Industry Wide Cooperation Vision 2020

Fred Goodwin, FICRI, FACI, FASTM
BASF Construction Chemicals
ICRI TAC Chair

Effectively, CHANGE is almost impossible without
industry-wide collaboration,
cooperation
and
consensus.
--Simon Mainwaring

FACTS and FIGURES

CONCRETE: 2nd Most Common Man-Made Material

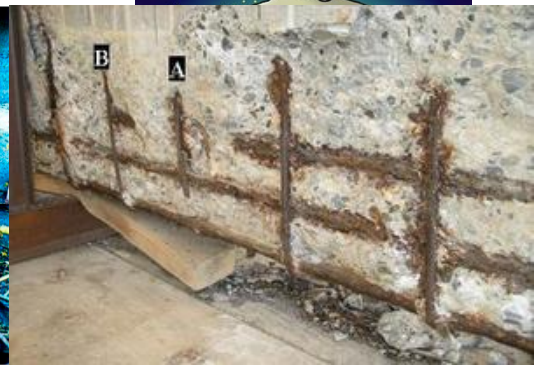
>One half ton of cement is produced for every person on earth
http://minerals.usgs.gov/minerals/pubs/commodity/cement/

>One third cubic meter of concrete is used / year / person
(1.6 tons of structural concrete / person / year)
http://ciks.cbt.nist.gov/~garbocz/appendix1/node4.html

>More concrete is used that all other construction materials combined

32% of occupied structures constructed from reinforced concrete
(in USA 2008) http://pubs.usgs.gov/of/2008/1160/

The cost of corrosion of concrete reinforcement in the US is > $125B (116B€) / yr http://www.corrosioncost.com/infrastructure/highway/index.htm



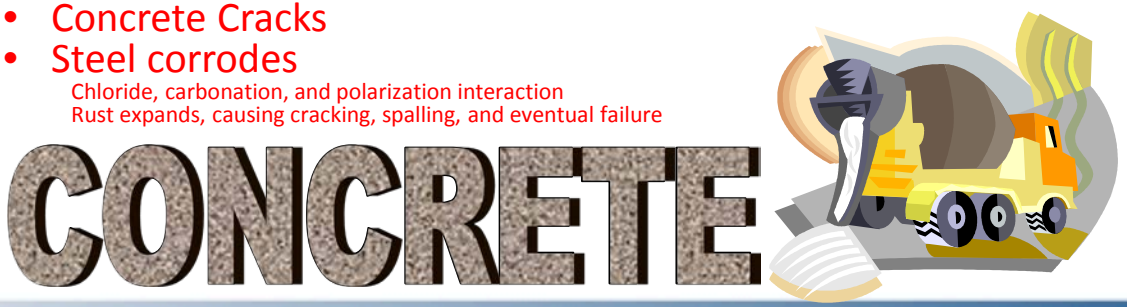
What is Concrete?

+ Concrete is economical with a long life & low maintenance
+ Concrete does not usually rot, corrode, or decay.
+ Concrete can be molded or cast into almost any desired shape.
+ Concrete is fire-safe & able withstand high temperatures.
+ Concrete is resistant to wind, water, rodents, and insects.

BUT (compared to other building materials)

-It has low tensile strength (~10% of compressive strength),
-It has low ductility (it's brittle),
-It has a low strength-to-weight ratio (it's heavy),
-It responds to the environment (it changes with time)
-It has permeability (ingress of liquids and gases)
- It is susceptible to chemical attack (acids, AAR, etc.)

- Concrete Cracks
- Steel corrodes
  Chloride, carbonation, and polarization interaction
  Rust expands, causing cracking, spalling, and eventual failure

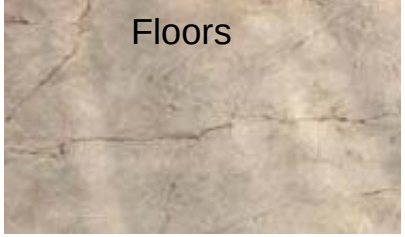


Oldest Concrete Structures

Cisterns

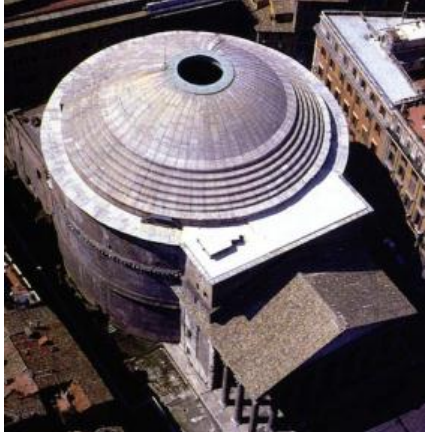
An ancient Nabataea building

~6500 BC Syria



Floors

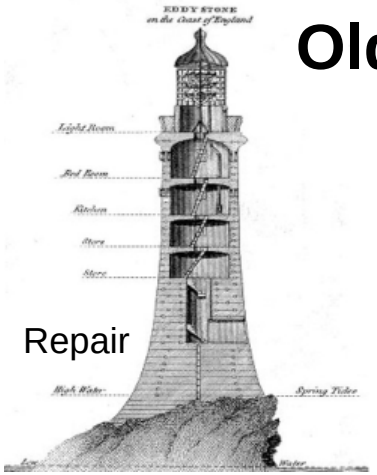
Yiftahel Israel ~8000 BC



Cast in Place

The Pantheon

125 CE (AD)



Repair

Eddystone Lighthouse 1793

Lepenski Vir, Serbia ~5600 BC

Reinforced

Ward's Home 1875







Why does concrete fail?

