"Haggie Hints"

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Haggie North America - Meeting your hoisting needs!

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Rope Attachments – pros/cons, assembly and maintenance

DISCUSSION:

This is the third in a series of technical bulletins that will discuss the various types of Rope Attachments. Issue 10A covered "Thimble & Clips" and "Thimble Type Rope Cappels" while 10B discussed Wedge Cappels" and "WRC Rope Clamps – (Glands)".

This bulletin, 10C, will discuss the pouring of sockets with resin. The illustrations and general guidelines refer specifically to the Bellambie (now renamed Becker) rope attachments but the principles can be applied to other approved attachments.

It is highly recommended that each mine have formal training c/w certification and a peer review system in place to ensure that only competent people are doing the appropriate tasks.

WRS and BRS Wire Rope Sockets:

1.0 – Description

Fig. # 1 shows the WRS (Winder or hoist Rope Sockets) and BRS (Balance Rope Sockets).

Sockets can be used to replace almost all other type of rope attachments and while they are very efficient when properly applied, they may not necessarily be the most effective. In the end, the choice should be made by the end user based on his experience.

White metal, zinc or resin can be used to pour the socket however, the latter is becoming much more common as it eliminates the need of high temperatures to melt the metal and does tend to offer a greater fatigue life of the wire rope at the socket exit point.

Since the procedure that must be followed is very specific and lengthy, this technical bulletin will only outline the basic steps. Detailed procedures are available from the socket manufactures or certified trainers so it is highly recommended that the individual responsible be trained and certified. The certification process covers all the steps in detail and an actual test to destruction is performed on the trainee's socket.

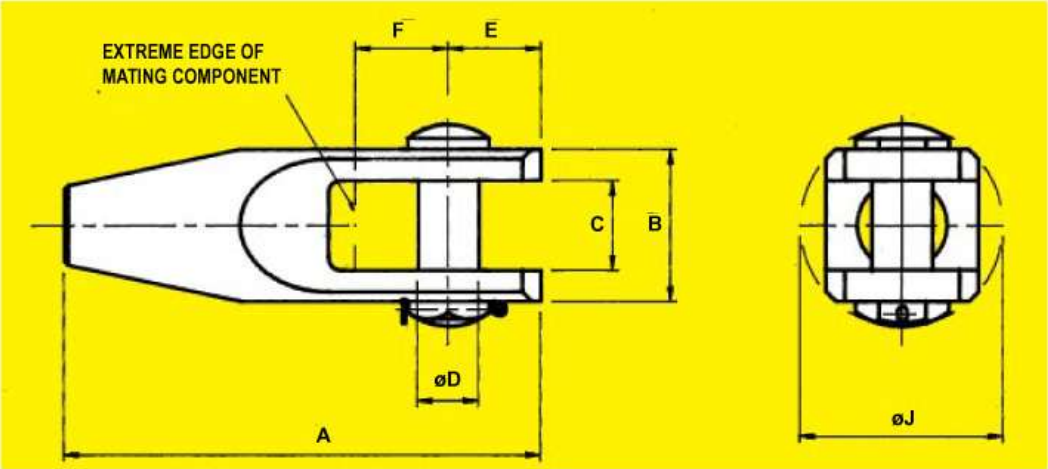
2.0 – Precautions and Notes

- It is essential that all personnel associated with the capping operation are aware of the potential hazards from improper procedures.
- Premature failure of the capping can be caused by the following:-
    - Incorrect choice and specification of the socket.
    - Incorrect preparation of the brush (broom) and socket.
    - Incorrect positioning of the brush and alignment of the socket.
    - Incorrect pouring procedure.

3.0 – Condensed version of a "Resin" Socketing Procedure

- For use in a mine shaft, only machined sockets with a long basket should be used. The most popular types are manufactured to NCB (National Coal Board) specs. Full efficiency depends upon the wedging action of the cone within the socket and therefore, a smooth finish within the socket basket is essential. Seating of the cone is required to develop the wedging action. Note; - the inside of the socket basket must be smooth without burrs or retaining rings etc.
- Before cutting a rope, it must be well seized. The amount of seizing varies with the rope construction. FLC (Full Locked Coil) requires the most attention. The rope manufacturer can describe the correct seizing methods.
- For all "working" sockets (not the safety block on a FLC using Wedge cappels), at least two rope diameters of seized rope must extend into the rope socket (Fig. # 2). In the case of the plastic enhanced balance rope, 1-1/2 rope diameter of seized rope should extend into the socket. The purpose of having the rope body extend into the socket is to insure good fatigue resistance. The point at which the broom begins has poor fatigue resistance and therefore should be well into the socket body. For the safety block on the FLC, only $\frac{1}{4}$" of seized rope is required to be extending into the block.

