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**SOLICITATION AMENDMENT
MODIFICATION DE L'INVITATION**

The referenced document is hereby revised; unless otherwise indicated, all other terms and conditions of the Solicitation remain the same.

Ce document est par la présente révisé; sauf indication contraire, les modalités de l'invitation demeurent les mêmes.

Comments - Commentaires

Vendor/Firm Name and Address
Raison sociale et adresse du
fournisseur/de l'entrepreneur

Issuing Office - Bureau de distribution
TPSGC/PWGSC
601-1550, Avenue d'Estimauville
Québec
Québec
G1J 0C7

Title - Sujet Refit Martha Black_Fall 2016	
Solicitation No. - N° de l'invitation F3012-16N397/A	Amendment No. - N° modif. 001
Client Reference No. - N° de référence du client F3012-16N397	Date 2016-05-24
GETS Reference No. - N° de référence de SEAG PW-\$QCL-036-16754	
File No. - N° de dossier QCL-6-39021 (036)	CCC No./N° CCC - FMS No./N° VME
Solicitation Closes - L'invitation prend fin at - à 02:00 PM on - le 2016-06-21	
Time Zone Fuseau horaire Heure Avancée de l'Est HAE	
F.O.B. - F.A.B. Specified Herein - Précisé dans les présentes	
Plant-Usine: <input type="checkbox"/> Destination: <input type="checkbox"/> Other-Autre: <input checked="" type="checkbox"/>	
Address Enquiries to: - Adresser toutes questions à: Gagnon, Mathieu	Buyer Id - Id de l'acheteur qcl036
Telephone No. - N° de téléphone (418) 649-2883 ()	FAX No. - N° de FAX (418) 648-2209
Destination - of Goods, Services, and Construction: Destination - des biens, services et construction:	

Instructions: See Herein

Instructions: Voir aux présentes

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Vendor/Firm Name and Address Raison sociale et adresse du fournisseur/de l'entrepreneur	
Telephone No. - N° de téléphone Facsimile No. - N° de télécopieur	
Name and title of person authorized to sign on behalf of Vendor/Firm (type or print) Nom et titre de la personne autorisée à signer au nom du fournisseur/ de l'entrepreneur (taper ou écrire en caractères d'imprimerie)	
Signature	Date

Please amend the above mentioned bidding solicitation with the changes below:

Item 1 : Item 10.2 – Fall Protection

Please include Item 10.2 – Fall Protection as follow:

10.2 FALL PROTECTION

10.2.1 Provide the equipment, tools and labour to evaluate the steelwork described in this section.

10.2.2 Provide the services of an entrepreneur specialized in fall protection systems for the purpose of ensuring that work being performed aloft or over the vessel's side is performed safely in accordance with the Maritime Occupational Health and Safety (MOHS) Regulations and the Canadian Coast Guard Fall Protection Program.

10.2.3 Identify anchor points for ships' masts, as well as other areas exceeding 2.4 meters in height, with the vessel chief-officer support.

10.2.4 References;

10.2.4.1 Canada Occupational Health and Safety Regulations (SOR/86-304) section 12.10 FALL-PROTECTION SYSTEMS

<http://laws-lois.justice.gc.ca/eng/regulations/SOR-86-304/page-31.html#h-167>

10.2.4.2 Fleet Safety Manual

- 7.B.2 – Fall Protection

10.3 Deliverable

Report

Provide a report detailing the anchor points required to make any type of work in height safe, according to actual standards. A paper copy, PDF and word version will be necessary, in French and English version.

Item 2 : Item 15.2 – Vapor Generator

Item 15.2 – Vapor Generator is cancelled.

Item 3 : Appendix 1 of Annex I – Price per Article Sheet

Eliminate the Price per Article Sheet of the Solicitation to Tender document and replace with the following:

APPENDIX 1 OF ANNEX I

SCHEDULED WORK:

PRICE PER ITEM SHEETS		
Item	Description – A) SCHEDULED WORK	Firm Price
1	General Remarks (Scope, health and safety related requirements and general requirements)	\$ _____
10	Safety and Security Equipment	\$ _____
11	Hull and Structure	\$ _____
15	Auxiliary Systems (other than 15.2 below)	\$ _____
16	Domestic Systems	\$ _____
17	Deck Equipment / Ship Support Systems	\$ _____
A) SCHEDULED WORK – TOTAL FIRM PRICE		\$ _____

OPTIONAL WORK:

PRICE PER ITEM SHEETS		
Item	Description – B) OPTIONAL WORK	Firm Price
10.1.2.2 h)	Safety and Security Equipment – Fixe CO ² System	\$ _____
10.1.2.3 e) & g)	Safety and Security Equipment – Portable Fire Extinguisher	\$ _____
15.2	Auxiliary Systems – Vapor Generator	CANCELLED
B) OPTIONAL WORK – TOTAL FIRM PRICE		\$ _____

Note: PWGSC reserves the right to exercise all the options or partial options.

The Contractor grants to Canada the irrevocable option to acquire the goods, services or both described at Annex A of the Contract under the same conditions and at the prices and/or rates stated in the Contract. The option may only be exercised by the Contracting Authority and will be evidenced, for administrative purposes only, through a contract amendment. The Contracting Authority may exercise the option within **5 days** after beginning of work by sending a written notice to the Contractor.

TOTAL (A) SCHEDULED WORK	TOTAL (B) OPTIONAL WORK	TOTAL KNOWN WORK FIRM PRICE ((A) + (B))
\$ _____	\$ _____	\$ _____

Remark to Bidders:

Canada may reject the bid if any of the prices submitted do not reasonably reflect the cost of performing the part of the work to which that price applies.

Item 4 : Annexe J – Pricing Data Sheet

Eliminate the Price per Article Sheet of the Solicitation to Tender document and replace with the following:

ANNEX J

PRICING DATA SHEETS

Item	Description – A) SCHEDULED WORK	Firm Price
1 & 2 (also 14)	General Remarks (Scope, health and safety related requirements and general requirements) (Bidders can enter \$0.00 or indicate 'included' if the fees for this item are distributed in each of the items below. In case the fees are not distributed an amount must be indicated in the price box.) This includes, but not limited to, the coordination required with the work under CCG supervision.	\$ _____
10	Safety and Security Equipment (Overheads fees related to this item and its sub items must be distributed in each sub items.)	\$ _____
	10.1.2.2 Fixed CO₂ Smothering Systems Except for item 10.1.2.2 h) (Optional) Price for this article (other than subcontracting) = _____ \$ Subcontracting price Mobilisation / Demobilisation = \$ _____ Materials, equipment and consumables = \$ _____ Labour ; \$ _____ /hour X _____ hours = \$ _____ Total for this item : \$ _____	
	10.1.2.3 Portable Fire Extinguishers Except for items 10.1.2.3 e) & g) (Optional) (Based on due dates provided in the list). Price for this article (other than subcontracting) = _____ \$ Subcontracting price Mobilisation / Demobilisation = \$ _____ Materials, equipment and consumables = \$ _____ Labour ; \$ _____ /hour X _____ hours = \$ _____ Total for this item : \$ _____	
	10.1.2.4 Galley, Fixed Fire Extinguishing (Pyrochem) Price for this article (other than subcontracting) = _____ \$ Subcontracting price Mobilisation / Demobilisation = \$ _____ Materials, equipment and consumables = \$ _____ Labour ; \$ _____ /hour X _____ hours = \$ _____ Total for this item : \$ _____	

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QCL-6-39021

Buyer ID - Id de l'acheteur
qcl036
CCC No./N° CCC - FMS No/ N° VME

PRICING DATA SHEETS

Item	Description – A) SCHEDULED WORK	Firm Price
	10.1.2.5 Flight Deck Fire Extinguishing System Price for this article (other than subcontracting) = _____ \$ Subcontracting price Mobilisation / Demobilisation = \$ _____ Materials, equipment and consumables = \$ _____ Labour ; \$ _____ /hour X _____ hours = \$ _____ Total for this item : \$ _____	
	Total for item 10.1 : \$ _____	
	10.2 Fall Protection Price for this article (other than subcontracting) = _____ \$ Subcontracting price Mobilisation / Demobilisation = \$ _____ Materials, equipment and consumables = \$ _____ Labour ; \$ _____ /hour X _____ hours = \$ _____ Total for this item : \$ _____	
	Total for item 10.2 : \$ _____	
	Total for item 10 : \$ _____	
15	Auxiliary Systems (Overheads fees related to this item must be distributed in each sub items.)	
	15.1 Fuel Transfer Hoses Price for this article (other than subcontracting) = _____ \$ Subcontracting price Mobilisation / Demobilisation = \$ _____ Materials, equipment and consumables = \$ _____ Labour ; \$ _____ /hour X _____ hours = \$ _____ Total for this item : \$ _____	
	Total for 15.1 : \$ _____	
	15.2 Vapor Generator (See optional work below)	

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PRICING DATA SHEETS

Item	Description – A) SCHEDULED WORK	Firm Price
	16.2 Kitchen Hood cleaning Price for this article (other than subcontracting) = _____ \$ Subcontracting price Mobilisation / Demobilisation = \$ _____ Materials, equipment and consumables = \$ _____ Labour ; \$ _____ /hour X _____ hours = \$ _____ Total for this item : \$ _____	
	Total for 16.2 : \$ _____	
	16.3 Cleaning of ventilation ducts Price for this article (other than subcontracting) = _____ \$ Subcontracting price Mobilisation / Demobilisation = \$ _____ Materials, equipment and consumables = \$ _____ Labour ; \$ _____ /hour X _____ hours = \$ _____ Total for this item : \$ _____	
	Total for 16.3 : \$ _____	
	16.4 Refrigeration Systems and Air Conditioning (Overheads fees related to this item must be distributed in each sub items.) Domestic Refrigeration Price for this article (other than subcontracting) = _____ \$ Subcontracting price Mobilisation / Demobilisation = \$ _____ Materials, equipment and consumables = \$ _____ Labour ; \$ _____ /hour X _____ hours = \$ _____ Total for this item : \$ _____	
	Air conditioning Systems S1, S2, and S3 Price for this article (other than subcontracting) = _____ \$ Subcontracting price Mobilisation / Demobilisation = \$ _____ Materials, equipment and consumables = \$ _____ Labour ; \$ _____ /hour X _____ hours = \$ _____ Total for this item : \$ _____	
	Total for 16.4 : \$ _____	
	Total for item 16 : \$ _____	

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PRICING DATA SHEETS		
Item	Description – A) SCHEDULED WORK	Firm Price
17	Deck Equipment / Ship Support Systems (Overheads fees related to this item must be distributed in each sub items.)	
	17.1 Loading Arm	
	Price for this article (other than subcontracting) = _____ \$	
	Subcontracting price	
	Mobilisation / Demobilisation = \$ _____	
	Materials, equipment and consumables = \$ _____	
	Labour ; \$ _____ /hour X _____ hours = \$ _____	
	Total for this item : \$ _____	
	Total for 17.1 : \$ _____	
	17.2 Vessel's Anchors	
	Price for this article (other than subcontracting) = _____ \$	
	Subcontracting price	
	Mobilisation / Demobilisation = \$ _____	
	Materials, equipment and consumables = \$ _____	
	Labour ; \$ _____ /hour X _____ hours = \$ _____	
	Total for this item : \$ _____	
	Total for 17.2 : \$ _____	
	Total for 17 : \$ _____	
A) TOTAL FIRM PRICE =		\$ _____

Optional Work:

PRICING DATA SHEETS		
Item	Description – B) OPTIONAL WORK	Firm Price
10	Safety and Security Equipment (Overheads fees related to this item and its sub items must be distributed in each sub items.) 10.1.2.2 h) Fixed CO₂ Smothering Systems h) Price for handling, emptying, refilling reinstallation of cylinders Cylinder CO ₂ 100 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ Cylinder FM 200 113 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ Total for this item : \$ _____	
	10.1.2.3 e) & g) Portable Fire Extinguishers (For extinguisher not provided in the list). e) Price for handling, emptying, refilling and installation of cylinders (Final prices to be prorated) Cylinder ABC 2,5 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ Cylinder ABC 5 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ Cylinder ABC 10 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ Cylinder ABC 15 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ Cylinder ABC 20 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ Cylinder CO ₂ 5 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ Cylinder CO ₂ 10 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ Cylinder CO ₂ 15 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ Cylinder BC 20 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ Cylinder AFF 9,5 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ g) Price for replacement of cylinders (Final prices to be prorated) Cylinder ABC 2,5 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ Cylinder ABC 5 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ Cylinder ABC 10 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ Cylinder ABC 15 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ Cylinder ABC 20 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ Cylinder CO ₂ 5 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ Cylinder CO ₂ 10 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ Cylinder CO ₂ 15 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ Cylinder BC 20 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ Cylinder AFF 9,5 lbs; _____ \$/cylinder X 5 cylinders = _____ \$ Total for this item : \$ _____	
	Total for item 10.1.2.2 h) as well 10.1.2.3 e) & f) : \$ _____	
15	Auxiliary Systems (Overheads fees related to this item must be distributed in each sub items.) 15.2 Vapor Generator	CANCELLED CANCELLED
	Total for item 15.2 : \$ _____	
B) OPTIONAL WORK – TOTAL FIRM PRICE =		\$ _____

Remark to Bidders:

Canada may reject the bid if any of the prices submitted do not reasonably reflect the cost of performing the part of the work to which that price applies.

All other clauses and conditions from the bidding solicitation remain the same.



Fisheries and Oceans
Canada

Pêches et Océans
Canada

CA-013-000-QM-GL-001

Canadian
Coast Guard

Garde côtière
canadienne

Fall Protection Program Part I – Policy and Plan



Canadian Coast Guard
Program

Canada 

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Fall Protection Program – Part I

SECOND EDITION – NOVEMBER 2014

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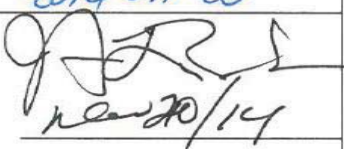
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Table of Contents

1.	AUTHORITY	IX
2.	RESPONSIBILITY	IX
3.	INQUIRIES AND/OR REVISION REQUESTS	IX
FOREWORD.....		XI
CHAPTER 1	GENERAL	1
1.1	TERMS AND DEFINITIONS	1
1.2	BACKGROUND	1
1.3	PROGRAM OVERVIEW	2
CHAPTER 2	REFERENCES.....	3
2.1	GENERAL HIERARCHY OF DOCUMENTS.....	3
2.2	REGULATIONS, LAWS AND STANDARDS	4
2.2.1	General	4
2.2.2	Bill C-45.....	4
2.2.3	Canada Labour Code, Part II (CLC-II).....	5
2.2.4	Canadian Standard Association (CSA) Standards	6
2.3	GOVERNMENT REQUIREMENTS	6
2.3.1	Treasury Board Guidelines.....	6
2.3.2	Canada Shipping Act, 2001 (CSA, 2001).....	6
2.4	DFO REQUIREMENTS	7
2.5	CANADIAN COAST GUARD SHIP-BASED REQUIREMENTS	7
2.6	OTHER REQUIREMENTS	7
2.6.1	International Safety Management Code	7
2.6.2	Marine Occupational Safety and Health Regulations.....	7
2.7	SUMMARY OF APPLICABLE REQUIREMENTS.....	8
CHAPTER 3	POLICY STATEMENT.....	9
CHAPTER 4	RESPONSIBILITIES AND AUTHORITY.....	11
4.1	GENERAL	11
4.2	SHIP RESPONSIBILITIES AND AUTHORITIES	12
4.2.1	General/Fleet Program	12
4.2.2	Shipboard Personnel.....	12
4.3	SHORE RESPONSIBILITIES AND AUTHORITIES.....	13

Table of Contents

CHAPTER 5	QUALIFICATIONS, TRAINING AND COMPETENCIES.....	15
5.1	QUALIFICATIONS AND TRAINING.....	15
5.1.1	General	15
5.1.2	Overview training.....	15
5.1.3	Fall Protection Training.....	16
5.1.4	Competent Person Training	16
5.1.5	Rescue Training.....	16
5.1.6	Refresher Training	17
5.2	COMPETENT PERSONS	17
5.3	FALL PROTECTION COMPETENCIES	17
CHAPTER 6	FALL PROTECTION PROCEDURES / REQUIREMENTS.....	19
CHAPTER 7	EMERGENCY PREPAREDNESS / RESCUE AND RESCUE PLAN REQUIREMENTS	21
CHAPTER 8	ACCIDENTS, INCIDENTS, PREVENTION, INVESTIGATIONS, AND REPORTING	23
CHAPTER 9	EQUIPMENT MAINTENANCE, INSPECTION, AND PURCHASING.....	25
9.1	MAINTENANCE, INSPECTION.....	25
9.2	PERIODIC MAINTENANCE	25
9.3	PURCHASING	25
CHAPTER 10	DOCUMENTATION, RECORDS, AND REPORTING	27
CHAPTER 11	PROGRAM REVIEW, AUDIT, AND CHANGE PROCESS.....	29
11.1	REVIEW	29
11.2	AUDIT.....	29
11.3	CHANGE PROCESS	29
ANNEX A	TERMS AND DEFINITIONS	1
ANNEX B	RISK ASSESSMENT MATRIX.....	1
B.1	BACKGROUND	1
B.2	APPROACH AND METHODOLOGY	1
B.3	THREE VESSEL TYPES	2
B.4	WORKING AREAS	4
B.5	TASK ANALYSIS	5
B.6	MOTION ANALYSIS.....	8
B.6.1	Introduction	8

B.7	PARAMETERS FOR EVALUATION.....	9
B.7.1	Geometry.....	9
B.7.2	Vessel Loading Conditions	10
B.7.3	Heading and Wave Environment.....	11
B.8	SIMULATION RESULTS.....	12
B.9	RISK ASSESSMENT MATRIX	13
B.9.1	Fall Severity	13
B.9.2	Fall-Likelihood.....	13
B.9.3	Fall-Risk Classification	14
B.9.4	Overall Fall Risk – CCGC W. Jackman.....	15
B.9.5	Overall Fall Risk – CCGS Cygnus.....	16
B.9.6	Overall Fall Risk – CCGS Henry Larsen	17
B.10	CONCLUDING REMARKS.....	18
ANNEX C	CANADA LABOUR CODE: R.S. 1985, C.L2	1
C.1	MARINE OCCUPATIONAL SAFETY AND HEALTH REGULATIONS	1
C.2	CANADA OCCUPATIONAL HEALTH AND SAFETY REGULATIONS	2
ANNEX D	CANADA SHIPPING ACT, 2001	1
D.1	SAFE WORKING PRACTICES REGULATIONS (C.R.C., C. 1467).....	1
D.2	TACKLE REGULATIONS (C.R.C., C. 1494)	3
ANNEX E	DFO HEALTH AND SAFETY MANUAL	1
ANNEX F	CANADIAN COAST GUARD FLEET SAFETY AND SECURITY MANUAL.....	1
ANNEX G	MARINE OCCUPATIONAL SAFETY AND HEALTH REGULATIONS	1
ANNEX H	FALL PROTECTION COMPETENCIES	1
H.1	SENIOR MANAGEMENT	1
H.2	COMMANDING OFFICER	1
H.3	REGIONAL AUTHORITY	2
H.4	SUPERVISOR	2
H.5	COMPETENT PERSON	3
H.6	CLIMBER	4

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Document Management

1. Authority

This document is issued by the Director General, Integrated Technical Services (ITS), Canadian Coast Guard's National Technical Authority under delegation from the Deputy Minister, Fisheries and Oceans and the Commissioner of the Canadian Coast Guard.

2. Responsibility

- a) The Director, Engineering Services is responsible for:
 - i) the creation and promulgation of the document; and
 - ii) the identification of an Office of Primary Interest (OPI) who is responsible for the coordination and the content of the document.
- b) The OPI is responsible for:
 - i) the validity and accuracy of the content;
 - ii) the availability of this information;
 - iii) the update as needed;
 - iv) the periodical revision; and
 - v) the follow-up of all requests, comments and/or suggestions received to the originator.

3. Inquiries and/or Revision Requests

All inquiries regarding this document, including suggestions for revision and requests for interpretation shall be addressed to:

Position Title: Manager, Environmental Engineering (ITS)
Address: Fisheries and Oceans – Canadian Coast Guard
200 Kent Street, 7W064
Ottawa, Ontario
K1A 0E6

All requests should:

- i) be clear and concise; and
- ii) reference the specific Chapter, Section, Figure or Table.

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Foreword

Canadian Coast Guard's Fall Protection Program is, as the reader will see, a requirement by law and this document is CCG's implementation and the Report has been endorsed by the Commissioner.

CCG's Fall Protection Program consists of three (3) parts, namely:

Part I – Policy and Plan;

Part II – Land-based Fall Protection for Structures and Towers; and

Part III – Ship-based Fall Protection.

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Chapter 1 GENERAL

1.1 TERMS AND DEFINITIONS

Terms and Definitions are attached at Annex A.

1.2 BACKGROUND

The Canadian Coast Guard (CCG), administered by the federal Department of Fisheries and Oceans (DFO), became the largest special operating agency (SOA) within the federal government in 2005. The responsibilities of this large civilian organization are challenging and unique. In order to fulfill its mandate patrolling more than 202,000 km of Canadian coastlines and meet its many other obligations, a large workforce has to be employed that is competent, reliable and safety conscious.

The CCG maintains more than 17,000 marine aids including lighthouses, buoys, fog horns, radar aids, Differential Global Positioning Systems (DGPS) and more than 480 land based communication towers, communication systems and navigational aids mounted on ships and masts that need to be inspected, maintained and repaired. This is often dangerous and difficult work that has to be done by skilled personnel, familiar and well trained with working at heights, knowledgeable about safety regulations and procedures as well as basic rescue techniques. The diversity and associated risk of these activities necessitate a comprehensive and robust Fall Protection Program.

Subject to recommendations in the Office of the Auditor General's (OAG) report of 2002, the CCG began to design and implement national programs to standardize operating and policy procedures for all of its five (5) regions. In 2005 a new initiative was put in place by the CCG with the objective to identify, classify and address safety issues and standards that might impact its operations. One of the areas reviewed concerned working at heights. The intent was to develop a national standard for the CCG that would address Fall Protection. This initiative was originally based upon various existing Regional programs already in place and a review of regulatory requirements, associated standards and guidelines, and other Government and Departmental requirements. This was a significant undertaking since working at heights had to address land-based structures as well as masts and stacks on ships. Even though the laws and standards governing work at heights are for the most part common to ship and shore, there are also many differences. After numerous revisions, the Canadian Fall Protection Program dated December 2006 was adopted. This document focused mostly on land-based structures and was a useful tool, identifying applicable laws, regulations and standards pertaining to Fall Protection, Fall Restraint and Fall Arrest.

Based upon feedback from the regions related to the unique environment on ships, headquarters decided to expand, clarify and enhance ship-related sections of the Fall Protection Program. The CCG identified nine (9) areas on vessels that should be addressed specifically as it relates to the hazard of falling and furthermore, a risk assessment study, attached at Annex B, was to be undertaken that would help to ascertain when certain work at heights could be undertaken. The

final component was a Gap analysis that should identify where changes on board of ships would have to be made in order to ensure a safe working environment that is also code compliant.

1.3 PROGRAM OVERVIEW

The CCG decided during the later part of 2007 that the interest of all effected parties would be best served if the existing Fall Protection Program would be integrated in this new document and broken down into three (3) parts:

- a) Part I: Policy and Plan;
- b) Part II: Land-based Fall Protection for Structures and Towers; and
- c) Part III: Ship-based Fall Protection.

Fall Protection is divided into Land-based Towers and Structures (Part II) and Ship-based Fall Protection (Part III). The applicable regulations and standards are referred to and explained in Section 2 under REFERENCES and are then further sub-divided into land-based and ship-based regulations and standards, whereas Part II and Part III deal with equipment, climbing procedures, Rescue plans, etc.

