CONCRETE CARE

REPAIR GUIDELINES
FOR
CONCRETE CURBS AND SIDEWALKS

Prepared For

BOROUGH OF BIRDSBORO
BERKS COUNTY, PA

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Spalling/Chipping

What is it? – Spalling is the deterioration of the curb/sidewalk surface, resulting in the "flaking" or "chipping away" of pieces of concrete.

Repair Solutions – Depending on the extent of deterioration, the section of curb/sidewalk may need to be patched or replaced.

For patching, residents may use SikaQuick®1000, a "rapid hardening repair mortar" (see attached information), or an approved equal.

Care should be taken to properly clean and prepare the area prior to repairing the curb/sidewalk surface.

If you are unsure about whether or not a particular section of curb or sidewalk needs to be repaired or replaced, please contact the Borough Engineer for assistance.

This degree of spalling is not repairable, but instead the entire affected area of concrete would need to be replaced.

While significant in extent, this area of spalling could be repaired since the underlying integrity of the concrete slab remains unaffected. Alternatively, this slab could be replaced.

Cracking (Narrow)

What is it? – Narrow cracks are less than 1 inch in width measured ½ inch below the surface and typically have a clean, undeteriorated edge.

Repair Solutions – Narrow cracks should be repaired before they worsen and cause more serious damage to the curb/sidewalk. A ready-mix concrete patch can be used, such as the Sikaflex®1a or Sikadur® Crack Fix (see attached information), or approved equal. Sikadur® Crack Fix is appropriate on small cracks that do not run the full width of a concrete slab and are not subject to movement. Cracks subject to movement must be repaired with a flexible material, such as Sikaflex®1a, that allows for movement. Cracks subject to movement include cracks running the full width of a slab and cracks extending from a concrete joint (expansion and contraction/score joints).

Care should be taken to properly clean and prepare the area prior to repairing.

The lower left crack is an example of a narrow crack with relatively clean edge.

This narrow crack extends from a concrete joint and must be repaired with a flexible material such as Sikaflex®1a.

Cracking (Wide)

What is it? – Wide cracks are greater than 1 inch in width measured ½ inch below the surface and may be associated with additional chipping or spalling of the surface adjacent the crack.

Repair Solutions – Wide cracks and any crack with a deteriorated edge (chipping and/or spalling) adjacent the crack will require replacement of the affected portions of concrete.

If you are unsure about whether or not a particular section of curb or sidewalk needs to be repaired or replaced, please contact the Borough Engineer for assistance.

This crack is an example of a wide crack with deteriorated edge. This crack cannot be repaired. The affected section of concrete must be removed and replaced.

Settlement/Heaving

What is it? – Settlement and heaving of a sidewalk/curb can occur for different reasons, but is typically associated with uneven settlement of the sub-base and/or subgrade beneath a single or multiple slabs of concrete, or by tree roots growing beneath the surface. Settlement (subsidence) and heaving may or may not result in cracks or other damage to the curb/sidewalk. It can also result in the concrete being pitched toward the adjacent property instead of the street, which may lead to drainage problems.

Repair Solutions – If the amount of vertical displacement is minor, occurs at a joint, and no adverse drainage conditions are created (such as pooling of water or incorrect drainage patterns), it may be possible to repair the section. Displacement of no more than 1-1/2 inches may be corrected by grinding away the high edge of the curb/sidewalk. If the amount of displacement is no more than 2" you may be able to "mudjack" (injecting concrete grout under the sunken slab) the lower side.

If displacement of the sidewalk is too great or if the displacement occurs at a crack as opposed to a joint, the affected area will need to be removed and the sub-base/subgrade beneath leveled appropriately before replacing the concrete section.

If displacement is caused by tree roots growing beneath the surface, see section below.

If you are unsure about whether or not a particular section of curb or sidewalk needs to be repaired or replaced, please contact the Borough Engineer for assistance.

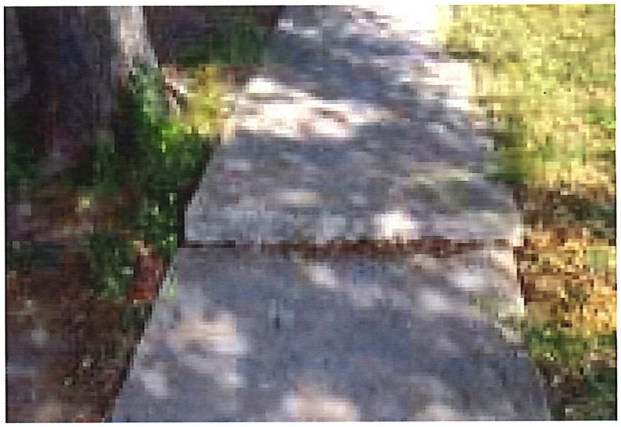
Tree Root Conflicts

What is it? – Tree roots can cause heaving of concrete sidewalks as they grow beneath the slab. As the roots increase in size, upward force is exerted on the concrete slabs of the sidewalk. This force eventually causes them to lift upward, creating an uneven walking surface. This can result in differential movement at joints in the concrete walk or it can cause a slab of concrete to crack. In either instance, this can cause abrupt vertical displacements in the walking surface.

