


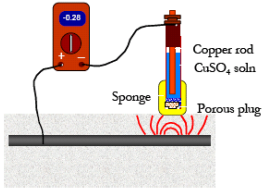



Glossary of terms.

<i>air void system</i>	Concrete which has been purposefully entrained with air during its production to introduce microscopic air bubbles in the finished structure. These bubbles (voids) are typically 1 mm or less in diameter. The presence of air voids improves the freeze-thaw durability of the concrete by providing an internal means of escape for expanding ice crystals or other contaminants.
<i>alkalinity</i>	The presence of the salt formation of alkali metals (in particular Sodium and Potassium) in concrete and the corresponding high pH. Alkalinity commonly refers to a pH higher than 7 which passivates reinforcing steel and protects it from corrosion when the pH is typically above 10-11.
<i>anode</i>	A negative electrical pole as in a battery where electrochemical oxidation takes place. Oxidation represents half of the overall corrosion reaction which affects steel reinforcing bar. Anodes are distinct locations on the surface of a bar where Iron ions are coaxed from the surface and into the surrounding concrete. Freed electrons then flow through the bar from the anode site to a nearby cathode.
<i>carbonation</i>	The reaction of carbon dioxide with a hydroxide to form carbonates. The term typically refers to the penetration of atmospheric carbon dioxide into concrete and the subsequent drop in concrete pH due to reaction with the alkaline components of the cement paste. Carbonation encourages the corrosion of reinforcing steel by neutralizing the cement and lowering the pH. The action of carbonation can be delayed by high durability concretes which slow carbon dioxide penetration. Typically, carbonation is not detectable by visible inspection unless the level of carbonation is severe, in which case the concrete surface becomes chalky and somewhat brittle.
<i>cathode</i>	A positive electrical pole as in a battery where electrochemical reduction takes place. The reduction of hydrogen represents half of the overall corrosion reaction which affects steel reinforcing bar. Iron oxide (rust) is formed at the cathode through a series of reactions in the presence of Oxygen. To complete the reaction, electron currents flow through the steel to the cathodes from other distinct locations on the bar known as anodes.
<i>cathodic protection</i>	The protection of steel reinforcement by the active application of a direct current to the reinforcing steel at a higher voltage than that of the anodic surface. By disrupting the normal current flow involved in the natural corrosion reaction, corrosion products are unable to form and the steel is protected. Cathodic protection is very effective in preventing corrosion but typically requires an exterior power supply.

<p><i>chloride content by mass of cement</i></p>	<p>A measure of chloride concentration in concrete as percent chloride per mass of cement paste which makes up a fraction of the mass of the given concrete sample. The more massive sample contains a large fraction of large and small aggregate among other components.</p>
<p><i>chloride content by mass of concrete</i></p>	<p>A measure of chloride concentration in concrete as percent chloride per mass of the overall concrete sample (total mass).</p>
<p><i>chloride induced corrosion</i></p>	<p>Corrosion of reinforcing steel initiated by the destruction of the protective oxide film on the surface of the steel by chloride ions present in the concrete. Chloride ions may be incidental to the concrete mix, have been added intentionally in accelerating agents, or may have permeated the concrete due to exposure to salt water.</p>
<p><i>compressive strength</i></p>	<p>The maximum compressive pressure (psi) which can be safely carried by a concrete under axial load. Compressive strength is often denoted f'_c and is an important property specified in design documents.</p>
<p><i>concrete core</i></p> 	<p>A cylindrical sample of concrete drilled from an existing structure used to determine the strength and characteristics of the concrete. Cores vary greatly in size depending upon the test procedures but a common core is 3-4 in. in diameter and approximately 12 in. long.</p>
<p><i>concrete cover</i></p>	<p>A measure (expressed in inches) of the minimum thickness of concrete which separates steel reinforcing from the outside environment. Higher concrete cover provides reinforcement greater protection from chemical attack and carbonation.</p>
<p><i>copper-copper sulfate reference electrode (CSE)</i></p>	<p>A standard half-cell electrode used to make electrical contact with a concrete surface for the measurement of the corrosion potential of the steel below. The electrode consists of a copper rod in a copper-sulfate solution which contacts the concrete through a porous membrane. If the reinforcing bar is corroding, electrons tend to flow from the bar to the rod, giving a voltage indication.</p>
<p><i>corrosion</i></p>	<p>The deterioration of reinforcing steel by chemical, electrochemical or electrolytic reaction with the environment. Corrosion reduces the size of a reinforcing bar while increasing the volume it occupies through the generation of Iron Oxide. This volume change creates undesirable internal forces in the surrounding concrete.</p>

