AHLSTRÖM STRUCTURAL DESIGN ENGINEERS (PTY) LTD

COMPANY PROFILE 2025

Nonlinear FEA Specialists in Structural and Civil Engineering.

Mining, Power, Hydraulic and Industrial Infrastructure.

ECSA Pr.Eng. 20130617 | P.E. M.ASCE 11024835 | MSAICE 201301837 | www.asde.co.za

Concrete repair method and design.

ARCELORMITTAL HYPERBOLIC COOLING TOWERS (SA)

3D Scan Result (Inhouse 3D Scan Facilities)
ARCELORMITTAL HYPERBOLIC COOLING TOWERS (SA)

01. ABOUT

AHLSTRÖM STRUCTURAL DESIGN ENGINEERS

Established in 2001 as Ahlström Consulting, ASDE has grown into one of South Africa's most technically specialised structural and civil engineering consultancies. The practice operates across structural design, advanced finite element analysis, mining and industrial infrastructure, and proprietary engineered systems.

ASDE's founding principle — doing things the right way, the first time — drives a practice culture focused on getting to the root cause of structural problems. This approach has built a client base spanning mining majors, power utilities, industrial manufacturers, and international engineering contractors across Africa, Canada, Namibia, Indonesia, and the Middle East.

The practice is led by Carl R Ahlström, a dual-registered Professional Engineer holding registration in both South Africa (ECSA) and the United States (ASCE), with particular expertise in nonlinear finite element analysis of complex and dynamic structures.

02.
ASDE

AHLSTRÖM STRUCTURAL DESIGN ENGINEERS

OUR VISION
To be the leaders in finding practical applications for groundbreaking research.

OUR MISSION
To increase the body of knowledge in the industry, to create practical applications to solve clients' requirements and to improve the quality of South Africa's structural infrastructure through the application of knowledge.

OUR VALUES

Teamwork – being part of the global team of civil and structural engineers
Connecting – understanding client's needs
Knowledge – pursuing education and increasing the knowledge of individuals and the industry
Solutions – being a solutions-driven organisation
Safety – all work is uncompromising in its quality and unwavering in standard
Passion – we are motivated to function at our best all the time.

Transfer House 8 (TH8) - Structural Audit
ESKOM KUSILE POWER PLANT (SA)

04.
OUR HISTORY

1997

Carl Ahlström is part of the team that wins the SAICE national prize for the best engineering achievement for the Harper Road Stayed Cable Bridge.

2001

After gaining valuable experience with various UK consulting engineering firms such as Halliburton, TPS Consult Ltd, W.S. Atkins Consulting Engineers & Mouchel, Carl Ahlström forms Ahlström Consulting.

2001

Carl Ahlström appointed to manage the Aspire Defence Allenby Connaught bid for Haliburton.

2001

A303 Stonehenge – appointed to review design of the tunnel section, for the improvement of the A303 past Stonehenge.

2001

A3 Hindhead bid and M25 widening from Junctions 12-15 bid – appointed to manage ECI bids.

2002

Aspire Defence Allenby Connaught bid, £4.5 billion over 30-year term – appointed to complete Risk Assessment for a PFI bid for the maintenance of existing roads and paved areas over a period of 30 years.

2003

Stansted Airport Long Term Car Park – appointed as Lead Project Engineer completing the detailed design of all civil works associated with a 12 ha, 4500 parking bays, car park.

2004

Stansted Airport World Cargo Centre Forecourt – appointed as Lead Project Engineer responsible for the preliminary design of the Cargo Centre's Forecourt Landside.

2005

A2 / M2 Cobham to Junction 4 Widening (£ 140 Million) – appointed as Lead Project Engineer responsible for the 1st Stage Safety Audit illustrative design, of a six-legged grade separated roundabout and dual highway junction. .

2007

Ben Gurion Airport Israel and Lisbon Airport Portugal – appointed as Lead Project Engineer to investigate whether the main runway design specifications are in accordance with the International Standards and Recommended Practices – Aerodromes.

2010

Medupi Power Plant, Ellisras South Africa – appointed to manage the Coal Stockyard (GOBA) construction.

2011

Carl Ahlström appointed as Lead Structural Engineer for the BHPBiliton M14 Manganese Furnace.

2014

- Ahlström Consulting is registered as a closed corporation and becomes Ahlström Structural Design Engineers (ASDE) Pty. Ltd.
- Appointed to complete a full Structural Audit on the Eskom Kusile Power Station.
- Structural design for the repair of the ArcelorMittal Vanderbijlpark Works Blast Furnace C & D.
- Appointed to complete a Structural Audit on 6 Hyperbolic Cooling Towers and thereafter completing a full concrete repair design thereof
- Civil and structural design of underground head-end station and bifurcating chute at PT Freeport, Indonesia. Also, designing all supporting conveyor structures.
- ASDE promotes George Lishea to form ASDE Leabua, the company's wholly Black-owned subsidiary.

WOW LOOK HOW WE HAVE GROWN!

70 PROJECTS!

LOUWILL ENGINEERING
- Sasol Impumelelo Guarding Design
- Scrubber Building Connection Design and Check

COAL OF AFRICA
- Dams Inspection and APP Sign-off
- Pollution Control Dam 1 (PCD1) Dam Inspection and APP Sign-off
- Vele Colliery - Dam Inspections

ARCELORMITTAL
- Blast Furnace D -Remedial Structural Work Design - Design of support floor slab
- Blast Furnace C - Remedial Works - Inspection & recommendation & repair report
- Blast Furnace C - Remedial Works - Inspection & recommendation report
- Cooling Towers Concrete Investigation and Remedial Design
- Kiln Design and Fabrication Drawings
- Silo's & Bunker Structural Audit
- Road Crossing South Gate Tube City Design
- Compressor Rooms Design
- Plate Mill Hydraulic Basement Structural Assessment
- SC5 Bunker Structural Assessment
- Retaining Wall - BF 'D' - Design
- Blast Furnace C Skip Bridge design audit and analysis of vibrations
- Sludge Drying Area Wash Bay Design
- Concrete Walkway at Back of Lab Design
- Tippler 1 & 4 Support Beams Design
- A Tip's Loading Phase - Remedial work design
- Head Pulley Chutes - DR Plant - Remedial work design
- FMB Workshop - Full design of steel portal frame and concrete foundation
- Crane 741 - Structural audit and remedial work design
- Platform Boiler 6
- Quencing Tower D - Design of pipe support structures

