



2023 IPMI PARKING GARAGE SAFETY SYMPOSIUM

How Safe are Your Parking Facilities?

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Welcome



Rachel Yoka, CAPP, LEED AP
Chief Strategy Officer
International Parking & Mobility Institute



Gary A. Means, CAPP
Chair, Board of Directors
International Parking & Mobility Institute

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Presenters



Brett Munkel, CAPP
Vice President
SP+
Moderator



Blake Hodge, PE
Vice President, Structural
Engineer Team Lead
Kimley-Horn



**Rob McConnell, PE SE,
LEED GA**
Vice President
WGI Parking Solutions



Mark Santos, PE, CAPP
Director of Operations
Walker Consultants

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Intent and Objectives



- Raise awareness about the single most important aspect of planning, design, construction, and operations: **the safety and welfare of our patrons, employees, and the public.**
- Share expert insight, experience, and best practices gleaned from comprehensive experience across market sectors.
- Learn how to assess your facilities for safety considerations; spot red flags and warning signs, and train your team.
- Update and enhance your standard operating procedures for improved maintenance and long-term asset management.

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Our Scope Today

- **Primary Focus: life safety and structural considerations**
 - Every project and structure is different, as is every jurisdiction.

- **Additional related subjects that will be discussed as they relate to primary focus:**
 - Mechanical, Engineering, and Plumbing (MEP) systems and service, including but not limited to ventilation, lighting, elevators, etc.
 - Electric Vehicle Charging Systems (EVCS) and related infrastructure
 - ADA Guidelines, and others.

- **For more complete information and guidance on these and other topics, reference the Resources and Next Steps slides at the end of the presentation.**

The following information should be considered as guidance and best practices, and is not a substitute for professional services from licensed engineers and contractors. It is of note that all professionals should carefully adhere to all federal, state, and local regulations, codes, and ordinances, as these vary widely depending on jurisdiction.

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Maintaining a garage is like maintaining any other asset...



- Repairs
- DIY
- Preventative Maintenance
- Equipment/Appliance Replacement and Upgrades
- Budget

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But knowing garage-specific details about maintenance, operations, and asset management matter!



Each includes structural, operational, and aesthetic elements

Routine maintenance

- Housekeeping, tasks, & safety checks for effective day-to-day operation

Preventative maintenance

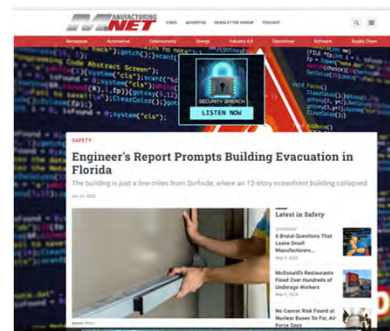
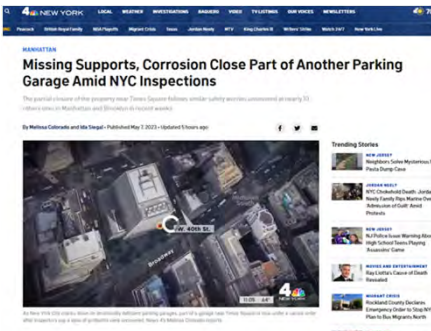
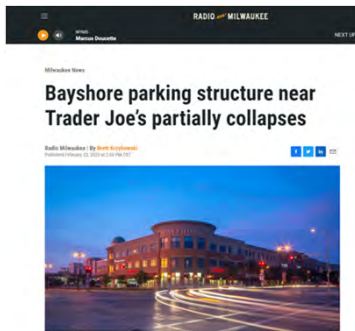
- Actions to protect asset and extend the service life of facility

Replacement or repair

- Actions to repair or replace elements at end of service life.

