

DECEMBER 1st, 2001

**CANADIAN RAILWAY MEDICAL RULES
HANDBOOK
(FOR POSITIONS CRITICAL TO SAFE RAILWAY
OPERATIONS)**



Copyright © 2001 by the Railway Association of Canada.

All rights reserved. With the exception of members of the Railway Association of Canada (RAC), no part of this publication may be reproduced, translated, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of the Railway Association of Canada. Requests for information should be addressed to the Railway Association of Canada, 99 Bank Street, Suite 1401, Ottawa, Ontario, K1P 6B9. While great care has been taken to ensure the accuracy of this material, the RAC does not guarantee such accuracy. By using this material, or any portion thereof, the user agrees to waive all claims or causes of action against the RAC and agrees to indemnify the RAC against any such claims which may arise through or be related to such use.

ACKNOWLEDGEMENTS

This document was prepared by the Medical Advisory Group of the Railway Association of Canada.

TABLE OF CONTENTS

Introduction	5
Section 1 – Background and History	1-1
Section 2 – Safety Critical Position Rules.....	
2.1 Overview	2.1-1
2.2 Rules	2.2-1
2.3 Approval by Minister.....	2.3-1
Section 3 – Railway Medical Rules.....	
3.1 Overview	3.1-1
3.2 Rules	3.2-1
3.3 Approval by Minister.....	3.3-1
3.4 List of Railways Subject to Rules.....	3.4-1
Section 4 – Railway Medical Guidelines	
4.1 Overview	4.1-1
4.2 Hearing	4.2-1
4.3 Vision	4.3-1
4.4 Epilepsy or Isolated Epileptic Seizures.	4.4-1
4.5 Mental Disorders	4.5-1
4.6 Cardiovascular Disorders	4.6-1
4.7 Diabetes	4.7-1

	Version: 1.0
	Title: INTRODUCTION

INTRODUCTION

This handbook was designed to provide Canadian railway companies and medical service providers with the information necessary to implement the Railway Medical Rules for Positions Critical to Safe Railway Operations (Railway Medical Rules and Railway Rules Governing Safety Critical Positions).

The Safety Critical Positions Rules and the Railway Medical Rules were developed pursuant to Section 18(1)(b), Section 20(1) and Section 35 of the Railway Safety Act (RSA), as amended on June 1, 1999. This Act requires persons working in positions that are deemed critical to safe railway operations to undergo periodic medical examinations. These sections of the RSA are included in the Introduction for reference.

The Act requires that all persons employed in railway Safety Critical Positions must advise their medical professional of that fact prior to any examination.

The Act further requires medical examiners who believe that a person employed in a safety critical position has any condition that may reasonably pose a threat to railway safety must immediately notify both the patient and the railway company. Medical information provided to railway companies in accordance with this section of the Act is privileged and cannot be used in any legal or disciplinary proceedings except as otherwise provided.

The Safety Critical Position Rules and the Railway Medical Rules were developed by the Railway Association of Canada (RAC) and approved by the Minister of Transport on June 16, 2000. The Railway Medical Rules became effective on November 29, 2001 simultaneously with the revocation of General Order 0-9, Regulations Respecting the Examination of Vision and Hearing of Railway Employees, as amended by CTC 1985-3. Any questions regarding either the Act or the Rules should be addressed to the RAC or to the Department of Transport.

The RAC has a standing Medical Advisory Group (MAG) that is composed of medical professionals who represent several member railways and other interested parties. This Group addresses questions and issues of a technical nature, and monitors medical conditions which may affect safe rail operations. From time to time, the RAC may recommend new or revised medical guidelines. Persons who have received a copy of this handbook may obtain updates from the RAC when they become available.

	Version: 1.0
	Title: INTRODUCTION

The intent of these Rules is to provide for individual medical assessments by personal physicians for persons performing work in Safety Critical Positions in the railway industry.

Included in this handbook is background information on how and why the Rules were developed, a copy of section 35 of the Act, a copy of the Rules, guidelines for assessment of medical conditions required by the Rules, and contacts for additional information.

Section 18(1) of the Railway Safety Act reads as follows:

- 18(1)** The Governor in Council may make regulations
- (b) declaring positions in railway companies to be critical to safe railway operations.

Section 20 of the Railway Safety Act reads as follows:

- 20(1)** A railway company shall file with the Minister for approval any rules in respect of any matter referred to in subsection 18(1) or (2.1) that it proposes to formulate or revise on its own initiative.

Section 35 of the Railway Safety Act reads as follows:

Medical examination

- 35(1)** A person who holds a position that is declared by regulations made under paragraph 18(1)(b) or by any rule in force under section 19 or 20 to be a position critical to safe railway operations, referred to in this section as a ‘designated position’, shall undergo a medical examination organized by the railway company concerned, including audio-metric and optometric examination, at intervals determined by the regulations made under paragraph 18(1)(c)(iii) or by any rule in force under section 19 or 20.

	Version: 1.0
	Title: INTRODUCTION

Physician or optometrist to disclose potentially hazardous conditions

- (2) If a physician or an optometrist believes, on reasonable grounds, that a patient is a person described in subsection (1), the physician or optometrist shall, if in their opinion the patient has a condition that is likely to pose a threat to safe railway operations,
 - (a) by notice sent without delay to a physician or optometrist specified by the railway company, inform the specified physician or optometrist of that opinion and the reasons for it, after the physician or optometrist has taken reasonable steps to first inform the patient, and
 - (b) without delay send a copy of that notice to the patient,

and the patient is deemed to have consented to the disclosure required by paragraph (a)

Holder of designated position to inform physician or optometrist

- (3) A person who holds a designated position in a railway company shall, prior to any examination by a physician or optometrist, advise the physician or optometrist that the person is the holder of such a position.

Railway company may act in interests of safe railway operations

- (4) A railway company may make such use of information provided pursuant to subsection (2) as it considers necessary in the interests of safe railway operations.

Proceedings not to lie against physician or optometrist

- (5) No legal, disciplinary or other proceedings lie against a physician or optometrist for anything done by that physician or optometrist in good faith in compliance with this section.

Information privileged

- (6) Information provided pursuant to subsection (2) is privileged and
 - (a) no person shall be required to disclose it or give evidence relating to it in any legal, disciplinary or other proceedings; and
 - (b) it is not admissible in any such proceedings, except

		Version: 1.0
	Title: INTRODUCTION	

- (i) as provided by subsection (4), or
- (ii) where the patient consents.

	Section: 1	Version: 1.0
	Title: BACKGROUND AND HISTORY	

1. Introduction

This section describes the background and history behind the development of the Railway Medical Rules and the Safety Critical Position Rules.

2. Legislative History

Medical requirements for certain railway positions were most recently contained in General Order O-9, Regulations Respecting the Examination of Vision and Hearing of Railway Employees, as amended by CTC 1985-3. This legislation contained standards for vision and hearing only. Medical requirements beyond these had been left up to the individual railways as a matter of company policy

General Order O-9 had been in place since 1978. Minor revisions had been made to the order on several occasions, most recently as part of CTC 1985-3 (April 23, 1985). In 1998, CN and CPR also obtained exemptions from some of the requirements of the General Order to address Canadian Human Rights Commission (CHRC) issues relating to the difference in initial certification and recertification standards.

The move towards legislated medical standards beyond those for hearing and vision arose primarily from the Foisy Commission review of the 1986 Hinton train collision.

Recommendation 10 of the Commission stated "that the CTC review its regulations concerning medical fitness with a view to including standards with respect to matters of physical health in addition to vision and hearing acuity and that regulations establishing such standards be promulgated as soon as possible".

As a result of this recommendation, the RTC set out in 1987 to review the issue of expanded medical examinations. Draft regulations were developed by the RTC (Regulations Respecting the Medical Examination of Railway Employees) and included the requirement for a physical examination including "a review of the nervous, cardiovascular, respiratory, gastro-intestinal, genitourinary and musculoskeletal systems, a clinical history and special investigations if clinically indicated having regard for the examinee's age and work duties". The proposed regulation also included the specific need for chest x-rays, electrocardiogram tests, urinalysis and tuberculin tests. The draft regulation also required railway companies to file standards for medical fitness in each of the aforementioned areas.

The need for expanded medical examinations was carried over into the Railway Safety Act when it was enacted in 1989. Section 35(1) of the RSA requires that railway employees in positions deemed critical to safe railway operations undergo annual medical examinations including audiometric and optometric assessment. Section 35(2) of the Act addressed another of the Foisy commission recommendations by requiring any physician or optometrist treating a person in a Safety Critical Position to report to the railway's Chief Medical Officer

	Section: 1	Version: 1.0
	Title: BACKGROUND AND HISTORY	

any medical condition that they believe could constitute a threat to safe railway operations. Section 35(3) of the Railway Safety Act requires that persons in Safety Critical Positions inform the physician or optometrist of their position.

Although included in the Railway Safety Act since its inception in 1989, these sections have never been fully enacted due to their reliance on regulation identifying a list of Safety Critical Positions. This regulation has been delayed several times due to various issues and concerns. Also hindering the enactment of this section of the Railway Safety Act was its initial specified requirement for an annual medical examination, a frequency deemed to be excessive by railway industry medical experts. Revisions to the Railway Safety Act, which came into force on June 1 1999, eliminated the annual requirement.

A new initiative aimed at drafting a new medical rule for Safety Critical Positions commenced in December 1996. The Railway Association of Canada's Safety and Operations Management General Committee authorized a formal Medical Steering Committee to oversee the development of Rules Identifying Safety Critical Positions and Rules Governing Medical Standards for SCPs.

The steering committee was comprised of railway industry multi-functional stakeholders including representatives from the Regulatory Affairs, Medical, Employee Relations, Labour Relations and Law departments of various RAC member railways. A Medical Working Group consisting of the Chief Medical Officers from CN, CPR and VIA Rail was also formed to work with medical specialists in the development of specific medical requirements and the guidelines required to support the medical rules. As part of this process field research was carried out in the railway environment.

The Steering Committee's mandate was to develop rules which would provide a contemporary list of Safety Critical Positions based on potential risk to public safety as well as modern and consistent medical requirements which address those diseases or disorders that have the potential to impact railway safety.

In accordance with the requirements of the Railway Safety Act, the steering committee consulted with railway labour organizations throughout the development process. In addition the CHRC and Transport Canada were kept up to date on the rules' progress.

The Safety Critical Position Rules and the Railway Medical Rules were developed by the Railway Association of Canada (RAC) and approved by the Minister of Transport on June 16, 2000. The Railway Medical Rules became effective on XXX, simultaneously with the revocation of General Order 0-9, Regulations Respecting the Examination of Vision and Hearing of Railway Employees, as amended by CTC 1985-3. Any questions regarding either the Act or the Rules should be addressed to the RAC or to the Department of Transport.

	Section: 2	Version: 1.0
	Title: SAFETY CRITICAL POSITION RULES	
	Subsection 2.1 - Overview	

1. Background

Section 35(1) of the Railway Safety Act refers to the requirement for regulation or rule specifying positions deemed critical to safe railway operations. In 1997 the RAC Medical Steering Committee undertook to develop such a rule along with a related Medical rule for Safety Critical Positions.

The committee's goal was to develop a straightforward rule which would identify the occupational requirements deemed to be safety critical while allowing individual railways to determine the specific list of occupations that meet these requirements on their particular railway.

As required by the Railway Safety Act, consultation with railway labour organizations took place throughout the development process. In addition the Canadian Human Rights Commission and Transport Canada were kept up-to-date on the rule's development.

The Rule Governing Safety Critical Positions was developed by the Railway Association of Canada and approved by the Minister of Transport on June 16, 2000 (copy of approval notice can be found in section 2.3). It became effective on September 30, 2000.

2. Development Process

A vital part of the development of the Railway Rules Governing Safety Critical Positions was ensuring that an objective means was in place to identify those occupations deemed to be critical to safe railway operations.

It was important that the list of Safety Critical Positions include only those positions with the highest risk to public safety.

For this purpose, the Railway Association of Canada's Medical Rules Steering Committee developed a "risk matrix" which would allow an assessment of railway occupations based on five key risk components. These were:

- General risk component of occupation
- Public interface
- Frequency of risk activities
- Presence of safety back-up systems
- Degree of risk environment

Based on this assessment, it was determined that Safety Critical Positions should be comprised of running trades positions directly engaged in train or yard service and positions engaged in rail traffic control. In addition, other occupations would be considered as Safety Critical when performing any of these duties.

	Section: 2	Version: 1.0
	Title: SAFETY CRITICAL POSITION RULES	
	Subsection 2.1 - Overview	

Due to variances in actual occupational titles, the list of specific SCP occupations was to be developed and filed with Transport Canada by individual railways. A typical list of occupations would include:

- Locomotive Engineer
- Conductor
- Asst. Conductor (Brakeman)
- Yard Foreman
- Rail Traffic Controller (Train Dispatcher)
- Operators of Specialized Equipment operating as trains
- Asst. Superintendent (Trainmaster)
- Superintendent
- Asst. Chief Rail Traffic Controller
- Chief Rail Traffic Controller

Railways must reassess their SCP occupational list at regular intervals and file updated lists as required.

3. Disclosure Requirements

In addition to being subject to the requirements of the Medical Rules, the Railway Safety Act contains another important obligation for persons employed in a Safety Critical Position. This is the requirement that persons in Safety Critical Positions must, prior to any examination by a physician or optometrist, advise the physician or optometrist that they occupy a Safety Critical Position under the Railway Safety Act. (Note this includes all examinations and not just fitness for duty assessments under the Medical Rules).