Concrete requires repair and strengthening due to the 3 **D**'s

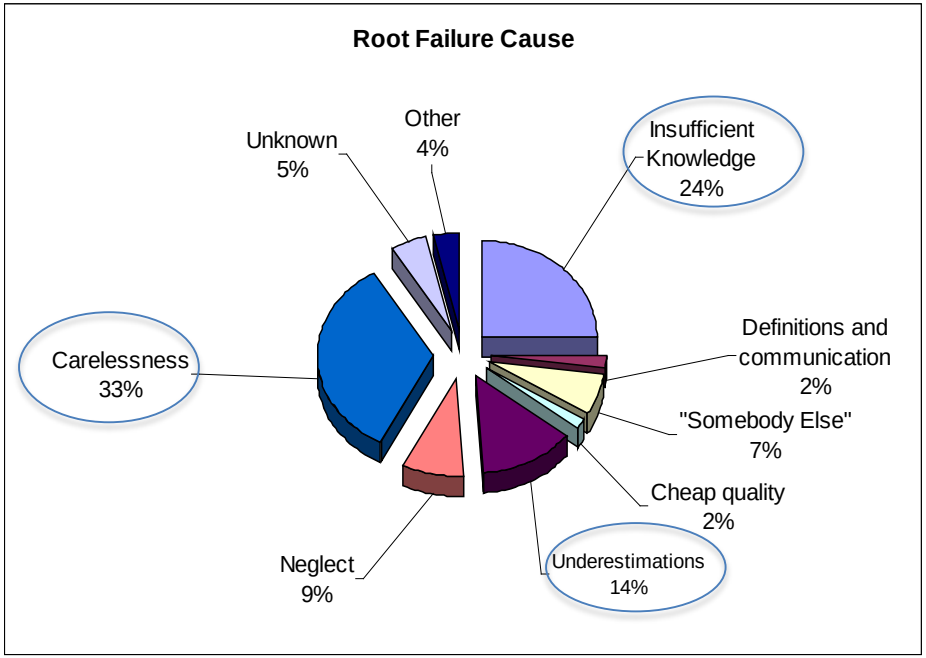
Design and Construction Errors → Deterioration → Damage

= Repair

or Demolition

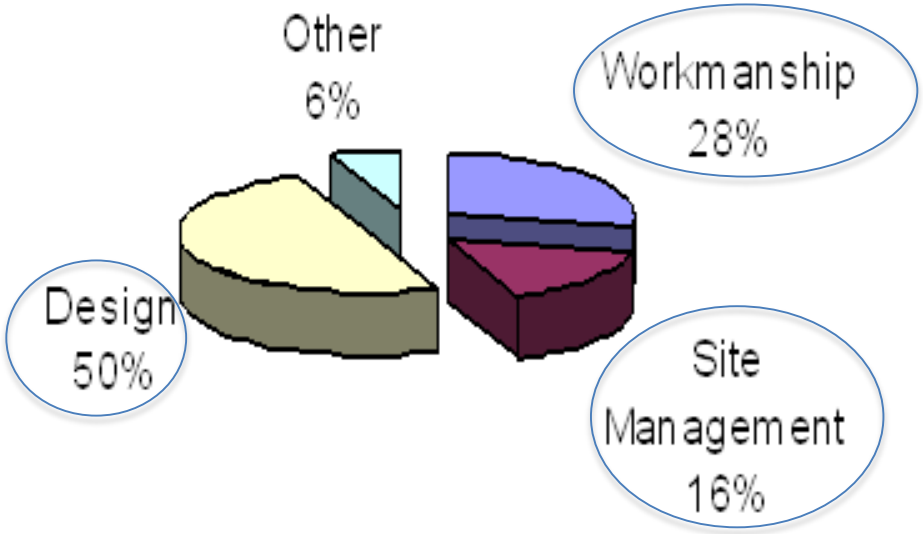
Why Does Concrete Fail?

Fraczek, J., "ACI Survey of Concrete Structure Errors," Concrete International, V. 1, No. 12, Dec. 1979



Why Does Concrete Fail?

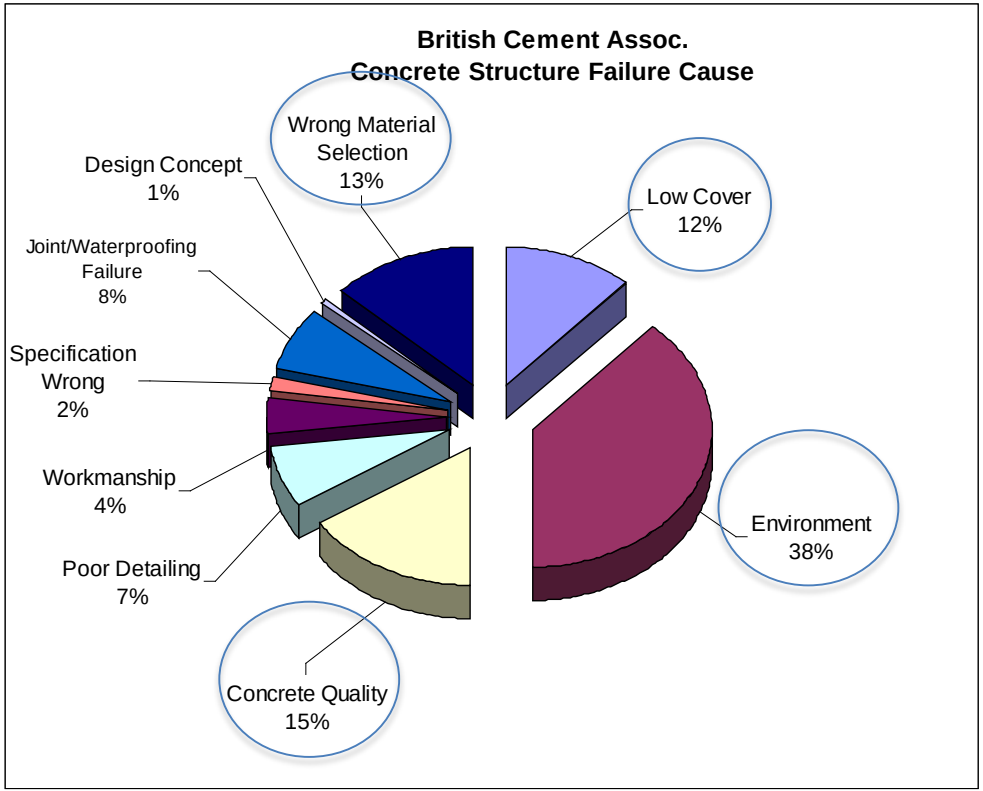
3 Factors=94% of Issues



King. N.P. “Efficient Concreting Practice: A review of Current Procedures”

ICC-2000 E&FN Spon **1993**

Why Does Concrete Fail?



