

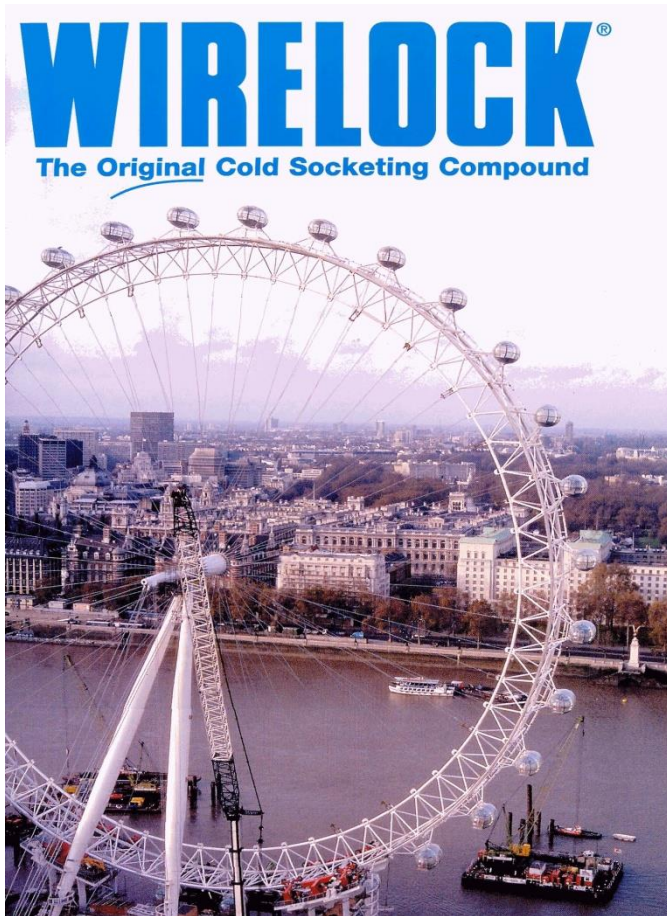


DELTA Safety Training welcomes you for the training

SOCKET TERMINATION BY WIRELOCK RESIN

SOCKET TERMINATION BY WIRELOCK RESIN

WIRELOCK RESIN



Wirelock is a unique socketing compound for steel wire ropes

Wirelock has been used in the Offshore, Construction and mining industry for over 30 years

Wirelock is the only socketing system that meets the requirements of D.N.V.'s certification standard,
D.N.V. – OS – E304.

Certification of: “Mooring Steel Wire Ropes”

Wirelock has both Lloyds and ABS Type Approval



SOCKET TERMINATION BY WIRELOCK RESIN

WIRE ROPE SOCKETING

Course Content:

Part 1: Components

- Spelter Sockets
- Steel Wire Rope
- Wirelock Resin

Part 2: Termination Method

- Theory & Practical

Part 3: Exam

- Test Paper



SOCKET TERMINATION BY WIRELOCK RESIN

Spelter Sockets



Steel Wire Rope



Wirelock Resin



SOCKET TERMINATION BY WIRELOCK RESIN

SPELTER SOCKETS

Sockets are the strongest steel wire rope fittings available. When they are fitted correctly they meet or exceed the breaking load of the steel wire rope

Sockets are manufactured to various International standards

- BS: 463
- DIN: 50049
- American Federal Specification RR-S-550

Test certificates including M.P.I reports are always recommend to be provided from the supplier



SOCKET TERMINATION BY WIRELOCK RESIN

SOCKET DIMENSIONS

R = Rope diameter, S = Strand diameter

W = Outer Wire diameter

THEN IDEALLY:-

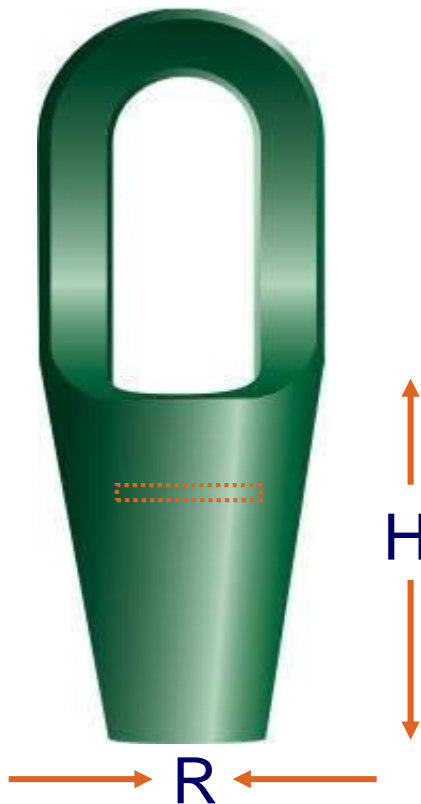
$$H/R > 3$$

or

$$H/S > 5$$

or

$$H/W > 50$$







CIRCULAR GROOVES

**Are generally thought to
do more harm than good**

SOCKET TERMINATION BY WIRELOCK RESIN

SOCKETS TERMINATION EFFICIENCY

% Against the Minimum Breaking Load of the steel wire rope

- **Wire rope bulldog grip 80 / 90 %** 
- **Mechanical spliced eye 85 / 95 %**
- **Wedge socket 80 %** 
- **Swaged socket 100 %** 
- **Spelter socket 100 %** 