Physicians and optometrists also have an obligation under the Railway Safety Act to report to the railway any condition in a person occupying a Safety Critical Position which they feel may pose a threat to safe railway operations. A copy of the report must also be provided to the employee.

Individual railways should ensure that they inform those employees in Safety Critical Positions of these requirements. Although information will be provided by the Railway Association of Canada to the medical community at large regarding their obligations under the Railway Safety Act, where possible, individual railways may also wish to provide such information to those physicians who will be dealing with employees in Safety Critical Positions.

	Section: 2	Version: 1.0
	Title: SAFETY CRITICAL POSITION RULES	
	Subsection 2.2 – Rules	

Rules Governing Safety Critical Positions

1. Short Title

For ease of reference, this rule may be referred to as the “Safety Critical Position Rules”.

2. Scope

These rules have been developed pursuant to Section 20 of the *Railway Safety Act*.

3. Definitions

A “Safety Critical Position” is herein defined as:

- a) any railway position directly engaged in operation of trains in main track or yard service; and
- b) any railway position engaged in rail traffic control.

Any person performing any of the duties normally performed by a person holding a Safety Critical Position, as set out in section 3 above, is deemed to be holding a Safety Critical Position while performing those duties.

4. Records to be Kept by the Company

Each railway company shall:

- a) maintain a list of all occupational names or titles which are governed by this rule;
- b) maintain a list of the names of all employees qualified to serve in Safety Critical Positions; and
- c) make all such records related to this rule available to Transport Canada inspectors upon reasonable request.



Section: 2

Version: 1.0

Title: SAFETY CRITICAL POSITION RULES

Subsection 2.3 – Approval by Minister

	Section: 3	Version: 1.0
	Title: RAILWAY MEDICAL RULES	
	Subsection 3.1 – Overview	

1. Introduction

The Railway Medical Rules were developed over the course of 1998/99 by a Medical Steering Committee formed by the Railway Association of Canada. This committee was comprised of railway industry multi-functional stakeholders including representatives from the Regulatory Affairs, Medical, Employee Relations, Labour Relations and Law departments of various RAC member railways.

A Medical Working Group consisting of the Chief Medical Officers from CN, CPR and VIA Rail worked with medical specialists in the development of specific medical requirements and the guidelines required to support the medical rules. As part of this process field research was carried out in the railway environment.

The Steering Committee's goal was to develop a basic enabling rule which would be supported by recommended medical practices guidelines. This would allow medical assessments to remain current through updates to the guidelines without having to regularly modify the actual rule.

The Medical Rules allow medical assessments for Safety Critical Positions to be directed and managed by a railway's Chief Medical Officer. It requires that an employee must meet medical fitness for duty assessment requirements so as to work in a Safety Critical Position.

The Rules set an assessment frequency of 5 years to age 40 and 3 years beyond age 40 with the Chief Medical Officer having the ability to reduce the interval for specific situations.

Assessments are based on those diseases or disorders that have potential to impact railway safety including sudden impairment, impairment of judgement or alertness, impairment of senses or significant musculoskeletal impairment. The Rules provide the basis for assessments to be conducted by personal physicians at the discretion of individual railways.

As required by the Railway Safety Act, consultation with railway labour organizations took place throughout the development process. In addition, the Canadian Human Rights Commission and Transport Canada were kept up-to-date on the rule's development.

The Railway Medical Rules were developed by the Railway Association of Canada (RAC) and approved by the Minister of Transport on June 16, 2000. They became effective on November 29, 2001 simultaneously with the revocation of General Order 0-9, Regulations Respecting the Examination of Vision and Hearing of Railway Employees, as amended by CTC 1985-3. Any questions regarding either the Act or the Rules should be addressed to the RAC or to the Department of Transport.

	Section: 3	Version: 1.0
	Title: RAILWAY MEDICAL RULES	
	Subsection 3.2 – Rules	

Railway Medical Rules for Safety Critical Positions

1. Short Title

- 1.1 For ease of reference, these rules may be referred to as the "Railway Medical Rules".

2. Scope

- 2.1 These rules, which have been developed pursuant to Section 20 (1) (a) of the Railway Safety Act, define the Medical Fitness for Duty requirements for Safety Critical Positions within railway companies subject to the jurisdiction of the Department.
- 2.2 In the case of international train movements, a railway company may allow persons to perform limited service in Safety Critical Positions while using medical requirements stipulated by U.S. Federal Railroad Administration regulations.

3. Definitions

- 3.1 “Chief Medical Officer” means a physician licensed to practice medicine in Canada and who is employed or contracted by a railway company for the purpose of, among other things, directing and managing the area of Medical Fitness for Duty requirements and guidelines.
- 3.2 “Department” means the Department of Transport, Rail Safety Group.
- 3.3 “Medical Fitness for Duty” means that a determination was made by the Chief Medical Officer, subject to any restrictions or requirements imposed under Section 6 hereof, that a person has taken the medical assessments required by these rules, and that the person meets all of the Medical Fitness for Duty requirements provided herein.
- 3.4 “Safety Critical Position” has the same meaning as provided in the Railway Rules Governing Safety Critical Positions.
- 3.5 “person” means a person in a Safety Critical Position.

	Section: 3	Version: 1.0
	Title: RAILWAY MEDICAL RULES	
	Subsection 3.2 – Rules	

4. Frequency of medical assessments

- 4.1 Subject to sub-section 4.2, a person shall undergo a company organized Medical Fitness for Duty assessment:
- a) prior to commencement of employment in a Safety Critical Position;
 - b) upon promotion or transfer to a Safety Critical Position; and
 - c) every five years until the age of forty, and every three years thereafter until retirement, or until that person is no longer employed in a Safety Critical Position.
- 4.2 Without varying the requirement of sub-section 4.1(c), no assessment shall be required under sub-section 4.1(b) if the person had previously occupied a Safety Critical Position which, in the opinion of the Chief Medical Officer, had similar mental and physical demands as the Safety Critical Position into which the person is entering.
- 4.3 The Chief Medical Officer may require additional assessments to those set out in Section 4.1 if:
- a) the person has or may have a medical condition that requires assessment or more frequent monitoring; or
 - b) the person is returning to work in a Safety Critical Position after a leave due to illness or injury.

5. Assessment for medical fitness for duty

- 5.1 The Medical Fitness for Duty for a person shall be assessed on an individual basis, taking into consideration medical conditions, both past and current, that could result in:
- a) sudden impairment;
 - b) impairment of cognitive function including alertness, judgement, insight, memory and concentration;
 - c) impairment of senses;
 - d) significant impairment of musculoskeletal function; or
 - e) other impairment that is likely to constitute a threat to safe railway operations.

	Section: 3	Version: 1.0
	Title: RAILWAY MEDICAL RULES	
	Subsection 3.2 – Rules	

5.2 The medical conditions referred to in Section 5.1 shall include:

- a) diseases of the nervous system, including seizure disorders, narcolepsy, sleep apnea and other disturbances of consciousness, vestibular disorders, disorders of coordination and muscle control, head injury, post traumatic conditions and intracranial tumours;
- b) cardiovascular diseases, including high blood pressure, coronary artery disease, myocardial infarction, cerebrovascular disease, aortic aneurysm, congestive heart failure, cardiac arrhythmia, valvular heart disease and cardiomyopathy;
- c) metabolic diseases, including diabetes mellitus, thyroid disease, Cushing's Disease, Addison's Disease and pheochromocytoma;
- d) musculoskeletal disabilities, including amputation of a limb, arthritis, significant joint dysfunction, disease of the spine, obesity or other significant musculoskeletal conditions;
- e) respiratory diseases, including obstructive or restrictive conditions resulting in functional impairment;
- f) mental disorders, including the following types of mental disorders:
 - i) cognitive, including dementias, delirium and amnesia;
 - ii) psychotic, including schizophrenia;
 - iii) mood, including depression, manic, bipolar;
 - iv) anxiety, including panic attacks and phobias; and
 - v) personality, resulting in anti-social, erratic or aggressive behaviour;
- g) substance abuse, including abuse or dependence on alcohol, prescription medications, or illicit drugs;
- h) hearing impairment, including hearing acuity;
- i) visual impairment, including distant visual acuity, field of vision, colour vision; and
- j) any other organic, functional or structural disease, defect or limitation that is likely to constitute a threat to safe railway operations.

	Section: 3	Version: 1.0
	Title: RAILWAY MEDICAL RULES	
	Subsection 3.2 – Rules	

6. Medical restrictions

- 6.1 If the Chief Medical Officer, in making an individual assessment of a person's Medical Fitness for Duty, is of the opinion that there exists a threat to safe railway operations, the Chief Medical Officer may:
- a) restrict a person from occupying a Safety Critical Position;
 - b) require the use of corrective devices or other medical aids; or
 - c) otherwise restrict a person's ability to work or perform certain tasks in a Safety Critical Position.
- 6.2 Upon completion of a Medical Fitness for Duty assessment, the Chief Medical Officer shall advise each person and the person's supervisor of that person's Medical Fitness for Duty and of any restrictions or requirements imposed pursuant to sub-section 6.1.

7. Records to be kept by the chief medical officer

- 7.1 The Chief Medical Officer of the railway company shall maintain records of all persons' medical assessments required hereunder and any restrictions required pursuant to sub-section 6.1.
- 7.2 The Chief Medical Officer shall maintain copies of all medical policies and guidelines used by a railway company for the examination or assessment of persons employed in Safety Critical Positions.
- 7.3 The Chief Medical Officer shall make records, policies, and guidelines related to these rules available to the Department upon reasonable request.

	Section: 3	Version: 1.0
	Title: RAILWAY MEDICAL RULES	
	Subsection 3.3 – Approval by Minister	

	Section: 3	Version: 1.0
	Title: RAILWAY MEDICAL RULES	
	Subsection 3.4 – List of Railways Subject to Rule	

Current List of Federally Regulated Railways

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.1 – Overview	

**FITNESS FOR DUTY MEDICAL GUIDELINES FOR THE EMPLOYMENT OF
INDIVIDUALS IN SAFETY CRITICAL POSITIONS IN THE
CANADIAN RAILWAY OPERATIONS**

Guidelines have been developed for a number of medical conditions that are both prevalent in the population and represent a significant potential risk to safe railway operations. These medical guidelines were developed by a team of physicians with an understanding of the occupational requirements of Safety Critical Positions in the railway industry including the Chief Medical Officers of Canadian Pacific Railway, Canadian National and VIA Rail with input from specialists and medical expertise from Transport Canada. The team is known as the Railway Association of Canada (RAC) Medical Advisory Group.

The goal of these medical guidelines is to provide a consistent application of medical standards in the railway industry across Canada while allowing for individual assessment of employees at the discretion of the Chief Medical Officers. The guidelines are made available to any physician or other Health Care Professional in Canada who is involved in treating or assessing an employee in a Safety Critical Position (SCP).

The following guidelines are currently available and may be found within this section of the handbook:

- Cardiovascular Disorders
- Diabetes
- Epilepsy and Isolated Seizures
- Hearing
- Mental Disorders
- Vision.

The RAC Medical Advisory Group will review and update these guidelines as needed to insure they continue to reflect accepted medical practices in Canada. Additional guidelines will be developed as required. Medical conditions not covered by a specific guideline will be governed by accepted medical practice for these conditions.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.2 – Hearing	

**FITNESS FOR DUTY MEDICAL GUIDELINES FOR THE EMPLOYMENT OF
INDIVIDUALS WITH IMPAIRED HEARING IN SAFETY CRITICAL
POSITION IN THE CANADIAN RAILWAY INDUSTRY**

1. Introduction

Canadian railway employees working in a Safety Critical Position (SCP) operate or control the movement of trains. Physical and mental fitness is mandatory. Impaired performance due to a medical condition could result in a significant incident affecting the health and safety of employees, the public, property or the environment.

Employees working in an SCP are required to have sufficient hearing to meet the demands of these positions. Individuals who are occupying these positions must, even in noisy environments, be able to receive direct verbal communication and communicate through telephone and radio systems. They must also be able to detect and recognize the type and source location of any sound signal, particularly warning sounds.

AN INDIVIDUAL CANNOT BE DECLARED UNFIT TO OCCUPY AN SCP UNTIL HIS/HER HEARING CONDITION HAS BEEN MEDICALLY ASSESSED BY AN OTOLARYNGOLOGIST. THIS PHYSICIAN MUST CONSULT THE INDIVIDUAL'S JOB DESCRIPTION AS PART OF HIS/HER ASSESSMENT.

2. Fitness for duty criteria

An average hearing loss in either ear of less than 40 dB in the frequencies of 500, 1000 and 2000 Hz.

3. Assessment requirements

3.1 Screening test

Hearing is evaluated using an audiometer calibrated in accordance with the requirements of the American National Standard Institute (ANSI S3.6 - 1996). Each ear is tested separately without a hearing aid in an audiometric test booth in accordance with the background noise requirements of the American National Standard Institute (ANSI S3.1 - 1991).

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.2 – Hearing	

3.2 Frequency of screening test

- every 5 years until the age of 40
- every 3 years thereafter.

The Chief Medical Officer (CMO) may determine different periodicity for those individuals who have symptoms or signs of hearing impairment or who are at risk of developing impaired hearing.

3.3 Medical assessment

Individuals who do not meet the fitness for duty criteria require further medical assessment by an Otolaryngologist. This medical assessment should consist of:

- a comprehensive medical history
- an examination
- an audiometric testing by a certified audiologist and,
- a medical report.

