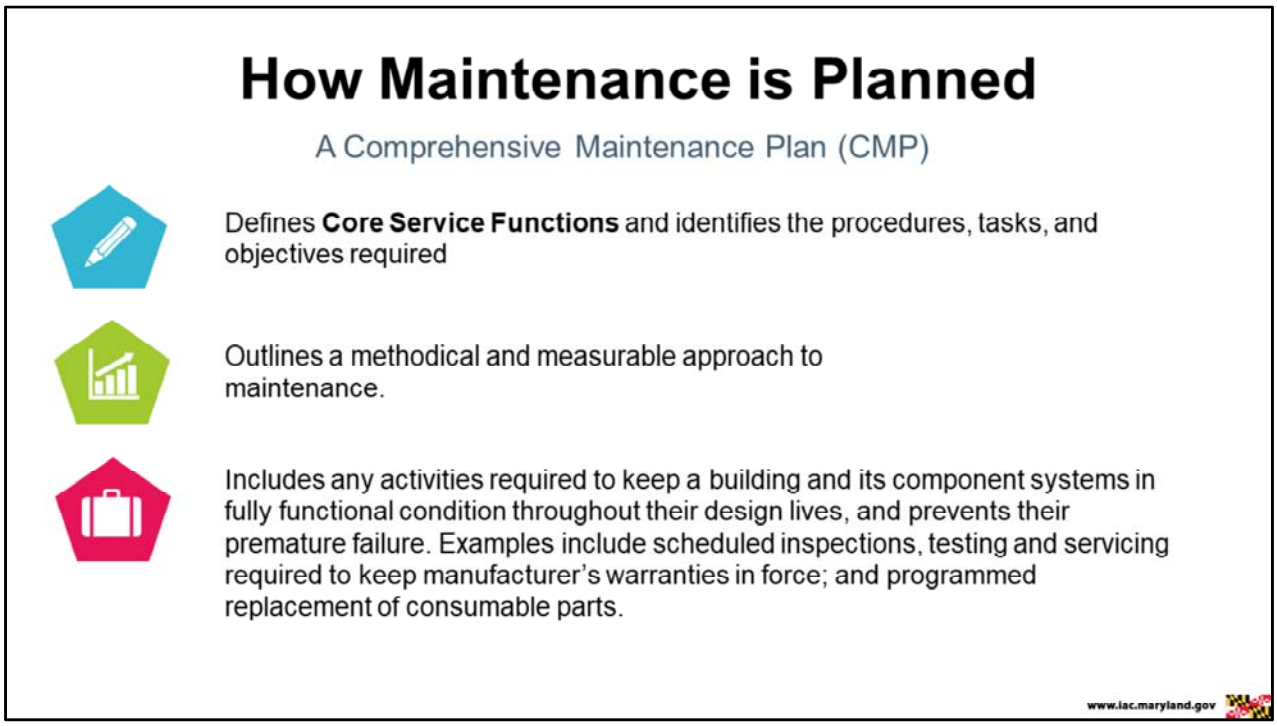
This slide models an example of pavement surrounding a building. The cost of preservation work performed during the first 75% of the standard lifespan of the pavement is $2 per unit. If that work is not performed, however, and the condition is allowed to sink to fair or poor, the cost of repair increases to $4 per unit. And, if the condition is allowed to deteriorate to the point of failure, the cost jumps to $12 to $16 per unit to rehabilitate the damaged pavement!

