ROYAL CANADIAN SEA CADETS

PHASE THREE

INSTRUCTIONAL GUIDE

SECTION 2

EO M321.02 – RIG SHEERS

Total Time: 150 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-603/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy and cut out the parts cards located at Annex A.

Photocopy the blank sheers diagram located at Annex B, the sequence for Station 3 located at Annex C and the sheers scoresheet located at Annex D.

Ensure that the cadets have their issued cadet boots with them.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1, 2 and 5 to present and illustrate the function, basic materials needed and the application of commands for rigging sheers.

Demonstration and performance was chosen for TPs 3, 4, 6 and 8 as it provides the instructor the opportunity to introduce sheers, demonstrate procedures and observe the cadets' rigging and de-rigging skills.

A practical activity was chosen for TP 7 as it is an interactive way to introduce the cadets to operating sheers in a safe and controlled environment. This activity contributes to the development of seamanship skills and teamwork in a fun and challenging setting.

INTRODUCTION

REVIEW

Review safe practices, personal safety equipment and sheers danger zones from EO M321.01 (Describe Safety Procedures for Operating Lifting Devices, Section 1).

OBJECTIVES

By the end of this lesson the cadet shall, as a member of a group, rigged, operated and de-rigged sheers.

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IMPORTANCE

It is important for cadets to rig sheers as it introduces sea activities of the Canadian Navy while stimulating an interest in seamanship specialty training. Although sheers are no longer used regularly by the Canadian Navy, it is a great way to foster teamwork and practice seamanship skills.

Teaching point 1 **Explain the Function of Sheers**

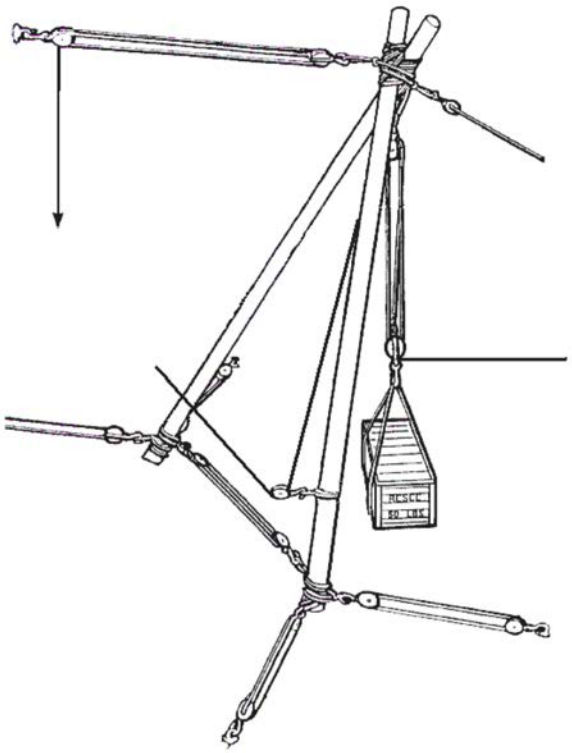
Time: 5 min Method: Interactive Lecture

SHEERS

Due to improvements in technology, improvised lifting devices are not as widely used today as in the past. However, when no suitable crane or hydraulic device is available on board or ashore for lifting a heavy object or equipment, some form of lifting device must be rigged. This may include sheers, a standing or swinging derrick or a gyn.

Sheers consist of a pair of spars called legs, which are lashed together and crossed near their heads. The heels of the spars are splayed apart a distance that is approximately one third the length of the spars used for the sheers. This splayed distance is maintained by the use of a splay tackle. The heel tackles provide firm tension on the heels and are placed in such a way to provide both lateral and fore-and-aft support. As sheers need no lateral support, side guys are not required.

Since sheers use two spars, they are stronger than a derrick of similar size. Sheers can be raised or lowered to a limited angle using a topping lift. Sheers are particularly suited for lifting loads vertically from the edge of a jetty onto the deck of a ship.



Royal Navy, Admiralty Manual of Seamanship 1967 (Vol. 2), Her Majesty's Stationery Office (p. 197)

Figure 1 Assembled Sheers

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CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. How many spars are required to rig sheers?

Q2. What is the purpose of the splay tackle?

Q3. When are sheers used?

ANTICIPATED ANSWERS

A1. Two.

A2. To maintain the distance that the spars are splayed.

A3. For lifting loads vertically from the edge of a jetty onto the deck of a ship.

