Cracks

ئەندازیار

فائزە نعمت جوامیر

ژمارەی پێناسە 531

لقی خانقین

Cracks

Cracks in Concrete

Common adage is that there are two guarantees with concrete. One, it will get hard and two, it will crack.

One of the most common questions is about cracks that are developing in newly poured concrete. The people will question why it is cracking and did they receive a shoddy job.

When installed properly, concrete is one of the most durable and long lasting products you can use around your home. But it is important that concrete contractors follow well-established guidelines with respect to concrete placement. Durable, high strength and crack resistant concrete does not happen by accident.

Why Concrete Cracks

Reason #1 - Excess water in the mix

Concrete does not require much water to achieve maximum strength. But a wide majority of concrete used in residential work has too much water added to the concrete on the job site. This water is added to make the concrete easier to install. This excess water also greatly reduces the strength of the concrete.

Shrinkage is a main cause of cracking. As concrete hardens and dries it shrinks. This is due to the evaporation of excess mixing water. The wetter or soupier the concrete mix, the greater the shrinkage will be. Concrete slabs can shrink as much as 1/2 inch per 100 feet. This shrinkage causes forces in the concrete which literally pull the slab apart. Cracks are the end result of these forces.

The bottom line is a low water to cement ratio is the number one issue effecting concrete quality- and excess water reduces this ratio.

What you can do about it:

Know the allowable water for the mix the contractor is pouring- or be very sure you have chosen a reputable contractor who will make sure the proper mix is poured. It is more expensive to do it right- it simply takes more manpower to pour stiffer mixes.

Reason #2 - Rapid Drying of the concrete

Also, rapid drying of the slab will significantly increase the possibility of cracking. The chemical reaction, which causes concrete to go from the liquid or plastic state to a solid state, requires water. This chemical reaction, or hydration, continues to occur for days and weeks after you pour the concrete.

You can make sure that the necessary water is available for this reaction by adequately curing the slab.

Reason #3- Improper strength concrete poured on the job

Concrete is available in many different strengths. Verify what strength the concrete you are pouring should be poured at.

Reason #4 - Lack of control joints.

Control joints help concrete crack where you want it to. The joints should be of the depth of the slab and no more than 2-3 times (in feet) of the thickness of the concrete (in inches). So 4"concrete should have joints 8-12' apart.

Other reasons:

Never pour concrete on frozen ground.

The ground upon which the concrete will be placed must be compacted.

The sub grade must be prepared according to your soil conditions. Some flatwork can be poured right on native grade. In other areas 6"of base fill is required along with steel rebar installed in the slab.

Cracking can be the result of one or a combination of factors such as drying shrinkage, thermal contraction, restraint (external or internal) to shortening, sub grade settlement, and applied loads. Cracking can not be prevented but it can be significantly reduced or controlled when the causes are taken into account and preventative steps are taken.

Another problem associated with cracking is public perception. Cracks can be unsightly but many consumers feel that if a crack develops in their wall or floor that the product has failed. In the case of a wall, if a crack is not structural, is not too wide (the acceptable crack of a crack depends on who you ask and ranges from 1/16” to 1/4”) and is not leaking water, it should be considered acceptable. It is in the best interest of you, the wall contractor, to educate your customers that the wall will crack and when it should be a concern to them.

Cracks that occur before hardening usually are the result of settlement within the concrete mass, or shrinkage of the surface (plastic-shrinkage cracks) caused by loss of water while the concrete is still plastic.

Settlement cracks may develop over embedded items, such as reinforcing steel, or adjacent to forms or hardened concrete as the concrete settles or subsides. Settlement cracking results from insufficient consolidation (vibration), high slumps (overly wet concrete), or a lack of adequate cover over embedded items.