TENOVA MINING & MINERALS S.A.
- Freeport - All underground Structure Design including Bifurcating Chute & connections
- Kusile Structural Audit and Remedial Work Design - Gantries, trestles & Transfer Houses
- Tweedraai Sasol Conveyor Structures Design
- BRMP 100ktpm Feasibility Study
- Adani Train Loadout Station Design
- Ambotovy Bridge and Feedwel Design Check
- Moatize Expansion Project - Train Loadout Station Audit and Design
- Husab - Clarifier Tank Design and Shop fabrication drawings
- Breaker Structure - Klipfontein Mine - Remedial work design of foundations
- Kolomela - Stacker and Reclaimer 3D Scan Alignment
- Drop Test Structure Structural Sign-off
- Silo No. 1 - Installation of Remedial Work
- Kusile Security Barrier Foundations

JDA
- Esselin Street Clinic JHB Building Design

THYSSEN KRUPP
- Medupi Power Station - Structural Surveying Assessment

WBHO
- Kusile - Cracked Concrete Pipe Claim Investigation
- Bridge Abutment Formwork Sign-off
- Specialist Scaffolding Design and Sign-off Namibia

AMEC FORSTER WHEELER
- Husab - CCD Over Flow Tanks Design & Fabrication Drawings

SANRAL - CONSULTANTS
- Visual Assessment - M1/M2 & M70 - Municipal Roads

ESKOM KUSILE POWER PLANT
- TH8 Silo No. 1 FEA Structural Audit - Remedial work execution & QCP implementation

ELB
- 3D Scan for Eskom Hendrina Sampling Chute

BOOYSENDAL MINE (NORTHAM MINES)
- Silo Inspection
- Mill Scan

EXXARO - GROOTEGELUK
- Jib Crane Design and Drawings

ESKOM LETHABO POWER PLANT
- Concrete Investigation on Water Treatment Plant Acid Spillage
- RO Bund Wall Acid Tank

BOOYSENDAL MINE (NORTHAM MINES)
- Chromite Stockpile Expansion - Design of floor slab
- Filter Building Bins
- Booysendal Area 1 - 4 Structural Audit 2017

ESKOM MEDUPI POWER PLANT
- Complete Plant Audit on all Super Structures

ENDEAVOUR MINING CANADA
- Rotary Impellor Design
- BME Shed
- Sprocket Design and Drawing

SMT - IMPUMELELO SASOL
- Monorail Transport System Structural and Civil Design

TRAFALGAR PROPERTIES
- Knightsbridge Building Landslide Remedial Work Design
- Knightsbridge Building Landslide Remedial Work Project Execution

BEUMER KANSAS
- Design of Plant Bowen Dewatering Plant Conveyor Belt

SENET
- Heap Leach Conveyor Catalogue Design

OPTICO / FNB BANK
- Traffic Study

SCHENK PROCESS
- FEA - Structural Audit Report on Train Loadout Station Equipment -Grootegeluk Mine

PMC PALABORWA MINING COMPANY
- Smelter Retrofit Structural Audit

MELCO - CPM ENGINEERING
- 3D Scan Alignment of 16ton Lathe

TIGERBRANDS
- Randfontein Mill Silo Inspection and Concrete Repair Method Design

05.
OUR CLIENTS

ArcelorMittal

Eskom

NORTHAM
PLATINUM LIMITED

tenova
MINING & MINERALS

amec
foster
wheeler

exxaro
POWERING POSSIBILITY

PMC
PALABORA
MINING COMPANY

TIGER BRANDS

BEUMERGROUP

FNB
First National Bank

thyssenkrupp

sasol

CONVEYOR PULLEY
MANUFACTURERS
CPM Engineering (Pty) Ltd

JDA
Johannesburg Development Agency

SANRAL
BUILDING SOUTH AFRICA
THROUGH BETTER ROADS

trafalgar
One-stop property solutions

COAL
COAL of AFRICA LIMITED

LOUWILL
ENGINEERING

SENET

WBHO

ENDEAVOUR
MINING

MELCO
CONVEYOR EQUIPMENT

schenck process

Case Study · Proprietary Technology
Ahlström Structural Design Engineers (Pty) Ltd
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PROPRIETARY TECHNOLOGY · MINING INFRASTRUCTURE · HYDRAULIC ENGINEERING

WaterDoor – Flood Guard™

De Beers Venetia Underground Mine · Limpopo, South Africa · 2024

9/9	$500M+	0
UNITS HELD	PROTECTED	FAILURES

THE CHALLENGE

Underground mining operations face a permanent and escalating threat from water ingress. A single flooding event can mean loss of life, destruction of critical infrastructure, extended production shutdown, and dewatering costs running into hundreds of millions of dollars.

The Venetia Underground Project required a flood barrier capable of sealing irregular rock haulage tunnels against water heads from 50 m to 3,000 m — while maintaining full operational access and integrating with existing mine services.

No commercially available system met all four requirements. ASDE designed a solution from first principles.