Current Condition of Maryland's Portfolio

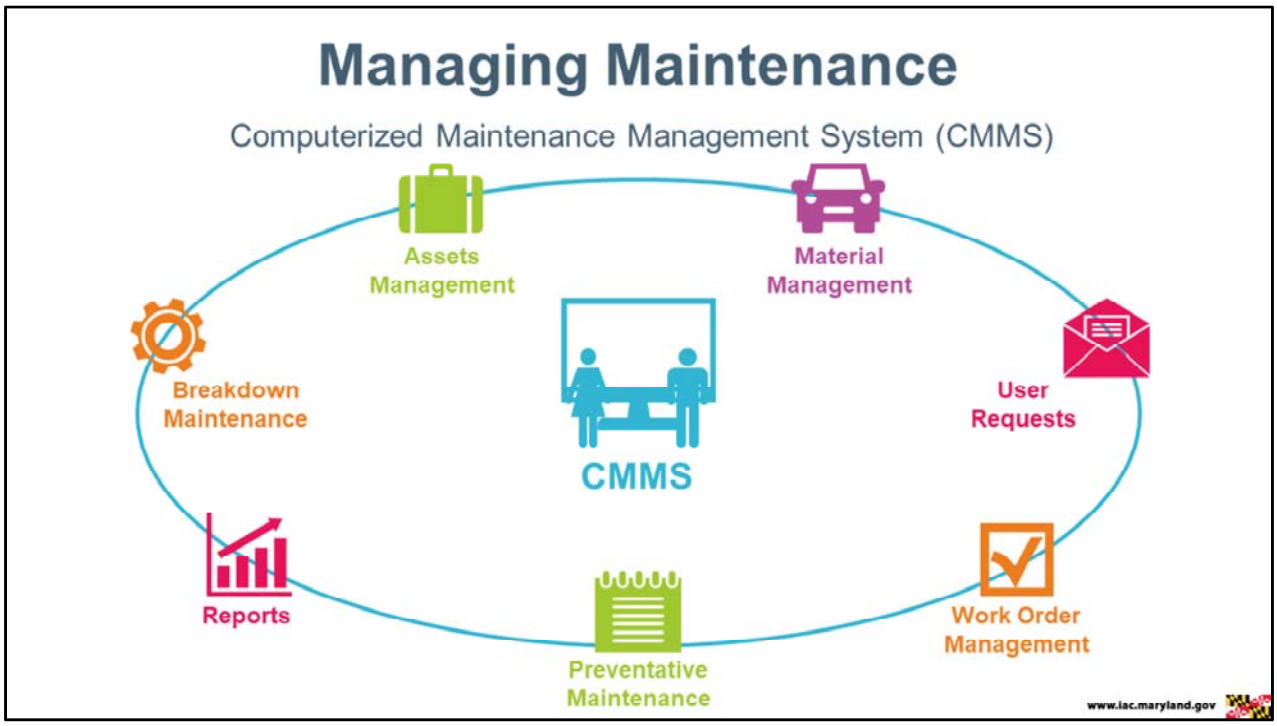


ALEX: We saw that the cost of preventive maintenance in the earlier years of a system's lifespan is much cheaper than reactive maintenance in the later years. So, how are Maryland's facilities doing now? The average Maryland K-12 facility is now 30 years old, and nearly a third of Maryland's 24 LEAs have an average facility age that's even higher than 30. This means that the average facility in Maryland is now in the high-cost phase of its lifespan. Even with timely and thorough preventive maintenance, systems will eventually exceed their lifespans and fail, causing LEAs to shift money from needed preventive maintenance work to replacing systems reactively.

Capital maintenance expenditures (aka systemic projects) are needed. However, they compete with facility renewals and replacements as well as needed new space to accommodate enrollment growth, which causes the facilities portfolio to age even more quickly. A temporary boost in funding for maintenance—even if sizable—cannot push an aging portfolio back into the equilibrium required for fiscal sustainability. We must either have a portfolio size that we can afford or add more annual funding. Otherwise, we will always draw resources from the renewal budget in order to keep all of the building systems functional. One of the biggest levers for sustainability is longitudinally comparable data on systems condition that we can use to inform both planning and maintenance.



