



## CASE STUDY

# Cloudbreak Reclaim Tunnel

Pilbara Region, WA, Australia

TechSpan®

Owner: Fortescue Metals  
 Consultants: WorleyParsons  
 Project Manager: Team 45, The  
 Pilbara Iron Ore &  
 Infrastructure Project  
 Construction: 2007

### Background

In 2002/2003, many analysts predicted a rise in iron ore prices of up to 40%, with long-term demand expected to remain strong on the back of east-Asian economic growth. Traditionally, BHP and Rio Tinto have had a monopoly on iron ore mining in the Pilbara but with higher iron ore prices came prospective new entrants to the market. In 2003 Fortescue Mining was formed to take up the challenge to become a third major player and embarked on a rapid development program that as of mid 2008 saw it become a \$30 billion company.

Consequently, in mid 2008 Fortescue was on the verge of completing the construction of its open-access port and rail infrastructure, and first mine site – the Cloudbreak Iron Ore Project. Cloudbreak is located in the north of WA, in the Pilbara region, approximately 120km northwest of Newman and at the time of writing would be ranked as the most high profile mining project in the country.

### Challenge

The Team 45 alliance was set up to develop the Cloudbreak mine and manage the construction. Engineering consultant and alliance member Worley Parsons approached The Reinforced Earth Company (RECO) to design and supply a reclaim tunnel and escape tunnel under the new iron ore stockpile.

The design was complex. The conical shaped iron ore stockpile above the tunnels reached some 55m height above the crown of the arch (10m of backfill and 45m of very dense iron ore at 2.9 t/m<sup>3</sup>). This made the Cloudbreak TechSpan® arch tunnels some of the most heavily loaded structures RECO has designed in Australia to date and one of the most heavily loaded structures RECO has undertaken anywhere in the world.

The iron ore is deposited by an overhead conveyor and moved around by a Caterpillar D10 dozer with a gross vehicle weight of 67 tonnes. The tunnels had to be designed for both the live load of the dozer acting at pad level and



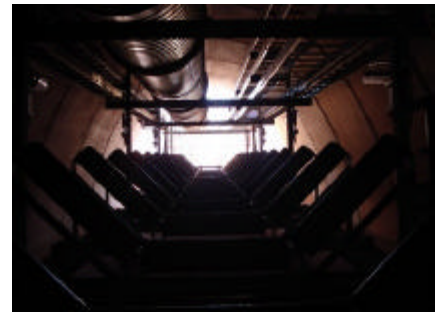
Installation of TechSpan® reclaim tunnel with a variable vertical alignment of up to 10% grade adding significantly to the design complexity and requiring wider arch units to ensure longitudinal arch stability.

Mining infrastructure



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Left: TechSpan® precast arch unit is placed on the concrete footing.

Above: Inside the conveyor tunnel.

the dead load of a full height stockpile and all the potential load cases associated with it. The shape of the stockpile will always be changing as the ore is reclaimed for export and as more iron ore is deposited.

Consequently several unbalanced load cases were carefully considered by RECO. The unbalanced load cases often control the design and may cause the tunnel to fail if the designer does not consider all possible load cases.

#### Solution

In late 2006 RECO was initially awarded the first stage of the mine reclaim tunnel, which accounted for some 315 lineal meters of 6.7m span arch. This was followed in June 2007 with the award of a further 160 lineal metres extension to the original tunnel, this section was on a variable vertical alignment of up to 10% grade adding significantly to the design complexity and requiring wider arch units to ensure longitudinal arch stability. This was one of the steepest grades undertaken using

TechSpan® arches.

A further 77 lineal metres extension to be used as the escape tunnel was also added in September 2007. To complete the structure and complement RECO's involvement in the project, a TerraMet® headwall to the tunnel was also supplied in late 2007.

#### Special features/benefits

- The TechSpan® arch tunnel was designed to carry extremely high dead loads associated with continuously changing 55m high stockpile.
- The precast concrete arch units were manufactured in Perth by Georgiou Group using two moulds and turned around daily.
- The installation of arches was a rapid and efficient process overseen on site by experienced RECO technicians.
- The arch headwall used TerraMet®, RECO's lightweight steel faced retaining wall system, which is widely used in the Pilbara, particularly to ROM dump structures behind crushers.

#### Project specifications

<b>System</b>	TechSpan®
<b>Arch Type</b>	TSX1& TSX2
<b>Span</b>	6.95m
<b>Height</b>	4.35m
<b>Length</b>	540m
<b>Thickness</b>	0.30m
<b>No. Units</b>	375



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