



CRE

COMBINED RESOURCE ENGINEERING

Capability for engineering
design, manufacture and
construction projects



MAGMAHON

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. Construction and shaft sinking activities are conducted throughout Australia.





5m Diameter Headsheaves

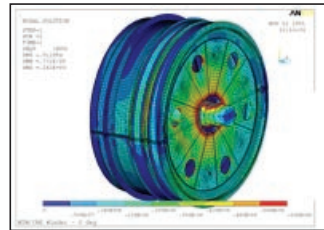
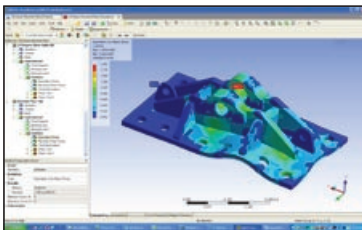
Designed in the West Perth office, and then manufactured in our Lonsdale workshop, CRE has produced various specialised products primarily for the mining industry. These have included headframes, headsheaves for winders, shaft conveyances, person riding winders and hoists.

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.

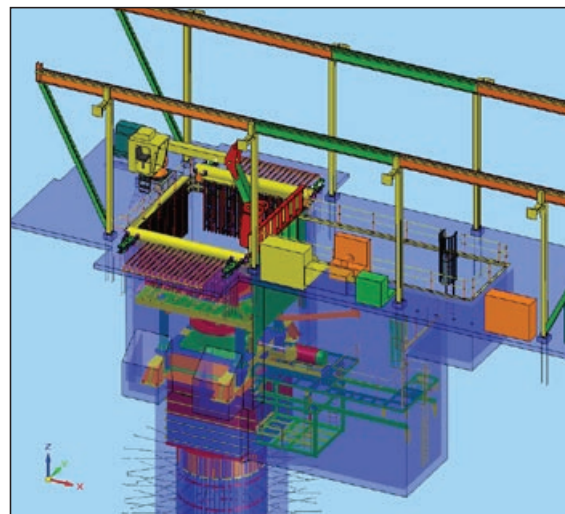
Our drawing office uses latest versions of Solid Edge, AutoCad and Microstation drafting software for all our drawing requirements. Our design engineers use SpaceGass for structural analysis and Ansys for Finite Element Analysis (FEA). State of the art Helix Conveyor software is used to design all our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



Tuff Torquer Model 610



FEA Models



Solid Edge 3D Modelling

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.

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



Enterprise Mine Project, Mt Isa Queensland



42" Gyratory Crusher and RoOM Bin



Portal Conveyor

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.



Plate Feeder & Picking Conveyor



Conveyor entering decline



Portal Conveyor



Crusher Base FEA Model



Underground Pump Station

Underground Construction

Location: Argyle Diamonds Underground Project, WA

Project: CRE was 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.

Specialised Construction

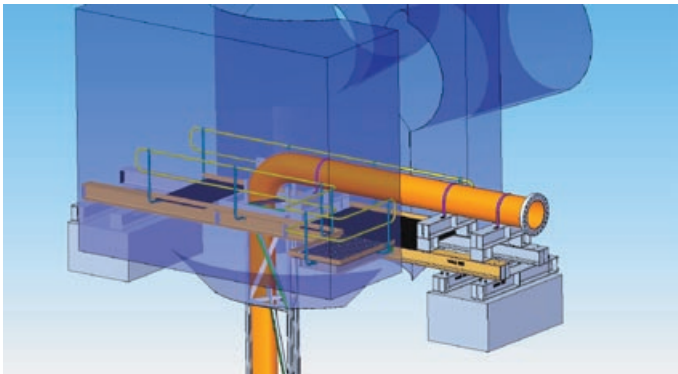
Location: Mount Isa Mine Queensland

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.