SOCKET TERMINATION BY WIRELOCK RESIN

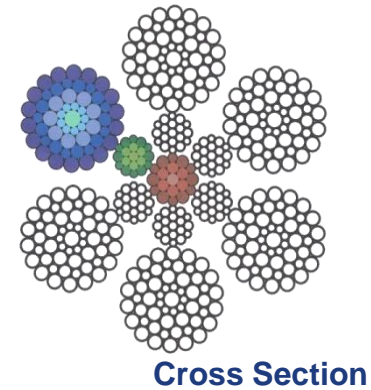
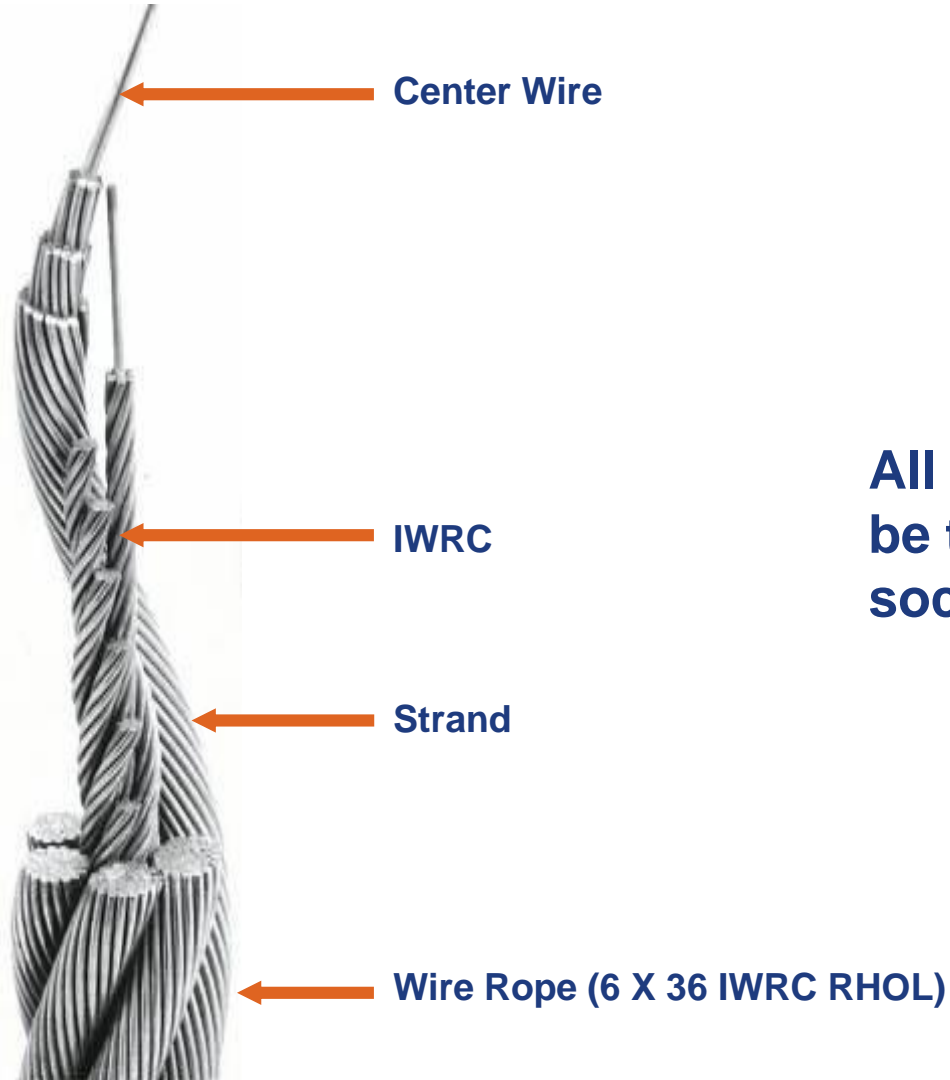
SOCKETS ARE USED IN THE FOLLOWING APPLICATIONS:

- **Anchor Lines**
- **Marine Mooring Lines**
- **Winch Tow Wires**
- **Suspension Bridges**
- **Dredging Wires**
- **Crane Pennants & Hoist Ropes**
- **USAGE TEMPERATURE SOCKETS:
MIN. -53°C / MAX. +115°C**



SOCKET TERMINATION BY WIRELOCK RESIN

STEEL WIRE ROPE



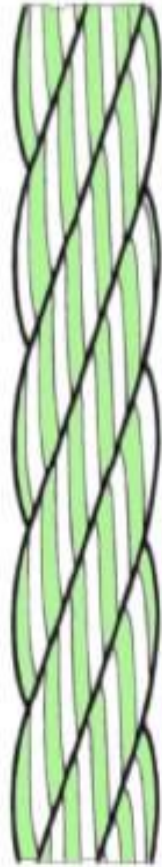
All types of steel wire rope can be terminated with spelter sockets

SOCKET TERMINATION BY WIRELOCK RESIN

STEEL WIRE ROPE CONSTRUCTION



Left Hand



Right Hand

Ordinary Lay



Right Hand

Lang Lay



Left Hand

SOCKET TERMINATION BY WIRELOCK RESIN

WIRE LOCK RESIN



Prior to use ALWAYS check:

- ▶ **The Suppliers Name**
- ▶ **Batch Number**
- ▶ **Shelf Life Date (This should not exceed 18 months)**



SOCKET TERMINATION BY WIRELOCK RESIN

WIRE LOCK RESIN: CAUTION

Material Safety Data Sheet

CAUTION	
<ul style="list-style-type: none">• WIRELOCK® resin, in liquid state, is flammable.• Chemicals used in this product can give off toxic fumes and can burn eyes and skin.• Use only in well-ventilated work areas.• Never breathe fumes directly or for extended time.• Always wear safety glasses to protect eyes.• Always wear gloves to protect hands.• Avoid direct contact with skin anywhere.	

Material Safety Data Sheet

1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY

Product Name: Wirelock/Paralock Rope Capping kit

Company: Millfield Enterprises (Manufacturing) Limited
16 Shelley Road
Newburn Industrial Estate
Newburn
Newcastle upon Tyne NI15 9RT

Emergency Contact No: Tel: + 44 (0) 191 264 8541
Fax: + 44 (0) 191 264 6962

2 COMPOSITION/INFORMATION OF INGREDIENTS

Product Description: Unsaturated polyester resin, dissolved in styrene containing low levels of inhibitors to prevent premature polymerisation. The solid portion of the kit contains less than 1% of Benzoyl Peroxide and does not have any significant health hazards apart from the fact that as a powder it may be irritating to the eyes and respiratory system.

Ingredients: Styrene CAS No: 100-42-5
Risk Phases: R10, R20, R36/38 EINECS: 202-851-5
Safety Phases: S23, S24/25, S26, S36/37/39 Concentration: 32% approx
Classification/Symbol: Harmful Xn

3 HAZARDS IDENTIFICATION

Flammable: Harmful by inhalation. Irritating to eyes and skin. This product may present a possible environmental hazard.

4 FIRST AID MEASURES

Inhalation: Remove to fresh air, keep patient warm and at rest. If breathing is irregular or has stopped, administer artificial respiration. Give nothing by mouth.

Eye Contact: Irrigate copiously with clean, fresh water for at least 10 minutes, holding eyelids apart.

Skin Contact: Remove contaminated clothing, wash skin thoroughly with soap and water or use a proprietary skin cleanser. Do not use solvents.

Ingestion: If accidentally swallowed, DO NOT INDUCE VOMITING, keep at rest and obtain medical attention.

General: In all cases of doubt, or where symptoms persist, seek medical attention.

Millfield
Millfield Enterprises (Manufacturing) Limited
Theby Road
Newburn Industrial Estate
Newcastle upon Tyne
NE15 9RT
United Kingdom

Telephone: +44 (0) 191 264 8541
Facsimile: +44 (0) 191 264 6962
E-mail: mail@millfield-group.co.uk

WIRELOCK

UN1 Registered 3B 47B 6/40 16. Corrosive Registration Number: 1009/09. Director: J.M. Dodd, J.F. Dodd, J.E. Dodd. Member of the Millfield Group of Companies.