Tree Evaluation – Prior to performing sidewalk repair, a tree evaluation should be conducted by a qualified individual, such as a Certified Arborist or Forester, to determine the tree's physical condition, provide recommendation as to whether the tree should remain or be removed, and help identify appropriate sidewalk repair solutions. If the tree is to be removed, then consideration shall be given as to whether the tree should be replaced. Consideration shall be given to the numerous benefits afforded by trees such as shade and windbreak, both of which reduce energy consumption for cooling and heating of buildings and provide comfort for pedestrians; improved air quality through pollutant removal; carbon dioxide removal and oxygen release; increased property values; aesthetic beauty; and contribution to stormwater quality and runoff control. If site conditions allow, locate replacement trees so the base of the tree at maturity will be at least four to five feet from the edge of the sidewalk.

Repair Solutions – For displacement caused by tree roots growing beneath the sidewalk a number of repair solutions exist. The advantages and disadvantages of each option should be considered as well as physical site constraints which may limit the options available.

Approval must be received from the Borough Engineer prior to implementing a repair solution. Any changes in sidewalk material, alignment or dimensions must be approved by the Borough.



Vertical displacement of sidewalk slab caused by tree roots.

- **Grinding or mudjacking** the affected sidewalk as described in the previous section. (a short term solution)
- **Root Pruning**, which must be conducted by a qualified professional using extreme care to avoid unduly compromising the root system, tree stability and overall health of the tree. Root pruning should be used when no other alternatives are available and must be conducted in strict conformance with industry standards. (a short term solution)
- **Sidewalk Ramping**, which consists of replacing affected portions of sidewalk with reinforced concrete walkway ramped overtop existing roots. Ramping must conform to ADA standards and the interface of the edges of the sidewalk and adjacent grade/features carefully resolved. This option has limited suitability and is not appropriate adjacent curbs and many existing structures. (a short term solution)

- **Increase Tree Well and/or Meander Sidewalks** around trees where existing site conditions allow and sufficient area exists. Locating the sidewalk away from the base of the tree, increase the distance from the root flare and associated larger upward-growing tree roots nearer the tree trunk. (length of solution effectiveness varies dependent upon distance gained)

Example of increased tree well area.

Example of meandering sidewalk around existing tree. When space permits, the walk would be located at least four to five feet from the base of the tree.

- **Reduce Sidewalk Width** where possible to increase distance between sidewalk and problematic tree roots. (length of solution effectiveness varies dependent upon distance gained)
- **Replace with Unit Pavers**, such as brick or concrete pavers on a flexible base. Unit pavers create a flexible pavement that tends to undulate under the force of upward-growing tree roots. Though unit paver sidewalks can become wavy over time, they are commonly considered to be easier to navigate than heaved concrete sidewalks and are simpler to correct/level. (a long term solution)
- **Replace with Rubberized Sidewalk Panels** Rubberized sidewalks have an elastic property that allows them to mound under the stress of upward growing tree roots instead of cracking and heaving as concrete is prone to do. These gently undulating mounds are less problematic than vertically displaced concrete sidewalk slabs. This technology utilizes recycled tires to make the heavy, rubber sidewalk panels which are being utilized in cities in 25 states across the nation, including Santa Monica, San Francisco, Los Angeles, Seattle, Aspen, Indianapolis, Orlando, Savannah, Washington D.C., Baltimore, Boston, and Mt. Lebanon in Pennsylvania. Rubber sidewalk panels are produced by RubberSideWalks, Inc. (www.rubbersidewalks.com). (asserted as a long term solution, though a newer technology so may not yet be entirely proven)

Section of rubberized sidewalk panels under installation in proximity to existing street trees.

Sections of rubberized sidewalk panels installed adjacent existing street trees.

- **Replace with Asphalt**. Asphalt is a flexible pavement that can flex under the pressure of upward-growing tree roots. Since asphalt is placed in a continuous ribbon with no joints, there are no slabs to become uneven. Instead, tree roots grow through the pavement or create bulges in its surface rather than lips of vertically displaced concrete slabs. These surface irregularities are generally simpler and less costly to repair than buckling of concrete. Aesthetic considerations limit the use of asphalt walking surfaces to trails and other similar applications. Asphalt is not suitable for roadside sidewalks. (considered a long term solution)

Example of an asphalt walking trail rippled by tree roots. A conventional concrete walkway in this same location would likely have experienced considerable vertical displacement and present much greater a problem than that which is illustrated in this photograph.

While performing sidewalk repairs, extreme care must be taken to limit damage to existing trees and associated root systems to help ensure tree longevity. It is highly recommended that a Certified Arborist or Forester be consulted prior to implementing any changes or improvements around existing trees.

If you are unsure about the appropriate repair solution for a particular section of sidewalk or desire additional information, please contact the Borough Engineer for assistance. Approval must be received from the Borough Engineer prior to implementing repairs.