



# MINIMISING LIFE CYCLE COSTS

DURABILITY DESIGN | CONCRETE TECHNOLOGY | METALS CORROSION | CATHODIC PROTECTION  
TIMBER ASSESSMENT | FIELD AND LAB TESTING | REPAIR CONSULTANCY

[www.bcrc.com.au](http://www.bcrc.com.au)



# DURABILITY DESIGN



*Narrows Rail Bridge, Perth, WA. BCRC provided durability consultancy for the steel box section rail bridge sandwiched between the two carriageway bridges.*

**We ensure your structures are designed and constructed with appropriate durability.**

#### **OUR PROJECTS INCLUDE:**

- Several Pacific Highway Upgrades
- Garden Island (East) refurbishment
- Albury Wodonga Bypass
- Mitchell Freeway Extension
- Gold Coast Desali Plant
- Mount Henry Bridge
- Esperance Port Access Corridor
- Kalgoorlie Reservoir
- Perth Underground Rail
- Port Botany Expansion
- Jervoise Bay Wharves
- Clem Jones Tunnel
- New Cotter Dam
- Northern Beaches Hospital Road Upgrades

**BCRC have been the durability consultant on some of Australia's largest infrastructure projects. We can advise on any building and construction materials durability issues.**

On major projects, the use of an independent Durability Consultant ensures that an expert will develop the durability plan, a blueprint for how serviceability will be attained over the design life.

Our advice is based on the use of a wide range of specialist durability design models for issues such as thermal analysis, cracking assessment, tunnel & tank corrosion, chloride penetration, permeability, sorptivity, physical properties, corrosion rate, carbonation, sulphate attack and alkali silica reactivity.

Our Durability Design services are aimed at minimising life cycle costs for an accepted level of reliability. It is not uncommon that our expertise in materials requirements leads to construction cost savings.

# CONCRETE TECHNOLOGY SUPPORT



*NorthConnex project, Sydney. BCRC provided materials advice in relation to tunnel waterproofing.*

**Our industry leaders can resolve your concrete construction problems.**

**We provide independent R&D support to help materials manufacturers introduce new products to market.**

We assist contractors to resolve issues where specifications are not met or damage has occurred. We design concrete mixes that are economical, fit for purpose, easy to place and finish, and meet engineering design requirements.

We work for contractors and designers on industrial floors, building facades, wharfs, power stations, tanks, reservoirs, dams, offshore platforms, railways, mines and bridges. We also support owners where their structures do not meet the design requirements and provide technical support to improve performance where it is outside of specification.

## **OUR PROJECTS INCLUDE:**

### **Product Developments**

- Geopolymers
- Microsilica
- Fly ash
- High performance concrete
- Mass concrete

### **Performance Assessments**

- Xypex
- Microsilica New Zealand
- Australian Silicon
- Talison Silica

### **NCR Resolution**

- Pacific Highway Upgrades
- Port Botany Expansion
- Madura Parkway bridge repairs
- Westconnex M4 East
- Westconnex New M5



# ASSESSMENT OF STEEL STRUCTURES

*Corrosion of steel structures has many facets not immediately apparent. Involving specialist corrosion engineers in the assessment of new and old structures is critical.*

**Corrosion control solutions to ensure the maximum durability, mechanical integrity and reliability of steel assets.**

## **OUR CAPABILITIES:**

- Testing of organic and metallic coatings
- Electrical potentials surveys
- NDT of steel components and their welds
- Visual inspection
- Corrosion monitoring
- CP inspection, surveys and monitoring
- AC/DC interference testing/electrolysis investigations
- CP system registration
- CP system testing and troubleshooting

**BCRC diagnose corrosion mechanisms present in metallic structures and provide remedial solutions.**

Our solutions, plans and recommendations are aimed at maintaining the integrity of your assets. We also provide competitive and independent corrosion assessments to contractors proposing D&C remediation and upgrades.

Our experience applies to steel structures exposed to all types of environments. Our designs and proposals are always based on the latest standards, best practices and technologies available worldwide.

# CATHODIC PROTECTION DESIGN

*For a successful project, whether impressed current or sacrificial anode, for steel or concrete structures, it is vital that a qualified CP engineer undertakes the design.*

**Our CP certified engineers provide cost-effective solutions to protect important assets from corrosion.**

**BCRC are at the forefront of developing and applying CP for steel and concrete structures.**

Cathodic protection (CP) is the only corrosion control technique capable of eliminating destructive oxidation of metal assets. CP systems need to be designed by knowledgeable, certified professionals.