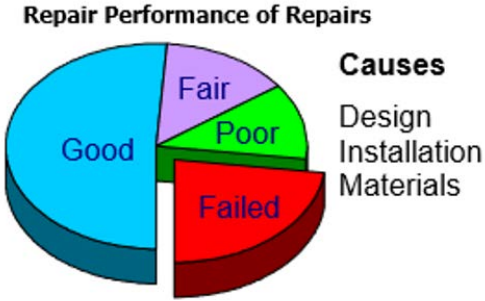
British Cement Association, "Development of an Holistic Approach to Ensure the Durability of New Concrete Construction," *Final Report to the Department of the Environment*, BCA, Crowthorne, UK, October **1997**

Repair Material Performance

"A little more than 50% of the repairs performed on the Corps structures are performing satisfactorily, which is an unacceptable rate.

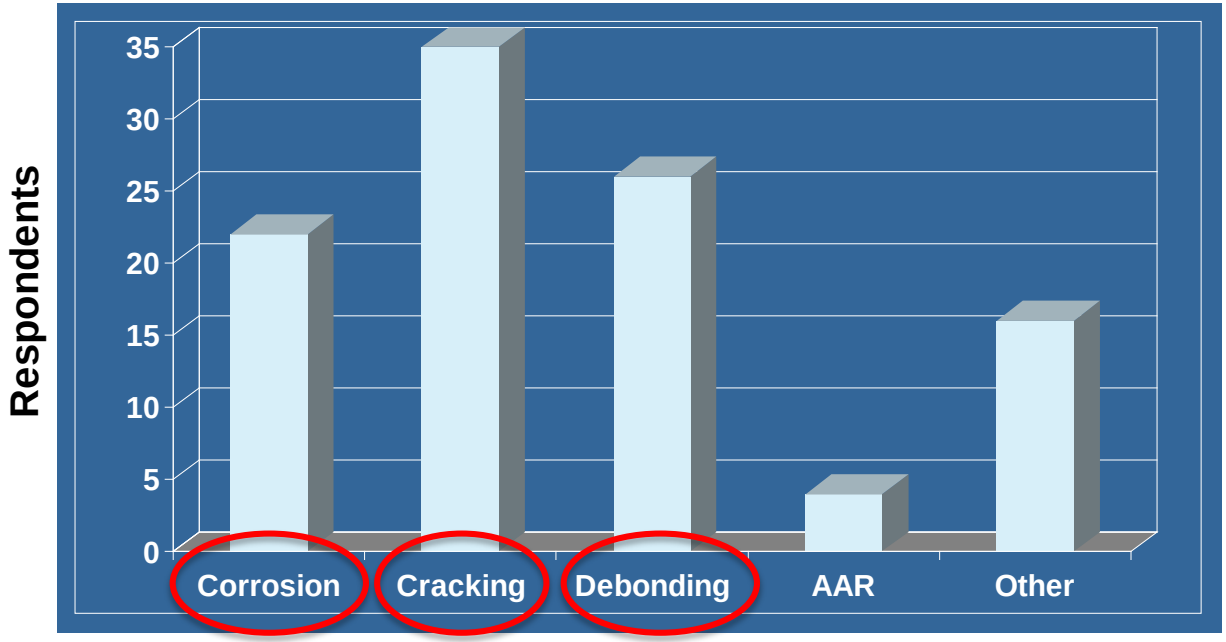
Failures of repairs are attributable to
design or evaluation errors,
material performance, and
installation or construction errors.

The Corps experience is not unusual."



1985 REMR CS-2 as reported in Vision 2020

The # 1 Problem with Repairs

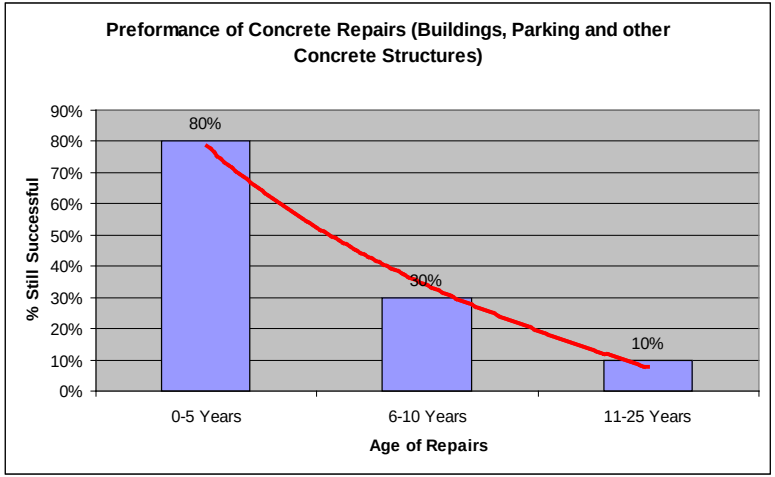


Modes of Repair Failure

2004

http://projects.bre.co.uk/conrepnet/pages/default.htm

How many repairs fail?