Plastic-shrinkage cracks are most common in slabs and are relatively short cracks that may occur before final finishing on days when wind, a low humidity, and a high temperature occur. Surface moisture evaporates faster than it can be replaced by rising bleed water, causing the surface to shrink more than the interior concrete. As the interior concrete restrains shrinkage of the surface concrete, stresses can develop that exceed the concrete's tensile strength, resulting in surface cracks. Plastic-shrinkage cracks are of varying lengths spaced from a few centimeters (inches) up to 3 m (10 ft) apart and often penetrate to mid-depth of a slab.

Cracks that occur after hardening usually are the result of drying shrinkage, thermal contraction, or sub grade settlement. While drying, hardened concrete will shrink about 1/16 in. in 10 ft of length. One method to accommodate this shrinkage and control the location of cracks is to place construction joints at regular intervals. For example, joints can be constructed to force cracks to occur in places where they are inconspicuous or predictable. Horizontal reinforcement steel can be installed to reduce the number of cracks or prevent those that do occur from opening too wide.

The major factor influencing the drying shrinkage properties of concrete is the total water content of the concrete. As the water content increases, the amount of shrinkage increases proportionally. Large increases in the sand content and significant reductions in the size of the coarse aggregate increase shrinkage because total water is increased and because smaller size coarse aggregates provide less internal restraint to shrinkage. Use of high-shrinkage aggregates and calcium chloride admixtures also increases shrinkage. Within the range of practical concrete mixes – 470 to 750 lb/yd3 (5- to 8-bag mixes) cement content – increases in cement content have little to no effect on shrinkage as long as the water content is not increased significantly.

Concrete has a coefficient of thermal expansion and contraction of about 5.5 x 10-6 per °F. Concrete placed during hot midday temperatures will contract as it cools during the night. A 40°F drop in temperature between day and night-not uncommon in some areas-would cause about 0.03 in. of contraction in a 10-ft length of concrete, sufficient to cause cracking if the concrete is restrained. Thermal expansion can also cause cracking.

Structural cracks in residential foundations usually result from settlement or horizontal loading. Most (but not all) structural cracks resulting from applied loads are nearly horizontal (parallel to the floor) and occur 16” to 48” from the top of the wall. They are much more prevalent concrete block construction. They can be brought about by hydrostatic pressure or heavy equipment next to the foundation.

Diagonal cracks that extend nearly the full height of the wall are often an indication of settlement. In either of the above conditions, an engineer should be consulted. Diagonal cracks emanating from the corner of windows and other openings are called reentrant cracks and are usually the result of stress build-up at the corner. Diagonal reinforcement at the corner of openings can reduce the instance of crack formation and will keep the cracks narrow.

Other Reasons Why Walls and Ceilings Crack

Everyone is familiar with cracked walls and ceilings. Sometimes the reasons for the cracks are evident to everyone, but at others the reasons are not so plain to be seen. Sometimes the materials used are thought to be at fault when the real underlying cause of failure is that good materials have been used too sparingly or in a wrong manner. The best materials in the world, used without taking into consideration the limits of their strength, or not put together after ways that have been tried and proven, will not give complete satisfaction.

It is unfortunately true that thousands of small homes have been built and are being built which in a comparatively short time will deteriorate outrageously. It is a waste of money to use good materials in an unwise way. The jerry builder who puts these materials together so that they do not stay put is really either making you the victim of his ignorance or else at your expense is indulging in a form of legalized robbery.

Following are some of the reasons why walls and ceilings crack:

Building a house on a fill.

Failure to make the footings wide enough.

Failure to carry the footings below the frost line.

Width of footings not made proportional to the loads they carry.

The posts in the basement not provided with separate footings.

Failure to provide a base rose above the basement floor line for the setting of wooden posts.

Not enough cement used in the concrete.

Dirty sand or gravel used in the concrete.

Failure to protect beams and sills from rotting through dampness.

Setting floor joists one end on masonry and the other on wood.

Wooden beams used to support masonry over openings.

Mortar, plaster, or concrete work allowed freezing before setting.

Drainage water from roof not carried away from foundations.