BCRC has skilled and experienced CP engineers who can objectively advise on the best value, most suitable CP system for your application, offering a competitive service to help you comply with your integrity plans and system monitoring requirements. We can also review existing CP system performance and advise on maintenance needs or upgrade alternatives.

BCRC has developed innovative CP design solutions for specific applications that provide considerable savings compared to conventional concrete repair.

## **OUR CAPABILITIES:**

- CP system design and commissioning

### **Steel Piles**

- Impressed current in-water and in-ground anodes
- Bridges
- Wharves & jetties
- Ports
- Offshore structures

### **Tanks**

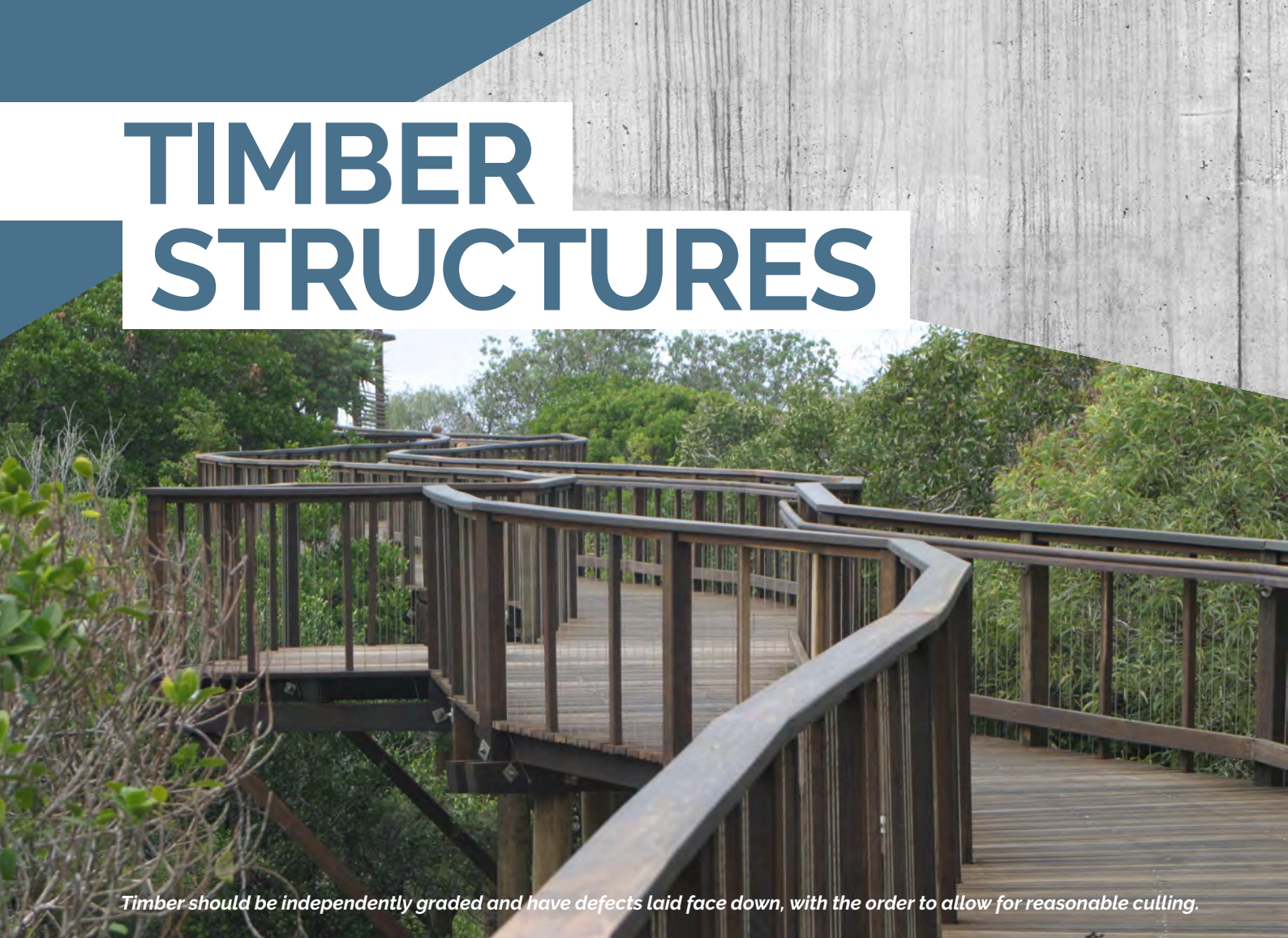
- Above ground and underground

### **RC Buildings**

- MMO ribbon, mesh and discrete anodes
- Conductive coatings
- Surface and embedded sacrificial anodes



