BCRC
DURABILITY CONSULTANTS

MINIMISING LIFE CYCLE COSTS

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

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

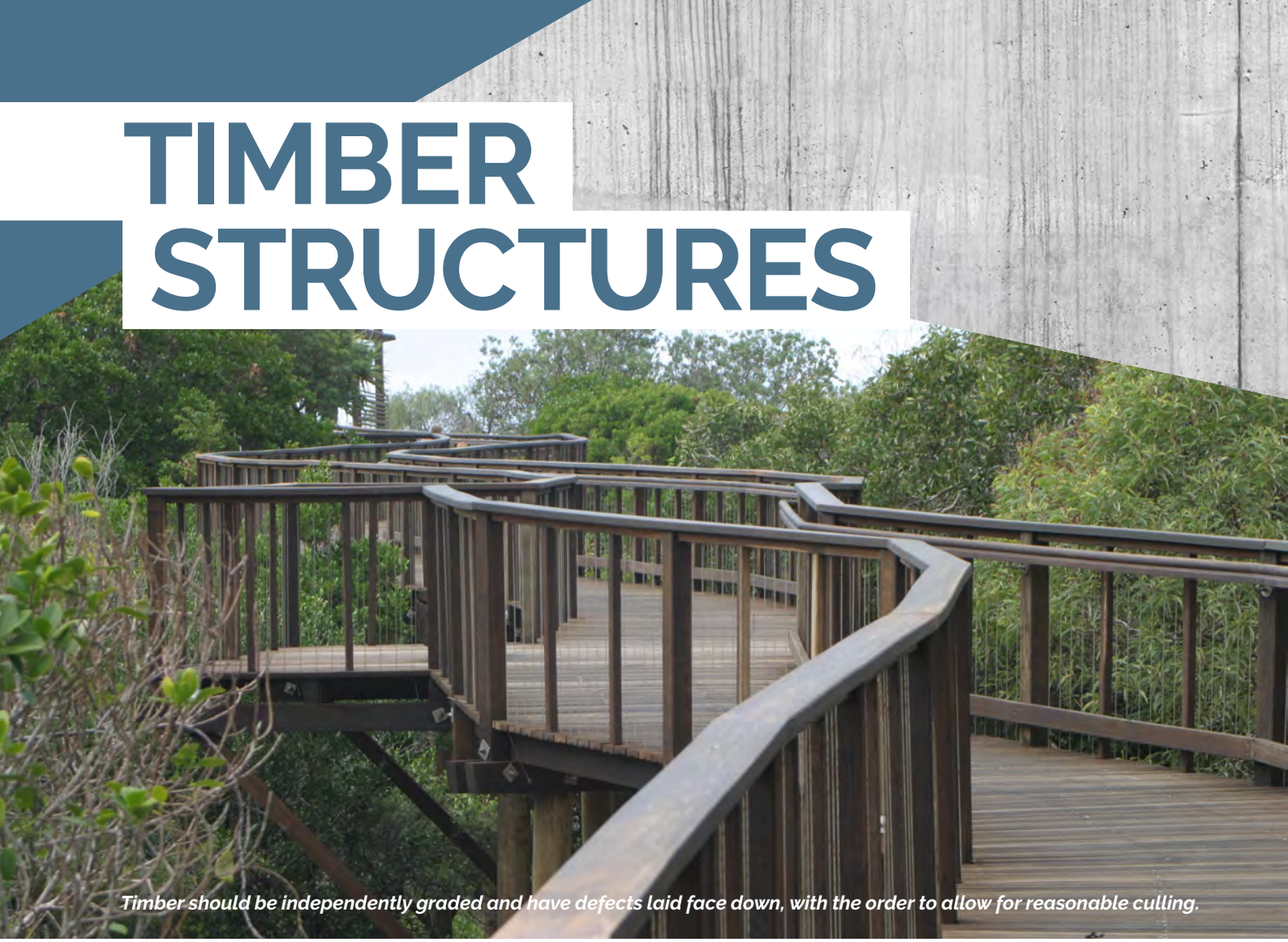
Tanks

- 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.

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.

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

Technology Management

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

KEY STAFF

Jonathon Dyson

GM & NSW Manager

Major projects lead and SME for in situ strength evaluation of concrete structures.

Inam Khan

QLD Manager

Lead for corrosion modelling and early age thermal assessment.

Herman Jong

Principal Durability Engineer

Lead for durability planning and thermal analysis

Gulraiz Ijaz

NSW Senior Engineer

Lead for advanced NDT of concrete structures.