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Teaching point 2 **Describe the Parts of the Sheers**

Time: 10 min Method: Interactive Lecture

PARTS OF THE SHEERS

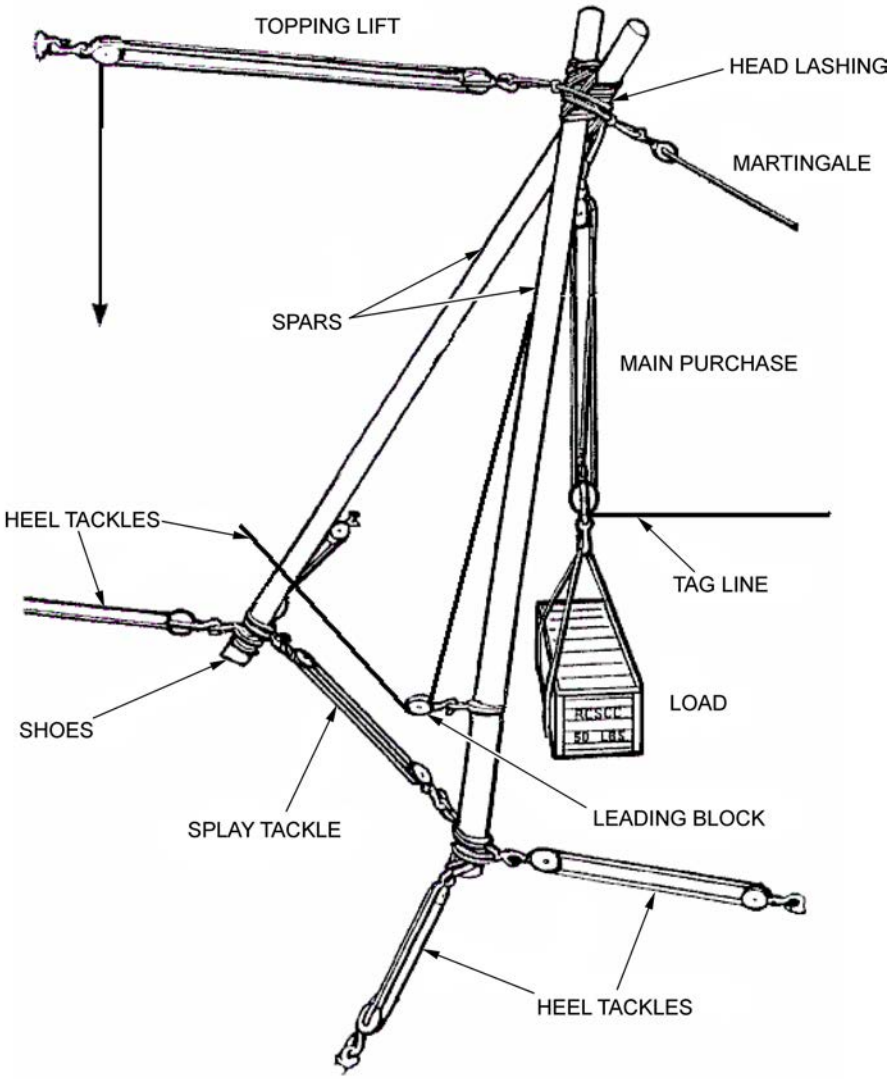

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Figure 2 Assembled Sheers

Spars. Two spars are used as the legs of the sheers. The spars are crossed and lashed together with a head lashing.

Head Lashing. The head lashing forms the head of the sheers. The spars are lashed together using 14 or more turns around both spars followed by four or more frapping turns through the upper and lower crutch that forms when the spars are splayed apart (as illustrated in Figure 3).

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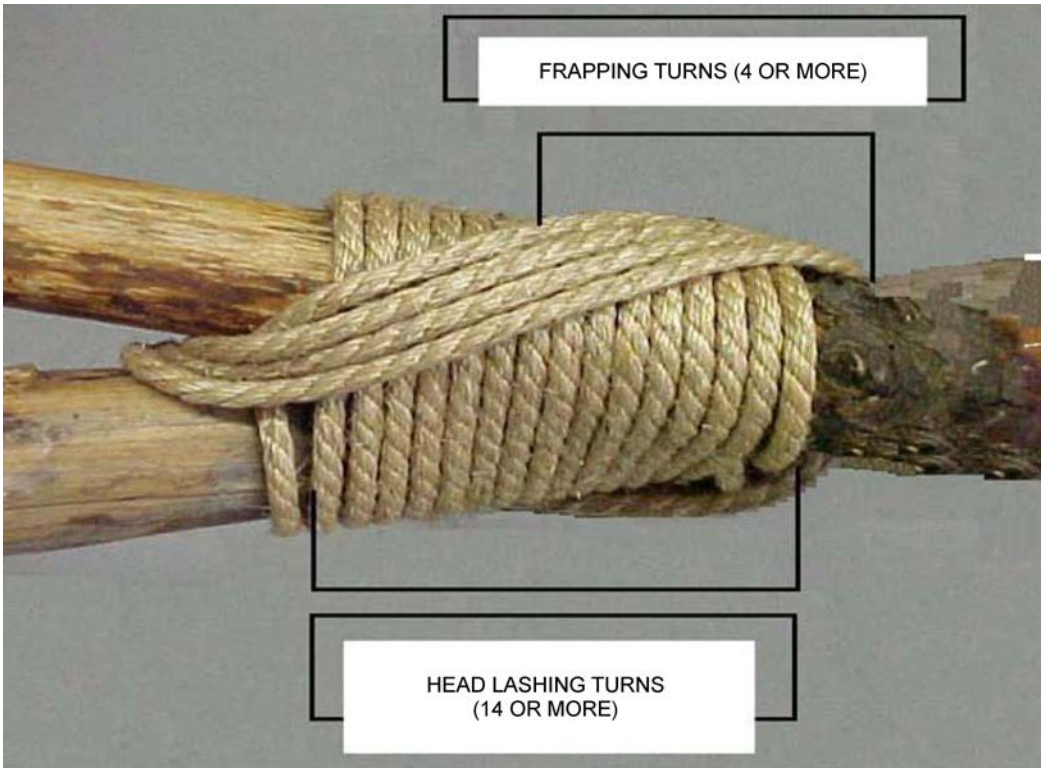