- 14 -



SOCKET TERMINATION BY WIRELOCK RESIN

WIRELOCK RESIN:



Polyester Resin

Thermosetting (Exothermic
reaction)

No Heat Required

No Socket Pre-heat

Two Pack System

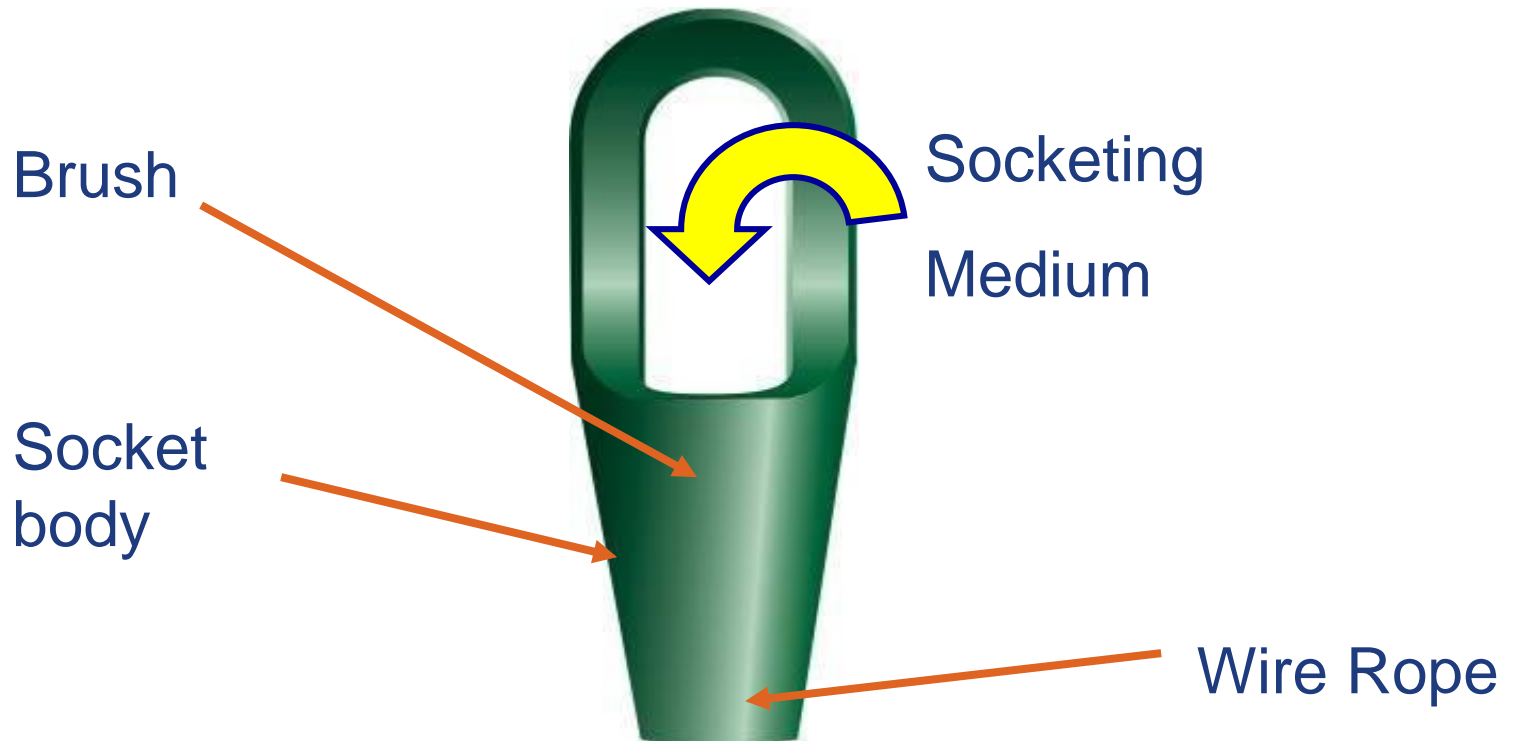
One Pack Contains Resin +
Accelerator

One Pack Contains Filler +
Catalyst

Mix together thoroughly to activate

SOCKET TERMINATION BY WIRELOCK RESIN

HOW A SOCKET WORKS:

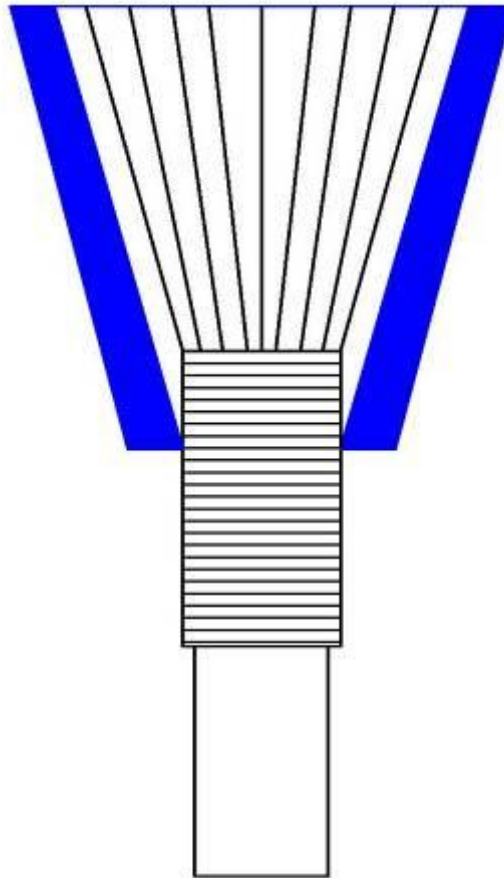


SOCKET TERMINATION BY WIRELOCK RESIN

HOW A SOCKET WORKS:

So:-

The socketing medium needs to adhere to the wires in order to generate the initial downward force

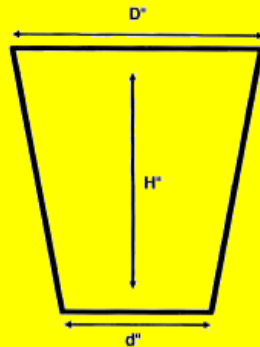


And:-

The socketing medium needs to be compressible under radial pressure to grip the wires

SOCKET TERMINATION BY WIRELOCK RESIN

CALCULATION OF SOCKET VOLUME:



$$\frac{(D + d)^2}{4} \times H \times 3.142 = \text{cc}$$

(D, d & H are in cm)

$$(D + d)^2 \times H \times 3.34 = \text{Socket Volume in cc}$$

(D, d & H are in inches)

