SUCCESSFUL SIDEWALK STRATEGIES:
EFFECTIVE SIDEWALK MAINTENANCE MANAGEMENT

Presented By
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Learning Objectives
- Develop a comprehensive, systematic sidewalk inspection and inventory process
- Identify potential liabilities and risks and prioritize deficiencies
- Design and implement a coordinated and proactive sidewalk repair program for maximum effectiveness of limited funds

Part I  Problems Underfoot...
- Sidewalks an essential part of public infrastructure
- Deterioration and damage occur over time
- Repairs historically a low priority
- Competition for limited funds
- Deferred maintenance backlog grows

Part I  Complications
- Potential hazards/ liability risk increase
- Confusion as to repair responsibility
- Claims and lawsuits grow
- ADA compliance
- Focus on pedestrian safety and mobility

Part I  Typical Approaches
- Do nothing
- Respond only to complaints
- Temporary repairs only
- Limited permanent repairs
- Periodic area inspections
- Inspect, notify property owner to repair
- Inspect, share cost
- Inspect, agency pays all cost
Part I  New Pressures

- Increased awareness by public
- Seen as quality-of-life issue
- Affects property values

“do it yourself”

Overview of Overland Park

Overland Park  Current Facts:
- 74 Square miles
- 1,750 lane miles of streets
- Over 800 miles of sidewalks
- Population 170,000
- Suburban; one of Top Ten medium-size Livable Cities

Part II  The Big Questions

How much sidewalk?

Where are the deficiencies?

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How much sidewalk?

Where are the deficiencies?
Part II Basic Answers

Three areas that will get those answers:
- Inventory
- Criteria
- Data Collection

Part II First Step: Inventory

- Created electronic database of our sidewalks using ArcMap by ESRI and aerial photos.
- GBA Master Series module is where the data is stored.

Part II Inventory

Aerial with sidewalk overlay

Part II Inventory Record

Inventory Record Contains:
- Sidewalk ID #
- Address Location
- Length
- Width
- Date Built
- Summary of Inspections
- Summary of Work Orders

Part II Inventory Additions

Maintaining the database
- New sidewalk from developer projects
- Subdivisions
- Private/Developer projects

- New sidewalk from PW projects
- Thoroughfare construction
- Residential in-fill by petition
- Residential Street Program
Part II The Evaluation Criteria

- Needs to be simple, objective and comprehensive as possible
- Flexible & adaptable to changing needs
- Based on standards established by other agencies
  (Nashville, Milwaukee, University of Wisconsin course)
- Field tested and refined

So, what is your criteria?

Part II Criteria; All Cracked Up

Durability or ‘D’ Cracking

Part II Criteria; Whose Fault?

Faults or Vertical Displacement

Part II Criteria; The Gap Trap

Gap

Part II Criteria: A Bad Joint...

Joint Spalling

Part II Criteria

Linear Cracking
Part II Criteria; Depressing...

Settlement

Part II Criteria; Rough Stuff

Surface Defects

Part II Data Collection

Measuring Up...

Part II Walk the Walk

- Begin survey in May 2004; six seasonal workers.
- Operate in teams of two.
- Program Manager trained and monitored crew.
- Follow Operations map; City divided into mile-sections and quarter-mile quadrants.
- Provides closer control and a system for logging the data.

Part II Walk the Talk

Part II Data Collection In The Field

Then

Now
Part II Taking a Shot in GPS

Data Collection Screen
- List of Distresses
- Cross Slope as a %
- Distance in L.F. of Sidewalk to be Replaced.

Part II Dot the Spot With GPS

Part II Slopinator...What’s That?

Part II Inspection Record

Part II Re-Inspections
- Re-inspect prior to major contract work
- Street rehabilitation / reconstruction projects
- Selected Neighborhood sidewalk replacement program
- Re-inspect entire city on 7-year cycle.
- Each year, 15% of sidewalk system or 10 sq. miles of Overland Park
- Additional deterioration, damage that has occurred
- Note any sidewalk replaced since last inspection and not already discovered or new installations

Part II Work Orders
Part II Grinding List

Part II Tracking Completed Work
- Repair & replacement data back into the database by way of
  new inspection records.
- Reports crews use.
- Program work is re-inspected by project inspectors using the
  Trimble units.

