Coming To Terms With Terminology

Jon Dongell
Prado & Sons Pool Plastering Co.

Having a common terminology can be critical when comparing research in order to ensure accurate comparisons between separate data and conclusions. This technical note shows improper usage of the terms "nodule" and "scaling" and advocates a change in usage to benefit the industry.

Call the American Concrete Institute and tell them you have a nodule on your pool. They won't have the foggiest idea what you are talking about. Why? Nodule, according to Webster's Dictionary, means "a small knot or irregular, rounded lump." (Webster 1980) But to a cement and concrete technician, what does it mean? Absolutely nothing.

Although research in some areas of our industry has been steadily advancing recently, the study of plaster problems seems to have languished. The lack of a common terminology with which we could describe and discuss plaster–related phenomena may be one of the hindrances to advances in our field. A common vocabulary can facilitate the sharing of ideas and information, thus assisting all of those doing research. Pool plasterers have created much of their own terminology, which does not correspond to, and in some instances contradicts terminology used by other related industry groups such as the American Concrete Institute and the Portland Cement Association. This paper was written specifically to address this need for a common terminology.

The term "efflorescence" is a term used world–wide to describe the depositing of salts, which are in all cements, onto the surface of the cement product. The actual definition is as follows, according to the Portland Cement Association: "A crystalline deposit, usually white, that sometimes appears on the surfaces of masonry." They then note that "a combination of circumstances causes efflorescence. First, there must be soluble salts in the material. Second, moisture must be present to pick up the salts and carry them to the surface. Third, some force – evaporation or hydrostatic pressure – must cause the solution to move." (Efflorescence 1968)

As noted above, the first criterion is that there must be a soluble salt. The salts involved in both concrete products and swimming pool plaster are calcium salts, such as calcium hydroxide.

The second criterion is the requirement for moisture as a carrying mechanism. In dams, bridges, and other concrete products the moisture may be manifest in many different ways, but in swimming pool plaster, which is subject to a 100% hydrated environment, there is always enough moisture present to carry salts to the plaster surface.

The third criterion is that of force. In atmosphere–exposed concrete, evaporation is usually the force which carries the moisture from the interior to the surface, thus providing a depositing mechanism. Hydrostatic forces would be the force mechanism for cements in submerged in water.

These three criterion are therefore applicable to both atmosphere–exposed cement constructs and submerged cement constructs, including dams, bridges, swimming pools, etc. The terminology is also, then, applicable to both.

In the Technical Manual published by the National Plasterers Council we find that the term "plaster dust" is used to describe a condition that is nothing more than efflorescence. (Technical Manual 1994) Plaster dust is nothing more than the carrying of a salt (calcium hydroxide) to the surface of the cement and depositing of it, the classic definition of efflorescence. When calcium hydroxide efflorescence comes to the surface on cement exposed to air, it carbonates to form calcium carbonate. The exact same thing would happen on the plaster surface underwater if we didn't brush the "plaster dust" away and filter it out. If we left the efflorescence alone and did not brush the pool, it would carbonate within several days to form calcium carbonate.

"Nodules", though there is some controversy over

Journal of the Swimming Pool and Spa Industry
Volume 1, Number 1, pages 45–46

their origin and the mechanism for their occurrence, are nothing more than a form of efflorescence. A salt (calcium hydroxide) is carried to the surface and deposited: the exact definition once again of efflorescence. There are many schools of thought as to the causes for conditions conducive to "nodule" efflorescence, but the description of, and the growth mechanism of a nodule is fairly well established. That growth mechanism fits the three criterion for efflorescence as set forth above.

Misleading and inappropriate terms such as "point of attachment," and "growth crystal" should finally be eliminated. These terms are not associated with efflorescence, but with crystallization theory. Efflorescence occurs from material within a matrix forming on the surface. Crystallization theories are based on solutes present in a liquid forming crystals onto a surface from out of the liquid. These two totally different concepts could be separated by adopting the term efflorescence. The term "nodule" lays nothing to rest and has no benefit other than being used as a descriptive term for a visible phenomena. For the sake of understanding and simplicity we should use the best and most appropriate terminology.

Next we might look at the term "scaling". In this case, our industry is closer to being correct while the Portland Cement Association's definition of "scaling" seems to be guilty of not following the rules regarding scientific mechanism and names. "Scaling" has had an accepted meaning as far back as the early 1900s, as evidenced by a reference in the Chemical Engineers' Handbook (1934), which states that scaling "is always due to the presence of a substance having an inverted solubility curve" such as "calcium sulfate... calcium hydroxide" etc. In other words, scale is the result of a material in aqueous solution which, due to heat, saturation, or other factors can no longer be held in solution and precipitates out. It is also interesting to point out another note in this publication. "If scale-forming substances are present, there is no way of preventing scale formation." It goes on to talk about ways to reduce its formation and then reiterates the fact that, "these are nothing more than the reduction of scale rather than its prevention." (Chemical 1934)

The National Plasterers Council's Technical Manual defines scaling (precipitation) as "a solid material which is forced out of solution... the most common forms [being] calcium scale, calcium carbonate precipitates (plaster dust), and metal precipitation." (Technical Manual 1994) The Portland Cement Association, however, uses the term "scaling" to denote "the loss of surface mortar" – "a scabrous condition where the surface... has peeled away, usually exposing the coarse aggregate." (Concrete) This would be better described by our term "spalling". (Technical Manual 1994) It is certainly not scaling. It would seem that we could assist them with some of their terminology.

Finally, the publications of both the Portland Cement Association and the National Plasterers Council agree that the terms "craze cracks," "checking," "hairline cracks," and "shrinkage cracks" all mean the same thing. (Technical Manual 1994; Portland 1980) I suggest that shrinkage cracks would be the correct term. As cement hydrates, some water is consumed in the reaction and some evaporates. This results in "shrinkage cracks" which usually reseal but sometimes can remain visible. The other names describing this phenomena were created probably as a descriptive help and eventually became used throughout the industry.

It should now be evident where we should be headed; towards technically correct definitions according to scientific mechanisms or names. Towards a universal vocabulary. Towards communication between fellow industries which would allow for further education and understanding of our own industry. Towards the future.

References

Chemical Engineers' Handbook. ?, Editor. (York, PA: Maple Press Co., 1934) p. 936.

"Concrete Slab Surface Defects: Causes, Prevention, Repair" *Concrete Information*. Portland Cement Association. p. 2.

"Efflorescence" *Concrete Info*. Portland Cement Association, 1968. p. 1.

Portland Cement Plaster (Stucco) Manual. Portland Cement Association, 1980. pp. 6, 7.

Technical Manual. (Trabuco Canyon, CA: National Plasterers Council, 1994.) Glossary of Terms pp. 1, 2.

Webster's New World Dictionary. 2nd Edition. (Cleveland, Ohio: William Collins Publishers, Inc., 1980) p. 965.

About the Author

Jon Dongell is currently the Director of Sales at Prado & Sons Pool Plastering Company in Phoenix, Arizona. He is also the President of two organizations, Universal Cement and Concrete Products (formulators of cement enhancement products) and General Cement and Concrete Technologies (a consulting firm dealing with cement and concrete failures). He is the past president of Precision Pool Plastering, Inc. of Arizona, and the author of the self–published book *Cement/Aggregate: Finish for Swimming Pools* (1994).