50% Successful Repairs Survival

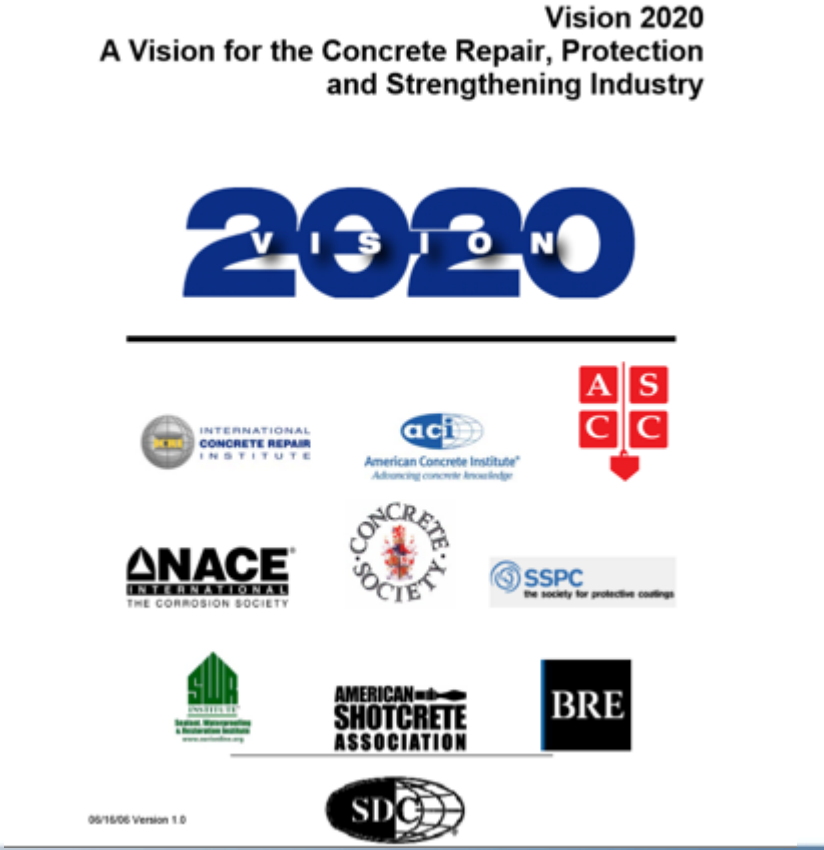
215 useable case-histories

- 50% Successful and exhibiting no signs of deterioration.
- 25% Exhibiting evidence of deterioration, …not necessarily requiring remedial action.
- 25% Failure, clearly requiring remedial action.

http://projects.bre.co.uk/conrepnet/pages/default.htm

2004

CONREPNET


Vision 2020
A Vision for the Concrete Repair, Protection and Strengthening Industry
2020 VISION
INTERNATIONAL CONCRETE REPAIR INSTITUTE
aci
American Concrete Institute
ASCC
NACE INTERNATIONAL THE CORROSION SOCIETY
CONCRETE SOCIETY
SSPC the society for protective coatings
SWA INSTITUTE
AMERICAN SHOTCRETE ASSOCIATION
BRE
06/15/06 Version 1.0
SDC

2004-2006


PROBLEM
SOLUTION

THE **REAL** SITUATION

Strategic Development Council

aciFoundation

Great Job of Keeping Vision 2020 Alive

SPONSOR and FACILITATION Vision 2020, 2004
CONSORTIA UPDATES Concrete Repair Engineering Experimental Program
INDUSTRY CRITICAL TECHNOLOGIES" (ICTS) Cracking, Sustainable Development, Repair and Protection Council, Repair code/specifications, Prepackaged Powdered Construction Products, Strategic Repair Research Council, Vision 2020

Driving Forward with Vision 2020 05/2006
Vision 2020 Goal #8 Research, Vision 2020 Update 10/2006
2020 Vision: A Vision for the Concrete Repair, Protection, and Strengthening Industry 4/2008
Vision 2020: Corrosion Testing Evaluation - an SDC Research Project, Vision 2020 Update: Sustainability/Research 5/2009
Vision 2020 Update - Concrete Repair, Protection, and Strengthening, Corrosion Issues in Repair, Suggested Protocol for Measuring the Performance of Reinforcing Steel Corrosion Mitigation and Prevention Technologies for Concrete Repair, 5/2010
Baha'i House of Worship Restoration, 9/2011
Alcatraz: Concrete Preservation and Training the Next Generation, Update on USBR Research Project, 9/2012
Update on Strategic Repair Research Council Workshop, 3/2013
SDC Workshop - Establishing Standards of Care for Prepackaged Powdered Materials for Use in Construction, Protocol For Measuring the Performance of Reinforcing Steel Corrosion Mitigation Technologies For Concrete Repair, 9/2013
Approach to ACI 562 Code Requirements for Evaluation, Repair & Rehabilitation of Concrete Buildings, 2/2014
Update on Protocol for Measuring the Performance of Reinforcing Steel Corrosion Mitigation Technologies for Concrete Repairs, 9/2014, 2/2015
ISO 16311 Maintenance and Repair of Concrete Structures, 2/2015
Durability Codes - International Codes, Durability in Canadian Codes: CSA A23.1 and A23.2, 2/2017

6 Publications:

- Applicator Magazine
- Applying Liquid Sealants Program
- Below Grade Waterproofing Manual
- Clear Water Repellant Handbook, Manual, and Field Manual
- Practical Guide to Waterproofing Exterior Walls ,
- Sealants: The Professionals' Guide

14 Technical Meeting Videos:

- Corrosion Considerations: How Compatible Are Your Balcony Repairs?
- Anatomy of a Historical Preservation Project
- Building Restoration for Hurricane Impact or Blast Mitigation
- Evaluation and Repair of Thin Brick Veneer Facades
- Everything You've Always Wanted to Know About Sealants
- Facing the Challenges in Waterproofing Plaza Decks
- Proper Selection and Use of Pre-Bagged Concrete Patching Mortars
- Handling Hazardous Sealants
- High-rise Facades & Overhead Hazards Mitigation – Restoration
- Faking It: The Use of Alternate Materials in Restoration
- High Rise Façade Restoration
- Lessons Learned During Restoration
- The Value of Petrography in Concrete Repair
- Using Technology to Document Historic Buildings