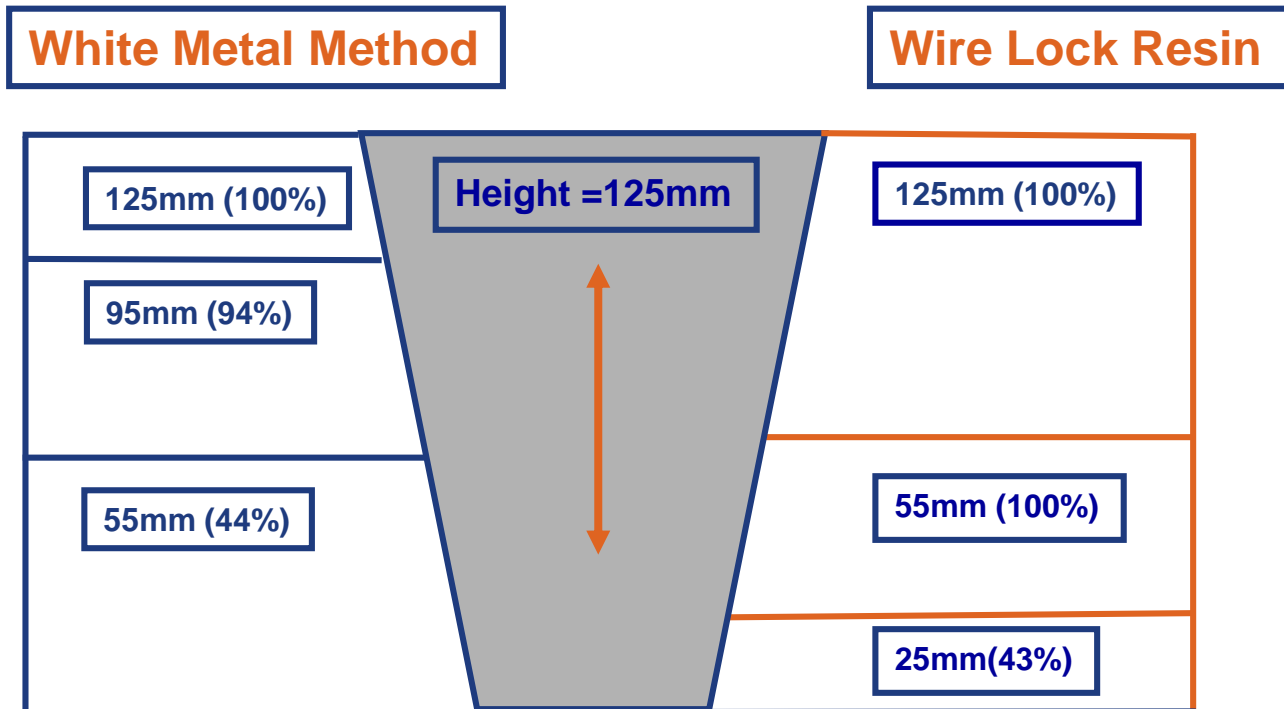
GUIDE TO AMOUNT OF WIRELOCK® REQUIRED

6.5mm (1/4")	.....9cc	44.5mm (1 3/4")	.....700cc
8mm (5/16")	.....17cc	47.5mm (1 7/8")	.....700cc
9.5mm (3/8")	.....17cc	51mm (2")	.....1265cc
11mm (7/16")	.....35cc	54mm (2 1/8")	.....1265cc
12.5mm (1/2")	.....35cc	57mm (2 1/4")	.....1410cc
14mm (9/16")	.....52cc	60mm (2 3/8")	.....1410cc
16mm (5/8")	.....52cc	63.5mm (2 1/2")	.....1830cc
19mm (3/4")	.....86cc	66.5mm (2 5/8")	.....1830cc
22mm (7/8")	.....125cc	70mm (2 3/4")	.....2250cc
25mm (1")	.....160cc	76mm (3")	.....3160cc
28.5mm (1 1/8")	.....210cc	82.5mm (3 1/4")	.....3795cc
32mm (1 1/4")	.....350cc	89mm (3 1/2")	.....4920cc
35mm (1 3/8")	.....350cc	95mm (3 3/4")	.....5980cc
38mm (1 1/2")	.....420cc	101.5mm (4")	.....7730cc
41mm (1 5/8")	.....495cc		