Ore Bin Wear Liner



Rising Main Design

Installing the sheaves in the Headframe



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



Fine Ore Bin Rail Liner Installation

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:

- n Headframes
- n Winders and hoists
- n Stages and conveyances
- n 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 $\text{Ø}4.5 \times 207\text{m}$ long Return Air Rise, $\text{Ø}4.2 \times 194\text{m}$ 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

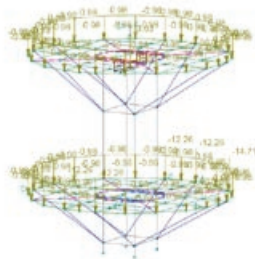


207m Long Egress Ladderway





Installing the Double Deck Stage



Space Gass Model of the Double Deck Stage

Location:

Xsrata Nickel – Cosmos Project

Project:

CRE was responsible for the construction of a $\text{Ø}5.0 \times 285\text{m}$ long Return Air Rise, and are currently constructing a $\text{Ø}3.0 \times 405\text{m}$ 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.

Location:

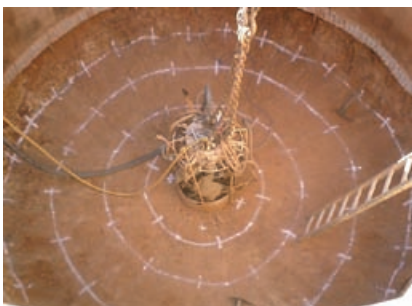
WMC Leinster Nickel Operations,

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

Location:

Argyle Diamonds – Special Excavations

Project:

CRE recently completed (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.



Installing Formwork in the Vertical Dam



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.



Underground Hoist Installation



Egress System Installed over Surface Fan



Mobile Egress System



Torpedo Person Riding Gig



Egress Headframe

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.

Brendon Rabie

Operations Manager - CRE

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”.

Russell Wood

Consultant

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

Consultant

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”.

Antony Osborne

Shaft Development Manager

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

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.

Josef (Joe) Bartolo

Operations Manager - CRE 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 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.

Gordon Morris

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.

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).

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.

Our key personnel continued

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.

Ken Shackleton

Project Engineer

has in excess of 25 years experience of heavy industry exposure, along with materials handling experience and has occupied senior operational roles in the iron ore, contract crushing and construction materials industries, both within Australia and internationally. He project managed the design, construction & commissioning of a large mobile Field Screening Unit for Macmahon Contractors for use at the alluvial operations at Argyle Diamond Mine. Ken has been involved in the optimisation of several processing plants during his tenure with a major global processing plant supplier.

Russell Phillips

Construction Manager

has in excess of 25 years experience in construction, materials handling and shaft equipping in Australia and overseas. Russell is a hands on operational supervisor with extensive experience in particular in UG construction and materials handling systems. Russell has extensive experience in supervising and training Nationals in shaft sinking and equipping in Fiji..

Maurie Kellow

Sinking Superintendent

has 30 years underground mining experience in hand held and mechanised development and production mining. Maurie spent 3 years working in Ghana and Zimbabwe on training and development projects. Shaft work experience includes running the Material Handling System and Shaft Hoisting system at BHP Billiton Leinster Nickel, and for the last 2 years shaft sinking with CRE. This has involved, collar construction, pre and post sinks, strip and lining of shafts, plus installation of ladder ways and installation of ore/waste pass steel can liners.

Bruce Caldwell

Sinking Superintendent

has over 15 years underground mining experience within Australia as a hands-on operator plus in Statutory appointed positions. The last 2 years he has been employed with CRE as the shaft sinking superintendent at various sinking activities in Australia.

Andrew Dwyer

Site Supervisor

has over 14 years experience relating to shaft sinking, ladderway installations, and underground construction. For the past 3 years he has been appointed as the CRE Site Supervisor at the major Rio Tinto – Argyle Underground Project.