Floor joists too light.

Floor joists not bridged.

Supporting posts too small.

Cross-beams too light.

Subflooring omitted.

Poor materials used in plaster.

Plaster applied too thin.

Metal reinforcement omitted in plaster at corners.

Metal reinforcement omitted where wooden walls join masonry.

Plaster applied directly on masonry at chimney stack.

Plaster applied on lath that is too dry.

Subsoil drainage not carried away from walls.

First coat of plaster not properly keyed to backing.

Failure to use double joists under unsupported partitions.

Various Reasons of Cracks in Buildings?

Cracks can occur due to chemical reactions in construction materials, changes in temperature and climate, foundation movements and settling of buildings, environmental stresses like nearby trains, earth quakes etc. Faulty design, bad quality materials, wrong method of construction, weather effects and lots of wear and tear can create cracks in walls, floors and ceilings. Here are given various reasons of cracks and their prevention techniques.

Elastic Deformation

When the walls are unevenly loaded, due to variation in stresses in different parts of wall the cracks are formed in walls. When two materials having wide different elastic properties are built together under the effect of load, different shear stresses in these materials create cracks at the junction. Dead and live loads cause elastic deformation in structural components of a building.

Prevention

Create slip joints under the support of RCC slab on walls. Masonry work on RCC slabs and beams should not be started before drying RCC slab and beam. Provide horizontal movement joints between the top of Elastic

Thermal Movement

All materials expand on heat and contract on cool. Thermal movement in components of structure creates cracks due to tensile of shear stresses. It is one of the most potent causes of cracking in buildings and needs attention.

Prevention

Construct joints such as construction joints, expansion joints, control joints and slip joints. The joints should be planned at the time of design and be constructed carefully.

Chemical Reaction

Chemical reactions in building materials increase their volume and internal stress causes cracks. The components of structure also weaken due to chemical reactions. Some common instances of chemical reactions are following.

Sulphate attack on cement products

Carbonation in cement based materials

Corrosion of reinforcement in concrete

Alkali aggregate reaction

Prevention

Use dense and good quality concrete i.e. richer mix of cement concrete 1:1.5:3 to prevent cracks. Repair corrosive cement concrete surface by injecting technique after removing all loose and damaged concrete and cleaning brick panel

TOLERABLE CRACK WIDTHS,

REINFORCED CONCRETE (ACI 224R-90)

EXPOSURE CONDITION	TOLERABLE CRACK WIDTH IN INCHES
Dry air or protective membrane	0.016
Humidity, moist air, soil	0.012
Deicing chemicals	0.007
Seawater and seawater spray: Wetting and drying	0.006

Water-retaining structures	0.004

Observed crack widths, however, are not necessarily very good indicators of durability (the structures resistance to corrosion and deterioration). It may be (and ACI 224 states that is should be expected) that some of the cracks in a structure will be significantly wider than those in the table. The amount of concrete cover over the reinforcement may be a better indicator of corrosion resistance than crack width.

Another point to consider when using this table is that it applies only to structural reinforced concrete. These values should not be used to judge crack widths in unreinforced or lightly reinforced slabs on grade or in unreinforced basement walls. Also take into account the high variability in crack widths. Isolated locations where cracks are wider than those in this table 224 should not be grounds for rejection or reduced pay.

Other procedures which can reduce cracking in concrete include the following practices.

Minimize the mix water content by maximizing the size and amount of coarse aggregate and by using low-shrinkage aggregate.

Use the lowest amount of mix water required for workability and placement; do not permit overly wet consistencies.

Use calcium chloride admixtures only when necessary.

Prevent rapid loss of surface moisture while the concrete is still plastic through use of spray-applied finishing aids or plastic sheets to avoid plastic-shrinkage cracks (more important in slabs)

Provide contraction joints at reasonable intervals, 30 times the wall thickness is a good “rule-of-thumb”.

Prevent extreme changes in temperature after placement and initial cure.