Many **Case Histories**

15 Technical Bulletins

- Elastomeric wall coatings,
- Exterior stone restoration,
- Mortar joint removal,
- Repointing mortar joints,
- Clear water repellents for masonry,
- Below grade waterproofing - sheet membrane,
- Sealant types and uses,
- Fiber reinforced composites,
- Vehicular deck coatings,
- Urethane grout injection,
- Epoxy injection,
- Terra cotta,
- Green roof applications,
- Through-wall flashing
- Restoration cleaning of masonry facades

Overcoming Existing Corrosion When Using Shotcrete for Repair
Aiming for Extended Service Life with Migrating Corrosion Inhibitors
Field Guide to Concrete Repair Application Procedures
Shotcrete Toward Sustainability
ACI Nozzleman Certification and Underground Robotics
Use of Cathodic Protection in a Shotcrete System
Sewer Rehabilitation Using Shotcrete
Using Galvanic Anodes in Shotcrete Repairs
Marine Structures: Pier Projects
Hydrodemolition and Shotcrete for Rehabilitation of a Reservoir Spillway
Sustainability of Shotcrete in the Pool Industry
Surface Preparation for Shotcrete Repair
Adaptability to Repair Surfaces That Are Not Cost-Effective with Other Processes
Speed of Repair Reduces or Eliminates Downtime
The Question of Bonding Compounds and Shotcrete
Shotcrete Repairs to Infrastructure
Shotcrete in Liquid-Containing Concrete Structures
Concrete Repair by Shotcrete Application
Shotcrete and Sustainability
Shotcrete is a Versatile Structural Concrete Repair Material
Nondestructive Testing Verifies Quality of Repair
Repair Procedure for Exposed or Shallow Reinforcement
Advances in Shotcrete Technology for Infrastructure Rehabilitation
What is the International Concrete Repair Institute?

308 Case Histories and Articles
302 FAQ's
7 Position Statements
- Compressive Strength Values of Pool Shotcrete
- Shotcrete Terminology
- Sustainability of Shotcrete in the Pool Industry
- Watertight Shotcrete for Swimming Pools
- Monolithic Shotcrete for Swimming Pools (No Cold Joints)
- Forming and Substrates in Pool Shotcrete
- Shotcrete Contractor and Crew Qualifications

5 Specification Resources
- Shotcrete Testing – Who, Why, When, and How
- U.S. Shotcrete Standards Update
- Shotcrete Testing around the World
- Guide Specification for Structural Shotcrete Walls
- Performance-Based Specifications for Shotcrete Contracts

Webinars
Many **Conference Proceedings**

Certification

- Fire and security certification, LCBP
- Environmental certification schemes, BREEAM, Microgeneration
- Management systems and quality ISO, OHSAS, BIM L2

Advisory Services

- Planning advisory services
- Design advisory services
- Specification advisory services
- Construction
- Buildings in use
- Refurbishment

Sustainability

- Sustainable construction of buildings
- Sustainable organisations
- Sustainable products and materials

Research & innovation

- Fire research
- BRE Trust research programme
- Materials research
- Innovation Park
- Projects and reports

Testing

- Acoustics
- Air quality
- Airtightness testing services
- Construction troubleshooting
- Building investigations
- Fire Research
- Engineering and building diagnostics
- Indoor air quality and environments
- Materials research
- Monitoring
- Stone testing
- Weathertightness, operation, strength and impact resistance
- Wind engineering

423 Concrete Related Publications Listed for Download

STG 01 - Reinforced Concrete active Technology Exchange Groups (TEG) and Task Groups (TG)

- TEG 043X Reinforced Concrete: Cathodic Protection
- TEG 053X Reinforced Concrete: Design, Evaluation, and Remediation
- TG 044 ICCP of Reinforcing Steel in Atmospherically Exposed Concrete Structures
- TG 045 Reinforced Concrete: Anode Test Procedures
- TG 046 Cathodic Protection of Prestressed Concrete Elements
- TG 050 Reinforced Concrete: Inhibitors and Admixtures
- TG 055 Inspection Methods for Corrosion Evaluation of Conventionally Reinforced Concrete Structures
- TG 057 Reinforced Concrete: Corrosion-Resistant Reinforcement
- TG 324 Reinforced Concrete: Maintenance and Rehabilitation Considerations for Existing Structures
- TG 356 Reinforced Concrete: Stray-Current-Induced Corrosion
- TG 460 Testing and Evaluation of Corrosion on Steel-Framed Buildings
- TG 472 Test Procedure for Embeddable Impressed Current Anodes for Atmospherically Exposed Structures
- TG 504 Inspection Methods for Corrosion Evaluation of Prestressed Concrete Structures
- TG 545 State of the Art Report: Criteria for Corrosion Control of Steel in Concrete
- TG 556 Electrochemical Realkalization of Steel-Reinforced Concrete – A State of the Art Report”
- TG 557 Sacrificial Cathodic Protection of Reinforced Concrete Elements
- TG 920 Electrochemical Chloride Extraction and Realkalization of Reinforced Concrete (Rapid Electrochemical Treatment of Steel in Concrete
- TEG 022X Corrosion Control Coordinating Committee
- TEG 192X Coating Industry Problems Confronting Owners and Contractors
- TEG 255X Coatings, Thermal-Spray for Corrosion Protection
- TG 018 Steel, Structural: Corrosion Control of Pilings in Nonmarine Applications
- TG 323 Wet Abrasive Blast Cleaning
- TG 388 Cathodic Protection Rectifier Safety
- TG 439 Bridge Corrosion Management
- TG 517 Corrosion Control of Reinforced Concrete Piles in Nonmarine Applications

33 publications on repair

The Concrete Vault

OR	NOT			OR	NOT		
		Keyterm 1:	REPAIRING	☑	☐	Keyterm 2:	REHABILITATION
☑	☐	Keyterm 3:	CORROSION	☑	☐	Keyterm 4:	DETERIORATION PROPERTIES
☑	☐	Keyterm 5:	DAMAGED	☐	☐	Keyterm 6:	

Total number of records found: 17,513: including ACI + Others
Subscription Based

SSPC the society for protective coatings

SSPC.org The Coatings Society.

