

HOW TO TALK TO END USERS ABOUT REPAIRS AND SURFACE IMPERFECTIONS

Presented by:
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PRECAST CONCRETE IT'S PERFECT

Perfect: "Being complete of its kind and without defect or blemish."

A Perfect Masterpiece



Your "Perfect" Masterpiece




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AT THE CONCLUSION OF THIS COURSE, YOU WILL:


- Better understand, quantify and classify precast concrete damage
- Learn what the standards say about repair
- Determine if an identified defect is repairable or should be repairable (there is a difference)
- When and how to have the discussion with the end user about precast product repair.
- Items that lead to successful repairs and successful allowance to repair.

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BETTER UNDERSTAND, QUANTIFY AND CLASSIFY PRECAST CONCRETE DAMAGE

- How many have a detailed written Precast Concrete Repair Procedure and Guide for your specific plant?
 - Determine what is causing the problem.
 - Evaluate the severity of damage (classification, major/minor).
 - Determine your repair method & repair materials.
 - Preparation of concrete for repair.
 - Apply repair to the product.
 - Allow & describe proper curing of the repair.
 - Inspection of the repaired concrete.
 - Establish a database of files for repaired products and document repairs.


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BETTER UNDERSTAND, QUANTIFY AND CLASSIFY PRECAST CONCRETE DAMAGE

- **NPCA QUALITY CONTROL MANUAL For Precast Concrete Plants 14th edition**
- 1.1.2 Plant-Specific Quality Control Manual
 - 9. Product repair policy and procedures
- 4. Production Practices
 - 4.6.2 Product Damage During Stripping

Products damaged during stripping shall be evaluated by qualified plant personnel to determine if repairs are necessary, and if so, what repair is required before shipping. A record of any major damage and the repairs shall be kept on file with the final inspection report, as required in Section 4.8.5.


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BETTER UNDERSTAND, QUANTIFY AND CLASSIFY PRECAST CONCRETE DAMAGE

- **NPCA QUALITY CONTROL MANUAL For Precast Concrete Plants 14th edition**
- 4.7.1 Repairing Minor Defects


Defects not impairing the functional use or expected life of a precast concrete product shall be considered minor defects. Minor defects may be repaired by any method that does not impair the product.

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BETTER UNDERSTAND, QUANTIFY AND CLASSIFY PRECAST CONCRETE DAMAGE


- **NPCA QUALITY CONTROL MANUAL For Precast Concrete Plants 14th edition**
- 4.7.2 Repairing **Major Defects**
Defects in precast concrete products that **impair the functional use or the expected life** of products shall be considered major defects. Unless major defects are repaired the product shall be rejected. **Major defects** shall be evaluated by **qualified personnel** to determine if repairs are feasible and if so, to establish the repair procedure. Proper repairing procedures and curing shall be inspected.

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LEARN WHAT THE STANDARDS SAY ABOUT REPAIR

- **ASTM / AASHTO Product Standards**


- **9. Repairs (C478)**
 9.1 Repair of manhole products **shall not be prohibited**, if necessary, because of imperfections in manufacture or damage during handling, and will be acceptable if in the opinion of the owner, the repaired products conform to the requirements of this specification.
- **9. Repairs (C858)**
 9.1 Precast concrete structures **may be repaired**. Repairs **shall be performed at the direction of the manufacturer** in a manner to ensure that the repaired structure conforms to the requirements of this specification

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LEARN WHAT THE STANDARDS SAY ABOUT REPAIR

- **301-16 Specifications for Structural Concrete**

 American Concrete Institute
 Always advancing
- **surface defects**—imperfections in concrete surfaces defined in Contract Documents requiring repair
 1.7.1.1 Concrete Work that fails to meet one or more requirements in Contract Documents but subsequently is repaired to bring concrete into compliance will be accepted.


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LEARN WHAT THE STANDARDS SAY ABOUT REPAIR


- **301-16 Specifications for Structural Concrete**


 American Concrete Institute
 Always advancing
- 1.7.1.3 Repair rejected concrete Work by removing and replacing or by additional construction to strengthen or otherwise satisfy project requirement as directed by Architect/Engineer. To bring rejected Work into compliance, **use repair methods that meet applicable requirements for function, durability, dimensional tolerances, and appearance as determined by Architect/Engineer.**
- 1.7.1.4 Submit proposed repair methods, materials, and modifications needed to repair concrete Work to meet requirements in Contract Documents.

