Critical Task Hazard Analysis Worksheet

Critical Task: Conducting CTD/Rosette Operations from Large Vessels

Notes:

- This Task Hazard Analysis (THA) is in response to the Canada Labour Code Part II, the Canada Occupational Health and Safety Regulations Part XIX Hazard Prevention Program, and the DFO Occupational Health and Safety Manual.
- It is to assist personnel in identifying foreseeable hazards when *Conducting CTD/Rosette Operations from Large Vessels.*
- The application of these control measures will assist in preventing occupational accidents.
- This THA is to be reviewed regularly to ensure that all potential hazards have been identified.

Region: Pacific	TASK HAZARD ANALYSIS
Branch/Division: Science	Conducting CTD/Rosette Operations from Large Vessels
Last revision: September 22, 2020	Developed from THA *CTD/Rosette Operations from Large Vessels* prepared by: R. Reinger/Bert Hartling, Maritimes Region, April 2003

Column A - BASIC STEPS	**Column B - HAZARDS** CONSIDER: Health and safety, damage to people, property, equipment or program/the 5 categories of hazards; biological, physical, ergonomic, chemical, and psycho-social.	**Column C – TASK INSTRUCTIONS** Define how each step is to be performed safely, ensuring all hazards are addressed.
1. Planning	a) Physical injury caused by equipment failure. b) Physical injury caused by extreme weather conditions. c) Ergonomic injury from repetitive strain d) Psycho-social injury due to harsh working conditions, long working hours, working night shift.	a) Follow *Canadian Centre for Occupational Health and Safety (CCOHS)* guidelines for Ergonomics, Physical and Psychosocial. b) Include in cruise plan with deck layout. c) Recognize differences for each vessel and plan accordingly. d) Ensure that winches, A-Frames and cranes are suitable for operations. e) Ensure that each member of the team is qualified to carry out each task required. f) . Follow safe work procedures from **THA/SWP Science Pacific** *Covid – Field work* If required g) Verify that the weather conditions are suitable.

		h) If weather conditions are extreme recommend that the operation be postponed. i) Conduct step-by-step safety briefing with all team members (Mate, Chief Officer, Bosun, Deck crew and Science crew) to look at risks and mitigation factors, roles &responsibilities, command structure and steps of operation. j) Review objectives of the operation (depths, types of sampling, etc.) with team. k) Check all equipment to be used for the CTD/Rosette operation is functioning properly, safely, and has the appropriate safe working load (SWL). Replace any faulty equipment. l) Check that all necessary safety equipment/Personal Protective Equipment (PPE) required is on hand in working area: safety footwear, hard hats, safety harnesses, Personal Floatation Device (PFD). m) Plan to monitor working conditions and communicate with Bridge officer regarding changing weather conditions and sea state throughout the operation. n) Confirm expected time at station with bridge. o) Confirm that deck lighting is suitable. p) Confirm communication is operational between lab, winch, deck and bridge. q) If all basic steps cannot be performed safely, do not perform the task and notify the chief scientists or watch leader. r) Ensure MSDS onboard and ship informed of any chemicals brought onboard. Team members have current WHMIS training. s) Have appropriate spill kits available and team members trained in their usage. t) Ensure team members communicate any safety concerns or personal health concerns to watch leader or chief scientist.
2. Prepare the CTD/Rosette	a) Physical injury due to slips and tripping on wet/oily deck. b) Physical injury caused during the connection of the lanyards. c) Electric shock due to voltage on damaged system or from touching open connectors when system powered on. d) Damage to CTD/Rosette during cast due to improperly prepared bottles.	a) Be aware of sea conditions and how they may affect working around the CTD/Rosette. b) Inspect decks and staging areas for oil and other potential hazards. c) Ensure all participating team members wear appropriate PPE (PFD, hard hat and steel toed footwear). d) Check that the bottles are open and ready and all sensors are prepared (caps off PAR, transmissometer cleaned, etc.). Ensure any maximum depth sensitive equipment is removed if applicable and dummy plugs installed. Ensure all auxiliary equipment is secured to CTD/Rosette. e) Ensure that all latches of firing mechanism are securely closed before connecting the bottle lanyards to prevent an accidental release.