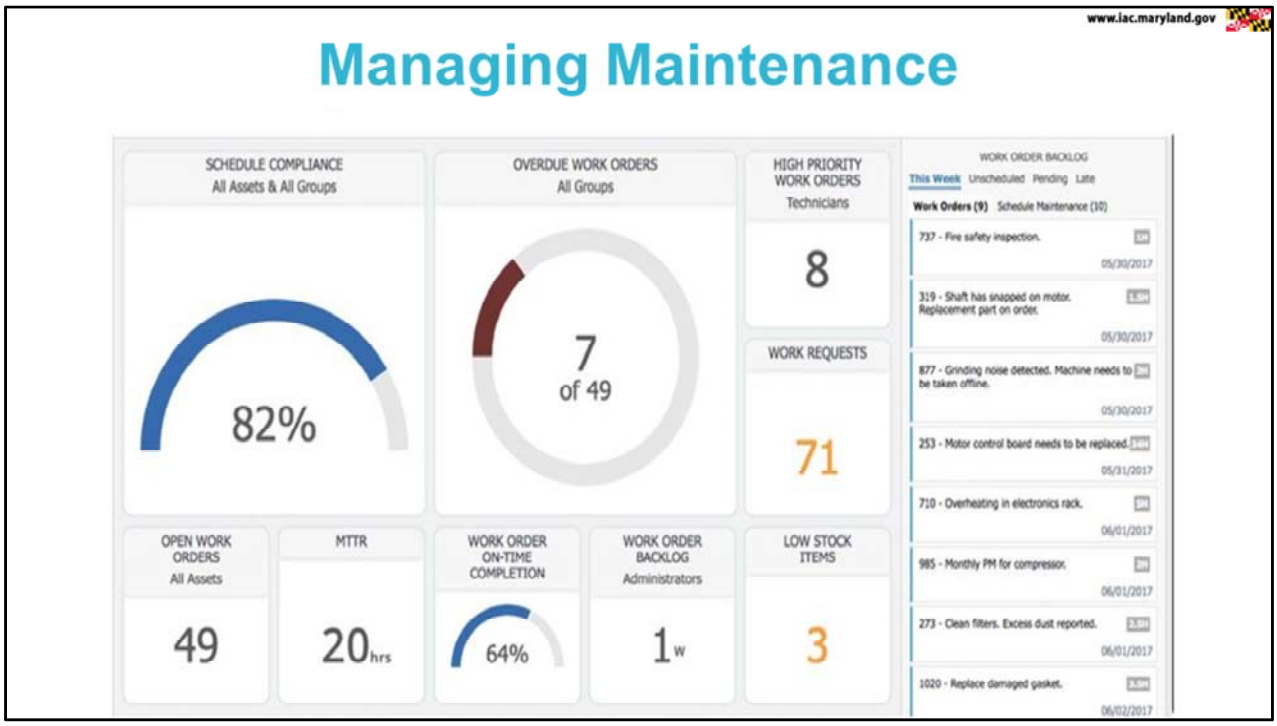
ALEX: Properly maintaining a facility (and certainly a portfolio of facilities) involves so many different actions that they MUST be planned out in advance. Every year, each Maryland school district updates its Comprehensive Maintenance Plan (CMP), which identifies the maintenance procedures, tasks, and objectives over a period of five years that are required to keep its facilities in good condition. It is based on the strategy of attaining a high level of accountability by outlining a methodical and measurable approach to maintenance. The CMP shows how maintenance work is funded, staffed, and prioritized for the school district. But just having a plan is not enough. The plan must include the right maintenance activities in the right places at the right times.



