UGMINING PTY LTD

18MM, 38T STRAND MECHANICAL SHELL THREADED ANCHOR

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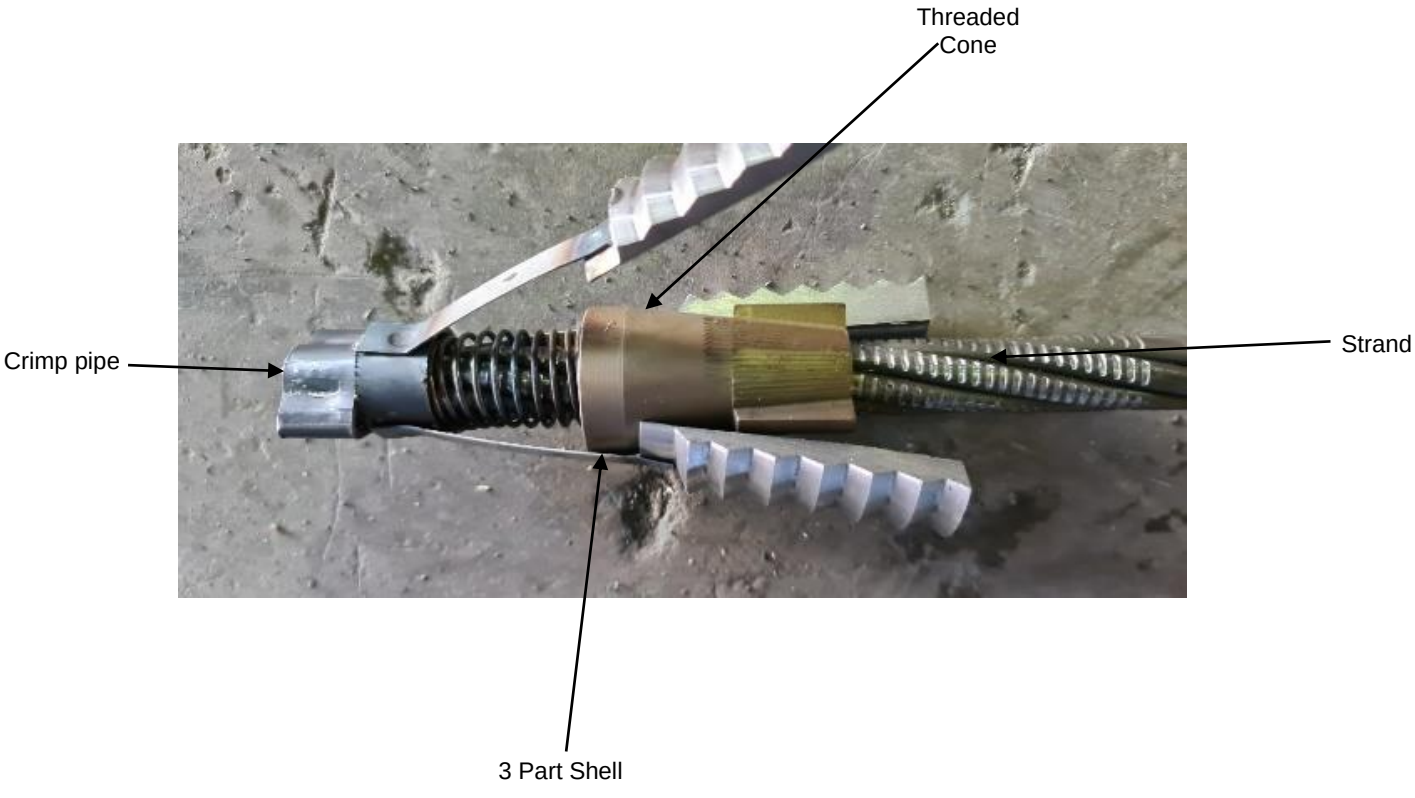
Introduction

UG MINING's latest innovation in cable anchor technology is the mechanical shell threaded anchor. The threaded anchor consist of strand, 3 part expansion shell, threaded cone, breather pipe, square plate, grout pipe, gasket, load indicator and nut.

