

Total Building Envelope Management SolutionSM
www.structuretec.com

MEMO FROM THE PRESIDENT

Facility managers play a significant part in providing for an organization's well-being. They oversee the day-to-day operations of a facility and protect one of its largest assets. It is not enough to look at a building as a place to conduct business; instead, it should be looked upon as a large, in many cases the largest, investment of an organization.

Though facilities do not generate revenue for the organization, they can severely affect the "bottom line" when not managed properly. Emergency situations arise due to building degradation when facilities are not managed properly, causing expenses to escalate dramatically. In most cases, the cost of an emergency "fix" far outweighs the cost of providing preventative maintenance and long-term renovation.

The same is true for national organizations, which are often faced with numerous buildings in need of repairs or maintenance. Through proper prioritization you can develop a Long-Range Building Envelope Asset Management Program to protect all of these investments and maximize the ROI (Return on Investment).

StructureTec's National Accounts Program provides a total inventory of all building envelope and pavement assets, and is designed to aid organizations in establishing maintenance priorities, the "Total Building Envelope Management Solution" approach. This concept addresses the roofs, walls and pavement, providing a "state-of-the-art" solution for protecting multiple facilities. Basic objectives involve **Prioritization**, **Cost Reduction**, and **Sustainability**. In today's economy, building owners must protect their investments.



Jeffrey L. Brittan
Chief Executive Officer

DO YOU HAVE A ... Pavement Management Program?

Proper pavement maintenance is essential to any organization that has the responsibility for maintaining the condition of parking lots, loading docks, etc. Pavement upkeep is critical to not only providing a professional appearance, but also to creating a safe environment for both employees and

Prioritize needed
improvements
along with
projected
budgets.



guests. Uneven pavement can become a liability and an accident waiting to happen. A good pavement management program will help you develop a plan that will fit the purpose based on individual owners' needs as traffic patterns and load requirements demand. A pavement management program will help you prioritize needed improvements along with projected budgets.



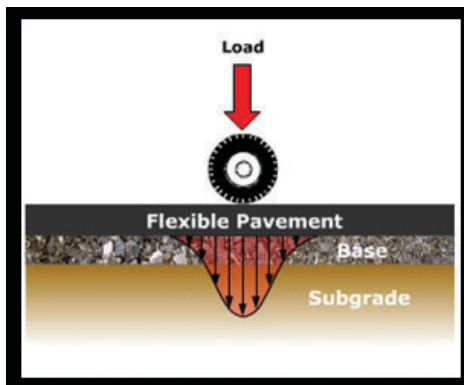
The Necessity of a Pavement Management Program

W. Thomas Rea - Manager, Pavement Management Group

In order to create a significant pavement management program, you will first need to understand what pavement is, the two types of pavement and the adverse effects on the overall weatherproofing integrity of your pavement areas.

Pavement is found everywhere, and is defined as an artificially covered surface of a public thoroughfare. The following information will discuss pavement as it pertains to parking lots, sidewalks and curbs.

Your parking lots will fall into two different classes (groups or types): **light-duty**, which is the standard parking lots with smaller axle weights and volumes, and **heavy-duty**, which



Flexible pavements “HMA” will bend, give way or deflect the traffic load.

pertains to higher axle weights and volumes. This class is also determined by the purpose of your pavement, or the initial usage of your pavement. It all correlates with the gross axle weight and volumes as they are treated differently. You will need to make sure with all driving sur-

faces that the purpose, classification and material are all in sync for proper design.

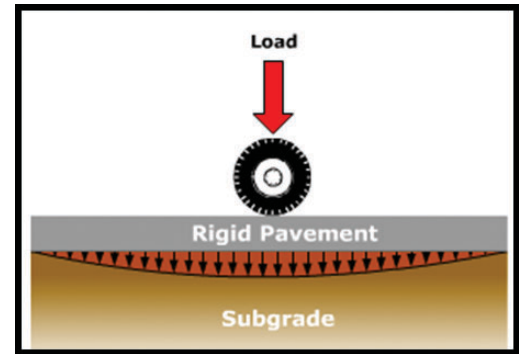
Pavement can be generally classified into one of two categories: **hot-mix asphalt (HMA)** or **Portland cement concrete (PCC)**. The manufacturing process, method of paving and performance characteristics vary between types, but both have the same fundamental design of a load-bearing aggregate held together by a bonding agent.