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LEARN WHAT THE STANDARDS SAY ABOUT REPAIR

- **301-16 Specifications for Structural Concrete**

 American Concrete Institute
 Always advancing
- 13.2.11.11 If members are damaged, submit repair procedures before executing repair. Repair damaged precast concrete members to meet the requirements of accepted repair procedures.

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LEARN WHAT THE STANDARDS SAY ABOUT REPAIR

- **Architectural Concrete and Structures**


- Typically covered by building specifications by architect.
- **Architectural Finishes**
 Aesthetics, color and finish match is what the customer is paying for
- Consequently, the expectations are typically clearer through required mockup panels & inspection criteria (20' rule ACI 303R-12 Guide to Cast-in-Place Architectural Concrete Practice.)

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LEARN WHAT THE STANDARDS SAY ABOUT REPAIR

- **301-16 Specifications for Structural Concrete**



14.1.4 Design reference samples, sample panels, and mockup
14.1.4.1 Design reference samples—Design reference samples for initial verification of design intent shall be approximately 12 x 12 x 2 in. and be representative of finishes, color, and textures of precast concrete unit exposed surfaces.
14.1.4.2 Sample panels—Unless otherwise specified, before fabricating CA members or architectural precast concrete units, produce and submit at least two sample panels each with an area of at least 16 ft² in area. Incorporate full-scale details of architectural features, finishes, textures, and transitions.

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14.1.4.1 Design reference samples or panels???
It is hoped not

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LEARN WHAT THE STANDARDS SAY ABOUT REPAIR

- **301-16 Specifications for Structural Concrete**



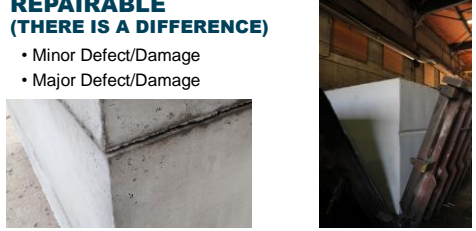
14.1.4 Design reference samples, sample panels, and mockup
14.1.4.4 Damage part of an exposed-face surface on two sample panels for each finish, color, and texture, and demonstrate sufficiency of repair techniques proposed for repair of surface damage.
14.1.4.5 After acceptance of repair technique, maintain one sample panel at manufacturer's plant and submit one for project site in an undisturbed condition as a standard for visual evaluation of completed Work.


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DETERMINE IF AN IDENTIFIED DEFECT IS REPAIRABLE OR SHOULD BE REPAIRABLE (THERE IS A DIFFERENCE)

- Minor Defect/Damage
- Major Defect/Damage

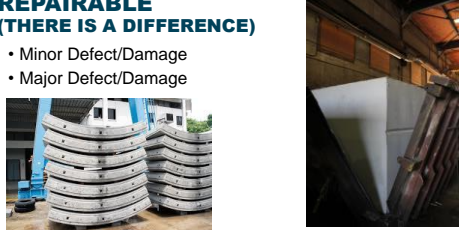


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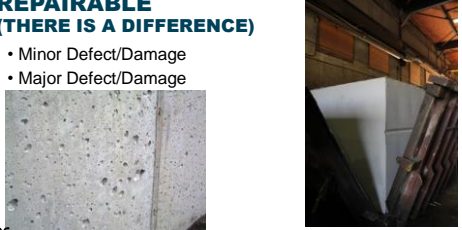



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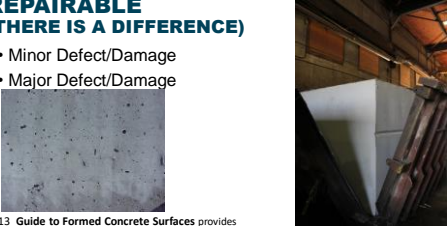
Web page from **civilstructuralENGINEER** website
<https://cseengineermag.com/npc-and-pci-issue-joint-concrete-products-document-to-clarify-certification-requirements/>

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- Major Defect/Damage



ACI 347.3R-13 **Guide to Formed Concrete Surfaces** provides quantitative analysis and categorizing of bughole based on application