The report must establish a medical diagnosis and make recommendations regarding treatment, the use of hearing aids, the impact of the hearing disorder on their ability to occupy a Safety Critical Position. The report must be sent to the CMO of the railway company for review.

4. Individual Assessment

The CMO may authorize an individual who does not meet the above criteria to occupy an SCP if the CMO has reasons to believe that the individual can perform his/her duties in a safe manner.

In doing so, the CMO must take into consideration the following:

- the specific requirements of the SCP
- the opinion of an Otolaryngologist who has assessed the individual and who is of the opinion that the hearing disorder is unlikely to interfere with safe performance of SCP duties and,
- any relevant ability, skill or experience of the individual.

The CMO may also require that a practical test be performed before allowing an individual to occupy an SCP.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

**FITNESS FOR DUTY MEDICAL GUIDELINES FOR THE EMPLOYMENT OF
INDIVIDUALS WITH IMPAIRED VISION IN SAFETY CRITICAL
POSITIONS IN THE CANDIAN RAILWAY INDUSTRY**

1. Introduction

Canadian railway employees working in a Safety Critical Position (SCP) operate or control the movement of trains. Physical and mental fitness is mandatory. Impaired performance due to a medical condition could result in a significant incident affecting the health and safety of employees, the public, property or the environment.

Employees working in an SCP are required to have sufficient vision to meet the demands of these positions. Working on, or around, moving equipment, identifying track and yard signals, and controlling rail traffic are duties where adequate visual acuity, colour perception, visual fields and extra-ocular muscle balance are mandatory.

Background information on visual requirements and fitness for duty issues is provided in Appendix I.

INDIVIDUALS WHO FAIL TO MEET THE CRITERIA FOR DISTANT OR NEAR VISION, EXTRA-OCULAR MUSCLE BALANCE OR VISUAL FIELDS ARE TO BE ASSESSED BY AN OPHTHALMOLOGIST OR AN OPTOMETRIST BEFORE THEY ARE DECLARED UNFIT TO OCCUPY AN SCP BY THE CMO.

2. Fitness for duty criteria

2.1 Visual Acuity

2.1.1 Distant Snellen acuity

- not less than 6/9 (20/30) in the better eye with or without correction
- not less than 6/15 (20/50) in the worse eye with or without correction

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

2.1.2 Near acuity

<u>NOTATION</u>	<u>Both Eyes Open (Corrected or Uncorrected)</u>
Reduced Snellen (American)	20/30
Reduced Snellen (Metric)	6/9
Snellen (Metric)	40/60
M notation @ 40 cm	0.63 M
N notation @ 35 cm @ 40 cm	N5 N6
Jaeger notation @ 35 cm @ 40 cm	J2 J4

2.2 Visual fields

The minimum extent of the uninterrupted monocular visual field in each eye without correction should be:

Horizontal meridian: 120°
 Vertical meridian: 90°
 Oblique meridians: 90°

The monocular visual field must be continuous within these limits.

2.3 Colour vision

2.3.1 Normal unaided* colour vision as determined by the Ishihara Colour Vision Test.

<u>Version of the Ishihara</u>	<u>Plates to be administered</u>	<u>Maximum number of allowable errors</u>
14 plate edition:	1 through 10 inclusively	2
16 plate edition:	1 through 11 inclusively	2

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

24 plate edition: 1 through 15 3
inclusively

36 plate edition: 1 through 21 5
inclusively

* Unaided means that no visual aid other than clear spectacles, clear contact lenses, or contact lenses with light handling tints may be worn while performing the test. If there is any question as to the lightness of the tint, then clear spectacles or clear contact lenses should be worn while performing the test.

2.3.2 Failure of Ishihara Test

2.3.2 a) Railway Lantern Test (CNLAN)

A specific colour Lantern Test (CNLAN) has been developed by the railway industry. The CNLAN is designed to determine an individual's ability to identify colours used in rail wayside signals. The intensity and size of the lights are equivalent to a viewing distance between 0.2 and 0.4 miles. The colours fall within the American Association of Railroads standards for wayside signals.

Individuals (excluding rail traffic controllers) who fail the Ishihara Colour Vision Test are required to undergo further assessment, including a CNLAN. Canadian National Railway (CNR) and Canadian Pacific Railway (CPR) currently administer the CNLAN. Testing can be arranged through the Occupational Health Services Department of either CNR or CPR.

2.3.2 b) Rail Traffic Control (RTC) Practical Test

Rail traffic controllers who fail the Ishihara Colour Vision Test will be assessed using a practical test developed by each railway company.

NOTE: Both the CNLAN and the rail traffic control tests must be conducted unaided as defined in section 2.3.1.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

2.4 Extra-ocular muscle balance

Individuals who experience diplopia at different eye positions within a 30° radius of their habitual straight-ahead gaze or have a restriction of eye movements within 30° of straight-ahead cannot occupy a an SCP.

2.5 Contact lenses

They are permitted provided that regular glasses are available at all times. If only one contact lens is lost, the other contact lens must be removed before using back-up glasses.

2.6 Spare spectacles

They are mandatory at all times for individuals using any form of acceptable corrective visual device in order to meet the visual acuity standards.

3. Monitoring requirements

3.1 Frequency

Assessment for distant and near acuity, visual fields, ocular muscle balance and colour vision is done as part of the periodic medical examination

- every 5 years until the age of 40.
- every 3 years thereafter.

CNLAN and RTC colour vision tests are done at every second periodic medical examination (i.e. every 10 years until the age of forty and every 6 years thereafter).

The Chief Medical Officer (CMO) may determine different periodicity for those individuals who have symptoms or signs of visual disorders or who are at risk of developing such disorders.

3.2 Testing methods:

Distant and near acuity, visual fields, colour vision and extra-ocular muscle balance assessments may be done by a physician, an optometrist, a nurse or a trained technician

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

duly authorized by the CMO in accordance with current testing protocols (as described in Appendix II).

4. Individual assessment

The CMO may authorize certain individuals who do not meet the above-mentioned criteria to occupy an SCP if the CMO has reasons to believe that the individuals can perform their duties in a safe manner despite their visual disorder.

In doing so, the CMO will take into consideration the following:

- the specific requirements of the position;
- the opinion of an ophthalmologist or an optometrist who has examined the individual; and
- any relevant ability, skill or experience of the individual.

The CMO may also require that a practical test be performed before allowing an individual to occupy an SCP.

5. Guidelines for some exceptional cases

5.1 Refractive surgery

Any individual who has had refractive surgery will be considered to be unfit for an SCP until his/her vision has been stable for at least 30 days after the last surgery.

Individuals who have had refractive surgery must provide documentation that their visual acuity and refraction are stable. The necessary documentation should be provided by their eye care provider and include:

- the uncorrected monocular acuities;
- the corrected monocular acuities; and
- the subjective refraction results

for two examinations that are at least 30 days apart. The documentation must also indicate that all drugs and medications related to the surgery have been discontinued for at least 1 month.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

If the refractive surgery was radial keratotomy (RK), then the two measurements should be made at different times of day to verify that the diurnal variations are not significant. One assessment should be in the early morning and the other in the late afternoon.

5.2 Monocular Individuals

For the present purposes, a monocular individual is a person who has lost the use of one eye or has a visual field in one eye that is less than 40 degrees in any direction. A monocular individual may be deemed as acceptable for an SCP provided that the following conditions are met:

5.2.1 A report by an eye care professional indicates that, with respect to the worse eye, the condition is stable and unlikely to affect the better eye;

5.2.2 With respect to the better eye:

- the vision is corrected to 6/9 or better;
- the visual field is within acceptable limits. The minimal acceptable visual field limits are defined as:
 - horizontal meridian of 120°
 - vertical meridian of 90°
 - oblique meridians of 90°
 - a continuous visual field within the above limits.
- colour vision is adequate under binocular viewing conditions;
- the eye's adnexa are normal in all other respects.

5.2.3 The individual, following an adequate period of adaptation, has satisfactorily completed a practical test ^(*) conducted by a person designated by the CMO demonstrating his/her ability to perform his/her duties in a safe manner while maintaining an adequate look-out for other traffic and obstructions

^(*) A practical test or adaptation may not be necessary in all cases. Demonstrated ability to perform tasks similar to those in an SCP that were gained through past work experience may be sufficient.

NOTES: 1. Periodic reports from an eye specialist may be required.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

2. Based on the medical and performance evidence for an individual case, the CMO may restrict the individual to only specific SCP or duties.

5.3 Substandard Vision in One Eye

These are individuals whose worse eye has a corrected central vision of less than 6/15 and a normal peripheral visual field in that eye. Individuals who have a scotoma within the central 10° visual field, but the remaining visual field is normal would also fall into this category. These individuals can be deemed fit for an SCP provided that the following conditions are met:

5.3.1 A report by an eye care professional indicates that with respect to the worse eye:

- the condition is stable and unlikely to affect the better eye;
- the visual field is normal outside the central 10°; and
- the eye's adnexa are normal in all other respects.

5.3.2 With respect to the better eye:

- the vision is corrected to 6/9 or better;
- the visual field is normal; and
- the eye's adnexa are normal in all other respects.

5.3.3 With respect to binocular viewing conditions:

- colour vision is adequate; and
- diplopia is absent.

5.3.4 An accredited professional concludes that the visual defect is unlikely to interfere with safe performance of duties, and the CMO is satisfied that any relevant ability, skill or experience of the individual has been given due consideration. In certain cases, a practical test may be advised.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

APPENDIX I

BACKGROUND INFORMATION ON VISION

For decades, safety of railway operations has been a concern. This is acknowledged in the Railway Safety Act which has been enacted further to the National Transportation Act. The Railway Safety Act incorporated a prior General Order on the Railway Vision and Hearing Examination Regulations known as the General Order O-9.

Amended the last time in 1985, General Order O-9 has been repealed and is now replaced by the Railway Medical Rules. These rules will allow health professionals to assess accurately and equitably the capacity of individuals with impaired vision to occupy a Safety Critical Position (SCP).

Visual Acuity

In general, the recommended standards are similar to those used for commercial drivers in Canada. Most Canadian provinces require a minimum distance acuity of 6/9 (20/30) corrected or uncorrected for the better eye and 6/15 (20/50) corrected or uncorrected for the worse eye. It is anticipated that the majority of individuals between the ages of 18 and 60 years old should be able to meet the proposed distance acuity standards. The proposed scoring criterion of allowing only one mistake on a line is explained by the fact that different charts are used in testing distant acuity. These charts vary in the number of letters per line and the types of letters in the line. All letters are not equally difficult to identify. These variations have an influence on the probability that the assessed individual would correctly identify the letters based on guessing and prior experience. For example, it would be easier to obtain 75% correct on a chart with 4 letters per line that are relatively easy to identify than it would be for a chart which had 6 letters per line and the letters vary in their difficulty. Because this factor is difficult to control when using multiple chart designs, there is a necessity to adopt a strict scoring criterion to minimize the interaction.

A near vision standard is maintained to ensure that individuals over 40 years have the proper spectacle correction in order to read and carry out tasks within arm's length efficiently. It may also identify a small number of moderate hyperopic individuals under 40 years who may benefit from a correction in order to reduce the eyestrain.

Refractive Surgery

The primary concern with refractive surgery procedures and individuals who occupy an SCP is that their vision may fluctuate due to the regression of the refractive error, changes in the corneal transparency, or both. The degree of the fluctuation and the time required for vision to stabilize depend on many factors. These factors include the type of surgery, the amount of the surgical correction, and the individual's healing characteristics. In certain cases, the vision may be stable

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

within a month, whereas other individuals require longer than 6 months. Regardless of how long it takes for the vision to stabilize, any fluctuations will usually be evident within the first 3 weeks after surgery. Thus, if the vision has remained stable for the first 30 days after surgery, it is highly probable that it will remain stable.

However, in cases where the vision is fluctuating, the person will require more time away from the SCP until their vision does become stable. Again, the minimum period that the vision (i.e. visual acuity and refractive error) has to be stable is at least 30 days.

Radial keratotomy (RK) is a special case. Fluctuations during the day are still possible long after surgery. For this reason, individuals who have had RK surgery will have to document that their vision still meets the required standard for different times of the day. The times would be early morning and late afternoon or early evening. For those individuals on shift work, the different times would be shortly after waking and after being awake for at least 8 hours. It may be necessary for these individuals to have separate pairs of spectacles for day and night in order to meet the visual acuity standards.

Visual Fields

Most commercial driving regulations require the license holder to have 120° continuous visual field in the horizontal meridian in each eye. The Canadian Ophthalmologic Society may expand their recommendation to be 120° in the horizontal meridian AND 120° along the meridians 20° above and below the horizontal meridian.

Visual fields are usually assessed using the "confrontation" method which is user-friendly, practical and sufficient to detect quadrantanopias and hemianopias. These visual field losses are large enough to have a detrimental effect on employee's performance resulting in an unacceptable risk to the safety of the individual and others. The simplicity of the confrontation concept has led to a multitude of techniques for performing the test. Some techniques are better than others. The recommended procedure is "finger counting". The finger-counting procedure is primarily intended as a screening test. If a defect is found, then further testing will be necessary to diagnose the cause and quantify the functional impact of the field loss. The recommended test conditions are designed to quantify an absolute loss. The size and contrast of the targets (which have approximately equal detectability) are designed to measure the maximum extent of the visual field. Each eye should be tested. Different testing conditions may be required for diagnostic purposes.