Part II Add it Up...The Numbers

<table>
<thead>
<tr>
<th>DEFECT</th>
<th>INITIAL</th>
<th>NOW</th>
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</thead>
<tbody>
<tr>
<td>D CRACKING</td>
<td>591</td>
<td>740</td>
</tr>
<tr>
<td>FAULTS</td>
<td>27,716</td>
<td>23,391</td>
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<tr>
<td>GAP</td>
<td>1,152</td>
<td>1,679</td>
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<tr>
<td>JOINT SPALLING</td>
<td>2,548</td>
<td>2,800</td>
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<tr>
<td>LINEAR CRACKING</td>
<td>18,220</td>
<td>16,671</td>
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<tr>
<td>SETTLED</td>
<td>248</td>
<td>320</td>
</tr>
<tr>
<td>SURFACE DEFECT</td>
<td>3,286</td>
<td>3,759</td>
</tr>
</tbody>
</table>

Part II Mapping It Out
- GIS Mapping

Part III Repairs; Where To Start
- Use the data to:
  - identify areas of greatest need
  - determine order / sequence of repair work
  - track work completed

Part III Repairs; The “Tool Box”
- Priority to faults (trip hazards)
- Three-prong approach:
  - Temporary patch
  - Grinding
  - Full-slab replacement
Part III Repairs; A Patch In Time...

- **Patching**
  - Originally for faults of ½” +; now used when grinding and replacement not readily available
  - Temporary; quickly mitigates hazards
  - Concrete mixtures instead of asphalt
  - Two-person team
  - About 20 minutes to complete

Part III Repairs; Work Is A Grind...

- **Grinding**
  - for faults of ½” to 2”
  - Machines cost about $5,000
  - Generally favorable acceptance by public
  - Regarded as a “permanent” repair
  - Two-person team
  - About 20 minutes each site
  - More than 26,000 locations

Part III Repairs; Root It Out...

- **Full-slab replacement**
  - Faults over 2” and certain other problems
  - More than 1,200 locations
  - Focus contract on areas with highest concentration
  - Maintenance Division crews handles others outside of the contract target area

Part IV Proactive Measures To Reduce Liability

- **No Problem?**

Part IV Requirements

- Federal regulations
- State jurisdiction
- City ordinances & resolutions
- Adopted manuals, i.e. “Manual on Uniform Traffic Control Devices” (MUTCD)
- Court cases and precedents
- Standard specifications

Part IV Federal Requirements

Title II subpart A of the Americans with Disability Act (ADA) covers state and local governments -

- Enforced by the Department of Justice (DOJ)
- Implemented by the Federal Highway Administration (FHWA) Office of Civil Rights
- Access Board develops and maintains the minimum design ADA Accessibility Guidelines (ADAAG) for new construction and alterations.
Part IV State & City Requirements

State
- Specifications
- Standard Details

City Policies -
- The Implementation of the Action Plan
- Follows City Ordinances and Regulations

Specifications: Based on Standards and Guidelines -
- Sidewalk width: 4' or 5' - more walkable usage and up to 10' for a combine Sidewalk & Bike trail
- Precedent: Consistency

Part IV A Coordinated Plan

Sidewalk replacement by various sources:
- Annual sidewalk area replacement contract
- Annual street overlay program (includes curbs)
- Residential street reconstruction project
- Thoroughfare street widening projects
- Maintenance Division's own crews
- Storm sewer projects
- Other agencies
  - Adjacent Cities
  - State and County projects
  - Major utility repair or installation

Part IV Coordination Of Effort

Part IV What To Do or... Not

Safety?

Part IV What Not To Do

Down slope too steep
And this is...?

For a skywalk?

All or nothing...
Part IV What To Do

- Follow Your ADA Transition Plan
- Wheel Chair Ramps: When & Where

Establish Policies:
- Sidewalk abuts at driveway, not through a driveway
- Who will pay
- Citizen’s request

Part IV What To Do

Be Specific…

Establish clear replacement guidelines:
- Faults (trips) greater than 1” (replace)
- Settlements drainage problem
- Cross-slope greater than 3\\degree
- Gaps greater than 3” (joint seal)
- Joint spalling more than 2” width; loose pieces
- Linear cracking displacement greater than 1”
- Surface defects more than 25% of slab; loose pieces
- “D” cracking more than 25% of slab; loose pieces