Properly place and consolidate the concrete.

Cracks can also be caused by freezing and thawing of saturated concrete, alkali- aggregate reactivity, sulfate attack, or corrosion of reinforcing steel. However, cracks from these sources may not appear for years. Proper mix design and selection of suitable concrete materials can significantly reduce or eliminate the formation of cracks and deterioration related to freezing and thawing, alkali-aggregate reactivity, sulfate attack, or steel corrosion.

For more information, refer to Design and Control of Concrete Mixtures, EB001, and Diagnosis and Control of Alkali-Aggregate Reactions in Concrete, IS413.

"Discusses in detail the process of evaluating foundation cracks and signs of foundation damage by examining the crack size, shape, pattern, and location. Foundation cracks and movement are discussed by type and location of foundation cracks, vertical foundation cracks, horizontal cracks, and diagonal foundation cracks, and shrinkage cracking. This article series describes how to recognize and diagnose various types of foundation failure or damage, such as foundation cracks, masonry foundation crack patterns, and moving, leaning, bulging, or bowing building foundation walls.

To be used properly, this information must be combined with specific on-site observations at the particular building in order to form a reliable opinion about the condition of that building's foundation. Anyone having concern regarding the structural stability, safety, or damage of a building, foundation or other components, should consult a qualified expert.

See this close companion article: FOUNDATION FAILURES by TYPE & MATERIAL which describes the types of foundation damage, cracks, leaks, or other defects associated with each type of foundation material (concrete, brick, stone, concrete block, etc.).

FOUNDATION CRACK EVALUATION - How to Inspect & Evaluate Building Foundation Cracks & Movement & Foundation Crack Patterns

This is a chapter of "The Foundation Crack Bible". Use links at page left to read other document sections.

Foundation cracks, which are signs of foundation damage, can mean very different things depending on the material from which a foundation is made, the location, size, and shape of the foundation crack, and other site observations. The size, shape, pattern, location of foundation cracks on a building, along with correlation with other site and construction conditions helps distinguish among probable causes.

By knowing the probable cause and history of foundation cracking or movement one can distinguish between continuing movement (more likely to be a problem) and single events which may, depending on extent of damage, not require repair. This chapter elaborates types and patterns of foundation cracks to assist in that evaluation.

General Suggestions for the Evaluation of Foundation Cracks

Links at page left discuss the evaluation of individual types of building foundation cracks. Here are some general suggestions:

Look at shape, pattern, frequency of occurrence, relationship to wall discontinuities and angles, placement of wall penetrations, correlation with cracks in floors, and location in the wall (corners, center), as well as length, width, continuity, age of wall, relation to site conditions (depth of backfill, blasting, rock).

Shrinkage cracks are usually uniform in width or (less common) vee-shaped, wider at top and diminishing or stopping before reaching the bottom of the foundation wall (where attachment to footing may tend to hold foundation wall materials in place). A wall crack which continues into the floor is likely to involve the building footings and may be a settlement crack of more structural importance.

Concrete shrinks as it cures. In poured concrete, shrinkage cracks may be non-uniform if wall components are held by footings/framing; very often there are minor shrinkage cracks which are hairline, random, intermittent, multiple, and meandering in the concrete, forming discontinuous cracks in the wall. Shrinkage cracks occur as concrete cures, appearing more frequently and larger if the mix was improper and where control joints were omitted. Omission or pattern of placement of steel reinforcement may also be a factor in crack formation and location.

Poured concrete shrinkage cracks: usually shrinkage cracking is due to conditions at original construction: poor mix, rapid curing, and possibly other conditions. Shrinkage cracks are less likely to require structural monitoring and repair in poured concrete as they would be expected to continue after initial curing.

Concrete block foundation walls shrink as they cure. They rarely expand much on exposure to moisture and temperature variations. In concrete block walls shrinkage cracks are likely to be uniform in width and usually occur towards the center of a concrete masonry unit (CMU) wall. The wall is stronger at the building corners.