Navy League of Canada, NLP 101 Flotilla and Provincial Seamanship Competition Manual, Navy League of Canada (p. 14)

Figure 3 Sheers Head Lashing

Topping Lift. The topping lift, consisting of a two-fold purchase, is used to raise or lower the sheers. If no suitable overhead attachment point exists, the topping lift can be anchored to the deck or ground a minimum distance of one and a half spar lengths from the heel anchor points.

The sheers should not be raised to an angle greater than 75 degrees from the ground or deck.

If the topping lift is anchored to the ground, the sheers should not be lowered to an angle less than 25 degrees from the ground.

Main Purchase. The main purchase, consisting of a two-fold purchase, is attached to the head of the sheers and is used to raise or lower the load.

Strops. Strops are a continuous loop in a line or wire rope. They are used to pass around a cask, spar, piece of line, etc to provide an eye to be placed over a hook or shackle (as illustrated in Figure 4).

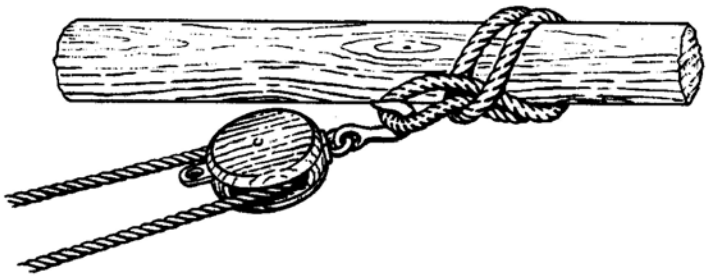

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Figure 4 Strop on a Spar

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Leading Block (for the Fall of the Main Purchase). The leading block is secured to one of the spars and the hauling part, or fall of the main purchase, is led through it. This block is used to change the direction of pull on the fall of the main purchase.



The fall of the main purchase refers to its hauling part which exits the standing block attached to the head of the sheers. The fall must be heaved in a downward motion, directly under the spars which would put a cadet within a danger zone. The leading block allows the line to be safely heaved in from the side of the sheers.

Splay Tackle. The splay tackle, consisting of a luff, prevents the spars from splaying – moving further apart – when they are under load.

Heel Tackles. The heel tackles, consisting of luffs, provide firm tension on the heels of the spars and also provide both lateral and fore-and-aft support.

Tag Line. A line, attached to the running block of the main purchase, used to retrieve the main purchase without stepping into the forward danger zone.

Martingale (if Fitted). If a suitable attachment point exists at the front of the sheers, a martingale may be led down from the head. This will prevent the sheers from springing up or back when hoisting and lowering a load.

Shoes (if Fitted). Shoes are usually square slabs of hardwood with a recess in their upper surface to take the heel of a spar. The length of each side should not be less that four times the diameter of the spar. They are used to distribute the weight of the load and the thrust of the spars over an area of the deck. When ashore, they are used to distribute the weight to prevent the spars from sinking into the ground.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is the purpose of the topping lift?

Q2. How many turns are required for the sheers head lashing?

Q3. Why is a leading block used for the fall of the main purchase?

ANTICIPATED ANSWERS

A1. To raise or lower the sheers.

A2. 14 or more.

A3. To redirect the hauling part so it may be heaved in from the side of the sheers.

Teaching point 3 **Demonstrate and Have the Cadets Tie a Timber Hitch**

Time: 20 min Method: Demonstration and Performance

TIMBER HITCH

Use of a Timber Hitch

The timber hitch is used to tow, hoist or lower a spar. The more tension placed on the hitch, the more it will hold the spar. When the tension is released, the hitch will loosen.

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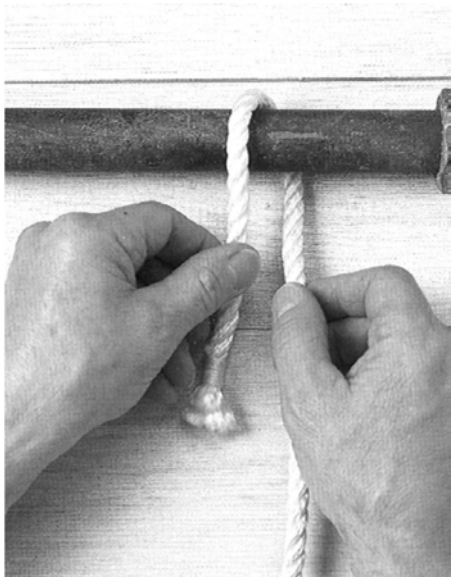
To add directional stability or when tying the hitch to a tapered spar, an extra half hitch should be added beside the timber hitch on the side facing the direction of pull.