3 Certification Programs

- 7 Paths to Concrete Coating Inspector (depending on experience)
- + Supplement-Determine Level of Moisture in Concrete
- Concrete Coating Basics (CCB)
- Basics of Concrete Surface Preparation eCourse

13 Standards

- TU 2/NACE 6G197, Concrete Secondary Containment Coatings
- TU 12, Ambient-Curing Fluoropolymer Coating
- TR 5/ICRI 03741/NACE 02203, Concrete Flooring Systems
- SP 13/NACE 6, Surface Prep of Concrete
- QP 8, Concrete Coating Contractor Qualification
- QP 6, Thermal Spray Contractor Qualification
- Paint 46, Elastomeric Coating for Masonry and Concrete
- Paint 45, Two-Component Thick-Film Polyurea Coating
- Paint 16, Coal Tar Epoxy-Polyamide Black (or Dark Red)
- PA 9, Measurement of DFT on Concrete
- PA 7, Applying Thin-Film Coatings to Concrete
- PA 14, Applying Plural Component Polyurea
- Paint 44, Coatings for Concrete in Wastewater Facilities

6 Training Programs

- Floor Coating Basics
- Concrete Coating Basics
- Concrete Coating Inspector Program (CCI)
- CCI Supplement: Determining the Level of Moisture in Concrete
- Basics of Concrete Surface Preparation (online)
- Plural Component Application for Polyureas and High Solid Coatings

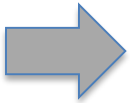
3 Webinars

- Preparing and Lining Concrete for Immersion Service, Steps and Procedures to Avoid Failures
- Moisture Testing of Concrete Walls & Floors Webinar
- Measuring Adhesion to Concrete

12 Committees

43 Concrete Position Statements, 7 decorative concrete
3 Technical Bulletins
3 Best Practices (decorative concrete)
8 Problems and Practices (decorative concrete)
5 Sealer Documents (decorative concrete)
Troubleshooting Newsletters 4x/year since 1986, multiple topics
27 Safety Bulletins
2 Polishing Certifications
3 books

American Concrete Institute
Advancing concrete knowledge



American Concrete Institute
Always advancing

092 TRRC TAC Repair and Rehabilitation Committee (0 documents, 0 webclasses, 15 members)
364 Rehabilitation (14 documents, 1 webclass, 76 members, 3 subcommittees)
546 Repair (3 documents, 96 members, 4 subcommittees)
437 Strength Evaluation of Existing Concrete Structures (3 documents, 1 webclass, 57 members)
440 Fiber-Reinforced Polymer Reinforcement (11 documents 2 webclasses, 232 members, 12 subcommittees)
515 Protective Systems for Concrete (1 document, 0 webclasses, 24 members)
562 Evaluation, Repair, and Rehabilitation of Concrete Buildings (1 document, 0 webclasses, 36 members, 6 subcommittees)
563 Specifications for Repair of Structural Concrete in Buildings (0 documents, 0 webclasses, 36 members15 subcommittees)
E706 Concrete Repair Education (14 documents, 6 webclasses, 25 members)
345 Concrete Bridge Construction, Maintenance, and Repair (3 documents, 0 webclasses, 49 members, 0 subcommittees)
349 Concrete Nuclear Structures (4 documents, 1 webclasses, 111 members, 3 subcommittees)
369 Seismic Repair and Rehabilitation (1 document, 0 webclasses, 78 members, 5 subcommittees)

206 Standards & Documents
33 Online Learning - ACI University
108 News Articles
13 Frequently Asked Questions
8 Repair Committees
1132 Journal Articles
72 Free Online Education Presentations (Videos)
13 Events

INTERNATIONAL CONCRETE REPAIR INSTITUTE

ADMINISTRATIVE COMMITTEES

Awards
Certification
Chapters
Education
Fellows
Finance
Marketing
Meetings & Conventions
Publications
Strategic Planning
Membership
Nominating

Secretariat (4 members, 5 others)
COORDINATION COMMITTEE
(2 documents, 46 members)

TECHNICAL COMMITTEES

TECHNICAL ACTIVITIES COMMITTEE (2 documents,
TAC-A Technical Programs
COMMITTEE 110 - GUIDE SPECIFICATIONS (1 document, 30 members)
COMMITTEE 120 - ENVIRONMENTAL HEALTH AND SAFETY (4 documents, 11 members)
COMMITTEE 130 - PROCUREMENT METHODS AND RELATIONSHIP ARRANGEMENTS
(1 document, 11 members)
COMMITTEE 160 - LIFE CYCLE AND SUSTAINABILITY (1 document, 23 members)
COMMITTEE 210 – EVALUATION (3 documents, 18 members)
210-A Verification of Epoxy Injection of Concrete Cracks
210-C Tensile Pull-Off Testing
COMMITTEE - 310 SURFACE PREPARATION (3 documents, 17 members)
310-A Sealers, Coatings and Polymer Overlays
COMMITTEE 320 - CONCRETE REPAIR MATERIALS AND METHODS (6 documents, 71 members)
320-A Application Methods for Concrete Surface Repair
320-B Materials for Concrete Surface Repair
320-C Grout Material Data Sheet Protocol
320-D Pictorial Atlas of Concrete Repair Equipment
COMMITTEE 330 - STRENGTHENING AND STABILIZATION (2 documents, 22 members)
COMMITTEE 410 – MASONRY (1 document, 34 members)
COMMITTEE 510 – CORROSION (1 document, 21 members)
510-A Electrochemical Techniques for Corrosion Mitigation in Concrete Structures
510-B Corrosion Inhibitors
COMMITTEE 710 - COATINGS AND WATERPROOFING (2 documents, 43 members)
710-A Horizontal Waterproofing of Traffic Surfaces
710-B Moisture-Related Issues with Concrete Floor Finishes
710-D Polymer Flooring Systems
710-E Grouting

OUR IMPACT | ICRI'S VISION

ICRI will be the center for repair leadership supporting a profession built on science and craftsmanship—making the built world safer and longer-lasting.