Key features and benefits of mechanical shell threaded anchor

- Ease to install
- The threaded anchor is cheaper than mechanical shell cable anchor
- No need for cropping after installation
- The threaded anchor can be installed closer to the working faces
- The threaded anchor offers active support -spring loaded shells allows immediate shell activation
- Visual load indicating device, the bright silicone ring

Mechanical shell threaded anchor components



A. STANDARD OPERATING PROCEDURE FOR THE INSTALLATION OF MECHANICAL SHELL THREADED ANCHOR

1 Purpose

To ensure that the Mechanical shell threaded anchor is installed in a correct and safe manner.

2 Scope

UG MINING Mechanical shell threaded anchor installation for underground strata support (hanging wall, side wall and footwall support)

3 Definitions

Underground strata support – support installed to prevent a fall of ground, or, a pressure burst of either the sidewall or footwall.

4 Responsibilities

A responsible person must be put in place to ensure that all stressing equipment and drilling equipment required for the installation of the anchors is available and in good working order. This person should also ensure that the anchor and all its components, including any cement / grouts are available if required.

5 Procedure

STEP	ACTIVITY	RESPONSIBILITY
1.	**Instructions & Preparation**	
	Receive instructions clearly defining (authorising) the location, type of anchor and the quantity of anchors to be installed.	Section Manager/ Contract Manager
	Ensure that the correct materials are used for installation- i.e. anchors and resin	
	Ensure that all of the required machinery and equipment is available to perform the installations and that they are in good working order. Recommended air pressure 6 to 7 Bar.	
	Ensure the compressed air or hydraulic power pack is available to power the stressing equipment.	
	Ensure that the correct stressing equipment is available and in good order. Stressing pump, stressing jack	

	Ensure that temporary support is in place before starting with the installations. The area must be declared safe by the responsible person appointed for that area.	
2.	**<u>De-coiling the anchor (if required)</u>** If the anchor is coiled it will need to be de-coiled for use. An anchor is made from high strength, high carbon steel that has tremendous spring energy when coiled. Lay the anchor flat on the ground and inform personnel around you that you are going to de-coil the anchor. Standing on the anchor with it lying flat on the ground cut the wire binding so that the leg of the anchor will kick out AWAY from you. Exercise great caution when de-coiling anchors.	Operator assistant
3.	**<u>Checking & Preparing the Drilled Hole</u>** Ensure that the hole is flushed with air/water to remove dust and loose particles. Insert the anchor upside down into the hole to determine whether the hole is clear of obstacles and is the correct depth After checking remove the anchor from the hole. Also check that the correct diameter hole has been drilled.	Operator assistant
4.	**<u>Installing & Tensioning</u>** <u>If anchor is not fully assembled</u> - Place the gasket over the strand then the square plate; guide the breather tube through a slot on the square plate and push the grout tube into the other side of the slot; then place the load indicator l followed by the nut over the strand up against the square plate. Push the assembly firmly into position. <u>If the anchor is fully assembled</u> (as is requested from time to time) then the gasket, square plate, barrel and wedge would be fitted onto the strand. Fit the spinning adaptor onto the tail of the anchor (over the strand). Spin the anchor with the portable roof bolter/roof bolter. Hold the anchor in position under pressure with the portable roof bolter/roof bolter. *Be careful when spinning the flexibolt as the strand may snake.* Push the nut, square plate, over the strand and securely up against the roof/hanging wall. The nut will hold the assembly in place.	Operator assistant Operator Operator assistant