Brick walls do not normally shrink, but rather, grow indefinitely. Bricks are not often used for below-grade foundations but was often used above-grade supporting the first floor of older buildings, and of course entire buildings may be constructed using structural brick walls (look for the bond courses). If you see a crack in a brick wall it's more likely due to movement in the structure, a support problem, or due to thermal expansion. Cracks in structural brick walls may be very serious if the bond courses are broken as there is then a risk of sudden catastrophic wall collapse. Cracks and especially bulged cracked brick walls need immediate expert investigation.

Stone foundation walls do not normally crack through individual stones, but the interlaced stone layout of the wall may be bulged and cracked due to damage from frost, loading from driving vehicles near the wall, or by the removal of stones to pass piping or make doorways. As with other cases of foundation movement, a diagnosis of the cause, amount of movement, and effects on structure are needed to decide what repair may be needed.

VERTICAL FOUNDATION CRACKS - Vertical Foundation Crack Patterns

In the photos shown here, substantive cracks appeared and continued to increase in size in this poured concrete foundation used to support a modular home which had recently been completed. The cracks and foundation movement were probably due to a combination of: poorly prepared foundation footings, blasting on an adjacent building lot to prepare that site for new construction, and possibly omission of steel reinforcement in the poured wall.

The cracks in this building foundation wall were visible shortly after construction as vertical hairline openings (less than 1/16" wide) in the right hand foundation wall, above grade and inside in the basement. Within a year the owner reported several times that the cracks were becoming noticeably wider.

A careful inspection of the building interior suggested that the front foundation wall and portions of the right foundation wall were settling. There were no corresponding cracks in the finished surfaces of the structure, probably because this was very stiffly-framed modular construction. Notwithstanding the absence of damage upstairs, this was a problem that deserved further evaluation and repairs. The builder may have repaired the foundation by supporting it from below using one of the methods described at FOUNDATION REPAIR METHODS.

This settlement crack probably occurred during initial footing settlement. Notice that it is wider at the top than the bottom of the crack.

This suggests that the footing to the left or right of the crack has moved downwards; with further downwards movement as we move further from the crack itself.

If this is new construction and the crack does not change in width the site conditions may have stabilized.

Additional photographs of types of foundation cracks and other foundation damage: we have an extensive library of photographs which will be added to this document. Pending completion of that work, contact the author if assistance is required with images.

In masonry between two structures - differential settlement or thermal movement

Straight or wandering, in poured concrete, generally even width, intermittent, or more often straight - shrinkage / thermal - low risk

Straight generally even width, in a masonry block wall, in mortar joints but possibly right through concrete block - shrinkage / thermal - low to modest risk

Straight or stepped in brick, esp. near ends of wall - expansion / thermal, potentially dangerous if wall bond courses are broken, collapse risk.

In wall, wider at bottom than top - settlement under building. These cracks may be less serious than horizontal when found in a masonry block wall. These cracks could be quite serious when found in a brick wall, especially if bond courses are broken and there is risk of collapse.

More area.

While a vertical foundation crack could be serious depending on its cause and on the type of foundation in which it appears (stone, brick, masonry block, concrete), these are often the least threat to the building. If there is significant vertical dislocation or signs of ongoing movement, further investigation is more urgent. If the cause is shrinkage (concrete, masonry block) it is probably less of a concern than if due to settlement. A vertical crack due to earth loading or frost would be unusual.

DIAGONAL FOUNDATION CRACKS - Diagonal & Step
Crack Patterns in Building Foundations

This settlement crack probably occurred during initial footing settlement. Notice that it is wider at the top than the bottom of the crack. This suggests that the footing to the left or right of the crack has moved downwards; with further downwards movement as we move further from the crack itself. If this is new construction and the crack does not change in width the site conditions may have stabilized.