Part IV Be Precise…

- Data from Inspection Inventory and Citizen Requests tracked to make sure they are not missed by the Project Manager
- Check for additional deterioration since last survey by your Inspector
- Actual quantities will increase due to practicality
- Difference between your criteria and the citizen’s perception
- Budget constraints and just how you stretch it

Part IV Be Proactive By Preventive Measures

- Flowable Fill at utility cuts plus 2 year warranty
- Use of re-bar in a sidewalk
- Materials used: brick, asphalt, concrete, gravel, rubber, and maybe even mulch
- Concrete mix: granite, fiber, ASR additive, color
- Thickness may vary at location (i.e., ramp)
- Joint tooling & use of joint material
- Joint locations outside the curb returns
- Tree restrictions

Part IV A Tree For Thee…

- Types of trees allowed between curb and the sidewalk
- Work with your City Forester before, not after
- Tree roots
- Tree pruning
Part IV Customer Service

Quality Control
- Advance written notification to property owner
- Educate the homeowner on criteria
- Repair sprinklers within 48 hours of tear-out
- Grading and hydro-seed yard restoration within r.o.w.
- Mark-out no more than 30 days in advance
- Use survey card for feedback

Part IV Keep On Tracking

Collect data with GPS to give to:
- Sidewalk Inventory Manager
- ADA Inventory Manager
- Document where a driveway affects the walking path

Part IV Around We Go

Part V Summary

Evaluation of program
- Better communications & information access
- Improved efficiency, effectiveness, responsiveness
- Enhanced public safety
- Quicker resolution of claims
- Favorable public perception
- Positive support from elected officials
- Accurate information for budgeting
- "Esprit de crew"
- Article in Journal of Public Works and Infrastructure

Lessons Learned

Don’t be overwhelmed
- Well-defined criteria
- Simplified data collection process
- Divide into manageable units
- Adjust as needed
- Focus on priorities
- Coordinate efforts

Closing

Other related sessions
Evaluations and CEUs
Comments, Questions?

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Overland Park
Sidewalk Distress Identification Manual

July 19, 2007
Castings (1)

Description
Castings are cast iron manholes, valve covers, or other similar devices that are located within a sidewalk slab. Castings can be a tripping hazard, and can interfere with the operation of wheelchairs or pedestrians. Castings are often attached to structures with deep foundations that resist earth movements caused by changes in moisture and freezing and thawing differently than ordinary sidewalks. This difference can cause faulting at the edges of the slab containing a casting, and is the basis for the recommendation that slabs containing castings be isolated from adjoining slabs. Castings should be located outside the minimum 4 foot access route in a sidewalk.

Severity Levels
There are no severity levels for castings.

How to Count
Measure each slab that has one or more castings. If a wide slab has a casting, but still retains a minimum of 4 feet of clear access do not count the distress. Downtown areas have sidewalks that may be 10 or more feet wide. These areas will typically have a 4 foot access route that is free from castings. **Count castings in addition to other distresses for each slab that contains castings.** Record the length of affected slabs in feet.
Figure 1 – Casting
Durability ("D") Cracking (2)

Description

“D” Cracking is caused by freeze-thaw expansion of the large aggregate which, over time, gradually breaks down the concrete. This distress usually appears as a pattern of cracks running parallel and close to a joint or linear crack. Since the concrete becomes saturated near joints and cracks, a dark-colored deposit can usually be found around fine “D” cracks. This type of distress may eventually lead to disintegration of the entire slab.

Severity Levels

M  One of the following conditions exists (Figure 2M): (1) “D” cracks cover less than 25 percent of the area and most of the pieces are loose and or missing, or (2) “D” cracks cover more than 25 percent of the area. Most of the cracks are tight, but a few pieces may be loose or missing.

H  “D” cracks cover more than 25 percent of the area and most of the pieces have come out or could be removed easily (Figure 2H)

How to Count

When the distress is located and rated at one severity, it is counted as one slab. If more than one severity level exists, the slab is counted as having the higher severity distress. For example, if low and medium “D” cracking is on the same slab, the slab is counted as medium-severity “D” cracking only. **“D” cracking should be counted in addition to other distresses for a slab with the exception of surface defects.** Record the length of affected slabs in feet.
Figure 2M – Medium Severity “D” Cracking

Figure 2H – High Severity “D” Cracking
Faulting (Kickers) (3)

Description

Faulting is the difference in elevation across a joint. Some common causes of faulting are:

1. Settlement because of soft foundation.
2. Tree roots that raise a slab above the adjacent slab.
3. Overlays on drives.