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DETERMINE IF AN IDENTIFIED DEFECT IS REPAIRABLE OR SHOULD BE REPAIRABLE (THERE IS A DIFFERENCE)

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- Major Defect/Damage



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DETERMINE IF AN IDENTIFIED DEFECT IS REPAIRABLE OR SHOULD BE REPAIRABLE (THERE IS A DIFFERENCE)

AASHTO
 Standard Practice for Evaluation of Precast Concrete Drainage Products
 AASHTO Designation: R 73-16
 Technical Section: 4a, Concrete Drainage Structures
 Release: Group 2 (June 2016)

SCOPE

1. This standard practice describes the evaluation of precast concrete pipe, box culverts, manholes, and drainage vaults. This standard also describes criteria for acceptable products, rejectable products, and the rejection of defective products. All repairs that conform to the criteria found in this document or to contract documents as applicable.
- 1.2. This standard practice is applicable to storm water management precast concrete products manufactured by both the wet cast and the cast production methods, after curing and prior to installation.
- 1.3. This standard practice covers the inspection of finished products manufactured per M 86, M 109, M 199, M 206, M 207, M 242, M 250, and M 275; and ASTM C660, C683, C803, C863, C883, C943, C958, C1038, and C1537.
- 1.4. Evaluation guidelines are included for the following conditions:
 - cracks;
 - manufacturing defects; and
 - damaged ends.
- 1.5. This standard practice is not intended for the evaluation of related precast concrete pipe, box culverts, transitional structures, manholes, drainage vaults, or other precast products.

Available at: AASHTO Store
<https://store.transportation.org>

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DETERMINE IF AN IDENTIFIED DEFECT IS REPAIRABLE OR SHOULD BE REPAIRABLE (THERE IS A DIFFERENCE)

4. ACCEPTABLE DEFECTS IN PRECAST CONCRETE PRODUCTS
 4.1 Minor defects, which do not affect the performance or design life of the product as described in Sections 4.2 through 4.8, will not be cause for rejection or repair.





Figure 6—Acceptable Bug Holes and Shallow Pitting
 AASHTO R73-16
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DETERMINE IF AN IDENTIFIED DEFECT IS REPAIRABLE OR SHOULD BE REPAIRABLE (THERE IS A DIFFERENCE)





Figure 25—Acceptable Pipe Spigot Repair
 AASHTO R73-16
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DETERMINE IF AN IDENTIFIED DEFECT IS REPAIRABLE OR SHOULD BE REPAIRABLE (THERE IS A DIFFERENCE)





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DETERMINE IF AN IDENTIFIED DEFECT IS REPAIRABLE OR SHOULD BE REPAIRABLE (THERE IS A DIFFERENCE)

- Minor Defect/Damage
- Major Defect/Damage



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DETERMINE IF AN IDENTIFIED DEFECT IS REPAIRABLE OR SHOULD BE REPAIRABLE (THERE IS A DIFFERENCE)

6.4.4 Honeycomb and Bleedout:

6.4.4.1 Honeycomb or bleedout that extends to a depth greater than the size of the coarse aggregate and exposes reinforcing steel or causes concrete permeability beyond the project specification for leakage, which either occupies a single defect area greater than 4 percent or a cumulative area greater than 10 percent of the internal surface area of the product, as shown in Figure 32, **shall not be repairable.**

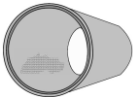



Figure 32—Rejectable Manufacturing Defect—Honeycombing ASHTO R72.16

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DETERMINE IF AN IDENTIFIED DEFECT IS REPAIRABLE OR SHOULD BE REPAIRABLE (THERE IS A DIFFERENCE)

Even with skilled repair personnel, will the product be acceptable to the customer? Consider these questions:

- Will the expected performance and useful life of the product be compromised?
- Will the aesthetics of the repair be acceptable?
- Is there time to complete the repair thoroughly?
- Will the total cost of repair exceed casting a replacement?
- Will this repaired product upon delivery impact your company's relationship with the buyer and negatively influence future work? What cost do you put on that?

Keep in mind that perception usually pre-empts reality or fact.
Quality concrete out of the form is desirable; quality concrete in service is essential.
By Carl S. Buchman, P.E. NPCA May 28, 2010

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DETERMINE IF AN IDENTIFIED DEFECT IS REPAIRABLE OR SHOULD BE REPAIRABLE (THERE IS A DIFFERENCE)

- Sometimes you must bite the bullet...