It is possible that a person with a visual field loss might be able to compensate by making additional eye and head movements. Nevertheless these individuals may not be suitable for a certain SCP. Operating equipment on the main track may not be a problem because the necessary scanning movements are mostly along the near horizontal meridian and at the instrument panel. However, someone working in a large yard or along multiple sections of track may be at greater risk because equipment could be moving on any of the closely-spaced sections of track; the loss

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

of peripheral vision may impair his/her ability to detect moving objects in sufficient time. For these reasons, individuals with a visual field impairment should be considered on an individual basis with a practical evaluation if necessary.

Extra-ocular Muscle Balance

In the past, the examiners relied on the patients to report whether they experienced double vision, had a strabismus, or a lazy eye. The visual acuity standard also provided a method to screen for long-standing extra-ocular muscle problems. Failure to meet the acuity standard in the worse eye may be a result of a strabismus or long-standing ocular muscle problem, particularly in the younger individuals. In order to increase the sensitivity of the ocular muscle testing and reduce the reliance on the medical history, a stereopsis test has been added as a screening tool. Individuals with a subtle eye turn, suppression of one eye due to a binocular vision problem, or inadequate binocular fusional eye movements are unlikely to meet the stereopsis screening value of 60 sec arc. Only individuals with reasonably good single clear binocular vision can obtain this level of stereopsis. It is important to note that the stereopsis requirement is not a depth perception standard. Rather it is a screening device designed to increase the sensitivity and reliability of the extra-ocular muscle testing.

It is also important to note that because the stereopsis test requires single clear binocular vision, individuals with uncorrected refractive errors could fail the stereopsis test whether or not they meet the visual acuity requirements. Thus, one should not be too surprised if further evaluation shows that stereopsis improves to acceptable levels with the proper refractive correction in place.

Colour Vision

Assessment of colour vision is particularly important in railway operations as colour signals are extensively used to control the movements of trains. The use of the Ishihara plate method remains the best screening tool as it is inexpensive and sensitive. The recent development of an improved Lantern Test makes the confirmation process more accurate as it identifies those individuals who are at risk because of their colour identification deficiency.

Coloured spectacle or contact lenses worn before one or both eyes, or other devices purported to aid colour discrimination or correct colour vision deficiencies, are not permitted. It is safe to make the general statement that these devices are primarily designed so that the individual passes the Ishihara (or equivalent) test. On most practical tests, performance usually does not improve unless the practical test is very similar to the colour vision demands of the Ishihara. The reason for the discrepancy is that in aiding discrimination for certain specific colours, the filters usually worsen discrimination for other colours, resulting in no overall improvement in their general colour discrimination capabilities. For example, a red coloured lens which blocks green light from reaching the eye would allow a person to pass the Ishihara test because the orange numbers would appear brighter than the green background while wearing the red lens. However, when the person is required to identify signal lights while wearing the lens, the green light would appear to be as

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

very dim yellow or white light if they are detected at all and the yellow light would appear as an orange or red light.

Individuals with a colour vision defect who pass the CNLAN or the RTC colour vision test and who show no other change in their visual status are to be retested at every second periodic medical examination (every 10 years until 40 and every 6 years thereafter).

Monocular Vision

There is little question that an individual's performance on a number of laboratory tests will be impaired when there is either a sufficient reduction in the visual acuity in one eye or the individual is monocular. However, these degradations in laboratory measures do not usually translate into appreciable losses in on-the-job performance. Performance in terms of driving either a truck or automobile has not been shown to be significantly affected when the driver is monocular. Although some studies have reported higher accident rates for drivers with impaired vision in one eye only, more recent studies have not been able to confirm these findings. In fact, one study reported that the accident rates were lower for monocular truck drivers. One possible explanation for the differences is that the older studies did not always control for age and driving experience. Despite the more recent performance data indicating that monocular drivers do not pose an increased risk, many agencies still remain reluctant to relax the visual field standard for commercial drivers to allow monocular drivers. It is important to remember that, although individuals with monocular visual fields losses may not be a safety risk, there is a general consensus in the data that individuals with an appreciable field loss in both eyes are a significant risk to safety.

Although monocular individuals may not pose an increased risk to safety on the roadways, driving a vehicle is not necessarily equivalent to performing duties in the rail industry. For this reason a more conservative approach is taken in assessing individuals who are monocular or have substandard vision in one eye to ensure that the vision defect will not pose an increased risk to safety. One of the primary safety concerns for the rail industry is the impact of the visual field loss on the person's ability to detect hazards. A person who has lost total vision in one eye has lost approximately 40 ° of his/her peripheral visual field on the same side of the body as the blind eye. This loss could be problematic in detecting objects coming from the side if the person has not developed coping strategies such as scanning eye movements, head turning, or both. The development of these strategies often requires time and this is one reason why Civil Aviation Authority typically use an adaptation period of 6 months before they will re-license a pilot who has lost vision in one eye and restrict a monocular commercial pilot to a 2-person crew.

Even with the additional eye and head movements, a person with only one eye (or a bilateral loss of upper or lower visual fields) may not be suitable for an SCP. Operating equipment on the main track may not be a problem because the necessary scanning movements are mostly along the near horizontal meridian and at the instrument panel. However, someone working in a large yard or along multiple sections of track may be at greater risk because equipment could be moving on any

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

of the closely-spaced sections of track and the loss of peripheral vision may impair his/her ability to detect moving objects in sufficient time. For these reasons, individuals with a visual field impairment should be considered on an individual basis with a practical evaluation if necessary.

Visual Assessment Form

In order to assist the examining practitioner and the CMO, an example of a visual assessment form is provided in Appendix IV. This form could serve as either the actual document or a template for developing an equivalent form.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

APPENDIX II

VISUAL ASSESSMENT METHODS

1. Visual Acuity

1.1 Distant acuity

Distant acuity is assessed with the individual wearing his/her habitual distance visual correction (if any), using a Snellen chart or an equivalent.

When acuity charts printed on white surface are used, the light falling on the chart should be uniform and the amount should be greater than 250 lux. Most offices with overhead fluorescent light fixtures will meet this requirement. If the chart is placed at the end of a long hallway, then adequate illumination should be confirmed with a light meter. Long hallways tend to be dimmer than the work areas. Glare sources such as windows are to be away from the chart. The individual being assessed should not sit or stand directly below a light.

If a projected chart or computer screen is used, the room lights should be turned off prior to the assessment.

The individual is allowed only one mistake on a line in order to receive credit for that line.

1.2 Near acuity

Near vision is assessed with the individual wearing his/her habitual visual correction for reading (if any), using one of the following scales:

Reduced Snellen (American)	Reduced Snellen (Metric)
Snellen (Metric)	M Notation @ 40 cm
N Notation @ 35 cm or 40 cm	Jaeger Notation @ 35 cm or 40 cm

Examiners must use the appropriate test distance specified for the given scale. Testing is done with individuals wearing their current visual correction for reading. Normal office lighting is sufficient. There should be no shadows falling on the near acuity card.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

2. Visual fields

Visual fields are assessed using the confrontation method. If a defect is found, then a more quantitative method should be used.

2.1 Recommended procedure (confrontation method)

- The individual is positioned 0.66 to 1.0 metre away from the examiner. The examiner should be positioned at approximately the same height as the individual. Individuals do not need to wear their corrective lenses but those with higher prescriptions may find the test easier to perform when wearing their habitual prescription. Normal office lighting is sufficient.
- The individual is instructed to occlude his/her left eye using the palm of his/her hand. The examiner occludes or closes his/her right eye.
- The individual is instructed to fixate the examiner's open eye with his/her open eye. The examiner informs the individual that he/she will be holding his/her hand in different locations to test the individual's side vision. The individual is to report how many fingers are held up. The examiner informs the individual that he/she will be holding up 1, 2, or 4 fingers. (3 fingers are difficult to distinguish from 2 or 4.) The examiner reminds the individual to maintain fixation on the open eye and not to glance at the hand.
- The examiner holds his/her hand about halfway between him/herself and the individual. The examiner starts with his/her hand in one of the four quadrants approximately 50 degrees from the common line of sight. The hand should be placed in the middle sector of the quadrant. (Other areas of the quadrant can also be tested.) The examiner holds up 1, 2, or 4 fingers and asks the individual to tell how many fingers are present. Fingers should be kept in a plane parallel to the individual's facial plane and rotated so that the fingertips are directed toward the individual's line of sight.
- The examiner repeats this procedure for the other 3 quadrants.
- The examiner may have to switch hands to test the other half of the visual field.
- If the individual responds incorrectly, the examiner moves his/her fingers closer to the individual's line of sight until the number of fingers is identified correctly. The examiner compares the difference in position between when he/she was first able to identify the number of fingers correctly and the position of his/her hand when the individual identified the number of fingers correctly.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

- The procedure is repeated for the other eye.

2.2 Quantification of field loss.

In order to assess the functional extent of field loss, any of the following test methods could be used. Other test conditions may be necessary for diagnostic purposes.

LIST OF EQUIVALENT TEST METHODS

- 3 mm white target at 33 cm viewing distance (black or grey background).
- Goldmann Perimeter: Target III 3/e.
- Humphrey Perimeter: Size III at 15 decibels.
- Octopus 1-2-3 Perimeter: Size III at 10 decibels.
- Dicon Perimeter: 10 decibel target.

3. Colour vision

Colour vision is screened using the Ishihara Colour Vision Test.

Ishihara plate test

This test is designed to be used under natural daylight. If natural daylight is unavailable, "natural daylight" fluorescent lamps may be used. In practice, normal "cool white" fluorescent lamps are sufficient for the vast majority of individuals. A few individuals with very mild defects may pass using this light source. Although they do pass, they usually make more errors than an individual with normal colour vision. This means that, if an individual makes the maximum number of allowable errors when cool white fluorescent lamps are used, this individual should be re-tested using natural daylight or light source that is rated as comparable a suitable substitute for natural daylight.

Incandescent bulbs, halogen or warm white fluorescent lamps should not be used to illuminate the Ishihara test.

When scoring the test, the individual has to read the complete number correctly in order for the response to be counted as correct. Missing one digit of a two-digit number is an error.

CNLAN test method (See Appendix III)

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

4. Extra-ocular muscle balance

Extra-ocular muscle balance is assessed by a history of double vision, squint or strabismus. In addition, stereoacuity (i.e. stereopsis) is added to screen for ocular misalignments and suppression. Individuals are required to obtain at least 60 sec arc on either the Titmus Butterfly Stereo (or Stereo Fly) Test, Randot Stereo Test, or an equivalent test. Individuals who fail to meet this screening value should be referred for further assessment of their binocular vision status.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

APPENDIX III

CNLAN-Lantern Colour Vision Test for The Canadian Railway Industry

Introduction

The Lantern Colour Vision test is designed to determine one's ability to identify colours used in rail wayside signals. The intensity and size of the lights are equivalent to a viewing distance between 0.2 and 0.4 mile (0.3 to 0.64 km). The colours fall within the American Association of Railroads standards for wayside signals.

Test Description

The test should be conducted under normal room illumination at a viewing distance of 4.6 meters (15 feet). There are three parts to the Lantern: the lantern itself, the control unit and a remote control unit. There is a slot on the back of the lantern for carrying the control unit. The unit should be placed in the slot with the top facing away from the lantern and the connectors facing up. The remote control is attached to the control unit.

A computer cable connects the control unit to the lantern. On the left front of the lantern, is a connector for the control unit. (Just above the plug for the power cord). The control unit also has an RS232 connection so that a computer can control the lantern if desired.

Test Set-up

Place the lantern 4.6 metres from the applicant. Remove the control unit from the back. If necessary, connect the control unit to the lantern using the computer cable. The control unit can be placed anywhere convenient. We recommend placing it so that you view both the applicant and the lantern. The power switch is on the right side of the lantern. This switch controls power for both the lantern and control unit. As the power comes on, the control unit will set the lantern to the first example set. The colour of the lights will be listed on the control unit display.

Pressing the arrow buttons on the control panel changes the test lights. The arrow pointing to the left displays the previous set of lights and the arrow pointing to the right advances to the next set of lights. The lights will be extinguished between presentations. The button labelled with the "X" turns off the lantern's light, but the control unit remains on. To turn the lantern on, press one of the arrow buttons.

The test lights can also be changed by the remote control. The asterisk on the remote control presents the previous set of lights and the pound button (#) advances to the next set of lights. The number buttons can be used to move to a specific set of test lights. To present a specific set, you must always press two buttons. For example, to display set 5, you must press 0 and 5.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

Aim the remote control at the dark rectangular window on the control unit. If the control unit received information from the remote, a little red light will flash. A light on the remote will also flash if the information was transmitted. Pressing 0 twice will turn off the tests lights.

We recommend that you turn off the lights, if not the entire lantern, between tests. The reason is that there is a thermostat which will turn off the light if the lantern gets too hot. It takes about 45 minutes before it cools down enough to use.

Testing Procedure

Before starting the test, make sure that the tested individual has corrected or uncorrected distance vision that meets the current standards.

The individual’s normal clear spectacle lenses or clear contact lenses can be worn while performing the test. However, coloured spectacle lenses or coloured contact lenses worn before one or both eyes or other devices purported to aid colour discrimination or correct colour vision deficiencies are not permitted. Contact lenses, which are tinted with a light blue handling tint, are permitted. Light handling tints have essentially no effect on the test results. However, if there is any question as to how light the tint is, then testing must be done with either clear spectacle lenses or clear contacts lenses.

