

CAPABILITY FOR ENGINEERING DESIGN, MANUFACTURE AND CONSTRUCTION PROJECTS

Combined Resource Engineering (CRE), an operating division of Macmahon Mining Services, and part of the Macmahon Group is an engineering design, manufacture, construction and project management company which specialises in mining and industrial projects including material handling systems, process plants, pumping systems, haulage shafts, escape ways, and underground materials handling systems. CRE also specialises in shaft sinking activities.

Our design and engineering office is located in West Perth, Western Australia with fabrication and workshop facilities in Lonsdale, South Australia and Mt Isa in Queensland. Construction and shaft sinking activities are conducted throughout Australia.

Specialised Engineering Design and Fabrication

Designed in the West Perth office, and then manufactured in our Lonsdale or Mt Isa workshops, CRE has produced various specialised products primarily for the mining industry. These have included headframes, headsheaves for winders, shaft conveyances, person riding winders and hoists.



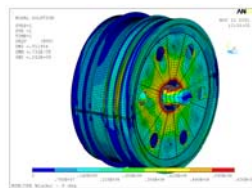
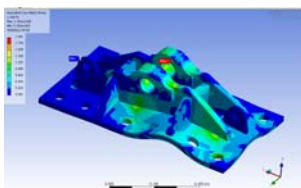
5m Diameter Headsheaves



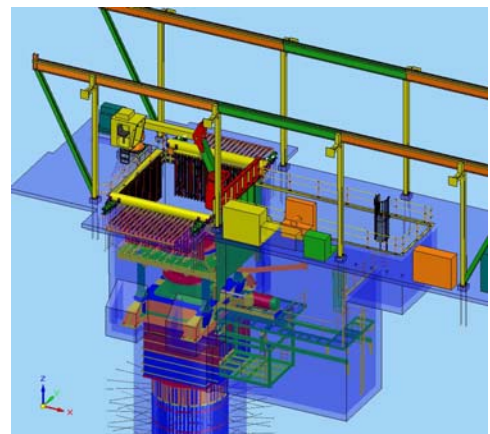
Tuff Torquer Model 610

The Tuff Torquer range of person riding hoists and winders, which are used for shaft sinking and egress systems, are type approved for use within the Australian Resource sector.

Our drawing office uses latest versions of Solid Edge, AutoCad and Microstation drafting software for all our drawing requirements. Our design engineers use SpaceGass for structural analysis and Ansys for Finite Element Analysis (FEA). State of the art Helix Conveyor software is used to design all our conveyor installations



FEA Models



Solid Edge 3D Modelling

Engineering Design, Procurement, Construction and Project Management:

CRE have over the years been involved in a multitude of materials handling, and process plant installations. Our involvement varied from site construction through to complete EPCM projects. Backed by our workshop capacity, we offer the complete package. Some examples of these projects are:

Process and Paste Fill Plants

Location: Enterprise Mine Project, Mt Isa Queensland

Project: CRE designed and constructed a fully automated Paste Fill Plant providing cemented backfill into the mine. This plant is amongst the most modern and technologically advanced paste fill plant in the world.



42" Gyratory Crusher and RoQM Bin

Material Handling and Conveying

Location: Aditya Birla Nifty Copper

Project: Feasibility Study, then the design, supply and installation of a 3.0MTPA underground crushing and conveying project. The project involved all design, supply and installation of a FFE, 42" Primary Gyratory Crusher, Plate feeder, and conveying system. The main drift conveyor was 2300m long, and conveyed the crushed ore from 410m BC on a 900mm steel chord belt to the surface.