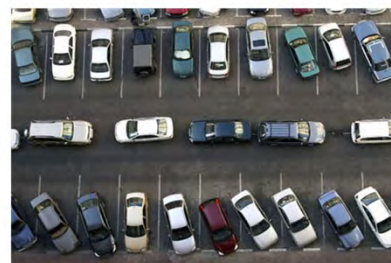
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Introduction: Design and Structural Issues



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Introduction: The Human Factor



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Fundamentals of Garage Design

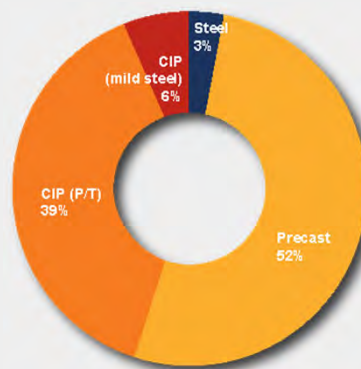
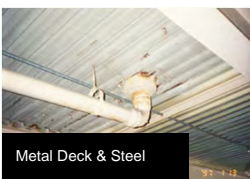
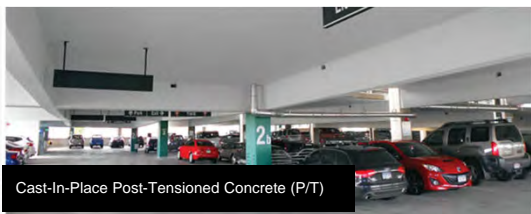


- Structured Parking Types
- New Construction vs Existing
- Time and Cost Implications
- Facility Components
- Deterioration Types

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Structured Parking Types



New Construction vs. Maintenance/Renovation

New Construction designed to current building codes, which change over time:

- Earthquakes
- Wind
- Fire
- Life Safety
- Salt usage

Existing Construction: Maintenance is required for all structures, starting day one.

- Preventative/Routine
- Sealants/coatings: typically 5 year warranty, 7-10 year lifespan
- Roofing/Plaza Waterproofing: 20-25 years
- LED Lamps: ~5 years
- Precast and flange connections
- Corrosion-induced deterioration: 10-20 years



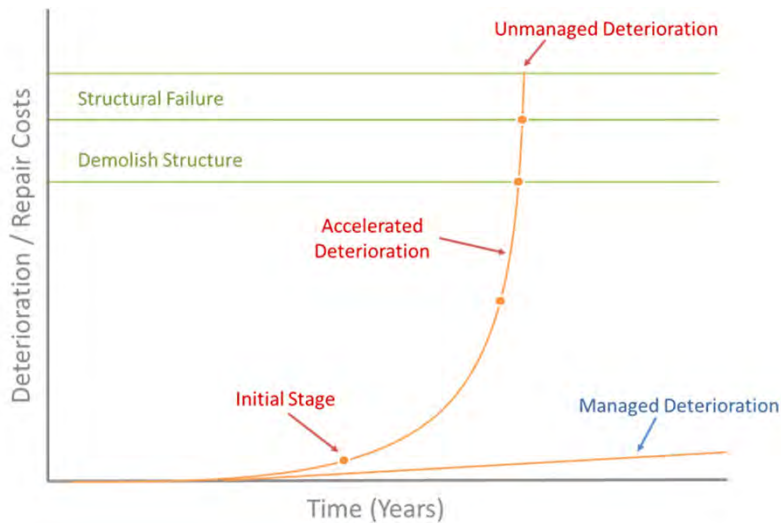
Location and Cost Implications

- Age of structure
- Geographic location
- Structural type

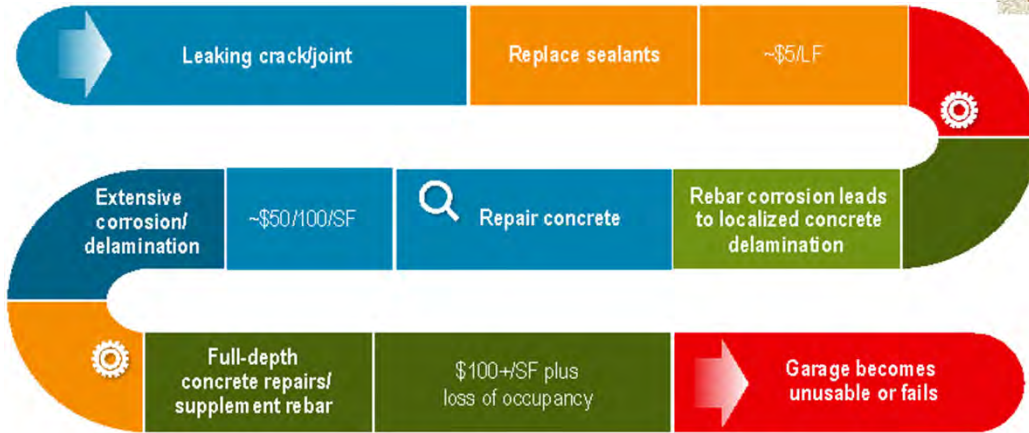


Source: ACI 362.1, also reference 362.2

Time and Cost Implications



Time and Cost Implications



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Operational and Aesthetic Elements