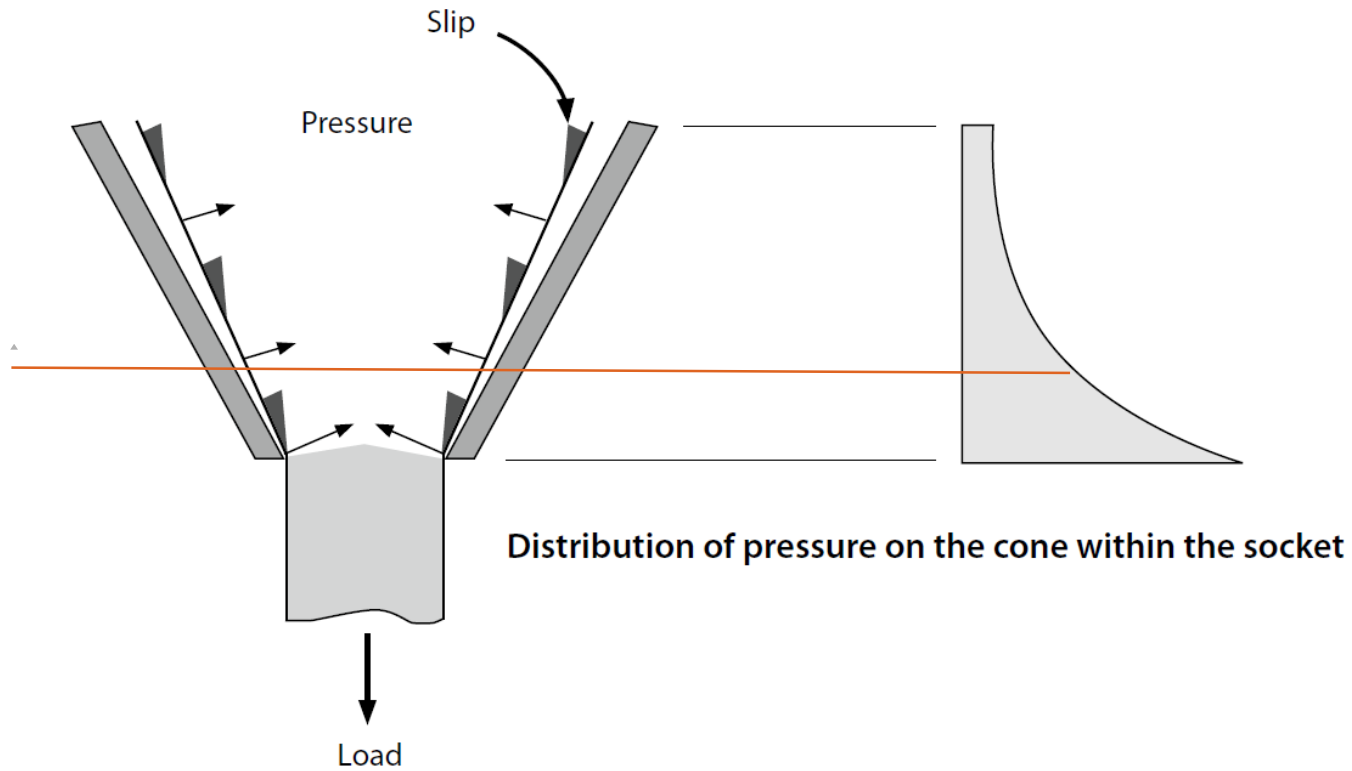
SOCKET TERMINATION BY WIRELOCK RESIN

COMPARISON OF TERMINATION BY WHITE METAL AND WIRE LOCK RESIN

EFFICIENCY RATING



SOCKET TERMINATION BY WIRELOCK RESIN



SOCKET TERMINATION BY WIRELOCK RESIN

Part 2: Theory



SOCKET TERMINATION BY WIRELOCK RESIN

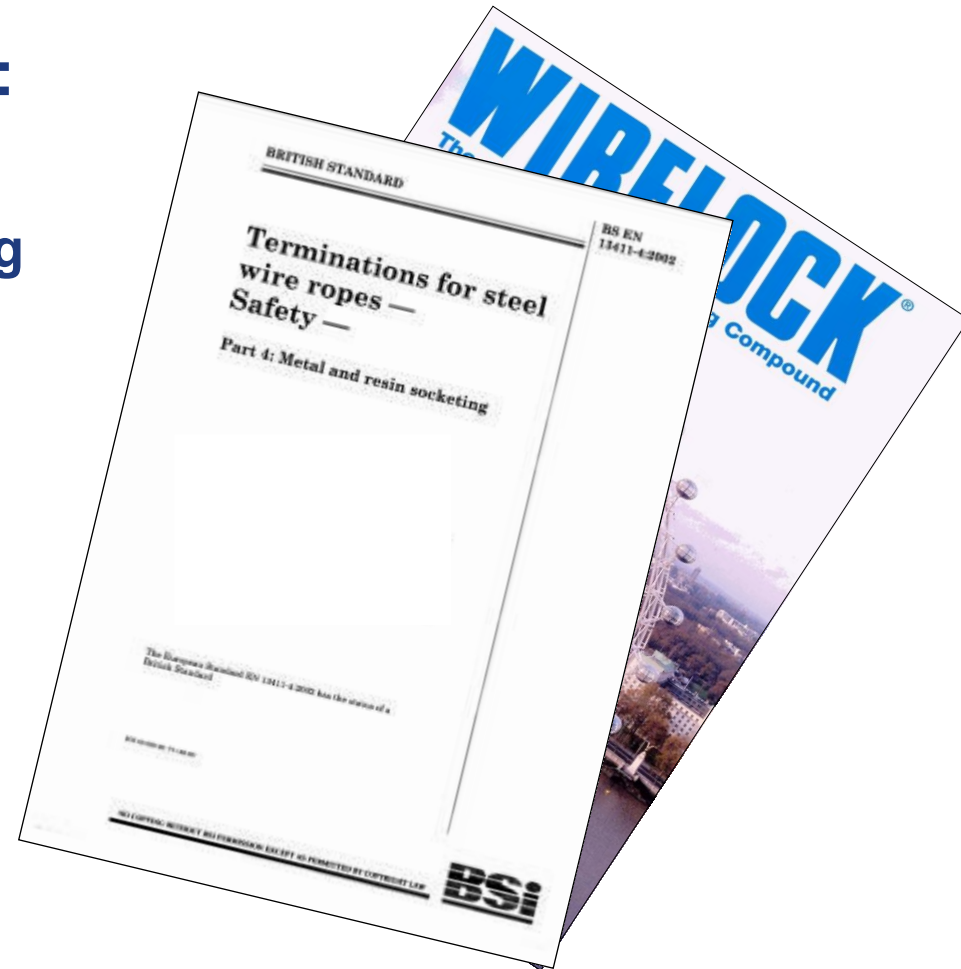
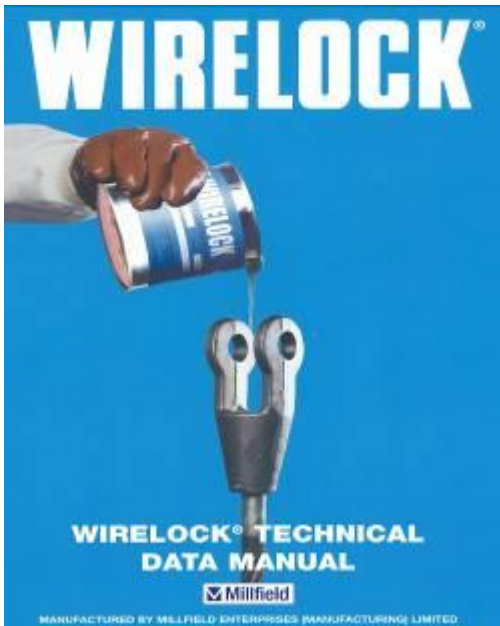
TECHNICAL REFERENCES:

BS EN 13411-4:2011

Part 4: Metal and Resin Socketing

WIRELOCK

Technical Data Manual



SOCKET TERMINATION BY WIRELOCK RESIN

SAFETY AND RISK ASSESSMENT

Safety Considerations	<p>Sockets terminations can be carried out in a workshop facility or on offshore locations. Example: AHV Deck</p> <p>Therefore inspection of your work area should be carried out prior to starting the work.</p> <p>Ensure you have the appropriate work permit for the work that you are going to carry out.</p> <p>Personnel are to wear appropriate personal protective equipment related to the work site.</p>
Risk Assessment	<p>When conditions or the work site constitute the need for a risk assessment, the following should be used for guidance:</p> <p>Look for the hazard.</p> <p>Decide who might be harmed, and how.</p> <p>Evaluate the risk and decide whether existing precautions are adequate.</p>

SOCKET TERMINATION BY WIRELOCK RESIN

TOOLS AND EQUIPMENT REQUIRED:

- **Steel Wire Rope**
- **Spelter Socket**
- **Rags**
- **Cleaning Fluid**
- **Abrasive Cutter**
- **Serving Wire**
- **Clamps**
- **T Needle / Spikes**
- **Opening Tubes**
- **Pliers / Grippers**
- **Suitable Stand or Vice**
- **Containers for Mixing**
- **Plasticine or fire clay**



A Safe Workstation

SOCKET TERMINATION BY WIRELOCK RESIN

PREPARATION: SOCKET

Is the socket suitable for the application..?

(Do not use oversized sockets)

Check :

Socket Size against rope size.?

Ensure socket is dry and grease free

Has the socket been inspected ?

ALL CLEAR..?