5.	**<u>Grouting</u>** A good quality grout must be used and be mixed thoroughly to a homogenous consistency. Mix the grout thoroughly to the grout manufacturer's specification, using a good quality mixer (not by hand with a stick). Connect the grout pump from the grout mixer and place over the grout tube. Before pumping blow into the anchor breather tube to ensure it is not blocked or pinched closed. It is a norm that grout will settle in the hole. With this in mind, pump until it is obvious that grout, and not only water, is bleeding from the breather tube. Note It is of prime importance that the grout manufacturer's directions for use and specifications are adhered to. Once grout starts pumping from the hole on the breather tube, the hole is fully grouted. When you are sure that it is a grout bleeding from the breather, bend the breather tube over and tie off with the pull wire. Continue pumping for a few strokes, thus pressurising the hole. Bend over the grout tube and tie off with a piece of wire or cable tie. The installation is now complete.	Operator

RISK ASSESSMENT FOR THE MANUFACTURE, SUPPLY AND USE OF 30T MECHANICAL SHELL THREADED ANCHOR

1. Methodology

A risk assessment generally involves identifying the potential hazards, which could lead to injury to persons or property loss, and giving them a risk rating. Suitable controls are then put in place to reduce the risk to one which is acceptable in terms of the relevant sections of the mines Health and Safety Act and Occupational Health and Safety Act.

NOTE: In terms of the Mines Health and Safety act, a manufacturer is regarded as any person or organisation which designs, manufactures, imports, sells or supplies any article for use at work. Legislation requires that articles used at work must be safe and without risk to the safety and health of the user when properly used.

- A **HAZARD** is something that has the potential to cause **HARM.** This includes substances, machines, methods of work or other aspects of the work organisation.

- **SEVERITY** is a figure attached to the amount of damage or harm that could be incurred should an incident take place.

- **PROBABILITY** is the likelihood that harm from a particular hazard will occur;

- **RISK RANKING** is the product of **SEVERITY** and **PROBABILITY.**

- The extent of the risk depends not only on the severity of the harm to a person that may occur but also on the number of people who may be involved or the extent of property damage or financial loss.

The intention is to see where failure may take place and then assessing the severity in terms of the degree of harm or damage, which may occur. This will include the extent of exposure to the risk.

2. Risk Measurement and Risk Matrix

The risk team (Table 4) made use of the 5 point risk matrix (Table 1) as tabulated below. The probability and severity of each item / job was evaluated in terms of the likely hood of an event taking place and should such an event take place, the possible consequences. (Tables 2 and 3). This is a standard system which has been previously used in the industry and has been recognized by international authorities.

Risk Matrix

Severity \ Probability	1	2	3	4	5
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20
5	5	10	15	20	25

Table. 1

Probability of an Event Taking Place		
1	Practically Impossible	Un-likely (25 years)
2	Not Likely	10 Years
3	Could Happen	Annually
4	Has Happened	Monthly / Quarterly
5	Common	Daily / Weekly or more often.

Table. 2

Consequence / Severity Should the Event take Place		
	People Related	**Financial Implications**
1	No Injury or Lost Time	High Potential with Little to No cost
2	Lost Time Injury	R50,000
3	Reportable Injury / Disability	R50,000, Less Than R1m
4	Permanent Disability / Fatal	R1m to R5m
5	Multiple Fatality	>R5m

UGMINING PTY LTD

RISK ASSESMENT FOR 18MM, 38T STRAND MECHANICAL CABLE ANCHOR

MANUFACTURING, QUALITY ASSURANCE, HANDLING, STORAGE, LOADING, TRANSPORT & USE											
Task / Process / Activity	**Potential Hazard**	**Possible Consequences**	**Existing Controls**	**P**	**C**	**R.R.**	**Additional Controls**	**P**	**C**	**R.R.**	**Responsible Person**
Manufacturing the Anchors	Anchors not manufactured to specification	Support failure F.O.G. Multiple fatalities Serious Injuries to persons Damage to equipment and infrastructure Production loss	ISO9000 quality management system (A*nchor Manufacturing production Job Card work instruction* ***LOGM_WI017****)* Batch control of all critical input components from suppliers Batch control	**2**	**5**	10					Production Supervisor