The candidate should be seated comfortably at a distance of 4.6 metres (15 feet) from the lantern and have a straight-on view of the front of the lantern. The room lights should be turned on. If necessary, set the lantern to the first presentation. This is one of the examples. Inform the candidate that this is a test to determine his/her ability to identify rail signal light colours. State that “there will always be three lights presented. The colours of the lights will be in any combination of red, green and yellow. Only the names of red, green and yellow should be used to identify the lights. Identify the colour of the lights starting at the top, followed by the middle, and then the bottom. The three lights that you see here are examples. The top is green, the middle is yellow and the bottom is red.” Advance to the next presentation. Inform the candidate that this is another example. It has red on top, yellow in the middle, and green on the bottom.

Ask if there are any questions or if the candidate would like to see the examples again. If not, advance to the third set of lights. This is the first test set. Record the responses on the score sheet by circling the correct answer and writing in the incorrect response. Allow approximately 5 seconds for a response. If the candidate takes longer than 5 seconds to respond, extinguish the lights, by pushing the “X” button or entering 00 on the remote. In order to avoid confusion in recording, do not advance to the next set until the candidate has responded. The test set ends at 15.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

If the candidate uses a colour name other than red, green or yellow, remind her/him that only red, green and yellow responses are allowed. The exception to this rule is that amber can be used to identify yellow lights.

A passing performance is no more than one error, and that error cannot be identifying a red light as green or a green light as red.

Alternative Testing Protocol (for shorter sighting distances)

In some positions, the sighting distance required for identifying signal light colours is not as far as required on the main track. These are usually positions where the employee is operating equipment only within a yard. The sighting distances in these settings are usually significantly shorter than the distances on the main track. Shortening viewing distance for the Lantern Test can accommodate these differences in visual demands. For example, if the test distance from the lantern was 2.3 metres (7.5 feet), then the Lantern Test would correspond to viewing distances on the track ranging from 0.1 to 0.2 mile (0.16 to 0.32 km). Table 1 lists some equivalent distances between the Lantern Test and actual viewing distances. The exact test distance may have to be determined on an individual basis. However, there is a limit. A Lantern Test distance closer than 0.5 metre is an unrealistic simulation. This occurs because, as one gets within 50 yards of the dwarf (and wayside signals) signal lights along the track, their brightness begins to decrease. This decrease is due to the relatively narrow and directed beam spread of the lights. In contrast, the brightness of the Lantern Test lights will continue to become brighter as the test distance decreases. There is also a change in the scoring criterion at the shorter test distances. Individuals must now obtain a perfect score (i.e., no errors).

Table 1. Test distance for the lantern and the equivalent viewing distance in the field.

Lantern Test Distance		Equivalent Field Viewing Distances			
Metres	Feet	Miles	Feet	Yards	Metres
4.6	15	0.2 to 0.4	1050 to 2110	350 to 700	320 to 640
2.3	7.5	0.1 to 0.2	530 to 1060	175 to 350	160 to 320
1.15	3.75	0.05 to 0.1	260 to 530	90 to 175	80 to 160
0.5	1.8		130 to 265	45 to 85	40 to 80

Troubleshooting

The filter wheel keeps turning and the light does not come on.

This usually means that the cable connecting the control unit and the lantern is not completely plugged in. Reconnect both plugs and make sure that they are secure.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

Replacing the light bulb.

Before you replace the bulb, you may want to let the lantern cool for 1 hour. The light will automatically turn off when the temperature inside the lantern gets too hot. If the black tube holding the light is very hot to the touch, wait and retry the lantern before replacing the bulb.

If it is the bulb, then loosen the set-screw on the black tube coming out of the back of the lantern. Gently pull back on the plastic fixture until the bulb is completely removed. The replacement is 10 watt, 18 volt Sig. Bulb. These are the bulbs that are used in the searchlight style signal lights.

Replacing the remote batteries.

The batteries for the remote are located on the backside at the bottom. It takes 2 AA batteries.

If there are any other problems, ship the unit to the address below with a short description of the problem.

Dr Jeff Hovis
School of Optometry
University of Waterloo
Waterloo, Ontario N2L 3G1

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

APPENDIX IV

VISION REPORTING FORM EXAMPLE

Employee Information (Employee to complete all areas)			Employee No.	Male	Female
Last Name	First Name	Initial		D'	D'
			Date of Birth:		
Position	Department	Work Location			
		Telephone: (Home)			
		(Office)			
Supervisor's Name			Employee's Signature		

Information to the Examining Eye Care Specialist

Canadian railway employees working in a Safety Critical Position (SCP) operate or control the movement of trains. Physical or mental fitness is mandatory. Impaired performance due to a medical condition could result in a significant incident affecting the health and safety of employees, the public, property or the environment.

Railway employees working in an SCP are required to have periodic screening assessments. This employee failed to meet the visual screening standard established for the Canadian railway industry by Government Legislation in the area(s) checked below. Your assessment of these areas is required. The established standard for each area is described.

SECTION A

Visual Acuity

Standards:

Corrected or uncorrected distance visual acuity not less than 6/9 (20/30) in the better eye. Corrected or uncorrected visual acuity not less than 6/15 (20/50) in the worse eye. Corrected or uncorrected near visual acuity of 6/9 (20/30) with both eyes open.



Section: 4

Version: 1.0

Title: RAILWAY MEDICAL GUIDELINES

Subsection 4.3 – Vision

	Distance Vision		Near Vision	
	Uncorrected	Best Corrected	Uncorrected	Best Corrected
Right Eye				
Left Eye				
Both Eyes				
Test Method				

1. If new glasses or contact lenses are required to meet the vision standards, have they been prescribed?

- Yes. Anticipated date of dispensing _____
- No. Explain: _____

2. Even though the acuity standards are met with an updated prescription, are there other conditions contributing to the reduction in visual acuity other than uncorrected refractive errors?

- Yes. Indicate diagnosis and management.

- No

3. If the best corrected visual acuities do not meet the required standard, indicate your diagnosis and management of this patient's condition.

4. **If the better eye does meet the requirement but the worse eye does not meet the acuity requirement, then we require an extra-ocular muscle assessment as outlined in Section B and visual field assessment of each eye as outlined below in Section C.**

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

SECTION B

Extra-Ocular Muscle Balance

Standard: No diplopia or strabismus at different eye positions within a 30 degree radius of their straight-ahead gaze or a restriction of eye movements within 30 degrees of straight-ahead.

a. Is diplopia present within a 30 degree radius of straight-ahead gaze under daytime or night time viewing conditions?

Yes No

b. Is the patient’s stereoacuity worse than 60 sec arc when wearing his/her most recent prescription?

Yes No

If “Yes” is answered to any of the above, please indicate your diagnosis and management of the extra-ocular muscle or binocular vision problem.

SECTION C

Visual Fields/Peripheral Vision

1. Does this employee meet the following limits of uninterrupted monocular visual field for each eye tested separately without correction?:

Standard	Right Eye		Left Eye	
	Yes	No	Yes	No
Horizontal meridian: 120° Continuous				
Vertical meridian: 90° Continuous				
Oblique meridian: 90° Continuous in both meridians				



Section: 4

Version: 1.0

Title: RAILWAY MEDICAL GUIDELINES

Subsection 4.3 – Vision

2. If “No” is answered to any of the above limits, please attach the results and indicate your diagnosis and management of the visual field problem.

3. Indicate test method used:

- 5 mm white target at 33 cm viewing distance (black or gray background)
- Goldmann: Target III 3/e
- Humphrey: Size III at 15 decibels
- Octopus 1-2-3 Size III at 10 decibels
- Dicon Perimeter: 10 decibel target
- Equivalent Condition (Specify)_____

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

EYE CARE SPECIALIST STATEMENT, INFORMATION AND REPORTING GUIDELINES:

An answer to the following is required:

Are there other visual conditions or disorders that could affect this employee’s performance in a Safety Critical Position in the Canadian railway industry?

Yes. Indicate diagnosis and management.

No

This report will be used to make an assessment on this employee’s fitness for duty and constitutes a third party service. In completing this report, please be thorough and write legibly. If you have any questions regarding any component of this report, call the toll-free number listed below.

I certify that the information documented in this report is, to the best of my knowledge, correct.

Date of examination: _____

Signature: _____

Optometrist
Ophthalmologist

Name (Print): _____

Telephone: () _____

Address: _____

Fax: () _____

City/Province: _____

Postal Code: _____

Report and Invoice may be sent to:

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.3 – Vision	

APPENDIX IV

ACKNOWLEDGEMENTS

The RAC would like to acknowledge the contribution of:

Dr. Jeffery K. Hovis, OD, PhD, FAAO
 School of Optometry
 University of Waterloo
 Waterloo ON
 Canada
 N2L 3G1

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.4 – Epilepsy or Isolated Epileptic Seizures	

**MEDICAL GUIDELINES FOR THE EMPLOYMENT OF INDIVIDUALS WITH
EPILEPSY OR OTHER EPILEPTIC SEIZURES IN A SAFETY CRITICAL
POSITION IN THE CANADIAN RAILWAY INDUSTRY**

1. Introduction

Canadian railway employees who work in a Safety Critical Position (SCP) operate or control the movement of trains. Physical and mental fitness is mandatory. Impaired performance due to a medical condition could result in a significant incident affecting the health and safety of employees, the public, property or the environment. Sudden impairment of their alertness, judgement, or sensory or motor function can pose a serious safety threat.

Although the overall prognosis for seizure control is excellent, with about 70% of patients having a 5-year remission of seizures, epilepsy is a condition which can cause sudden and unpredictable impairments of the functions noted above. Each person with epilepsy has different disabilities. Complete evaluation of each case is therefore needed to assess the risk of seizure recurrence and the risk to safety caused by a seizure. The notion of "significant risk" cannot be precisely defined. A risk-free environment is unattainable and undoubtedly some employees with no history of epilepsy will have their first, and unpreventable seizure on the job.

Background information on epilepsy and other epileptic seizures is provided in Appendix I.

2. Basic considerations

Employment of individuals with epilepsy or other epileptic seizures in an SCP shall be guided by the following considerations:

2.1 Medical history and findings (see Appendix II)

- nature of seizure disorder
- results of investigations
- adherence to treatment protocols
- results of treatment

2.2 Treatment

- antiepileptic drugs (AEDs)
- surgery
- withdrawal of medication

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.4 – Epilepsy or Isolated Epileptic Seizures	

2.3 Nature of the job

3. Definitions

For the purpose of this document, the definitions of epilepsy and other epileptic seizures are those of the International League Against Epilepsy:

- **Epileptic seizure** is defined as a clinical manifestation presumed to result from an abnormal and excessive discharge of a set of neurons in the brain. The clinical manifestation consists of sudden and transitory abnormal phenomena which may include alteration of consciousness, motor, sensory, autonomic, or psychic events perceived by the patient or an observer.
- **Epilepsy** is defined as a condition characterized by recurrent (two or more) epileptic seizures, unprovoked by any immediate identified cause. An individual who has a first seizure with an electroencephalogram (EEG) with epileptiform activity must be considered suffering from epilepsy until proved otherwise.
- **Single or isolated seizures** are defined as one or more epileptic seizures occurring within a 24-hour period.
- **Unprovoked seizures** are defined as seizures that occur in relation to a well-demonstrated antecedent condition, substantially increasing the risk for epileptic seizures. Two major subgroups may be categorized as follows:
 - **Remote symptomatic unprovoked seizures** owing to conditions resulting in a static encephalopathy subsequent to insult to the central nervous system (CNS) such as infection, cerebral trauma, or cerebrovascular disease, which are generally presumed to result in a non-progressive (static) lesion.
 - **Symptomatic unprovoked seizures** owing to progressive CNS disorders.
- **Acute symptomatic seizures (Provoked seizures)** are defined as seizures occurring in close temporal association with an acute systemic, metabolic, or toxic insult or in association with an acute CNS insult (infection, stroke, cranial trauma, intracerebral hemorrhage, or acute alcohol intoxication or withdrawal). Such seizures are often isolated epileptic events associated with acute conditions, but may also be recurrent seizures or even status epilepticus when the acute conditions recur, e.g., in alcohol withdrawal seizures.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.4 – Epilepsy or Isolated Epileptic Seizures	

4. Medical Fitness for Duty Criteria

4.1 In the case of epilepsy:

4.1.1 treated at any time with AEDs only:

- A period of 5 years without seizures with or without medication, and
- Absence of epileptiform activity in serial EEGs performed over a period of 5 years and interpreted by a certified electroencephalographer
- Following withdrawal of AEDs, absence of epileptiform activity in serial EEGs performed over a period of 3 years and interpreted by a certified electroencephalographer.

4.1.2 that has been treated surgically:

- A period of 5 years following the surgery, on medication, without seizures, and
- Absence of epileptiform activity in serial EEGs performed over a period of 5 years and interpreted by a certified electroencephalographer.

4.1.3 with epileptic seizures occurring in relation to sleep only

- Absence of postictal impairment during wakefulness
- Treatment with AEDs
- Stable clinical pattern for 5 years

4.1.4 with strictly simple partial seizures, including isolated auras, as defined in Appendix I, which occur even with AED treatment:

- Absence of cognitive sensory, or motor impairment
- Stable clinical pattern for 5 years.