# TIMBER STRUCTURES



*Timber should be independently graded and have defects laid face down, with the order to allow for reasonable culling.*

**BCRC has unmatched expertise in durability design and detailing of timber to ensure external structures such as decks and boardwalks age gracefully.**

## **SERVICES OFFERED:**

- Timber grading & assessment
- Timber design & construction verification
- Exposure & treatment assessment
- Visual inspection and testing of timber
- Timber pile testing & assessment
- Handrail, decking and framing specification
- Expert witness
- Timber courses/CPD

**The skills needed for timber durability design are a thorough understanding of the art of timber detailing, of material supply, and of construction techniques.**

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Only a limited few possess the skills and experience needed for successful durability design of timber structures and we are proud to offer this level of capability.

In our area of expertise, often it is the art that proves as important as the science. Weather-exposed timber structures often fail not because of incorrect member size calculations, but because myriad of small points of important detail are not taken care of.

# SAMPLING & LABORATORY TESTING



*BCRC take core samples on a site as well as NDT measurements where it is efficient to do so.*

**BCRC use NATA-accredited laboratories with proven ability for specific tests. Tests are often in accordance with a BCRC specification.**

**Laboratory tests are used to support development of products for manufacturers or assessment of deterioration of existing structures.**

Laboratory tests are an important part of forensic investigation, but the risk of invalid results is high where the laboratory is inexperienced or the test method is inadequately specified. Avoidance of errors in the base data is vital for a correct assessment. We appoint an appropriate, trusted laboratory to complete high quality tests using test methods we carefully specify.

BCRC understands that analysis of combined visual survey, NDT and laboratory test data is critical to an efficient and accurate assessment of in situ performance and remaining service life.

## **TEST METHODS USED:**

### **Steel**

- Tensile strength
- Hardness
- Chemical composition
- Weldability

### **Concrete**

- Permeability
- Absorption
- XRD
- FTIR
- SEM
- Petrography
- Infrared
- Chemical (chloride profiles, sulphate profiles, carbonation, cement content)

### **Timber**

- Termite/rot assessment



# NON-DESTRUCTIVE TESTING



*BCRC makes use of a broad range of state-of-the-art non-destructive technologies for assessing concrete structures. Shown here is our world-leading Proceq GPR surveying cover on a concrete jetty in Sydney Harbour.*

**Our vast experience supported by the use of advanced NDT equipment allows us to accurately diagnose the condition of structures.**

## **NDT CAPABILITIES**

### ***Defects in concrete***

- Ground penetrating radar
- Impact echo
- Impulse response
- Analysis of surface waves
- Crack measurement
- Ultrasonic pulse echo

### ***Rebar corrosion & CP***

- Half-cell potentials
- Polarisation resistance
- Resistivity
- Cover

### ***Concrete in-situ strength***

- Ultrasonic pulse velocity
- Rebound hammer

### ***Coatings Assessment***

- Ultrasonic thickness
- Adhesion/pull off

**We have been instrumental in developing Non-Destructive Test (NDT) methods globally and have excellent relations with the world's leading suppliers of NDT equipment.**


We complete structural and durability surveys and remaining life assessments of structures including mines, railways, floors, buildings, wharfs, bridges and tanks.

We use the most advanced inspection equipment in Australia and have developed detailed standards for their use. Our people are skilled in the use of a wide range of test methods to examine concrete, brick, steel, timber and other materials.

We use our NDT data to strategically locate where we sample for maximum sample value in informing our asset assessments.