Clues to help diagnose the probable cause of diagonal foundation cracks in buildings:

From corner towards adjacent opening, wider at top than bottom - often due to foundation settlement, expansive clay soil, frost damage, or damage from a shrub/tree close to the foundation wall.

Under a ground floor window, from sill to ground, sill bowed up - often due to foundation heave, clay soil, frost, shallow or absent footings

In the foundation wall anywhere, wider at bottom than top - settlement under building

At building corners in cold climates - frost heave, frost lending, shallow footings, water problem, or insufficient backfill. In a typical raised ranch with a garage located in part of the basement, and with the garage entering at one end of a home, we often find step cracks in the front and rear foundation walls only on the garage-end of the home. These cracks may correspond to some related observations: (1) there may be less backfill against the front and rear foundation walls where a garage entry is located between them; (2) the reduction in backfill combined with an un-heated garage may expose these building corners to more frost damage; (3) if a building downspout or gutter defect spills roof drainage against the building wall, these forces will often combine to make more severe frost cracks appear on the garage-entry end of the home.

Vertical or diagonal crack which over a short time - settlement over sink holes- serious, open suddenly after rain; or ravines, mulch, fill, organic debris (later rots and settles).

Over window/door, straight or diagonal - loading/header defect - may appear as horizontal along top or bottom of header, vertical at ends of header (possibly due to differences in thermal expansion of different materials of header vs. wall) or vertical/diagonal at center of header (loading failure) or at corners (possible point-load failure)

Cracks in a poured concrete foundation which are diagonal or vertical and which are generally uniform in width, or which taper to an irregular hairline form, usually in fact a discontinuous crack in the hairline area, are usually shrinkage cracks and should not be ongoing nor of structural significance, though they may invite water entry through the wall.

Note that often at these foundation failures cracks are visible both outside and inside, but outside they may be covered by backfill.

For detecting evidence of sink holes in an area by visual inspection see Sink Holes: Can X-Ray Vision [Advanced Building & Building Site Inspection Techniques] Warn of Sink Holes? In Florida or elsewhere

HORIZONTAL FOUNDATION CRACKS - Patterns

These notes presume that you are examining a wall which is entirely or nearly all below-grade level.

Horizontal Foundation Cracks Located High on a Foundation Wall

Horizontal foundation cracks located in the upper third of a concrete block wall (presuming most of the wall is below grade) are most likely to have been caused by vehicle loading or in freezing climates, by surface and subsurface water combined with frost. In northern climates if we see cracked mortar joints in the top third of a block wall, at about the same depth as the frost line in that area the damage is almost certainly due to frost. Often outside we'll find corroborating evidence such as drip lines below the building eaves confirming a history of roof spillage against the building, and back inside we may see that the foundation damage is occurring only at the building walls below roof eaves and not at the gable ends of the home.

Cold climates- frost, possible displacement inwards

Possible vehicle loading, displacement inwards

Horizontal Foundation Cracks Located at Mid-wall Height on a Foundation

Masonry block or stone walls which are cracked and/or bulging inwards at mid height on the wall are likely to have been damaged by vehicle traffic or earth loading.

Possible vehicle loading (look for a driveway near the wall or site history involving movement of heavy equipment near the wall)

Backfill damage - excessive height or premature backfill before the first floor framing was in place.

Hillsides - earth loading or earth loading exacerbated by water or frost

Areas of wet soils - likely to be earth-loading or earth loading exacerbated by water or frost

Horizontal Foundation Cracks Located Low on a Foundation Wall

The forces exerted by soils against a foundation wall increase geometrically as we move from surface level of the soil against the wall to the areas near the bottom of the wall. In other words, earth pressure is greatest at the bottom of the wall. This fact helps us distinguish between frost or water-related cracking and simple earth loading in some cases since a wall which has become dislocated laterally only at or near its bottom is likely to have been damaged by earth loading.