Wire Rope Sockets



BALANCE ROPE SOCKETS

TYPE	Safe Working Load (tons)	Dimensions (mm)								Approx. Mass (kg)
		Rope Dia.	A	B Sq.	C	Dia. D	E	F	Dia. J	
BRS-4	4	16	206	74	40	32	42	47	99	5
BRS-5	5,5	19	225	81	44	35	47	50	109	6
BRS-7	7	22	251	92	51	40	53	56	124	9
BRS-9,5	9,5	26	277	103	58	45	60	62	140	12
BRS-12	12	29	308	116	65	51	66	68	158	17
BRS-14,5	14,5	32	343	129	72	57	75	75	177	23
BRS-18	18	35	387	143	81	64	83	92	196	32
BRS-18	18	36	387	143	81	64	83	92	196	32
BRS-23,5	23,5	41	436	160	90	72	92	100	220	45
BRS-29,5	29,5	46	478	176	99	80	102	108	243	61
BRS-36	36	51	528	195	108	89	114	118	270	84
BRS-40	40	54	563	209	116	96	123	125	290	103
BRS-45	45	57	589	220	120	101	130	130	305	120
BRS-49	49,5	60	623	234	128	108	138	137	325	144
BRS-49	49,5	63	623	234	128	108	138	137	325	144

WINDING ROPE SOCKETS

TYPE	Safe Working Load (tons)	Dimensions (mm)								Approx. Mass (kg)
		Rope Dia.	A	B Sq.	C	Dia. D	E	F	Dia. J	
WRS-3	3,5	16	240	70	42	27	42	52	98	5
WRS-5	5	19	274	96	57	38	48	58	128	10
WRS-6	6,5	22	310	96	57	38	58	58	128	11
WRS-9	9	26	371	122	72	48	68	71	162	22
WRS-11	11	29	389	122	72	48	74	71	162	23
WRS-13	13,5	32	432	146	88	59	82	83	197	36
WRS-14	14,5	33	448	146	88	59	85	83	197	38
WRS-16	16,5	35	474	146	88	59	89	93	197	39
WRS-18	18,5	36	513	176	103	70	92	108	229	62
WRS-19	19	38	530	176	103	70	96	108	229	64
WRS-21	21,5	40	546	176	103	70	100	108	229	65
WRS-22	22,5	41	566	176	103	70	108	108	229	67
WRS-24	24,5	43	592	200	117	80	108	120	267	94
WRS-27	27	44	608	200	117	80	112	120	267	97
WRS-28	28	46	624	200	117	80	115	120	267	99
WRS-31	31	48	641	200	117	80	119	120	267	101
WRS-32	32	49	671	226	132	90	124	133	292	133
WRS-35	34,5	51	684	226	132	90	127	133	292	135
WRS-37	37,5	52	701	226	132	90	132	133	292	138
WRS-39	39	54	718	226	132	90	135	133	292	141
WRS-42	42	55	746	252	147	102	138	146	324	185
WRS-43	43,5	57	764	252	147	102	143	146	324	188
WRS-46	46	59	779	252	147	102	146	146	324	191
WRS-47	47,5	60	797	252	147	102	151	146	324	195
WRS-51	50,5	62	819	264	154	106	154	152	343	222
WRS-54	54	63	834	264	154	106	157	152	343	223

• Design incorporates a minimum safety factor of 10:1 on safe working mass load.