How to Tie a Timber Hitch



Demonstrate and have the cadets practice each step of making the timber hitch.

1. Pass the working end of a line around the spar and bring it to the front.



G. Budworth, The Ultimate Encyclopedia of Knots & Ropework, Anness Publishing Limited (p. 98)

Figure 5 Timber Hitch Step 1

2. Take the end around the standing part and make a small loop.

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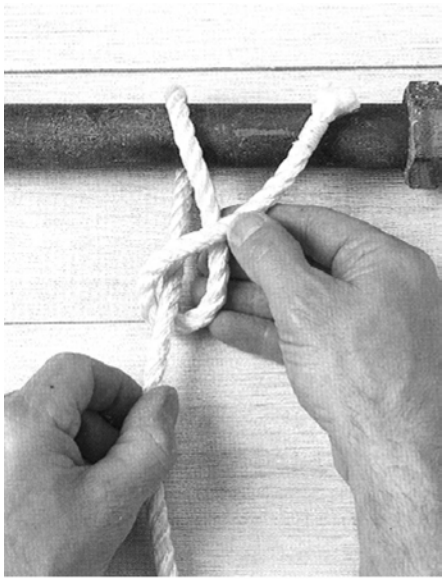

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Figure 6 Timber Hitch Step 2

3. Tuck the working end between the standing end and itself.

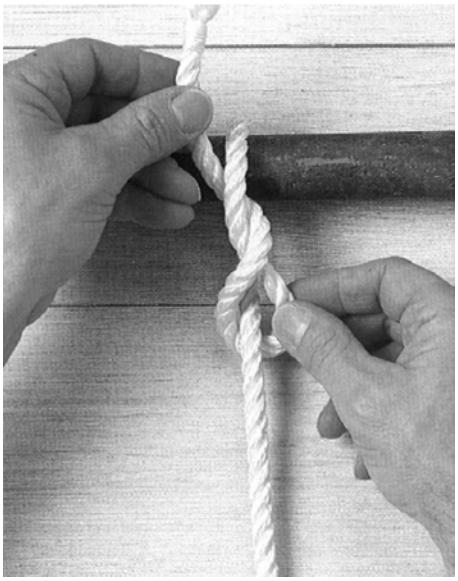

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Figure 7 Timber Hitch Step 3

4. Bring the end around and repeat Step 3 until the required number of tucks are completed (minimum of three).

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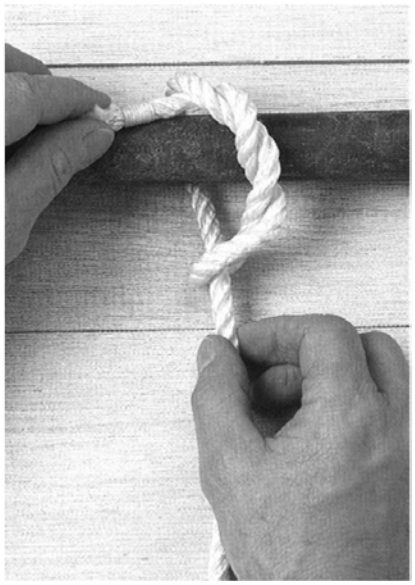

G. Budworth, The Ultimate Encyclopedia of Knots & Ropework, Anness Publishing Limited (p. 98)

Figure 8 Timber Hitch Step 4

Tucking in this fashion, to make a sliding noose, is known as “dogging”.

5. Pull on the standing end to tighten the hitch around the spar.

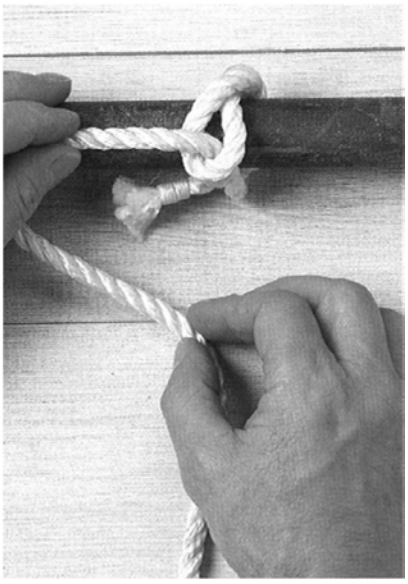

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Figure 9 Completed Timber Hitch

CONFIRMATION OF TEACHING POINT 3

The cadets tying a timber hitch will serve as the confirmation of this TP.

