TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE CASPER, WYOMING SOIL CONSERVATION SERVICE

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Proper Curing of Concrete

The Soil Conservation Service has always stressed proper curing of concrete. This technical note hopes to answer questions commonly raised in the field as to why and how.

Concrete begins to gain cementing strength as soon as the initial set takes place. This initial set and subsequent hardening is due to a chemical reaction between the cement and water called hydration. The water content of fresh concrete is considerably more than that required for hydration of the concrete.

The chemical reaction takes place very rapidly at first and gradually slows down. If water is lost through evaporation or otherwise, hydration slows down or stops entirely with resultant porous and weak concrete. With hydraulic structures, such as that found in the majority of our work, it is essential that the concrete be as dense as possible to prevent water being absorbed in the concrete with resultant spalling or rupturing upon freezing.

The purpose of proper curing of concrete is simply to prevent the loss of moisture during the early, relatively rapid stage of hydration.

The best procedure for accomplishing this is to "moist cure," by continuous ponding or spraying, or by covering with earth, sand or burlap maintained in a wet or moist condition. Intermittent wetting and drying is usually worse than no curing. "Moist curing" not only keeps the exposed surfaces moist or wet but keeps concrete cooler, which greatly aids strength development and reduces shrinkage, cracking and crazing.

Under many concreting operations, such as ditch lining, etc., it becomes impractical, if not impossible, to "moist cure" concrete. It then becomes desirable to apply sealing membranes such as commercial curing compound. An effective membrane properly applied will, under most conditions, retain enough moisture for adequate curing.

Recent research has shown the desirability of using white pigmented curing compounds for all concrete exposed to the elements and especially for thin sections such as ditch lining. The white coating reflects a considerable amount of the heat which would be absorbed from direct sunlight if the concrete were coated with the clear or translucent curing compounds. In hot weather, the decrease in temperature may be as high as 40° F. The lower and more uniform temperature materially reduces cracking caused by thermal

expansion and contraction. This research indicates that the use of white-pigmented curing compounds properly applied, approximates the effect of shading in maintaining low concrete temperatures. The white pigmented curing compound must be thoroughly mixed and continuously agitated during application to prevent spray nozzle clogging.

To be most effective, the compound should not be applied while bleeding water or "shine" remains on the surface, but immediately after the surface has a dull appearance.

The curing period or time for concrete depends on temperature of the air in contact with the concrete, and also on the type of cement used to produce the concrete. The minimum time normally specified is 7 days. This can be reduced to 3 days where Type III-High Early Strength cement is used. However, Type III cement has some undesirable characteristics, especially in moderate to high sulfate areas.

C. L. Eubank