

CONCRETE & MASONRY STANDARD

Background

Concrete and masonry work in residential construction is most often the base structure upon which the house is built. It may also provide the veneer for the architectural appearance and is a system growing in popularity for reasons of durability and performance for the house itself. The work is performed with manufactured or natural materials combined through manual labor and therefore can express variations in natural color and size uniformity. Subject to harsh weathering conditions such as erosion, freezing and thawing and chipping these systems are designed for permanence or longevity. The work can also be performed with an almost infinite variety of materials, methods of application and techniques of installation. This permits the Buyer a wide range of choices, creating a finished product that can never fully be duplicated. The final appearance of either concrete or masonry work is dependent upon the variation of the product and the techniques of the individual workman.

Builders and homeowners should consult the latest edition of the Wisconsin state building codes (UDC: Uniform Dwelling Code) along with standards provide by the ACI (American Concrete Institute and the WARFP (Wisconsin Association of Foundation Repair Professionals) for the most up to date requirements for new construction and remodeling/repair projects. They include and are not limited to:

Masonry and concrete work consist of four primary divisions:

1. **Foundations** – The construction of a basement which may be of cast-in-place (poured) concrete, concrete block masonry, or engineered systems
2. **Flatwork** – The placing of basement slabs, garage floors, stoops, patios, walks or drives.
3. **Veneer** – The veneering of the interior or exterior of some structures with brick, stone, cultured stone, or other masonry products.
4. **Structural Shells** – The construction of above-grade shells which may be of cast-in-place (poured) concrete, concrete block masonry, or engineered systems and include walls, suspended slabs and even roofs.

Depending on the severity of the climate and the division (location) for the application of this work, weathering variables and nature of the concrete or masonry work itself will require consideration. Concrete is subject to natural stresses including shrinkage, settling, volume change and temperature. These stresses as well as structural loads create cracks. These cracks may not affect the integrity of the structure, which is why reinforcement is added for controlling cracks.

Flatwork

Flatwork is rarely a structural component of the house. However, concrete driveways and garage floors are subject to the elements and are attacked by deicing chemicals. Pitting, scaling, or spalling can develop under unusual conditions or when certain salts or chemicals are placed on a slab in winter for ice removal or drop from a car onto a garage slab and/or drive. Proper Buyer maintenance is required. A certain amount of surface dusting can be normal along with surface crack development. A sealer can be applied by the Buyer to the concrete to minimize dusting, spalling or other effects from chemicals. Settling is a natural phenomenon in the construction of a new home and concrete slabs are subject to the settling process. For this reason, it is recommended that wherever possible, the construction of floating slabs, such as patios, walks and drives, be postponed until at least the end of the first year of occupancy or even longer so that a more stabilized soil condition will be available prior to actually doing the work. Exterior slabs or slabs in an unheated area may heave in the winter due to frost.

Walls

Like flatwork, cracking is normal and a natural characteristic of concrete. Cracks in walls are usually caused by shrinkage of the concrete during volume change. Expansion and contraction due to temperature and humidity changes may also occur throughout the life of the house.

Cracks in concrete walls or mortar joints of concrete masonry foundations may not compromise the structural integrity of the home and the design of reinforcement assumes cracking.

It should also be noted that concrete masonry walls and concrete walls with cracks are not waterproof and can leak. Therefore, foundation walls are to be dampproofed or waterproofed to protect the interior spaces as well as the walls.

Pre-Cast Concrete

All standards for pre-cast concrete falls under the design, installation guidelines and warranty of the manufacturer.

Appearance

Masonry and concrete work are subject to color and texture variations due to the nature of the materials and the process used. Repairs, when made, seldom match in color, and some variation is to be expected.

When concrete is used as a decorative or finished material, the Buyer should be aware that the same standards apply. The Buyer is cautioned that samples used for selecting colors are not very good indicators of the final product, as variables within the cement affect the color and texture of the finished product along with color migration over time, humidity and other variables. Any repair to decorative concrete cannot be guaranteed to match the existing product. Furthermore, periodic maintenance of the concrete, including waxes, tints, and sealers, are often necessary to maintain the intended appearance of the decorative concrete.

These standards are applicable for the first year of warranty only.

FOUNDATION WALLS

1. Interior surface of a basement/foundation wall is wet.

Performance Standard

The interior surface of a basement or foundation wall is considered wet if persistent moisture exists, over an extended period of time, on the surface of the wall. It is not acceptable for leaks or flow of water to exist.