Portal Conveyor



Portal Conveyor

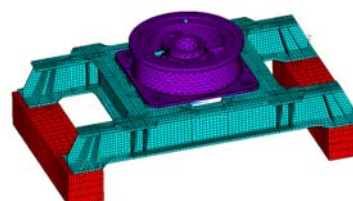


Plate Feeder & Picking Conveyor



Conveyor entering decline

A unique feature of the crusher installation was that the crusher was mounted on a fabricated steel base which negated the need for extensive civil works



Crusher Base FEA Model

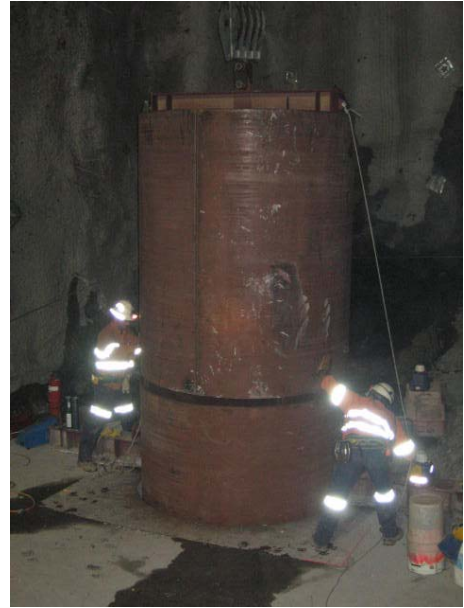
Underground Construction

Location: Argyle Diamonds Underground Project, WA

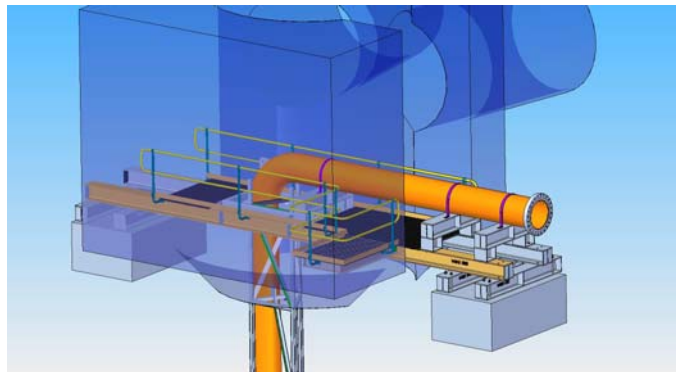
Project: CRE is responsible for underground services construction at the Argyle underground expansion project. This involves the installation of underground pumping stations with associated rising mains, supply and installation of underground ventilation doors, installation of a temporary underground crushing facility, plus other general underground construction works.



Underground Pump Station



Ore Bin Wear Liner



Rising Main Design

Specialised Construction

Location: Mount Isa Mine Queensland

Project: CRE supplied, fabricated and installed four deflection sheaves for the U62 Winder at Mount Isa Mines.

The sheaves weighed approximately 30 tonne and were installed 40 meters above ground. CRE developed the methodology which completed the sheave change out in 27 hrs rather than the scheduled 96 hrs resulting in significant savings for the client.



Installing the sheaves in the Headframe



Fine Ore Bin Rail Liner Installation

Underground Specialised Construction

Location: Leinster Nickel Operations

Project: CRE constructed the new underground materials handling system, located on the 10 level of the mine. This work included the special vertical excavation and lining of the ROM and Fine ore bins

Shaft Sinking

Together with our sister company Australian Raise Drilling (ARD), CRE has the capability to develop vertical shafts down to 1100 metres. We design and fabricate all our own shaft sinking equipment which includes:

- Headframes
- Winders and hoists
- Stages and conveyances
- Kibbles

CRE unique “Transportable” headframes require minimal infrastructure for installation meaning that they can be quickly assembled in a relatively small area. Examples of our recent projects are:

Location: BHP Billiton – Cliffs Nickel Project

Project: CRE was responsible for the construction of a Ø4.5 x 207m long Return Air Rise, Ø 4.2 x 194m long Fresh Air Rise, and the design, supply and installation of 190m long emergency egress ladderway. The rises were first raise-bored to the base of the “weathered zone” using the ARD Raise Drill Equipment. Sinking through the weathered zone was then undertaken using the CRE slewing headframe, and a combination of “blind” and “strip and line” shaft sinking methods.



Headframe Installation



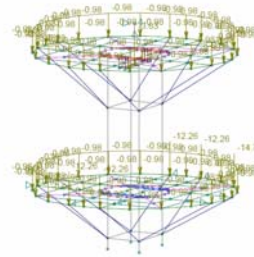
207m Long Egress Ladderway



Installing the Double Deck Stage

Location: Xsrata Nickel – Cosmos Project

Project: CRE was responsible for the construction of a Ø5.0 x 285m long Return Air Rise, and are currently constructing a Ø3.0 x 405m long fresh air rise. This rise will be full concrete lined and will also be used as the emergency egress shaft. The headframe and winder will be installed once sinking is complete.