General projects and photo gallery



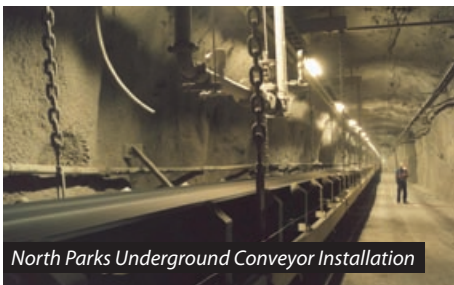
2.5 Kilometres of Compressed Air line installation



Weather Radar Tower Fabricated in Lonsdale



Ridgeway Mine Conveyor Installation



North Parks Underground Conveyor Installation



Portable Oil Storage Enclosures



Underground Fan Installations



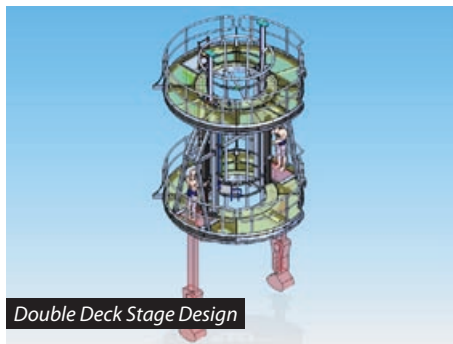
The APEX Pump Designed & fabricated by CRE



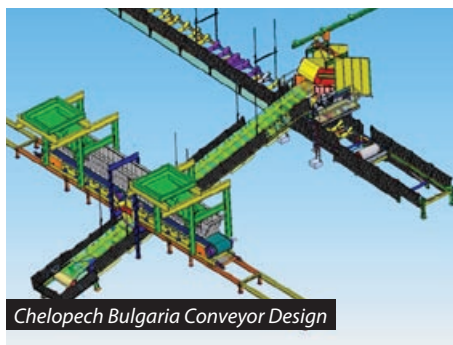
Winder Fabrication in Lonsdale



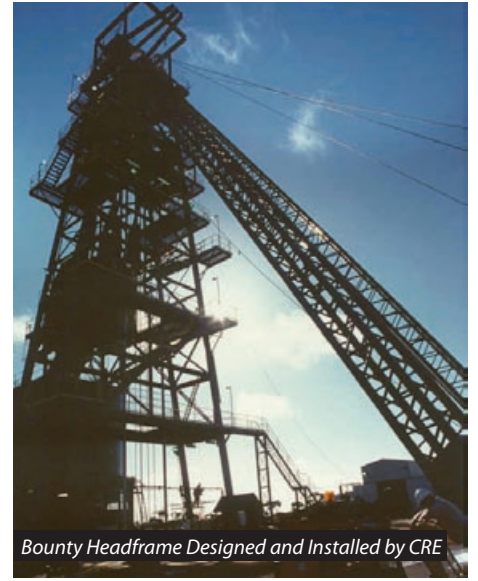
Ore Transfer Station



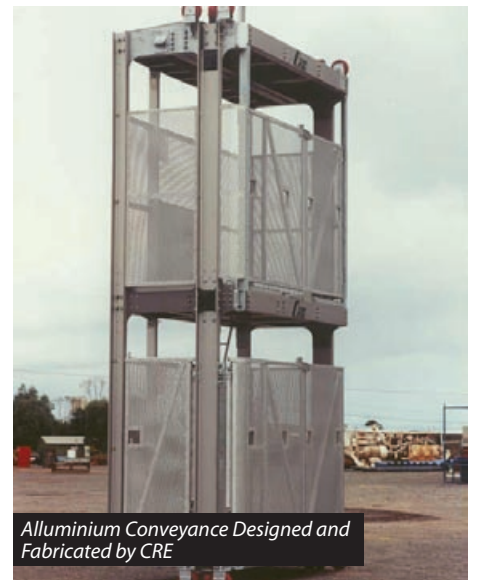
Double Deck Stage Design



Chelopech Bulgaria Conveyor Design



Bounty Headframe Designed and Installed by CRE



Alluminium Conveyance Designed and Fabricated by CRE



Enterprise Mine Skips Fabricated by CRE



COMBINED RESOURCE ENGINEERING

Contact information

Adelaide:

13 Heath Street Lonsdale SA 5160

Phone: (08) 8326 3955

Fax: (08) 8326 3910

Josef Bartolo

E: jbartolo@cre.com.au

Peter Williams

E: pwilliams@cre.com.au

Perth:

Level 3, 27-31 Troode Street,

West Perth WA 6005

Phone: (08) 9232 1520

Fax: (08) 9232 1006

Brendon Rabie

E: brabie@cre.com.au

Rob West

E: rwest@cre.com.au