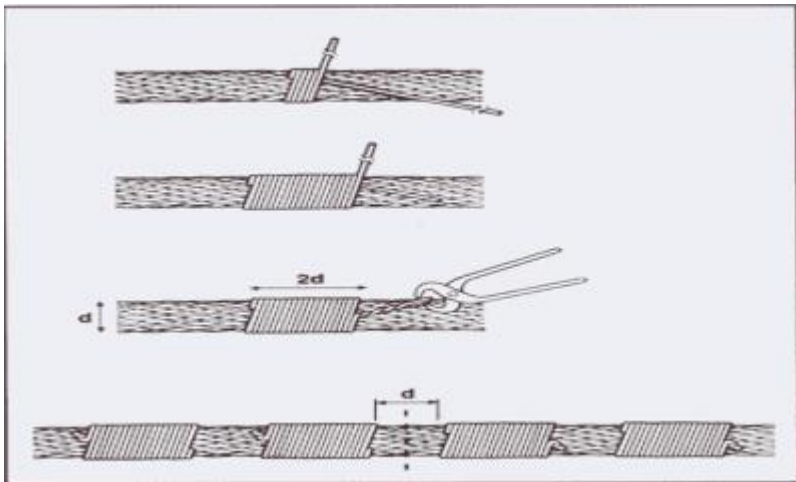
Proceed

SOCKET TERMINATION BY WIRELOCK RESIN

Preparation: of Steel Wire Rope to be Terminated

Select wire rope, measure & mark for cutting

Apply temporary serving each side of cut mark



Did we fit the socket..?

SOCKET TERMINATION BY WIRELOCK RESIN

Preparation: of Steel Wire Rope to be Terminated

Cut the rope (abrasive wheel preferred)

Select socket

Mark to show start of permanent serving

Secure steel wire rope in holding vice or clamp

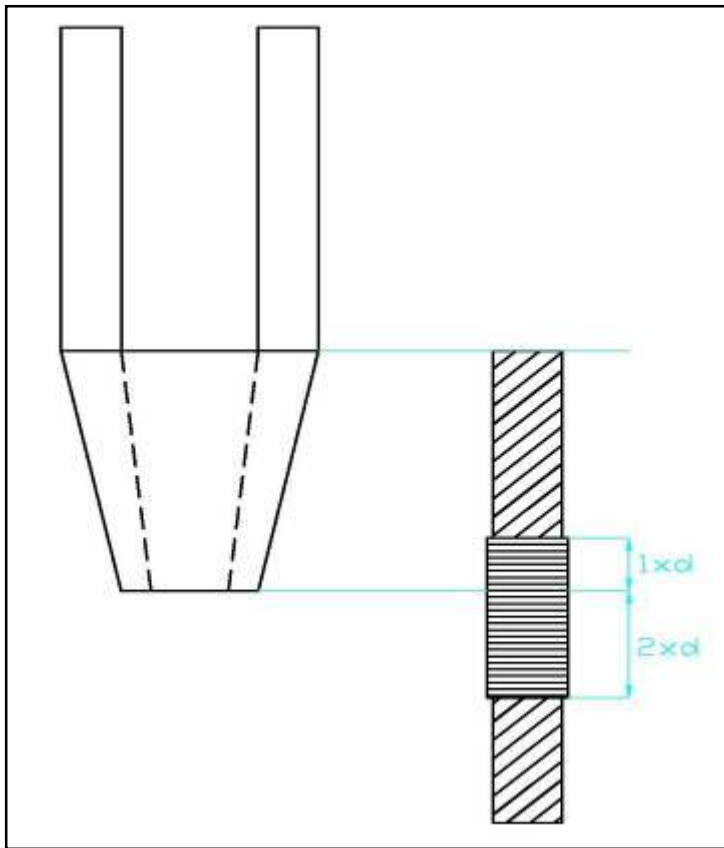
Did we fit the socket..?



SOCKET TERMINATION BY WIRELOCK RESIN

Preparation: of Steel Wire Rope to be Terminated

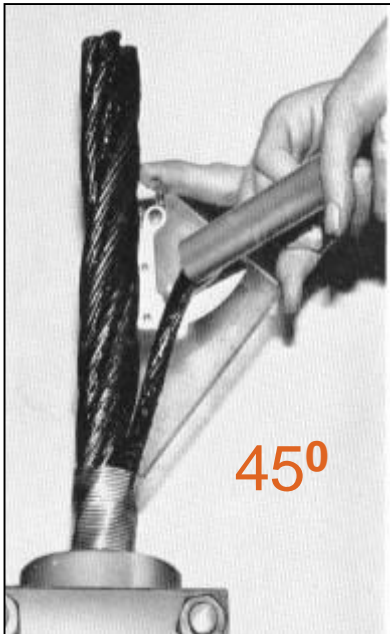
Location of Permanent Serving



SOCKET TERMINATION BY WIRELOCK RESIN

Preparation: of Steel Wire Rope to be Terminated

Brooming is one of the most critical parts of any socketing operation



Note:

Any Plastic covering or in-fills / fibre cores should be removed

SOCKET TERMINATION BY WIRELOCK RESIN

SOCKETING CARRIED OUT ON LOCATION OFFSHORE



SOCKET TERMINATION BY WIRELOCK RESIN

CLEANING THE BROOM

The broom should be cleaned using:

- **Jizer**
- **Gunk**

You must always clean towards the broom

After washing and cleaning keep the broom upright

Keep the broom clean at all times

SOCKET TERMINATION BY WIRELOCK RESIN



SOCKET TERMINATION BY WIRELOCK RESIN

REFORMING THE BROOM

- The brush should be reformed using **CLEAN** tools
- Reform the broom so that it is approximately the same shape as the inside of the socket
- Avoid lots of wires touching the inside of the socket

SOCKET TERMINATION BY WIRELOCK RESIN

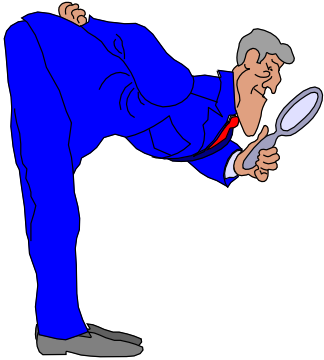
POSITIONING OF BROOM AND ALIGNMENT OF SOCKET

- The axis of the socket must be align with the axis of the rope
- The rope must be **30 x the rope dia** on the vertical with no bends or curves within the wire
- The broom location and positing is vital in which to provide an efficient termination with the load from the wire being uniformly distributed.



SOCKET TERMINATION BY WIRELOCK RESIN

POSITIONING OF BROOM AND ALIGNMENT OF SOCKET

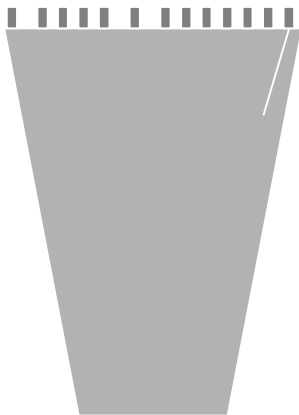


Make certain the broomed wires are uniformly spaced in the basket, with wires ends at the top edge of the basket, with a slight protrusion of the single wires by 1 / 2 mm. and that the axes of the rope and the fitting are aligned.