Hot-mix asphalt is considered a flexible pavement. As the name suggests, it is paved while still hot (generally 270°F or hotter) and must be placed and compacted prior to cooling off.

HMA consists of a particular blend of aggregate sizes bound together with an asphalt binder. It is the asphalt binder that gives HMA its characteristic black color as well as its relatively flexible properties.

Portland cement concrete is a rigid pavement. Concrete is mixed just prior to delivery to the job site out of aggregate of varying sizes, Portland cement, and water. Concrete can

also be given added strength through the addition of reinforcing bars, typically made of steel. Unlike asphalt, which attains its strength as it cools, concrete's strength comes from a chemical reaction between the Portland cement and water known as hydration. When initially mixed,



Rigid pavements PCC are substantially “stiffer” than flexible HMA and will spread the load over a larger area.

the concrete will have a lower viscosity and can be poured into a pre-constructed form. As the chemical reaction takes place, the Portland cement will begin to harden around the aggregate, holding it in place.

Maintaining a pavement asset is an ongoing process, whether it is a parking lot, an access drive, a loading dock or even a sidewalk. There is a wide range of defects and failures that can occur with pavements, and the way each problem is addressed depends on the root cause of failure. It is important to be able to recognize issues as they arise.

In HMA, some of the most common types of failures are cracking, potholes, surface deformation, and raveling. Within each failure type, there can be subcategories, and each one may be a sign of a different underlying issue. Cracking, for example, could be the result of a poor bond between subsequent layers of pavement. Alligatoring, a series of interlocking cracks that resemble alligator skin, is



more closely related to overloading or general failure due to age.

Concrete also suffers widely from cracking, but there are other issues that can arise with this type of pavement. Spalling can occur where the concrete is overloaded or subject to excessive movement. Potholes can occur in concrete just as they are found in asphalt, but the technique of restoring such conditions varies between pavement types.

As is the case with other systems such as the automobile or the human body, pavement will achieve the greatest lifespan and return on investment when it is properly maintained. In HMA pavement, cracks often occur, and can be a contributing factor in premature failure if not properly addressed. Cracks in asphalt that are left open, especially in northern climates, are subject to debris and water. If water infiltrates pavement through a crack, it can freeze



Cement Plant

and expand in the winter and thaw and contract in the spring, causing smaller cracks to grow, spread, and eventually lead to the complete failure of a pavement area. The application of hot-poured rubberized asphalt crack sealant to fill these cracks will serve not just a cosmetic benefit, but can also prevent the cracks from spreading. Surface deformation can cause uneven loading as traffic continues to traverse an area. This loading condition can cause sections of the asphalt pavement to crack or break off. Storm water can also collect in these depressions and in cooler climates could freeze and cause not only failure, but a safety condition as well.

Concrete must also be maintained to ensure continued performance and longevity. The same freeze-thaw cycle that can damage HMA can promote cracking, spalling, and section

loss in concrete. Repairing damaged areas early can reduce the risk of damage spreading to adjacent areas of pavement. Cracks that form in concrete can also be filled with a urethane sealant to reduce water infiltration.