4.2 In the case of epileptic seizures other than epilepsy

4.2.1 Single or isolated seizure

Fitness for duty of individuals with single or isolated seizure or with remote symptomatic unprovoked seizures must be assessed using the fitness for duty criteria determined for individuals with epilepsy.

4.2.2 Acute symptomatic seizures (provoked seizures)

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.4 – Epilepsy or Isolated Epileptic Seizures	

Fitness for duty of individuals with acute symptomatic seizures (provoked seizures) must be assessed individually. Once the seizure trigger has been clearly identified and the seizures judged unlikely to recur, a minimum of 1 year from the illness or the acute CNS insult may be considered acceptable prior to returning to an SCP.

4.3 Other criteria of temporary exclusion from an SCP of individuals with epilepsy:

- Job requiring overtime or rotating shifts resulting in sleep deprivation or the likelihood of disturbed sleep patterns
- Non compliance with treatment
- Inadequate blood AED levels
- Side effects from AEDs that could significantly impair job performance

4.4 Criteria of permanent exclusion

4.4.1 Symptomatic unprovoked seizures owing to progressive CNS disorders.

4.4.2 Repeated non compliance with treatment.

5. Monitoring requirements before and after returning to work in an SCP

5.1 Within 3 months before returning to work in an SCP: review by a neurologist with submission of a written report.

5.2 After returning to work:

- Yearly review by a neurologist with submission of a written report
- For individuals taking AEDs, results of blood AED levels forwarded quarterly to the Chief Medical Officer of the railway company

6. Individual assessment

Individuals with epilepsy or other epileptic seizures must be assessed with regard to their suitability for a particular position. The nature of the duties and responsibilities associated with their specific Safety Critical Position must be closely evaluated before any final determination of their fitness for duty.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.4 – Epilepsy or Isolated Epileptic Seizures	

APPENDIX I

BACKGROUND INFORMATION ON THE EPILEPSIES

Appropriate medical information is required to establish the diagnosis of epilepsy as outlined in Appendix II. The medical information may predict the prognosis for seizure control. Physicians are expected to classify seizures and epilepsies in accordance with current international classification applicable to each. Terms in this document related to epilepsy are defined in accordance with a 1997 report of the International League Against Epilepsy published in the journal *EPILEPSIA*, volume 38, pp 614-618.

Simple partial seizures are seizures with evidence of a clinical partial onset in which alertness and ability to interact appropriately with the environment are maintained. Complex partial seizures are those in which impairment of consciousness, amnesia, or confusion during or after a seizure is reported. Auras are a type of subtle simple partial seizure which may herald the onset of a clinically evident attack.

Most patients with epilepsy take daily antiepileptic drugs (AEDs). Current practice in adults is to taper and then stop AEDs after two, or preferably 5 years without seizures. About 60% of patients will remain seizure-free. In most, there are no clear-cut predictors of remission or of successful drug withdrawal in otherwise normal adults with normal neurological examinations. Some patients may wish to remain on AEDs even if they have been seizure-free for many years because of concerns about driving, work, and the social handicaps associated with epilepsy. Some patients have disorders which respond well to medication but which have a high likelihood of recurrence if AEDs are stopped. Neurologists do not usually recommend stopping drugs in these subjects.

If seizures cannot be adequately controlled with AEDs, surgical treatment may be needed. Such patients are investigated and treated in highly specialized centres. About 60% to 80% of such patients will be seizure-free after surgery. Medication is normally continued after surgery and then may be tapered and stopped after 1 to 3 years if the patient remains seizure-free. This may be done sooner if the cause of the seizures was a well-circumscribed lesion, especially if the seizures were infrequent and of relatively recent onset.

Some isolated seizures occur with systemic metabolic, toxic, or acute CNS diseases and are presumed to have been provoked by them. However, they may herald remote symptomatic recurrent spontaneous seizures. Review of the literature on risk factors for recurrent seizures after a first attack associated with these conditions indicates that adequate evidence is available for head injury only. A single seizure occurring within a week of minor head trauma rarely recurs. With more severe head trauma, especially if a seizure occurs more than one week after injury, 60% to 80% recur, 50% within the first year. More severe head trauma, bacterial

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.4 – Epilepsy or Isolated Epileptic Seizures	

meningitis with neurologic sequelae, encephalitis, and brain abscess are the most likely to lead to seizures.

Seizures often occur during alcohol withdrawal but are rarely precipitated by alcohol use itself. Seizures may, however, be a direct consequence of some non medical drugs. These events may occur when an individual is no longer under the influence of alcohol or a drug of abuse. In each case, the seizure may also be a symptom of an underlying brain disorder unmasked by the use of alcohol or drugs. For these reasons, employees with such attacks require complete neurological evaluation including an EEG and imaging, and must be evaluated according to the guidelines for individuals with epilepsy.

These rules for a Safety Critical Position in the Canadian railway industry have been developed based on the European studies of Chadwick and van Donselaar on professional drivers (bus, heavy truck, taxi, commercial van). Although scientifically reliable data are not available for all conditions, these authors believe that their figures are good approximations. In the USA, experts from the American Academy of Neurology, the American Epilepsy Society, and the Epilepsy Foundation of America calculated the recurrence risk after a first unprovoked seizure to be 8.12% in the second six-month period after the initial attack, and 5.36% in the third six-month period after the initial attack. Their recommendations for a seizure-free interval before driving were based on an estimate of the actual time driven of 1 hour/24 hours and a seizure/accident ratio of 0.55. They suggested that driving personal passenger cars could be permitted after a 3 month seizure-free period and believed that in treated and reliable patients, the first 3 months determined the likelihood of remaining seizure-free for the next year. For professional drivers, the US Federal Highway Administration requires a 10-year period without seizures and without AEDs for interstate and international driving.

The participants at a 1996 workshop representing all members of the European Union declared that people with epilepsy would be fit for professional driving when the risk of a seizure in the next year was not greater than 2%. A driving ban of 5-10 years was considered acceptable for a seizure-free subject off medication and without any EEG abnormality. In the case of a patient with a single isolated seizure without any known cause, a normal neurological examination and EEG, and, on no medication, a seizure-free period of 2-5 years was considered acceptable.

The risk posed by seizure recurrence for workers in a Safety Critical Position in the Canadian railway industry has not been studied but should not be greater than for professional drivers in Canada. This is understandable if the time during which the employee is alone in command is less than that for heavy truck or bus drivers, and if devices such as dead man controls or other safety mechanisms are used.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.4 – Epilepsy or Isolated Epileptic Seizures	

APPENDIX II

MEDICAL INFORMATION SUGGESTED FOR THE EVALUATION OF EPILEPSY OR ISOLATED SEIZURES IN INDIVIDUALS OCCUPYING A SAFETY CRITICAL POSITION IN THE CANADIAN RAILWAY INDUSTRY

Documentation

- Authorization to obtain medical records
- Pertinent medical records, including hospital and office notes and previous test results
- Records/reports of motor vehicle accidents and work accidents for the previous 5 years
- Reports of seizure recurrences

Medical History

- Etiology
- Family history of epilepsy
- Age of onset
- Circumstances of onset, e.g., alcohol use
- Date of last seizure, including isolated auras
- Clinical seizure pattern:
 - Presence of an aura with attention to alteration of sensory, motor or, cognitive functions
 - Duration and stability of the clinical pattern
 - Assessment of the level of risk associated with any interference with occupational activities
 - Accurate description of the seizure(s) including frequency, relation to time of the day and sleep cycle, alteration of consciousness, postictal features
- Precipitating factors:
 - Identify correctable factors such as sleep deprivation.
 - Identify seizures induced exclusively by specific situations with a view to determining if triggers can be modified or avoided and if treatment is likely to be effective.
- Treatment records:
 - Evaluate treatment with drugs or surgery or both.
 - Review drug level results over previous 5 years and effectiveness of treatment



Section: 4

Version: 1.0

Title: RAILWAY MEDICAL GUIDELINES

Subsection 4.4 – Epilepsy or Isolated Epileptic Seizures

- Compliance with treatment including factors such as avoidance of alcohol and sleep deprivation
- Adverse reactions to treatment

EEG including sleep tracing

MRI

Diagnosis in accordance with the International Classification of Epilepsies



Section: 4

Version: 1.0

Title: RAILWAY MEDICAL GUIDELINES

Subsection 4.4 – Epilepsy or Isolated Epileptic Seizures

APPENDIX III

**Example of a Medical Report for the Evaluation of Epilepsy or Isolated Epileptic Seizures
in Individuals Occupying a Safety-Critical Position in the Canadian Railway Industry**

IDENTIFICATION

Name: _____ Initials: _____ Surname: _____

Address: _____

City: _____ Province: _____ Postal Code: _____

Telephone no. (work): _____ (home): _____

Date of birth: _____ SIN/Employee no: _____

SECTION A (To be completed by the examined individual only if currently employed in an SCP)

Information on work schedule

Average number of hours worked per week: _____

Average number of hours worked per day: _____

Irregular work shifts Yes: ___ No: ___

Overtime Yes: ___ No: ___

If yes, how many hours in overtime per day: _____

how many hours in overtime per week: _____

Maximum of hours worked per day: _____



Section: 4

Version: 1.0

Title: RAILWAY MEDICAL GUIDELINES

Subsection 4.4 – Epilepsy or Isolated Epileptic Seizures

SECTION B (To be completed by the neurologist after reading Section A)

General information

How long has the applicant been your patient? _____

Is there a family history of seizure disorders? Yes _____ No _____

If yes, give details: _____

Information on individual's seizures

Date of first seizure: Y: ___ M: ___ D: ___ Date of last seizure: Y: ___ M: ___ D: ___

Type(s) of seizures: (Describe prodrome, pre-ictal, ictal and post-ictal symptomatology and duration):

Etiology of seizure disorders (according to the International Classification):

Describe all precipitating factors:



Section: 4

Version: 1.0

Title: RAILWAY MEDICAL GUIDELINES

Subsection 4.4 – Epilepsy or Isolated Epileptic Seizures

Aside from seizures, does the examined individual's health condition include other neurological symptoms or signs?

Yes: _____ No: _____

If yes, provide details: _____

Are you aware of any other medical condition that could impact the safety of the railway operations?

Yes: _____ No: _____

If yes, give details: _____

Treatment

Current treatment: _____

Does the examined individual adhere to his/her treatment? Yes: _____ No: _____

Is the examined individual free from side effects from treatment? Yes: _____ No: _____

If no, provide details: _____

Has the examined individual been adequately educated on his/her condition? Yes: _____ No: _____

Did the examined individual ever have surgery for his condition? Yes: _____ No: _____

If yes, give date and describe procedure: _____



Section: 4

Version: 1.0

Title: RAILWAY MEDICAL GUIDELINES

Subsection 4.4 – Epilepsy or Isolated Epileptic Seizures

Neurological examination

Is the examined individual currently free from abnormal neurological findings? Yes: _____ No: _____

If no, give details: _____

Additional reports

EEG

IMPORTANT: The results of an EEG recorded during the past year and signed by a certified electroencephalographer must be attached to this medical report.

Antiepileptic Drug (AED) levels: Please attach copies of all AED blood levels performed during the past year:

Name of drug: _____

Results

Dates: Y:____ M: ____ D: ____ _____

Y: ____ M: ____ D: ____ _____

Y: ____ M: ____ D: ____ _____

Y: ____ M: ____ D: ____ _____



Section: 4

Version: 1.0

Title: RAILWAY MEDICAL GUIDELINES

Subsection 4.4 – Epilepsy or Isolated Epileptic Seizures

CONCLUSION

The Chief Medical Officer would appreciate your professional opinion on the examined individual's fitness to work in positions that are critical to the safety of the public, other employees and him/herself.

Comments: _____

In order to assess your patient's capacity for occupying a Safety Critical Position in the Canadian railway industry, would you recommend that he/she be medically assessed by a physician appointed by the railway?

Yes: ____ No: ____

PHYSICIAN'S IDENTIFICATION

Name: _____ Date of examination: Y: ____ M: ____ D: ____

Address (in full): Street: _____

City: _____ Province: _____ Postal Code: _____

Telephone: _____ Fax: _____

Signature

Date: Y: ____ M: ____ D: ____

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.4 – Epilepsy or Isolated Epileptic Seizures	

APPENDIX IV

ACKNOWLEDGEMENTS

The RAC would like to acknowledge the contribution of:

DR. Guy Rémillard
 Neurologist and Electroencephalographist
 Associate Clinical Professor
 Faculty of Medicine
 Université de Montréal

Assistant Neurologist, Epilepsy Clinic
 Neurological Hospital and Institute
 McGill University

Member of the Committee of Epilepsy International on Motor Vehicle Driving and Epilepsy

Dr. Frederick Andermann
 Tenured Professor of Neurology
 McGill University

Director, Service of Neurology
 Neurological Hospital and Institute
 McGill University

Dr. Claire Laberge-Nadeau
 Tenured Professor
 Faculty of Medicine
 Social and Preventive Medicine
 Université de Montréal

Director
 Centre de recherche sur les transports
 Laboratoire sur la sécurité des transports



Section: 4

Version: 1.0

Title: RAILWAY MEDICAL GUIDELINES

Subsection 4.4 – Epilepsy or Isolated Epileptic Seizures

Dr. Benjamin Zifkin
Associate Clinical Professor
Faculty of Medicine
Université de Montréal

Consultant Neurologist Epilepsy Clinic
Neurological Hospital and Institute
McGill University

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.5– Mental	

**FITNESS FOR DUTY MEDICAL GUIDELINES FOR THE EMPLOYMENT OF
INDIVIDUALS WITH MENTAL DISORDERS IN SAFETY CRITICAL POSITIONS
IN THE CANADIAN RAILWAY INDUSTRY**

1. Introduction

Canadian railway employees who work in a Safety Critical Position (SCP) operate or control the movement of trains. Physical and mental fitness is mandatory. Impaired performance due to a medical condition could result in a significant incident affecting the health and safety of employees, the public, property or the environment. Impairment of their alertness, judgement or sensory or motor function can pose a serious safety threat.

