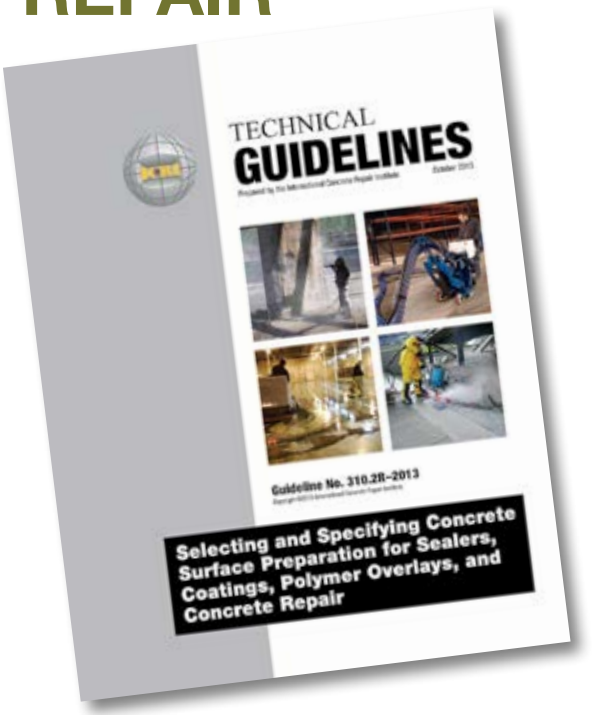
INTRODUCTION TO ICRI TECHNICAL GUIDELINE NO. 310.2R-2013,

SELECTING AND SPECIFYING CONCRETE SURFACE PREPARATION FOR SEALERS, COATINGS, POLYMER OVERLAYS, AND CONCRETE REPAIR

BY PAT WINKLER



ICRI Technical Guideline No. 310.2R-2013, "Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair," was recently revised and updated. Many of you are familiar with the new guideline, as numerous copies have already been purchased. But, in case you missed it, the new guideline has been expanded to include surface preparation for concrete repairs. This resulted in the addition of a 10th concrete surface profile (CSP 10) with an amplitude of greater than 0.25 in. (6 mm). Accordingly, a new CSP 10 chip (Fig. 1) has been added to the existing nine CSPs currently used to evaluate concrete surface profile following surface preparation. In addition, Appendix A, "Surface Preparation Selection," has been expanded to provide a detailed selection criteria list and a new Appendix B, "Testing," provides a summary of test methods that may be used to specify and verify the quality of the surface preparation.

The purpose of the guideline is to help ensure proper concrete surface preparation. Most protective systems and repair materials designed for application to concrete require some level of surface preparation. Manufacturers of these products often specify the type and quality of the surface preparation that is required to ensure the success of their product. The type of material, concrete substrate, and job-site conditions will impact the type of surface preparation required for the project.

Proper surface preparation is the key to successful repairs. Poor surface preparation may lead to:

- Failure of the protective system or repair material (Fig. 2);
- Further repairs;
- Added expense;
- Loss of use of the structure; and
- Compromised integrity of the structure.

Deadlines drive project schedules and surface preparation can be the loser. Surface preparation is often hidden as the work progresses and may be easily overlooked. Proper selection and execution of the surface preparation is key to a successful project.

Fig. 1: CSP 10

Fig. 2: Protective coating failure

How can the new guideline help you? The guideline provides four steps to assist in specifying concrete surface preparation, including:

1. Evaluation of:
   a. Substrate condition,
   b. Material to be installed, and
   c. Job-site conditions;
2. Review of surface preparation method(s);
3. Selection of surface preparation method(s); and
4. Surface preparation requirements:
   a. Profile (CSP), and
   b. QC testing criteria.

Appendix A provides a detailed checklist of items to be evaluated prior to selecting a surface preparation method. A complete evaluation of the substrate and job-site conditions will impact the material selection. Selection of a protective system or repair material must be made in context with the substrate and job-site conditions. For example, on your project, it is determined that a clear sealer exists on the concrete surface (Section A.1, "Substrate Condition") and surface preparation must be done in a dust-free environment (Section A.3, "Job-Site Conditions"). The owner would like to install a new high-build coating and Section A.2, "Protective system and repair material requirements," suggests that the required surface profile should be CSP 3-5. With this information, you have the initial criteria to evaluate surface preparation options. Consulting the manufacturer's recommendations for surface preparation will provide further guidance.

TABLE 7.2: PREPARATION METHODS

Surface preparation method	Concrete Surface Profile									
	CSP 1	CSP 2	CSP 3	CSP 4	CSP 5	CSP 6	CSP 7	CSP 8	CSP 9	CSP 10
Detergent scrubbing	■									
Low-pressure water cleaning	■									
Grinding	■	■								
Acid etching	■	■	■							
Needle scaling		■	■	■						
Abrasive blasting		■	■	■	■	■				
Shotblasting		■	■	■	■	■	■	■	■	
High- and ultra-high-pressure water jetting			■	■	■	■	■	■	■	■
Scarifying				■	■	■				
Surface retarder (1)					■	■	■	■	■	■
Rotomilling						■	■	■	■	
Scabbling							■	■	■	
Handheld concrete breaker							■	■	■	■