Correct alignment will avoid premature failure of the assembly due to unequal loading of the wires.

SOCKET TERMINATION BY WIRELOCK RESIN

POSITIONING OF BROOM AND ALIGNMENT OF SOCKET

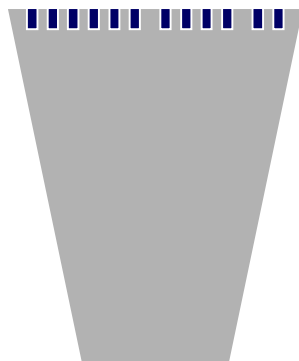


Question:

1. Is it necessary to have a flushed surface?

Answer: No.

The customer / inspector/ insurance inspector need to know that a proper broom has been created and not half way.



Corrosion – O₂ + H₂O

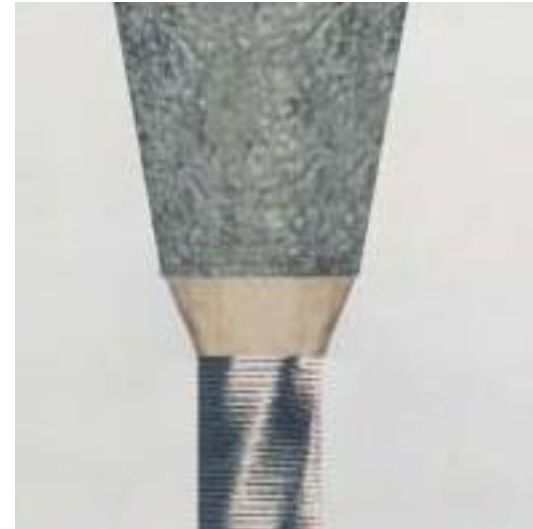
Over years, the protruding wires may disappear due to corrosion.

SOCKET TERMINATION BY WIRELOCK RESIN

SEALING OF THE SOCKET PRIOR TO POURING

Plasticine, Putty is required to seal the base of the socket, thus preventing the resin leakage which would result in the socket termination being totally useless.

Extreme care must be taken that the sealing compound is able to hold the volume weight of the wirelock



Note that resin in particular is very ‘searching’ and the sealing process must be done carefully otherwise you will end up with an empty socket and a resin covered rope!

SOCKET TERMINATION BY WIRELOCK RESIN



Identification Plate

Duck Tape

SOCKET TERMINATION BY WIRELOCK RESIN

MIXING WIRELOCK RESIN KITS

You must plan safely and carefully the next fitting steps as time is a key factor.



**The complete mixing process
must be completed within 2 minutes
Min./Max. pouring temperature -3°C / +35°C.**

SOCKET TERMINATION BY WIRELOCK RESIN

MIXING THE RESIN

Pour the liquid into the powder and mix with a wooden spatula or similar.
When combining two or more kits pour all the powder into a suitable clean container followed by all the resin

Do not split kits into smaller quantities

Make sure no powder remains at the bottom of the mixing container

When you are mixing please watch the wirelock resin as it will turn greenish, turquoise in color.

In the event that the color changes to a straw color please do not use.

Always mix the complete kits : Resin & Powder

Ensure thorough mixing



SOCKET TERMINATION BY WIRELOCK RESIN

MIXING THE RESIN

Booster Pack

At ambient temperatures below 9 deg C (48deg F) and above 2 deg C (35 deg F), one (1) Booster Pack should be used.

Below 2 deg C (35 deg F) and above -3 deg C (27 deg F), two (2) Booster Packs should be used.

The Booster Pack compensates chemically for the slower gel time experienced at lower temperatures.

Ensure thorough mixing



SOCKET TERMINATION BY WIRELOCK RESIN

POURING THE SOCKET

Ensure the rope, socket is held secure

Once the Wirelock resin has been mixed correctly it should be immediately poured into the basket of the socket.

To ensure that the basket accepts the full volume of resin the pouring should be done slowly and preferably down the side of the socket to allow air to escape

Pour the socketing medium in a continuous flow down the inside face of the socket “puddle” with a wooden or metal rod to remove trapped air



SOCKET TERMINATION BY WIRELOCK RESIN

POURING THE SOCKET

The gelling process should start within the basket of the socket and not before.

Always mix sufficient wirelock to complete the pouring in a single event



SOCKET TERMINATION BY WIRELOCK RESIN



SOCKET TERMINATION BY WIRELOCK RESIN



Socket should be straight and level prior to pouring the resin

SOCKET TERMINATION BY WIRELOCK RESIN

CHECK ON PENETRATION

The top of the cured cone should have the single wires slightly visible by 1 or 2 mm

On removing the stopper material from the socket base it will be visible that the wirelock resin has gone down into the throat of the socket



SOCKET TERMINATION BY WIRELOCK RESIN

TOPPING UP OF THE RESIN

The topping up of resin in the socket basket may be done providing the following are observed:

- **The socket must be allowed to cool for 1 hour after it has gelled**
- **Topping up is complete within 24 hours of the socket pour and**
- **only be done with a thin layer for cosmetic / protection reasons!!!**

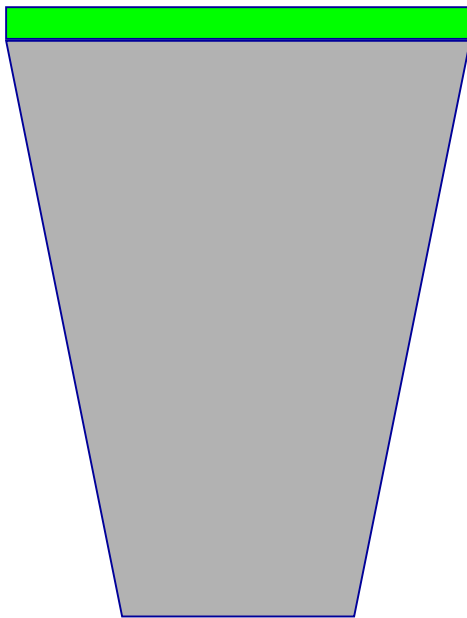
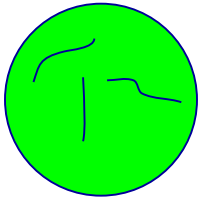
SOCKET TERMINATION BY WIRELOCK RESIN

MOVEMENT OF THE WIRE ROPE AND SOCKET Don't...!

Do not move the socket from its pouring position until at least 30 minutes after the gelling has been completed.