OUR BUSINESS | ICRI'S MISSION

ICRI provides education, certification, networks, and leadership to improve the quality of repair, restoration, and protection/preservation of concrete and other material systems.

OUR SUCCESS | KEY PERFORMANCE INDICATORS

Member Satisfaction	Fiscal Performance	Organization Reputation
✓	✓	✓

Industry Leadership

ICRI will be the state of the art, trusted, and reliable source of delivering best industry practices and professional networks in the repair industry.

- Develop industry professionals
- Professional networks
- Champion innovation and safety

Professional Development

ICRI will develop and deliver programs, products, and services that provide knowledge, build skills, and validate expertise.

- Expand certification
- Quality programs and products
- Enhanced product program services

ICRI

Organization Strength

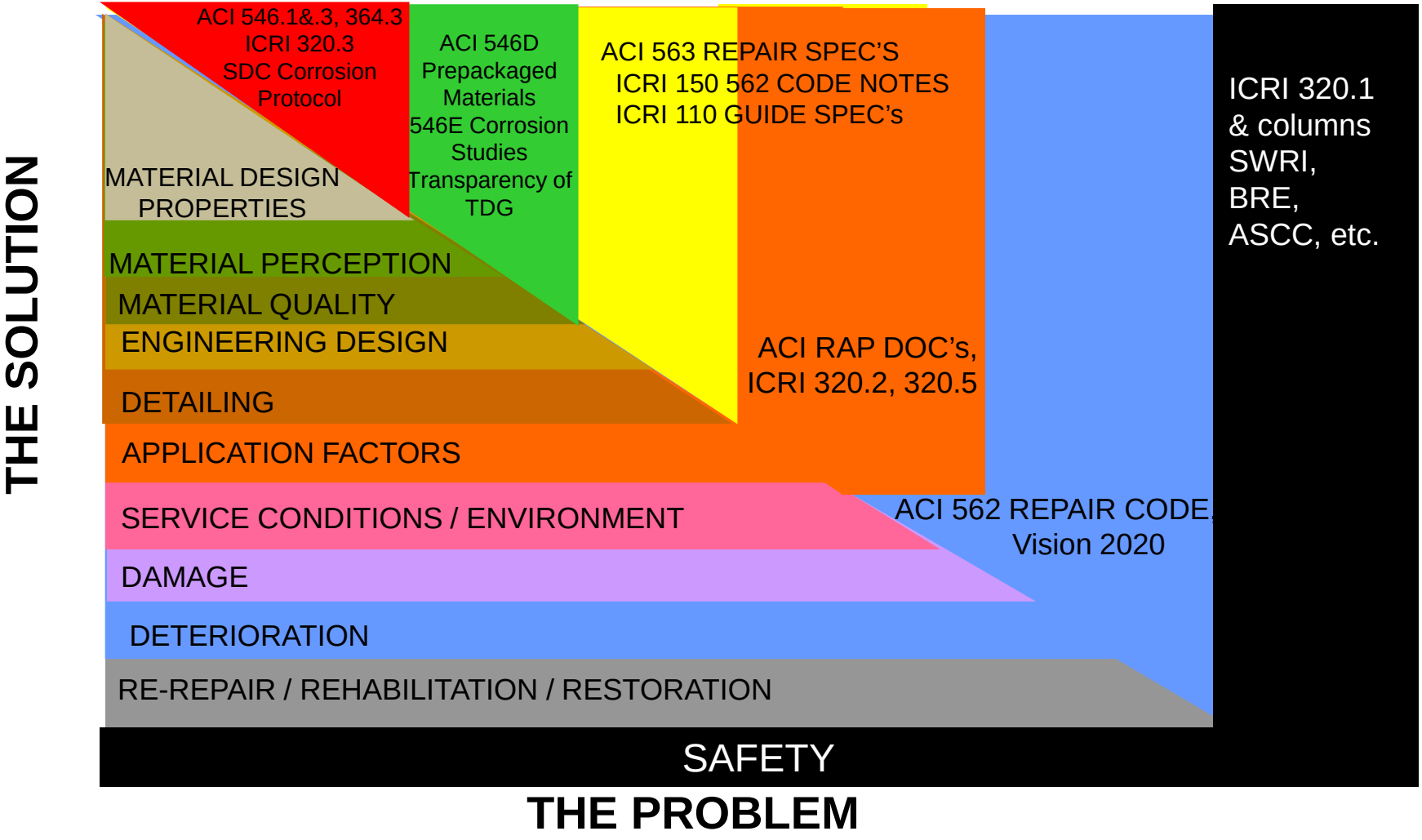
ICRI will have the resources, staff, and structures to fully support its strategic priorities.

- Engage Members
- Strengthen Chapters
- Grow Staff Capacity and Capabilities
- Serve Members

Organization Credibility

ICRI will be a well-connected organization backed by a recognized and respected brand locally, nationally and internationally.