20,000 m³ — WATER INGRESS EVENT DEC 2024

294 bar — MAX DESIGN PRESSURE RATING

13–20× — ROI ON $30M INVESTMENT

15 min — EMERGENCY CLOSURE TIME

ENGINEERING APPROACH

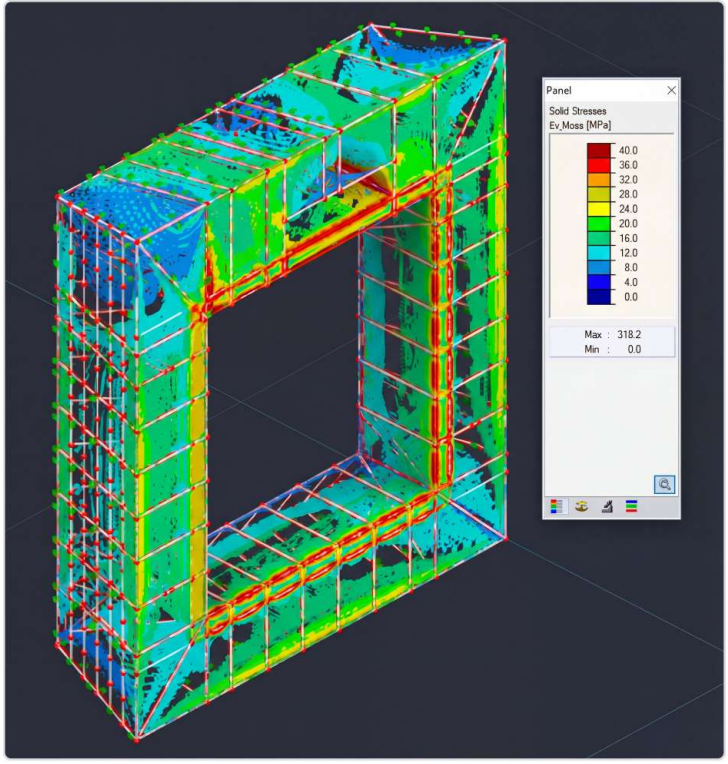
ASDE developed the WaterDoor – Flood Guard™ over ten years of materials science R&D. The design methodology for each installation follows a three-stage nonlinear FEA-driven process:

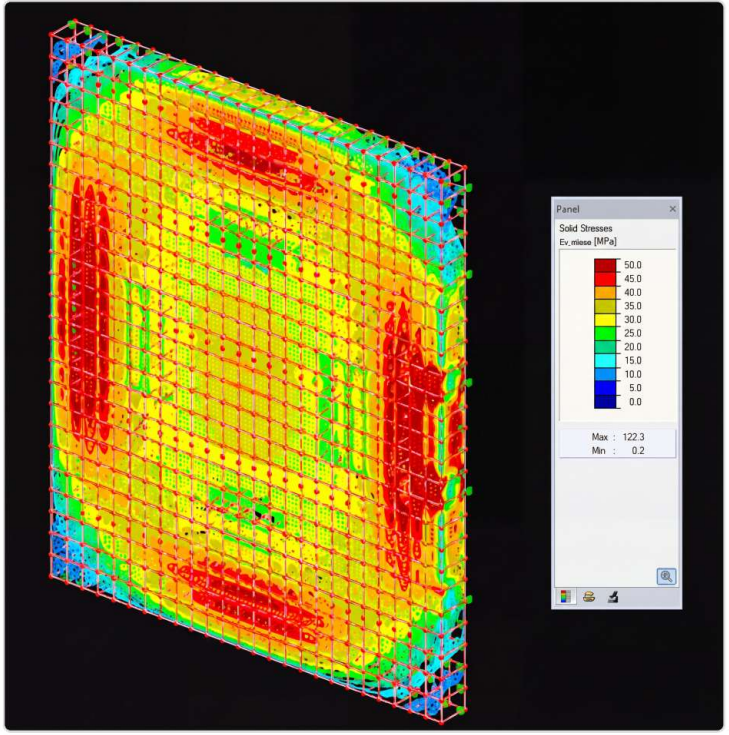
- **3D geometric survey** of the existing haulage cross-section, capturing irregular blasted rock profiles.
- **Nonlinear finite element analysis** (RFEM energy method) determining stress distribution under design water head, sizing the door leaf, frame, and anchor rod schedule to the specific tunnel geometry.
- **Composite construction** integrating structural steel, concrete, and proprietary RCK100 100 MPa epoxy cement, anchored via CF-ROD 1300 carbon-fibre rods at 1,300 MPa tensile strength.

The pressure-activated WD-SEAL 800 elastomeric seal ensures performance increases proportionally with rising water head — the system becomes more effective precisely when it is needed most.

KEY TECHNICAL SPECIFICATIONS

Parameter	Specification
Design water head range	50 m – 3,000 m
Max pressure rating	294 bar (29,400 kPa)
Epoxy cement (RCK100)	100 MPa compressive strength
Anchor rod (CF-ROD 1300)	1,300 MPa tensile strength
Seal system	WD-SEAL 800 — pressure activated
Emergency closure	15 minutes (full cycle)
Adaptive geometry	Horseshoe, arched, irregular rock
Analysis method	Nonlinear FEA — site-specific
Design life	25+ years