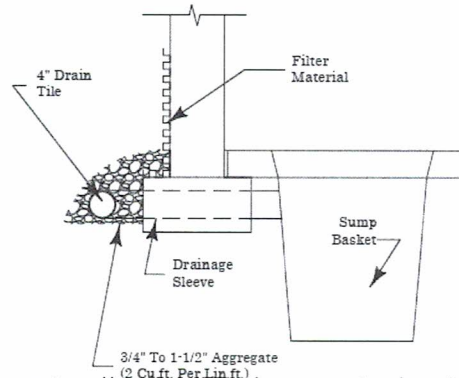
Causes

Wetness of a basement or foundation wall is most often due to excessive groundwater. Cracks in a wall left untreated will allow moisture to migrate through the wall. Additionally, long-term exposure to persistent excessive water without treatment will allow the migration of water through any concrete section. Groundwater adjacent to foundations is most often caused by an improper ground pitch toward the foundation. A proper grade must be delivered by the contractor and maintained by the Buyer. The International Residential Code (IRC) requires a proper pitch to be 6 in. (300 mm) of fall for every 10 ft. (3.05 m) away from the foundation. Failure to maintain downspouts and gutters for designed removal of rainwater away from the foundation can also lead to excessive groundwater as well as a failed, ineffective, or non-present drainage system at the perimeter base of the foundation. A foundation contractor cannot be held responsible for unknown or unforeseen subsoil conditions or improper landscaping by the Buyer. If the basement has an engineered waterproofing system (spray-applied or mechanically fastened), the Buyer should refer to the manufacturer's warranty.

Contractor Repair Responsibility

Once a proper grade has been established at the proper height and pitch away from the foundation, if wet conditions, leaks, or flow of water still exist, then Contractor will correct as required to include

waterproofing systems, repair of drainage systems and injection crack repairs. Any openings made in order to correct should be repaired. Color variations and hairline cracks in repairs are to be expected.



2. Basement wall is damp.

Performance Standard

Periodic dampness of basement walls, discoloration or water beads can be normal. However, the presence of moisture should not be persistent in significant quantity at the base of the wall and no water flows should be present on the face of the wall (see #1 above).

Cause

Water condensation is a condition occurring when the relative humidity of the air confined by the foundation meets a wall surface cooler than the air temperature itself. Often uninsulated basement or foundation walls are exposed in areas of a foundation with little to no air movement that would mix warm moist air with cooler and/or drier air. The moisture condenses from the warm humid air on the colder concrete surface and becomes absorbed by the natural pores of the concrete.

Contractor Repair Responsibility

There is no responsibility for this condition by the foundation contractor unless the relative humidity is determined to be the cause of a drainage system issue. If this is determined, cases of water flow or persistent moisture presents, see # 1 above. The mechanical contractor should be consulted for potential issues with the HVAC system or altered use of the structure has resulted in the need for improvements to be made.

Neither the builder nor the homeowner can control the effects of a high-water table or extreme weather conditions, flooding, underground springs, etc.

3. Cracked basement wall.

Performance Standard

Vertical cracks or diagonal cracks at the corners of openings in foundations not exceeding 3/16 in. (5 mm) that do not leak water are acceptable and to be considered as normal. These include step cracks in concrete block walls at mortar joints through one course of block or where a horizontal crack at a mortar joint with no bowing. Cracks that leak need to be investigated and repaired as determined per #1 above. Cracks that are not vertical, evidence displacement or are wider than 3/16 in. (5 mm) may or may not need repair depending on severity and would need to be analyzed by the Contractor and/or a Licensed Design Professional.

Cause

Cracks are caused either by volume change (shrinkage or temperature) or from pressures applied to the structure that exceed the capacity of the constructed condition. Cracks from volume change only create problems when pressure from moisture causes them to leak. Cracks may become problematic structurally with pressure over time that exceeds the intended design. Backfilling a basement or foundation wall improperly may produce initial cracking and/or bowing.

Contractor Repair Responsibility

- a. Once the grade is determined to be correct per #1 above, then poured concrete foundation cracks that exceed 3/16" or are leaking need to be repaired. If the cracks exceed 3/16" and are not leaking, and are outside of a control joint, the cracks will need to be filled. Color and texture will not match. If the wall is leaking, it will need to be repaired from the inside. No repairs on the outside are necessary.
- b. Block foundation cracks exceeding 3/16" width or cracks that are leaking need repair by the Contractor. The inside face of the broken blocks should be removed and replaced. Tuckpointing of the affected joints should be done. It should be noted that the mortar color will not match. If the wall leaks, it must be repaired by the Contractor. If the wall has horizontal cracks and/or is bowed, an engineered repair may be needed.
- c. Bowing in a foundation wall must be reviewed by the Contractor or a Licensed Design Professional and determined if structure is sacrificed.