(1) Only suitable for freshly placed cementitious materials

Fig. 3: CSP comparison

Fig. 4: Surface preparation to remove coating

Once the evaluation process is complete and the protective system or repair material has been selected, it is time to review the 13 surface preparation method summaries contained in Section 8.0 of the guideline. Each method summary follows a general format including:

1. Summary—of the surface preparation method;
2. Removal—method of concrete removal;
3. Profile—range and pattern expected from this method;
4. Accessibility—of equipment to areas to be prepared;
5. Limitations—associated with this method;
6. Environmental factors—issues such as dust, noise, or chemicals;
7. Execution—how the method is performed;
8. Equipment—required for the method;
9. Materials—consumables required;
10. Employee skill level—required for method;
11. Setup and down time—estimated for method;
12. Cleanup—cleanup criteria and options;
13. Production rates—estimated for method;
14. Quality control—general statement referring to Appendix B; and
15. Safety hazards—minimum recommended PPE and Appendix C.

The aforementioned format allows for a quick comparison between surface preparation methods. A comparison chart of the CSP produced by each method is provided in the guideline (Fig. 3).

The goal of the surface preparation method is to provide a clean, sound, roughened surface including:

- Removal of laitance, dirt, oil, films, paint, and coatings (Fig. 4);
- Removal of contaminated and/or unsound concrete;
- Opening of the pores;
- Removal of any material that will interfere with penetration, adhesion, or bonding; and
- Creation of a surface profile.

Knowledge of the surface preparation requirements for the protective system or repair material and the substrate and job-site conditions, together with the capabilities of the various surface prepara-

Fig. 5: Concrete removed during scarification

Fig. 6: CSP chips on prepared surface

tion methods, allows one to select the appropriate surface preparation method(s). Following the previous example, where the goal would be to remove the clear sealer and create a CSP 3-5 in a dust-free environment, a contained dust-free system such as shotblasting, which is capable of producing a CSP of 2-9, may be an appropriate choice for the surface preparation necessary to install a new high-build coating.

The last step is specifying the surface preparation criteria. During surface preparation, almost all of the methods will remove some amount of concrete (Fig. 5). This removal results in a surface profile (roughness or amplitude) that is generally the most visible condition following surface preparation. The guideline includes 10 concrete surface profiles ranging from CSP 1 (minimal roughness) to CSP 10 (very rough with amplitude greater than 0.25 in. [6 mm]). Typically, a CSP range should be used and included in the project specifications. The concrete surface profile of the prepared surface can quickly be compared to the specified profile range using the CSP chips (Fig. 6).

There are several test methods, such as tensile bond strength (Fig. 7), that may be used for quality control to ensure the suitability and condition of the concrete surface following surface preparation. Appendix B includes a brief discussion of several test methods that may be used to verify the quality of the surface preparation. Where appropriate, the ASTM reference is provided.

There are no shortcuts with surface preparation. Following a system of evaluation, review, selection, and specification, the proper surface preparation method(s) can be selected and verified. This process will greatly enhance the success of the repair project.

If you already have the previous Technical Guideline No. 310.2 and CSP 1-9 chips, you can update your set by obtaining the new Technical Guideline No. 310.2R-2013 and the CSP 10 chip only.

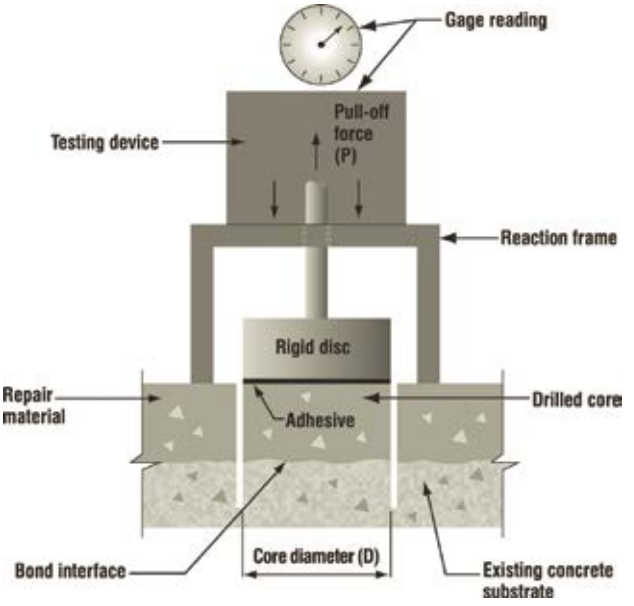


Fig. 7: Tensile bond test device

Pat Winkler *is Vice President of Rampart Hydro Services, LP, in Coraopolis, PA. He has been directly involved in hydrodemolition and surface preparation for over 25 years. Winkler is a past Chair of ICRI Committee 310, Surface Preparation, and was one of the principal authors of ICRI Technical Guideline No. 310.3, "Guide for the Preparation of Concrete Surfaces for Repair Using Hydrodemolition Methods." Winkler has served on the ICRI Technical Activities Committee and was recently named an ICRI Fellow. Winkler is also a member of ACI and serves on Committees 546, Repair of Concrete, and E706, Concrete Repair Education. He received his BA in chemistry from Michigan State University, East Lansing, MI, and his MBA from Rutgers University, New Brunswick, NJ.*