If not well controlled, some mental disorders can cause impaired performance. Fitness for duty guidelines have been developed for the employment of individuals with mental disorders in the Canadian railway industry.

Background information on mental disorders is provided in Appendix I.

2. Basic considerations

Employment of individuals with mental disorders in an SCP will be guided by the following considerations:

- 2.1 Presence of a mental disorder from Axis I of the Diagnostic and Statistical Manual IV (DSM IV) of the American Psychiatric Association.
- 2.2 Presence of a personality disorder.
- 2.3 Degree of impairment of cognitive function, alertness and memory.
- 2.4 Degree of mood dysfunction, with special attention to euphoria, depression, suicidal or homicidal risk.
- 2.5 Degree of behavioural dysfunction.
- 2.6 History of mental disorder, and the severity of previous episodes.
- 2.7 Compliance with treatment, insight into the disorder, reliability and responsibility for self- observation.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.5– Mental	

2.8 Side effects of medications as they relate to mental functions, coordination and reaction time.

2.9 Likelihood of recurrences or of acute or gradual incapacitation at work.

All of the above considerations focus on assessing the ability of the individual to perform safely, consistently and predictably over time.

3. Guidelines for specific disorders

3.1 Anxiety Disorders

3.1.1 Generalized anxiety disorder

Description This disorder is characterized by excessive anxiety and worry lasting for at least six months and relating to a number of events or activities. The worry can not be controlled by the individual and it leads to feeling restless or keyed up, to having difficulty concentrating, being irritable, and experiencing skeletal muscle tension. Often there is difficulty falling asleep or staying asleep. The intensity of the symptoms must be of such a degree that it interferes with the normal function of the individual.

Fitness for duty: Individuals suffering from generalized anxiety disorder can not work in an SCP because of the risk of impaired judgement, inattention and fatigue. Individuals who have been treated by psychotherapy and/or pharmacotherapy must be documented as stable for three months before they can return to work in an SCP. They must be assessed by a psychiatrist who is required to submit a written report to the CMO. This report must include an assessment of the individual's judgement and attention and also on the side effects of any medication. Regular follow-up reports indicating fitness for duty may be requested at the discretion of the Chief Medical Officer (CMO).

3.1.2 Post-traumatic stress disorder (PTSD)

Description: Post-traumatic stress disorder is characterized by pervasive agitation, depression and/or emotional numbing and various re-experiencing phenomena, including flashbacks, nightmares and reminders. Panic attacks are common in this disorder. Thus, the condition pervasively degrades attention, judgement and predictability.

Fitness for duty: Individuals suffering from PTSD can not work in an SCP.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.5– Mental	

Individuals who have been treated by psychotherapy and/or pharmacotherapy must be documented as asymptomatic for three months before they can return to work in an SCP. The individual must be asymptomatic for three months in three areas: recurrence, hyperarousal and affective problems. They must be assessed by a psychiatrist who is required to submit a written report to the CMO. This report must include an assessment of the individual’s judgement, attention, alertness, predictability, and also on the side effects of any medication. Regular follow-up reports indicating fitness for duty may be requested at the discretion of the CMO.

3.1.3 Panic disorder

Description: Panic disorder is characterized by the sudden, unexpected onset of extremely high anxiety associated with strong physical evidence of adrenergic output including rapid heart beat, pounding heart, sweating, trembling, sense of shortness of breath, feelings of choking, chest pain, nausea or abdominal distress, dizziness, feelings of unreality or being detached from oneself, fear of imminent catastrophe or doom, chills or hot flashes. These symptoms will suddenly explode within an individual. The attacks are brief, usually lasting only a few minutes, but are totally incapacitating. Frequency can be highly variable, from once every few months to several times per day.

Fitness for duty: Individuals suffering from panic disorder can not work in an SCP because their ability to perform their duties may be unpredictable. Individuals who have been treated by psychotherapy (including cognitive behavioural therapy) and/or pharmacotherapy must be documented as asymptomatic for six months before they can return to work in an SCP. This disorder is chronic and the symptoms can render the sufferer non-functional very quickly. There needs to be clear evidence that the disorder has been completely resolved. Individuals must be assessed by a psychiatrist who is required to submit a written report to the CMO. This report must include an assessment of the individual’s judgement, attention, ability to function in an SCP, and also on the side effects of any medication. It must also take into consideration the degree of stress in the individual’s life. Regular follow-up reports indicating fitness for duty may be requested at the discretion of the CMO.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.5– Mental	

3.1.4 Phobic disorder

Description: Phobic disorder is similar to panic disorder except that the panic occurs only in relation to a specific, fixed stimulus. As long as the stimulus is not associated with the SCP, it is possible for an individual with phobic disorder to function appropriately.

Fitness for duty: Individuals with phobic disorder must be stable while working in their SCP. They must be assessed by their physician who is required to submit a written report to the CMO. This report must include an assessment of the individual's judgement, attention, predictability, their ability to function in an SCP, and also on the side effects of any medication. Regular follow-up reports indicating fitness for duty may be requested at the discretion of the CMO. The phobic disorder must be a response to neutral objects. If the phobic object is work-related, such as engines, engine cabs, switching yards, moving cars or particular locales along the right of way, the illness must be treated as Panic Disorder.

3.1.5 Obsessive-compulsive disorder (OCD)

Description: Obsessive-compulsive disorder (OCD) is characterized by recurrent, intrusive, distressing ideas, impulses, thoughts (obsessions), or patterns of behaviour (compulsions) that are viewed by the individual as outside his or her normal thinking and that produce anxiety if resisted. The emphasis is on the intrusiveness and inappropriateness of the experiences and the marked anxiety or distress they cause. These symptoms must be differentiated from simple excessive worrying about real-life problems. Panic attacks may also be present.

Fitness for duty: OCD is a serious and debilitating illness. A preoccupation with worrying or repetitive behaviours can occupy large portions of time and attention. Individuals suffering from active OCD can not work in an SCP because their ability to perform their duties may be unpredictable.

Individuals who have been treated by psychotherapy (including cognitive behavioural therapy) and/or pharmacotherapy must be documented as asymptomatic for three months before they can return to work in an SCP. They must be assessed by a psychiatrist who is required to submit a written report to the CMO. This report must include an assessment of the individual's judgement and attention and also on the side effects of any medication. The examiner must also address the individual's flexibility, the degree of stress in the individual's life, his/her level of insight, and his/her level of subjective control over thoughts

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.5– Mental	

and behaviours. Regular follow-up reports indicating fitness for duty may be requested at the discretion of the CMO.

3.2 Mood Disorders

3.2.1 Depressive disorders

Description: Mood disorders, including depression, are very common. Feelings of depression are universal but are usually transient. If feelings of depression are severe or prolonged, they constitute a depressive episode. Problematic symptoms include social withdrawal, lack of motivation, low frustration tolerance, easy fatigability and sleep disorder. Insight and judgement are impaired because of distortions of self-perception.

Fitness for duty: Individuals suffering from mild depression, whose symptoms do not interfere with function at work may work in an SCP at the discretion of the CMO. Individuals suffering from a major depressive episode can not work in an SCP because of concerns about consistency, judgement and predictability. Individuals who have been treated for a major depressive episode by psychotherapy and/or pharmacotherapy must be stable before they can return to work in an SCP. At the request of the CMO, they must be assessed by a psychiatrist who is required to submit a written report. This report must include an assessment of the individual’s judgement, attention, insight, alertness, and also on the side effects of any medication. Variables to be considered are intensity or length of illness and response to medication. Regular follow-up reports indicating fitness for duty may be requested at the discretion of the CMO.

3.2.2 Bipolar disorders

Description: Bipolar disorders are characterized by cycles of alternating depressive feelings, and mania and hypomania. Mania is characterized by excessive energy, erratic and disinhibited behaviour, low frustration tolerance and lack of insight and judgement.

Fitness for duty: Individuals with bipolar disorder, maintained on medication, must be documented as asymptomatic for two years before being employed in an SCP. An asymptomatic individual who is withdrawn from medication must continue to be asymptomatic and stable for two years before returning to work in an SCP. These individuals must be assessed by a psychiatrist who is required to submit a written report to the CMO. This report must include an assessment of the individual’s judgement and attention and also on the side effects of any

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.5– Mental	

medication, if applicable. Regular follow-up reports indicating fitness for duty may be requested at the discretion of the CMO

Since bipolar illness will present alternately as depressive or hypomanic phases, the follow-up for each phase must be individually tailored. Once the individual has had manic episode and is stable, he/she must be followed up at three month intervals by the family doctor and have at least semi-annual checks of blood levels of medication.

3.3 Sychoses

3.3.1 Schizophrenia and delusional disorders

Chronic psychoses including but not limited to schizophrenia and delusional disorders are addressed in Section 4.

3.3.2 Brief psychotic disorder

Description: In brief psychotic disorder, an individual suffers from psychosis for a period of less than one month, and there is complete resolution following the episode with return to full prior level of mental functioning.

Fitness for duty: Individuals suffering from brief psychotic episode can not work in an SCP. They must be asymptomatic and off medication for six months before they can return to an SCP. They must be assessed by a psychiatrist who is required to submit a written report to the CMO. This report must include an assessment of the individual’s judgement, attention and the stability of mental function. Attention must also be paid to the cause or precipitant of the episode. Regular follow-up reports indicating fitness for duty may be requested at the discretion of the CMO

3.4 Personality Disorders

Description: These disorders are characterized by pervasive, persistent, maladaptive patterns of behaviour that are deeply ingrained. They are disorders of trait rather than state. Maladaptive traits can be behavioural, emotional, cognitive, perceptual or psychodynamic. They cause difficulty by diminishing the individual’s ability to react flexibly and adaptively in social or professional situations. They usually come to light because of conflict with others. The maladaptive patterns of behaviour become exaggerated at times of acute or chronic stress. Personality disorders exhibit a very large range of symptoms from mild to severe.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.5– Mental	

Fitness for duty: In the majority of cases, people with personality disorder only rarely suffer from significant intellectual or emotional disorder. They are thus responsible for their own behaviour and can be expected to perform or behave in a manner acceptable in the workplace. If the presence of a personality disorder is confirmed by overt acts in the workplace, the individual should be assessed by a psychiatrist and a report forwarded to the CMO. This course of action will be necessary before a decision concerning work in an SCP can be made. The examiner must pay particular attention to the assessment of the individual’s ability to function appropriately under stress.

3.5 Adjustment Disorders

Description: An adjustment disorder is characterized by an overly intense response to a psychosocial stressor which is within the range of normal experience. This results in impaired social or vocational function.

Fitness for duty: Individuals who have been treated by psychotherapy and/or pharmacotherapy must be documented as asymptomatic before they can return to work in an SCP. The severity of symptoms can be highly variable for individuals with adjustment disorders. There is no specific time limit for post-morbid normal behaviour. They must be assessed by their own physician or by a psychiatrist who is required to submit a written report to the CMO. This report must include an assessment of the individual’s judgement and attention and also on the side effects of any medication. Regular follow-up reports indicating fitness for duty may be requested at the discretion of the CMO.

3.6 Substance Related Disorders

Description: Substance related disorders include disorders related to the taking of a drug of abuse (including alcohol), to the side effects of a medication, and to toxin exposure.

Fitness for duty: Substance abuse frequently coexists with other psychiatric conditions, particularly with certain personality disorders. Depressed, anxious or psychotic patients may self-medicate with prescribed or non-prescribed substances. Substance abuse disorders should always be considered in the evaluation of depression, anxiety or psychosis. Individuals with co-existent psychiatric conditions must also be treated for those conditions. Individuals with documented substance abuse will be treated through the appropriate employee substance abuse assistance program.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.5– Mental	

3.7 Attention deficit disorder

Description: Attention Deficit Disorder (ADD) can only be diagnosed in the adult if there is a positive childhood history of Attention Deficit Disorder with Hyperactivity Disorder (ADDHD). The syndrome never develops *de novo* in the adult. Criteria include motor hyperactivity, attention deficits, emotional lability and overreactivity, short-lived explosive hot temper, disorganization on task with inability to complete tasks, and impulsivity. These symptoms are pervasive and may vary from minimal to severe. A diagnosis of attention of ADD adult variety can only be accepted from a psychiatrist. Individuals with this disorder are at high risk for substance abuse and depression.

Fitness for duty: Individuals suffering from ADD can not work in an SCP if their symptoms affect their ability to perform their duties in a safe, predictable manner. Individuals who have been treated with appropriate psychotherapy must be documented as stable before they can return to work in an SCP. They must be assessed by their own physician or a psychiatrist who is required to submit a written report to the CMO. This report must include an assessment of the individual's judgement and attention and also on the side effects of any medication. Regular follow-up reports indicating fitness for duty may be requested at the discretion of the CMO.