MANUFACTURING, QUALITY ASSURANCE, HANDLING, STORAGE, LOADING, TRANSPORT & USE											
Task / Process / Activity	**Potential Hazard**	**Possible Consequences**	**Existing Controls**	**P**	**C**	**R.R.**	**Additional Controls**	**P**	**C**	**R.R.**	**Responsible Person**
Packaging	Anchor are not packed completely (missing accessories)	Short supply Commercial loss	ISO9000 quality management system (A*nchor Manufacturing production Job Card work instruction* ***LOGM_WI017****)*	**3**	**2**	**6**					Production Supervisor

			Packaging procedure in place								
	Anchors are not strapped together properly	Damage to anchor components (plastic pipes) Short supply Commercial loss	ISO9000 quality management system (A*nchor Manufacturing production Job Card work instruction* ***LOGM_WI017****)* Packaging procedure in place	**3**	**2**	**6**					Production Supervisor

MANUFACTURING, QUALITY ASSURANCE, HANDLING, STORAGE, LOADING, TRANSPORT & USE											
Task / Process / Activity	**Potential Hazard**	**Possible Consequences**	**Existing Controls**	**P**	**C**	**R.R.**	**Additional Controls**	**P**	**C**	**R.R.**	**Responsible Person**
Storage at manufacturer	Anchors are not stored correctly	Damage to anchors and or components go missing Commercial loss	Storage procedure in place Anchors to be stored in demarcated area's	**3**	**2**	**6**					Production Supervisor
	Anchors exposed to adverse weather conditions	Corrosion of metal components; deterioration of plastic	Anchors to be stored under waterproof covering.	**2**	**2**	**4**					Production Supervisor

		components Commercial loss									

MANUFACTURING, QUALITY ASSURANCE, HANDLING, STORAGE, LOADING, TRANSPORT & USE											
Task / Process / Activity	**Potential Hazard**	**Possible Consequences**	**Existing Controls**	**P**	**C**	**R.R.**	**Additional Controls**	**P**	**C**	**R.R.**	**Responsible Person**
Loading for transportation to mine	The anchors are loaded incorrectly. Un-even or off balance.	Damage to anchors Financial loss Short supply Damage to equipment and infrastructure	Competent trained personnel operating loading equipment Loading procedure in place	**2**	**2**	**4**					Production Supervisor
	Load not securely fastened	Load can fall during transport Damages to load Shortage of supply Damage to equipment and infrastructure Damage to 3rd party vehicles Road accidents		**1**	**4**	**4**					Production Supervisor

		Serious injuries Fatalities									

MANUFACTURING, QUALITY ASSURANCE, HANDLING, STORAGE, LOADING, TRANSPORT & USE											
Task / Process / Activity	**Potential Hazard**	**Possible Consequences**	**Existing Controls**	**P**	**C**	**R.R.**	**Additional Controls**	**P**	**C**	**R.R.**	**Responsible Person**
Transporting material to the store	Company driver not familiar with Client Stores and offloading procedures	Time Delays Deliveries in-completed. – Financial loss. Client dissatisfaction Serious injuries to person Damage to equipment and infrastructure. (People not fully aware of site safety rules and regulations)	Adhere to all rules and regulations. Complete necessary induction.	**2**	**3**	**6**					Production Supervisor
Handling the anchors in the stores	Sharp steel edges	Lacerations and piercing injuries	Mines working procedures and instructions. Correct use of P.P.E. including gloves & safety goggles.	**3**	**2**	**6**					Client Store Supervisor

	Heavy lifting	Back injuries	Mines working procedures and instructions.	**3**	**2**	**6**					Client Store Supervisor