Earth Loading, especially if in an area of dense or wet soils

Horizontal dislocation of a masonry block or brick wall may appear first as a crack and then later as horizontal movement as a wall is pushed inwards by earth or wet soil pressure.

Horizontal Cracks in an Attached Garage Foundation

Construction methods for attached garages (as opposed to a garage located under a home and adjoining its basement) may create some special opportunities for foundation cracks:

Shallow garage footings: The garage foundation footings are less deep than the house footings, exposing the foundation to other risks of frost or settlement damage and movement.

Garage additions: The garage may have been added after original construction, creating newly-disturbed soils around the foundation and footings that have settled more recently than that of the original home.

Garage slab settlement and cracking: A garage foundation is often constructed as a concrete footing and a low masonry block wall, followed by dumping fill inside this structure to raise the level of the garage slab to the desired height. A common construction error is the omission of adequate soil compacting before the garage slab is poured. A related common construction shortcut for these "raised slabs" (on fill, higher than and not resting on the garage wall foundation footings), is the omission of pins connecting the slab to the garage foundation wall at its elevated position.

The result of these details is that as the soils below the slab settle and compact the slab can move and settle significantly. Depending on the amount of garage floor slab reinforcement (wire or re-bar or none), the slab may crack as well as tip and settle. How does garage slab settlement crack the garage foundation walls? The weight of a garage floor slab, combined with the weight of vehicles in the garage, compresses the soil below the slab. Soil pressure includes an outwards force which can cause horizontal cracks in a masonry block garage foundation wall. Look for these cracks outside the garage and above grade-level.

Detecting soil voids below a garage slab is quite possible using this "ghost busters" technique: drag a heavy chain across the floor and listen to the sound it produces. If the chain moves across an area of soil void you'll hear a change in pitch in its sound, typically dropping lower. This is not a technique for every building inspection but it is useful when evaluating garage floor slab movement, tipping, cracking, or foundation cracks.

Where are Horizontal Foundation Cracks Visible?

Horizontal foundation cracks are usually visible only from inside a basement or crawl area unless building is all masonry.

Lateral or horizontal movement of a masonry foundation wall inwards from earth pressure will often be seen at the first mortar joint above a basement or crawl space slab. Remember that the slab itself may be holding the very first course of masonry blocks or brick in place. This is a useful detail to keep in mind if you are using a plumb line and measuring tape to document the total amount and location of wall movement. The bottom course of concrete blocks or bricks, held in place by the floor slab, can usually be taken as a baseline of zero movement, from which other measurements to the plumb line are compared over the height of the wall. Concrete Slab Cracks

New

Concrete is a very unique material. When installed properly, it can be one of the most durable and long lasting products you can use around your home. However, many concrete contractors fail to follow established guidelines with respect to concrete placement. Durable, high strength and crack resistant concrete does not happen by accident. You must do many things to achieve these qualities.

Concrete can crack for many reasons. Shrinkage is a primary cause of cracking. As concrete hardens and dries it shrinks. This is due to the loss, thru evaporation, of excess mixing water. Thus, in most cases, the wetter or soupier the concrete mix, the greater the shrinkage will be. Concrete slabs can shrink as much as 1/2 inch per 100 feet. The actual amount is 1/16th inch for every ten feet of horizontal distance. This shrinkage causes forces in the concrete which literally pull the slab apart. Cracks are the end result of these forces.

Concrete does not require much water to achieve maximum strength. In fact, a wide majority of concrete used in residential work, in many cases, has too much water. This water is added to make the concrete easier to install. It is a labor saving device. This excess water can not only promote cracking, it can severely weaken the concrete.

Also, rapid drying of the slab will significantly increase the possibility of cracking. The chemical reaction which causes concrete to go from the liquid or plastic state to a solid state requires water. This chemical reaction, or hydration, continues to occur for days and weeks after you pour the concrete. You can make sure that the necessary water is available for this reaction by adequately curing the slab. The use of liquid curing compounds, covering the slab with plastic, wet burlap, and other methods can be used to cure concrete.