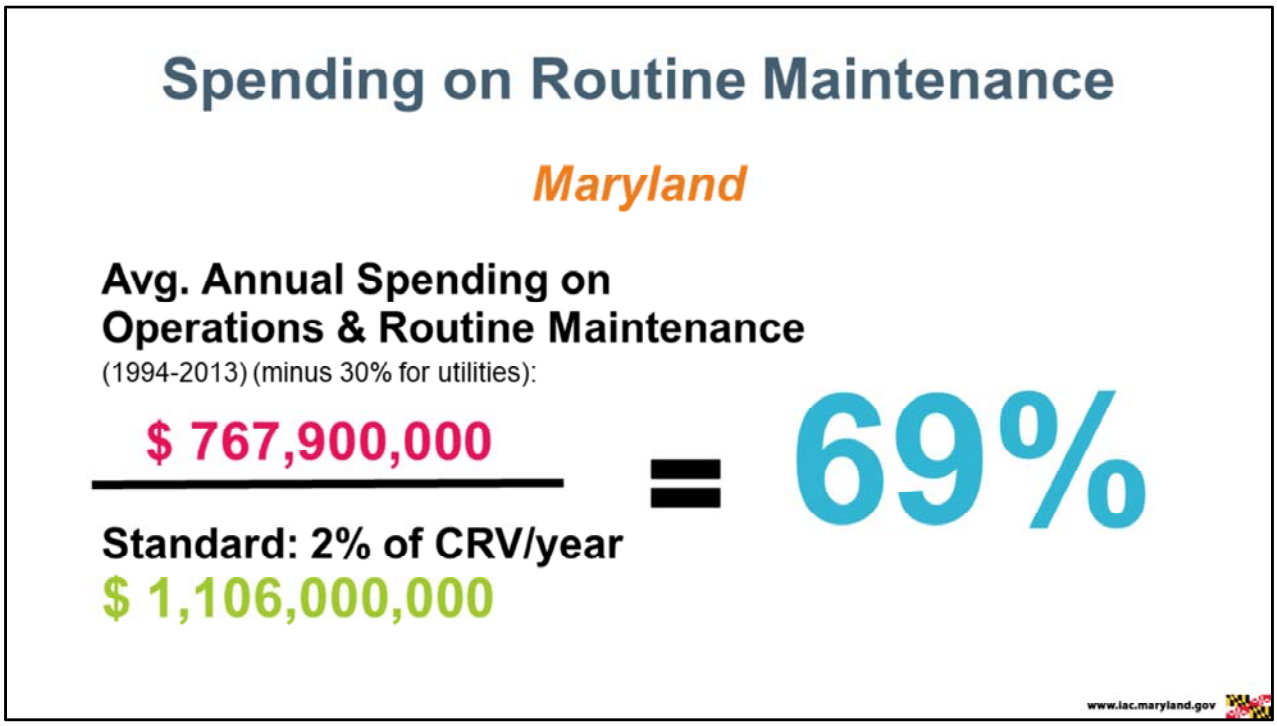
ALEX: A Computerized Maintenance Management System (knows as CMMS) is the major tool that LEAs use to manage maintenance. Any school-district employee who is given appropriate access may enter a request for maintenance work into the CMMS, and preventive maintenance work orders are prescheduled. The CMMS then routes the request as a work order to the appropriate maintenance staff for action.
The CMMS manages the work orders, categorizes and accounts for the resources—meaning, the money, materials, & staff time—that is expended on the work.
The CMMS can be used to schedule and generate work orders for the all-important preventive maintenance activities so that they are more likely to be performed on time.

We do not currently have standard and comparable measures throughout all the LEAs, and having them would significantly assist our districts. The Workgroup on Educational Specifications has recommended the adoption of the National Council on School Facilities standard definitions for facilities-related expenditures. Adopting these in Maryland would be a great step towards obtaining comparable and useful data. Finally, implementing a statewide CMMS would be a great tool and beneficial