MANUFACTURING, QUALITY ASSURANCE, HANDLING, STORAGE, LOADING, TRANSPORT & USE											
Task / Process / Activity	**Potential Hazard**	**Possible Consequences**	**Existing Controls**	**P**	**C**	**R.R.**	**Additional Controls**	**P**	**C**	**R.R.**	**Responsible Person**
	Sharp steel edges	Minor cuts / bruises Serious injury to person	Mines working procedures and instructions including COP's Correct use of P.P.E.	**3**	**2**	**6**					Client
Installing the cable anchor	Spin anchor slips when being tensioned	Production delays Serious injury to person F.O.G. Fatalities Multiple fatalities Damage to equipment Financial loss	Check that the correct size hole as been drilled (36-38mm dia.) Check the spin anchor bulb size (it should be greater than 30mm dia.) Check the expiry date of the resin and the set & hold times. Follow suppliers installation SOP's	**3**	**5**	**15**	Inspection of ground conditions by trained professionals (Rock Engineers) Annual training of installation teams (COP's, SOP's, hazards and risks etc.)	**2**	**5**	**10**	Client

			Mines working procedures and instructions including COP's								
Installing the cable anchor	Spin anchor does not fit into the drilled hole	Production delays	Check that the correct size hole as been drilled (36-38mm dia.) Check the spin anchor bulb size (it should be greater than 30mm dia. and about 1-2mm smaller than the drilled hole size). If too large it can be hammered smaller using a suitable steel dolley. Mines working procedures and instructions including COP's Follow suppliers installation SOP's	**3**	**1**	**3**	Annual training of installation teams (COP's, SOP's, hazards and risks etc.)				Client

Installing the cable anchor	Anchor not tensioned to the desired load (under tensioned)	Anchor does not lock-off properly and slips Production delays F.O.G. Serious injury to person Fatalities Multiple fatalities Damage to equipment Financial loss	Mine to inspect quality of installations and tension indicating devices Mines working procedures and instructions including COP's Follow suppliers installation SOP's	**3**	**5**	**15**	Annual training of installation teams (COP's, SOP's, hazards and risks etc.)	**2**	**5**	**10**	Client
	Spin anchor over tensioned	Anchor breaks Damage to roof / strata F.O.G. Serious injury to person Fatalities Multiple fatalities Damage to equipment	Mines working procedures and instructions including COP's Follow suppliers installation SOP's	**2**	**5**	**10**	Annual training of installation teams (COP's, SOP's, hazards and risks etc.)	**2**	**5**	**10**	Client

		Financial loss									
Installing the cable anchor	Debris falling from roof	Eye irritation, damage to eyes Minor cuts / bruises Serious injury to person	Mines working procedures and instructions including COP's <u>Never enter an area under unsupported roof</u> Correct use of P.P.E.	**3**	**2**	**6**					Client
	F.O.G.	Minor cuts / bruises Serious injury to person Fatalities Multiple fatalities Damage to equipment Financial loss	Mines working procedures and instructions including COP's <u>Never enter an area under unsupported roof</u> Correct use of P.P.E.	**3**	**5**	**15**	Inspection of ground conditions by trained professionals (Rock Engineers) Annual training of installation teams (COP's, hazards and risks etc.)	**2**	**5**	**10**	Client
	Mobile Machinery	Vehicle colliding with installation personnel	Mine's working procedures and instructions including COP's	**2**	**5**	**10**					Client

		Minor cuts / bruises Serious injury to person Fatalities Multiple fatalities Damage to equipment Financial loss	Never enter an area under unsupported roof								
Installing the cable anchor	Working at heights	Minor cuts / bruises Serious injury to person Fatalities Damage to equipment Financial loss	Mine's working procedures and instructions including COP's Never enter an area under unsupported roof Correct use of P.P.E. Mines procedures for working at heights. Use of safety belts etc.	**3**	**4**	**12**					Client
	Heavy lifting	Back injury Minor cuts / bruises	Mine's working procedures and instructions including COP's								Client

		Serious injury to person	Never enter an area under unsupported roof Correct use of P.P.E. Mines procedures for working at heights. Use of safety belts etc.								
Installing the cable anchor	Pneumatic / Hydraulic anchor installation equipment	Pipes dislodging and causing injury Hydraulic pipes failing under high pressure causing oil injection injuries (serious, potentially fatal injury) Serious injury to person Fatalities Damage to equipment Financial loss	Make use of safety slings Check the condition of equipment especially pipes before each use. Do not use equipment that appears to be faulty, defective or incomplete Follow the equipment manufacturers guide for safe operation and maintenance Never enter an area under	**2**	**4**						Client

			unsupported roof Correct use of P.P.E.								