<p><i>corrosion staining</i></p>	<p>The rust colored staining of the outer surface of a concrete member indicating the presence of corroding reinforcement near the surface.</p>
<p><i>delamination</i></p>	<p>A partial separation of an outer surface layer of concrete from the bulk concrete of the structural member. Delaminations indicate a splitting or cracking parallel to the surface often along the plane of corroding reinforcing steel. They are easily detectable by sounding the surface with a hammer or other impactor.</p>
<p><i>depassivation</i></p>	<p>The destruction of a thin film of iron oxide which coats and protects steel reinforcement thereby freeing it to “active” and rapid corrosion. Depassivation is typically accomplished by carbonation or the presence of chloride ions.</p>
<p><i>exposed reinforcement</i></p> 	<p>Embedded reinforcing steel which is exposed to the environment and visible to the eye due to loss of concrete cover by spalling or other means.</p>
<p><i>exposed strands</i></p> 	<p>Exposed reinforcement referring specifically to pre-stressing strands typically found in long-span precast girders. Exposed strands are of greater consequence than exposed reinforcing since they can indicate a loss in pre-applied compressive force that the designer intended.</p>
<p><i>half-cell potential</i></p> 	<p>The half-cell potential measurement is an electrochemical technique commonly used to assess the severity of corrosion in reinforced concrete structures by measuring the corrosion potential, since it is qualitatively associated with the steel corrosion rate. One can measure the potential difference between a standard portable half-cell, normally a copper/copper sulphate (Cu/CuSO4) standard reference electrode placed on the surface of the concrete with the steel reinforcement underneath. The reference electrode is connected to the positive end of the voltmeter and the steel reinforcement to the negative.</p>
<p><i>mil</i></p>	<p>One thousandth of an inch (0.001 in.). An increment commonly used in the measurement of crack widths. A mil is in English units and should not be confused with millimeter.</p>

<i>passivate</i>	To produce a thin film (on the atomic level) of iron oxide on the surface of steel reinforcement thus protecting it from further corrosion. The reinforcement is then “passive” to corrosion.
<i>petrography</i>	The classification of concrete samples by microscopical examination of the cement and aggregate characteristics and by other chemical and physical tests. Petrography is used to determine the content of the concrete, the degree of hydration of the cement, the bond of the aggregate, the degree of air-entrainment and many other structural properties.
<i>pH</i>	A measure of acidity of a solution or substance indicating the concentration of hydrogen ions. The pH scale runs from 0 to 14 with lower pH indicating higher strength acids. Water is considered the center of the scale and has a pH of 7. Highly alkaline substances have higher pH values.
<i>phenolphthalein solution</i>	A compound (C ₂₀ H ₁₄ O ₄) in solution used to indicate pH by painting on a surface or adding to solution. Phenolphthalein has a clear or light yellow color but changes to a strong pink in the presence of alkalines. The acidity of a substance can be estimated by observation of the shade of color of the applied phenolphthalein.
<i>Spall</i> 	A concrete fragment completely separated from the surface of a structural element due to the action of the environment or interior forces. Corroding reinforcing bar frequently induces a spall. Spalled areas are visible as pocked or cratered areas where concrete has been shed from the structure.
<i>steel reinforcing</i>	Steel bars, wires or strands embedded in concrete which act in concert with the concrete to carry applied forces. Reinforcing is typically placed to carry tensile forces and to limit cracking.
<i>ultrasonic pulse velocity</i>	A nondestructive test method to evaluate the integrity of reinforced concrete. An ultrasonic pulse is directed through a concrete element and the velocity (speed) of the pulse is measured. The speed that an ultrasonic pulse travels through concrete is a function of the elastic modulus, the density of the material, and the presence of any cracks or voids. The pulse velocity can therefore be used to assess the general quality and uniformity of the material.