Space Grid Model of the Double Deck Stage

Location: WMC Leinster Nickel Operations,

Project: CRE was responsible for the construction of 7.5m diameter ventilation shaft 805m deep. This project involved a blind pre-sink to a depth of 65m using CRE's slewing headframe. The shaft was benched and lined from 65m to 79m and the remaining length of the shaft was excavated using the horidiam process. This process involves the drilling of a pilot shaft at 2.4m diameter, drilling horizontal rings from inside the pilot shaft and then subsequently firing the rings from the bottom of the shaft and retreating back to the surface. In some sections of the shaft it was necessary to pre-install "counter-sunk" rock bolts so that there is no requirement to re-enter the shaft after stripping.



Installing the Horidiam Stage



Marking the Face



Blind Sinking



Installing Formwork in the Vertical Dam

Location: Argyle Diamonds – Special Excavations

Project: CRE is currently excavating (sinking) all the Argyle Diamonds Underground Project special vertical excavations. These comprise the vertical dams, ROM bins and fine ore bins. Excavations are first Raise Bored by ARD then stripped and concrete lined by the CRE shaft sinking crews.



Underground Hoist Installation



Boring the Cut in the ROM Bin

Emergency Egress System

CRE design, fabricate and install emergency egress system for the resource sector. Our systems have generally been approved for use around Australia and utilise “Torpedo” shaped person riding gigs to access the mines through ventilation rises. We have also designed and supplied a fully mobile system which provides emergency egress for a number of underground mines located in close proximity to each other.



Mobile Egress System



Egress System Installed over Surface Fan



Torpedo Person Riding Gig



Egress Headframe

Our Key Personnel

Key personnel employed by the Group have extensive experience at senior levels in the mining industry and are familiar with the demands of contracting. We pride ourselves on our ability to “deliver the goods” Our combination of skills enables the group to provide a wide range of services from complete "turnkey" packages to specialised requirements.

Russell Wood (National Manager) is a qualified Electrical Engineer and has had in excess of 30 years experience in the areas covering maintenance, design, construction and management within the mining and mineral processing areas of the industry. As well as his extensive experience in his own discipline, he has held the senior management positions of Chief Engineer of the Kambalda Nickel Operations and Project Manager within the industry.

Rob West (Operations Manager) is a qualified Mechanical Engineer with in excess of 25 years experience in the industry in both the processing area (including smelting) and the mining area. He has extensive experience in the areas of materials handling in both surface and underground installations including design and construction of shaft headframes, shaft furniture, loading stations and conveyances. Rob is also very experienced in shaft sinking and has designed and/or managed several shaft sinking project and hoisting facilities. Rob is a member of the Australian Standards Committee for the "Safe use of Winders".

Richard Cowell (Operations Manager Queensland) holds a Diploma of Building and has over 30 years experience in managing

Simon Putna (Commercial Manager) is a qualified Accountant with over 30 years of experience within a number of industries including Manufacturing, Retail, Wholesale Supply and Consulting. He has been the General Manager of a number of businesses and led them to vastly improved performances. Simon has studied Engineering, Marketing and is a Graduate of The Australian Institute of Company Directors.

Brendon Rabie (Operations Manager WA) is a qualified mechanical engineer with over 25 years experience in the heavy industry, both in the mining and mineral processing areas. He has extensive experience in project management, co-ordination, equipment selection and maintenance (both stationary and mobile plant, surface and underground). Brendon is a member of the Australian Standards Committees for “Winder Suspension and Rail Haulage Equipment”, “Safe Use of Winders”, and “Shaft Equipment”.

Josef (Joe) Bartolo (Operations Manager SA) is a qualified mechanical engineer with over 20 years experience in the design, manufacture, installation and maintenance of underground materials handling systems including crushing, conveying and shaft

manufacturing and construction works in the engineering industry. Richard has sound business management skills and has worked in business development, project and contract management in his career. Based in Mount Isa, Richard heads the Queensland division of CRE.