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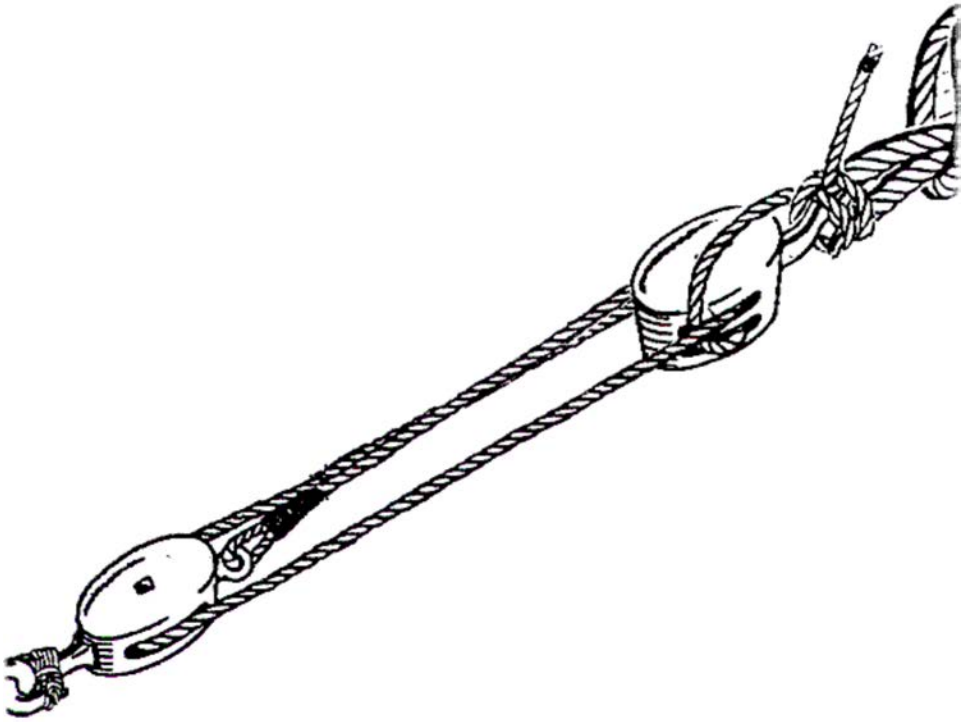
Teaching point 4 **Demonstrate and Have the Cadets Choke a Luff**

Time: 20 min Method: Demonstration and Performance

CHOKING A LUFF

Demonstrate and have the cadets practice choking a luff.

To temporarily secure a luff under tension when there is no cleat available, the hauling part is passed underneath its adjacent running part where it fouls, or chokes, the block. Two half hitches may be added above the block to ensure that the choke does not slip.



Navy League of Canada, NLP 101 Flotilla and Provincial Seamanship Competition Manual, Navy League of Canada (p. 13)

Figure 10 Choking a Luff

This method should be used with luffs under light loads only, as damage to the rope may occur if the load is too heavy.

CONFIRMATION OF TEACHING POINT 4

The cadets choking a luff will serve as the confirmation of this TP.

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Teaching point 5 **Describe the Actions Taken in Response to Commands**

Time: 15 min Method: Interactive Lecture

COMMANDS

Heave in. Give a strong pull together on a line.

Check Away. Ease out a line under control.

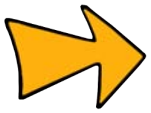
Avast. Stop.

Choke. Choke the standing block with the hauling part and secure it with two half hitches above the crown.

Secure. Make fast a line.

Handsomely. Slowly, carefully.

Roundly. Rapidly.



These are the most commonly used commands for working with sheers; however, the list is not exhaustive. Other commands may be used based on unit preferences.

CONFIRMATION OF TEACHING POINT 5

QUESTIONS

Q1. What does the order HEAVE IN mean?

Q2. What order is given to make fast a line?

Q3. What does the order AVAST mean?

ANTICIPATED ANSWERS

A1. Give a strong pull together on a line.

A2. SECURE.

A3. Stop.

Teaching point 6 **Demonstrate and Have the Cadets, as Members of a Group, Rig Sheers**

Time: 20 min Method: Demonstration and Performance

RIGGING SHEERS



Demonstrate and have the cadets practice the steps for rigging sheers.

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1. Lay the spars for the legs side by side, with their heels together and their heads supported clear of the ground or deck.

2. Start the head lashing with a timber hitch on one of the spars followed by 14 or more turns around both spars. Spread the spars apart to allow four or more frapping turns to pass around the spars and through the crutch formed above and below the spars (as illustrated in Figure 3). Finish the head lashing with a clove hitch on the spar opposite to the timber hitch. Once the head lashing is complete, splay the heels of the spars apart to a distance of one third the length of the spars used for the sheers.

3. Place the main purchase strop around the head lashing, following the path of the frapping turns (as illustrated in Figure 11). Ensure the bight of the strop is pointed down between the spars.

4. Place the topping lift strop around the head lashing and main purchase strop (as illustrated in Figure 11). Ensure the bight of the strop is pointed up from the head.



Navy League of Canada, NLP 101 Flotilla and Provincial Seamanship Competition Manual, Navy League of Canada (p. 14)

Figure 11 Topping Lift and Main Purchase Strops

5. Rig the main purchase using a two-fold purchase (as illustrated in Figure 12). Attach the standing block to the main purchase strop (as illustrated in Figure 11) ensuring that the main purchase is rigged to disadvantage with the hauling part exiting the standing block. Attach the tag line to the running block and lay it out so an end will be outside the danger zone when the sheers are raised.