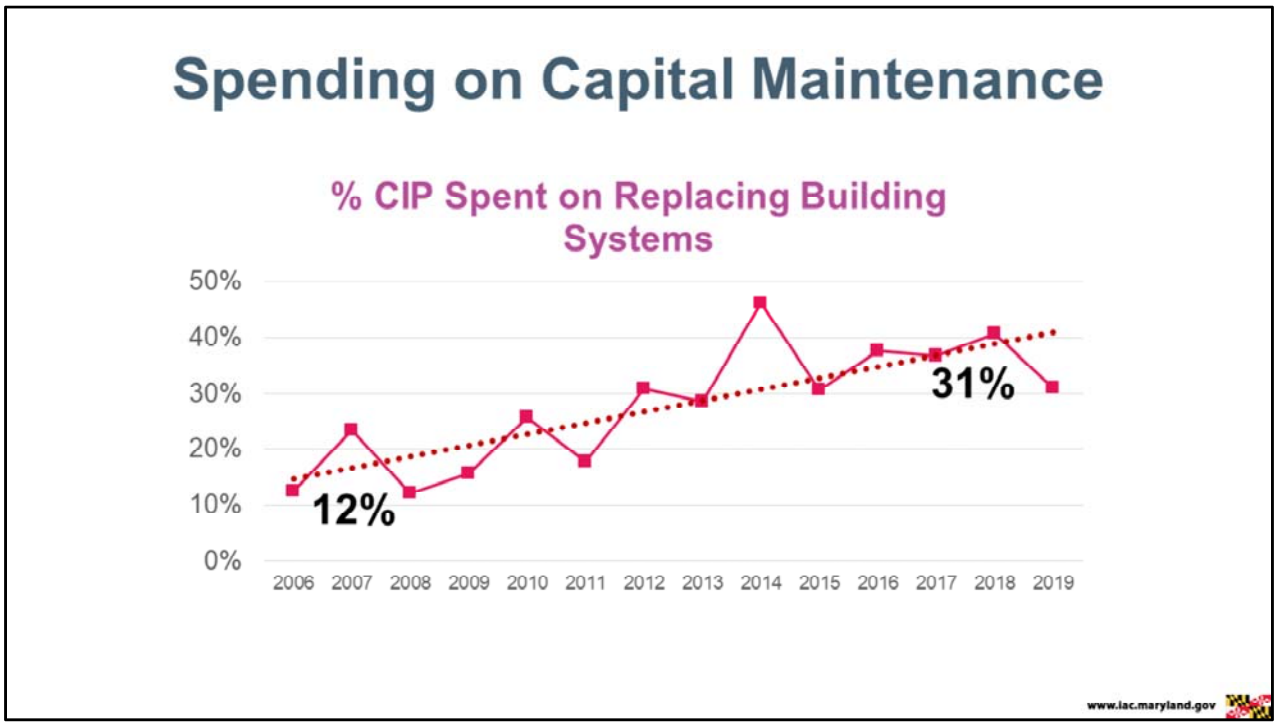
to all of Maryland's LEAs.



ALEX: Here is an example of a *computerized maintenance management system* dashboard that presents summary data about the current status of the maintenance activities being undertaken. It supports comparisons of maintenance performance against selected metrics to describe what's being done and not being done, and in what time frames. A good CMMS system uses this comparative information to support management by exception so that attention and resources can be applied where they are most effective. A CMMS also produces reports such as Work-Order Aging Reports, which show how long it's taking for staff to respond to the maintenance requests. Knowing the percentage of all work orders that are preventive as well as the age of the work orders helps show the effectiveness and health of a portfolio's overall maintenance effectiveness and identifies which facilities are in trouble.



ALEX: According to LEA data submitted through the State to the U.S. National Center for Education Statistics, Maryland LEAs together have historically been annually spending an average of 69% of industry standards on maintenance and operations combined. This number includes operations spending but has been adjusted to exclude the cost of utilities, which are estimated as averaging about 30% of routine maintenance and operations spending. It's inevitable that this underspending over time will have a detrimental effect on the condition of building systems and the functional lifespans of the facilities. The result is an additional drain on public resources that could be spent on programs, services, and other needs.



CLARENCE: In light of this underspending on Capital Maintenance, it is not surprising that the percentage of state CIP dollars going to replacing building systems has been on an upward trend. Between FY 2006 and FY 2019, the percentage more than **doubled**. Yes -- system-replacement costs have been rising -- and the total portfolio size has been increasing -- but neither has come close to doubling. Nor has there been a significant decline in local jurisdictions' investment of local funds.

The more likely cause of this spending increase is that more building systems are reaching the end of their lives and are requiring replacement. From this we can tell that the longevity of building systems is declining. Why? Well, it's certainly possible that the build quality of the systems is decreasing. But its almost certain that the main reason is that, as costs have risen and budgets have become leaner, LEAs are no longer investing as much in capital maintenance and so are obtaining shorter lifespans from their systems.