MANUFACTURING, QUALITY ASSURANCE, HANDLING, STORAGE, LOADING, TRANSPORT & USE											
Task / Process / Activity	**Potential Hazard**	**Possible Consequences**	**Existing Controls**	**P**	**C**	**R.R.**	**Additional Controls**	**P**	**C**	**R.R.**	**Responsible Person**
Storage of Anchors	Anchors are not stored correctly	Damage to anchors and or components go missing Support failure F.O.G. Multiple fatalities Serious Injuries to persons Damage to equipment and infrastructure Production loss	On surface, anchors to be stored undercover. Anchors to be issued last in, first out to reduce time that the anchors are exposed to surface elements	**3**	**2**	**6**	Mines supervisory controls. Inspections etc	**2**	**2**	**4**	Client

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Mechanical Testing

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Cottesloe 2092 Johannesburg

CERTIFICATE OF TEST

Test of three threaded cable anchors complete with load indicators, nuts and 150 mm x 150 mm forged plates

Application Received: 01 July 2020

Certificate No.: T28266

Order No.: POD41720

Date of Test: 30 August 2020

SUBMITTED TO

Mr Jaco Prekkus
Pabchem Mining (Pty) Ltd
P O Box 1253
SPRINGS
1560

1. INTRODUCTION

At the request of Mr Jaco Prekkus of Pabchem Mining (Pty) Ltd, three threaded cable anchors (30 t) complete with load indicators, nuts and 150 mm x 150 mm forged plates were submitted for tensile testing to destruction. The test was conducted in accordance with the customer's request.

2. TEST PROCEDURE

Testing machines:	1 000 kN Amsler Universal testing machine and 4 448 kN (500 sh ton) Mohr & Federhaff tensile testing machine
Test type:	Destruction in tension
Test specification:	Customer's request