- Strengthen strategic partnerships
- Strengthen Brand
- Engagement of diverse participants


THE SOLUTION
ACI 546.1&.3, 364.3
ICRI 320.3
SDC Corrosion
Protocol
ACI 546D
Prepackaged
Materials
546E Corrosion
Studies
Transparency of
TDG
ACI 563 REPAIR SPEC'S
ICRI 150 562 CODE NOTES
ICRI 110 GUIDE SPEC's
ICRI 320.1
& columns
SWRI,
BRE,
ASCC, etc.
MATERIAL DESIGN
PROPERTIES
MATERIAL PERCEPTION
MATERIAL QUALITY
ENGINEERING DESIGN
ACI RAP DOC's,
ICRI 320.2, 320.5
DETAILING
APPLICATION FACTORS
SERVICE CONDITIONS / ENVIRONMENT
ACI 562 REPAIR CODE
Vision 2020
DAMAGE
DETERIORATION
RE-REPAIR / REHABILITATION / RESTORATION
SAFETY
THE PROBLEM

Concrete And Masonry Related Associations

CAMRA

OTHER INDUSTRY INFLUENCES (NOT VISION 2020)

ASTM (C09→C315, C928, C1107…)

NIST (Handbook 133)

ISO (DIS 16311-1, 2, 3, 4)

EN1504 (Parts 1-10)

AASHTO/NTPEP

FHWA

TRB

BoR

USACE

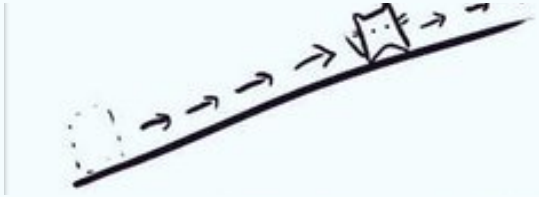
ICC (IEBC , ICC Evaluation)

- Africa — Concrete Society of Southern Africa (CSSA)
- Asia — Asian Concrete Federation (ACF)
- Australia — Cement Concrete & Aggregates Australia (CCAA)
- Australia — Concrete Institute of Australia (CIA)
- Austria — Austrian Society for Concrete and Construction Technology (ASCCT)
- Brazil — Associacao Nacional de Pisos e Revestimentos de Alto Desempenho (ANAPRE)
- Brazil — Instituto Brasileiro Do Concreto (IBRACON)
- Chile — Instituto del Cemento y del Hormigon de Chile (ICH)
- China — China Concrete & Cement-Based Products Association (CCPA)
- China — Shanghai Concrete Industry Association (SCIA)
- China — Shanghai Research Institute of Building Sciences (SRIBS)
- Colombia — Asociación Colombiana de Ingeniería Sísmica (AIS)
- Colombia — Iberoamerican Federation of Ready Mixed Concrete (FIHP)
- Costa Rica — Instituto Costarricense del Cemento y del Concreto (ICCYC)
- Czech Republic — Czech Concrete Society (CCS)
- El Salvador — Fundación ISCYC
- Europe — Fédération international du béton / International Federation for Structural Concrete (fib)
- Guatemala — Instituto del Cemento y del Concreto de Guatemala (ICCG)
- Hong Kong — Hong Kong Concrete Institute (HKCI)
- India — Indian Concrete Institute (ICI)
- Indonesia — Indonesian Society of Civil and Structural Engineers (HAKI)
- Japan — Japan Concrete Institute (JCI)
- Jordan – Jordan Concrete Association (JCA)
- Korea — Korea Concrete Institute (KCI)
- Mexico — Instituto Mexicano del Cemento y del Concreto (IMCYC)
- Mongolia — Mongolian Concrete Association (MCA)
- New Zealand — New Zealand Concrete Society (NZCS)
- Nicaragua — Instituto Nicaragüense del Cemento y del Concreto (INCYC)
- Norway — Norwegian Concrete Association (NCA)
- Pakistan — Pakistan Engineering Council (PEC)
- Poland — Polish Academy of Sciences (KILW)
- RILEM
- Sweden — Swedish Concrete Association (SCA)
- Taiwan — Taiwan Concrete Institute (TCI)
- Thailand — Thailand Concrete Association (TCA)
- United Kingdom — The Concrete Society
- United Kingdom — The Institute of Concrete Technology (ICT)
- Vietnam — Ministry of Construction (MOC)
- Vietnam — National University of Civil Engineering (NUCE)
- Vietnam — Vietnam Concrete Association (VCA)
- Vietnam — Vietnam Institute for Building Science and Technology

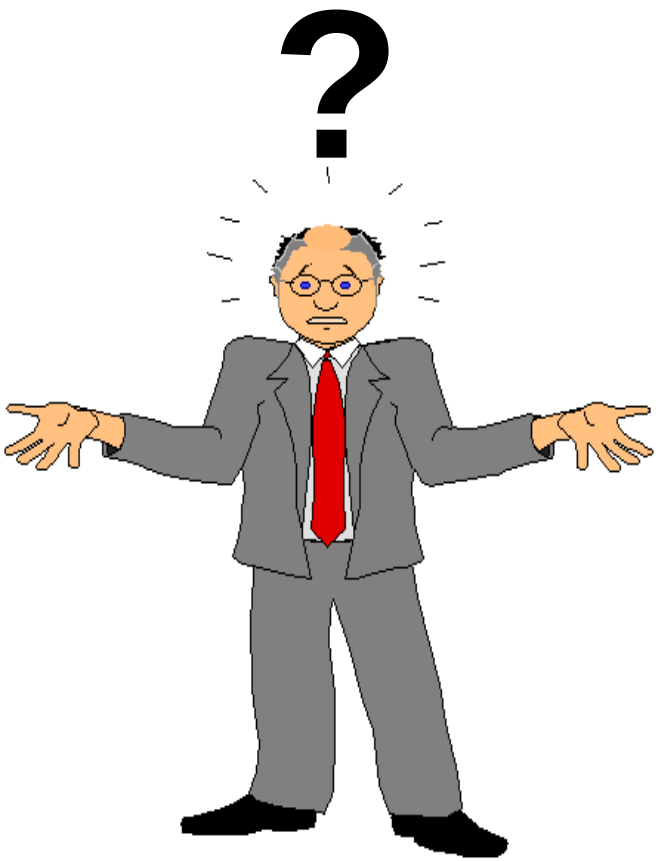
International CONCRETE Associations

WE Still have a long way to go

BUT we're already so far from where we used to be



AND we are proud of that.



Questions?

THANK

YOU !

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