In conclusion, with a first-rate Pavement Management Program in place, your facility management team will have the ability to achieve a well-maintained, high performance pavement area that will have a greater return on your investment. By doing the right things and having the right specs for the load and volume purpose of your pavement, you can decrease your annual cost of ownership and enhance the life cycle. ■

Program Basics:

- Collecting Data from Pavement Surveys
- Pavement Management Systems
- Benefits of a Pavement Management System
- Integrating with other facility systems

Benefits of a program:

- Prioritizing and Budgeting
 - Forecasting
 - Presentations
 - Record keeping (Auditing)
 - Project Management
 - Sharing Information with your Existing Systems
-



Typical Pavement Terms

Alligator/Fatigue Cracking - Alligator or fatigue type cracking is the interconnecting of cracks forming small pieces ranging in size from 1" to approximately 6". This is caused by failure of the surface due to traffic loading (fatigue) and very often also due to inadequate base or sub-grade support. Neglected or poorly sealed cracks exposed to moisture and temperature changes can quickly grow into "alligatored" areas that then turn into potholes. The cracking pattern is similar to an alligator's skin or chicken wire fencing.

Asphalt Cement - A dark brown to black cementitious material in which the predominating constituents are bitumens which occur in nature or are obtained in petroleum processing. In varying proportions, asphalt is a constituent of most crude petroleum. Penetrations grades vary.



Verification of minimum pavement depth.

Cement (Portland) - A hydraulic cement produced by pulverizing clinker consisting essentially of hydraulic calcium silicates, and usually containing one or more of the forms of calcium sulfate as an inter-ground addition.

Climatic Conditions - Given the climate of this pavement section, it is anticipated that the rate of deterioration will be increased.

Excessive Loading Factor - Given the observed traffic conditions and use of this pavement section, it is anticipated that this pavement will undergo a more rapid rate of deterioration.

Flexible Pavement - A pavement structure which maintains intimate contact with and distributes loads to the sub-grade and depends on aggregate interlock, particle friction, and cohesion for stability; cementing agents, where used, are generally bituminous materials as contrasted to Portland cement in the case of rigid pavement.

Hot Mix Asphalt (HMA) - The bound layers of a flexible pavement structure, which is a mixture of coarse and fine aggregate, and asphalt binder.

Life Cycle Cost Analysis (LCC) - The investigation and valuation of the environmental impacts of a given product or service caused or necessitated by its existence.

Longitudinal Cracking (Roadway) - Cracks running in the direction of traffic are longitudinal cracks.

Potholes - Pot-shaped holes caused by a weak base or sub-grade soil. Potholes are the complete failure of an asphalt pavement structure. Typically, the potholes are formed from small sections of severely alligatored areas that break free of the asphalt pavement.

Raveling - Progressive loss of pavement material from the surface downward caused by lack of bond between the asphalt binder and aggregate material, leaving a rough, jagged or wavy surface. Poor initial compaction during construction, cold weather construction, insufficient asphalt cement content, and/or environmental aging can all be causes of raveling.



Terms continued ...

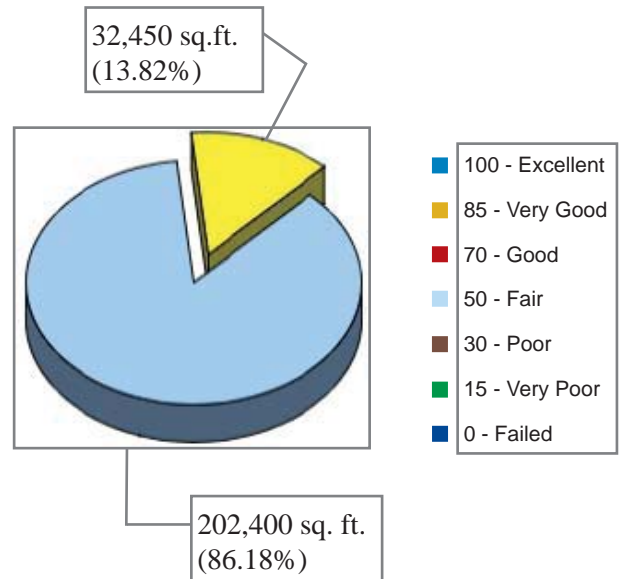
Rigid Pavement - Pavement that will provide high bending resistance and distribute loads to the foundation over a comparatively large area.