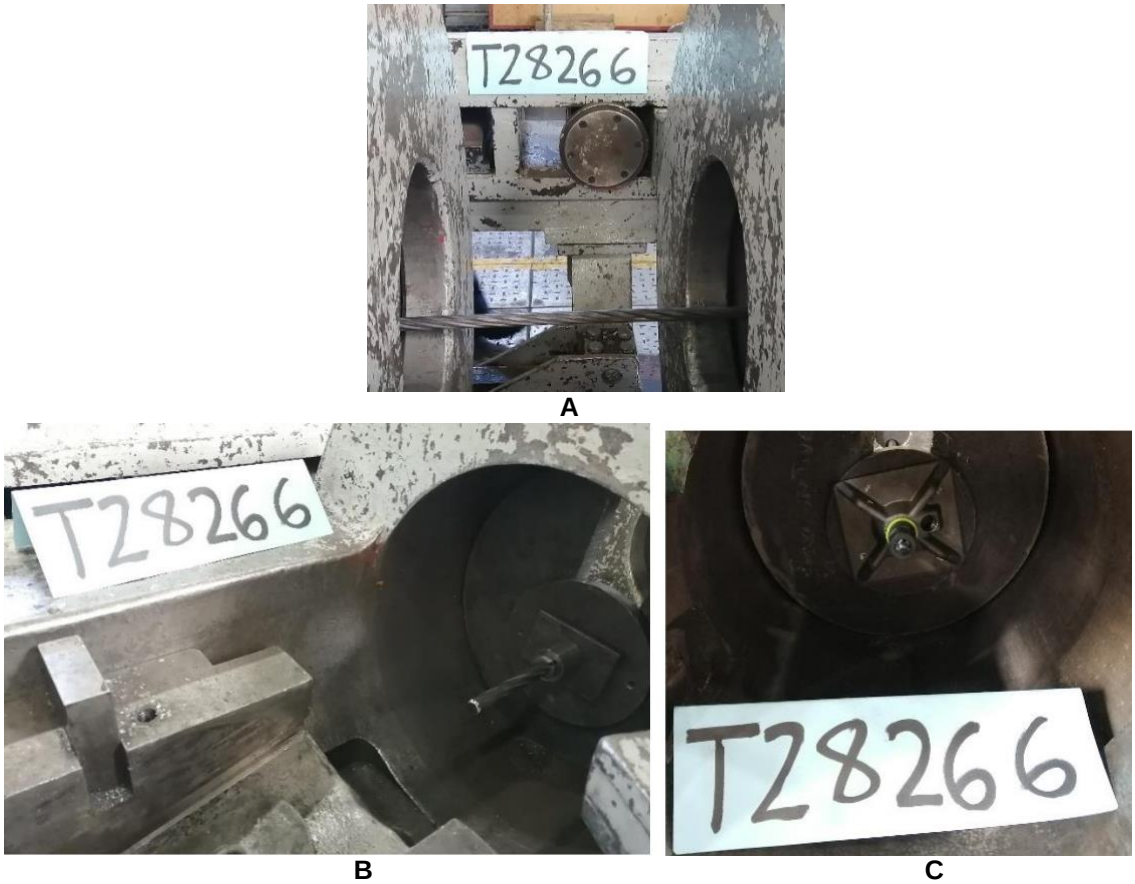
The cable anchor samples were in turn installed in the 1 000 kN Amsler Universal testing machine using suitable fittings as shown in Figure 1. A gradually increasing tensile load was applied to the assembly until failure occurred. For Test 3 the cable anchor sample was first pulled on 1 000 kN Amsler Universal testing machine and thereafter pulled for the second time on 4 448 kN (500 sh ton) Mohr & Federhaff tensile testing machine (Figure 2) until failure occurred.

Testing Officer: . . . . . .
JAN KGANYAGO

Engineer: . . . . . .
RUTH TELEKA

A **B**

Figure 1. Threaded cable anchor complete with load indicator, nut and 150 mm x 150 mm forged plate installed in the 1 000 kN Amsler Universal testing machine



A

B **C**

Figure 2. Threaded cable anchor complete with load indicator, nut and 150 mm x 150 mm forged plate installed in the 4 448 kN (500 sh ton) Mohr & Federhaff tensile testing machine

Testing Officer: . . . . . .
JAN KGANYAGO

Engineer: . . . . . .
RUTH TELEKA

3. TEST RESULTS

The results of the destruction tests carried out on the threaded cable anchors, complete with load indicators, nuts and 150 mm x 150 mm forged plates are summarised in Table 1.

Table 1. Test results for the threaded cable anchors, complete with load indicators, nuts and 150 mm x 150 mm forged plates

Test No.	Maximum load carried (kN)	Test Comment
1	316	The cable anchors fractured as shown in Figure 2.
2	298	
3	325	
Average	**313**	
Standard deviation	**13.7**	