Measuring Maintenance Effectiveness

IAC Facility Maintenance Assessment (FMA)

Covers

- Site Exterior
- Building Exterior
- Building Interior
- Equipment and Systems
- Maintenance Management

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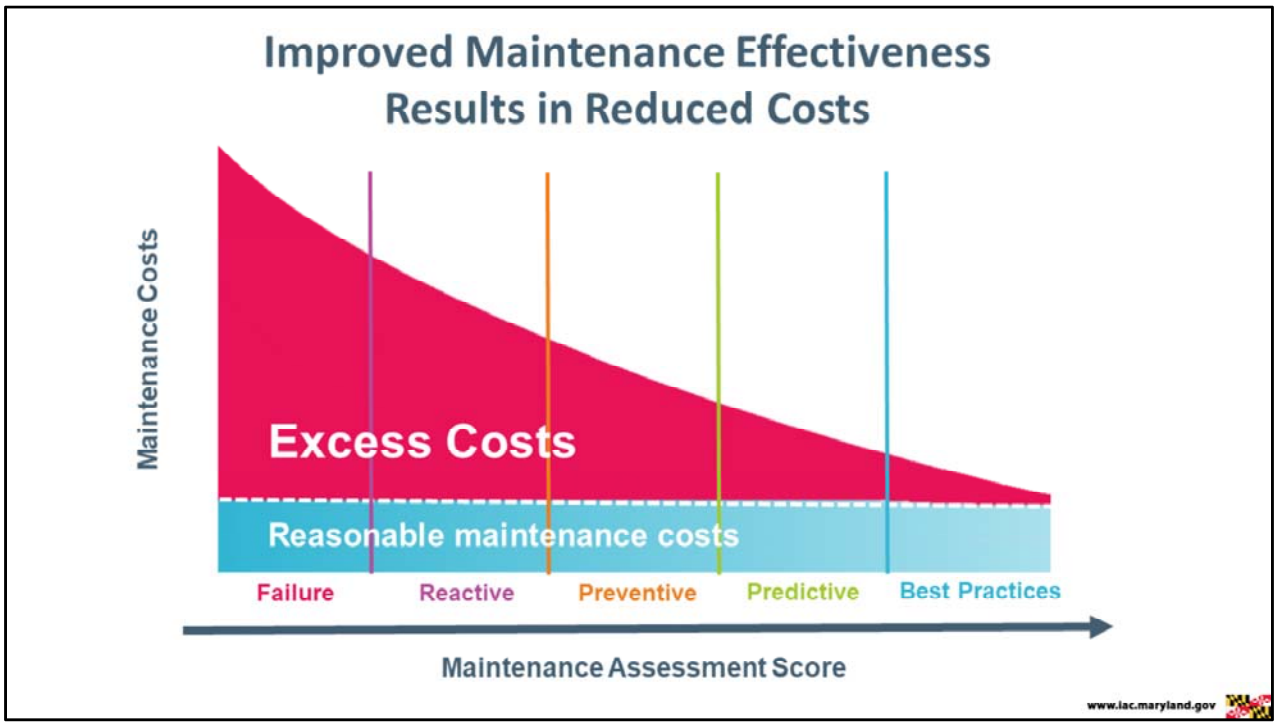
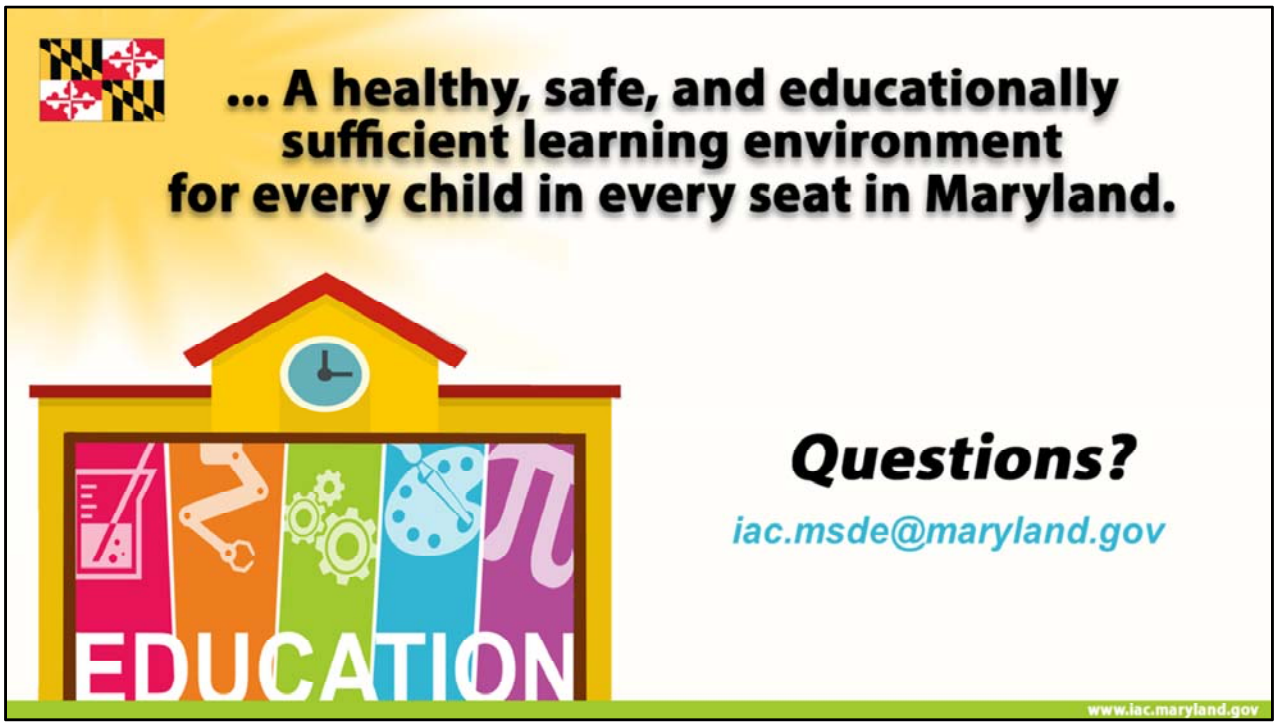
DAVID: We don't truly know how well we are maintaining our facilities unless we measure our maintenance effectiveness. The IAC is phasing in a new Facility Maintenance Assessment tool (FMA) for use in assessing the major components and attributes of each facility that can hinder the proper delivery of educational programs and services, as well as the maintenance systems and processes that LEAs are using. The IAC will use the results of the assessments to