6. Rig the topping lift using a two-fold purchase (as illustrated in Figure 12). Attach the standing block to the topping lift anchor point and the running block to the topping lift strop. Ensure the topping lift is rigged to disadvantage with the hauling part exiting the standing block. Tie a figure eight knot in the end of the hauling part.

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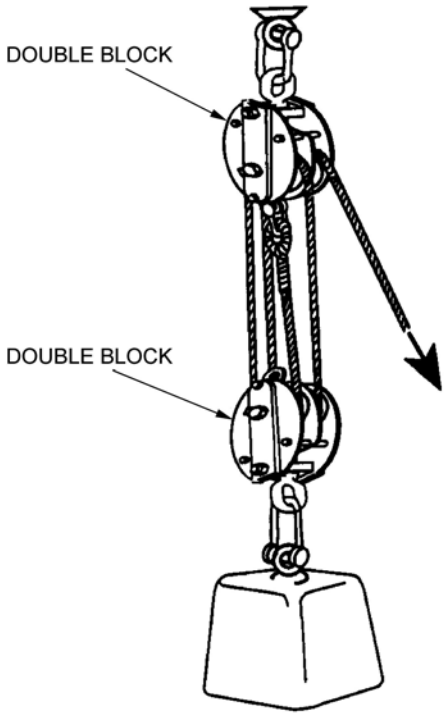

BON-050-002/PT-004, BR 67 Admiralty Manual of Seamanship (p. 3-155)

Figure 12 Two-Fold Purchase

7. Attach strops to the feet of the spars (as illustrated in Figure 14) for the leading block, splay and heel tackles. Attach the splay tackle strops between the strops for the heel tackles. Attach the leading block strop above or between the heel tackle strops. Ensure the strops are placed together, as low as possible but no lower than one hands-width above the heels.



Placing the leading block strop between the heel tackle strops will stop it from sliding up the spar when the fall is heaved in.

8. Hook the leading block on to the strop. Reeve the fall of the main purchase through the leading block and tie a figure eight knot in the end. Coil the excess line and place it on the deck outside the danger zone, on the opposite side of the sheers from the side where the leading block is attached.

9. Rig the splay tackle using a luff (as illustrated in Figure 13) and attach to the strops between the spars and under the topping lift. Tie a figure eight knot in the end of the hauling part. Heave in the splay tackle to splay the heels of the spars apart to a distance approximately one third the length of the spars used for the sheers. Choke and secure the splay tackle. Coil any excess line and place it on the deck.

10. Rig the heel tackles using luffs (as illustrated in Figure 13) and attach to the strops and anchor points. Ensure that all heel tackles are rigged to advantage with the hauling parts exiting the running blocks attached to the spars (as illustrated in Figure14). Tie a figure eight knot in the end of the hauling part.

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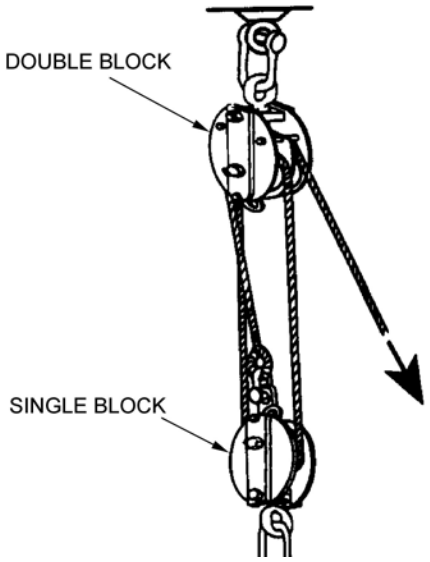

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Figure 13 Luff

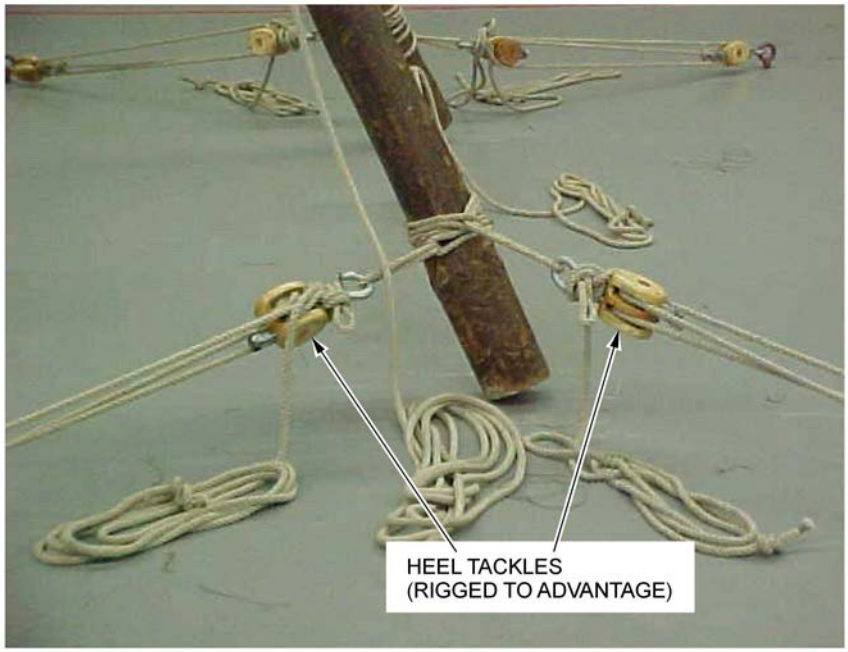

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Figure 14 Heel Tackles Rigged to Advantage