Operational

- Plumbing and mechanical systems
- Electrical systems
- Parking and revenue control equipment
- Security system
- Functional design and striping
- Signage and wayfinding elements

Aesthetic

- Architectural facades and finishes
- Landscaping
- Painting
- General appearance



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Facility Components



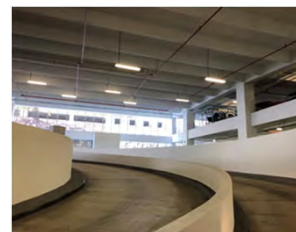
Selected components to be addressed in today's symposium

- Functional Design
- Signage and Parking Access & Revenue Control
- Stairs and Elevators
- Related aspects of lighting, plumbing, ventilation, and fire protection

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Facility Components: Functional Design



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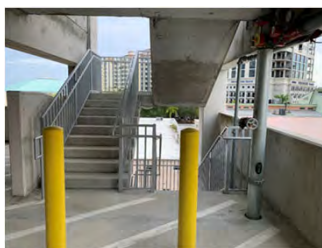
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Facility Components: Signage and Parking Access & Revenue Control



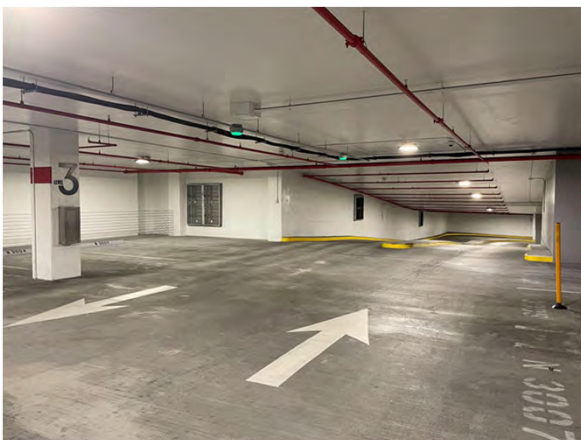
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Facility Components: Stairs and Elevators



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Facility Components: Lighting, Plumbing, Ventilation, and Fire Control



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Identifiers

Types of Deterioration, Definitions,
and Sample Images



- Concrete cracking
- Concrete spalling, cover, and freeze-thaw
- Precast-specific
- Water Ponding, Leaking, & Intrusion
- Barrier Repairs
- Expansion Joints
- Sealants and Coatings

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Deterioration Types

Concrete Cracking

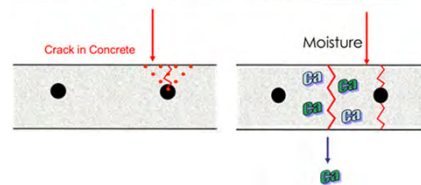
A complete or incomplete separation of concrete into two or more parts produced by breaking or fracturing



Structural Overloading



Shrinkage



Deterioration Types

Concrete Delamination

A fragment detached from a larger mass by the action of weather, by pressure, or by expansion within the larger mass



Deterioration Types



Reinforcement Failure

Broken PT tendons, loss of reinforcement area



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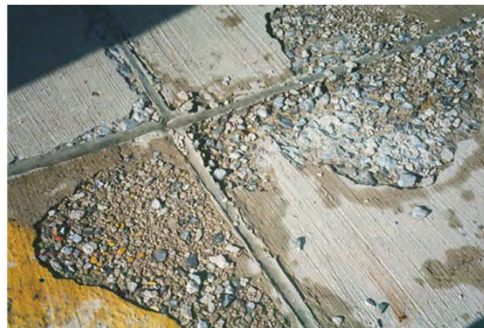
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Deterioration Types



Scaling (Freeze/Thaw)