Gordon Morriss (Engineering Manager) is a qualified Mechanical Engineer with over 25 years professional experience in the materials handling area. Gordon has worked with companies involved with hard rock crushing, screening, conveyor systems, shaft winders and the mining industry in general. Gordon brings to the Organisation specific working knowledge and skills, co-ordinating contracts, design and construction teams to ensure projects are completed on time and under budget.

Peter Williams (Project Manager) is a qualified Mechanical Engineer with over 25 years experience in engineering and technology industries. Peter has a broad experience base having worked as a technician before completing his engineering degree in Mechanical Engineering. He has practical hands on approach to problem solving and combined with sound business management skills is a valued project manager in the team.

Nic Breheny (Senior Engineer) has been part of the CRE engineering team for 5 years. This time has been spent equally as a site engineer for underground construction projects and office based design and project management roles. His specialties involve man-riding conveyance systems and underground materials handling systems.

haulage. Joe also has extensive experience with underground dewatering systems and with the reticulation of services. Joe leads the SA operation which includes the manufacturing facility at Lonsdale

Grant Brinkmann (Project Manager) is a qualified Mechanical Engineer with over 12 years experience in Mining (underground & surface, mineral processing and smelting), Power Generation (specialising in Gas Turbines) and Heavy Engineering Industries. His experience covers the design and construction of crushers, conveyors, shaft headframes, loading stations and conveyances, as well as miscellaneous services such as pump stations, pipelines and water and wastewater treatment plants for both private and public installations. Grant is a registered member of the Board of Professional Engineering of Queensland (RPEQ).

Antony Osborne (Shaft Development Manager) has over 20 years experience in mining and shaft construction works. Antony (Ozy) has extensive experience in shaft sinks in both metalliferous and coal mines as well as stripping and lining of raise drilled shafts, pre and post sinking on raise drilled shafts.

Kim Anderson (Operations Manager - Drilling) has been responsible for the successful operation of ARD's raise drilling division since 1990. Prior to that, he has had 20 years of practical experience with Western Mining Corporation as a driller, raise drill foreman and, latterly as ARD's Drilling Superintendent and now Operations Manager.

General Projects & the Photo Gallery



The APEX Pump Designed & fabricated by CRE



2.5 Kilometres of Compressed Air line installation



Bounty Headframe Designed and Installed by CRE



Enterprise Mine Skips Fabricated by CRE



Aluminium Conveyance Designed and Fabricated by CRE



Ore Transfer Station



Machining a Winder Drum



Underground Fan Installations



Renison Internal Haulage Shaft



Winder Fabrication in Lonsdale



Weather Radar Tower Fabricated in Lonsdale



Ridgeway Mine Conveyor Installation



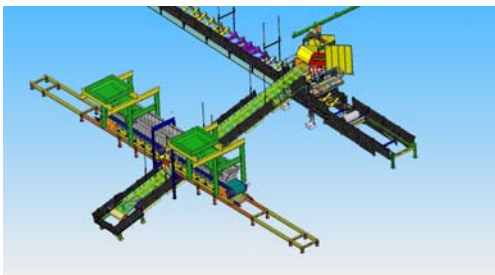
North Parks Underground Conveyor Installation



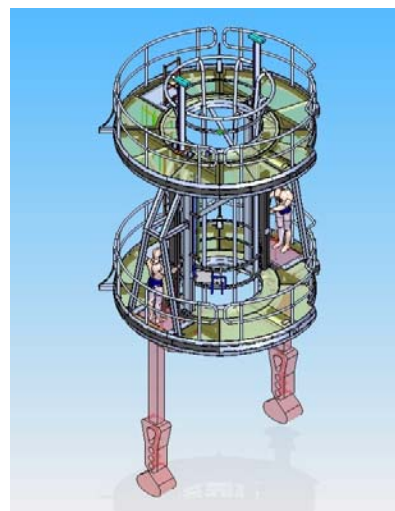
Sheave Wheel Overhaul & Repair



Portable Oil Storage Enclosures



Chelopech Bulgaria Conveyor Design



Double Deck Stage Design

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