11. Mouse all hooks (as illustrated in Figure 15).

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B-GN-181-105/FP-E00, CFCD 105 Seamanship Rigging and Procedures Manual (p. 5-46)

Figure 15 Mousing a Hook



Mousing is not required for blocks equipped with a safety catch on the hook. If the safety catch has been removed or the spring is missing from the catch, the block must be replaced.

12. Heave in all heel tackles until they are evenly taut. Choke and secure them with two half hitches. Coil any excess line and place neatly on the deck. If the sheers are not positioned correctly, they can be adjusted by heaving in or checking away the individual heel tackles.



To adjust the position of the sheers, stand at the head facing the heels and use the following sequence:

(1) Adjust the side-to-side position of the sheers by heaving in evenly on both heel tackles on the side the sheers are to move toward while checking away handsomely on the opposite heel tackles. When the sheers reach the correct position, avast checking away.

(2) Adjust the fore-and-aft position of the sheers by heaving in evenly on both forward heel tackles (tackles closest to the head) while checking away handsomely on the after heel tackles. When the sheers reach the correct position, avast checking away.

(3) Adjust the head of the sheers so that it is centred between the heels by heaving in on the after heel tackle on the side the head is to move towards while checking away handsomely on the opposite side's forward heel tackle. When the head is in the correct position, avast checking away.

(4) Choke all heel tackles and secure them with two half hitches above the blocks.

13. Heave in on the topping lift handsomely until the sheers have been raised to an angle between 25 and 75 degrees from the floor. Choke and secure the topping lift.



If the topping lift is anchored to the deck, the head of the sheers must be picked up and held at chest height until the topping lift becomes taut. The person at the head of the sheers shall then step out of the danger zone.

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14. Heave in on the tag line to pull the running block out of the danger zone, checking away on the fall of the main purchase if required. Secure the fall of the main purchase to the spar opposite the leading block with a round turn and two half hitches.

15. The sheers are now complete and ready for operation (as illustrated in Figure 2).

CONFIRMATION OF TEACHING POINT 6

The cadets' participation in rigging sheers will serve as the confirmation of this TP.

Teaching point 7 — **Have the Cadets, as Members of a Group, Operate the Sheers**

Time: 40 min — Method: Practical Activity



Demonstrate how to operate the sheers prior to starting the activity.

ACTIVITY

OBJECTIVE

The objective of this activity is to have the cadets, as members of a group, operate the sheers.

RESOURCES



The list of required equipment for the sheers is located at A-CR-CCP-603/PG-001, Chapter 2, Annex C, Appendix 1.

When choosing the equipment for rigging the sheers, ensure that each item is compatible with the others (e.g., the blocks are suitable for the size of the line).

- Assembled sheers,
- Load of 22 kg (50 lbs) or less,
- Whipping twine,
- Pylons,
- Hooks,
- Hard hats,
- Parts cards located at Annex A,
- Picture/model of sheers (blank picture located at Annex B),
- Sequence for Station 3 located at Annex C,
- Scoresheet located at Annex D,
- Whistle, and

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Verify against the official publication.