Panel
Solid Stresses
Ev,Mises [MPa]
40.0
36.0
32.0
28.0
24.0
20.0
16.0
12.0
8.0
4.0
0.0
Max : 318.2
Min : 0.0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Solid Stresses
Ev_mises [MPa]
50.0
45.0
40.0
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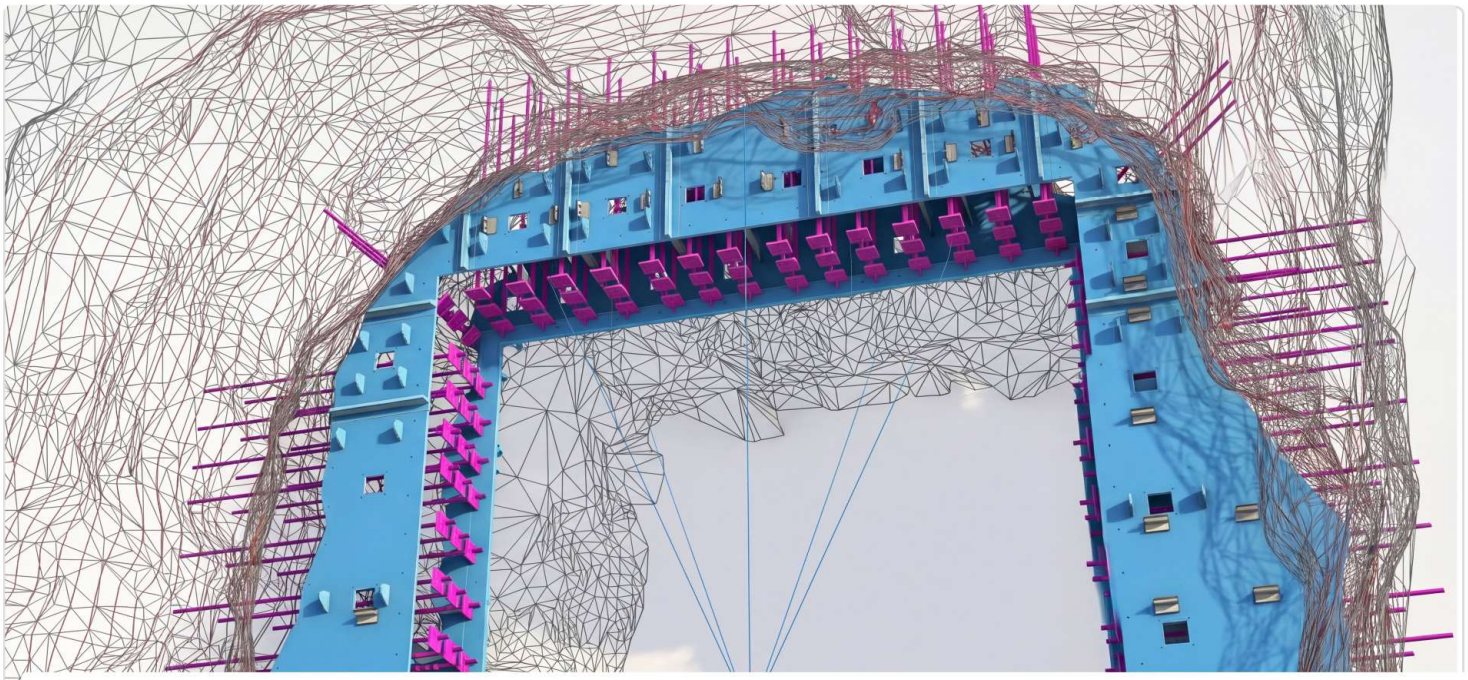
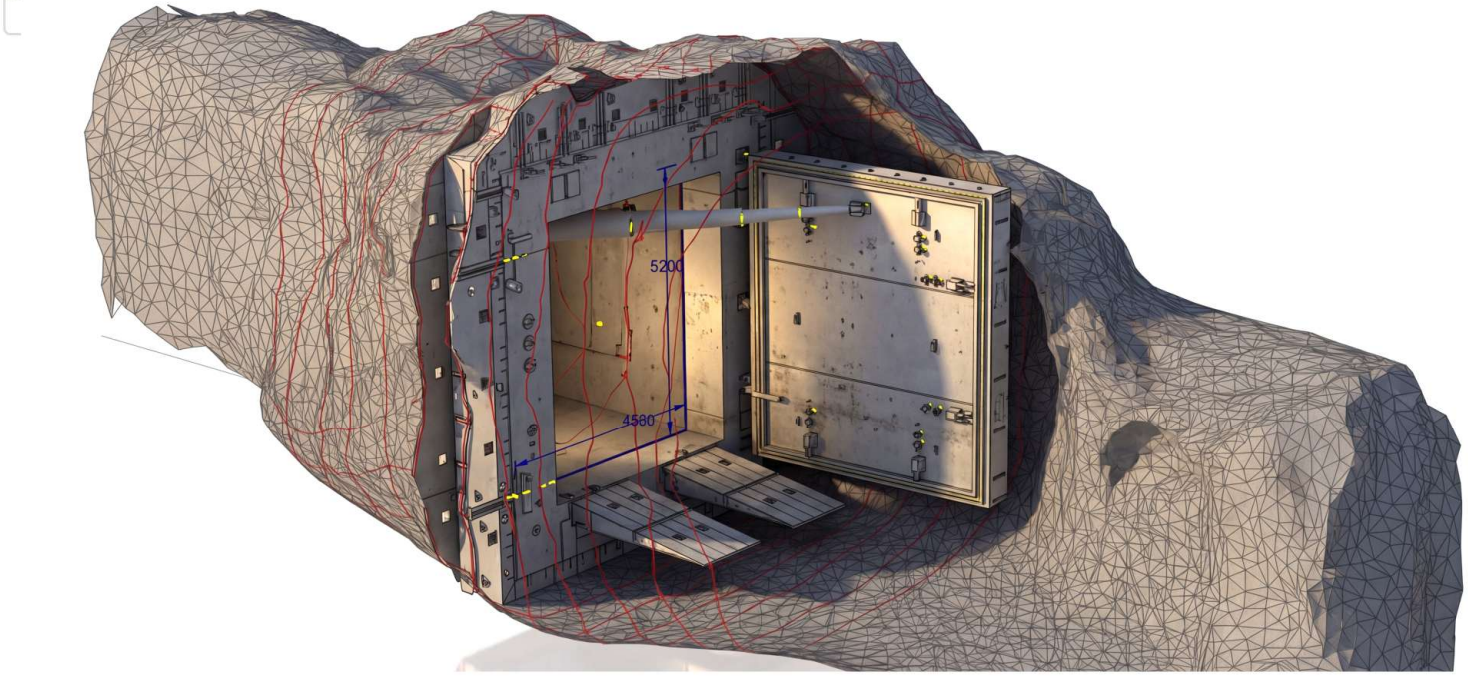
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Max : 122.3
Min : 0.2




5200
4580

16 December 2024 — Venetia Underground Mine: A major water ingress event released an estimated 15,000–20,000 m^3 into the underground workings. All nine commissioned WaterDoor – Flood Guard™ units activated and held under load. Zero failures. Zero casualties. Value of infrastructure protected: $400–600 million.

THE RESULT

The December 2024 event at Venetia transformed the WaterDoor from innovative technology to proven life-saving infrastructure. De Beers (Anglo American) subsequently designated the system as the reference standard for underground flood protection across their operations.

South African mine safety regulators began citing the Venetia event as the new engineering benchmark for water barrier design. The $30M total investment across nine units delivered a demonstrated return of 13–20× on a single event.

The system has since been presented to international mining and infrastructure clients as the first operationally validated flood barrier designed for extreme-head underground conditions.

06.
OUR DIRECTOR

CARL R AHLSTRÖM PR.ENG.

Pr.Eng, MSAICE, P.E., M.ASCE, B.Eng

Pr.Eng. Reg. No: 20130617

MSAICE Reg. No: 201301837

P.E. Reg. 11024835

Carl's engineering career began with the design of the Harper Road Cable Stayed Bridge — a project that won the SAICE national prize for best engineering achievement in 1997. It set the tone for a practice defined by technically challenging, solutions-driven work.