SOCKET TERMINATION BY WIRELOCK RESIN

SURFACE CRACKS



Cracks means good shrinkage

2-3 mm standard

Crack will stop penetrating

SOCKET TERMINATION BY WIRELOCK RESIN

INSPECTION

- **Allow the socketing medium to fully set and scratch test**
- **Remove the “permanent” serving**
- **Check alignment of rope & socket**
- **Check wire protrusion**
- **Check complete filling of socket particularly at socket neck**
- **Re-lubricate the rope at the neck of the socket**

SOCKET TERMINATION BY WIRELOCK RESIN

LOAD TESTING OF THE SOCKET TERMINATION

Should the socket termination require load testing then this can be carried out 1 hour after the gelling period.

Should the socket be proof load tested we recommend 2 x the safe working load. (Presuming 5: 1 Factor Of Safety)



SOCKET TERMINATION BY WIRELOCK RESIN



FRANKLIN OFFSHORE
REPORT / RECORD
OF SOCKET TERMINATION BY WIRE LOCK RESIN
REPORT TYPE FOS : 009

FRANKLIN OFFSHORE QUALITY CONTROLLED FITTING PROCEDURE Non. F.O.S SSP-1

Record of Socket Termination by Wirelock Resin

REPORT NUMBER			
NAME OF OWNER			
DATE			
LOCATION			
SERVICE WORK COMPLETED BY			
DESCRIPTION OF WORK			
SOCKET DETAILS		WIRE LOCK RESIN KIT DETAILS	
MANUFACTURER		MANUFACTURER	
TYPE		SUPPLIER	
I.D NUMBER		KIT SIZE	
TO SUIT ROPE SIZE		BATCH NUMBER	
TEST CERTIFICATES		EXPIRY DATE	
MPI REPORT		MIXING METHOD	
SOCKET CONDITION		AMBIENT KIT	
NEW / USED		BOOSTER KIT	
CLEANING METHOD		COLOUR OF MIXED KIT	
STEEL WIRE ROPE DETAILS			
LOCATION			
DIA			
CONSTRUCTION			
FINISH			
LAY			
CLEANING METHOD			
IS THE ROPE FREE FROM INTERNAL CORROSION			
STEEL WIRE ROPE AND SOCKET PROOF LOAD DETAILS			
LOCATION			
SWL AND IDENTIFICATION NUMBER			
PROOF LOAD TO BE APPLIED			
METHOD OF TEST			
TYPE OF LOAD MEASURING UNIT			
CALIBRATION REPORT			
STEEL WIRE ROPE AND SOCKET PROOF LOAD DETAILS			
THE SOCKET TERMINATION WAS FULLY INSPECTED BY			

SOCKET TERMINATION BY WIRELOCK RESIN

RE - USE OF USED SPELTER SOCKETS

The socket should be fully inspected against an inspection criteria

Use only sockets that :

- **Do not show any evidence of distortion**
- **The socket is not Bent, Deformed or Cracked**
- **The socket is free from nicks and gouges**
- **The socket should be free from welding**
- **The socket should not show any signs of discoloration from excessive heating**

SOCKET TERMINATION BY WIRELOCK RESIN

RE - USE OF USED SPELTER SOCKETS

Procedure for removing resin cone

The wire should be cut close to the nose end of the socket, and gently pressed out. In some cases the unit can be knocked out by a hammer

Heating of the socket should be avoided unless you can control the temperature maximum **95°C. (200°F by Crosby)**

Should the socket be suitable for further service then the socket must be cleaned, including the inside of the basket.

SOCKET TERMINATION BY WIRELOCK RESIN

FAILURE OF SOCKET OR SOCKET TERMINATION



SOCKET TERMINATION BY WIRELOCK RESIN

**The socket alignment with the rope is not straight.
This leads to unequal load distribution and termination failure.**



SOCKET TERMINATION BY WIRELOCK RESIN



SOCKET TERMINATION BY WIRELOCK RESIN



SOCKET TERMINATION BY WIRELOCK RESIN

FAILURE OF SOCKET OR SOCKET TERMINATION



SOCKET TERMINATION BY WIRELOCK RESIN



SOCKET TERMINATION BY WIRELOCK RESIN



PART 2: PRACTICAL

Safety takes Priority

PPE: Required



Copyright DELTA Safety Training

TRAINING

SOCKET TERMINATION BY WIRELOCK RESIN

PPE

Please use the correct PPE:

- **WORK SUIT**
- **SAFETY GLASSES**
- **SAFETY GLOVES**
- **HARD HAT**
- **SAFETY BOOTS**

SOCKET TERMINATION BY WIRELOCK RESIN

SOCKETING ON SITE...



SOCKET TERMINATION BY WIRELOCK RESIN

SOCKETING ON SITE...



SOCKET TERMINATION BY WIRELOCK RESIN

SOCKETING ON SITE...



SOCKET TERMINATION BY WIRELOCK RESIN

SOCKETING ON SITE...



SOCKET TERMINATION BY WIRELOCK RESIN

PART 3; EXAM...

The test paper will consist of twenty questions with multiple choice answers

**SPELTER SOCKET TRAINING COURSE
TEST PAPER**

YR Name:				
Non.	Questions	Your Answer:		
1	Travelling can reduce: A: Overtime? B: The amount of work we do? C: Accidents?	A: <input type="checkbox"/>	B: <input type="checkbox"/>	C: <input type="checkbox"/>
2	To carry out a spelter socket rope termination what are the 3 main units used? A: Socket, Glas, Steel wire rope B: Socket, Wirelock, Steel wire rope C: Socket, Wirelock, Steel bars	A: <input type="checkbox"/>	B: <input type="checkbox"/>	C: <input type="checkbox"/>
3	Against the Minimum Breathing Load of a STD EPF5 Grade steel wire rope filter correctly what is the termination efficiency of a spelter socket? A: 90 TO 95% B: 80 TO 90% C: 100%	A: <input type="checkbox"/>	B: <input type="checkbox"/>	C: <input type="checkbox"/>
4	Wirelock is a A: Super glue B: Sealing compound C: Type of special wire rope	A: <input type="checkbox"/>	B: <input type="checkbox"/>	C: <input type="checkbox"/>
5	Wirelock has a shelf life period of A: 12 Months B: 24 Months C: 18 Months	A: <input type="checkbox"/>	B: <input type="checkbox"/>	C: <input type="checkbox"/>
6	Wirelock what colour consistency is obtained: A: Greenish to turquoise B: Yellow straw colour C: Blue	A: <input type="checkbox"/>	B: <input type="checkbox"/>	C: <input type="checkbox"/>

**SPELTER SOCKET TRAINING COURSE
TEST PAPER**



Good Luck.....

SOCKET TERMINATION BY WIRELOCK RESIN



Geysendorfferweg 47 | 3088 GJ Rotterdam (Waalhaven)
| The Netherlands Tel.: +31 (0)10 204 22 55
info@deltasafetytraining.com | www.deltasafetytraining.com