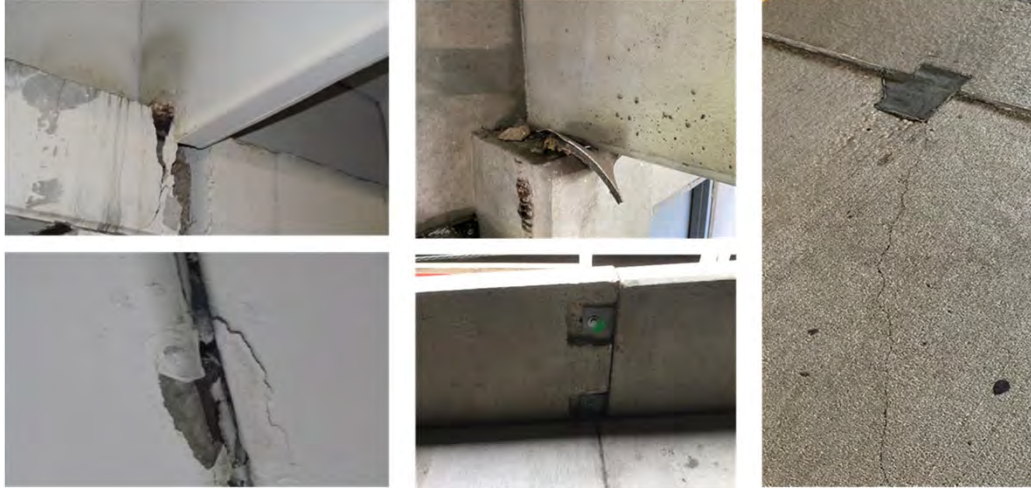
Fluctuation of temperatures above and below freezing where water freezes and causes expansion, typically associated with lack of air entrainment in the concrete



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Deterioration Types: Precast-Specific



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Deterioration Types

Standing Water and Ice



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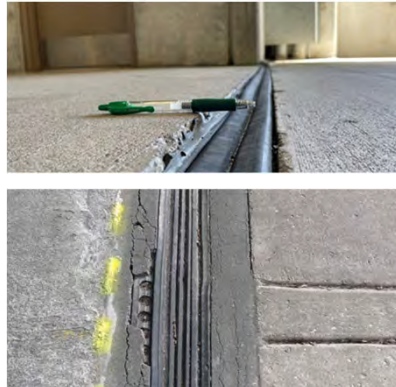
Deterioration Types



Guardrail Failure



Expansion Joint Failure



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Deterioration Types



Failed Sealants



Failed Coatings



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Questions thus far?



Coming up...

- Five Steps to Prepare for Management/Repair
- Immediate Needs vs. Planning Cycle
- Reactive to Proactive Strategies
- Roles: Owner/Operator vs. Expert/Contracted
- Asset Management Planning & Key Questions
- Funding
- Operational Context
- Best Practices and Resources

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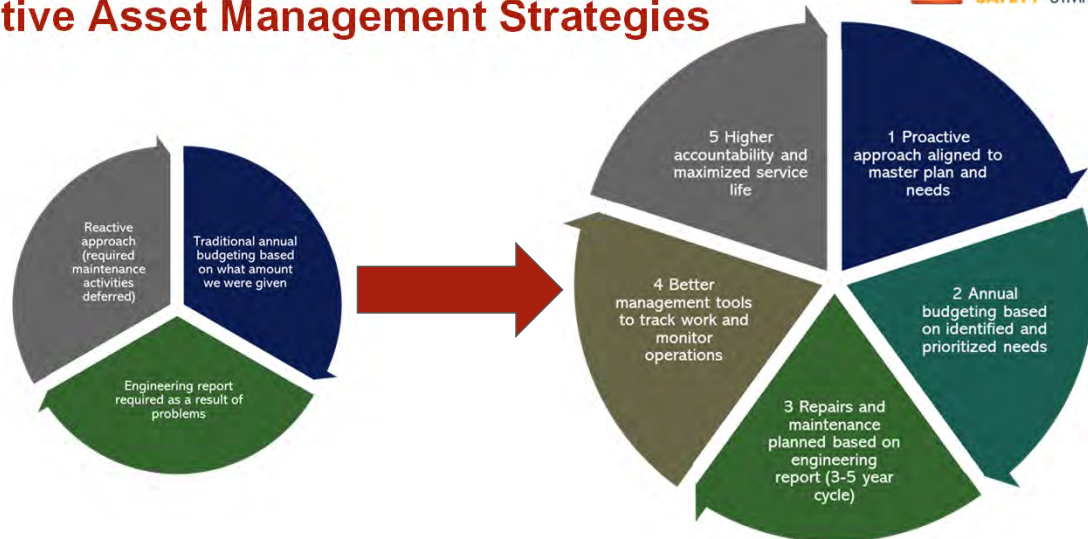
Five Steps to Prepare for Asset Maintenance & Repair