In order to establish clear guidelines that help to identify areas of responsibility, the Fall Protection Program is based on the following aspects:

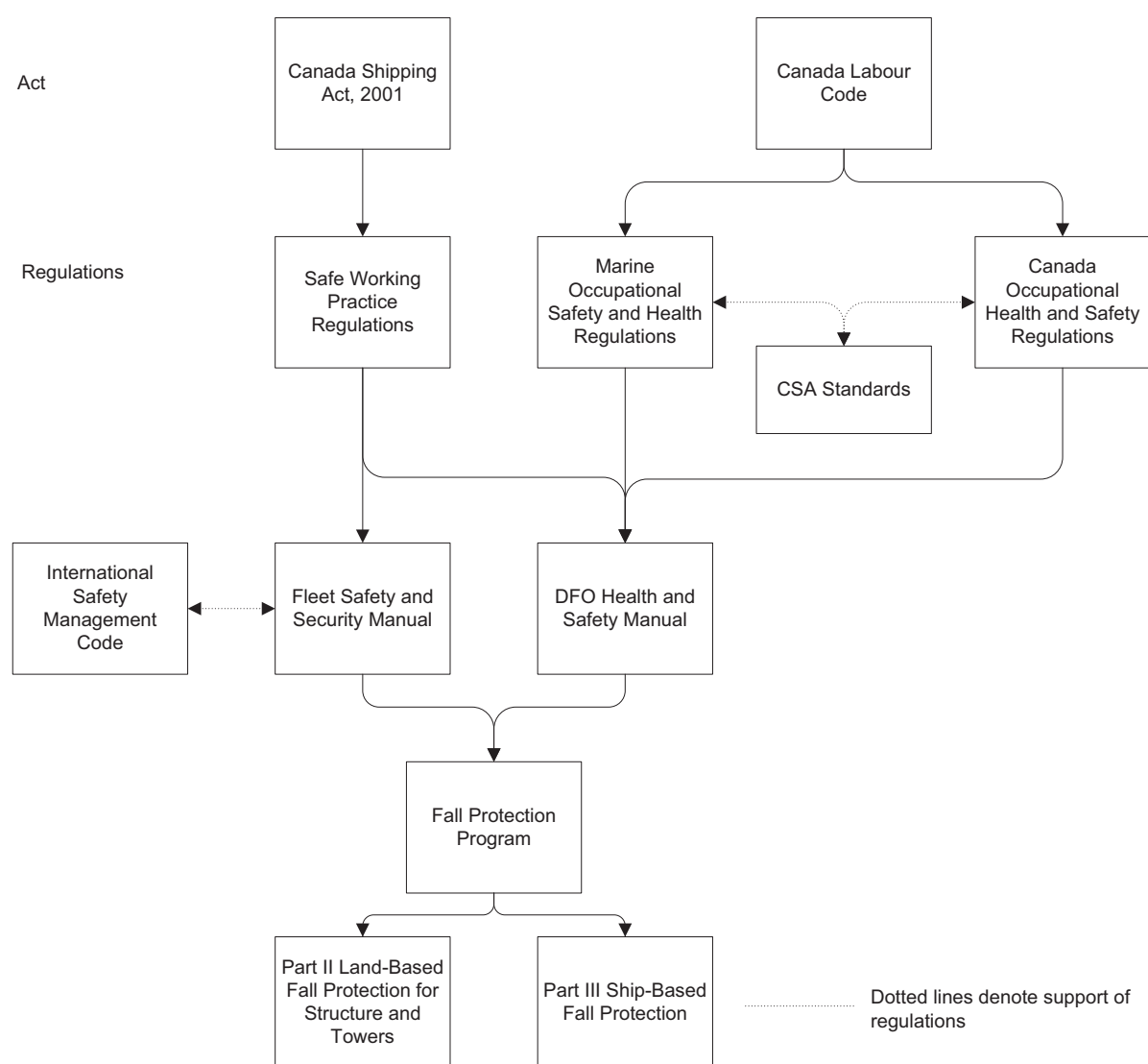
- a) References including Regulations, Laws and Standard, Internal Guidelines, Policies and Directives, etc;
- b) Policy;
- c) Responsibility and Authorities;
- d) Qualifications, Training, and Competencies (including Competent Persons);
- e) Fall Protection Procedures and Requirements;
- f) Emergency Preparedness/Rescue and Rescue Plan Requirements;
- g) Accidents, Incidents, Prevention, Investigations, and Reporting;
- h) Equipment Maintenance Inspections, and Purchasing;
- i) Documentation, Records, and Reporting; and
- j) Review, Audit, and Change Process.

Chapter 2 REFERENCES

2.1 GENERAL HIERARCHY OF DOCUMENTS

Various federal regulations as well as labour laws and compliance board standards address safety at the work place. These regulations and laws are often supplemented and further detailed by departmental regulations and policies and at times, enhanced by regional and local directives.

The hierarchal relationship between the different regulations governing fall protection on shore and ships is illustrated below.



2.2 REGULATIONS, LAWS AND STANDARDS

2.2.1 General

The Canadian Standard Association (CSA) is a voluntary compliance board that has, amongst many other standards, developed, tested and recommended the use of the various components comprising Fall Restraint, Fall Protection and Fall Arrest equipment.

Regulations are typically government enforced sets of rules that must be complied with and are legally binding. Often, regulations and legislation refer to the mandatory compliance of certain standards that then become an integral part of those regulations.

The CSA Z259 series of Fall Protection Standards are the principal standards used for personal fall protection equipment on shore as well on ships. Ship fall protection is addressed and referred to in many federal regulations whereas land-based fall protection is mostly addressed by regulations such as the Canada Occupational Health and Safety Regulations. Since communication towers are federally regulated, all issues concerning work on communication towers, health and safety, labour, etc. are subject to federal jurisdiction and interpretation and the Canada Labour Code.

Whenever a conflict in standards is noted, the more stringent standard(s) shall be applied.

American and other foreign made fall protection, fall arrest and fall prevention equipment and systems that are available in Canada are not always CSA compliant. The American National Standards Institute (ANSI) standards and the National Fire Protection Association (NFPA) standards are often similar to the CSA standards but not necessarily identical. It is the responsibility of CCG management to ensure that all safety equipment used meets or exceeds the requirements of all applicable CSA standards.

Fall protection systems or equipment that have not yet been tested and approved by the CSA shall only be employed subject to the approval of a licensed engineer knowledgeable in all aspects of fall arrest and prevention.

2.2.2 Bill C-45

On March 31, 2004 [Bill C-45](#) was created, resulting in an amendment to the Criminal Code:

- a) The purpose of amending the Criminal Code was to enable the Crown to hold an organization criminally responsible for the negligent act(s) of its representatives if it can prove, that those offenses were committed deliberately, resulting in a standard of care that was decidedly lower than could be reasonably expected;
- b) The provisions of Bill C-45 also enable the Crown to lay charges against corporate representatives if the combined action of two or more of its employees resulted in a serious violation that could knowingly jeopardize the safety of others; and
- c) In order for a corporation to be found guilty of a criminal offence under Bill C-45, it has to be proven that there was intent by senior officer(s) to circumvent the

standard of care for the direct benefit of the corporation and/or to direct others to commit such acts.

2.2.3 Canada Labour Code, Part II (CLC-II)

Employer.

This act defines and specifies the responsibilities of the employer as it relates to training, instructions, information, supervision and safety. More specifically, the Code requires the employer to ensure that:

- a) All workers are made aware of predictable hazards at the work place, that accidents are properly investigated and recorded and that a work place health and safety committee be instituted at each work place location where 20 or more employees are present;
- b) All workers can enjoy a safe and healthy work environment as set out in the Canada Occupational Health and Safety regulations; and
- c) A policy committee is formed when the total numbers of employees is 300 or more.

Employee.

The Code also grants the following three (3) basic rights to all employees:

- a) The right to know. All employees are entitled to be fully informed of the expected and anticipated risk associated with their duties as it relates to their health and safety;
- b) The right to participate. All employees may exercise their right to participate and inform themselves on all matters concerning the health and safety at their work place; and
- c) The right to refuse. All employees may refuse work that they deem dangerous and not part of their regular duty, as long as their refusal to do the work does not endanger the health or safety of another person.

[The Canada Labour Code, Part II](#) also identifies different processes and rules regarding complaints, refusal to work, training, offences and punishments, monthly inspections, safety officers, etc. and it clearly defines the responsibilities of upper management, middle management and line management.

The Canada Occupational Health and Safety Regulations Part XII (<http://laws.justice.gc.ca/en/showtdm/cr/SOR-86-304>), a part of the Canada Labour Code is attached at Annex C.

2.2.4 Canadian Standard Association (CSA) Standards

The following provides a summary of relevant standards:

- a) Z259.1-05 Body belts and saddles for work positioning and travel restraint;
- b) Z259.2.1-98 Fall Arresters, Vertical Lifelines and rails;
- c) Z259.2.2 Self-retracting devices for personal Fall Arrest systems;
- d) Z259.2.3-99 Descent Control Devices;
- e) Z259.10-M90 Full Body Harness;
- f) Z259.11-05 Energy Absorbers and lanyards;
- g) Z259.12-01 Connecting Components for Personal Fall Arrest Systems (PFAS);
- h) Z259.13-04 Flexible Horizontal Lifeline Systems;
- i) Z259.14-01 Fall Restrict Equipment for Wood Pole Climbing;
- j) Z259.16-04 Design of Active Fall Protection Systems; and
- k) CSA-S37-01 Antennas, Towers, and Antenna-Supporting Structures.

2.3 GOVERNMENT REQUIREMENTS

2.3.1 Treasury Board Guidelines

The Canada Labour Code, Part II is comprised of many sub-sections and regulations and is the principal governing authority on issues concerning safety. This includes specific instructions on fall protection and safety concerns pertaining to the working at heights. Treasury Board (http://www.tbs-sct.gc.ca/hr-rh/osh-sst/index_e.asp) requires all departments and ministries to be in compliance with the Canada Labour Code at all times. Treasury Board re-engineered their Directive and eliminated all duplication with the Canada Labour Code and Regulations, thus, there no longer is any reference to fall restraint

2.3.2 Canada Shipping Act, 2001 (CSA, 2001)

The Canada Shipping Act, 2001 (Annex D refers) is the most comprehensive set of regulations that define the overall operation of ships and vessels. Areas of particular interest as it pertains to the CCG Fall Protection Program are found in:

- a) Safe Working Practices Regulations, (CRC, ch. 1467):
 - i) Scaffolding, Scaffolds and Stages,
 - ii) Ladders and Gangways,

- iii) Personal Protective Equipment, and
 - iv) General Requirement and Working Practices.
- b) Tackle Regulations, (CRC, ch. 1494).

2.4 DFO REQUIREMENTS

In order to provide additional guidelines on safety procedures, the DFO's **Health & Safety Manual** (Annex E refers) was developed that also underlines the requirements of the Canada Labour Code, Part II. Of particular interest are the following Program Elements:

- a) 13. Health and Safety; and
- b) 14. Personal Protective Equipment (PPE) and Clothing.

2.5 CANADIAN COAST GUARD SHIP-BASED REQUIREMENTS

CCG ship-based requirements are currently identified in its **Fleet Safety and Security Manual** (Annex F refers), a document widely used to help personnel understand its obligations regarding safety in general and this manual also refers to fall protection specifically in section 7.B.2, entitled Fall Protection. In order to have one document that deals with all fall protection related issues, this 3-part document is designed to compile, identify and summarize the safety requirements referred to in the various regulations and standards identified in this Policy and Plan section.

2.6 OTHER REQUIREMENTS

2.6.1 International Safety Management Code

The safe operation of ships and vessels is guided by the [International Safety Management \(ISM\) Code](#). This code is specific regarding the areas of operation such as Safety, Documentation, Reporting, Emergency Preparedness, Resources, Personnel, Environmental Protection, Maintenance, etc. It is the responsibility of the ship's owner (CCG) to develop those areas with clearly defined policies, procedures and work instructions.

2.6.2 Marine Occupational Safety and Health Regulations

This regulation, [Marine Occupational Safety and Health Regulation](#) (MOHS) (Annex G refers) addresses safe working procedures and a safe working environment on board ships. Of particular interest as it relates to the Fall Protection Program are the following sections:

- a) Part II: Temporary Structures; and
- b) Part X: Safety Materials, Equipment, Devices and Clothing.

2.7 SUMMARY OF APPLICABLE REQUIREMENTS

REQUIREMENT	Land Based	Ship Based
Canada Labour Code, Part II (CLC-II)	X	X
Canadian Standard Association (CSA) Standards	X	X
Treasury Board Guidelines	X	X
Canada Shipping Act, 2001 (CSA, 2001)		X
DFO Health & Safety Manual	X	X
Fleet Safety and Security Manual		X
International Safety Management (ISM) Code		X
Marine Occupational Safety and Health Regulations (MOHS)		X

Chapter 3 POLICY STATEMENT

As the employer, the CCG shall make every effort to ensure safety of its personnel by addressing all related provisions in existing regulations and standards. This Fall Protection Program underlines this commitment which clearly identifies the steps and procedures all parties have to follow (employer and employee), in order to make the work place as safe an environment as possible. It shall be CCG's policy, however, that work at any height, where there is a risk of personal injury, shall employ the safety measures set out in this document.

Note: as a minimum, regulations mandate fall protection measures at 8 feet (2.4meters).

Ultimately, CCG's goal is zero falls.

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Chapter 4 RESPONSIBILITIES AND AUTHORITY

4.1 GENERAL

It is the responsibility of the employer (CCG) to establish a Fall Protection program that is compliant with Regulations and conforms to other Government Department, DFO, and CCG requirements. Overall, the Assistant Commissioner is accountable for ensuring that these requirements are met. Management shall provide adequate training and resource material that will enable the worker to become proficient and skilled to meet the requirements for working at heights, but it is also the worker's responsibility to communicate to the employer if and when the received training is felt to be inadequate or if other parameters have changed, causing the worker to lose confidence that the task at hand can be done safely.

Commanding Officers, Managers, Supervisors and Program Coordinators are responsible to ensure all policies and procedures are put in place and followed. This includes the purchase and installation of permanent fall protection, fall restraint and/or fall arrest equipment, the provision of certified personal protection equipment to employees, the provision of appropriate training, and the inspection of equipment and its proper use. Supervisors are also responsible for monitoring contractors who perform work on behalf of CCG in accordance with the DFO Health and Safety Manual, Chapter 6, Section 6.3.2 Contractor Selection.

The CCG must ensure that all contractors hired comply with all safety provisions, rules and regulations of this program.

Management is responsible for providing proper training and equipment as required by law whereas the field worker is responsible for following the safety instructions received.

Safety is a collective responsibility. Whenever work at height is required, the worker shall always monitor and visually inspect, note and record any possible deficiencies that might effect or compromise the current or future safe working environment.

Working at heights is dangerous. No worker shall be working at heights unsupervised, alone or out of visual/verbal contact whenever work is conducted that requires the use of Personal Protection Equipment (PPE).

Employees (including contract workers) are to exercise the necessary self-discipline to follow the requirements of the Fall Protection Program to reduce the risk of falling and personal injury. It is a paramount requirement for all to exercise due diligence in the performance of their duties and their work to ensure a safe work environment within the CCG. It is the worker's responsibility to ensure that:

- a) A supervisor is informed that work at height is to commence;
- b) That all equipment or systems are shut off, locked-out, or turned down that could potentially interfere with a safe working environment or where other potential hazards exist that might jeopardize health and safety. This includes but is not limited to:

- i) Working in the vicinity of antennas where the effective radiated power exceeds the safety limits as identified in [Health Canada's Safety Code 6](#),
 - ii) Where the proximity of a moving radar antenna(s) or other moving objects might cause a safety concern,
 - iii) Where the safety standards as identified in the [Canadian Aviation Regulations](#) does not allow for such activity when aircrafts and/or helicopters land or take off from the landing area,
 - iv) Working within the proximity of hot exhaust vents of generators, motors, boilers venting steam or other substances, gases or projectiles, and
 - v) Any other moving, vibrating, elevating or non-stationary objects, materials or substances.
- c) The current weather conditions allow for the work planned to be conducted safely;
 - d) Additional PPE and/or material or equipment shall be used to protect against wind, heat and snow if required; and
 - e) There are conditions that could develop where risks need to be re-evaluated (e.g.: strong winds, thunderstorms, lightning, heavy rain, freezing rain, inclement weather). Work shall be stopped if the worker experiences drowsiness, blurred vision, cramps, disorientation, extreme sweating, chills or any other symptoms that signal stress, fatigue or illness.

The Commissioner, who in turn is responsible through the Deputy Minister (DM) to the Minister of DFO, is ultimately accountable for the health and safety of all CCG personnel. It is the responsibility of upper management at headquarters to ensure that a properly constituted safety committee is in place and that appropriate directives are communicated to the various regions for the implementation of this Fall Protection Program and other safety programs.

4.2 SHIP RESPONSIBILITIES AND AUTHORITIES

4.2.1 General/Fleet Program

The responsibilities and authorities section of the Fleet Safety and Security Manual applies for the Fall Protection Program.

The Director, Fleet Safety and Security, is responsible for oversight of the national-level Fleet Fall Protection Program.

The Marine Superintendents are responsible for the oversight of the regional-level Fleet Fall Protection Programs.

4.2.2 Shipboard Personnel

It is the responsibility of the Commanding Officer or Master of the ship to ensure that all provisions of the Fall Protection Program as it relates to vessels are followed and implemented, that adequate training is provided, that proper safety equipment is available and periodically inspected, and that an up-to-date inventory list of fall protection equipment is maintained,

detailing all safety equipment used, inspected and repaired. Supervisors are responsible to ensure that proper safety equipment is provided and used correctly, and that training is provided. Supplementary and detailed steps and procedures are also identified in Section 13. *Health and Safety Training* and in Section 14 *Personal Protective Equipment and Clothing* of the DFO's Health & Safety Manual.

4.3 SHORE RESPONSIBILITIES AND AUTHORITIES

The Director of Engineering Services is responsible for the development, implementation, and ongoing oversight of the CCG Fall Protection.

Regional Superintendents are accountable for the execution of Regional Fall Protection Programs that must comply with regulatory requirements and conform to this CCG National Program. Regions shall assign a Fall Protection focal point within their management structure for managing their Programs; this shall include access to technical expertise in Fall Protection.

It is the responsibility of the supervisor to ensure that all provisions of the Fall Protection Program as it relates to land-based structures and towers are followed and implemented, that adequate training is provided, that proper safety equipment is available and periodically inspected, and that a up-to-date inventory list of fall protection equipment is maintained detailing all safety equipment used, inspected and repaired.

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Chapter 5 QUALIFICATIONS, TRAINING AND COMPETENCIES

5.1 QUALIFICATIONS AND TRAINING

5.1.1 General

Every person required to work at heights of 8 ft (2.4 m) or more shall be thoroughly familiar with all aspects of fall prevention, fall restraint and fall arrest systems and all of its components. In order to receive adequate training, qualifying the worker to safely engage in working at height, the theory of fall protection shall be supplemented through active field training; supervised by an experience rigger until the required level of confidence and expertise is obtained. This would enable the worker to carry out the required tasks when working at heights. Part II and Part III of this Fall Protection Program provide only the theory. Competence as a climber working at heights can only be achieved with adequate training, experience and ongoing awareness of new and existing regulations, by trusting the fall protection equipment deployed that is inspected before each climb. The worker should be in good health, fit, not easily frustrated, deliberate, methodical and cautious whenever aloft.

Training courses in fall protection shall be provided as follows:

- a) Overview training for executives and upper management;
- b) Fall protection training for commanding officers, supervisors and employees who climb and work at elevated heights;
- c) Competent Person training for qualifying selected personnel to perform specified inspections of fall protection equipment; and
- d) Rescue training to selected personnel.

5.1.2 Overview training

Overview training shall provide senior management with a review of:

- a) The Acts and Regulations requiring fall protection;
- b) CCG's fall protection program and how it complies with the Acts and Regulations; and
- c) Status on the implementation of CCG's fall protection program.

5.1.3 Fall Protection Training

Fall Protection training is required of all personnel who climb and work at elevated heights. They shall be trained in fall protection requirements, particularly personal fall arrest equipment, before their very first climb.

The CCG may also appoint, select, hire or contract qualified instructors familiar with safe climbing procedures, tower rescue, applicable codes and standards that are able to teach and instruct specifics in the specified areas of fall protection.

Fall protection training shall include, but not be limited to the following:

- a) Before-use inspection of personal fall arrest equipment;
- b) Before-use inspection of the permanent fall protection equipment on the structure to be climbed;
- c) Proper donning of one's full body harness;
- d) Fall distance calculations to determine lanyard lengths;
- e) Proper hook-up procedures, including D-ring security;
- f) Ensuring component compatibility;
- g) Alternate climbing procedures and the 100% connection rule;
- h) Self-rescue techniques;
- i) Recording; and
- j) Tower and Mast rescue

The various levels of required competence training for CCG personnel are shown in Annex H: Fall Protection Competencies.

5.1.4 Competent Person Training

Competent Person training shall provide extensive in-depth training in how to inspect both permanent and personal fall protection equipment in order to qualify the person to complete all annual and/or specified inspections. A Competent Person's training may, as required, be extended to include the use of rescue equipment and rescue techniques to enable the person to train other personnel in rescue procedures, and teaching techniques to enable the person to provide guidance to co-workers in the use of their equipment.

5.1.5 Rescue Training

Rescue training shall provide CCG employees with the knowledge and skills to use specialized/ dedicated rescue equipment to affect the rescue of a fallen co-worker.

5.1.6 Refresher Training

Refresher training shall be given to the employees once every three years. At the discretion of the Commanding Officer/Supervisor, refresher training may be provided more often if deemed necessary. Subject matter experts who provide the training and who have met the conditions required for a trainer shall be certified every five years.

5.2 COMPETENT PERSONS

This term is generally used in various standards and regulations for individuals trained to provide on-site expertise and guidance. With respect to fall protection, they are responsible for completing specified inspections of permanent and personal fall protection equipment. Competent Persons may be required to provide On-the-Job training to co-workers as necessary. Part II and Part III define the duties of a “Competent Person” in more detail.

5.3 FALL PROTECTION COMPETENCIES

This section specifies the competencies required by CCG personnel in fall protection. These competencies are consistent with the Competency-Based Management (CBM) program of the Public Service of Canada. CBM is a management system that ties the performance of its people to the organization's strategic goals, and CCG's strategic goal with respect to its Fall Protection Program is zero falls.

Competencies are normally thought to be knowledge, skills, and abilities. CBM extends competency to include the behaviour (i.e. attitude and performance) of an employee such that an employee helps to achieve the organization's strategic goals continuously through their daily effort and the organization, in return, facilitates the development of the employee to enhance and expand his/her overall abilities.

Tables containing the competencies in fall protection for CCG personnel, either by organizational level of responsibility or by occupation, are attached at Annex H. The Qualification Standard column lists the training prescribed in this Fall Protection Program; this training may be satisfied by either CCG or commercial sources. Note that the competencies required of a Competent Person include both those listed for a Competent Person and also those listed for a Climber

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Chapter 6 FALL PROTECTION PROCEDURES / REQUIREMENTS

The Fall Protection Plan is a methodological approach that, if followed, aims to ensure the safety of workers when working at heights. This can only be achieved if the worker is familiar with safety procedures, basic provisions of applicable standards and trained in the proper use of the safety equipment to be deployed.

The Plan requires the worker to have a good general understanding of basic minimum equipment standards as it pertains to permanent fall arrest, fall restraints and fall prevention systems, to recognize defects and to be able to check for damaged or expired Personal Protective Equipment (PPE). Following the plan will enable the worker to assess any potential work hazards correctly before attempting to install, repair, maintain or replace damaged part(s) or component(s) at elevated heights.

The Plan is not designed to eliminate risks that are inherently associated with working at heights but rather, to reduce the risks to a manageable and safe level.

The addition of permanent fall protection equipment to ships and land based structures and, in particular, aging tower replacement to meet CLC Regulations and CSA Standards is an on-going initiative, and where it is necessary to climb a ship/structure that is not yet compliant, special authorization and climb instructions must be obtained first from the Commanding Officer/Regional authorities.

The Fall Protection Program is one of many programs within CCG that has occupational health and safety requirements associated with it. The DFO Health and Safety Manual and the Fleet Safety and Security Manual are the governing documents for all health and safety requirements within CCG. Accordingly, periodic health evaluations, first aid and CPR training, as set out in the OHS Loss Control Manual, are required for employees who work and climb as part of their duties.

Part II: Land-Based Fall Protection for Structures and Towers contains equipment and system definitions as well as climbing instruction, safety considerations, training and rescue instructions and explains safe climbing procedures for land-based towers and structures.

PART III: Ship-based Fall Protection focuses on all fall protection elements and expands on those areas that are unique to a maritime environment on board of ships.

The objectives of the Canadian Coast Guard's Fall Protection Program is to identify who is responsible for what part of the program, how the implementation of ongoing, well structured training can be made possible, what that training should contain and what needs to be done to ensure compliance with governing rules and regulations.

Part II, Land-based Fall Protection for Structures and Towers and Part III, Ship-based Fall Protection are organized in an easy-to-read and intuitive format that will enable the reader to:

Fall Protection Procedures / Requirements

- a) Understand the concept of Fall Protection, Fall Restraint and Fall Arrest systems and how to use them;
- b) Become familiar with Personal Protection Equipment, its components and their specifications and know how to use and inspect it;
- c) Learn about rigging accessories, their required specifications and how to use them;
- d) Do a initial risk assessment and if required, remove or address potential hazards before climbing; and
- e) Become familiar with basic rescue techniques.

This CCG Fall Protection Standard is intended to be used in conjunction with or supplementary to class-room and/or field instructions where the proper use of PPE, anchor points, safety rails or horizontal life lines as well as rescue plans can be clearly demonstrated.

Safety can only be insured through ongoing dialogue and communication between the field worker, reporting back on field safety procedures and equipment conditions encountered. Local supervisors and managers in turn have to compile, evaluate and process field data to senior administration on an ongoing basis. Headquarters in turn has to respond by amending policies and guidelines periodically and when special circumstances require the updating of policies and/or the need for specific action.

Chapter 7 EMERGENCY PREPAREDNESS / RESCUE AND RESCUE PLAN REQUIREMENTS

A rescue plan is a mandatory requirement of the fall protection program and shall be established for all types of work at each location where work at elevated heights is to be undertaken. Rescue plans are to address the following main requirements:

- a) Established and practiced rescue plans for potential rescue situations;
- b) Documentation;
- c) Rescue equipment and systems (including back-up systems);
- d) Rescue scenarios; and
- e) Rescue training.

Self-rescue is the optimum rescue scenario, however, in the event the worker is injured and self-rescue is not possible, rescue must be effected by other means.

Ship's crews and land-based work crews assigned to remote sites or in areas where professional rescue services (e.g. Fire Departments with high angle rescue capability) are not readily available shall be trained in rescue techniques and shall be deployed with rescue equipment to facilitate as rapid a rescue as possible.

Commanding Officers are responsible for establishing and documenting ship specific rescue plans. Regional authorities are responsible for establishing and documenting specific land based installation rescue plans.

Part II and Part III define rescue in detail and address different rescue scenarios.

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Chapter 8 ACCIDENTS, INCIDENTS, PREVENTION, INVESTIGATIONS, AND REPORTING

Good documentation, clearly defined rules, regulations and standards combined with thorough training using code compliant equipment are the first steps in preventing accidents

All accidents and incidents shall be reported, documented, filed and processed according to the rules and guidelines of the various standards and regulation identified in the Canada Labour Code, Part II and/or as complemented by standard CCG Accident Investigation and Prevention procedures.