# REPAIR & PROTECTION



*3-5 Towns Place, Walsh Bay, NSW. BCRC developed a crack injection and impressed current cathodic protection scope of work for a badly corroding basement subjected to seawater inundation.*

**Our experts have been at the forefront of the repair and protection of concrete, timber and steel structures for over three decades.**

**Our people have led major research programmes into assessment of repair materials, structural failure mechanism and prestress repair.**

BCRC has led the field of reinforced concrete structural repair and protection for decades. Frank Papworth introduced conductive coating CP to Australia 30 years ago and was responsible for the first chloride extraction project in Australia. At the same time, Marton Marosszeky led a major research program into structural repair materials and techniques.


We have been responsible for major repair projects to offshore structures, buildings, wharves, jetties, mines and industrial structures; developed repair materials and cathodic protection systems and designed and implemented highly successful concrete repair training programmes.

## **WE DESIGN, SPECIFY AND OVERSEE:**

- Concrete patch repair
- Shotcrete
- Coatings
- Impregnation
- Sacrificial Anode Cathodic Protection
- Impressed Current Cathodic Protection
- Chloride extraction
- Realkalisation
- Balcony & façade repairs
- Bridge repairs
- Complex re-waterproofing
- Brickwork failures
- Tile delaminations



# CONSTRUCTION DISPUTE SUPPORT



*Koolan Island, WA. BCRC independently investigated the cause of low strength in a very low permeability concrete in a cutoff seawall.*

**For years our consultants have provided high quality expert support services to our clients to help them resolve their construction disputes.**

## **OUR PROJECTS INCLUDE:**

- Bayside Apartments, Sydney, corroding steel frame
- Towns Place, Sydney, chloride damaged basement
- Dalgety Square, Sydney, heritage building conversion
- Chocolate Factory, Sydney, heritage building conversion
- Public swimming complex, Melbourne, major tile delamination
- Corten weathering steel façade, Toowoomba

**Our senior experts are experienced in the forensic analysis of evidence and have acted as experts in all types of dispute resolution processes. Our problem solving and technical experience helps our clients to achieve practical and effective outcomes.**

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BCRC's managing consultants provide expert support to contractors as well as asset owners embroiled in disputes or dealing with insurance claims, from residential strata plans to significant commercial litigation.

Our services include: Defect analysis, Remedial design, Expert reports for all Australian tribunals and courts, Expert representation at courts, conclaves and mediations and Insurance claim support



# OUR PEOPLE

Our principal asset is our people. Our managing consultants represent three faces of construction technology - concrete production, technology management and durability. They are supported by a team of local and international consultants.

## Directors



**Professor Marton Marosszeky**  
Chairperson

Former Multiplex Professor for Construction Innovation and director of the BRC and ACCI research centres at the University of NSW. He is an experienced structural, materials and repair engineer



**Professor Robert Munn**  
Construction Materials

Bob was Chief Engineer at Boral Construction Materials and Adjunct Professor at the University of NSW. He is the chair of Australian Standards Committees BD/42 & BD/49 relating to concrete specification and testing.



**Mr Frank Papworth**  
Durability Consultancy

In Frank's 35 years' experience in concrete durability, inspection and repair he has: Chaired CIA's durability committee  
Chaired fib COM8 on durability  
Won the Malhotra durability prize.



**Dr Inam Khan**  
Technology Director

Dr Khan has over 12 years of research and industry experience. His areas of expertise are steel corrosion in concrete, concrete durability in severe environments, service life modelling of concrete in severe environments, and crack modelling in concrete.



# OUR PEOPLE

## NSW Team



**REBECCA NEWBY**

NSW State Manager

Rebecca has over 15 years' experience in the fields of construction & material behaviour. Focused on in-situ condition of assets - steel & concrete & is experienced in assessing the condition of reinforced concrete for both new & existing structures by using the latest techniques to monitor corrosion in reinforced concrete structures & material testing.



**SAEED ALI**

Steel Corrosion & CP  
Senior Engineer

### NSW

Saeed has over 15 years of experience in infrastructure sector, mining, power plants, and oil/gas industries. With a BEng (Hons) in Materials Science, a MSc in Corrosion Engineering, and a MEng in materials from UNSW, his areas of expertise are failure investigation destructive and non-destructive testing, corrosion & CP



**SIMONE BERNARDINI**

Senior Durability Engineer  
Technician

### NSW

Simone has 15 years of experience in design & project management for major projects worldwide, who is a chartered professional in Italy. His primary expertise is in construction materials such as concrete & soil & concrete durability. Core skills are Design & selection of earthwork materials, Design of deep and shallow foundations, retaining structures, and slope stability analysis.