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Adapting from Reactive Maintenance to Proactive Asset Management Strategies



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Responding to Immediate Needs vs. Continuous Planning Cycle



Immediate Response

- Identify & respond to public safety issues.

Programming

- Budget, schedule, and operational constraints
- Customer needs
- Noise, vibrations, working hours
- Service objectives and useful service life
- Repair alternatives
- Life cycle costs
- Planning horizon (usually 3-5 years, 10 years max.)

Programming Continuity

- Periodic evaluations
- Tracking necessary deferred maintenance/repairs
- Track and monitor performance of repairs
- Update program regularly

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Asset Management Planning

Reap the Benefits



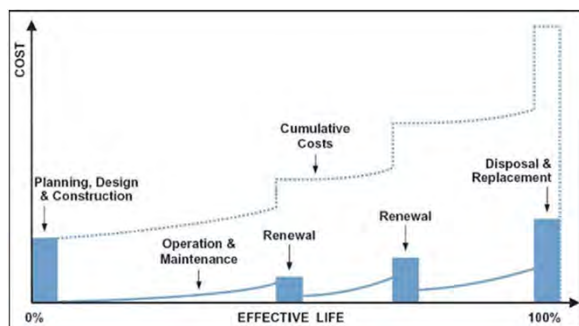
- Recordkeeping and Data Management
 - Past repairs
 - Financial projections for future repairs and maintenance
 - Reliable technical and support information for future funding
- Strategic and Master Planning
 - Enhance master planning and maximize useful service life of assets
 - Provides program continuity through organizational changes

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Asset Management Planning

Reap the Benefits



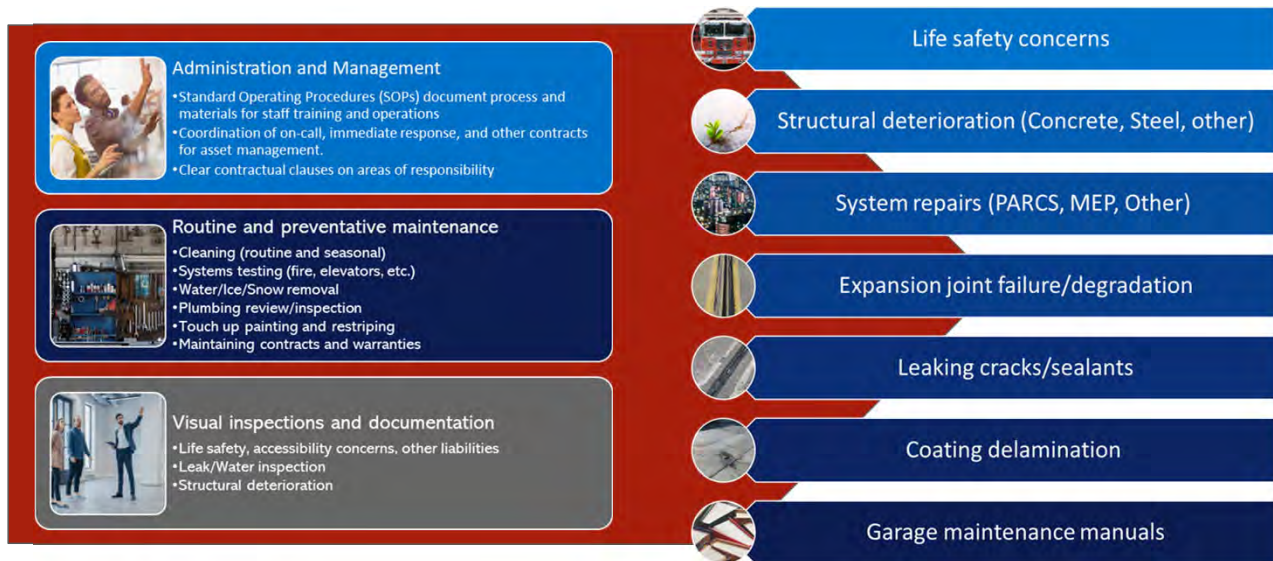
Financial Impacts

- Better plan for service life using the minimum amount of capital
 - Minimize financial/operational surprises
 - Meet mandated asset management requirements
 - Reduce downtime and lessen revenue impacts
- Creates a stronger position to compete for limited funding
- Allows for steady capture of program revenue over long-term

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Owner and Operator vs. Expert/Contracted Role



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Assessing your facilities: Can you answer these questions?