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Chapter 9 EQUIPMENT MAINTENANCE, INSPECTION, AND PURCHASING

9.1 MAINTENANCE, INSPECTION

All fixed equipment forming part of a fall prevention, fall restraint or fall arrest system shall be thoroughly inspected at least once a year and visually inspected before/during each climb. The 100% connection rule shall be applied whenever in doubt as to the integrity of any part of a permanent fall arrest system. All personal fall protection equipment such as harnesses, lanyards, connecting hardware, etc. shall be inspected before each use and documented using its own inspection sheet. If the equipment is found to be defective, it shall be taken out of service and documented by a competent person. All fall arrest equipment that has been used to arrest a fall shall be inspected and disposed of if necessary.

9.2 PERIODIC MAINTENANCE

Periodic maintenance of permanent fall protection equipment shall include the tightening of nuts and bolts of the fall protection/arrest system or any components thereof, cracked rails or mounts, the wire-brushing of rusted parts and the re-galvanizing of any exposed steel with zinc rich paint or other rust inhibitor. Safety rails should be checked for wear, rail splice joints realigned where required, cable tension adjusted when and if needed and all defects, deficiencies and remedial action should be recorded.

9.3 PURCHASING

Purchasing of fixed and personal fall protection equipment shall be done at the regional/local level for land based requirements through the supervisor and through the ship's commanding officer for vessels. Fall protection equipment is site and person specific and all purchases shall be made subject to the national policies of the CCG as outlined in this document. All equipment used and purchased in the fall protection program shall meet all of the applicable standards (CSA) that are explained in details in Part II and Part III.

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Chapter 10 DOCUMENTATION, RECORDS, AND REPORTING

All details regarding fall protection equipment, maintenance, inspection and repair shall be recorded and documented in detail. All accidents, incidents or concerns expressed by working personnel using safety equipment shall also be noted and acted upon if deemed necessary. Good record keeping ensures that typical problems with equipment can be identified, will aid in tracking the anticipated useful life cycle of the equipment and aid in budgetary forecasting.

Additional requirements for proper records and recording of all issues related to fall protection are contained in Part II and Part III under Records and also under Fall Plan Requirements. Standard CCG Accident Reporting requirements also apply.

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Chapter 11 PROGRAM REVIEW, AUDIT, AND CHANGE PROCESS

11.1 REVIEW

CCG Headquarters shall periodically chair a meeting with Regional participation to review this Fall Protection Program to ensure it is relevant and up-to-date with regulations, standards, and best practices. In conjunction this review of the Program, CLC and CSA, 2001 Regulations, and CSA Standards shall also be reviewed for changes affecting CCG's Fall Protection Program. This meeting shall also include continual improvement and review of accidents/incidents as part of the agenda

11.2 AUDIT

The National and Regional programs are subject to external and internal audits.

11.3 CHANGE PROCESS

Change requirements shall normally be processed as part of the periodic review, and recommended by national-level coordinators (Director, Fleet Safety and Security for Ships and/or Director of Engineering Services for Land-based), but the approval shall be done through a national committee. High priority changes shall be addressed as soon as possible.

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Annex A TERMS AND DEFINITIONS

Anchorage/ Anchor Point	A secure connecting point capable of withstanding the impact forces as result of a fall. By their very nature they are considered permanent fall protection equipment as well as a component of personal fall arrest equipment.
ANSI	American National Standards Institute
Boatswain's chair	A seat attached to a suspended rope, designed to accommodate one person in a sitting position to facilitate work.
CSA	Canadian Standards Association
CSA,. 2001	Canada Shipping Act, 2001
Competent Person	An individual knowledgeable in fall protection and manufacturer's recommendations, who can advise on the proper use of equipment, can recognize and evaluate the condition of equipment in order to complete an inspection and certify its acceptability for use.
Certified	Equipment meeting the requirements of a Standard as attested by a certification organization or other institution
Climber	A worker skilled and trained working at heights.
Energy Absorber	A device that dissipates kinetic energy, limits deceleration forces during fall arrest, and does not return the kinetic energy to the system or into the human body.
Fall Arrest Equipment/ System	A combination of components, when used together, constitutes a system to arrest a free fall. Components include anchorages, connecting devices such as buckles, 'D'-rings, and snap hooks, lanyards, shock absorbers, deceleration devices, and full body harness.
Fall Restraint Equipment/ System	A variety of devices (barriers, guardrails, work positioning lanyards) used to prevent a fall from occurring.
Fall Safety Margin	An unobstructed clearance below the worker at the point where the fall has been stopped, used in establishing the minimum clearance requirement during a fall.
Flexible Horizontal Lifeline	A horizontal line generally constructed of flexible material such as wire rope, fibre rope, or webbing.
Free-fall Distance	The vertical displacement of the fall-arrest attachment point on the full body harness (normally the dorsal D-ring) from the time a fall begins until the moment just before the system begins to react by applying force to arrest the fall.
Full Body Harness	A part of personal fall protection equipment composed of webbing/straps, padding, connecting hardware and, in some cases, integral shock absorbers. It serves to both position the user and distribute forces over the

body in the event of arresting a fall.

Hardware	A generic term for components such as snap hooks, D-rings, buckles, carabiners, that connect items of fall protection/fall arrest systems together; e.g. a full body harness to other fall protection equipment such as fall arrestors, cable grabs, etc.
Lanyard	A flexible line or strap used to secure a full body harness to a fall arrester, an energy absorber, a horizontal lifeline, or an anchorage connector.
Lifeline	A flexible line (may be wire rope/cable, synthetic fiber, or webbing) for connection to an anchorage(s) and to hang vertically (VLL) or to span horizontally (HLL).
Qualified Person	An individual who has successfully demonstrated the ability to complete the subject matter work, and solve/resolve problems related to the subject matter by possessing a recognized degree or certificate of professional standing, or by extensive knowledge, training and experience.
Regional Authority	The Regional Authority may be an individual within a Region's headquarters, a supervisor, or any other person who has been empowered by CCG by virtue of their position to exercise responsibility, technical or otherwise, of a particular function and, consequently, can approved/disapprove elements of that function.
Safe Level/ surface	An area of sufficient size and strength to adequately support a person at work or a person who falls and is sufficiently horizontal to prevent a further fall.
Scaffold	An elevated or suspended work platform supported in a number of different ways – the ground, brackets, ropes, or other means. Scaffolds may have permanently or temporarily affixed guardrails.
Self-retracting lanyard (SRL)	A device that provides a means of connecting a worker to an anchorage/anchor point that automatically adjusts its length under light tension as the worker moves toward or away from the anchorage, and is capable of stopping a fall.
Swingstage	A type of suspended scaffold/work platform usually supported by two ropes.
Travel Restraint System	An assembly of components that, when properly assembled and used together and when connected to a suitable anchorage, prevents a worker from reaching an unprotected edge or opening where a fall could occur.
Work Positioning System	An assembly of components that, when properly assembled and used together, supports a worker in a position or location so that the worker's hands.

Annex B RISK ASSESSMENT MATRIX

B.1 BACKGROUND

In December 2006, the Canadian Coast Guard (CCG) approved the final revision of the CCG's Fall Protection Program.

Based on feedback from the regions combined with headquarters' aim to further solidify a truly national program that stresses safety when working at heights, a new initiative was launched in 2007 which aimed to enhance and complement the CCG's Fall Protection Program of December 25, 2006

The called-for revisions specifically outlined the need to expand its ship-based fall protection program and address the unique conditions that prevail in a maritime environment. As part of the development of this program, the CCG is required to conduct a risk assessment considering the dynamic conditions found on ships at sea. To satisfy this requirement, a Risk Assessment Matrix (RAM) has been developed.

This RAM will focus on three specific ships which are to be considered typical examples of a small, a medium, and a large vessel, representative of the current fleet. Specifically the three candidate vessels are; *CCGC W. Jackman*, *CCGS Cygnus*, *CCGS Henry Larsen*.

To focus the investigation of the RAM tasks and activities relating to eight work areas of concern were considered. The tasks were developed to be specific to the three vessels identified for the assessment by the methods outlined in the RAM.

The dynamics of the three vessels in various sea conditions were assessed to develop sufficient motion and acceleration data upon which to assess the risk. In addition, the severity and likelihood of a fall at the various areas was categorized. The combination of inputs was used to develop an overall fall-risk classification that has been separated into three risk zones; acceptable, alarm, and unacceptable. The results for the three select ships are presented in series of colour coded tables.

B.2 APPROACH AND METHODOLOGY

A semi-quantitative approach considering different vessel specific locations and varying sea conditions was adopted to address and quantify the risk associated with each designated activity. Risk was assessed using likelihood of fall which is dependent on sea state, local acceleration at the point of interest, and on weather conditions. The severity of the fall is related to location and task being performed.

In current guidelines it is assumed that maintenance activities are being completed using standard operating procedures for which personnel are deemed trained, equipment is well-maintained and in proper working order, and that personnel are using fall protections gear.

It should be noted that if heavy specialized tools and/or chemicals are used during each task, then the assigned severity factor may change significantly. These cases can be evaluated on an individual basis using the method outlined in this assessment as a template.

To provide acceleration data for the vessels of interest, motions and accelerations at several locations were computed for three sea states, two headings, and two ship speeds. This data set will provide means to assess the effect a wide range of vessel operational scenarios on the associated risk of conducting a specific task.

For a given ship, the combination of scenarios against which the associated risk of a fall may be assessed is enormous given the vast operational profiles of each vessel and the different tasks and associated areas on each ship. The intention of this risk assessment matrix is to provide an indication of the risks associated with particular tasks on specific vessels as an example of the method and the applicability to this method to the assessment of risk.

The robustness of the provided method will be assessed using examples of inter- and intra-ship results which will provide insights into the range of applicability of the method to a broader range of scenarios and vessels.

B.3 THREE VESSEL TYPES

For this assessment, three individual ships considered to be representative as typical of the fleet were selected. The three specific vessels were chosen in close consultation with the CCG and are intended to broadly represent three vessel sizes; small, medium, and large. Given the variety of vessels that make up the current CCG fleet, this approach was deemed to be satisfactory for the intended purpose of this investigation.

The specific ship selected to be representative of the small vessels in the current CCG fleet is the *CCGC W. Jackman*. This vessel is a purpose-built search and rescue lifeboat based in Burin, NL. The vessel was built in 1994 and has a typical compliment of four persons during routine operations. Further information on *the CCGC W. Jackman* is provided in way of the CCG specification sheet for the vessel as replicated in Appendix A and an image of the vessel is shown in Figure 1.



Figure 1 CCGC W. Jackman

The vessel, *CCGS Cygnus*, was selected to be the moderately sized vessel for the assessment. The *CCGS Cygnus* is an offshore patrol vessel based in St. John's, NL with a typical complement of 17 and routinely operates in a wide variety of sea conditions in support of science, rescue, and the primary mission of fishery patrol and observation. An image of the vessel is given in Figure 2 and a copy of the CCG specification sheet for the *CCGS Cygnus* is provided in Appendix A.



Figure 2 CCGS Cygnus

The arctic icebreaker, *CCGS Henry Larsen*, has been selected as the representative large vessel for this investigation. This vessel was custom built in 1987 for operations in the Canadian arctic, is based in St. John's, NL with a typical operational compliment of 31 persons. A specification sheet for the *CCGS Henry Larsen* is given in Appendix A and an image has been provided in Figure 3.



Figure 3 CCGS Henry Larsen

B.4 WORKING AREAS

For the purpose of the fall-aboard risk assessment on the three subject vessels, eight working areas were considered.

- a) Ladders and stairways;
- b) Masts and mast platforms;
- c) Funnels and stacks (inside and out);
- d) Manholes and hatches;
- e) Decks;
- f) Machinery spaces;
- g) Ships side; and
- h) Gangways and boarding ladders.

B.5 TASK ANALYSIS

A summary of the relevant task analysis for the three specific ships and each of the eight areas of concern is provided below.

AREA OF CONCERN:	SHIP TYPE:		
	CCGS Henry Larsen	CCGS Cygnus	CCGC W. Jackman
1 - Ladders	Fixed ladders will be found leading up to mast platforms, down into holds and in the way of escape hatches leading out of internal compartments such as the motor room. Other area of the ship will be accessed through stairs. Portable ladders may be used to access davits, vertical sides of the superstructure or stack or hangar for the purpose of washing and painting.	Fixed ladders are common throughout for access to most spaces, although access between internal levels of the accommodations, and access to the engine-room will be by stairs. Portable ladders are frequently used to access various parts of the house, stack, smaller mast platforms and davits for the purpose of routine maintenance	Only the main mast will be fitted with a fixed ladder. Portable ladders are used often to climb in and out of the boat from a higher dock, or ship.
2- Masts and Mast Platforms	The main and secondary masts carry numerous and usually fairly spacious platforms, used for the carrying of radar antennae, and other communication gear, wind and weather instrumentation, ice-breaking siren and fog horn, and searchlights. Usually fitted with proper railings. Rarely used by crew whilst underway. Often used by shore-based electronic technicians in port.	Fewer and smaller masts, the smaller after mast used mostly for the carrying of navigation lights. Their platforms are smaller, with the uppermost not fitted with railings, and not large enough to stand on. For radar, satellite and radio antennae. Rarely used whilst underway.	Small mainmast only. It has very small platforms, with no railings. For the carrying of the radar antennae, searchlight and Radio Direction Finder. Not used whilst underway.

AREA OF CONCERN:	SHIP TYPE:		
	CCGS Henry Larsen	CCGS Cygnus	CCGC W. Jackman
3 – Funnels and Stacks	This vessel type will have a large and streamlined funnel which presents a considerable flat area that must be maintained clean and painted. It does have access doors at its base that lead onto internal ladders down into the Engine-room, and up into the stack. On this ship, the funnel is fitted with an external ladder leading to a platform on a mast adjacent to it and carrying a satellite dish.	Smaller, but still large funnel housing Engine-room exhausts and some ventilation equipment. Fitted with ladders on the inside.	This smaller ship has no funnel as the engine exhausts are out through the stern, at or slightly below the water-line
4- Manholes and Hatches	This vessel will have numerous examples of each. Hatches are used as escape routes from internal compartments, and for the passage of cargo, gear and supplies from the deck to the holds, which are deep and store-rooms. These hatches will be guarded by either permanent coamings or by portable railings. Manholes are used predominantly to access watertight compartments for the purpose of cleaning and maintenance.	The hatches here are used mostly for loading/unloading stores, supplies and gear from the hold forward or as escape routes from internal compartments, few of which are in excess of 2.4m. The main hatch is guarded by a coaming. The double-bottom tanks, fore and aft peaks and water and fuel tanks are access through manholes with bolt-on covers that lift free.	This small vessel will have a hatchway leading into the very small engine space. Manholes will provide access to tanks and floatation compartments. All are small, crowded and less than 2.4m in depth.

AREA OF CONCERN:	SHIP TYPE:		
	CCGS Henry Larsen	CCGS Cygnus	CCGC W. Jackman
5- Decks	The decks, both inside and out, are wide, spacious and well protected with handrails (on the inside) and guardrails or bulwarks (on the outside). Even the Engine-room will have decks that are well guarded and sufficiently wide to allow for easy passage.	The decks on the inside are narrower, usually allowing for a tight squeeze when meeting or crossing someone else. The outside decks are large, spacious and well-protected by railings. The Engine-room has a crowded and mostly unguarded deck around a variety of machinery.	Essentially a one-deck ship with narrow passageways, both inside and out. The outside decks are protected with a combination of steel wire and pipe railings. The wire railings can be dropped to facilitate the recovery of people in the water or in small boats.
6-Machinery Spaces	This ship has a number of spaces, each of which is quite large: engine-room, motor room and generator room. It also has an air-bubbler compartment, shaft tunnels, a workshop and steering gear flat. Most of the moving machinery is covered by a solid deck or by fairly wide and well-guarded walkways.	The ship's engine-room is smaller and more crowded, with narrow walkways over the main engines. It also has shaft tunnels and a steering gear compartment.	The engine space is very tight with access gained through a hatch in the interior space. This compartment is only accessed for maintenance or repairs, and is normally not manned while underway.
7-Ship's Side	The vessel's hull is normally maintained by contractors during dry-dockings. There is little activity over the side other than during the launching and recovery of small boats.	The crew will often work over the ship's side to chip, paint or wash the hull. This is now more often done with the use of scissor-lifts, "cherry-pickers" and other mobile platforms while the ship is secured alongside a wharf, but temporary structures such as bo'sun chairs and stages are still used sometimes.	Hull maintenance is normally done with the vessel out of the water, but can also be carried out from a small open boat secured alongside at a berth or secure anchorage.

AREA OF CONCERN:	SHIP TYPE:		
	CCGS Henry Larsen	CCGS Cygnus	CCGC W. Jackman
8- Gangways, and boarding ladders	The vessel employs a large, stable gangway for the movement of personnel to and from the shore. At-sea personnel transfers are done mostly with the use of the ship-borne helicopter, but small boats may be employed. The latter involves the use of rope ladders. The ship is also fitted with a fairly large hinged embarkation (pilot) ladder that can be brought down the ship's side almost to the water-line to facilitate the coming aboard from small boats. That is normally only used with the vessel at a safe anchorage.	The ship-to shore gangway complies with the applicable regulations and is quite satisfactory in most cases. While berthed at high docks where there are high tidal ranges, the gangway requires constant attention and possible shifting to ensure that it does not become unacceptably steep. At-sea transfers are done by boat with the use of Jacob's ladders.	The small size of the boat, its propensity to secure at a great variety of docks, from small floating finger wharfs to large commercial docks, makes the use of acceptable gangways a problem. Ship-shore personnel movement is often accomplished by the use of portable aluminum ladders or dockside climbing ladders. The use of safety nets is often impractical. At-sea transfers to a small boat are achieved by stepping off the relatively low deck into the boat.

B.6 MOTION ANALYSIS

B.6.1 Introduction

To provide input for the risk assessment matrix, the motions of the three candidate vessels were assessed. The motion and acceleration data for this study of the three vessels was generated by Motion Analysis Program Suite (MAPS), Memorial University's in-house seakeeping prediction code. This code is a linear frequency-domain seakeeping program based on solving designualized integral equations. It simulates vessel motion in six degrees-of-freedom, with zero or forward speed, in any wave conditions. The code has the ability to model multi-ship interaction as well as roll stabilization systems, including roll stabilization fins and bilge keels. Given that the source code was available, modifications were made to the program as necessary in order to address any special circumstances.

Motions and accelerations at the centre of gravity and other locations are computed for three sea states, two headings, and two ship speeds. The response of each vessel to the environmental conditions was assessed in the absence of any active or passive motion mitigation systems or devices. Thus the predictions are to be considered conservative should such systems or devices be utilized by either of the candidate ships.

B.7 PARAMETERS FOR EVALUATION

B.7.1 Geometry

The geometry of the three vessels, the *CCGC W. Jackman*, the *CCGS Cygus*, and the *CCGS Henry Larson*, as developed for use by the simulation program, is given in Figure 4, Figure 5, and Figure 6.

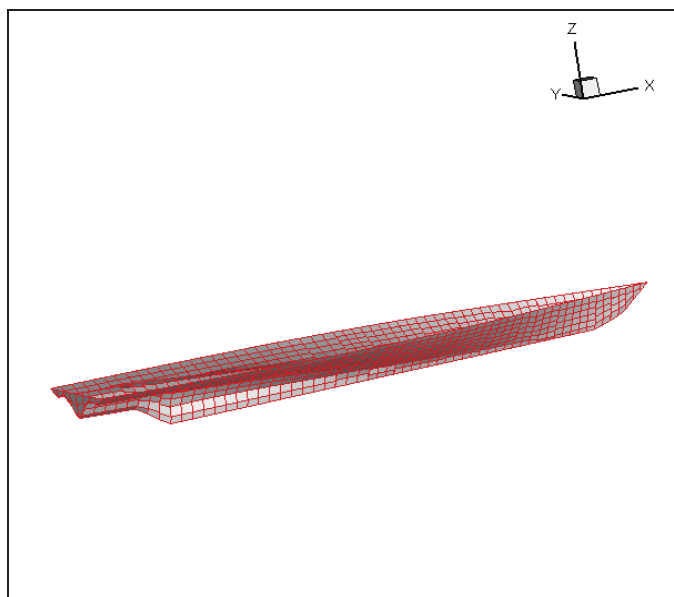


Figure 4 Panelized Geometry of CCGC W. Jackman

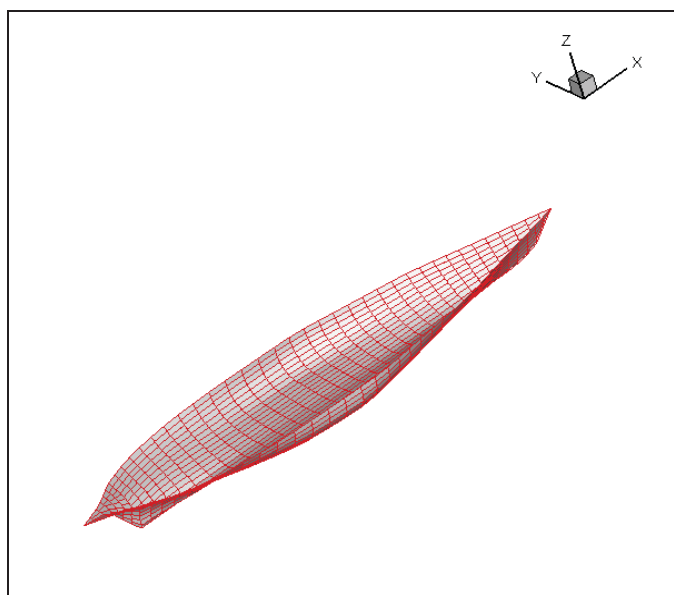


Figure 5 Panelized Geometry of CCGS Cygnus

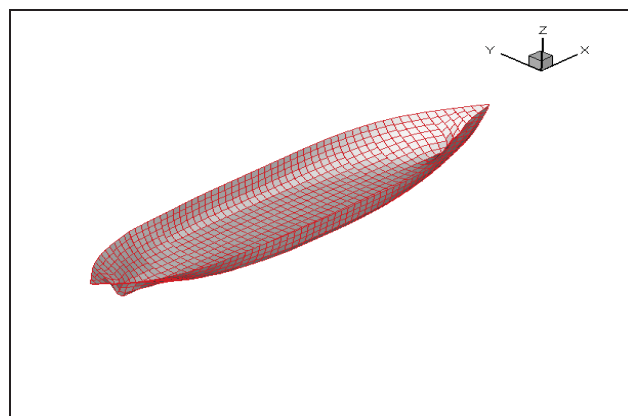


Figure 6 Panelized Geometry of CCGS Henry Larsen

B.7.2 Vessel Loading Conditions

For this assessment, one loading condition of each ship was examined. Vessel particulars and details of the loading condition are provided in Table 1. Since specific radii of gyration were not available for the three ships, estimations were made. The pitch and yaw radii of gyrations were estimated as $0.25L_{pp}$ and roll radius gyration as $0.35B$, which is regarded as an acceptable empirical means to estimate these values for this type of vessel.

Table 1 Vessel Particulars as Used in the Computations

Item	<i>CCGC W. Jackman</i>	<i>CCGS Cygnus</i>	<i>CCGS Henry Larsen</i>
Length overall (m)	15.77	61.0	99.8
Length BP(m)	14.0	57.0	93.0
Breadth.(m)	5.18	12.2	19.5
Depth (m)	2.0	8.0	13.8
Draught @ midships(m)	1.1	4.00	7.237
Displacement (tonnes)	15.5	1230.0	8097.5
KG (m, abl)	1.1	4.9	7.237
LCG (m, fwd of midship)	-0.61	-2.2	-0.5
Roll radius of gyration r_{xx} (m)	1.81	4.27	6.83
Pitch radius of gyration r_{yy} (m)	3.5	14.25	23.25
Yaw radius of gyration r_{zz} (m)	3.5	14.25	23.25

B.7.3 Heading and Wave Environment

Simulations were completed in irregular waves using a JONSWAP spectrum with peak enhancement factor of $\gamma = 3.3$. Two headings, 180° (head seas) and 90° (beam seas), three sea states, and two forward speeds are considered for each ship. Particulars for selected wave conditions are presented in Table 2. All simulations were made using salt water with density ($\rho = 1.025 \text{ t/m}^3$). The motions and accelerations were calculated for the centre of gravity and six other locations on each ship. The six locations (apart from the centre of gravity) were selected to provide suitable variation of location, and subsequent motions, in the data for each vessel. For each vessel the alternate locations of interest are:

Location 1 - A point 25% x L AFT of Centre of Gravity at the side of the ship.

Location 2 - A point 25% x L FWD of Centre of Gravity at the side of the ship.

Location 3 - Bow Extreme on centreline on the foredeck.

Location 4 - Extreme stern AFT deck edge at the side of the ship.

Location 5 - Wheel House at extreme bridge wing.

Location 6 - Highest Mast Platform on vessel centerline.

The specific coordinates of the six locations for each of the three vessels are listed in

Table 3.

Table 2 Heading and Wave Environment Parameters

Environment No.	Sea State	Spectrum	H_s (m)	T_p (sec)	Speeds (knots)	Headings (deg)	Water Depth (m)
Case 1	SS 3	JONSWAP, $\gamma = 3.3$	0.88	7.5	0	180	Deep
Case 2					0	90	
Case 3					10	180	
Case 4					10	90	
Case 5	SS 5	JONSWAP, $\gamma = 3.3$	3.25	9.7	0	180	Deep
Case 6					0	90	
Case 7					10	180	
Case 8					10	90	
Case 9	SS 7	JONSWAP, $\gamma = 3.3$	7.5	15.0	0	180	Deep
Case 10					0	90	
Case 11					10	180	
Case 12					10	90	

Table 3 **Coordinates of Locations Evaluated (other than centre of gravity)**

Location	CCGC W. Jackman			CCGS Cygnus			CCGS Henry Larsen		
	X (m from MS)	Y (m from CL)	Z (m above WL)	X (m from MS)	Y (m from CL)	Z (m above WL)	X (m from MS)	Y (m from CL)	Z (m above WL)
1	3.75	2.5	1.0	14.0	7.3	4.0	25.0	9.8	9.0
2	-3.75	2.5	1.0	-14.0	7.3	4.0	-25.0	9.8	9.0
3	7.5	0.0	1.0	28.0	0.0	4.0	49.5	0.0	9.0
4	-7.5	0.0	1.0	-28.0	0.0	4.0	-49.5	0.0	9.0
5	1.5	2.5	2.0	10.0	7.3	10.0	20.0	9.8	15.0
6	-1.5	0.0	9.0	-10.0	0.0	18.0	-20.0	0.0	20.0

B.8 SIMULATION RESULTS

A complete set of results for the simulations is provided in Appendix B. For each vessel, results are presented in six degrees-of-freedom (surge, sway, heave, roll, pitch, and yaw) for the centre of gravity and the vector motions and accelerations (surge, sway, and heave) are given for the six alternate locations. It should be noted that while the acceleration values are the primary inputs for the risk assessment matrix, the absolute motions are of interest when considering the details of fall protection equipment and attachments. In particular the simulation results provide roll and pitch angles for each simulation. These values can be used when accessing range of freedom of fall protection equipment or to assess specific locations of attachment points.