And Re Pour the Piece

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DETERMINE IF AN IDENTIFIED DEFECT IS REPAIRABLE OR SHOULD BE REPAIRABLE (THERE IS A DIFFERENCE)

THE ULTIMATE QUESTION:
Knowing the industry and capability within your company, would you spend your own money for that repaired product?

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WHEN AND HOW TO HAVE THE DISCUSSION WITH THE END USER ABOUT PRECAST PRODUCT REPAIR.

<p>RELATIONSHIPS</p> <ul style="list-style-type: none"> • Need to show up before an issue arises • Project Pre-bid, meet the engineer [maybe the inspector] • Project Pre-construction meeting • Onsite-address any issue quickly & in person if possible 	<p>EXPECTATIONS</p> <ul style="list-style-type: none"> • Plant tours with owners, engineers, inspectors, contractors • Photos of previous projects with acceptance • Inform on accepted standards and practice • Correct production errors – don't repeat
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WHEN AND HOW TO HAVE THE DISCUSSION WITH THE END USER ABOUT PRECAST PRODUCT REPAIR.

When BEFORE REPAIR QUALITY ISSUE ARISES

How WITH KNOWLEDGE AND CONFIDENCE OF PRECAST CONCRETE PRODUCTION, STANDARDS, AND QUALITY

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How WITH KNOWLEDGE* AND CONFIDENCE OF PRECAST CONCRETE PRODUCTION, STANDARDS, AND QUALITY

Concrete Repair-Precast Inc. January 8, 2018
 ACI 364.13T-15, "Repairs for Reinforcement with Shallow Cover"
 ACI 364.3R, "Guide for Cementitious Repair Material Data Sheet"
 ACI 546R-14, "Guide to Concrete Repair"
 ACI 546.3R-14, "Guide to Materials Selection for Concrete Repair"
 AASHTO R73-16, "Standard Practice for Evaluation of Precast Concrete Drainage Product"
 ICR 320.3R, "Guideline for Inorganic Repair Material Data Sheet Protocol"
 ICR RAP-10, "Leveling and Reprofilling of Vertical and Overhead Surfaces"
 NPCA Quality Control Manual for Precast Concrete Plants, 12th EDITION.
 TXDOT Concrete Repair Manual, January 2017
 Webinar, TXDOT Proper Design and Implementation of Concrete Repairs.
 Graham Bettis, P.E.
 U.S. Army Corps Engineers, "Evaluation and Repair of Concrete Structures," 1995.
 U.S. Bureau of Reclamation, "Guide to Concrete Repair," Second Edition.

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ITEMS THAT LEAD TO SUCCESSFUL REPAIRS AND SUCCESSFUL ALLOWANCE TO REPAIR.

<p>KNOWLEDGE, PLAN, TRAINING</p> <ul style="list-style-type: none"> • Why, What, How • Document-Use the Data • Train, Continuously Improve 	<p>TRUST, REPUTATION</p> <ul style="list-style-type: none"> • No second chances of first impressions-What are your products impressions • Correct production errors – don't repeat
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YOUR PRODUCT IS YOUR BILLBOARD.



"You may think that the piece will be buried, and no one will ever see it, but a lot of people see it when it arrives and gets unloaded" –Carl S. Buchman

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ITEMS THAT LEAD TO SUCCESSFUL REPAIRS AND SUCCESSFUL ALLOWANCE TO REPAIR.



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ITEMS THAT LEAD TO SUCCESSFUL REPAIRS AND SUCCESSFUL ALLOWANCE TO REPAIR.



When your name is one it for all to see, it becomes important for all involved to insure it is something to be proud to see.

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ITEMS THAT LEAD TO SUCCESSFUL REPAIRS AND SUCCESSFUL ALLOWANCE TO REPAIR.




Consistent legible & uniform product markings: **in the same place every time**, in accordance with the standards

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CONCLUSION

- Meet & Greet the Engineer and Inspector – **be part of the team.**
- Implement within your plant a **comprehensive written repair policy** and plan
- Train your employees on all aspects of that plan – **fix it like you own it.**
- **Raise the bar** through analysis employing procedures that reduces or eliminates existing product repairs at your plant.


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