Since then, Carl has been involved in projects across Europe, Asia, Africa, Canada, and the Middle East, consulting through ASDE and through internationally recognised firms including W.S. Atkins and Haliburton (UK), where he served as Principal Structural Engineer.

Carl is a specialist in nonlinear finite element analysis using the RFEM energy method — applied to structures where standard codified approaches are insufficient: complex dynamic systems, hydraulic machinery, extreme-load industrial structures, and composite material assemblies.

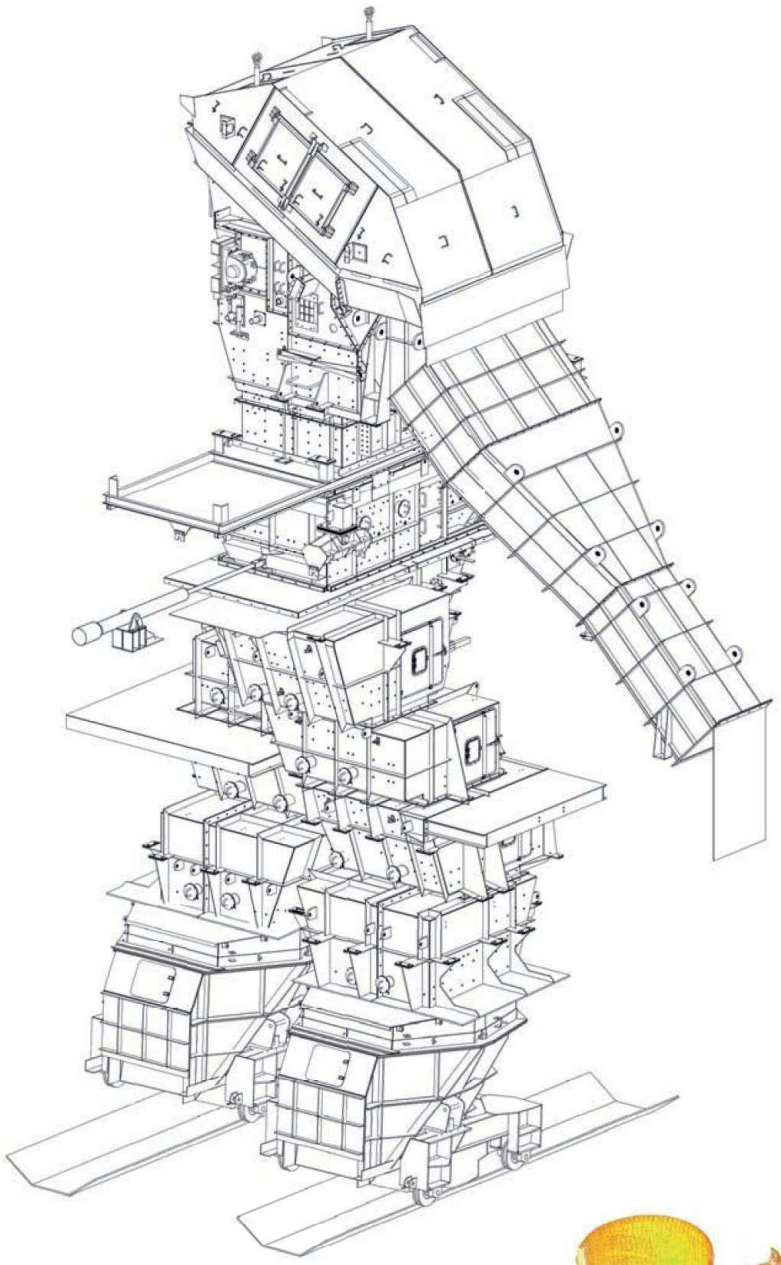
Inventor and Principal Engineer of the WaterDoor – Flood Guard™ — the world's first operationally validated underground mine flood barrier system. Proven at De Beers Venetia Underground Mine, December 2024.

07.
OUR PROJECTS

PT FREEPORT (INDONESIA)

Structural Design

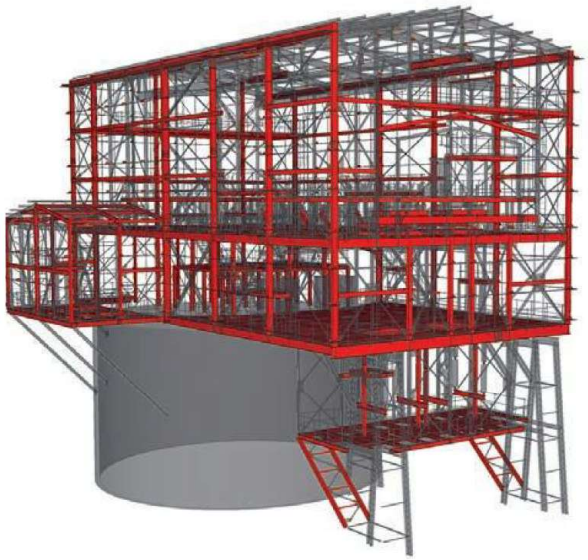
ASDE conducted a structural audit and design of the full underground bifurcating chute head-end structure for the mine's conveyor.



ESKOM KUSILE POWER PLANT (SA)

Structural Audit and Design

ASDE was oppointed by Tenova TAKRAF - Africa Mining & Minerals Division to perform a complete structural audit on the Kusile Power Plant as part of Eskom's efforts to ensure reliable electricity supply into the future. This structural audit is ongoing and will potentially include significant design recommendations for the successful completion of this plant.