The results of the simulations have been presented as motion and acceleration in root mean square (RMS) values. The statistical quantities in Table 4 can be applied if additional analysis is required. As outlined in this table, the significant single amplitude (SSA) corresponds to the mean $\frac{1}{3}$ highest amplitude value. To get peak-to-peak values, the relationships in the table must be multiplied by an additional factor of two. These relationships are given under the normally accepted assumption that the wave and motion spectra follow a Rayleigh distribution.

Table 4 **Statistical Relationships**

Statistical Quantity	Relationship
Mean 1/3 Highest Amplitude (i.e. SSA)	2.0 x RMS
Mean 1/10 Highest Amplitude	2.545 x RMS
Mean 1/100 Highest Amplitude	3.336 x RMS

B.9 RISK ASSESSMENT MATRIX

These guidelines were developed considering different locations and also different sea state. Risk was assessed using likelihood of fall which is dependent on sea state, acceleration, and weather condition. Severity of the fall was related to location and task being performed. In current guidelines we assume that maintenance activities are being completed using standard operating procedures for which personnel are deemed trained, equipment is well-maintained and in proper working order, and that personnel are using fall protections gear. If heavier specialized tools and/or chemicals are used, then severity may change significantly.

In present study severity and likelihood are classified in five categories. They are combined to associate risk which is described in the overall fall-risk classification. This associated fall-risk classification and matrix clearly indicates acceptable, unacceptable, and alarm regions.

In present study severity is classified considering six locations on the vessel and also described activities/area of concern. Likelihood will remain dependent on sea condition and weather.

B.9.1 Fall Severity

The severity of a fall is primarily dependant on the area on the ship being considered. For inclusion in the overall risk-classification the severity of a fall has been separated into five categories based on the six vessel specific locations and the eight areas/activities that have been considered. The resulting fall severity scale is provided in Table 5 in which a value of one is considered negligible and five is fatal.

Table 5 Fall Severity Scale by Location and Area

Location	Ladders	Mast and Mast Platform	Manholes and Hatches	Funnels and Stacks	Decks	Machinery Space	Ships Side	Gangways and Boarding Ladders
1	2	2	2	3	1	1	3	3
2	2	2	2	3	1	1	3	3
3	3	3	3	4	2	2	4	4
4	3	3	3	4	2	2	4	4
5	3	3	3	4	3	3	5 (N/A)	5 (N/A)
6	4	4	4	5	3	3	5 (N/A)	5 (N/A)

B.9.2 Fall-Likelihood

The likelihood of a fall during an activity is mostly dependant on overall environmental conditions as both the response of the vessel and the ability of a person to maintain a hold (grip or footing) while aboard a vessel are environmentally dependant. The response of the vessel will be directly affected by the wave environment (sea state) and the interdependency of the vessel heading and speed on the overall response are the key factors influencing the resulting motion and

accelerations. Of the responses of the vessel to the environment, acceleration is the primary factor as it significantly affects the ability of a person to hold on or to remain in place. As a result the acceleration is a primary influence on the fall-likelihood scale as outlined in Table 6. The scale ranges from one to five with one being considered remote and five considered as likely. It should be noted that the acceleration used in the assessment is the combined vectored acceleration of the three unidirectional (longitudinal, lateral, and vertical) acceleration values predicted for each vessel and environmental condition.

In addition to acceleration, weather conditions will be a factor in the likelihood of a fall; this is reflected in the fall-likelihood scale. Here, two primary weather conditions are indicated, warm and cold/wet, each with the affect on the fall-likelihood scale adjusted to suit.

Table 6 Fall-Likelihood Scale

Sea state	Acceleration	Weather	Fall Likelihood scale
<3	0.1g-0.25g	Warm	2
3	0.25g-0.50g	Warm	3
5	0.5g-0.9g	Warm	4
>7	=>0.9g	Warm	5
<3	0.1g-0.25g	Cold and Wet	4
3	0.25g-0.50g	Cold and Wet	5
5	0.5g-0.9g	Cold and Wet	5
>7	=>0.9g	Cold and Wet	5

B.9.3 Fall-Risk Classification

Using the method presented, the fall-risk associated with any activity can be classified into one of three regions, acceptable (green), alarm (yellow), unacceptable (red). The risk of fall while doing an activity is estimated by the product of the fall severity and the likelihood of a fall occurring for the environmental and weather conditions and the location and area on the vessel to be considered. As both the fall severity and the fall likelihood have been divided into five sub-classes therefore the overall fall classification scale is from one to twenty five. This is graphically represented below.

		<i>Consequence of Fall, injury severity</i>				
		Negligible (1)	Marginal (2)	Significant (3)	Critical (4)	Fatal (5)
<i>Likelihood of Fall</i>	Remote (1)	1	2	3	4	5
	Rare (2)	2	4	6	8	10
	Unlikely (3)	3	6	9	12	15
	Possible (4)	4	8	12	16	20
	Likely (5)	5	10	15	20	25

Red area:	Unacceptable Region
Yellow area:	Alarm region, need measure to reduce risk
Green area:	Acceptable Region

For the purposes of providing a generalized semi-quantitative estimate of the risk associated with activities in each of the eight areas on board a vessel, locations for which motion data was available was matched to each activity area. A summary of the activities assigned to each location for the three vessels is provided in Table 7. It should be noted that this matching of activity areas to location on each vessel is provided as an example only and alternate scenarios may be calculated on a case by case basis.

Table 7 Assignment of Location of Activity Per Vessel

Vessel	Ladders	Mast and Mast Platform	Manholes and Hatches	Funnels and Stacks	Decks	Machinery Space	Ships Side	Gangways and Boarding Ladders
Jackman	5	6	3	6	4	1	2	1
Cygnus	5	6	3	6	4	1	2	1
Larsen	5	6	3	6	4	1	2	1

B.9.4 Overall Fall Risk – CCGC W. Jackman

In order to provide an example of the a classification of the risk associated with conducting the tasks outlined in the eight assigned areas aboard the *CCGC W. Jackman* were assigned to vessel specific locations for which motion data was available as is presented in Table 7. Based on these inputs the resulting risk classification by sea state and heading will be as in indicated in Table 8 for warm weather and as in Table 9 for cold and wet weather.

Table 8 Overall Risk Classification - Warm Weather - CCGC W. Jackman

Sea State	Heading	Speed (knots)	Ladders	Mast and Mast Platform	Manholes and Hatches	Funnels and Stacks	Decks	Machinery Space	Ships Side	Gangways and Boarding Ladders
SS3	Head	0	3	4	3	5	2	1	3	2
SS5	Head	0	3	4	6	5	2	1	3	2
SS7	Head	0	3	4	6	5	4	1	3	2
SS3	Beam	0	3	8	3	10	2	1	3	2
SS5	Beam	0	3	12	3	15	2	1	3	2
SS7	Beam	0	6	12	6	15	2	2	6	4
SS3	Head	10	6	8	6	10	4	2	3	4
SS5	Head	10	9	12	9	15	6	3	6	6
SS7	Head	10	9	12	9	15	6	3	6	6
SS3	Beam	10	3	8	3	10	2	1	3	2
SS5	Beam	10	6	12	6	15	2	1	3	2
SS7	Beam	10	6	12	6	15	2	2	6	4

Table 9 Overall Risk Classification - Cold Weather - CCGC W. Jackman

Sea State	Heading	Speed (knots)	Ladders	Mast and Mast Platform	Manholes and Hatches	Funnels and Stacks	Decks	Machinery Space	Ships Side	Gangways and Boarding Ladders
SS3	Head	0	9	12	9	15	6	3	9	6
SS5	Head	0	9	12	12	15	6	3	9	6
SS7	Head	0	9	12	12	15	8	3	9	6
SS3	Beam	0	9	16	9	20	6	3	9	6
SS5	Beam	0	9	20	9	25	6	3	9	6
SS7	Beam	0	12	20	12	25	6	4	12	8
SS3	Head	10	12	16	12	20	8	4	9	8
SS5	Head	10	15	20	15	25	10	5	12	10
SS7	Head	10	15	20	15	25	10	5	12	10
SS3	Beam	10	9	16	9	20	6	3	9	6
SS5	Beam	10	12	20	12	25	6	3	9	6
SS7	Beam	10	12	20	12	25	6	4	12	8

B.9.5 Overall Fall Risk – CCGS Cygnus

In order to provide an example of the a classification of the risk associated with conducting the tasks outlined in the eight assigned areas aboard the *CCGS Cygnus* were assigned to vessel specific locations for which motion data was available as is presented in Table 7. Based on these inputs the resulting risk classification by sea state and heading will be as in indicated in Table 10 for warm weather and as in Table 11 for cold and wet weather.

Table 10 Overall Risk Classification - Warm Weather - CCGS Cygnus

Sea State	Heading	Speed (knots)	Ladders	Mast and Mast Platform	Manholes and Hatches	Funnels and Stacks	Decks	Machinery Space	Ships Side	Gangways and Boarding Ladders
SS3	Head	0	3	4	3	5	2	1	3	2
SS5	Head	0	3	4	6	5	4	1	3	2
SS7	Head	0	3	4	6	5	4	2	3	4
SS3	Beam	0	3	4	3	5	2	1	3	2
SS5	Beam	0	3	4	3	5	2	1	3	2
SS7	Beam	0	3	4	3	5	2	1	3	2
SS3	Head	10	3	4	6	5	2	1	3	2
SS5	Head	10	6	4	9	5	4	2	3	4
SS7	Head	10	6	8	9	10	4	2	3	4
SS3	Beam	10	3	4	3	5	2	1	3	2
SS5	Beam	10	3	4	3	5	2	1	3	2
SS7	Beam	10	3	4	6	5	2	1	3	2

Table 11 Overall Risk Classification - Cold Weather – CCGS Cygnus

Sea State	Heading	Speed (knots)	Ladders	Mast and Mast Platform	Manholes and Hatches	Funnels and Stacks	Decks	Machinery Space	Ships Side	Gangways and Boarding Ladders
SS3	Head	0	9	12	9	15	6	3	9	6
SS5	Head	0	9	12	12	15	8	3	9	6
SS7	Head	0	9	12	12	15	8	4	9	8
SS3	Beam	0	9	12	9	15	6	3	9	6
SS5	Beam	0	9	12	9	15	6	3	9	6
SS7	Beam	0	9	12	9	15	6	3	9	6
SS3	Head	10	9	12	12	15	6	3	9	6
SS5	Head	10	12	12	15	15	8	4	9	8
SS7	Head	10	12	16	15	20	8	4	9	8
SS3	Beam	10	9	12	9	15	6	3	9	6
SS5	Beam	10	9	12	9	15	6	3	9	6
SS7	Beam	10	9	12	12	15	6	3	9	6

B.9.6 Overall Fall Risk – CCGS Henry Larsen

In order to provide an example of the a classification of the risk associated with conducting the tasks outlined in the eight assigned areas aboard the *CCGS Henry Larsen* were assigned to vessel specific locations for which motion data was available as is presented in Table 7. Based on these inputs the resulting risk classification by sea state and heading will be as in indicated in Table 12 for warm weather and as in Table 13 for cold and wet weather.

Table 12 Overall Risk Classification - Warm Weather - CCGS Henry Larsen

Sea State	Heading	Speed (knots)	Ladders	Mast and Mast Platform	Manholes and Hatches	Funnels and Stacks	Decks	Machinery Space	Ships Side	Gangways and Boarding Ladders
SS3	Head	0	3	4	3	5	2	1	3	2
SS5	Head	0	3	4	3	5	2	1	3	2
SS7	Head	0	3	4	6	5	2	1	3	2
SS3	Beam	0	3	4	3	5	2	1	3	2
SS5	Beam	0	3	4	3	5	2	1	3	2
SS7	Beam	0	3	8	3	10	2	1	3	2
SS3	Head	10	3	4	3	5	2	1	3	2
SS5	Head	10	6	4	6	5	4	2	3	4
SS7	Head	10	6	4	6	5	4	2	6	4
SS3	Beam	10	3	4	3	5	2	1	3	2
SS5	Beam	10	3	4	3	5	2	1	3	2
SS7	Beam	10	3	8	3	10	2	1	3	2

Table 13 Overall Risk Classification - Cold Weather – CCGS Henry Larsen

Sea State	Heading	Speed (knots)	Ladders	Mast and Mast Platform	Manholes and Hatches	Funnels and Stacks	Decks	Machinery Space	Ships Side	Gangways and Boarding Ladders
SS3	Head	0	9	12	9	15	6	3	9	6
SS5	Head	0	9	12	9	15	6	3	9	6
SS7	Head	0	9	12	12	15	6	3	9	6
SS3	Beam	0	9	12	9	15	6	3	9	6
SS5	Beam	0	9	12	9	15	6	3	9	6
SS7	Beam	0	9	16	9	20	6	3	9	6
SS3	Head	10	9	12	9	15	6	3	9	6
SS5	Head	10	12	12	12	15	8	4	9	8
SS7	Head	10	12	12	12	15	8	4	12	8
SS3	Beam	10	9	12	9	15	6	3	9	6
SS5	Beam	10	9	12	9	15	6	3	9	6
SS7	Beam	10	9	16	9	20	6	3	9	6

B.10 CONCLUDING REMARKS

The risk assessment method that has been developed clearly indicates the variability in risk associated with sea and weather conditions for each vessel. However the weather, warm versus cold and wet, was seen to have a significant influence on the level of risk. The method does indicate the differences between specific sea states for a given vessel but the level of resolution of this variable is overshadowed by weather influence.

The semi-quantitative approach that has been developed to assess the risk of fall is based on the specific loading conditions, environmental, and sea conditions modeled. Deviations in any of these parameters can have significant influence on results; therefore caution is strongly encouraged when interpreting the data.

Further development and resolution of the fall severity and fall likelihood classification scales and a large number of detailed vessel specific location assessments may provide further insights in to the overall fall risk for a particular vessel.

Assessment of alternate lactation and activity combinations may yield alternate results and should be further explored. The combination of vessel specific location and activity presented in this assessment is intended to provide a typical example and is suggested as a logical first assessment.

This risk assessment was based on generic locations on the three individual ships. The broad applicability of this information to other ships, different activity areas, and other vessel specific locations may not be valid as these factors will have significant influences on the results.

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Annex C CANADA LABOUR CODE: R.S. 1985, c.L2

C.1 MARINE OCCUPATIONAL SAFETY AND HEALTH REGULATIONS

Part X – Safety Materials, Equipment, Devices and Clothing

Fall-Protection Systems

10.9 (1) Where a person, other than an employee who is installing or removing a fall-protection system in accordance with the instructions referred to in subsection (5), works from

- a) an unguarded structure that is
 - i) more than 2.4 m above the nearest permanent safe level,
 - ii) above any moving parts of machinery or any other surface or thing that could cause injury to an employee on contact, or
 - iii) above an open hold,
- b) a temporary structure that is more than 3 m above a permanent safe level, or
- c) a ladder at a height of more than 2.4 m above the nearest permanent safe level and, because of the nature of the work, that person can use only one hand to hold onto the ladder,

the employer shall provide a fall-protection system.

(2) The components of a fall-protection system shall meet the following standards

- a) CSA Standard Z259.1-1976, Fall-Arresting Safety Belts and Lanyards for the Construction and Mining Industries, the English version of which is dated November, 1976, as amended to May, 1979 and the French version of which is dated April, 1980;
- b) CSA Standard Z259.2-M1979, Fall-Arresting Devices, Personnel Lowering Devices and Life Lines, the English version of which is dated November, 1979 and the French version of which is dated October, 1983; and
- c) CSA Standard Z259.3-M1978, Lineman's Body Belt and Lineman's Safety Strap, the English version of which is dated September, 1978, as amended to April, 1981 and the French version of which is dated April, 1980, as amended to April, 1981.

(3) The anchor of a fall-protection system shall be capable of withstanding a force of 17.8 kN.

(4) A fall-protection system that is used to arrest the fall of a person shall prevent that person

- a) from being subjected to a peak fall arrest force greater than 8 kN; and
- b) from falling freely for more than 1.2 m.

- (5) Every employee required to install or remove a fall-protection system in a work place shall be instructed and trained by the employer in the procedures to be followed for the installation or removal of the system. SOR/95-74, ss. 61(E), 89(F).

C.2 CANADA OCCUPATIONAL HEALTH AND SAFETY REGULATIONS

Part XII – Safety Materials, Equipment, Devices and Clothing

Fall-Protection Systems

- 12.10 (1) Subject to subsection (1.1), every employer shall provide a fall-protection system to any person, other than an employee who is installing or removing a fall-protection system in accordance with the instructions referred to in subsection (5), who works:
- a) from an unguarded structure or on a vehicle, at a height of more than 2.4 m above the nearest permanent safe level or above any moving parts of machinery or any other surface or thing that could cause injury to a person on contact;
 - b) from a temporary structure at a height of more than 6 m above a permanent safe level; or
 - c) from a ladder at a height of more than 2.4 m above the nearest permanent safe level where, because of the nature of the work, that person is unable to use at least one hand to hold onto the ladder.
- (1.1) Where an employee is required to work on a vehicle on which it is not reasonably practicable to provide a fall-protection system, the employer shall:
- a) in consultation with the policy committee or, if there is no policy committee, the work place committee or the health and safety representative:
 - i) perform a job safety analysis to eliminate or minimize the need for the employee to climb onto the vehicle or its load, and
 - ii) provide every employee who is likely to climb onto the vehicle or its load with training and instruction on the safe method of climbing onto and working on the vehicle or its load;
 - c) make a report in writing to the regional health and safety officer setting out the reasons why it is not reasonably practicable to provide a fall-protection system and include the job safety analysis and a description of the training and instruction referred to in paragraph (a); and
 - d) provide a copy of the report referred to in paragraph (b) to the policy committee or, if there is no policy committee, the work place committee or the health and safety representative.
- (1.2) The job safety analysis, training and instruction referred to in paragraph (1.1)(a) shall be reviewed every two years in consultation with the policy committee or, if there is no policy committee, the work place committee or the health and safety representative.

-
- (2) The components of a fall-protection system shall meet the following standards:
- a) CSA Standard Z259.1-1976, Fall-Arresting Safety Belts and Lanyards for the Construction and Mining Industries, the English version of which is dated November, 1976, as amended to May, 1979 and the French version of which is dated April, 1980;
 - b) CSA Standard Z259.2-M1979, Fall-Arresting Devices, Personnel Lowering Devices and Life Lines, the English version of which is dated November, 1979 and the French version of which is dated October, 1983; and
 - c) CSA Standard Z259.3-M1978, Lineman's Body Belt and Lineman's Safety Strap, the English version of which is dated September, 1978, as amended to April, 1981 and the French version of which is dated April, 1980, as amended to April, 1981.
- (3) The anchor of a fall-protection system shall be capable of withstanding a force of 17.8 kN.
- (4) A fall-protection system that is used to arrest the fall of a person shall prevent that person:
- a) from being subjected to a peak fall arrest force greater than 8 kN; and
 - b) from falling freely for more than 1.2 m.
- (5) Where an employee is about to install or remove a fall-protection system, the employer shall:
- a) prepare written instructions for the safe installation or removal of the fall-protection system; and
 - b) keep a copy of the instructions readily available for the information of the employee. SOR/88-632, s. 50(F); SOR/94-263, s. 47(F); SOR/2002-379, s. 1.

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Annex D CANADA SHIPPING ACT, 2001

D.1 SAFE WORKING PRACTICES REGULATIONS (C.R.C., c. 1467)

Holds, Tanks and other Compartments

25. (1) When not in use, every hatch or other opening that leads to a hold, tank or other compartment exceeding 1.5 m in depth shall be securely covered or fenced to a height of 900 mm unless the opening is fitted with a coaming of not less than 760 mm in height.
- (2) Every opening in a deck or tank top that leads to a hold, tank or other compartment not exceeding 1.5 m in depth shall be covered, fenced or marked in such manner as necessary to prevent loss of life or injury to persons.

Scaffolding, Scaffolds and Stages

49. (1) Subject to subsection (3), every scaffold shall
- (e) be fitted with guard rails at a height of 900 mm above the scaffold except on the side thereof where the work to be performed would be hindered by the guard rails.
- (2) A safe means of access, secured to prevent its accidental movement, shall be provided to and from the working level of every scaffold.
- (3) A scaffold may be constructed of materials other than wood if the strength and safety features of the scaffold when so constructed are not less than those of a wooden scaffold.
51. (1) Every stage shall
- (d) be fitted with guard lines, where the stage is to be used at a height greater than 3 m.
53. Every person who is required to work on a stage at a height greater than 3 m shall wear a safety belt fitted with a safety line that is rigged to a life line so as to limit the free fall of a person from the stage to not more than 1.2 m.

Ladders and Gangways

54. (1) Every access ladder or gangway between a ship and the shore or between one ship and another ship shall provide a safe means of access between the ship and shore or between the ships, as the case may be.
- (2) Every ship that is in dry dock or moored alongside a wharf or other ship shall be fitted with at least one access ladder or gangway that, in the opinion of a qualified person, complies with subsection (1).

- (3) Where an access ladder or gangway leads to a location on board a ship at a height of more than 1 m above the deck, safe access to the deck shall be provided by means of a series of steps or some similar structure.
- (4) Where a bulwark ladder is used to provide the safe access to the deck of a ship required by subsection (3), it shall be firmly secured to the bulwark so as to prevent its shifting, slipping or pivoting and shall be equipped with two handhold stanchions
 - (a) each not less than 40 mm in diameter;
 - (b) each extending not less than 1.2 m above the top of the bulwark;
 - (c) fitted at the point of boarding or leaving the ship not less than 0.7 m and not more than 0.8 m apart; and
 - (d) firmly secured to the ship's structure at or near the base of the ladder and at a higher point.

55. (1) Every access ladder and gangway shall

- (a) be maintained in a safe condition;
- (b) be secured to prevent its shifting and slipping;
- (c) be suitably rigged and maintained to compensate for the movement of the ship;
- (d) be adequately lighted; and
- (e) have a lifebuoy with line, strategically placed and ready for immediate use.

- (2) When an access ladder is being used by a person to board or disembark from a ship, at least one end of the ladder shall be fastened securely and, if necessary to ensure safety, a person, other than a person engaged in manoeuvring the ship, shall be stationed at the ladder to assist the person using it.

56. (1) Safety nets shall be fitted under every part of an access ladder and gangway except where, in the opinion of a qualified person,

- (a) the ladder or gangway and the approaches thereto are constructed in a manner that makes the fitting of a safety net unnecessary; or
- (b) the fitting of a safety net is impracticable.

(2) Safety nets shall

- (a) extend on both sides of an access ladder or a gangway for a distance of 1.8 m; and
- (b) be kept taut at all times.

57. Where a platform is provided at the bottom of an access ladder or gangway, the platform shall be flat and horizontal.

58. Every Jacob's ladder shall be of sufficient length to reach the intended landing point and the means of attachment thereof to the ship shall be effective and maintained in a safe and good condition.
59. Every portable ladder shall be maintained in a safe and good condition and shall be secured to prevent its shifting and slipping when in use.
60. Every ladder, whether portable or permanently secured, shall be positioned in such a manner that it is not necessary for a person to use the underside of the ladder.

Personal Protective Equipment

79. Every person who is required to work at a height greater than 3 m, on a mast or at the edge of any other structure that is not provided with guard rails, shall wear a safety belt fitted with a safety line that is rigged so as to limit the free fall of a person to not more than 1.2 m.

General Requirements and Working Practices

88. No person shall, while a ship is underway, go over the side of the ship to carry out routine maintenance thereof.

D.2 TACKLE REGULATIONS (C.R.C., c. 1494)

Part III Safe Means between Ship and Wharf

Safe Means between Ship and Wharf

8. (1) Safe means shall be provided for the passage of workers to and from a ship and the wharf at which the ship lies, unless conditions are such that the workers would not be exposed to undue risk if no special appliances were provided.
- (4) A safety net or other satisfactory arrangement shall be provided, if required, so that workers accidentally falling from the safe means referred to in subsection (1) will not fall between the ship and the wharf.
- (5) Safety precautions similar to those referred to in subsection (4) shall be taken, where required, alongside hatches where the processes are being carried on, on the side of the ship next to the wharf.

Safe Means from Deck to Hold

11. (1) Where the processes (loading and unloading) are carried on in a hold the depth of which exceeds 1.52 m, safe means of access shall be provided from the deck to the hold.
18. (1) Where a worker is required to go outside of the rails or bulwarks to secure deck cargo or for any other purpose connected with the processes, means to ensure the safety of the worker shall be provided.

Part V Safety Measures during Processes

42. (1) While workers are on a ship for the purposes of the processes, any hatchway of a cargo or bunker space exceeding 1.52 m in depth that is not in use, and the coamings of which are less than 760 mm in height shall be fenced to a height of 915 mm or securely covered.