**MIHALY RUTKAI**

Graduate Engineer

### NSW

Mihaly is a Bachelor of Engineering (Honours) (Civil) graduate, who is eager to excel and apply his knowledge in all facets of engineering. Mihaly has a keen eye for detail, and eagerly tackles any challenges that face him, bringing modern solutions to the fore.

## NSW BCRC Undergraduates

### NSW Team Undergraduate Team



**JOHNLOUIS LANDSKRON**

Undergraduate Engineer



**RUBEN JOHNSON**

Undergraduate Engineer

At BCRC, we are committed to nurturing the future of engineering talent. We take pride in providing opportunities for young undergraduate engineers to embark on a transformative journey within the field of durability engineering. Our dedication goes beyond textbooks, as we believe in hands-on learning. We offer these aspiring engineers a chance to immerse themselves in real-world projects, allowing them to learn the ropes, gain invaluable practical experience, and become well-versed in the nuances of our industry. We take pride in mentoring and exposing the next generation to the exciting challenges and opportunities that await in the world of engineering. Join us as we empower young minds to shape a sustainable and innovative future.

# OUR PEOPLE

## WA Team



**HERMAN JONG**

Durability Planning  
Senior Engineer

**WA**

Dr Jong has 30 years experience in construction materials technology. He is expert in preparing Durability Plans. His interests are in mathematical modelling of microstructure development during hydration of cement-based materials and concrete deterioration.



**ADAM PAPWORTH**

Testing and Inspection

**WA**

Adam Papworth has worked as a concrete testing technician throughout Australia for the past 20 years. He has extensive experience in Ground Impact Echo, Ultrasonic Pulse Echo and destructive sampling of reinforced concrete structures.

Adam is well rounded with a variety of leading-edge technologies for inspections and conditions assessments in steel and concrete structures

## VIC Team



**JESSIE RATCLIFFE**

Durability Engineer  
PhD in Materials Engineering

**VIC**

Jessica has a background in condition assessment for a wide range of structures, inclusive of potable water tanks, sewerage infrastructure, dams, wharfs, building facades, and bridges.

Condition rating and risk assessment within frameworks such as WSAA and VicRoads.

Methodology development with consideration safe work approaches.

## BCRC Specialist Consultants



**CHRIS ZERVOS**

Senior Building Consultant  
Specialising in Waterproofing

Chris worked previously as a Senior Building consultant for Crawford and Company. In this role his main function was to Inspect and report on complex building related matters, undertake and/or co-ordinate forensic investigations, provide detailed defect reports, scope of works and cost estimates as well as, obtaining review tenders, and managing of various projects. Chris has also trained and mentor junior staff, and technical revision of colleague reports prior to submission to Clientele.



**BRENDAN COLGRAVE**

Senior Civil, Structural & Façade

Brendan's career spans over 29 years in the construction industry, encompassing both Structural and Civil Engineering disciplines, amongst a broad range of project scales and types to \$200M construction value (circa 2008) in senior capacity roles within both specialist construction and engineering companies. He has a strong engineering background in building structures of all types – Residential, Commercial, Industrial and Institutional, from small to large scale in both private and public sectors.



**TED STUBBERSFIELD**

Senior Engineer in Wood

Ted joined the family business, Gatton Sawmilling Company in 1975 becoming a partner and later a director. As Ted gained more experience, he eventually became responsible for the day-to-day operations of all aspects of the diversified business which included a sawmill, treatment plant, planning mill, crane hire, transport and a hardware store.



# CONSTRUCTION MATERIALS & DURABILITY CONSULTANCY SERVICES

- Durability Planning and Specification
- Concrete Materials and Production Advice
- Concrete Construction Advice
- Metals corrosion advice
- Quality Management in Construction
- Concrete Thermal and Cracking Assessment
- Building and Construction Inspections
- Flammability Testing
- Destructive and Non-destructive Testing
- Structure Repair Assessment and Design
- Remedial Project Management
- Product Testing, Development and Marketing
- Construction Dispute Resolution Support
- Strata Building Engineering Support
- Maturity Application for Rapid Construction
- Cathodic Protection Design and Testing
- Timber Assessment

*The Port Botany Expansion project. BCRC were engaged to provide Durability Consultancy services as part of the Project Verifier team.*

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