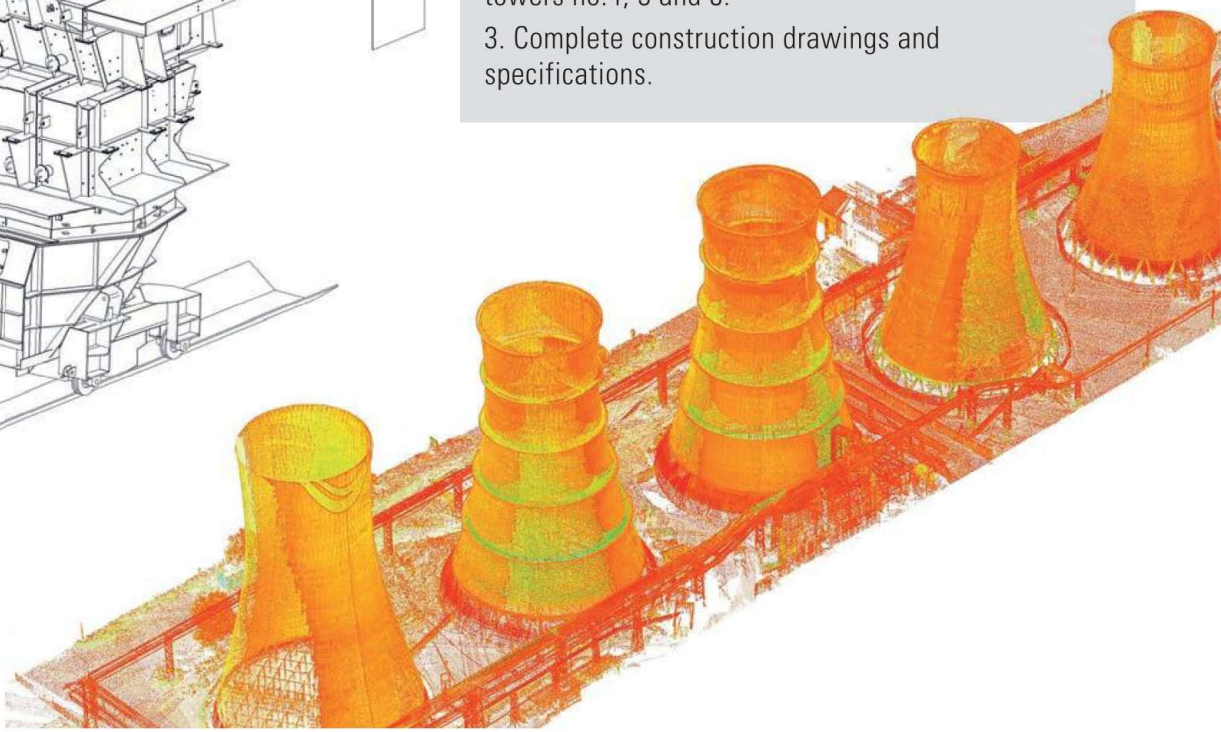


ARCELORMITTAL VANDERBIJLPARK WORKS (SA)

Concrete Repair Method Design and Specification

ASDE was requested by ArcelorMittal South Africa Vanderbijl Works to carry out:

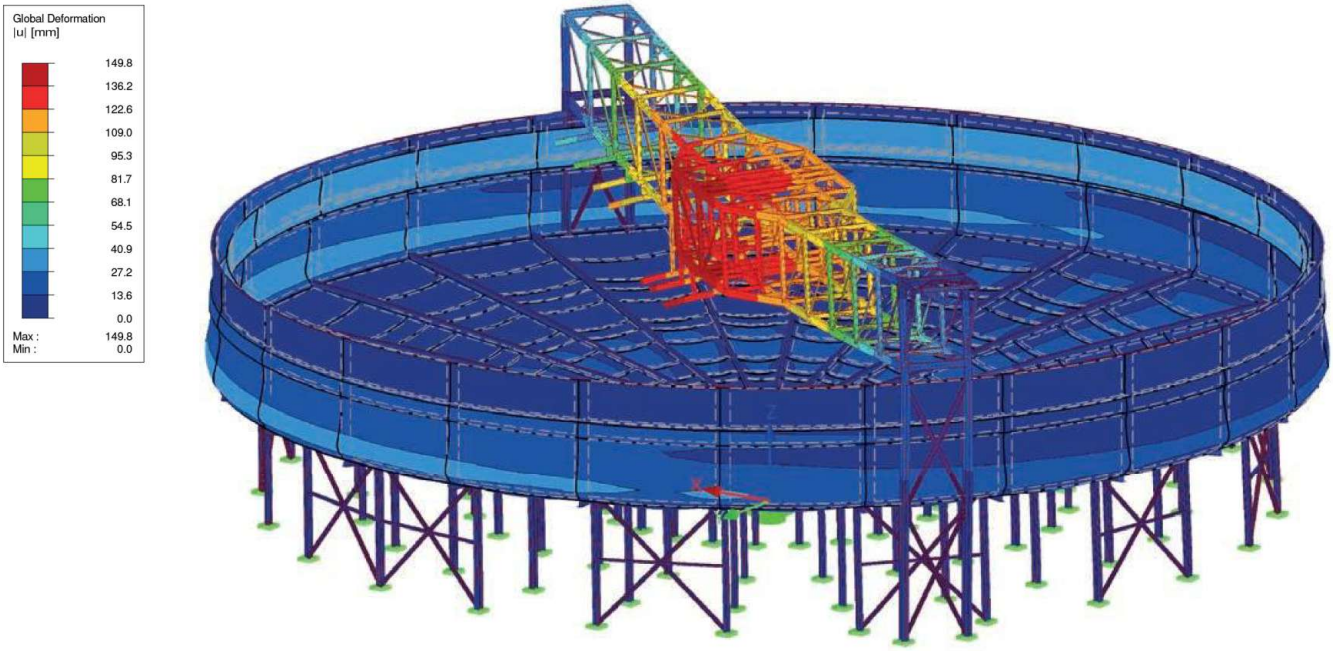
1. Full structural audit.
2. Design a full concrete repair method for cooling towers no.4, 5 and 6.
3. Complete construction drawings and specifications.



URANIUM THICKENER (37 METER SPAN), SWAKOP (NAMIBIA)

Structural Finite Element Analysis

ASDE was oppointed by Tenova TAKRAF - Africa Mining & Minerals Division to perform a complete structural audit on the 37m diameter thickener.