Severity Levels

Severity levels are defined by the difference in elevation across the joint as indicated in Table 3. Figures 3L through 3P show examples of the different severity levels.

<table>
<thead>
<tr>
<th>Severity Level</th>
<th>Difference in Elevation</th>
</tr>
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<tbody>
<tr>
<td>L</td>
<td>&gt; ½” and &lt; 1”</td>
</tr>
<tr>
<td>M</td>
<td>&gt; 1” and &lt; 2”</td>
</tr>
<tr>
<td>H</td>
<td>&gt; 2”</td>
</tr>
<tr>
<td>P</td>
<td>Any difference if patched and the patch is in good condition.</td>
</tr>
</tbody>
</table>

How to Count

Faulting across a joint is counted as one slab. Only affected slabs are counted. If the patch has failed or is not in good condition record the distress as either a Medium or High severity distress (if the difference is less than 1” record a Medium severity distress). Faults across a crack are not counted as a faulting distress, but are considered when defining crack severity. Record the total length of affected slabs in feet. Faulting should be counted in addition to other slab defects, except gaps.
Figure 3L – Faulting ½-1”

Figure 3M – Faulting 1-2”

Figure 3H – Faulting >2”

Figure 3P – Patched Fault
Gap (4)

Description

Gaps are horizontal openings between adjacent slabs caused by settlements, or by differential movements of sidewalk elements. ADAAG guidelines limit these gaps to $\frac{1}{2}$ inch.

Severity Levels

L  Gap is visible and $\leq 1$ inch
H  greater than 1 inch
P  Any gap if patched and the patch is in good condition

How to Measure

If two adjacent slabs have a visible gap, record one slab of gap at the appropriate severity level. Do not record cracks as gaps, instead record the measured longitudinal crack. Adjacent slabs will normally have some space between them; this distress should only record those spaces that are wider than the normal space. If the gap is between two slabs that have faulted, record the fault instead of the gap distress. **Gaps should be counted in addition to other distresses for the affected slabs.** Record the length of affected slabs in feet.
**Joint Spalling (5)**

**Description**

Joint spalling is the breakdown of the slab edges within 6 inches of the joint. A spall usually does not extend vertically through the slab, but intersects the joint at an angle. Spalling results from:

1. Weak concrete at the joint caused by overworking.
2. Water accumulation in the joint and freeze-thaw action.
3. Excessive stresses at the joint caused by improper slab isolation.

**Severity Levels**

Figures 5L and 5H show the severity levels of spalling. A frayed joint where the concrete has been worn away along the entire joint is rated as low severity.

L One of the following conditions exist: 1) the width of the spall (measured from the joint into the slab) is less than 2 inches, 2) less than 50% of the joint is affected, or 3) the spalled pieces are tight and cannot be removed easily.

H The width of the spall (from the joint into the slab) is greater than 2 inches over 50% or more of the joint and the spalled pieces are loose or missing.

**How to Count**

If spall is along the edge of one slab, it is counted as one slab with joint spalling. If spalling is on more than one edge of the same slab, the edge having the highest severity is counted and recorded as one slab. Joint spalling can also occur along the edges of two adjacent slabs. If this is the case, each slab is counted as having joint spalling. If the spall is the result of “D” cracking, record both distresses. **Joint spalling should be counted in addition to other distresses for the affected slabs.** Record the length of the affected slabs in feet.
Figure 5L – Low Severity Joint Spalling
**Linear Cracking (6)**
*(Longitudinal, Transverse, and Diagonal Cracks)*

**Description**

These cracks divide the slab into pieces and are usually caused by loading. Hairline cracks only a few feet long and not extending across the entire slab are counted as shrinkage cracks if they meet the criteria discussed in distress 11, Surface Defects.

**Severity Levels**

- **N** Cracks with widths < 1” and with no faulting at the crack.
- **W** Cracks with widths > 1” and with no faulting at the crack.
- **L** Any width cracks faulted ½” to 1”
- **M** Any width crack faulted 1” to 2”
- **H** Any width crack faulted > 2”
- **P** Faulted cracks that have been patched and the patch material is in good condition.