Annex E DFO HEALTH AND SAFETY MANUAL

14.4.9 Fall-Protection Systems and Safety Restraining Devices

A fall-protection system must be provided and used whenever work is to be performed from:

- a) an unenclosed or unguarded structure that is more than 2.4m above the nearest permanent safe level; or
- b) is above moving parts of machinery or any other surface or thing which could cause injury upon contact; or
- c) is above any open-top tank, pit or vat; or
- d) is a temporary structure that is more than 6m above a permanent safe level; or
- e) is a ladder at a height of more than 2.4m above the nearest permanent safe level where, because of the nature of the work, one hand cannot be used to hold the ladder.

The fall-protection system shall meet the requirements of:

- a) CSA Standard Z259.11-05 Energy Absorbers and Lanyards;
- b) CSA Standard Z259.2-M1979 Fall-Arresting Devices, Personnel Lowering Devices and Lifelines; or
- c) CSA Standard Z259.1-05 Body Belts and Saddles for Work Positioning and Travel Restraint;

as amended from time to time.

The equipment approved under the Body Belts and Saddles for Work Positioning and Travel Restraint Standard is to be used only during activities related to pole climbing and in combination with spurs or climbing staples.

The fall-protection system must prevent a person from falling freely more than 1.2m and prevent the person from being subjected to a peak fall arrest force of more than 8 kN.

The anchor point for the fall-protection system must be capable of withstanding a force of 17.8 kN.

Any fall-protection system that has arrested a fall must be tested before that system is returned to service.

All fall-protection systems must be inspected and serviced by a qualified person at intervals appropriate to their use. Devices used once a week or more often must be inspected and serviced at least once a month.

Where an employee is about to install or remove a fall protection system, the employer must prepare written instructions for the safe installation or removal of the system and keep them readily available for the employee to refer to.

14.5 Inspections/Maintenance

Personal protective equipment must be inspected and maintained by a qualified person as prescribed by applicable standards and/or recommended industrial hygiene practice. Any PPE found to be malfunctioning, damaged, or which has passed its expiry date, must be reported to the supervisor, removed and replaced at once. The supervisor must ensure that the equipment is safely disposed of - so no other person can use it - or destroyed.

14.6 Records

Both the Occupational Health and Safety Regulations 12.14(1) and Part XII Personal and Protective Equipment and Clothing,, of the Treasury Board Occupational Safety and Health Directive require that records of personal protective equipment be maintained by the Department. These records must be kept in the work place in which the equipment is (or was) located, for a period of two years after it ceases to be used.

At a minimum the records must contain:

- a) a description of the equipment, the date of purchase or acquisition, and its expiry date;
- b) the date and result of each inspection and test of the equipment;
- c) the date and nature of any maintenance work performed on the equipment since its purchase or acquisition;
- d) the name of the person who performed the inspection, test, or maintenance of the equipment;
- e) the date the item was returned to the supervisor; and
- f) the date on which it was safely disposed of or destroyed, with a description of the method used.

For items on long-term permanent loan (safety glasses and goggles, hardhats, hearing protectors, lifejackets, etc.) the Department must keep records as noted in paragraph one. The records must contain:

- a) a description of the equipment, including its expiration date, if any, and the date of purchase or acquisition;
- b) the date of issue;
- c) confirmation that those in receipt of the equipment have received any related safety or recall notices, or notifications of expiration; and

- d) in the event of a recall notice or notification of expiration, the date the item was returned to the supervisor and, the date on which it was returned to the supplier or destroyed.

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Annex F CANADIAN COAST GUARD FLEET SAFETY AND SECURITY MANUAL

1 PURPOSE

- 1.1 To ensure that work being performed aloft or over the ship's side is performed safely.

2 RESPONSIBILITIES

- 2.1 The Commanding Officer is responsible for ensuring that fall protection safety measures are in place and are followed.
- 2.2 Supervisors are responsible to ensure that proper safety equipment is provided and used correctly, and that training is provided.
- 2.3 All personnel must follow safety measures that have been put in place.

3 PROCEDURE

- 3.1 All personnel working aloft shall be suitably trained in fall protection and the use of fall protection equipment.
- 3.2 The fall-protection system that will be used must be inspected prior to use to ensure that the equipment conforms to safety standards contained in Section 10.9 of the Marine Occupational Safety and Health Regulations of the Canada Labour Code. These standards are to be readily available.
- 3.3 Fall protection systems that have arrested an accidental fall are to be removed from service until they have been examined by a qualified person to ensure that the system has not been weakened and is still effective.
- 3.4 When work is being performed on any energized system or component, lockout procedures are to be used as per 7.D.19 (FSSM).
- 3.5 Regardless of where equipment is being used, records shall be maintained of the acquisition, maintenance, and tests of protection equipment in accordance with the requirements of Part II of the Canada Labour Code, Occupational Safety and Health Regulations, Section 12.14(1)
- 3.6 Before work can begin, personnel engaged in the work must ensure that a rescue plan is agreed upon and that any required rescue equipment is readily available.

V 3-1 Effective 2008-12-19

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Annex G MARINE OCCUPATIONAL SAFETY AND HEALTH REGULATIONS

Canada Labour Code (R.S. 1985, c.L-2)

Part X – Safety Materials, Equipment, Devices and Clothing

Section 10: Fall-Protection Systems

10.9 (1) Where a person, other than an employee who is installing or removing a fall-protection system in accordance with the instructions referred to in subsection (5), works from

- a) an unguarded structure that is
 - i) more than 2.4 m above the nearest permanent safe level,
 - ii) above any moving parts of machinery or any other surface or thing that could cause injury to an employee on contact, or
 - iii) above an open hold,
- b) a temporary structure that is more than 3 m above a permanent safe level, or
- c) a ladder at a height of more than 2.4 m above the nearest permanent safe level and, because of the nature of the work, that person can use only one hand to hold onto the ladder,

the employer shall provide a fall-protection system.

(2) The components of a fall-protection system shall meet the following standards:

- a) CSA Standard Z259.1-1976, *Fall-Arresting Safety Belts and Lanyards for the Construction and Mining Industries*, the English version of which is dated November, 1976, as amended to May, 1979 and the French version of which is dated April, 1980;
- b) CSA Standard Z259.2-M1979, *Fall-Arresting Devices, Personnel Lowering Devices and Life Lines*, the English version of which is dated November, 1979 and the French version of which is dated October, 1983; and
- c) CSA Standard Z259.3-M1978, *Lineman's Body Belt and Lineman's Safety Strap*, the English version of which is dated September, 1978, as amended to April, 1981 and the French version of which is dated April, 1980, as amended to April, 1981.

(3) The anchor of a fall-protection system shall be capable of withstanding a force of 17.8 kN.

(4) A fall-protection system that is used to arrest the fall of a person shall prevent that person

- a) from being subjected to a peak fall arrest force greater than 8 kN; and
 - b) from falling freely for more than 1.2 m.
- (5) Every employee required to install or remove a fall-protection system in a work place shall be instructed and trained by the employer in the procedures to be followed for the installation or removal of the system. SOR/95-74, ss. 61(E), 89(F).

Annex H FALL PROTECTION COMPETENCIES

H.1 SENIOR MANAGEMENT

Standard No. tba

Task No. tba

COMPETENCY	KNOWLEDGE, SKILL, and ABILITY	QUALIFICATION STANDARD	PERFORMANCE STANDARD
Facilitation and implementation of CCG's Fall Protection Program	Understands the legal obligations to be compliant with the Canada Labour Code and the Canada Shipping Act, 2001 with respect to fall protection	Overview Training	Sets goals
Support and endorsement of CCG's Fall Protection Program	Understands CCG's Fall Protection Program requirements		Establishes program funding
Provision of program guidance			Ensures requirements of the fall protection program are being implemented/ followed in area of responsibility.

H.2 COMMANDING OFFICER

Standard No. tba

Task No. tba

COMPETENCY	KNOWLEDGE, SKILL, and ABILITY	QUALIFICATION STANDARD	PERFORMANCE STANDARD
Implementation of CCG's Fall Protection Program	Understands the legal obligations to be compliant with the Canada Labour Code and the Canada Shipping Act, 2001 with respect to fall protection	Overview Training	Ensures requirements of the fall protection program are being followed on board ship
	Understands CCG's Fall Protection Program requirements		Ensures ship unique fall hazards are identified and addressed by appropriate procedures
			Ensures personnel are trained and qualified for the work they are tasked to do
Promotion of a safety conscious work environment	Has good communication skills		Communicates the need for safe work practices on a regular basis

H.3 REGIONAL AUTHORITY

Standard No. tba
Task No. tba

COMPETENCY	KNOWLEDGE, SKILL, and ABILITY	QUALIFICATION STANDARD	PERFORMANCE STANDARD
Implementation of CCG's Fall Protection Program	Understands the legal obligations to be compliant with the Canada Labour Code and the Canada Shipping Act, 2001 with respect to fall protection	Overview Training	Ensures Region's unique fall hazards are identified and addressed by appropriate procedures
	Understands CCG's Fall Protection Program requirements		
	Understands CSA fall protections Standards		
Identification of improvements to fall protection program and procedures	Utilizes hazard analysis techniques to identified potential fall situations		Takes action to create/ amend procedures as required
	Can select the correct piece of permanent fall protection equipment for specific structures		
	Can identify interim solutions to fall protection requirements		Takes action to implement interim solutions to fall protection needs

H.4 SUPERVISOR

Standard No. tba
Task No. tba

COMPETENCY	KNOWLEDGE, SKILL, and ABILITY	QUALIFICATION STANDARD	PERFORMANCE STANDARD
Implementation of CCG's Fall Protection Program	Understands the legal obligations to be compliant with the Canada Labour Code and the Canada Shipping Act, 2001 with respect to fall protection	Fall Protection Training and Rescue Training	Ensures requirements of the fall protection program are being followed in area of responsibility
	Understands CCG's Fall Protection Program requirements		Oversees and/or delegates authority to work teams the work being done at height
	Understands CSA fall protections Standards		Ensures unique fall hazards are identified and addressed by appropriate procedures

Identification of improvements to fall protection program and procedures	Utilizes hazard analysis techniques to identified potential fall situations		Takes action to correct fall hazards
	Can identify potential fall hazards		Takes action to create/ amend procedures as required
Consultation with subject matter experts	Understands when personal knowledge of a subject requires augmentation		Seeks additional information from subject matter experts when necessary
Promotion of a safety conscious work environment	Has good communication skills		Communicates the need for safe work practices on a regular basis

H.5 COMPETENT PERSON

Standard No. tba

Task No. tba

COMPETENCY	KNOWLEDGE, SKILL, and ABILITY	QUALIFICATION STANDARD	PERFORMANCE STANDARD
Clarification and instruction of fall protection requirements	Knows the Basic Fall Protection course content and climbing techniques	Fall Protection Training, Competent Person Training, and Rescue Training	Conducts individual coaching and training sessions as required
Instruction of climbing techniques			
Instruction of rescue techniques	Knows the Rescue course content and rescue techniques		Conducts individual coaching and rescue training sessions as required
Inspection of permanent and personal fall protection equipment	Knows annual and specified inspection criteria and can detect defects in equipment		Completes required inspections and re-certification of fall protection equipment
Identification of improvements to fall protection program and procedures	Utilizes hazard analysis techniques to identified potential fall situations Can identify potential fall hazards		Takes action to correct fall hazards

H.6 CLIMBER

Standard No. tba
Task No. tba

COMPETENCY	KNOWLEDGE, SKILL, and ABILITY	QUALIFICATION STANDARD	PERFORMANCE STANDARD
Inspection of permanent and personal fall protection equipment before climbing	Knows before-use inspection criteria and can detect defects in equipment	Fall Protection Training, Rescue Training	Performs work at height safely and in accordance with CCG Fall Protection Program requirements Participates in fall protection and rescue training and practice sessions
Selection of appropriate lanyard length for work situation	Can determine fall distance calculations correctly		
Selection of hardware/ components that are compatible	Knows hardware compatibility criteria		
Donning personal equipment correctly	Knows how to adjust full body harness for safety and comfort		
Climbing safely and in compliance with appropriate procedures	Knows proper connection requirements, ladder climbing, vertical lifeline, and alternate climbing techniques		
Capability of using one's own equipment to effect self rescue in the event of a fall	Knows self-rescue techniques		
Capability of using rescue equipment to effect rescue of a co-worker	Knows rescue techniques		
Working safely at height in all situations: suspended, boatswain's chair, swingstage, scaffolding, etc.	Can select the correct piece of personal fall protection equipment for specific work situations		
Exercising self discipline to adhere to all procedures	Knows all safe working requirements regarding guardrails, 100% connection, etc.		Takes action to correct fall hazards
Awareness of potential fall hazards	Can identify potential fall hazards		
Identification of improvements to fall protection program and procedures	Can identify program/ procedure improvements	First aid and CPR training	Makes recommendations to improve the fall protection program/ procedures
Capability to administer first aid and CPR	Can administer first aid and CPR		Administers first aid or CPR when required



Fisheries and Oceans
Canada

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CA-013-000-QM-GL-005

Canadian
Coast Guard

Garde côtière
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Fall Protection Program Part III – Ship-based Fall Protection



Canadian Coast Guard
Program

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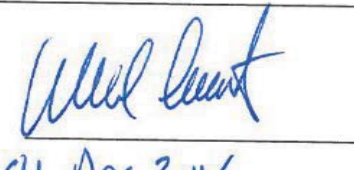
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Table of Contents

DOCUMENT MANAGEMENT	IX
1. AUTHORITY	IX
2. RESPONSIBILITY	IX
3. INQUIRIES AND/OR REVISION REQUESTS	IX
FOREWORD.....	XI
CHAPTER 1 INTRODUCTION	1
1.1 TERMS AND DEFINITIONS	1
1.2 GENERAL	1
CHAPTER 2 TRAINING	3
2.1 GENERAL	3
2.2 OVERVIEW TRAINING	3
2.3 FALL PROTECTION TRAINING	3
2.4 COMPETENT PERSON TRAINING	4
2.5 RESCUE TRAINING	4
2.6 REFRESHER TRAINING	4
CHAPTER 3 PURCHASING	5
CHAPTER 4 RECORDS.....	7
4.1 EQUIPMENT	7
4.2 PERSONNEL	7
CHAPTER 5 FALL PREVENTION	9
CHAPTER 6 FALL RESTRAINT SYSTEMS.....	11
6.1 HORIZONTAL LIFELINES, CSA STANDARD Z259.13.....	11
CHAPTER 7 FALL ARREST SYSTEMS	13
7.1 CABLE SYSTEMS	13
7.2 RAIL SYSTEMS	13
7.3 RAIL VERSUS CABLE	13
7.4 VERTICAL LIFELINES.....	14
CHAPTER 8 ANCHORAGES	17

CHAPTER 9	PERSONAL PROTECTION EQUIPMENT (PPE).....	19
9.1	GENERAL.....	19
9.2	SERVICE LIFE AND REMOVAL OF EQUIPMENT	19
9.3	PROVISION OF EQUIPMENT	19
9.4	COMPATIBILITY	20
9.5	INSPECTION REQUIREMENTS	20
9.6	ANNUAL INSPECTIONS	20
9.7	DEFECT REPORTING	20
9.8	FULL BODY HARNESS, CSA STANDARD Z259.10	21
9.9	ENERGY/SHOCK ABSORBERS. CSA STANDARD Z259.11	21
9.10	LANYARDS CSA STANDARD Z259.11.	21
9.11	CONNECTING COMPONENTS/HARDWARE	22
9.12	OTHER PERSONAL PROTECTION EQUIPMENT.....	22
9.12.1	Hard Hats.....	22
9.12.2	Ear Protection	22
9.12.3	Safety Boots.....	23
9.12.4	Safety Glasses.....	23
9.12.5	Hand Protection	23
9.12.6	Personal Floatation Device	23
CHAPTER 10	RIGGING ACCESSORIES.....	25
10.1	FALL ARRESTERS. CSA STANDARD Z259.2.1.	25
10.2	SELF-RETRACTING DEVICES. CSA STANDARD Z259.2.2.....	25
10.3	ROPES.....	26
CHAPTER 11	PREPARATION BEFORE WORKING AT HEIGHTS.....	27
CHAPTER 12	SHIP-BASED STRUCTURES AND CLIMBING METHODS.....	29
12.1	STAIRWAYS AND LADDERS.....	29
12.2	PORTABLE LADDERS	30
12.3	MASTS.....	30
12.4	STACKS	31
12.5	MANHOLES AND HATCH OPENINGS.....	31
12.6	SLIPPERY SURFACES – DECKS	31
12.7	FALL PROTECTION WHEN WORKING ABOVE/ NEAR MOVING MACHINERY	31
12.8	FALL PROTECTION ABOVE WATER	32
12.9	FALL PROTECTION DURING PERSONNEL TRANSFER.....	32

CHAPTER 13	BASIC LADDER AND MAST CLIMBING TECHNIQUES.....	35
13.1	DOUBLE TETHERING, METHOD 1	36
13.2	DOUBLE TETHERING, METHOD 2	36
13.3	WORK POSITIONING	37
CHAPTER 14	INSPECTION REQUIREMENTS	39
14.1	BEFORE-USE INSPECTIONS	39
14.2	DEFECT REPORTING	39
CHAPTER 15	FALL RESCUE PLAN REQUIREMENTS	41
15.1	GENERAL	41
15.2	RESCUE TRAINING	42
15.2.1	General	42
15.2.2	Self-Rescue Training	42
15.2.3	Ladder Rescue Training	42
15.2.4	Rescue Training	42
15.3	MINIMUM BASIC RESCUE EQUIPMENT	43
15.3.1	General	43
15.3.2	Rope	43
15.3.3	Carabiners	43
15.4	BASIC RESCUE PLAN	43
15.4.1	General	43
15.4.2	Rescue Scenario	44
CHAPTER 16	FALL PROTECTION COMPETENCIES	45
16.1	SENIOR MANAGEMENT	45
16.2	COMMANDING OFFICER	45
16.3	SUPERVISOR	46
16.4	COMPETENT PERSON	47
16.5	CLIMBER	47
ANNEX A	TERMS AND DEFINITIONS	A-1
ANNEX B	CANADA LABOUR CODE (R.S. 1985, C.L-2).....	B-1
B.1	MARINE OCCUPATIONAL SAFETY AND HEALTH REGULATIONS	B-1
B.2	CANADA OCCUPATIONAL HEALTH AND SAFETY REGULATIONS	B-2
ANNEX C	CANADA SHIPPING ACT, 2001	B-1
C.1	SAFE WORKING PRACTICES REGULATIONS (CRC, C. 1467)	B-1

Table of Contents

C.2	TACKLE REGULATIONS (C.R.C., C. 1494).....	C-3
ANNEX D	CSA FALL PROTECTION STANDARDS, Z59 SERIES	D-1
ANNEX E	SUMMARY OF BASIC CSA CODE REQUIREMENTS AND/OR INDUSTRY STANDARDS.....	E-1
ANNEX F	PURCHASING AND INSPECTION/REPAIR RECORD FORM.....	F-1
ANNEX G	SERVICE LIFE OF FALL PROTECTION EQUIPMENT	G-1

Document Management

1. Authority

This document is issued by the Director General, Integrated Technical Services (ITS), Canadian Coast Guard's National Technical Authority under delegation from the Deputy Minister, Fisheries and Oceans and the Commissioner of the Canadian Coast Guard.

2. Responsibility

The Director, Engineering Services is responsible for:

- i) the creation and promulgation of the document; and
- ii) the identification of an Office of Primary Interest (OPI) who is responsible for the coordination and the content of the document.

The OPI is responsible for:

- i) the validity and accuracy of the content;
- ii) the availability of this information;
- iii) the update as needed;
- iv) the periodical revision; and
- v) the follow-up of all requests, comments and/or suggestions received to the originator.

3. Inquiries and/or Revision Requests

All inquiries regarding this document, including suggestions for revision and requests for interpretation shall be addressed to:

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All requests should:

- i) be clear and concise; and
- ii) reference the specific Chapter, Section, Figure or Table.

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Foreword

Canadian Coast Guard's Fall Protection Program is, as the reader will see, a requirement by law and this document is CCG's implementation and the Report has been endorsed by the Commissioner.

CCG's Fall Protection Program consists of three (3) parts, namely:

Part I – Policy and Plan;

Part II – Land-based Fall Protection for Structures and Towers; and

Part III – Ship-based Fall Protection.

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Chapter 1 INTRODUCTION

1.1 TERMS AND DEFINITIONS

Terms and Definitions are attached at Annex A.

1.2 GENERAL

This Ship-Based Fall Protection section has been developed to define the various aspects of fall protection as it pertains to working safely at heights on ships.

Fall protection within the CCG is governed by its own policies as well as by federal regulations and standards. Among others, these specify the technical requirements of the different elements within fall protection, and these are also laid out and summarized in this document.

CCG management shall ensure that only code compliant safety equipment is used that is designed for the applicable tasks required.

Part I of the Fall Protection Program addresses Policies and Plan, Part II land and shore-based fall protection issues whereas this Part III deals with ship-based fall protection only.

Fall Protection is grouped into three areas:

- a) Fall Prevention;
- b) Fall Restraint; and
- c) Fall Arrest.

This document also explains the basic application of the equipment that is available and used in the fall arrest program as well as the governing codes and regulations that apply. The annexes include excerpts of:

- a) Marine Occupational Safety and Health Regulations, Annex B;
- b) Canada occupational Health and safety Regulations, Annex C; and
- c) CSA Fall Protection Standards, Z59 Series, Annex D.

In order to address all fall safety related issues, Fall Protection Part III is divided into the following sections:

- 2.0 Training;
- 3.0 Purchasing;
- 4.0 Records;
- 5.0 Fall Prevention;

Introduction

- 6.0 Fall Restraint Systems;
- 7.0 Fall Arrest Systems;
- 8.0 Anchorages;
- 9.0 Personal Protection Equipment (PPE);
- 10.0 Rigging Accessories;
- 11.0 Preparation before Working at Heights
- 12.0 Ship-Based Structures and Climbing Methods;
- 13.0 Basic Ladder and Mast Climbing Techniques;
- 14.0 Inspection Requirements;
- 15.0 Fall Rescue Requirements;
- 16.0 Fall Protection Competencies

For those already familiar with Fall Protection, a short SUMMARY OF BASIC CSA CODE REQUIREMENTS AND/ OR INDUSTRY STANDARDS is attached at Annex E.

All anchorages on ships shall be designed to withstand a minimum impact force of 22.2 kN (5,000 lbs) or be deemed unquestionably safe by a qualified person.

Connecting hardware used for any part of a fall arrest system shall be designed to withstand a minimum impact force of 5,000 lbs and be CSA approved.

Chapter 2 TRAINING

2.1 GENERAL

Training courses in fall protection shall be provided as follows:

- a) Overview training for executives and managers;
- b) Fall protection training for employees who climb and work at elevated heights;
- c) Competent Person training for qualifying selected personnel to perform specified inspections of fall protection equipment; and
- d) Rescue training.

2.2 OVERVIEW TRAINING

Overview training shall provide senior management with a review of:

- a) The Acts and Regulations requiring fall protection;
- b) CCG's fall protection program and how it complies with the Acts and Regulations; and
- c) Status on the implementation of CCG's fall protection program.

2.3 FALL PROTECTION TRAINING

Fall Protection training is required of all personnel who climb and work at elevated heights. They shall be trained in fall protection requirements, particularly personal fall arrest equipment, before their very first climb. Fall protection training shall include, but not be limited to the following:

- a) Before-use inspection of personal fall arrest equipment;
- b) Before-use inspection of the permanent fall protection equipment on the structure to be climbed;
- c) Proper donning of one's full body harness;
- d) Fall distance calculations to determine lanyard lengths;
- e) Proper hook-up procedures, including D-ring security;
- f) Ensuring component compatibility;
- g) Alternate climbing procedures and the 100% connection rule shall always be followed whenever climbing a ladder or mast to a height of 10 ft (3 m) or higher that is not equipped with a permanent fall arrest system. This includes double tethering while climbing the structure and being tied off whenever moving from a ladder or mast to another platform; and

- h) Self-rescue techniques.

2.4 COMPETENT PERSON TRAINING

Competent Person training shall provide extensive in-depth training in how to inspect both permanent and personal fall protection equipment in order to authorize the person to complete all annual and/or specified inspections. A Competent Person's training may, as required, be extended to include the use of rescue equipment and rescue techniques to enable the person to train other personnel in rescue procedures, and teaching techniques to enable the person to provide guidance to co-workers in the use of their equipment.

2.5 RESCUE TRAINING

Rescue training shall provide CCG employees with the knowledge and skills to use specialized/dedicated rescue equipment to affect the rescue of a fallen co-worker.

2.6 REFRESHER TRAINING

Refresher training shall be given to the employees once every three years. At the discretion of the Commanding Officer/Supervisor, refresher training may be provided more often if deemed necessary. Subject matter experts who provide the training and who have met the conditions required for a trainer shall be certified every five years.

Chapter 3 PURCHASING

All fall protection equipment when purchased shall be certified to meet the latest requirements of the applicable CSA, or where the equipment is engineered to a particular ship/structure, it shall be certified compliant by a professional engineer.

Other purchasing considerations include the selection of the right equipment, compatibility with other equipment, and standardization of equipment on board ship/ within the Region.

Purchasing documents shall contain adequate information for traceability and the initiation of internal records.

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Chapter 4 RECORDS

4.1 EQUIPMENT

A master record for each piece of fall protection equipment is required to ensure good management of CCG's fall protection program. A sample master record, Annex F refers, should include as a minimum:

- a) Purchasing information, including compliance to specifications and standards data, manufacturing date, serial number and/or lot number, maintenance and inspection requirements, and service life of equipment if applicable;
- b) All inspections (other than visual before-use inspections), maintenance, and repairs completed on the equipment over the life of the equipment; and
- c) Disposal information.

4.2 PERSONNEL

All fall protection and rescue training/retraining shall be recorded on an individual's personal file. A master training record shall also be maintained by every vessel for all related training in fall protection that was either given on board or received by the crew of that vessel at some other training venue.