- Identify effective and cost-effective maintenance **strategies**;
- Identify unmet facilities needs;
- Benchmark facility maintenance results and support continuous improvement; and
- Foster practices that are repeatable, transparent, and accountable.



DAVID: Maintenance effectiveness assessments produce data that can assist LEAs in prioritizing their maintenance resources so that they can maximize educationally sufficient learning spaces for every student in every seat in every school in Maryland. To support this work, the IAC is doubling the number of assessments per year going forward by adding assessors to its team working with LEAs. We've seen encouraging results at individual schools but we know that we need to enable systematic comparability of maintenance statewide in order to achieve educational sufficiency and fiscal sustainability across the state. We can also obtain significant savings over the long term by identifying LEAs' best practices and sharing them widely across the state.

This slide represents potential cost avoidance of increasing maintenance effectiveness. The takeaway is that it is just wasteful of our limited funding when we become trapped at the reactive-maintenance level.



BOB: Ultimately, we all agree that we need a healthy, safe, and educationally sufficient learning environment for every child in every seat in Maryland. Keeping our facilities educationally sufficient requires that we maintain them, and by measuring our maintenance effectiveness is how we'll improve our level of success. Good measures will also help us estimate the resources needed to do the work properly, and how we can do it better. This is all part of getting to fiscal sustainability and educational sufficiency.

Now, we will answer the unanswered questions received during the webinar and we will take any additional questions you may have.

We will keep the webinar open for 2-3 minutes after the last question received or up until 1PM when we are scheduled to end – whichever occurs first. If you have questions after we sign-off today, please send them to the address on the slide. If you have colleagues that were not able to attend today, please send them to our website were we will publish the recording of this webinar, all follow-up questions, and our the slide deck with our notes.

Prior to ending today's webinar, we will put up final slide informing you of the last webinar that preceding the Assessment and Funding Workgroup's meeting scheduled for August 28, at 9AM, in the Senate Building. Thank you again for participating in today's webinar.

Up next...

Measuring and Calculating a Deficiency Score for a Facility

In preparation for the Workgroup on Assessment & Funding of School Facilities

Webinar 4 of 4
August 20th, 2019
12:00 – 1:00 PM

Workgroup Meeting
August 28th, 2019
9:00 – 1:00 PM

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