SELECTED INTERNATIONAL CONSULTANTS

Dr John Broomfield (UK)
Reinforced Concrete Corrosion

Prof. Philip Bamforth (UK)
Concrete Cracking and Crack Control

Mr Roberto Giorgini (Netherlands)
Cathodic Protection

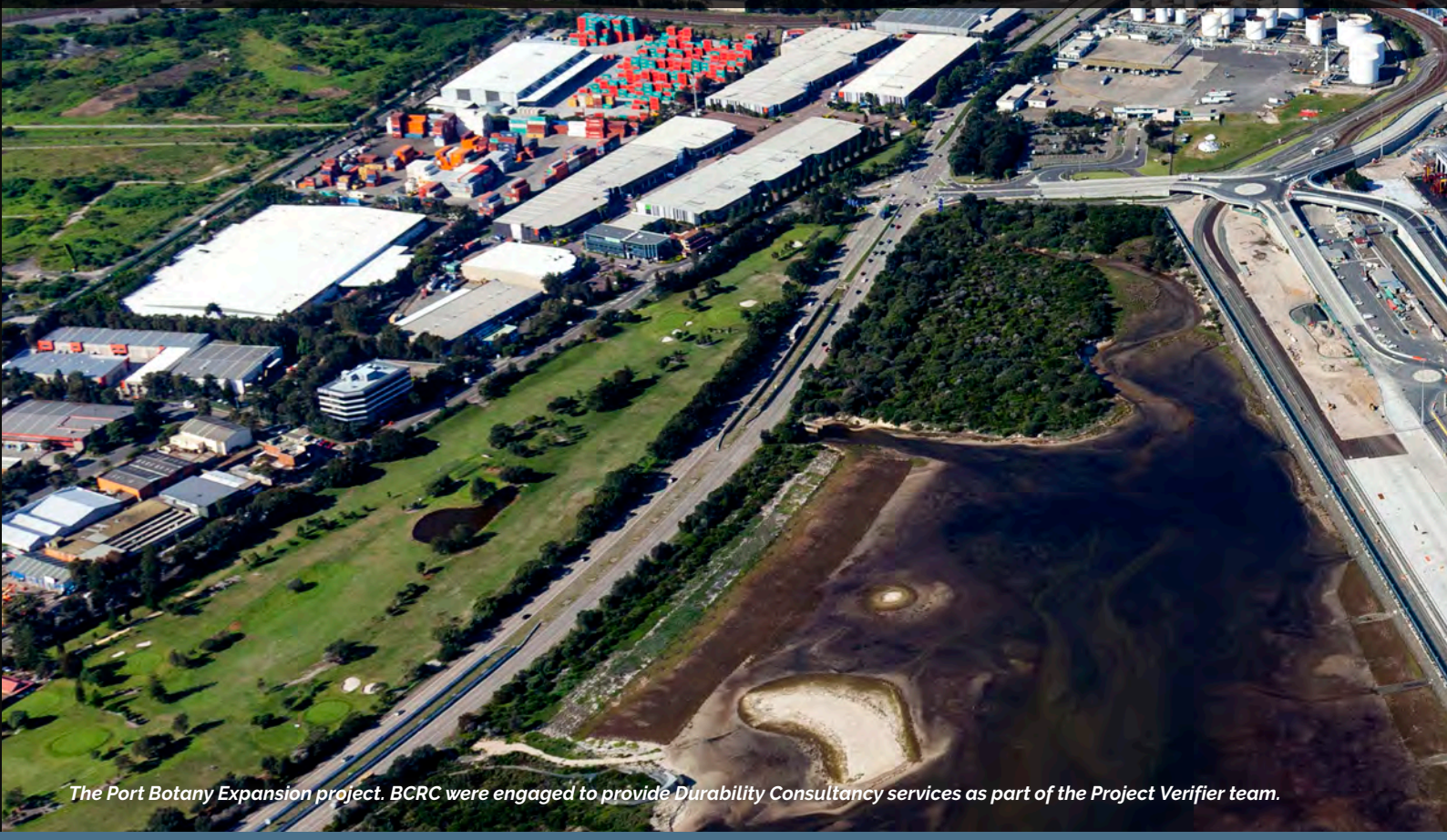
Mr Larry Olson (USA)
Non-Destructive Testing

Dr John Williams (UK)
Timber

Prof. Dr.-Ing. Christoph Gehlen (DE)
Durability Modelling

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.

SYDNEY

Unit 7, 9-11 Chaplin Drive Lane Cove West NSW 2066

Tel + 61 (0)2 9131 8018

JONATHON DYSON

+ 61 (0)450 163 695
j.dyson@bcrc.com.au

CENTRAL COAST

Unit 3 322 West St
Umina Beach,
NSW 2257

JONATHON DYSON

+ 61 (0)450 163 695
j.dyson@bcrc.com.au

NEWCASTLE

Tomato Hill
40 Maligan Lane
Mandalong NSW 2264

MARTON MAROSSZEKY

+ 61 (0)412 446 916
m.marosszeky@bcrc.com.au

PERTH

L1 Suite 2
949-951 Wellington St
West Perth WA 6005

Tel + 61 (0)8 9407 5363

FRANK PAPWORTH

+ 61 (0)411 018 702
f.papworth@bcrc.com.au

BRISBANE

Mezzanine Level
Aspley Hypermarket
59 Albany Creek Road
Aspley QLD 4034

INAM KHAN

+61 (0)421 011 249
i.khan@bcrc.com.au

MELBOURNE

L2, 326 Keilor Road
Niddrie Vic 3042

Tel + 61 (0)3 9938 3830

CLIVE HIGGINS

+ 61 (0)434 050 194
melbourne@bcrc.com.au