Rutting (Roadway) - Grooves that develop in the wheel tracks of the pavement. Channels may result in consolidation or lateral movement under traffic in one or more of the underlying courses. It can also be the displacement of the asphalt surface layer itself. A yielding sub-grade, insufficient compaction during construction, or a lack of structural strength in the pavement structure typically causes rutting.

Spalling - Loss of one or more pieces of the pavement from the surface, usually along cracks, joints, or edges. Aging, deterioration, and/or poor quality materials can cause spalling.

Transverse Cracking (Roadway) - A crack at approximately right angles to the roadway.

Pavement Condition Index



This chart describes the PCI system in detail, and provides a description of all the rating levels from 0 to 100 and what can be expected for each rating level.



Hot Mix Asphalt laydown paving machine.



36 ft. wide reinforced concrete road. Epoxy reinforcement bar 12 ft. on center.



36 ft. wide roadway during concrete pour with finishing crew.



Power trowel finishing for concrete surface.



Base course placement pavement section.



Completed end product.



General Description:

- **Locations:**
Indiana, Ohio and Kentucky
- **Profile:**
Multiple Sites
- **Project:**
Pavement Management Program

Services Provided:

- Pavement inspections/evaluations
- Construction Management/Field Quality Assurance
- Long Range Asset Management Program

Challenges:

- Evaluating many different pavement locations in multiple states
- Interfacing with multiple stakeholders
- Prioritizing based on site specific traffic needs
- Managing construction at different locations simultaneously

Solutions:

- Evaluated all paving assets and developed a prioritized, long-term budget plan based on condition ratings
- Achieved economies of scale by packaging into one project
- Designed site specific pavement cross-section based on traffic and load requirements

Industry-Leading Energy Provider

One of the most overlooked facility assets of a corporation is its parking lots. Although these assets do not generate income, the lack of proper planning and maintenance can have a significant impact on the financial “bottom line” of the organization. In addition to the aesthetics of a poorly maintained parking lot, the performance of operational vehicles can also be affected. These are just two reasons paving must be addressed and maintained to ensure the operation’s integrity.

As part of a comprehensive weatherproofing program, StructureTec was contracted to develop a pavement program for 116 sites across several states for a major utility company. The objectives for the program were to **prioritize** funding allocations for each site, aid in implementing **cost reduction** processes and procedures, and assist the corporation in achieving a level of **sustainability** moving forward.

Prioritization began by performing an evaluation of each site in conjunction with the company’s corporate national weatherproofing program team, and included other building envelope systems such as façade, roof and fall protection systems, along with paving.

The process began with a two-stage approach, a review of preliminary information and a survey of the sites. Each site was evaluated as follows:

Review Preliminary Information

- Review as-built drawings, including existing cross-sections, in order to determine the site’s original design criteria in comparison with its current and future need requirements.
- Review of existing traffic volume requirements, including load analysis based on axle weights.
- Review and confirm sight line distances to ensure safety access and egress.
- Review and confirm compliance with local regulations and construction codes.

Survey the Site

- Draft site plans delineating “areas” or “sections” based on perimeter definitions and pavement construction types (gravel, concrete, asphalt).

- Survey and document pavement deficiencies, load and volume failures, storm and drainage failures and trench failures.
- Geotechnical services are performed at strategic locations in order to determine existing soil composition.

After collecting the data for each site, the information was reviewed and analyzed with the objective of developing a prioritization program for capital and operating and maintenance funding requests.

The analysis for each site was performed using industry standard methods for reviewing existing pavement cross sections in order to determine proposed current and future needs based on axle weight loads and traffic volumes. The objective of the analysis process was to minimize the long-term cost of ownership for each site.

Upon completion of the analysis, a pavement condition index (PCI) rating scale was used to rate each site



Pavement failure due to age and neglect.



based on the remaining service life of each pavement section. This rating system allows upper management to easily review the recommended sites to be addressed for each year's funding requirements and helps develop a long-range pavement asset management program.