**How to Count**

After severity has been identified, the distress is recorded as one slab. Record the length of affected slabs in feet. **Count linear cracking in addition to other distresses for the affected slabs.** Do not count the faulted sections of a crack as a “Fault.” Instead, record the appropriate severity for the linear cracking distress.
Figure 5N – Non-faulted Linear Crack

Figure 5L – Low Severity Linear Crack
**Obstructions (7)**

**Description**
Obstructions are any structure or device that prevents the pedestrian from using at least a four foot section of a walk. Examples of obstructions include:

1. Poles located within a sidewalk
2. Fire Hydrants
3. Utility boxes.
4. Storm drainage structures that are not flush with the adjacent walk.
5. Street furniture.

**Severity Levels**
There are no severity levels

**How to Count**
Each slab that has an obstruction should be counted. Slabs with more than one obstruction should still be counted as one slab. Slabs that have a minimum 4 ft horizontal clearance do not have obstructions. **Count obstructions in addition to other distresses for the affected slabs.** Record the length of affected slabs in feet.
Protruding Objects (8)

Description
Protruding objects are those objects with leading edges more than 27 inches and not more than 80 inches above the surface of the walk that protrude more than 4 inches into the walk. These objects escape detection by blind pedestrians, and represent a hazard for them.

Severity Levels
There are no severity levels from protruding objects.

How to Count
Count each protruding object as one slab. Count Protruding Objects in addition to other distresses for the affected slabs. Record the length of affected slabs in feet.
Figure 8 – Protruding Objects
(Guy wire is 76” above walk)
Settlements (9)

Description

Settlements are two or more slabs of a sidewalk that have settled. These often are caused by the improper backfilling and compaction of a utility trench or pit. They should only be recorded at the point where they are clearly visible, and where they cause drainage, slope and ramp angle (counter slope) problems.

Severity

There are no severity levels for settlements.

How to Count

Count the number of slabs that have settled. One of the following conditions should be met before the distress is recorded:

1. The settlement creates a “bowl” that will not drain.

2. The counter slope (algebraic difference in grade) at the low point of the depression exceeds 11%. Thus if the entering slope were -6% and the leaving slope was +6% the counter slope would be 12% and the distress should be recorded. With 4 ft. x 4 ft. slabs, a settlement of 3 inches would produce a counter slope of 12%.

Record the length of the affected slabs in feet. **Record settlements in addition to other distresses for the affected slabs.**
Slope (10)

Description

Slope is not necessarily a distress, but excessive slopes may cause a section of walk to violate Americans with Disability Act requirements as set forth in ADAAG.

Severity Levels

There are no severity levels. Actual numeric slope readings should be recorded. For each entry, a cross-slope (across the direction of travel) and longitudinal slope reading should be recorded in percent.

How to Count

At least one slope reading should be taken for each walk section in the sidewalk inventory. If the slope or cross slopes vary within a section a reading should be taken that is representative of each segment. Slope should be recorded as a percentage gradient. A one foot rise in 100 feet of run would be recorded as a 1.0% slope. Slope should be recorded to the nearest 0.1%.
Figure 10a – Measuring Cross Slope

Figure 10b – Measuring Longitudinal Slope
Surface Defects (11)

Description

Map cracking or crazing refers to a network of shallow, fine, or hairline cracks that extend only through the upper surface of the concrete. Shrinkage cracks are single examples of the same type of crack. The cracks tend to intersect at angles of 120 degrees. Map cracking or crazing is usually caused by concrete over-finishing, and may lead to surface scaling, which is the breakdown of the slab surface to a depth of approximately ¼ to ½ inches. Scaling may also be caused by deicing salts, improper construction, freeze-thaw cycles, and poor aggregate. Popouts are voids at the surface caused by poor aggregate particles that disintegrate during freezing and thawing. The type of scaling defined here is not caused by “D” cracking. If scaling is caused by “D” cracking, it should be counted under that distress only.

Severity Levels

L  Crazing, map cracking, popouts, or shrinkage cracks exists over most of the slab area; the surface is in good condition, with only minor scaling present (figure 11L)

H  Slab is scaled over 25% of its area or scaling is more than ½” deep (figure 11H)

How to Count

A scaled slab is counted as one slab. Low-severity crazing should only be counted if the potential for scaling appears to be immanent, or a few small pieces come out. Record the length of affected slabs in feet.
Figure 11L – Low Severity Surface Defects (scaling is present in this photo)

Figure 11H – High Severity Surface Defects