		f) If a bottle is being deployed with endcaps closed, the bottle vent must be left open to prevent an implosion under pressure. g) Ensure operator confirms no one is handling open connectors before powering system on. h)
3. Deploy the CTD/Rosette	a) Physical injury caused by handling heavy items on a moving ship. b) Physical injury or death due to falling overboard. c) Damage to equipment.	a) Ensure all participating team members wear appropriate PPE (PFD, hard hat and steel toed footwear). b) Follow Standard Operating Procedures for CTD/Rosette Operations found at the Water Properties Website, https://www.waterproperties.ca/standards/CTD_911_launchingprocedures.pdf. c) Assess the sea conditions and weather to determine whether the deployment should proceed. **d)** Follow safe work procedures from **THA-SWP Science Pacific *Working at the Ship's Side.*** **e)** Follow safe work procedures from **THA-SWP Science Pacific *Lifting, transporting and Handling Heavy Objects*.** f) Do not proceed with deployment until permission has been received from the bridge. g) Confirm that there is only one instrument in the water at a time. h) If applicable, open the doors, drop the chains, or lower the screen prior to extending the A-Frame/boom /crane. The CTD/Rosette is then lifted off the deck, moved overboard and lowered under the surface of water (actual depth depends on the sea conditions). i) Only remove safety chains when CTD/Rosette is ready to be deployed. Ensure all safety chains are removed for the deployment and are replaced once the CTD/Rosette has been deployed. Ensure safety chains remain attached for the duration of the cast. j) Ensure that participants wear a safety harness and use it properly when working at the side of the ship when there is no railing.
4. Systems Check	a) Potential loss of the instrument due to snap load on the cable if the instrument comes out of the water during the roll of the ship.	a) Ensure the instrument is submerged below the water so that it does not come out and always maintain a watch. b) Ensure the systems are turned on and everything verified to be functioning properly. c) Follow the standard procedures for flushing and equilibrating the electronics prior to logging the cast. d) Review emergency recovery procedures.
5. Lower the CTD/Rosette to Depth	a) Physical injury caused by slack wire or wire breakage.	a) Ensure all participating team members wear appropriate PPE PFD, hard hat and steel toed footwear).

	b) Damage or loss of equipment caused by wire breakage. c) Physical harm due to working too long in uncomfortable conditions (i.e. too hot, or cold) d) Damage to equipment due to CTD/Rosette hitting ocean floor. e) Damage to ship from wire running against the ship's hull.	b) Lower the CTD/Rosette at the proper rate of descent to the desired depth. The wire is monitored as it is being paid out. c) Always stay clear of the wire and, unless the winch has a safety shield, never stand behind the wire, (this is especially true in high load situations). d) If a damaged spot is located on the wire, stop the operation and report to the watch leader and bridge. e) Communicate with the bridge regarding line positioning so they can adjust ship position as necessary to maintain a straight-up-and-down wire angle. f) During a long cast, change personnel as needed to prevent excessive discomfort due to environmental conditions and to prevent loss of attention. g) Have communication between CTD/Rosette operator and winch operator as to expected bottom depth at the start of the cast and warning as CTD/Rosette nears bottom. h) When wire may be in contact with ship's hull due to wire angle or A-frame use, stop the wire to prevent 'sawing' into hull and report to the watch leader and bridge.
6. Return CTD/Rosette to Surface	a) Physical injury caused by slack wire or wire breakage. b) Damage or loss of equipment caused by wire breakage. c) Damage to wire due to improper wrapping of wire on drum.	a) Ensure all participating team members wear appropriate PPE PFD, hard hat and steel toed footwear). Pull up the CTD/Rosette to the surface and if necessary, stopping at desired depths for additional sampling. b) Always stay clear of the wire and never stand behind the wire, (this is especially true in high load situations). c) Communicate with the bridge regarding line positioning so they can adjust ship position as necessary to maintain a straight-up-and-down wire angle. d) If a damaged spot is located on the wire or gaps or other uneven wrapping of wire is observed, stop the operation and report to the team leader and bridge. e) Reduce the winch speed as the CTD/Rosette approaches the surface to keep instrument submerged. f) Inform the bridge if any problems arise like the wire leading under the ship. a) Ensure that the CTD/Rosette is left at a safe distance below the surface and is watched prior to recovery to the ship b) Request permission from the bridge for CTD/Rosette recovery g) Give winch operator permission to recover
7. Ice Operations	a) Damage to wire and/or loss of CTD/Rosette due to being caught in the ice.	a) Communicate with bridge to have ship's bubbler, propeller, or position used to reduce contact between wire and ice. Use the A-frame to bring the wire to the side of the ship to protect from being caught in ice. Stop wire to prevent 'sawing' into a large piece of ice. Alternatively, start wire if the tension needs to be reduced if ice is pulling wire away from ship.
8. Return CTD/Rosette Aboard	a) Physical injury due to swinging load.	a) **Stand clear of swinging load**.