1 ton = 1000kg

Fig. # 1

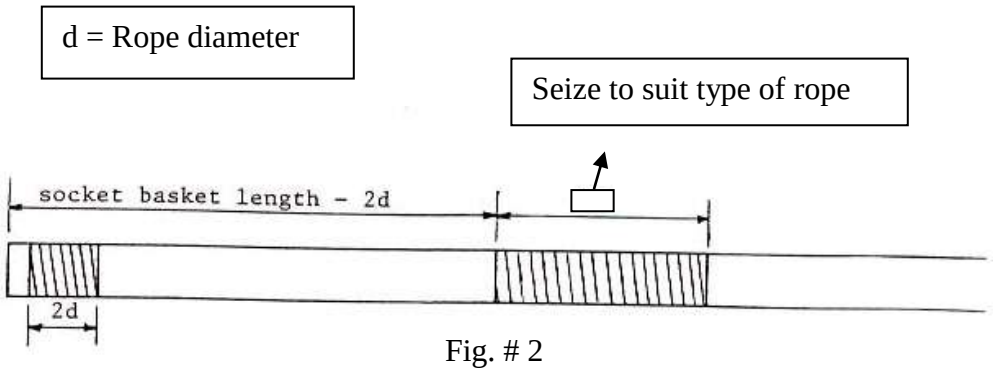


Fig. # 2

- The rope socket is slid onto the rope **before** brooming begins (Fig.# 3).
- Some extra seizing or a two part clamp is placed over the existing seizing to provide extra holding force as the "broom" is made (Fig. # 3 & 4).
- The rope is placed in a vise and the brooming commences (the jacket and all internal plastic of a plastic enhance tail rope must be removed). The outer wires of a FLC or the outer strands/wires of a tail rope are separated first. These wires should not be bent more than 45° to the rope axis.

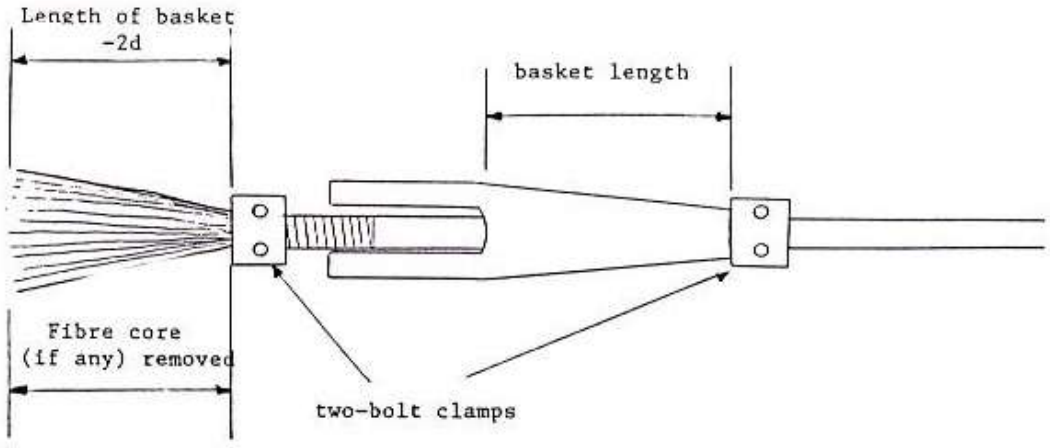


Figure 3: Positioning of two-bolt clamps.

Fig. # 4

- Once the rope has been opened up or broomed, all the wires must be thoroughly cleaned. The broom must be kept in a downward position so that the solvent will not penetrate into the rope. A white cloth is used to verify the cleanliness. There must be no grease whatsoever – **cleaning is most important**.
- Without contaminating the broom, the wires are pushed back into position close to the position they will take once they are in the socket. Special care should be taken to insure that the center of the broom has an equal distribution of wire (avoid a heavy concentration of wire against the socket basket and a void in the middle). Fig 5.
- The inside of the socket basket is coated with Dow Corning "Silicone No. 7 release agent" and then the socket is forced over the broom. A socketing table is very helpful for this maneuver (Fig. # 6). The

table should also ensure that the socket is properly aligned with the rope (a centering clamp will assist) and that sufficient rope i.e. at least 36 x rope diameter in length is held straight and vertical below the socket so that the wires will be equally loaded. The wires should be protruding above the socket basket by a few millimeters.