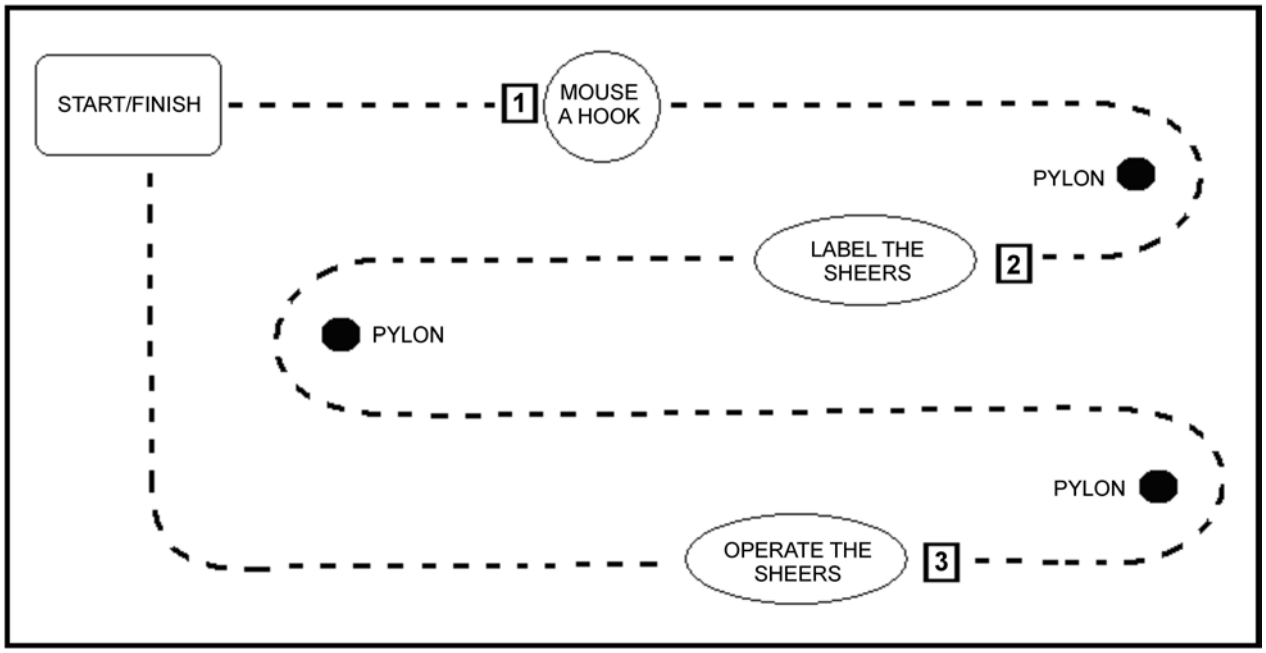
- Stopwatch.

ACTIVITY LAYOUT

- Mark off a start area.
- Set up the start area with various pieces of safety equipment.
- Set up Station 1 with whipping twine and hooks.
- Set up Station 2 with parts cards, tape and a picture/model of sheers.
- Set up Station 3 with the sheers, whipping twine and a load.



The sheers at Station 3 shall be fully rigged (as illustrated in Figure 1). If no overhead mounting point is available, anchor the topping lift at least one and one-half spar lengths back from the heel tackle anchors.



Director Cadets 3, 2008, Ottawa, ON: Department of National Defence

Figure 16 Sheers Run

ACTIVITY INSTRUCTIONS

1. Divide the cadets into groups of four.
2. Have the first group line up in the start area.
3. On the whistle signal, have the group put on their personal safety equipment and proceed to Station 1.



Ensure the time is started on the stopwatch at the whistle signal.

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Verify against the official publication.

4. At Station 1, have each cadet in the group mouse a hook. Check the mousings for strength. If any of the mousings come off easily, that cadet will do another mousing. Upon successfully completing the mousings, have the group proceed to Station 2.

5. At Station 2, have the group label the picture/model of the sheers and then proceed to Station 3.

6. At Station 3, stop and record the time. Have the group operate the sheers by responding to commands listed at Annex C, as given by the instructor. Award points IAW the scoresheet located at Annex D.

7. Upon completion of Station 3, have the group continue to the finish line and tally the score.

8. Have each group complete the sheers run in the above sequence.

9. Declare the group with the most points the winner.

SAFETY

- Ensure the personal safety equipment is worn at all times.
- Ensure the cadets stay outside the danger zones while the sheers are raised.
- Ensure all hooks are moused or fitted with working safety catches.

CONFIRMATION OF TEACHING POINT 7

The cadet's participation in the activity will serve as the confirmation of this TP.

Teaching point 8 **Demonstrate and Have the Cadets, as Members of a Group, De-Rig Sheers**

Time: 10 min Method: Demonstration and Performance

DE-RIGGING SHEERS



Demonstrate and have the cadets practice each step in de-rigging sheers.

1. Check away on the topping lift handsomely until the head of the sheers is resting on the deck. When the sheers near the deck, it is permissible to step into the danger zone to grab the head of the sheers and lower it by hand.

2. Release the choke on the heel tackles, being careful not to place hands in the running parts of the luffs.



Once the head is on the ground and the tension has been released from the heel tackles, the sheers are safe to de-rig.

3. Cut any mousings that have been applied and unhook the blocks from the strops.

4. Un-reeve the heel, splay, main purchase and topping lift tackles.

5. Remove the strops from the spars.

6. Untie the head lashing.

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7. Coil all lines and secure the equipment as required.

CONFIRMATION OF TEACHING POINT 8

The cadets' participation in de-rigging sheers will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' rigging, operating and de-rigging sheers will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-603/PG-001, Chapter 3, Annex B, Appendix 4 (321 PC).

CLOSING STATEMENT

Rigging sheers requires teamwork. Sheers are a device that has many practical uses within the Canadian Navy, although it is not used as frequently today as in years past due to improvements in technology. Rigging sheers acts as an introduction to sea activities of the Canadian Navy while stimulating an interest in seamanship specialty training.

INSTRUCTOR NOTES/REMARKS

This EO shall be conducted after EO M321.01 (Describe Safety Procedures for Operating Lifting Devices, Section 1).

This EO may be conducted as five consecutive periods on a weekend training day or over two training nights. Training night one will consist of TPs 1–4 for a total of two periods. Training night two will consist of TPs 5–8 for a total of three periods.

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