	b) Physical injury caused by wire breakage. c) Physical injury caused by handling heavy items on a moving ship. d) Physical injury or death due to falling overboard. e) Damage or loss of equipment caused by wire breakage.	b) Ensure all participating team members wear appropriate PPE PFD, hard hat and steel toed footwear). **c)** Follow safe work procedures from **THA-SWP Science Pacific *Working at the Ship's Side.*** **d)** Follow safe work procedures from **THA-SWP Science Pacific *Lifting, transporting and Handling Heavy Objects*.** e) Lower any chains, doors, or screenings prior to recovery. f) Tag lines shall be used to control the CTD/Rosette if the conditions warrant. g) Ensure that participants wear a safety harness and use it properly when working at the side of the ship when there is no railing. h) Assist in stabilizing CTD/Rosette on deck when safe to do so. i) Once CTD/Rosette is landed, raise any chains, doors, or screens. Secure CTD/Rosette with tag lines or other restraining devices. j) Power off CTD/Rosette.
9. Sampling	a) Physical injury due to slips and tripping on deck. b) Physical injury from partially unreleased bottles. c) Physical injury due to chemical spill. d) Physical injury due to broken glassware.	a) Have travel areas well lit and identify potential hazards. b) All team members must wear steel-toed boots and PDFs while taking samples. c) Check to see if there are any jammed bottle lids. If there are jammed lids then seek assistance from the watch leader to unjam and avoid injury. d) Check for jellyfish. If there are signs of jellyfish on the CTD/Rosette, immediately don gloves and carefully remove and dispose of the jellyfish pieces. Wash the entire CTD/Rosette down with salt water prior to sampling. e) Gloves shall be worn while taking chemical samples as per chemistry being conducted. Protective eyewear may be required for some chemistry samples. f) Team members taking samples that require dangerous goods will have current WHMIS training (e.g., Dissolved Oxygen, DIC). g) Take samples from bottles and transport to the appropriate lab for storage and/or analysis. h) When transporting samples, if possible, choose an inside passage, if not, have 2 people involved. i) Never sample alone. Always have someone with you or watching you. j) Prevent chemical spills with secure placement on counter. k) Address chemical spills following guidelines given on the chemicals' Safety Data Sheet (SDS). l) Clean up broken glassware.

10. Preparation for Next Cast	a) Physical injury from bottle cocking. b) Physical injury due to slips and tripping on deck.	a) Once all sampling is completed, reset the rosette CTD/Rosette by draining all bottles and recocking. b) Replace any fluid containers required as per CTD operations (e.g., pH4 solution, PAR cover). c) Ensure that someone is with you or watching you Report to bridge when sampling is complete.

Science	**Branch**
Pacific	**Region**
Conducting CTD/Rosette Operations from Large Vessels	**Subject**

I. PURPOSE

- Provide guidance to Science Pacific staff on how to Conduct CTD/Rosette Operations from Large Vessels properly and safely.
- Provide guidance on how to minimize risks to which the staff may be exposed when they are Conducting CTD/Rosette Operations From Large Vessels. This procedure is intended to guide the supervisor's and staff's use of discretion and common sense when making decisions related to Conducting CTD/Rosette Operations from Large Vessels.
- It is the responsibility of all Branch staff to conduct risk assessments on an ongoing basis to prevent injury to themselves, the public and other employees.
- As per Canada Labour Code Part II, 126. (1), employees shall review and comply with these procedures.
- Conducting CTD/Rosette Operations from Large Vessels is dangerous work but it can be done safely. If not done safely the severity of loss will be high. This task is done occasionally and if an accident occurs, the probability of loss occurring is high.
- **The Safe Work Procedures focus on hazards. The Critical Task Hazard Analysis Worksheet makes reference to physical injury and equipment damage or loss from falling overboard, slipping, fatigue, equipment failure, extreme weather, handling heavy items on a moving ship, and breakage of wire.**
- The Safe Work Procedures for Conducting CTD/Rosette Operations from Large Vessels will contribute to safe work and will ensure that the work is undertaken only under controlled and safe circumstances.

II. PROCEDURES

See above Critical Hazard Analysis Worksheet for Basic Steps, Hazards, and Control Measures.

III. TRAINING REQUIREMENTS

- On the job training
- Workplace Hazardous Materials Information System (WHMIS)

IV. PERSONAL PROTECTIVE EQUIPMENT REQUIRED

- CSA Z195 approved Safety Footwear
- CSA Class G Hard Hats
- CSA approved Safety Harnesses
- Transport Canada approved Personal Floatation Device (PFD)
- Whistle, Hydrostatic Strobe Light, and Reflective tape on PFD or Jacket
- Gloves when handling items
- For COVID, masks when not possible to keep a 2 meter separation from fellow science and/or crew members.
- For COVID, hand and surface sanitizer.

V. REFERENCES

- Canada Labour Code Part II
- Canada Occupational Health and Safety Regulations
- Canadian Centre for Occupational Health and Safety
- DFO Occupational Health and Safety Manual

VI. APPROVED BY

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Original prepared by: Joseph Linguanti 17-Mar-2016
OSH Representative Review by: Peter Chandler
Interviews conducted with: Sarah Zimmermann, Steve Romaine
Version 1.0
Updated by M Archer Nov 20, 2016: Changed Step 9k reference from MSDS to SDS (as per WHMIS 2015); changed SWP Purpose from *"….Ocean Sciences Division Pacific staff …"* to *"…Science Pacific staff…"* (V2.0).
Subject Matter Expert/Peer Review by: M Belton December 12, 2019: Added some task specifics (V3.0).
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OHS Representative Review by: Kim Houston Sept 22, 2020.

Carmel Lowe — Signature

10/06/2020 — Date *(mm/dd/yyyy)*

Director: Dr. Carmel Lowe

Branch: Science

Region: Pacific