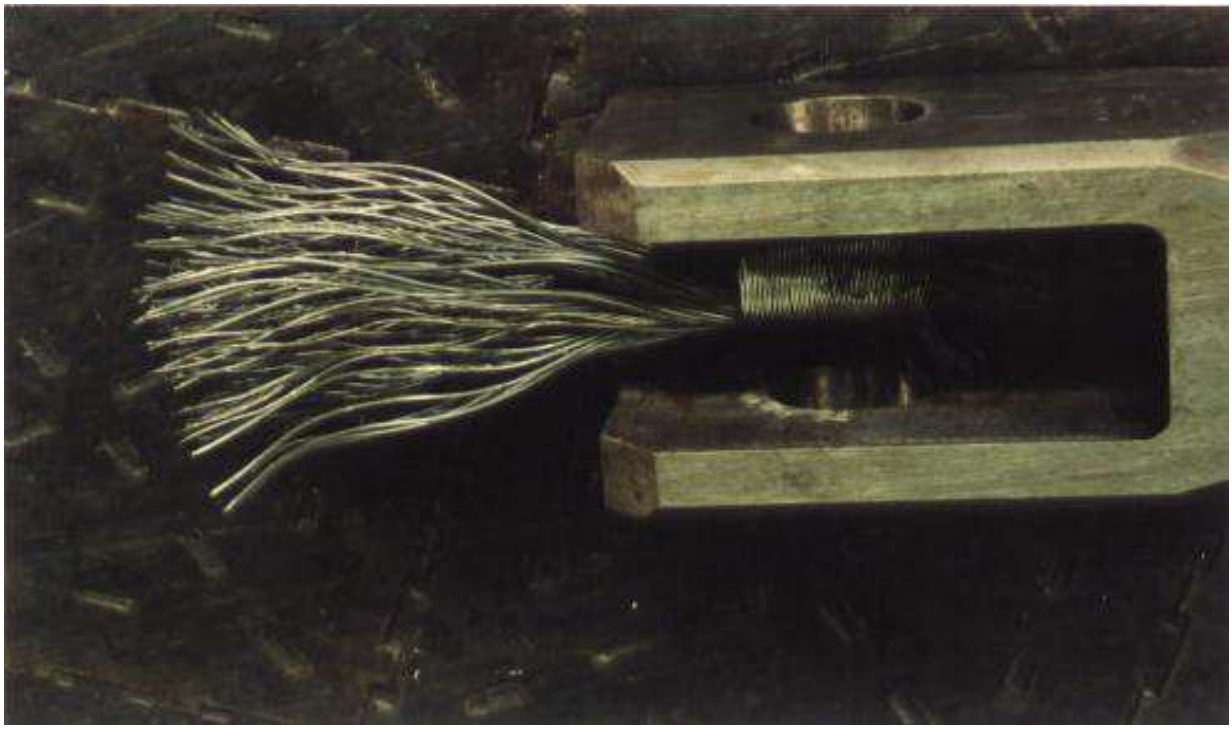


Fig. # 5

Fig. # 6 - These photos show the concept of holding the socket in line with the rope using a socketing table.

Once all is secured and the socket / centering clamp has been sealed with plasticine or an appropriate sealant, the socket is ready to receive the pouring material.

- When using "Wirelock" resin, the following must be verified:-
  - Check expiry date
  - Sufficient resin must be mixed at one time to fill the socket
  - The temperature is best at 18° C. Below 8°, special action must be taken.
  - Follow the instruction on the containers carefully and a complete procedure is available from Wirelock.
- Pour the resin slowly and steadily slightly off-center of the broom. Poke a straight wire into the resin to help free entrapped air.
- The resin must be allowed to cure without disturbance.
- After 1 hour or so, a sharp object is used to carry out a "scratch" test. If the temperature is below 18°C, more time will be needed for the resin to cure before the scratch test. A successful scratch test is when a shallow, light coloured mark results. After the scratch test, a minimum of one hour should elapse before the service load is applied to the rope.

- A final inspection should be made of the socket, checking:-
    - The socket and rope axis are aligned
    - Resin has penetrated down the socket basket to the rope
    - The socket basket is smooth and filled with resin
    - The wires are protruding by a few millimeters

For more information, videos and detailed procedures are available from qualified instructors.

Guide for Risk Assessment of resin sockets
Operating Errors and other human factors.

No.	Problem	Consequences	Safeguards	Recommendations
1	Using incorrect socket for rope size.	Termination may fail. Could cause accelerated fatigue at rope exit.	Ensure compatibility.	Operator training
2	Using conical inserts to change rope size.	Terminations may fail.	Ensure compatibility.	Ban the use of inserts completely.
3	Rope is not cleaned properly.	Rope may slip in cone	Follow instructions completely.	Operator training.
4	Using non N.C.B. recommended resin.	Termination may fail. Termination life may be affected.	Ensure N.C.B. acceptance number is on container.	Only stock N.C.B. Wirelock kits.
5	Using incorrect size of kit (under filling).	Termination strength will be reduced.	Check cone is full.	Operator training.
6	Socketing in very high temperatures.	Resin will gel quickly.	Store kits in refrigerator.	Discard kit if gelling has started before end of pour.
7	Long term skin exposure or spillage of resin.	May cause damage to eyes, skin, respiratory system etc.	Follow instructions from Wirelock	Wear personal protective equipment as recommended.