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Chapter 5 FALL PREVENTION

Fall prevention is often already incorporated during the design phase of a structure. Its objective is to prevent people from falling by:

- a) Eliminating the need to access un-safe work areas that are more than 8 ft (2.4 m) above the next permanent safe level;
- b) Installation of permanent guard rails or other barriers that are engineered to prevent persons from falling. Those CLC compliant guard and barrier rails shall be at least 3 ft (0.91 m) high;
- c) When working on elevated platforms or platforms where the hazard of falling exist and where the construction of guard or barrier rails does not appear to be in compliance with CLC standards, workers shall wear a full body harness with shock absorbing lanyard attached to their dorsal D-ring and to a secure anchor point;
- d) Installation of temporary, highly visible and clearly marked warning lines, where applicable, at least 6 ft (1.8 m) away from where the fall hazard exists.



Removable fence (fall protection) on the helicopter deck



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Chapter 6 FALL RESTRAINT SYSTEMS

6.1 HORIZONTAL LIFELINES, CSA STANDARD Z259.13

Horizontal lifelines may be used on Search and Rescue (SAR) ships and when traversing decks in inclement weather.

A permanent horizontal Lifeline can be rigid rail, flexible stainless steel or hot-dipped galvanized steel cable that is attached to two (2) or more permanent anchorages. This system has to be certified before use by a licensed engineer. A temporary horizontal lifeline is made of synthetic webbing or rope, usually polyester or nylon.

At a minimum, horizontal lifelines shall withstand a sudden impact force of 22.2 kN (5000 lbs) for each person connected to the horizontal lifeline at the same time.



Horizontal life lines are connected via lanyards to the dorsal D-ring of the worker's full body harness when working on elevated platforms, but can also be connected to the two (2) side D-rings of a body belt or full body harness via two (2) lanyards when used as a fall restraint system.

All horizontal lifelines attach to the full body harness using different types of connectors. Depending on the type of connector selected, the horizontal lifeline can be part of fall prevention, fall restraint or fall arrest system.

Horizontal lifelines can be attached to a full body harness using different equipment connections. Depending on the type of connection selected, the horizontal lifeline can be part of a fall restraint, fall arrest, or fall prevention system as follows:

- a) Fall restraint – when used with a short positioning lanyard connected to the 2 outer D-rings.
- b) Fall arrest – when used with a shock absorbing 1.2 m (4 ft) lanyard connected to the dorsal D-ring.
- c) Fall prevention – when used with a carabiner directly connected to the sternum or frontal D-ring.

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Chapter 7 FALL ARREST SYSTEMS

Fall arrest systems are those which are designed assuming that a fall is most likely to occur at some point and that such a fall has to be stopped.

Fall arrest systems typically include a permanent safety rail or cable that is attached to the ladder or climbing face of the structure that needs to be climbed. The trolley or slider moves freely upwards on a cable or rail and is attached with a carabiner to the sternum or frontal D-ring of the full body harness. As the climber moves upwards, the trolley follows but should a sudden fall occur, the lever of the trolley locks into position thereby arresting the fall of the worker.

7.1 CABLE SYSTEMS

Some ladders have been retrofitted with DBI/SALA Lad-Saf (3/8" cable), or similar systems. Each system has its own cable grab and climbers shall perform a 'Before-use inspection' prior to climbing the structure.

7.2 RAIL SYSTEMS

Some ladders on ships have been retrofitted with Miller Suretrack, Trylon, or similar rail systems. An inspection of safety cable systems shall take place yearly by a competent person as recommended in CAN/CSA-Z259.2.1-98.

7.3 RAIL VERSUS CABLE.

There are advantages and drawbacks to each type of fall arrest system. Typically, a cable system allows the climber to move more freely. Since the cable system is attached to a fixed point near the top and the bottom of the structure and is held tight with a spring-loaded tension mechanism, lateral movement is less restricted over a fixed rail system. This in turn leads often to abuse. The climber might be tempted to use that flexibility when reaching his/her work station to use the cable fall arrest system also as a positioning system. One advantage of a cable safety system is that it is less likely to be rendered inoperative during heavy icing or freezing rain.



The benefit of a safety rail lies with its multiple attachment points of the rail that are at a few feet apart and thereby allow for multiple users at the same time. The rigid nature of the rail systems also forces the climber to be in physical proximity with the rail and thereby reduces the actual fall distance before the arrest occurs.

7.4 VERTICAL LIFELINES

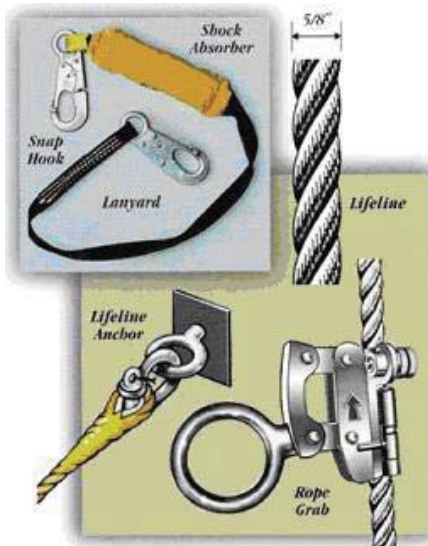
A vertical lifeline is a rope of synthetic fibre, often polyester or nylon that is fastened to an anchorage at some height above the worker's platform. A rope grab connected to the shock absorbing lanyard is then attached to the dorsal D-ring of the full body harness. The lifeline, typically 5/8" rope with a breaking strength of 27 kN (6,000 lbs) or higher shall meet the requirements of Z259.2.1 and shall be used solely for climbing. As the worker ascends or descends, the rope grab slides upwards and if deactivated, downwards and locks into positions during a sudden fall. When using a vertical lifeline the worker shall ensure that the rope grab is positioned as high as possible above their head to minimize the free fall distance.



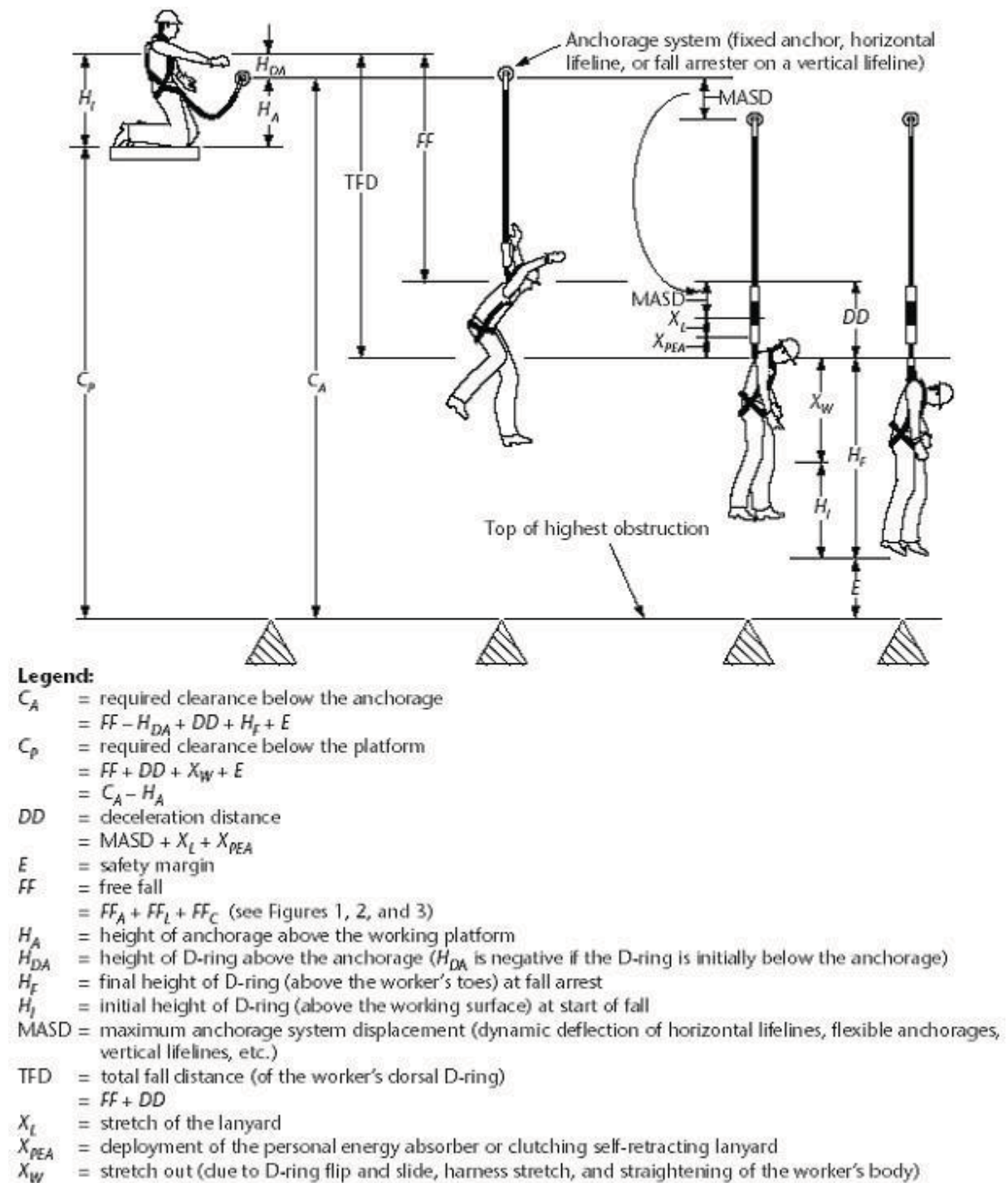
Knots lessen the breaking strength of a rope by up to 50% and should be avoided where possible in any fall protection application.

A vertical lifeline shall always be used in conjunction with a Bosun's Chair that is suspended on a separate rope for the worker to sit on while performing work at heights.

A vertical lifeline shall also be used whenever workers are lowered in their full body harness on a separate rope that is attached to the frontal or sternum D-ring (rappelling). The dorsal D-ring is then attached to the shock absorbing lanyard, the rope grab and the vertical lifeline.



Fall Distance considerations and calculations are identified in the picture below.



Fall Arrest Systems

CSA standard Z259.16. CLC Regulations specify that when working at a height above 2.4m (8 ft) (represented by C_p which is usually the distance from the bottom of the worker's feet to the safe surface), or any height over an unsafe surface, one must wear fall arrest equipment, and that free fall is to be 1.2m (4 ft), or less if required, putting the onus on the worker to select anchorages/anchor points and equipment (lanyards, energy/shock absorbers, etc) to ensure any fall, including a swing fall, would be within these parameters. The length of the deployed energy/shock absorber also has to be considered and any deflection of a horizontal lifeline if employed as anchorage. The total fall distance is calculated from the position of the dorsal D-ring at the start of the fall to its final position after the fall, based on the anchor initially being at the worker's shoulder height. At lower heights, or where there is an obstruction below the worker, it is equally important to ensure the worker cannot 'bottom out'. The free fall limit of 1.2m (4 ft) was selected after much calculation and debate to ensure the forces on the body, in the event of a fall, would be survivable. CLC Regulations established a limit of 8kN (1800 lbs), about 10 times the average body weight, to ensure survivability. CSA Standards, however, set a maximum of 6 kN (1300 lbs), and for self-retracting lanyards CSA set a maximum of 4 kN (900 lbs) - all in an effort to protect the worker from fatal or serious injury]. When working above 2.4m (8 ft) workers are to select equipment that will limit a free fall to 1.2m (4 ft) or less, if required, and not allow the worker to bottom out.

Chapter 8 ANCHORAGES

Anchorage are designated attachment locations whereas anchor points apply to non-designated attachment points.

Designated anchorages can be of the rigid type (e.g. permanent single points of attachment) or of the flexible type (e.g. a wire rope/cable lifeline). These anchorages are required by CSA standards to have a minimum breaking strength of 22.2 kN (5000 lbs). These are installed in accordance to the manufacturer's instructions, tested as specified and identified with the letter 'A' where possible. Designated anchorages are to be used whenever possible.

Designated anchorages for lifelines are subject to much greater forces and design considerations. Some of the calculations used to determine the design criteria include the distance of the lifeline between anchors, the number of workers able to use the same lifeline at the same time, as well as other built-in safety systems or devices. All permanent lifelines have to be engineered and certified and shall identify how many people may use the lifeline at the same time. Temporary lifelines can be installed by a competent person.

Non-designated anchor points are those that must be used when there is no designated anchorage available. Using a non-designated anchor point shall include the following considerations:

- a) **Strength:** select a part of the structure that can withstand a minimum breaking strength of 22.2 kN (5000 lbs) or more. It must be unquestionably strong enough to support an individual and arrest a fall;
- b) **Stability:** select a permanent, not a temporary, structure;
- c) **Location:** ideally just above the climber's head; and
- d) **Clearance:** select a point which will limit any fall to 1.2 m (4 ft) and not permit bottoming-out with the lanyard being used. To the extent possible, this point should be above the climber's shoulder.

Whenever a strong enough railing is used as a non-designated anchor point, the scaffold hook of the shock-absorbing lanyard shall connect to the vertical support of the railing as close as possible to its base if this provides the strongest anchorage.

When selecting a non-designated anchorage, its position, material, construction and age shall be considered. Care must be taken to ensure that lanyards or ropes will not be in direct contact with sharp, protruding edges.

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Chapter 9 PERSONAL PROTECTION EQUIPMENT (PPE)

9.1 GENERAL

Also referred to in CSA Standards as active fall protection equipment, personal protection equipment is intended to provide the following functions:

- a) work positioning;
- b) fall restraint; and
- c) fall arrest.

Many components or devices of personal fall protection equipment serve to satisfy more than one function and as a result no clear categorization can be made.

Design and performance requirements for personal fall protection equipment are contained in the Z259 series of CSA Standards. A common misconception with respect to this equipment is that certified ANSI equipment is equivalent to CSA equipment, but *this is not always the case*. The ANSI standard, Safety Requirements for Personal Fall Arrest System, Subsystems and Components, Z359.1, allows for a larger free fall distance and a heavier body mass than CSA standards, and as a result, ANSI designed equipment can exert greater forces on the body when arresting a fall than is allowed by Canadian standards. *If selecting ANSI certified equipment it is not sufficient to just confirm that an ANSI label or logo is attached; it is necessary to ensure the equipment meets all CSA requirements.*

9.2 SERVICE LIFE AND REMOVAL OF EQUIPMENT

Manufacturers normally apply a service life to personal fall protection equipment. Annual inspection of equipment includes a check of service life and items that have reached their service life are to be quarantined, removed from service, and disposed of in accordance to implemented record keeping procedures. For more detailed information, refer to Annex G. In addition, CSA standards specify that any personal fall protection equipment that has been involved in a fall shall be quarantined, removed from service, and inspected by a competent person in fall protection equipment. Such equipment may be returned to service if found acceptable.

9.3 PROVISION OF EQUIPMENT

A full body harness (properly fitted to the worker's body size) shall be made available to each employee who climbs as part of their normal duties. Additional equipment, the composition of which will be dependent on regional requirements, may also be provided. Employees are responsible for the serviceability and inspection status of their personal fall protection equipment.

9.4 COMPATIBILITY

Component compatibility of all fall protection equipment, including connection to permanent equipment, is essential to personal safety. Regions are to ensure equipment compatibility when purchasing equipment and when issuing it to individuals. Employees are to confirm equipment compatibility when it is issued, and whenever they have any concern about the equipment.

9.5 INSPECTION REQUIREMENTS

Before use inspection. A person who is about to climb shall complete a thorough visual inspection of their personal fall protection equipment, including:

- a) harness straps and webbing for cuts, fraying, broken stitches, and chemicals;
- b) harness D-rings and buckles for abrasion and wear, distortion, and corrosion;
- c) lanyards for integrity and operation of end fittings, cuts, fraying, and broken stitches;
- d) carabiners and snap hooks for operation, physical damage, wear, distortion, and corrosion;
- e) shock absorber for integrity of end loops and broken stitches;
- f) cable grab/fall arrester for operation, distortion, and corrosion; and
- g) inspection tag for currency and service life.

All deficiencies shall be reported and documented, and the climb may not be completed until a serviceable item is obtained, unless a suitable alternative is found. For example, if the cable grab was the item found defective then the climb may be completed using an alternate climbing procedure, with the 100% connection rule or other authorized climbing procedure.

9.6 ANNUAL INSPECTIONS

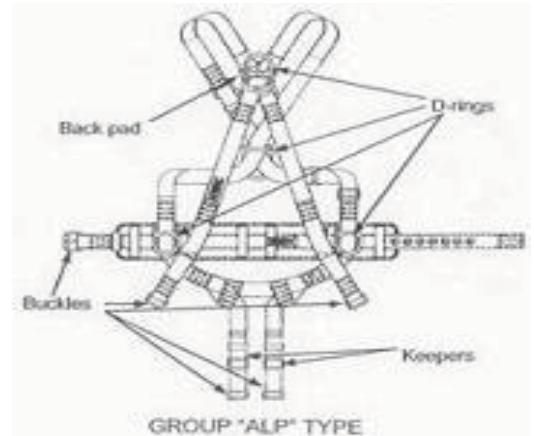
All personal fall protection equipment shall to be inspected annually for proper working condition by a competent person in fall protection equipment.

9.7 DEFECT REPORTING

All defects shall be documented and reported through existing ship and shore maintenance reporting procedures.

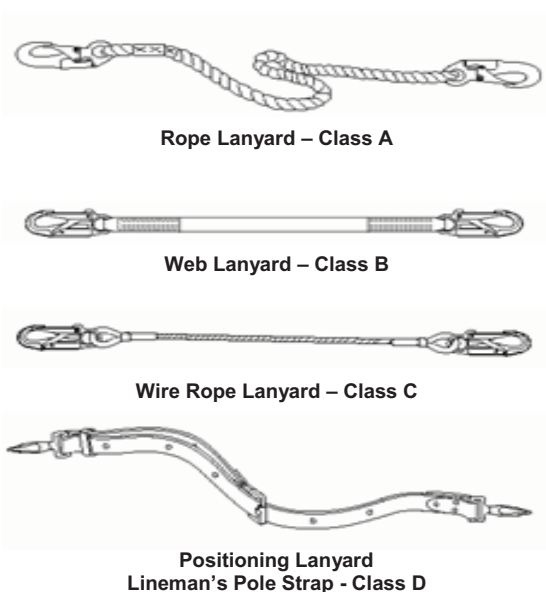
9.8 FULL BODY HARNESS, CSA STANDARD Z259.10

There are many harness types available tailored to particular work requirements, but for CCG operations the preferred harness shall be the ALP type (A designates fall arresting, L designates ladder climbing, and P designates work positioning). This type of harness is distinguished by having four D-rings: one on the back, or dorsal, for connecting to an energy/shock absorber for fall arrest; one on the front, or sternum, for connecting to a cable grab or rail to climb a ladder; and two on the sides at the waist for connecting lanyards for work.



9.9 ENERGY/SHOCK ABSORBERS. CSA STANDARD Z259.11

Energy absorbers or shock absorbers are intended to dissipate the energy of a fall and limit the deceleration forces when arresting a fall. They are available in two classes: E4 and E6. E4 designates 4.0 kN (900 lbs) arresting force and E6 designates 6.0 kN (1300 lbs) arresting force. An E4 energy absorber is the standard and is intended for absorbing a 'total mass' between 45 and 115 kg (100 and 254 lbs). An E6 energy absorber is intended for absorbing a 'total mass' between 90 and 175 kg (200 and 386 lbs) with an elongation of 6 feet. 'Total mass' is the weight of the climber, their clothing, and all equipment being taken aloft.



9.10 LANYARDS CSA STANDARD Z259.11.

Their major functions are work positioning, and providing fall restraint. Shock absorbing lanyards shall not be used for work positioning. Lanyards with self-locking snap hooks are to be used to connect around permanent anchorages and are then attached to the two (2) side-D rings of the full body harness.

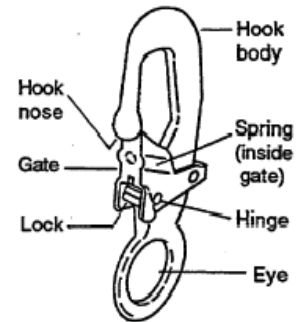
One of the most important lanyards for CCG operations is the dual-length shock-absorbing lanyard used for the alternate climbing procedure. Lanyard length and its anchorage/anchor point are the most critical factors in determining free fall distance. Lanyards should be kept as short as possible and not exceed 1.2 m (4 ft) in length.

Energy absorbing lanyards that are distinguished by a wrinkle/accordion-like outer jacket are subject to more rapid wear and are difficult to inspect but since their webbing is not as wide, it is more user friendly during high winds and less likely to get tangled if two shock absorbing lanyards with wide webbing and pouches have to be used when double tethering.

Some energy absorbers are a combination of lanyard and integral energy absorber, and are recommended because their use requires less connecting hardware.

9.11 CONNECTING COMPONENTS/HARDWARE

CSA Standard Z259.12 Connecting components (connecting hardware) are typically carabiners and snap hooks (class I), but it also includes buckles and even stitching (class II). When carabiners, snap hooks, D-rings, and the other items to which they connect are selected, ensure that each piece is rated for the anticipated use. Only one snap hook per dorsal and frontal D ring shall be connected.

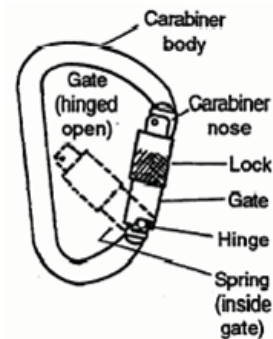


Self-Locking Snap

To prevent the possibility of ‘roll out’ only self-closing, self-locking carabiners, and self-locking snap hooks shall be used. Any gated hardware shall be used for in-line connection only to prevent gate and side loading.

Carabiners are typically made out of steel and an aluminum type alloy that is light weight, non corrosive and strong.

Carabiners are typically rated for a fall arresting force with open and with closed gate. All CSA approved carabiners shall have a self-locking gate with a minimum tensile breaking strength of 22.2 kN (5000 lbs) or better.



Self-Closing/Self

9.12 OTHER PERSONAL PROTECTION EQUIPMENT

9.12.1 Hard Hats

CSA compliant hard hats shall be worn at all times. This is to protect from falling objects, especially if two or more workers are working on the structure at the same time. Hard hats also protects against head injury while ascending a structure and colliding with objects higher up.

9.12.2 Ear Protection

It is important to keep head and ears warm and protected, especially during cold and windy conditions, to conserve body heat.

9.12.3 Safety Boots

CSA approved safety boots with steel shanks and steel/carbon composite toe protections shall be worn at all times to reduce stresses imposed by the working environment. Standing on ladders, steel or other narrow supports reduces the blood flow to the feet and thereby impairs circulation, leading to cold feet and fatigue.

9.12.4 Safety Glasses

Especially when working outside, the increase in wind is often proportionate to the height climbed. Safety glasses with or without ultraviolet protection will also help to keep the eyes moist. This is especially important for workers using contact lenses. Tinted safety glasses help cope with the glare of direct sun light when climbing up the structure with the sun shining towards the climber.

9.12.5 Hand Protection

Hands can get cold easily, especially in the winter or when strong winds are present, but they can also get blistered and damaged if not protected. During the colder periods, appropriate mittens or gloves shall be worn and during the summer months, an ultraviolet sun block cream or lotion should be considered for hands, face and exposed skin in general.

9.12.6 Personal Floatation Device

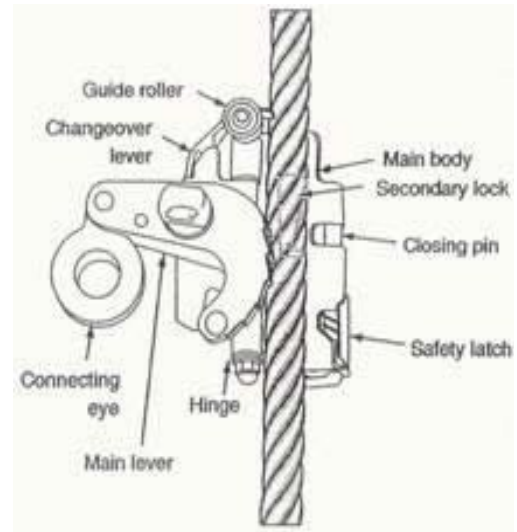
Whenever a worker is working near a body of water where there is a real or perceived risk of falling into the water, a TC and CCG approved floatation vest shall be worn. The worker shall ensure that the PDF is worn over top of the full body harness and that it does not interfere with the Dorsal D ring.

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Chapter 10 RIGGING ACCESSORIES

10.1 FALL ARRESTERS. CSA STANDARD Z259.2.1.

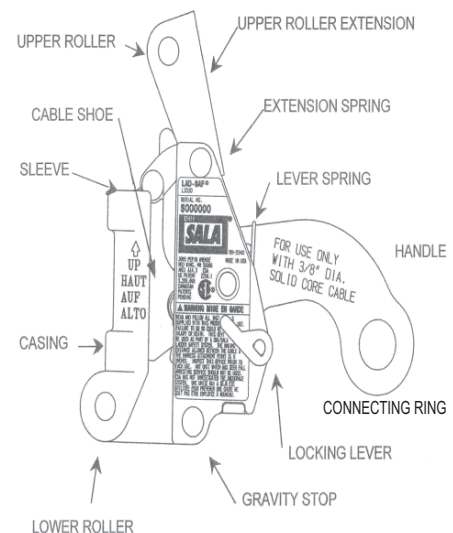
There are many classes of fall arresters. Some are used with vertical lifelines (rope) and are commonly referred to as rope grabs, and some are used with cable and rail systems. The fall arrester travels freely up and down the rope, cable or rail but in the event of a fall it automatically locks to the rope cable or rail. Some fall arresters have integral connecting linkages simplifying the connection procedure, see Z259.2.1 for details. Some fall arresters have a park feature that allows the worker to position himself at any point along the length of the rope, cable, or rail. Rope grabs are intended for use with a specific type and size of rope and are marked accordingly. Whenever possible, ropes and rope grabs shall be obtained from the same supplier as a complete kit to ensure compatibility of rope and rope grab.