4. Surface irregularities in poured concrete walls.

Performance Standard

Surface defects greater than 50 in² (322 cm²) consisting of voids with depths greater than ½ in. (13mm) are unacceptable and shall be repaired. Any steel reinforcement bars or wire mesh exposed in a finished concrete wall shall also be repaired to protect from corrosion and spalling of concrete surfaces. Aggregate can be exposed in a poured wall and pockets in the surface, commonly referred to as "bug holes" are to be expected when an architectural finish is not specified.

Fins or projections greater than 0.5 in. (13mm) are unacceptable and create concern for the performance of wall treatments or the accuracy of wall finishes and shall be removed.

Contractor Repair Responsibility

Contractor will repair voids that do not meet the Performance Standard. Proper repair can be affected by thoroughly filling the hole. The repaired area will not match the color of the surrounding concrete. Refer to ACI 332.1R for repair guidelines.

Contractor will "rub" the exterior wall surfaces and any interior surfaces of the wall that enclose occupied space to remove projections greater than 0.5 in. (13mm). This is to be completed prior to leaving the work site so as not to interfere with damp-proofing or waterproofing systems (exterior) or impede the interior surface finish system work quality.

5. Basement wall is out of plumb.

Performance Standard

Walls shall not be out of plumb greater than +/- 1 in. (25mm) in 8 ft. (2.44m) when measured from the base to the top of the wall from a vertical plane.

Contractor Repair Responsibility

A wall deemed out of plumb must be reviewed by a licensed design professional. If the wall meets building codes and structural engineering requirements, then no corrective action is required. Walls subject to correction as directed may be reinforced by columns or may need to be replaced if found to be structurally unsound. Masonry walls subject to an out of plumb condition may also be stabilized with ground anchors.

6. Basement wall is bowed.

Performance Standard

Basement or foundation walls shall not exhibit a bow of the horizontal or vertical plane in excess of 1 in. (25mm) in 8 ft. (2.44m) when measured between two corners, offsets or the top and bottom by string line.

Contractor Repair Responsibility

If the wall meets building codes and structural engineering requirements, then no corrective action is required. Masonry walls shall be noted to the owner as stable for periodic observation of cracking or movement. Walls that required repair may be reinforced with steel support restraints every 3 to 5 ft. (0.9 to 1.5 m) on center without excavation and grouted for full contact with the wall. Additional stabilization repairs shall be sought if necessary, from a licensed design professional.

7. A cold joint is visible in exposed poured concrete foundation walls.

Performance Standard

A cold joint is a visible joint that indicates where the pour terminated and continued. Cold joints are normal and should be expected to be visible. Cold joints should not be an actual separation or a crack that exceeds ¼" in width.

Note: Horizontal or sloping lines with changes in texture or color are indicators of a construction condition referred to as a "pour line" where two loads of concrete were separated by time but not much that structural performance is at risk. A pour line is not a crack and not of structural concern despite being a cosmetic mark.

Contractor Repair Responsibility

Contractor will cosmetically repair any cold joint that exceeds ¼" in width. Color variation in the repair should be expected.

FLATWORK (SLABS-ON-GROUND)

1. Cracking of basement floor.

Performance Standard

Shrinkage cracking is to be expected and requires no repair unless one or both of the following conditions exist:

- a. If the two surfaces of the crack are mismatched in height by more than 3/16".
- b. If the shrinkage crack exceeds 3/16" width.

Contractor Repair Responsibility

Contractor to repair cracks exceeding maximum tolerances by surface patching.

2. Basement floor does not pitch to floor drain.

Performance Standard

Basement floors are only pitched in the immediate area of the floor drain.

Contractor Repair Responsibility

None, if the floor meets the Performance Standard.

3. Pitting, scaling or spalling, and chert pops of concrete work.

Performance Standard

Aggregate pops and scaling are normal. Excessive aggregate pops and scaling should be analyzed by the Contractor. Contractor is not responsible for pops and scaling caused by freezing and thawing, use of salt or other chemicals and mechanical implements, and other factors beyond the Contractor's control. Buyer should consider sealing the concrete.