Cracking can be minimized by following other guidelines as well. Install the proper strength concrete for your intended use. Concrete is available in many different strengths. The ground upon which the concrete will be placed must be compacted. Never pour concrete on frozen ground. Install adequate control and isolation joints. Control joints occur at regular intervals in the slab and are intended to account for horizontal and vertical movement in slabs. These joints can be formed with a tool or saw cut soon after the slab has hardened. The purpose of these joints is to create a zone of weakness where the forces which are pulling on the slab will relieve themselves. Isolation joints allow a slab to move independently of other fixed or stationary objects.

As a last resort, consider installing reinforcing steel. Reinforcing steel for residential purposes comes in two basic varieties, wire mesh or rigid reinforcing bars (rebar). The use of reinforcing steel can help in the event a crack develops. The steel can often stop the crack from widening and displacing vertically. Reinforcing steel is also quite inexpensive. It is usually very easy to properly install. Steel can significantly enhance the strength and durability of concrete. In addition to all of the other measures taken to prevent concrete from cracking, steel offers a low cost last line of defense

Finding and Monitoring Cracks

Very often, **foundation wall cracks** are not detected until long after they've formed. However, these cracks are often still very distressing, causing homeowners to believe that this crack appeared suddenly. While this is usually not the case, it's certainly important to treat all foundation wall cracks as a potentially serious problem that should be assessed by a professional foundation engineer or specialist.

Cracks in the foundation walls will most often appear at the weakest points, including corners, edges of basement window frames, holes for service, concrete cold joints, long spans of wall, pipe penetrations, and along the tie rods in the foundation. Any cracks detected should be checked on regularly – if you suspect that the crack has moved, spread, or widened, then your basement walls may be experiencing increased fatigue which will increase the damage and deepen the problem. Keep an eye on the crack by monitoring its length. Mark the ends of the crack with a pencil, and draw several "alignment" marks along the crack to check that the edges of the crack are not shifting unevenly. Date all marks to help record the rate of deterioration. And since Foundation Support works offers all written estimates and consultations at no cost or obligation to you, do not hesitate to call for a free estimate today! You can also read more on what causes foundation settlement on these pages: what causes foundation settlement

Concrete Floor & Slab Crack Repair

Since 1998 Applied Technologies has been manufacturing quality waterproofing and repair products for professionals and homeowners. Our polyurea injection material can be used to repair cracks in concrete slabs, concrete floors, pools, decks, sidewalks and driveways.

Concrete slabs and floors can develop cracks for a variety of reasons. One of the most common reasons is a shrinkage crack. Water is one of the key components of concrete. As the concrete cures, the water is eliminated. This reduces the volume of the concrete, it shrinks in size. The shrinkage causes stress to develop in the concrete and this stress must relieve itself. So the concrete cracks. This is a normal condition, especially in residential basement floors.

Another reason that concrete cracks is from the substrate under the concrete heaving. When this happens, the concrete is broken and it cracks. Usually, the concrete slab on one side of the crack is elevated a little compared to the other side.

Finally, it is possible for a settlement crack to occur. This is the opposite of a heaving crack. The soil under a concrete slab or concrete floor is not properly prepared prior to the concrete placement. Eventually, the area under the slab settles and is no longer in contact and supporting the concrete slab. The concrete slab then gives way and cracks.

Why Use a Polyurea Injection Material?

Most repair methods for fixing a concrete floor crack are little more than band-aids. Putting an epoxy, cementations or caulk product over the top of a concrete floor or slab crack is not enough. Soon the crack with transmit itself through these repair methods and reopen.

Injection is the key. Injection completely fills the crack from top to bottom. The polyurea tightly bonds to the concrete and has a tensile strength of 4000 psi. Polyureas are an extremely fast setting material that cures in 10-15 minutes. When they are mixed with sand aggregate it is possible to get a look that nearly matches concrete

.