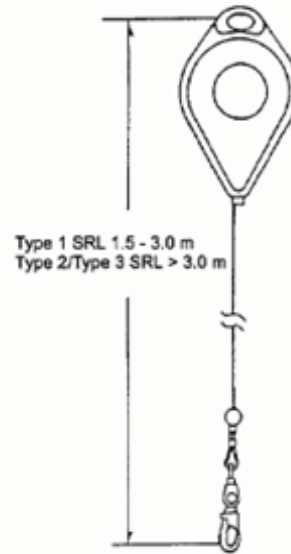
Typical Fall Arrester (Rope Grab)
For use with 16 mm (5/8 in) vertical lifeline of synthetic fiber rope

Some of CCG ladders have been fitted with DBI/SALA Lad-Saf (3/8" cable), Miller rail systems, or Trylon rail systems. These systems require the use of a fall arrester specific to their design. A worker's connection to a fall arrester is dictated by the class of fall arrester being used. Generally, vertical lifeline/rope grabs are connected to the full body harness dorsal D-ring with a three or four foot lanyard, and ladder climbing systems are connected to the full body harness sternum D-ring with an 8" (0.2m) lanyard or carabiner, or other suitable connecting hardware.

10.2 SELF-RETRACTING DEVICES. CSA STANDARD Z259.2.2.



The more common subset of self-retracting devices is the self-retracting lanyard (SRL). It performs a tethering function while allowing movement to the length of the lanyard. There are three types: type 1 which have a working length of 1.5 to 3m (5 to 10 ft) and which may have an energy absorption function, or if not, must be used with a separate energy/shock absorber; type 2 which have a working length greater than 5m (10 ft) and which have an integral energy/shock absorber, but are too heavy and bulky to be connected directly to the worker's harness and must be connected to an overhead anchorage or anchor point; and type 3 which are similar to type 2 but which also have a retrieval device which aids in rescue. Of special note is the requirement of the CSA Standard para 7.1.6 that type 2 and type 3 SRLs are to be returned to the manufacturer two years after the date of manufacture and annually thereafter for inspection and maintenance. Self-retracting lanyards must only be used in appropriate work situations.



Self-Retracting Lanyard

Even though self-retracting devices are a very useful tool, their main limitations become apparent when deployed in an area where there is a real risk of swing-fall injuries. These types of injuries occur when the falling worker is arrested by the Self-Retracting Device (SRD) and then swings back and forth, hitting obstructions leading to injuries. The longer the deployed lifeline, the greater the risk of swing fall sustained injuries.

10.3 ROPES

Rigging and working at heights often requires the use of ropes to hoist and lower goods and materials. Double braided polyester is an excellent synthetic rope with very good abrasion resistance. It does not break down quickly when exposed to ultraviolet rays, is still strong when wet and dries easily and fast. A good rope for most application made from 3/8" to 5/8" double braided polyester with a breaking strength of 4000 – 6000 lbs or better. This rope is not suitable for most rescue applications! Ropes shall be protected from going over sharp edges or other abrasive medium.

Chapter 11 PREPARATION BEFORE WORKING AT HEIGHTS

No worker shall work at elevated heights without having been trained properly.

The current weather conditions shall allow for the planned work to be conducted safely.

Before a climb takes place, a supervisor shall be informed that work at height is to commence.

Proper lockout/ tagout procedures are to be followed at all times as identified in section 7.D.19 Fleet Safety And Security Manual.

A lockout/ tagout shall occur when:

- a) working in the vicinity of antennas where the effective radiated power exceeds the safety limits as identified in Health Canada's Safety Code 6,
- b) where the proximity of moving radar antenna(s) or other moving objects might cause a safety concern,
- c) the safety standards as identified in the Canadian Aviation Regulations do not allow for such activities when helicopters land or take off from the landing area,
- d) working within the proximity of hot exhaust vents of generators, motors, boilers venting steam or other substances, gases or projectiles, and
- e) within the proximity of any other moving, vibrating, elevating or non-stationary objects, materials or substances.

Before climbing, the worker shall plan the ascent/descent, assess all risks associated with the work to be performed and use properly inspected and cared for personal protective equipment.

Many masts, A-frames and elevated platforms are different and require planning of site specific rescue scenarios. These rescue scenarios shall be briefly discussed before each climb.

Good two-way communication is often essential in order for the climber(s) to communicate with each other and/or the worker(s) on the main deck (e.g.: radio, cellular phones, verbal, hand signals, and other communication methods).

There are conditions that could develop where risks need to be re-evaluated (e.g.: strong winds, thunderstorms, lightning, heavy rain, freezing rain, inclement weather). Work shall be stopped if the worker experiences drowsiness, blurred vision, cramps, disorientation, extreme sweating, chills or any other symptoms that signal stress, fatigue or illness.

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Chapter 12 SHIP-BASED STRUCTURES AND CLIMBING METHODS

12.1 STAIRWAYS AND LADDERS

In the event of an emergency, all ladders may be climbed without special fall protection equipment.

All stairways shall be negotiated using at least one handrail, however should the ship's motion become excessive, one hand on each handrail shall be used.

All ladders reaching 3 m (10 ft) or higher above the next lower safe and permanent platform shall only be climbed when using a full body harness with the climber tethered at all times.

All shorter ladders or ladders designed for emergency exit may be climbed using the 3-point contact method of climbing. This method does not allow for using one hand for the transport of goods, tools or material.

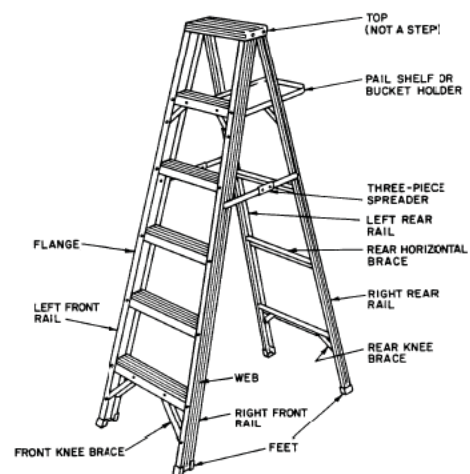
Ladders equipped with a safety cable or safety rail system shall only be climbed with the corresponding trolley properly attached to the frontal or sternum D-ring of the full body harness;

All other ladders that have no fall arrest systems installed shall only be climbed with a full body harness using the double tethering method, ensuring that the climber is tied off at all times while on the ladder.

Permanent ladders are typically welded or bolted to the side of existing structures to gain access to decks, access to elevated platforms, A-frames and other elevated areas.

Subject to earlier codes and standards, some permanent ladders were enclosed by cages that were supposed to help prevent falls by ensuring that the climber is close to the ladder. Ladder cages provide a false sense of security. All permanent ladders that enable a person to climb to 2.4 m (8 ft) above a permanent platform or any permanent ladder taller than 3 m (10 ft) shall be equipped with a permanent fall arrest system, typically cable or fixed rail.

All ladders equipped with ladder cages shall only be climbed when using a full body harness with shock absorbing lanyards for double tethering.



12.2 PORTABLE LADDERS

Select the appropriate ladder for the task. All portable ladders used on board a ship shall be of fibreglass construction.

All portable ladders shall be placed on level, stable ground ensuring solid footing.

Ladders shall be placed approximately $\frac{1}{4}$ of their height away from the structure to be climbed.

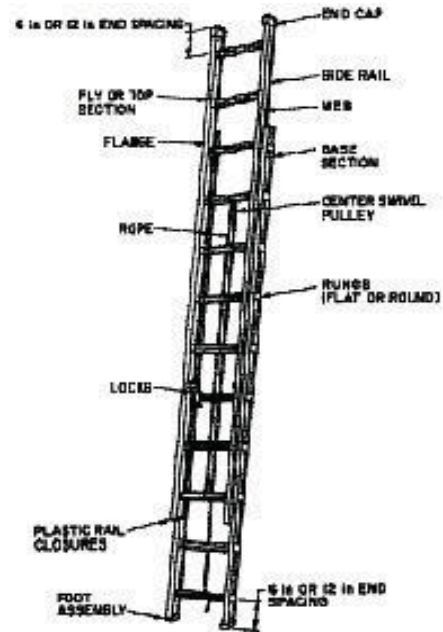
Where possible, ladders shall be tied off at the top and bottom.

Where a ladder is used to access an elevated platform, the ladder shall exceed the height of the structure by at least 3 rungs.

Ladders shall be clean, in good condition and without cracked, bent or broken portions that might fail.

When working or climbing a ladder, ensure that your center of gravity is between the vertical rails.

Do not work from any of the top three rungs of an extension ladder or the top two steps of a step ladder.



12.3 MASTS

All masts with fixed ladders attached shall be climbed using the double tethering method unless equipped with a fall arrest system.

Masts that have steel pegs mounted to the left and right side of the mast as climbing steps may not provide good anchor points to tie off to. Typically, the climbing pegs are either not strong enough to act as an anchorage for the scaffold hook of the shock absorbing lanyard, or if strong enough, the scaffold hook would slide off should a fall occur and the pegs bend trying to arrest a fall.



In order to climb masts with peg ladders safely, two (2) positioning lanyards should be used that act as fall restrains. The first positioning lanyard is placed around the mast and attached to the two (2) D-rings attached at waist level of the full body harness. The climber then slowly ascends the mast while alternately moving the positioning lanyard over one climbing peg at one side before moving it over the peg on the other side and thereby climbs up the mast. Once an obstruction is reached, the second positioning lanyard is placed above the obstruction around the mast and attached to the two (2) D-rings before the first lanyard is disconnected. The climber ascend the mast using this method until the work station is reached and then climbs down the mast using the same general approach.



Masts that have climbing pegs on both sides should be equipped with a safety cable or rail system that would then permit the climber to climb the mast the same way as a ladder would be climbed that has a fall arrest system.

12.4 STACKS

These are usually accessed by ladders from the inside and/or the outside of the ship and if not equipped with a fall arrest system, then the double tethering procedures shall apply. Short ladders may be climbed using the 3-point contact method.

12.5 MANHOLES AND HATCH OPENINGS

Proper guardrails or sufficiently high coaming of at least 36" shall be securely placed and fastened around open manholes or hatches. If neither is available, a fall restraint should be worn that would prevent the worker from falling into the opening.

12.6 SLIPPERY SURFACES – DECKS

Movement on wet and slippery decks should be slow, deliberate and methodical. If working on slippery decks or surfaces could bring personnel to a hazard, a lifeline should be considered.

12.7 FALL PROTECTION WHEN WORKING ABOVE/ NEAR MOVING MACHINERY

All steps identified in the ship's specific lockout/tagout procedures apply.

A safety net should be placed above the fall hazard and where that is not possible, a secondary fall arrest or restraint system should be employed. This could be achieved by utilizing more short positioning lanyards to act as a fall restraint and fall arrest system, limiting the free-fall distance to inches.

12.8 FALL PROTECTION ABOVE WATER

A safety net should be installed below the work area of the climber and where that is not possible, a secondary fall arrest or fall restraint shall also be used such as a lifeline, the use of multiple positioning lanyards acting as fall restraints, etc. The worker shall at all times wear an approved personal flotation device that shall not interfere with the deployment of the full body harness arresting a fall.

12.9 FALL PROTECTION DURING PERSONNEL TRANSFER

During regular shore-to-ship and ship-to-shore personnel transfer, gangways are typically employed that are often narrow in width, allowing personnel to at least hold on to one (1) railing, sometimes two (2). In this case, the railing(s) acts as the primary fall prevention system with the safety net installed below and above the water as the primary fall arrest system.

Personnel transfer from ship-to-ship is potentially dangerous. All personnel shall wear an approved PFD and where the physical strength or fitness of personnel is in question, a full body harness attached to a lifeline or anchorage shall also be worn. In situations where this is not practical or where the vertical distance between the decks of the two (2) ships is less than 3 m (10 ft), personnel transfer may take place with the assistance of personnel from both vessels.

The Jacob's ladder, accommodation ladder or equivalent, whenever possible, shall always be placed against the side of the ship in a manner that ensures that the ladder is lying flat against the ship's side to prevent it from swinging loosely back and forth.

In order to reduce possible harm to personnel caused when falling into or onto the lower boat during personnel ship-to-ship transfer, the lower boat shall move away from the larger boat if the height of the ladder to the taller boat exceeds 3 m (10 ft), as soon as the climbing person has stepped onto the Jacob's ladder. Injuries sustained by a fall into the water are typically less severe than a fall into the boat.

Whenever possible, the Jacob's ladder shall be placed near the middle of the ship.

Only one person at a time shall use the Jacob's ladder.

Scaffolds on board of ships are typically used on ships when maintenance work or major retrofits are carried out.

Work from scaffolds shall only be carried out when the ship is docked.

Work from scaffolds or other temporary elevated platforms that are 2.4 m (8 ft) above the next safe level shall only be carried out when the worker is wearing a full body harness that is attached at all times to a secure anchorage.

Working at heights requires the use of a full body harness with the ALP designation, ensuring that the worker can tie off with a positioning lanyard when required.

Regulations pertaining to the safe use of scaffolding on ships are in the CSA, 2001 under Safe Working Practices Regulations, *Scaffolding, Scaffolds and Stages*.



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Chapter 13 BASIC LADDER AND MAST CLIMBING TECHNIQUES

Permanent Ladders and their design are covered in CSA Standard Z259.2.1.

All ladders shall be climbed using the 3-point contact method where the worker ensures that two (2) legs and one (1) hand or two (2) hands and one (1) leg is always in direct contact with the ladder.

All ladders equipped with a fall arrest system shall have the trolley connected to the carabiner and the frontal D-ring of the full body harness.

The scaffold hook of the shock absorbing lanyard that is attached to the dorsal D-ring of the full body harness shall be connected to a confirmed anchor located near the top of the ladder before the worker disengages from the ladder's fall arrest system.

Visual confirmation shall be used that the correct cable grab/rail fall arrestor for the system is used and that the trolley is properly attached to the cable/rail.

Special attention is required to ensure that the trolley is not attached backwards to the cable or rail system.

The connection distance between the frontal D-ring of the full body harness and the fall arrestor shall not exceed 0.2 m (8") as specified in CSA Standard Z259.2.1.

The frontal D-ring, or the sternum D-ring when using a crossover body harness, shall always be used when attaching to a cable or rail fall arrest system.

All ladder cable or rail safety systems are designed to only allow for the simultaneous use of a restricted number of persons. This is especially critical for vertical cable safety lines that have only one anchorage near the top of the structure. If in doubt, the cable safety line shall only be used by one worker at a time.



The trolley of a cable or rail arrest system shall never substitute as a positioning device.

The climber shall pay special attention when reaching the end of a safety rail. Not all safety rails are equipped with a trolley stop that ensure that the trolley will not run off the rail once the end of the rail is reached. Ladders that have no stop at the end of their safety rail shall not be climbed or have to be climbed using the 100% connection method.

13.1 DOUBLE TETHERING, METHOD 1

Double Tethering, Method 1 (100% tie-off method) ensures that the climber is at all times connected to the fall arrest system. This method utilizes two shock absorbing lanyards not exceeding 1.2 m (4 ft) in length each, attached to the dorsal D-ring.

The climber shall attach the scaffold hook connected to the end of the first shock absorbing lanyard to an anchor point above their head and then climb up the structure and engage the second scaffold hook attached to the second shock absorbing lanyard at a height above the first scaffold hook.

The climber shall then climb up the structure a few feet, disengage the first scaffold hook and place it at a height above the second scaffold hook.

The climber shall proceed up the mast or ladder using this method until their work station is reached.



13.2 DOUBLE TETHERING, METHOD 2

The climber can use an alternate method of double tethering while climbing that is physically less demanding while still securing a full tie-off at all times.

A scaffold hook shall be attached to the frontal or sternum D-ring of the crossover full body harness or to the middle D-ring of the H-full body harness, attached to its belt using a small locking carabiner.

As in Method 1, the climber ascend the mast after having engaged the scaffold hook attached to the shock absorbing lanyard that is fastened to the dorsal D-ring at a higher elevation.

The climber now climbs past the first scaffold hook and then engages the scaffold hook attached to the sternum or middle D-ring and then disengages the scaffold hook that is attached to the shock absorbing lanyard and proceeds up the structure.

This method allows the climber momentary rest during the time that the scaffold hook is attached to the frontal or middle D-ring connected to the mast.

13.3 WORK POSITIONING

The climber shall always verify visually that their positioning lanyard, after it has been fastened to a solid anchor point, is properly engaged into the 2 side D-rings of the body harness.

The climber shall ensure at all times that the anchor point selected for their lanyards is strong enough to arrest a fall.

The climber shall at all times be mindful where their feet are positioned while climbing a structure. In the event of a sudden slip resulting in a fall, the body has a tendency to move backwards and downwards at the same time. This may cause the feet to be wedged in between the horizontal rung of the ladder and an obstruction attached to the mast or ladder, causing feet and/or legs to break while falling before the fall is arrested.

During the ascend of the structure, the climber shall take note of all irregularities encountered such as bent or damaged structural steel members, rust, abrasions, bent safety rail sections, slack safety rail junctions, loose mounts, damaged cables or wires, loose equipment, burnt lights, loose bolts or any other deficiencies that need to be rectified.

If the climber encounters defects or damage to the structure being climbed that compromises safety, the climb shall be aborted immediately.

Once the climber has reached their work station, a short positioning lanyard shall be secured to a firm anchor point and shall be attached to the 2 D-rings fastened to each side of their full body harness.

A shock absorbing lanyard shall be connected to the structure even when a positioning lanyard is being deployed.

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Chapter 14 INSPECTION REQUIREMENTS

14.1 BEFORE-USE INSPECTIONS

A person who is about to climb shall visually inspect the base of the structure, ladder cable/rail system, and anchorages before starting the climb, and during the climb, for:

- a) any signs of physical or structural damage, distortion, deterioration, or corrosion;
- b) cable for kinks, fraying and tension;
- c) cable/rail guide for condition;
- d) cable/rail mounting hardware for security;
- e) ladder welds for integrity;
- f) anchorages for integrity; and
- g) inspection tag for currency.

Deficiencies shall be reported and documented, and the climb may be completed using the alternate climbing procedure – the 100% connection rule or other authorized climbing procedure.

14.2 DEFECT REPORTING

All defects shall be documented and reported through existing ship and shore maintenance reporting procedures.

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Chapter 15 FALL RESCUE PLAN REQUIREMENTS

15.1 GENERAL

The tallest masts on ships deployed by the CCG are approximately 50 ft (15 m) above the nearest permanent platform. In most cases, emergency work on masts while ships are at sea is only carried out when the waters are calm, providing a more stable environment. Every ship is unique and therefore ship-specific rescue plans shall be developed that address the particular characteristics of the vessel, its masts and elevated platforms. The ship-based rescue training shall include a rescue scenario, bringing an injured worker down from a mast or elevated platform.

High angle rescue techniques are not well suited for ship-based installations where most of the masts being climbed are typically only about 30 feet (9 m) high, easily accessible and emergency assistance and rescue can be provided quickly with basic equipment.

The most likely cause of a fall is human error and poor judgment. Good training with regular refresher courses, well maintained equipment and being in good physical condition are a prerequisite for working safely at heights.

Before each climb, anticipated difficulties or problems regarding the climb or the structure should be addressed and a general rescue plan shall be discussed. A second worker, experienced and trained in climbing shall be on standby, dressed in a full body harness with some basic rescue equipment available, ready to provide assistance should the need arise.

Rescue, emergency or First Aid assistance may have to be provided to a worker under the following conditions:

- a) The climber fell off the structure and is badly hurt, in shock or fatally injured;
- b) The climber slipped or fell but was arrested by the fall arrest system deployed;
- c) The climber may have been injured during the fall before the fall arrest system was fully deployed and may be unconscious, in need of immediate medical attention, traumatised;
- d) The climber may have sustained an injury while working aloft such as cuts, bruises, etc.
- e) The climber may have suffered a panic attack, experienced severe cramping or succumbed to other physical or emotional distress, preventing a safe, unaided descend down from the elevated structure;
- f) Other

15.2 RESCUE TRAINING

15.2.1 General

The critical factor in rescue training is **PRACTICE**. In the event of a fall, and the person is uninjured and is capable of self-rescue as taught in basic fall protection training, or the worker can be rescued by ladder, the rescue situation is likely to proceed in an orderly fashion. In the event of a fall at height, and if there are complicating factors such as shock or injury, then the situation is likely to be quite different. Having personnel who are well trained and practiced for any and all types of rescue scenarios will help ensure a quick and safe rescue.

15.2.2 Self-Rescue Training

Self-rescue training shall be part of the fall protection training. The self-rescue scenario assumes the worker has had his fall successfully arrested by his equipment, is uninjured, and is capable of using his own equipment to reach a safe surface.

15.2.3 Ladder Rescue Training

Ladder rescue is a very basic form of rescue where the critical factor to a safe rescue is tying off the ladder to prevent further mishap. Ladder rescues should be practiced to re-enforce this option of rescue.

15.2.4 Rescue Training

Rescue training is to include in depth training on the ship's rescue equipment and to provide the trainee with the knowledge and skills to affect the rescue of a co-worker whose fall protection equipment has successfully arrested his fall and is suspended at some height above a safe surface. Such training should include, but not necessarily be limited to, the following:

- a) before-use inspection of the primary and back-up rescue equipment;
- b) before-use inspection of slings, connecting hardware, etc.;
- c) assignment of crew rescue duties including lead rescuer;
- d) proper hook-up procedure, including selection and tying of knots;
- e) proper hook-up procedure for back-up belay line;
- f) ascending/descending techniques including tending of the victim's equipment;
- g) anchor selection for a two person load;
- h) proper use of edge protectors;
- i) rigging techniques to avoid heat fusion of ropes;
- j) rigging techniques to maintain minimum bend radius of ropes; and

- k) communication skills to be calming and re-assuring to the victim.

Rescue of a person suspended at height in his fall protection equipment is one of the most critical and demanding rescue situations. A successful rescue is largely dependant on the skill of the rescue crew, a skill gained through ongoing training and practice.

15.3 MINIMUM BASIC RESCUE EQUIPMENT

15.3.1 General

Typically, rescues on ships do not take place from great heights but they are complicated because of the many attachment bars, antennas, lights and other obstructions fastened to the mast or structure. This may make it more difficult to lower an injured person quickly to a safe location on deck without getting tangled up in the many attachments protruding from the mast. Due to the ship's design and the limited deck space, rescue can not take place from all sides.

15.3.2 Rope

This is the most important piece of equipment for any rescues from heights. It provides the basic means for lowering and raising an injured worker to a safe level. Two (2) kernmantle ropes, three (3) times the length of the tallest mast on the ship shall be part of the ship's rescue kit. The rope shall be rated for at least 40 kN (9000 lbs), properly stored when not in use and only be used for rescue applications.



15.3.3 Carabiners

An assortment of locking carabiners of different sizes is required. This is the connecting hardware that can be used to attach the rope to anchorage, harness, D-rings or they can be used for linking or connecting with other points.

Rescue Belay System. This can be a breaking pulley that introduces friction and can assist in lowering a heavy weight to the ground or it can be any other device that will introduce friction when a rope passes through it.

15.4 BASIC RESCUE PLAN

15.4.1 General

In most cases, the need for a rescue from heights comes sudden and requires a fast response. Lowering an injured worker to the ground from a height of 15 m (50 ft) can be done quickly using just a few basic pieces of equipment, assuming that there are two (2) people ready to help. The benefit of block and tackle or other pulley systems used for lowering a person to the deck is questionable since the set-up time can be considerable and there is a real possibility that the

pulleys and ropes might get caught in protruding arms or other attachments on the mast when the pulley system is installed or the injured worker is lowered down.

15.4.2 Rescue Scenario

A worker had slipped and fallen near the top of the mast and while the fall was arrested, the worker's head was thrown against the mast causing loss of consciousness.

The stand-by worker dressed in his full-body harness calls for help and climbs up the mast with the rope, a few carabiners and the belay system. Once he reaches the unconscious climber and administers emergency First Aid, the rope is either attached via the belay system to a point above the injured worker or if no belay system is available, attaches a carabiner to an anchor point and then loops the rope around the carabiner to create a belay system. One end of the rope with a carabiner attached to it is fastened to the dorsal D-ring of the body harness of the injured worker and the lower end of the rope is looped around another carabiner that is fastened to an anchor point near the base of the mast. This end of the rope is controlled by the second rescue worker who can lower the injured person slowly to the ground while the first rescue worker, still on the mast, descends slowly while guiding the unconscious worker to a safe area.

The two main concerns after the worker is rescued from the elevated structure relate to the original injuries sustained before and during the fall and the physical trauma received to the body caused by being suspended in the harness. All fall protection and rescue training received by CCG employees working on ships shall include awareness training of how best to deal with suspension trauma.

Chapter 16 FALL PROTECTION COMPETENCIES

This section specifies the competencies required by CCG personnel in fall protection. These competencies are consistent with the Competency-Based Management (CBM) program of the Public Service of Canada. CBM is a management system that ties the performance of its people to the organization's strategic goals. The CCG's strategic goal is zero falls.

Competencies are normally thought to be knowledge, skills, and abilities. CBM extends competency to include the behaviour (i.e. attitude and performance) of an employee such that an employee helps to achieve the organization's strategic goals continuously through their daily effort and the organization, in return, facilitates the development of the employee to enhance and expand his/her overall abilities.

Managers shall be competent, trained and aware of all aspects of the fall protection program, enabling them to provide proper guidance and supervision.

The following tables contain the competencies in fall protection for CCG personnel either by organizational level of responsibility or by occupation. The Qualification Standard column lists the training prescribed in this **Fall Protection Program**; this training may be satisfied by either CCG or commercial sources. Note that the competencies required of a Competent Person include both those listed for a Competent Person and also those listed for a Climber.