On-site 3D Scanning and Drone Photography
ANGLO AMERICAN - KOLOMELA (SA)

08.
OUR PRODUCTS

NONLINEAR FEA

- Geometric & material nonlinearity
- Contact & interface modelling
- Dynamic & vibration analysis
- RFEM — energy method
- Mesh convergence studies
- Hydraulic pressure loading
- Fluid-structure interaction
- 3D scan-to-FEA model workflows

STRUCTURAL ENGINEERING

- Heavy industrial steel structures
- Blast furnace & silo structures
- Crane, conveyor & trestle design
- Bridges & civil infrastructure
- Remedial work design & sign-off
- Structural audits & inspections
- Statutory Pr.Eng. sign-off
- Concrete repair design

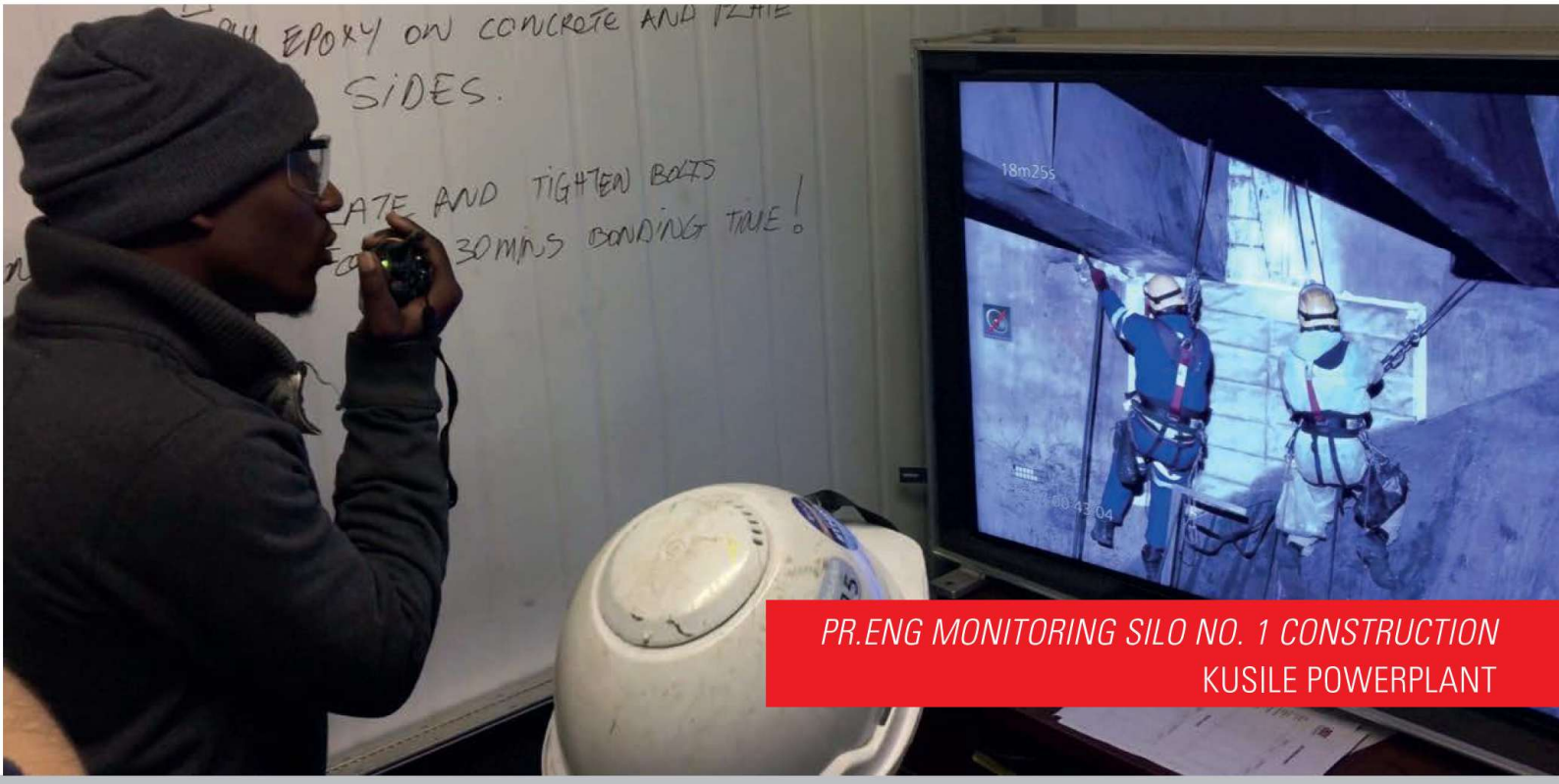
SPECIALIST SYSTEMS

- Hydraulic flood barrier design
- Composite steel-concrete-epoxy
- Pressure vessel assessment
- Anchor & rock bolt systems
- Underground mine structures
- Dam inspection & APP sign-off
- Construction monitoring (4K UHD)
- Drone & 3D laser scanning

PRODUCT DETAIL 2

EXECUTION MONITORING AND QUALITY ASSURANCE

ASDE loves technology! We endeavour to make innovative technologies part of our daily engineering routine to assist us in doing what we do better and more accurate. Using our technology mantra, ASDE has successfully employed to use of 4K Ultra High Definition Video Streaming to monitor construction works. This is done using a 100m Fibre Optic Line connected to our on-site control room.



PR.ENG MONITORING SILO NO. 1 CONSTRUCTION
KUSILE POWERPLANT

ADVANTAGES:

- Continual 4K UHD Video recording of all construction works.
- Increase production as technicians have full two-way radio contact with the Engineer monitoring the works.
- QCP's are daily updated and handed over on day of completion.

09.
PROJECT EXECUTION

ASDE frequently designs concrete repair and steel retrofit solutions, which are of a complex nature. Subsequently ASDE spends a considerable amount of time training the contractors to complete the complex work. It is this exact reason why ASDE decided to execute project engineering solutions as Principal Contractor.