Figure 2. Specimens after the test

A. DISCLAIMER

The CSIR cannot be held responsible for product indifferences and cannot be held responsible for any accidents or incidents as a result thereof.
Due to the limited amount of sample(s) tested and the type of testing done, CSIR can only account for the results from those specific samples tested.
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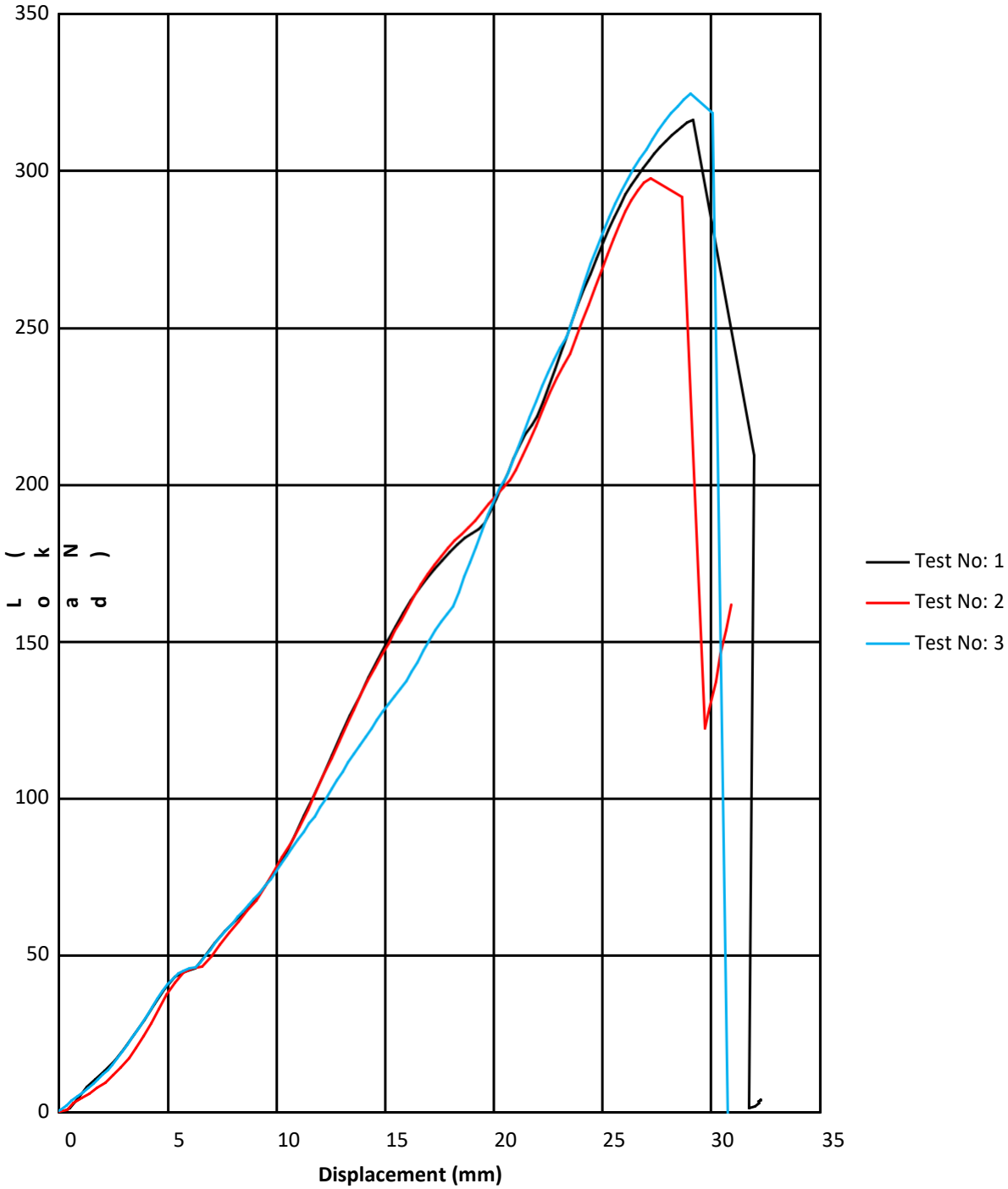
Testing Officer: . . . . . .
JAN KGANYAGO

Engineer: . . . . . .
RUTH TELEKA

Certificate No.:	**T28266**
Date of test:	**30 July 2020**
Applicant:	**Fabchem Mining (Pty) Ltd**
Description:	**Threaded cable anchors complete with load indicators, nuts and 150 mm x 150 mm forged plates**

	1	2	3
Maximum Force (kN):	**316**	**298**	**325**



Testing Officer: . . . . . .
JAN KGANYAGO

Notice:
ONLY the original signed report must be regarded as the official document.

Engineer: . . . . . .