- What is the current condition of each structure?
- Will the role/use change in the future?
- What's the expected service/use life?
- Which structure(s) need attention and in what order?
- Which minimal repairs ensure safety?
- Which repairs will maximize service life?
- Are there deferred maintenance needs?
- What structural maintenance should occur and how frequently?
- What are the long-term probable costs for maintenance/repair?
- Is your budget adequate to meet immediate, mid, and long-term objectives?
- Should upgrades be implemented:
 - Functional
 - Electrical service (EVSE and other needs)
 - Elevator
 - Lighting
 - Ventilation
 - ADA
 - PARCs and PGS
 - Signage and wayfinding, etc.

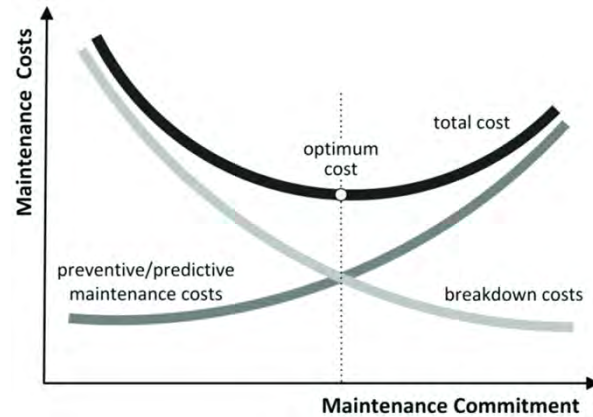
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Annual Funding



- Capital Improvements
- Operating Budgets
- Maintenance Budget
- Fixed
- Carry over



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The Operational Content



- Identify areas of focus
- Disseminate information to operations
- Routine reviews (checklists)
- Defined path
- Checks and balances for follow-up



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Best Practices

The Basics



1. Adopt a proactive approach versus a reactive one.
2. Maintain detailed SOP for maintenance and repairs.
3. Conduct operations/maintenance.
4. Train your employees to identify issues early.
5. Conduct routine visual reviews and documentation.
6. Scope and perform condition assessments every 3 to 5 years.
7. Budget and execute other capital repairs and improvements.

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Best Practices

Level Up



1. Initiate and consistently fund a capital reserve for each structure, that aligns with your asset management strategy.
2. Maintain pool of on-call consultants and experts for immediate response, ongoing support, engineering services.
3. Obtain and adhere to facility Maintenance Manuals.
4. Update and maintain consistent and comprehensive SOPs, and trigger full update when any new technology, amenity, or system is installed or updated.

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QUESTIONS & ANSWERS

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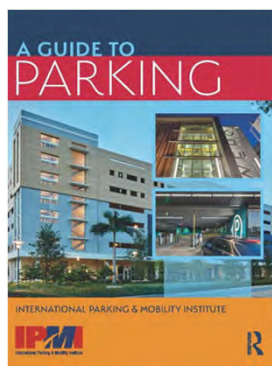
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Resources, Education, and Training

[A Guide to Parking](#)

IPMI's textbook for the industry, A Guide to Parking, provides information on the current state of parking, providing professionals and students with an overview on major areas of parking, transportation, and mobility industry.



- [IPMI's CAPP Program](#)
 - [Free CAPP Track](#)
- [IPMI Annual Conference & Expo](#)
 - June 11-14, 2023, Fort Worth
 - Comprehensive education program
 - Specialized pre-Conference Courses
 - Expert suppliers and consultants
- [Parking & Mobility](#) magazine
- [IPMI on-demand education on asset management and safety](#)
- Free Industry Shoptalks/Frontline Trainings
- [Industry events calendar](#)

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