Silo No:1
KUSILE POWER PLANT

Installation of support steel plate on Silo No:1
KUSILE POWER PLANT

ASDE ExecutionTeam
KUSILE POWER PLANT

Always adhering to HSE policies.
Core drilling at ArcelorMittal Hyperbolic Cooling Towers (SA)

11. CERTIFICATIONS & MEMBERSHIPS

ASDE has applied for and is in the process of qualifying for the following quality assurance certifications:

- ISO9001
- CESA
- ECSA commitment & undertaking

The company director, Carl Ahlström, is registered with the Engineering Council of South Africa (Reg. No.: 20130617) as a Professional Engineer and a member of the South African Institute of Civil Engineers (Reg. No.: 201301837). Furthermore, he has been accepted and is registered with the American Society of Civil Engineers as a Professional Engineer (Reg.No. 11024835)

ASDE Leabua has applied for and is in the process of qualifying for the following quality assurance certifications:

- ISO9001
- CESA

12.
CORPORATE SOCIAL INVESTMENT & SUSTAINABILITY

Structure Integrity Audit on Silo's
ARCELORMITTAL SILO'S (SA)

INTERNAL INVESTMENT

ASDE strongly believes in the transformation of the South African civil engineering field, as the country is currently suffering from an acute shortage of capable, qualified civil and structural engineers. To address this issue, we actively assist talented and skilled young engineers in achieving their goals and assisting them to register as a Professional Engineer (Pr.Eng.).

All ASDE engineers are assisted with continuous education and training opportunities. Some of the courses that have been sponsored for these engineers have included:

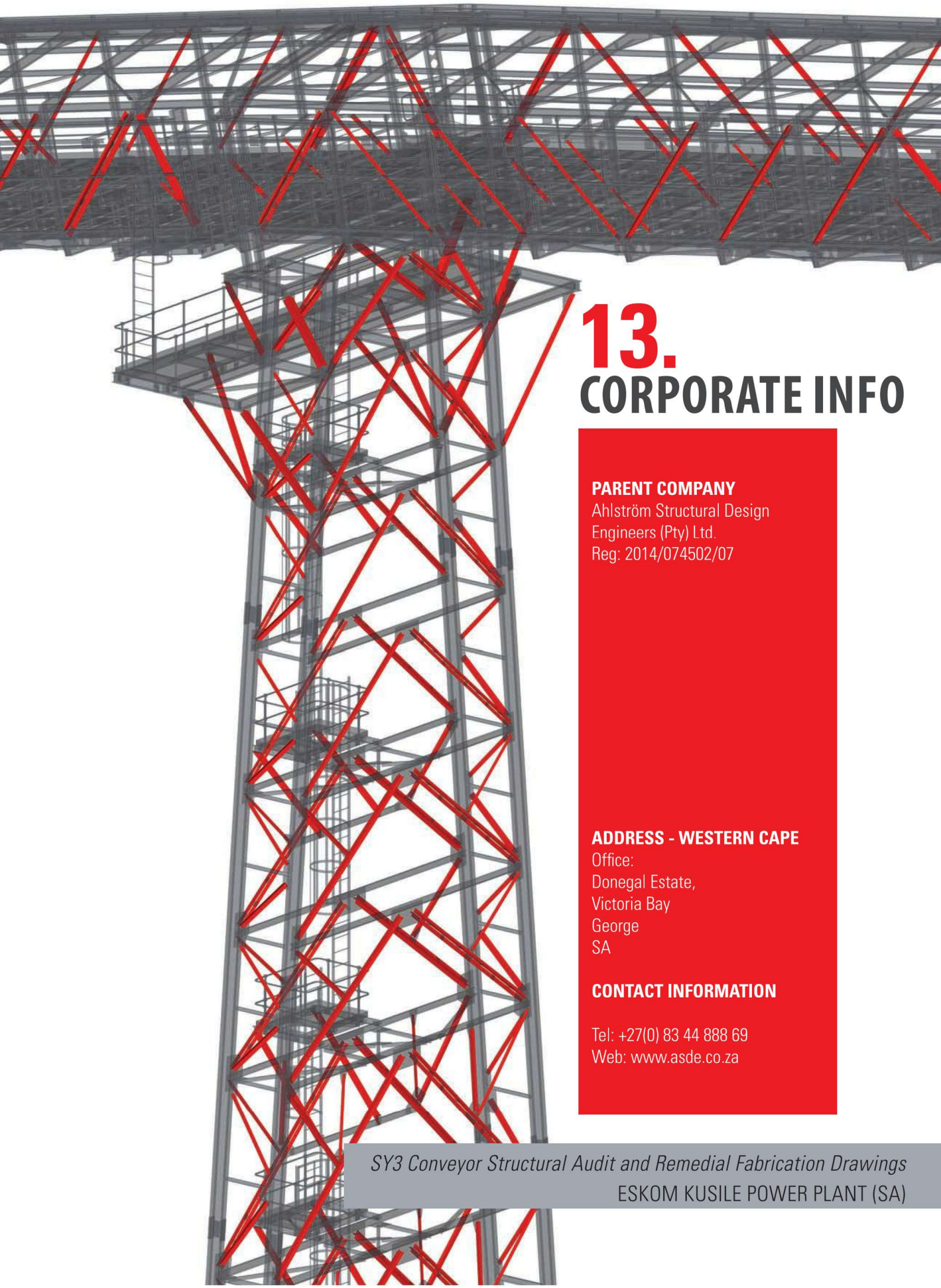
- 3D Scanner Operators Course
- Diamond Core Drilling Operators Course

EXTERNAL INVESTMENT

Each year, ASDE sponsors a Carols in the Park Christmas event. The company covers the rental of all equipment, the stage and sound professionals and community members are invited to attend and donate a soft toy. The toys gathered from this event are distributed to children's homes in the community.

ENVIRONMENTAL SUSTAINABILITY

ASDE is conscious of the environment in which it operates and understands that the very nature of its business and its clients' businesses are often high-impact. The company is investigating ways to improve and reduce its carbon footprint to minimise impact through the use of intelligent design techniques.



13.
CORPORATE INFO

PARENT COMPANY
Ahlström Structural Design
Engineers (Pty) Ltd.
Reg: 2014/074502/07

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Victoria Bay
George
SA

CONTACT INFORMATION

Tel: +27(0) 83 44 888 69
Web: www.asde.co.za

COMMITMENT

LISTENING TO THE CLIENT'S NEED

SOLVING PROBLEMS

WE RESPECT DETAIL

EXPERTISE

"ANOTHER CLEVER IDEA."

www.asde.co.za