16.1 SENIOR MANAGEMENT

Standard No. tba

Task No. tba

COMPETENCY	KNOWLEDGE, SKILL, and ABILITY	QUALIFICATION STANDARD	PERFORMANCE STANDARD
Facilitation and implementation of CCG's Fall Protection Program	Understands the legal obligations to be compliant with the Canada Labour Code and the Canada Shipping Act, 2001 with respect to fall protection	Overview Training	Sets goals
Support and endorsement of CCG's Fall Protection Program	Understands CCG's Fall Protection Program requirements		Establishes program funding
Provision of program guidance			Ensures requirements of the fall protection program are being implemented/ followed in area of responsibility.

16.2 COMMANDING OFFICER

Standard No. tba

Task No. tba

COMPETENCY	KNOWLEDGE, SKILL, and ABILITY	QUALIFICATION STANDARD	PERFORMANCE STANDARD
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Fall Protection Competencies

Implementation of CCG's Fall Protection Program	<p>Understands the legal obligations to be compliant with the Canada Labour Code and the Canada Shipping Act, 2001 with respect to fall protection</p> <p>Understands CCG's Fall Protection Program requirements</p>	Overview Training	<p>Ensures requirements of the fall protection program are being followed on board ship</p> <p>Ensures ship unique fall hazards are identified and addressed by appropriate procedures</p> <p>Ensures personnel are trained and qualified for the work they are tasked to do</p> <p>Communicates the need for safe work practices on a regular basis</p>
Promotion of a safety conscious work environment	Has good communication skills		

16.3 SUPERVISOR

Standard No. tba

Task No. tba

COMPETENCY	KNOWLEDGE, SKILL, and ABILITY	QUALIFICATION STANDARD	PERFORMANCE STANDARD
Implementation of CCG's Fall Protection Program	<p>Understands the legal obligations to be compliant with the Canada Labour Code and the Canada Shipping Act, 2001 with respect to fall protection</p> <p>Understands CCG's Fall Protection Program requirements</p> <p>Understands CSA fall protections Standards</p>	Fall Protection Training and Rescue Training	<p>Ensures requirements of the fall protection program are being followed in area of responsibility</p> <p>Oversees and/or delegates authority to work teams the work being done at height</p> <p>Ensures unique fall hazards are identified and addressed by appropriate procedures</p> <p>Takes action to correct fall hazards</p> <p>Takes action to create/amend procedures as required</p>
Identification of improvements to fall protection program and procedures	<p>Utilizes hazard analysis techniques to identified potential fall situations</p> <p>Can identify potential fall hazards</p>		

Consultation with subject matter experts	Understands when personal knowledge of a subject requires augmentation		Seeks additional information from subject matter experts when necessary
Promotion of a safety conscious work environment	Has good communication skills		Communicates the need for safe work practices on a regular basis

16.4 COMPETENT PERSON

Standard No. tba

Task No. tba

COMPETENCY	KNOWLEDGE, SKILL, and ABILITY	QUALIFICATION STANDARD	PERFORMANCE STANDARD
Clarification and instruction of fall protection requirements	Knows the Basic Fall Protection course content and climbing techniques	Fall Protection Training, Competent Person Training, and Rescue Training	Conducts individual coaching and training sessions as required
Instruction of climbing techniques			
Instruction of rescue techniques	Knows the Rescue course content and rescue techniques		Conducts individual coaching and rescue training sessions as required
Inspection of permanent and personal fall protection equipment	Knows annual and specified inspection criteria and can detect defects in equipment		Completes required inspections and re-certification of fall protection equipment
Identification of improvements to fall protection program and procedures	Utilizes hazard analysis techniques to identified potential fall situations Can identify potential fall hazards		Takes action to correct fall hazards

16.5 CLIMBER

Standard No. tba

Task No. tba

COMPETENCY	KNOWLEDGE, SKILL, and ABILITY	QUALIFICATION STANDARD	PERFORMANCE STANDARD
Inspection of permanent and personal fall protection equipment before climbing	Knows before-use inspection criteria and can detect defects in equipment	Fall Protection Training, Rescue Training	Performs work at height safely and in accordance with CCG Fall Protection Program requirements
Selection of appropriate lanyard length for work situation	Can determine fall distance calculations correctly		Participates in fall protection and rescue training and practice sessions

Fall Protection Competencies

Selection of hardware/ components that are compatible	Knows hardware compatibility criteria		
Donning personal equipment correctly	Knows how to adjust full body harness for safety and comfort		
Climbing safely and in compliance with appropriate procedures	Knows proper connection requirements, ladder climbing, vertical lifeline, and alternate climbing techniques		
Capability of using one's own equipment to effect self rescue in the event of a fall	Knows self-rescue techniques		
Capability of using rescue equipment to effect rescue of a co-worker	Knows rescue techniques		
Working safely at height in all situations: suspended, boatswain's chair, swingstage, scaffolding, etc.	Can select the correct piece of personal fall protection equipment for specific work situations		
Exercising self discipline to adhere to all procedures	Knows all safe working requirements regarding guardrails, 100% connection, etc.		Takes action to correct fall hazards
Awareness of potential fall hazards	Can identify potential fall hazards		
Identification of improvements to fall protection program and procedures	Can identify program/ procedure improvements		Makes recommendations to improve the fall protection program/ procedures
Capability to administer first aid and CPR	Can administer first aid and CPR	First aid and CPR training	Administers first aid or CPR when required

Annex A TERMS AND DEFINITIONS

Anchorage/ Anchor Point	A secure connecting point capable of withstanding the impact forces as result of a fall. By their very nature they are considered permanent fall protection equipment as well as a component of personal fall arrest equipment.
ANSI	American National Standards Institute
Boatswain's chair	A seat attached to a suspended rope, designed to accommodate one person in a sitting position to facilitate work.
CSA	Canadian Standards Association
CSA, 2001	Canada Shipping Act, 2001
Competent Person	An individual knowledgeable in fall protection and manufacturer's recommendations, who can advise on the proper use of equipment, can recognize and evaluate the condition of equipment in order to complete an inspection and certify its acceptability for use.
Certified	Equipment meeting the requirements of a Standard as attested by a certification organization or other institution
Energy Absorber	A device that dissipates kinetic energy, limits deceleration forces during fall arrest and does not return the kinetic energy to the system or into the human body.
Fall Arrest Equipment/ System	A combination of components, when used together, constitutes a system to arrest a free fall. Components include anchorages, connecting devices such as buckles, 'D'-rings, and snap hooks, lanyards, shock absorbers, deceleration devices, and full body harness.
Fall Restraint Equipment/ System	A variety of devices (barriers, guardrails, work positioning lanyards) used to prevent a fall from occurring.
Fall Safety Margin	An unobstructed clearance below the worker at the point where the fall has been stopped, used in establishing the minimum clearance requirement during a fall.
Flexible Horizontal Lifeline	A horizontal line generally constructed of flexible material such as wire rope, fibre rope, or webbing.
Free-fall Distance	The vertical displacement of the fall-arrest attachment point on the full body harness (normally the dorsal D-ring) from the time a fall begins until the moment just before the system begins to react by applying force to arrest the fall.
Full Body Harness	A part of personal fall protection equipment composed of webbing/straps, padding, connecting hardware and, in some cases, integral shock absorbers. It serves to both position the user and distribute forces over the body in the event of arresting a fall.

Hardware	A generic term for components such as snap hooks, D-rings, buckles, carabiners, that connect items of fall protection/fall arrest systems together; e.g. a full body harness to other fall protection equipment such as fall arrestors, cable grabs, etc.
Lanyard	A flexible line or strap used to secure a full body harness to a fall arrester, an energy absorber, a horizontal lifeline, or an anchorage connector.
Lifeline	A flexible line (may be wire rope/cable, synthetic fibre, or webbing) for connection to an anchorage(s) and to hang vertically (VLL) or to span horizontally (HLL).
Qualified Person	An individual who has successfully demonstrated the ability to complete the subject matter work, and solve/resolve problems related to the subject matter by possessing a recognized degree or certificate of professional standing, or by extensive knowledge, training and experience.
Regional Authority	The Regional Authority may be an individual within a Region's headquarters, a supervisor, or any other person who has been empowered by CCG by virtue of their position to exercise responsibility, technical or otherwise, of a particular function and, consequently, can approved/disapprove elements of that function.
Climber	A worker skilled and trained for working at heights.
Safe Level/ surface	An area of sufficient size and strength to adequately support a person at work or a person who falls and is sufficiently horizontal to prevent a further fall.
Scaffold	An elevated or suspended work platform supported in a number of different ways – the ground, brackets, ropes, or other means. Scaffolds may have permanently or temporarily affixed guardrails.
Self-retracting lanyard (SRL)	A device that provides a means of connecting a worker to an anchorage/anchor point that automatically adjusts its length under light tension as the worker moves toward or away from the anchorage, and is capable of stopping a fall.
Swingstage	A type of suspended scaffold/work platform usually supported by two ropes.
Travel Restraint System	An assembly of components that, when properly assembled and used together and when connected to a suitable anchorage, prevents a worker from reaching an unprotected edge or opening where a fall could occur.
Work Positioning System	An assembly of components that, when properly assembled and used together, supports a worker in a position or location so that the worker's hands.

Annex B CANADA LABOUR CODE (R.S. 1985, c.L-2)

B.1 MARINE OCCUPATIONAL SAFETY AND HEALTH REGULATIONS

Part X – Safety Materials, Equipment, Devices and Clothing

Fall-Protection Systems

10.9 (1) Where a person, other than an employee who is installing or removing a fall-protection system in accordance with the instructions referred to in subsection (5), works from

- a) an unguarded structure that is
 - i) more than 2.4 m above the nearest permanent safe level,
 - ii) above any moving parts of machinery or any other surface or thing that could cause injury to an employee on contact, or
 - iii) above an open hold,
- b) a temporary structure that is more than 3 m above a permanent safe level, or
- c) a ladder at a height of more than 2.4 m above the nearest permanent safe level and, because of the nature of the work, that person can use only one hand to hold onto the ladder,

the employer shall provide a fall-protection system.

(2) The components of a fall-protection system shall meet the following standards

- a) CSA Standard Z259.1-1976, Fall-Arresting Safety Belts and Lanyards for the Construction and Mining Industries, the English version of which is dated November, 1976, as amended to May, 1979 and the French version of which is dated April, 1980;
- b) CSA Standard Z259.2-M1979, Fall-Arresting Devices, Personnel Lowering Devices and Life Lines, the English version of which is dated November, 1979 and the French version of which is dated October, 1983; and
- c) CSA Standard Z259.3-M1978, Lineman's Body Belt and Lineman's Safety Strap, the English version of which is dated September, 1978, as amended to April, 1981 and the French version of which is dated April, 1980, as amended to April, 1981.

(3) The anchor of a fall-protection system shall be capable of withstanding a force of 17.8 kN.

(4) A fall-protection system that is used to arrest the fall of a person shall prevent that person

- a) from being subjected to a peak fall arrest force greater than 8 kN; and
- b) from falling freely for more than 1.2 m.

- (5) Every employee required to install or remove a fall-protection system in a work place shall be instructed and trained by the employer in the procedures to be followed for the installation or removal of the system. SOR/95-74, ss. 61(E), 89(F).

B.2 CANADA OCCUPATIONAL HEALTH AND SAFETY REGULATIONS

Part XII – Safety Materials, Equipment, Devices and Clothing

Fall-Protection Systems

12.10 (1) Subject to subsection (1.1), every employer shall provide a fall-protection system to any person, other than an employee who is installing or removing a fall-protection system in accordance with the instructions referred to in subsection (5), who works

- a) from an unguarded structure or on a vehicle, at a height of more than 2.4 m above the nearest permanent safe level or above any moving parts of machinery or any other surface or thing that could cause injury to a person on contact;
- b) from a temporary structure at a height of more than 6 m above a permanent safe level; or
- c) from a ladder at a height of more than 2.4 m above the nearest permanent safe level where, because of the nature of the work, that person is unable to use at least one hand to hold onto the ladder.

(1.1) Where an employee is required to work on a vehicle on which it is not reasonably practicable to provide a fall-protection system, the employer shall

- a) in consultation with the policy committee or, if there is no policy committee, the work place committee or the health and safety representative,
 - i) perform a job safety analysis to eliminate or minimize the need for the employee to climb onto the vehicle or its load, and
 - ii) provide every employee who is likely to climb onto the vehicle or its load with training and instruction on the safe method of climbing onto and working on the vehicle or its load;
- b) make a report in writing to the regional health and safety officer setting out the reasons why it is not reasonably practicable to provide a fall-protection system and include the job safety analysis and a description of the training and instruction referred to in paragraph (a); and
- c) provide a copy of the report referred to in paragraph (b) to the policy committee or, if there is no policy committee, the work place committee or the health and safety representative.

(1.2) The job safety analysis, training and instruction referred to in paragraph (1.1)(a) shall be reviewed every two years in consultation with the policy committee or, if there is no policy committee, the work place committee or the health and safety representative.

(2) The components of a fall-protection system shall meet the following standards

- a) CSA Standard Z259.1-1976, Fall-Arresting Safety Belts and Lanyards for the Construction and Mining Industries, the English version of which is dated November, 1976, as amended to May, 1979 and the French version of which is dated April, 1980;
- b) CSA Standard Z259.2-M1979, Fall-Arresting Devices, Personnel Lowering Devices and Life Lines, the English version of which is dated November, 1979 and the French version of which is dated October, 1983; and
- c) CSA Standard Z259.3-M1978, Lineman's Body Belt and Lineman's Safety Strap, the English version of which is dated September, 1978, as amended to April, 1981 and the French version of which is dated April, 1980, as amended to April, 1981.

(3) The anchor of a fall-protection system shall be capable of withstanding a force of 17.8 kN.

(4) A fall-protection system that is used to arrest the fall of a person shall prevent that person

- a) from being subjected to a peak fall arrest force greater than 8 kN; and
- b) from falling freely for more than 1.2 m.

(5) Where an employee is about to install or remove a fall-protection system, the employer shall

- a) prepare written instructions for the safe installation or removal of the fall-protection system; and
- b) keep a copy of the instructions readily available for the information of the employee. SOR/88-632, s. 50(F); SOR/94-263, s. 47(F); SOR/2002-379, s. 1.

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Annex C CANADA SHIPPING ACT, 2001

C.1 SAFE WORKING PRACTICES REGULATIONS (CRC, c. 1467)

Holds, Tanks and other Compartments

25. (1) When not in use, every hatch or other opening that leads to a hold, tank or other compartment exceeding 1.5 m in depth shall be securely covered or fenced to a height of 900 mm unless the opening is fitted with a coaming of not less than 760 mm in height.
- (2) Every opening in a deck or tank top that leads to a hold, tank or other compartment not exceeding 1.5 m in depth shall be covered, fenced or marked in such manner as necessary to prevent loss of life or injury to persons.

Scaffolding, Scaffolds and Stages

49. (1) Subject to subsection (3), every scaffold shall
- (e) be fitted with guard rails at a height of 900 mm above the scaffold except on the side thereof where the work to be performed would be hindered by the guard rails.
- (2) A safe means of access, secured to prevent its accidental movement, shall be provided to and from the working level of every scaffold.
- (3) A scaffold may be constructed of materials other than wood if the strength and safety features of the scaffold when so constructed are not less than those of a wooden scaffold.
51. (1) Every stage shall
- (d) be fitted with guard lines, where the stage is to be used at a height greater than 3 m.
53. Every person who is required to work on a stage at a height greater than 3 m shall wear a safety belt fitted with a safety line that is rigged to a life line so as to limit the free fall of a person from the stage to not more than 1.2 m.

Ladders and Gangways

54. (1) Every access ladder or gangway between a ship and the shore or between one ship and another ship shall provide a safe means of access between the ship and shore or between the ships, as the case may be.
- (2) Every ship that is in dry dock or moored alongside a wharf or other ship shall be fitted with at least one access ladder or gangway that, in the opinion of a qualified person, complies with subsection (1).

- (3) Where an access ladder or gangway leads to a location on board a ship at a height of more than 1 m above the deck, safe access to the deck shall be provided by means of a series of steps or some similar structure.
 - (4) Where a bulwark ladder is used to provide the safe access to the deck of a ship required by subsection (3), it shall be firmly secured to the bulwark so as to prevent its shifting, slipping or pivoting and shall be equipped with two handhold stanchions
 - (a) each not less than 40 mm in diameter;
 - (b) each extending not less than 1.2 m above the top of the bulwark;
 - (c) fitted at the point of boarding or leaving the ship not less than 0.7 m and not more than 0.8 m apart; and
 - (d) firmly secured to the ship's structure at or near the base of the ladder and at a higher point.
55. (1) Every access ladder and gangway shall
- (a) be maintained in a safe condition;
 - (b) be secured to prevent its shifting and slipping;
 - (c) be suitably rigged and maintained to compensate for the movement of the ship;
 - (d) be adequately lighted; and
 - (e) have a lifebuoy with line, strategically placed and ready for immediate use.
- (2) When an access ladder is being used by a person to board or disembark from a ship, at least one end of the ladder shall be fastened securely and, if necessary to ensure safety, a person, other than a person engaged in manoeuvring the ship, shall be stationed at the ladder to assist the person using it.
56. (1) Safety nets shall be fitted under every part of an access ladder and gangway except where, in the opinion of a qualified person,
- (a) the ladder or gangway and the approaches thereto are constructed in a manner that makes the fitting of a safety net unnecessary; or
 - (b) the fitting of a safety net is impracticable.
- (2) Safety nets shall
- (a) extend on both sides of an access ladder or a gangway for a distance of 1.8 m; and
 - (b) be kept taut at all times.
57. Where a platform is provided at the bottom of an access ladder or gangway, the platform shall be flat and horizontal.

58. Every Jacob's ladder shall be of sufficient length to reach the intended landing point and the means of attachment thereof to the ship shall be effective and maintained in a safe and good condition.
59. Every portable ladder shall be maintained in a safe and good condition and shall be secured to prevent its shifting and slipping when in use.
60. Every ladder, whether portable or permanently secured, shall be positioned in such a manner that it is not necessary for a person to use the underside of the ladder.

Personal Protective Equipment

79. Every person who is required to work at a height greater than 3 m, on a mast or at the edge of any other structure that is not provided with guard rails, shall wear a safety belt fitted with a safety line that is rigged so as to limit the free fall of a person to not more than 1.2 m.

General Requirements and Working Practices

88. No person shall, while a ship is underway, go over the side of the ship to carry out routine maintenance thereof.

C.2 TACKLE REGULATIONS (C.R.C., c. 1494)

Part III Safe Means between Ship and Wharf

Safe Means between Ship and Wharf

8. (1) Safe means shall be provided for the passage of workers to and from a ship and the wharf at which the ship lies, unless conditions are such that the workers would not be exposed to undue risk if no special appliances were provided.
- (4) A safety net or other satisfactory arrangement shall be provided, if required, so that workers accidentally falling from the safe means referred to in subsection (1) will not fall between the ship and the wharf.
- (5) Safety precautions similar to those referred to in subsection (4) shall be taken, where required, alongside hatches where the processes are being carried on, on the side of the ship next to the wharf.

Safe Means from Deck to Hold

11. (1) Where the processes (loading and unloading) are carried on in a hold the depth of which exceeds 1.52 m, safe means of access shall be provided from the deck to the hold.
18. (1) Where a worker is required to go outside of the rails or bulwarks to secure deck cargo or for any other purpose connected with the processes, means to ensure the safety of the worker shall be provided.

Part V Safety Measures during Processes

42. (1) While workers are on a ship for the purposes of the processes, any hatchway of a cargo or bunker space exceeding 1.52 m in depth that is not in use, and the coamings of which are less than 760 mm in height shall be fenced to a height of 915 mm or securely covered.

Annex D CSA FALL PROTECTION STANDARDS, Z59 SERIES

Standard Number	Standard Title
Z259.1-05	Body belts and saddles for work positioning and travel restraint
Z259.2.1-98	Fall Arresters, Vertical Lifelines, and Rails
Z259.2.2	Self-Retracting Devices for Personal Fall-Arrest Systems
Z259.2.3-99	Descent Control Devices
Z259.10-M90	Full Body Harness
Z259.11-05	Energy absorbers and lanyards
Z259.12-01	Connecting Components for Personal Fall Arrest Systems (PFAS)
Z259.13-04	Flexible horizontal lifeline systems
Z259.16-04	Design of active fall-protection systems

Note: *The Standard Number format includes the year of issue after the dash, and as the Standards are subject to change at any time, it is prudent to check for the latest issue.*

Note: *The American National Standards Institute (ANSI) equivalent standard for all the above standards is ANSI Z359.1-1992 (R1999).*

Note: *The ANSI standard for Safety Requirements for Personnel and Debris Nets is ASSE/ANSI A10.11*

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Annex E SUMMARY OF BASIC CSA CODE REQUIREMENTS AND/OR INDUSTRY STANDARDS

Lanyards and Shock Absorbers

- c) Maximum length of shock absorbing lanyards: 1.2 m (4 ft)
- d) Maximum length of positioning lanyards: 1.2 m (4 ft)
- e) Shock absorber, class E4 to arrest a mass between 45 kg and 115 kg (100 lbs and 254 lbs) and absorbing an energy of 4 kN (900 lbs)
- f) Shock absorber, class E6 to arrest a mass between 90 kg and 175 kg (200 lbs and 386 lbs) and absorbing an energy of 6 kN (1300 lbs)

Ladders and Platforms

- a) Maximum height of permanent ladder that can be climbed without full body harness: 2.4 m (10 ft)
- b) Maximum permissible height working above the next lower, safe platform without full body harness: 2.4 m (8 ft)

Free-fall Distances and Impact Forces

- a) Maximum free-fall distance allowed: 1.2 m (4 ft)
- b) Maximum linkage distance between sternum D-ring and safety cable or rail trolley: 0.2 m (8 in)
- c) Maximum permissible impact force on the body when fall is arrested: 6 kN (1300 lbs)
- d) Maximum permissible impact force on the body when self retracting Lifeline (SRL) is used: 4 kN (900 lbs)

Guard Rails and Barriers

- a) Minimum height of guard rail or coaming to serve as barrier: 0.91 m (3 ft)
- b) Minimum impact resistance of guard rails and barriers: 0.89 kN (220 lbs)

Anchorage

- a) Minimum anchorage breaking strength for single fall arrest point:
- b) Minimum anchorage breaking strength for single fall arrest point, typical industry standards: 22.2 kN (5000 lbs)

Annex E

- c) Minimum cable and anchorage breaking strength for horizontal lifeline, single user: 22.2 kN (5000 lbs)
- d) Minimum impact resistance of any connecting hardware such as carabiners, lanyards, etc.: 22.2 kN (5000 lbs)
- e) Minimum breaking strengths of any components or parts of a rescue system: 40 kN (9000 lbs)
- f) Minimum strength of anchor points of a cable-type-fall-arresting system is 12 kN (3000 lbs)
- g) Minimum strength of anchor points of a fixed ladder within each 6 m (20 ft) section to which a rail-type-fall-arresting system is fastened: 12 kN (3000 lbs)

Inspection Frequency of Cable and Rail Fall Arrest Systems

- a) Minimum inspection frequency of fall-arrest systems: yearly

Full Body Harness

- a) Type of full body harness permitted for CCG: ALP (A for Arrest, L for Ladder and P for Positioning)

Annex F PURCHASING AND INSPECTION/REPAIR RECORD FORM

PURCHASING INFORMATION

Equipment		Manufacturer
CSA Standard/Type/Class		Supplier:
Serial No. or Lot	Date of Manufacture (DD/MM/YY)	Additional info: (Service Life) (Strength, Capacity, etc.)
Contract/Invoice #	Date of Purchase (DD/MM/YY)	Disposal Date (YYYY-MM-DD)

INSPECTION/REPAIR LOG

Type (annual, or repair)	Pass/Fail (P/F)	COMMENTS (reason for failure, or repair details)	Inspector (initials)	Date DD/MM/YY

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Annex G SERVICE LIFE OF FALL PROTECTION EQUIPMENT

A qualified person other than the user shall thoroughly inspect all safety equipment annually and note, record and address all deficiencies found. More frequent inspection may be required if the equipment is regularly exposed to harsh environments, frequent use, not stored in a cool and dry location. All safety equipment failing inspection shall be immediately removed from service and destroyed. Manufacturer's restrictions to be observed. In many cases, fall protection equipment may have been used on rare occasions only and therefore, if stored properly and handled correctly, it should last for a long time. Harnesses, lanyards or any mechanical devices such as carabiners, pulleys, ropes, etc. that have not been exposed to a lot of sunlight, damp conditions or a corrosive environment will last reliably for many years.

The service life of the fall protection equipment in the following table was obtained from manufacturer's labels attached to the equipment, information provided with the equipment, or obtained by contacting the manufacturer.

Equipment	Projected Service Life	Comments
Full Body Harness (all Types)	5 years	Annual inspection required by a Competent Person May be extended to a maximum of 10 years if inspected and re-certified by the manufacturer
Energy/Shock Absorbers	5 years	Annual inspection required by a Competent Person May be extended if inspected and re-certified by a Competent Person
Lanyards	5 years	Annual inspection required by a Competent Person May be extended to a maximum of 10 years if inspected and re-certified by the manufacturer
Connecting hardware (anchorage connectors, carabiners, snap hooks)	10 years	Annual inspection required by a Competent Person May be extended if inspected and re-certified by the manufacturer
Fall arrester (rope and cable grabs)	No limit	Annual inspection required by a Competent Person
Ladder Climbing System	No limit	Specified inspection required by a Competent Person
Self-Retracting Devices/ Lanyards (type 1)	5 years	Annual inspection required by a Competent Person No extension permitted
Self-Retracting Devices/ Lanyards (type 2 and type 3)	5 year replacement for web lines 10 year replacement for wire rope lines	Requires re-certification by the manufacturer after the initial two years and annually thereafter
Vertical Lifelines (synthetic fibre ropes)	5 years	Annual inspection required by a Competent Person No extension permitted