Contractor Repair Responsibility

The Contractor will take corrective measures necessary to repair defective concrete surfaces. The Contractor is not responsible for deterioration caused by salt, chemicals, mechanical implements, or other factors beyond the Contractor's control.

CONCRETE STOOPS AND STEPS

1. Water stands on stoops with foundations.

Performance Standard

No measurable water depth exceeding 1/8" is permissible on stoops.

Contractor Repair Responsibility

Correct to meet Performance Standards by filling with a latex filler or grinding. Color variations in concrete are to be expected.

2. Cracking and chipping of stoops with foundations.

Performance Standard

All cracks, except hairline cracks, require repair. Chips greater than 1" in diameter and cracks in excess of 3/16" in width may be corrected with a filler. Color variations in concrete are to be expected.

Contractor Repair Responsibility

Correct to meet Performance Standard.

3. Color or texture variation in concrete.

Performance Standard

Due to the nature of the materials, weather conditions, and the concrete installation process, concrete work is subject to color and texture variations. Spotting and other color discoloration is considered normal. For example, a concrete color variance between the front stoop and exterior slab-on-grade sidewalk should be expected. Any repairs, when made, will seldom match in color, and some variation is to be expected.

Contractor Repair Responsibility

None.

GARAGES FLOORS

1. Garage floor not pitched to drain.

Performance Standard

Garage floors are pitched in the immediate area of the floor drain. No measurable water depth exceeding 5/16" is permissible.

Contractor Repair Responsibility

Contractor will take corrective action to meet Performance Standard.

2. Cracking of garage slab.

Performance Standard

Cracks in garage slabs in excess of 1/4" in width or 1/4" in vertical displacement shall be repaired.

Contractor Repair Responsibility

Contractor to repair cracks exceeding maximum tolerances by surface patching.

3. A garage concrete floor has settled, heaved, or separated.

Performance Standard

The garage floor shall not settle, heave, or separate in excess of 1" from the structure.

Contractor Repair Responsibility

The contractor will make a reasonable and cost-effective effort to meet the performance standard. This standard does not mandate the replacement of the entire slab.

DRIVEWAYS AND SIDEWALKS

1. An asphalt driveway has cracked.

Performance Standard

Longitudinal or transverse cracks greater than 1/16" in width or vertical displacement are considered excessive.

Contractor Repair Responsibility

The contractor shall repair the affected area to meet the standard. Contractor may repair using tar sealer. Buyer is cautioned that the repair may be more visible than the actual crack.

2. Standing water is observed on an asphalt pavement surface.

Performance Standard

Standing water greater than 1/8" in depth shall not remain on the surface 24 hours after a rain.

Contractor Repair Responsibility

The contractor shall repair or replace the affected area to meet the performance guideline. Buyer is cautioned that the repair may be more visible than the actual crack.

3. Adjoining exterior concrete flatwork sections deviate in height from one section to another.

Performance Standard

Adjoining concrete sections shall not differ in height by more than 1/2".

Contractor Repair Responsibility

The contractor shall repair deviations to meet the standard.

4. The aggregate of asphalt pavement is raveling.

Performance Standard

Asphalt pavement shall not ravel. However, raveling at the edges of driveways is normal and within the standard.

Contractor Repair Responsibility

The contractor shall repair or replace the affected area to meet the standard.

5. A sidewalk and other exterior concrete flatwork have settled.

Performance Standard

Adjoining concrete sections shall not differ in height by more than 1/2".

Contractor Repair Responsibility

The contractor shall repair the affected areas to meet the standard.

6. Water collects (ponds) on the sidewalk.

Performance Standard

Standing water that is 3/8" deep on a sidewalk 24 hours after the end of a rain is considered excessive.

Contractor Repair Responsibility

The contractor shall repair or replace the affected area to meet performance guideline.

7. Cracks in poured concrete patios and drives.

Performance Standard

Cracks in excess of 1/4" in width or vertical displacement (measured when no frost in ground) on a surface shall be repaired.

Contractor Repair Responsibility

Contractor to repair to meet Performance Standard. If replacement of a section is required, the minimum section should be removed from the walk, drive or patio at the blind or open joint. (In the case of a city sidewalk, the municipality may require more.) Buyer is cautioned that color of repaired section may not match.

8. Municipal or subdivision sidewalk cracks.

Performance Standard

If the sidewalk existed prior to construction, Contractor would have no repair responsibility.

Contractor Repair Responsibility

None.