Estimates for capital improvements (pavement replacement) and for strategic repairs or deferred maintenance (pavement repairs) were developed based on regional pricing in order to ensure that budgets were realistic and achievable based on local markets. Based on the project schedule provided by the long-range asset management program, upper management selects a list of projects based on capital and/or operating and maintenance (O&M) budgets to be released.

Design & Bidding Process

Utilizing the data collected through the evaluation/survey phase of the program, StructureTec proceeded to the design development phase by reviewing alternative pavement procedures with each site team. The pros and cons of the various procedures were evaluated and reviewed from different perspectives according to each stakeholder's objectives. This helped reduce the possibility of expensive unforeseen conditions during actual construction while ensuring the highest level of safety standards.

Preparation of site plans, details, and the specifications necessary to complete each project was completed based on the agreed upon objectives of the design development phase. In order to ensure regional compliance, all specifications were based on each state's Department of Transportation (DOT) guidelines. Each project specification also included the front end corporate guidelines; i.e., bid form, general conditions, etc., so

that the construction documents could be submitted for the bid process. This enabled us to acquire the most concise and competitive quotations for the designated scope of work.

In the bidding phase, qualified contractors were contacted and invited to attend a pre-bid conference for each site. After contractor bids had been submitted and tabulated, a select group of contractors was assigned sites based on each region.

Construction Management

A unique aspect of the program is that StructureTec provided its **Platinum ProgramSM** for all projects. The **Platinum ProgramSM** provides a construction manager as the prime contractor for each site, providing complete administration and supervision, including interface with all contractors and testing companies involved. Each project included site visits for construction review while the project was in progress, issuing field review reports for each site visit. The project closeout of this phase included a final walkthrough, project punch list, review of the contractor warranty submittals and closeout administration.

Warranty Audit

StructureTec has been implementing a **Warranty Audit ProgramSM** for capital projects. This program consists of two annual inspections of the completed project, twelve months and twenty-four months after completion.



Base course placement pavement section - Hot Mix Asphalt.

However, applying this program to a pavement capital project was a challenge due to the fact that most pavement contractors and product manufacturers have not offered more than a one-year warranty. By leveraging the volume of work and asking through the bid documents for a two-year warranty on all projects, we were able to overcome this challenge. The program allowed us to help our client protect their parking lot investments by ensuring that all aspects of their warranties are sufficiently covered by the contractor or manufacturer.

Long-Range Asset Management Program Update

Utilizing the completed project data from each capital and operating management annual program, StructureTec re-surveys all sites every year in order to readjust the long-range plan for the corporation.

Conclusion

Using a three-pronged approach—*prioritization, cost reduction and sustainability*—to maximize the service life of these important assets helped the company in developing a sustainable long-range asset management program. ■



Please route to:

1. _____
2. _____
3. _____

“HIGH PERFORMANCE PEOPLE ... HIGH PERFORMANCE RESULTS!”

Fall Preventive Maintenance Winterizing Your Roofs

Winter is on the horizon and your facilities' roofs have survived another year, or have they? Do you know what the effects of winter and the lack of maintenance on your building can lead to in the spring?

Damaging ice, spring rains, summer thunderstorms and temperature variations can easily play havoc with the water-tight integrity of your facility. Your roof and walls may not even be leaking into the building, yet thousands of dollars in damage may be occurring inside your roof assembly and wall components. These conditions are highly damaging to your building—especially the freeze/thaw condition. Seams can split and ice falls, causing punctures that allow water to enter your roofing system, soaking insulation and decreasing serviceability and causing increased energy expenses.



Why not perform a quality check?

Identify minor conditions before they become expensive major problems and while they can still be repaired in a cost-effective manner. This quality check is known as Fall Preventative Maintenance.

Emergency Leaks? 
Call 1-888-STOP-LEAK 
(1-888-786-7532)

24/7 Emergency Service