4. Exclusions from SCP

The following mental disorders are absolute contraindications to work in an SCP:

- 4.1 Chronic psychosis (current or on history).
- 4.2 Personality disorder severe enough to have repeatedly manifested itself by overt acts.
- 4.3 Disorder usually first diagnosed in infancy, childhood, or adolescence resulting in sub-normal intelligence.
- 4.4 Organic (physical) brain damage which results in an impaired performance.
- 4.5 Treatment-resistant depression.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.5– Mental	

5. Monitoring and follow-up

The length of the monitoring period follow-up, the frequency of assessments and the stringency of observation required may vary depending on the individual's diagnosis and degree of disability. Individuals with major mental disorders will require monitoring for as long as they continue to work in an SCP. Individuals with minor mental disorders, including adjustment reactions, depression or anxiety disorders will require monitoring for a period of at least two years to ensure that their condition remains under control.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.5– Mental	

APPENDIX I

BACKGROUND INFORMATION ON MENTAL DISORDERS

Mental disorders and abnormal mental function must be described in a consistent way. The Diagnostic and Statistical Manual IV (DSM-IV) of the American Psychiatric Association is the most widely recognized and accepted attempt at standardizing the description of mental disorders. This manual is a work in progress.

Currently, the definitions of many mental disorders are only approximations. When assessing an individual with a mental disorder, it is crucial that their surroundings, responsibilities, history, attitudes and expectations are taken into consideration. This acknowledged, reporting of employees with mental disorders must use DSM-IV terminology to ensure consistency.

There is an enormous variation between individuals with respect to their mental function or balance. The word “normal” has no real relevance. The main issue is whether the individual’s mental state compromises her/his function, judgement, ability to deal flexibly with the environment and, ultimately, everyone’s safety.

Mental illnesses the individual’s ability to function in the workplace. This may occur acutely or chronically and may be unpredictable. Long-term illnesses such as dysthymia or depression can affect function over months or years. Other mental illnesses, including some personality disorders, panic disorder, phobic disorder or a brief psychotic episode, may diminish an individual’s ability to function within minutes or hours.

Mental disorders can be divided into several large groups – major disorders, minor disorders, developmental disorders and personality disorders.

DESCRIPTION OF DISORDERS

MAJOR DISORDERS

Psychosis

Psychosis represents a profound disruption of an individual’s ability to relate to his/her own internal and external environment. Sensation and perception are disorganized and disrupted. False sensations such as hallucinations (hearing voices, seeing images) and delusions (fixed beliefs not supported by reality) are common. There is disorganization of both thought and emotion. The individual’s ability to integrate information about the outside world and bear judgement on it is severely compromised. Psychosis may be very short term or very long term. It can occur as a manifestation of schizophrenia, manic-depressive (bipolar) disorder, and/or

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.5– Mental	

illicit or prescription drug toxicity. It can also occur as a result of physical brain damage or of some overwhelming emotional crisis in an individual's life.

The presence of psychosis or a history of recurrent psychotic episode is an absolute contraindication to employment in an SCP. A history of a single brief circumscribed psychotic episode requires individual assessment.

MINOR DISORDERS

The minor mental disorders include anxiety disorders, depressive disorders, disorders usually first diagnosed in infancy, childhood, or adolescence (developmental), and adjustment disorders.

In the anxiety disorders, anxiety-related symptoms predominate. In generalized anxiety disorder, the individual experiences a chronic high level of distress, characterized by agitation, distractibility, exaggerated startle response and overreaction. These symptoms may interfere with the ability of an individual to function in an SCP. By contrast, in panic disorder or post-traumatic stress disorder, the individual experiences sudden onset of catastrophic anxiety which paralyzes mental function, judgement and the ability to react appropriately. These attacks may come on without warning, or may be associated with a particular stimulus.

The depressive disorders are extremely important and must be looked for in any individual working in an SCP. The onset of depression is usually slow and insidious. Depression is accompanied by a slowing of personal tempo and diminution of mental agility and initiative, as well as distorted judgement and a pervasive sense of hopelessness. Individuals suffering from depression function at a lower level of efficiency for long periods. Sudden decompensation is rare. In contrast to the anxiety disorders, individuals may not be aware that they are depressed and not functioning at an optimal level. Suicidal ideation or intent may be present.

The essential feature of an Adjustment Disorder is a psychological response to an identifiable stressor that results in the development of clinically significant emotional or behavioural symptoms. The symptoms must develop within three months after the onset of the stressor(s). The clinical significance of the reaction is indicated either by marked distress that is in excess of what would be expected given the nature of the stressor(s) or by significant impairment in social or occupational (academic) functioning (DSM-IV). Adjustment Disorders may occur in conjunction with depressed mood, anxiety, anger, disturbance of conduct or a combination of these.

DEVELOPMENTAL DISORDERS

Disorders usually first diagnosed in infancy, childhood, or adolescence (developmental) are characterized by any problem that begins in childhood and continues into adult life. They include mental sub-normality, attention deficit disorder with or without hyperactivity, Asperger's

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.5– Mental	

syndrome and learning disabilities. Mental Retardation is defined as intellectual function below an IQ of approximately 70. Individuals with this disorder tend to be concrete in thinking. Poor self-esteem is common.

Attention deficit disorder (with or without hyperactivity) is well documented in children. There is evidence that it is also in adults. The syndrome in adults and children is similar. Symptoms include distractability, irritability, impatience with details, and a tendency not to follow through with instructions or to forget assigned tasks. These individuals are often reluctant to engage in tasks that require sustained mental effort. There is evidence that individuals who show signs of adult attention deficit disorder are also at risk for personality disorders and substance abuse.

Asperger’s syndrome is characterized by subtle lifelong impairment in social interaction. The individual is deficient in the use of non-verbal communication and lacks the ability to relate to others emotional states. He/She may also express unusual preoccupations. Intelligence may be normal or above average.

Learning disabilities are characterized by a relative inability to read, write, calculate, and/or Develop appropriate co-ordination.

PERSONALITY DISORDERS

Personality disorders represent the most subtle form of dysfunction. They are not considered primarily as a mental illness themselves. Rather they are a description of the individual in which a mental illness may occur. A personality disorder is defined as a fixed and maladaptive individual style. The individual’s emotional and behavioural reactions always occur within a very narrow range of style. Though individuals suffering from a personality disorder look and sound superficially normal, their lack of adaptability produces problems in both work and social function. Their rigid and narrow style represents their attempts to cope with stress. Thus the problems of their characteristic style are exaggerated under stress. Personality disorders are often found in conjunction with major or minor mental disorders or substance abuse.

SUBSTANCE RELATED DISODERS

Substance related disorders are pervasive throughout society. They result in decreased work and school performance, accidents, and absenteeism. Men are more at risk than women. Substance related disorders must be looked for in any individual working in an SCP, often exist concurrently with other mental disorders, require assessment and a treatment plan from a specialist in abuse disorders, and long-term (often years) formal and informal support.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.5– Mental	

TREATMENT OF MENTAL DISORDERS

Mental disorders can be treated and significant improvement can be expected in the majority of cases. Treatment is three-pronged along biological, psychological and social lines (the so-called biopsychosocial approach).

Biological interventions include any treatment which is effected through physical means. There is a wide variety of such treatments, ranging from massage therapy or acupuncture to medications, electro-convulsive therapy (ECT) and even surgery.

Sedative, hypnotic, and anxiolytic drugs

This group includes the benzodiazepines: chlordiazepoxide, diazepam, alprazolam, clonazepam, lorazepam, and triazolam. A sedative drug reduces daytime activity, tempers excitement and decreases arousal. A hypnotic drug produces drowsiness, facilitating the onset and maintenance of sleep. An anxiolytic drug reduces pathological anxiety. The benzodiazepines generally act as hypnotics in high doses, as anxiolytics in moderate doses, and as sedatives in low doses. The benzodiazepines are the most commonly used anti-anxiety agents. Recent indications for their use include panic disorder, phobic disorder and bipolar disorder.

Chronic use may lead to problems. First, active metabolites of the drug may accumulate in the body, causing progressively heavier sedation. Second, tolerance or dependency may occur if a drug is used for more than a few weeks at a time.

Sudden withdrawal of benzodiazepines may result in a withdrawal syndrome. Abrupt discontinuation, especially of those with short half-lives, is associated with severe withdrawal symptoms, including depression, paranoia, delirium and even seizures. Alprazolam is particularly associated with immediate and severe withdrawal symptoms. Triazolam is associated with rapid dependence and antegrade amnesia.

The choice of benzodiazepine should be governed by a favourable sedative/hypnotic ratio, i.e. high efficacy as a sedative with low hypnotic potential. The use of alprazolam is to be discouraged. Clonazepam, however, does fit the above criteria and may be used long term by individuals in safety critical positions as long as they are closely supervised and judged not to be sedated. The dose of clonazepam must be individualized. Most individuals do well on 1 to 2 mg per day. A dose higher than 5 mg per day implies the presence of a significant disorder.

Benzodiazepines in hypnotic doses may be used in the short term for treatment of insomnia but they should not be taken within eight hours of the individual reporting to work.

Tricyclic anti-depressants (TCAs) and monoamineoxidase inhibitors (MAOIs)

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.5– Mental	

This group represents the original anti-depressants. They are indicated for use in major depressions, minor depressions, panic disorders, some forms of generalized anxiety, obsessive-compulsive disorder and eating disorders. They have a limited application in the treatment of chronic pain syndromes as well.

The TCAs and the MAOIs have an inconveniently wide range of side effects including sedation, low blood pressure and anti-cholinergic effects. These latter effects include blurred vision, constipation, problems with memory, urination and sexual function and, rarely, delirium. In addition, the MAOIs require fairly close adherence to a particular diet. An individual taking an MAOI who is non-compliant with the diet runs the risk of experiencing a catastrophic hypertensive crisis characterized by blinding headaches and sudden incapacitation.

For these reasons, the TCAs and the MAOIs should not be used by individuals employed in an SCP.

Newer anti-depressants

This group includes the specific serotonin reuptake inhibitors (SSRIs), moclobemide, trazodone and venlafaxine. SSRIs are indicated in the treatment of depression, dysthymic disorder, obsessive-compulsive disorder, panic disorder, eating disorders and post-traumatic stress disorder. SSRIs have very specific effects in the brain. As a result, they have a much smaller side effect profile than the TCAs. There are minor variations in the side effect profile between them, with sertraline being the least sedating. Short-term side effects may include nausea and headache, restlessness and insomnia.

There is considerable evidence that people who respond positively to the SSRIs do not suffer from sedation or impaired psychomotor co-ordination. Similarly, moclobemide and venlafaxine do not appear to have any degrading effect on alertness and psychomotor function.

Because they have a lower side-effect profile and sometimes even improve alertness and psychomotor performance in individuals recovering from depression, the SSRIs may be considered for long-term use in individuals who work in an SCP. However, side-effect profiles can be idiosyncratic. Any individual who is being treated with one of these anti-depressants must be followed closely by a physician.

Neuroleptic drugs

This group includes the major tranquilizers used in the treatment of psychosis. Examples include pimozide, haloperidol and risperidone. On rare occasions, they can be used in very small doses to treat high anxiety in non-psychotic individuals. An individual who is being continuously treated with one of these neuroleptic drugs must be followed closely by a physician.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.5– Mental	

Anti-convulsants

The anti-convulsants valproic acid and carbamazepine are both indicated in the treatment of mania and impulse control disorders. Individuals suffering from these disorders are not eligible to work in an SCP.

Sympathomimetics (Stimulants)

This group includes dextroamphetamine and methylphenidate. These drugs are used for the treatment of narcolepsy and attention deficit disorder with or without hyperactivity. Individuals suffering from these disorders and who require biological treatment must be regularly supervised by a psychiatrist.

Electroconvulsive therapy

Electroconvulsive therapy (ECT) is an effective but rarely used treatment for depression. It is seen as an alternative therapy when treatment with anti-depressants has failed. With ECT, an electrical current passes through the brain to induce a seizure. The seizure actually changes brain chemistry in a way that lightens depression. Individuals treated with ECT must be documented as asymptomatic for six months before they may be assessed for possible return to an SCP.

Psychological interventions

All the psychotherapies aim to alter the individual's patterns of thinking and feeling. Many different kinds of psychotherapy are designed to improve insight and to introduce alternative patterns of behaviour. Cognitive behavioural therapy (CBT) works differently. Here, the focus is on altering the individual's perception and reaction to distress in the here and now. The underlying whys and wherefores are not addressed. CBT is an extremely effective treatment for panic disorder, obsessive-compulsive disorder and some forms of depression.

Social Interventions

In Appendix I, the effect of stressors on a variety of mental disorders was discussed. Those stressors usually occur in the individual's social milieu: marital, occupational, financial, etc. Effective therapy for such disorders will take into consideration the individual's surroundings.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.5– Mental	

APPENDIX II

ACKNOWLEDGEMENTS

The RAC would like to acknowledge the contribution of:

Oliver Robinow, B.Sc., M.D., F.R.C.P. (C)
 Clinical Associate Professor
 Department of Psychiatry
 Faculty of Medicine
 University of British Columbia

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

MEDICAL GUIDELINES FOR THE EMPLOYMENT OF INDIVIDUALS WITH CARDIOVASCULAR DISORDERS IN SAFETY CRITICAL POSITIONS IN THE CANADIAN RAILWAY INDUSTRY

1. Introduction

Canadian railway employees who work in a Safety Critical Position (SCP) operate or control the movement of trains. Physical and mental fitness is mandatory. Impaired performance due to a medical condition could result in a significant incident affecting the health and safety of employees, the public, property or the environment.

Cardiovascular disorders (CVD) can cause gradual or sudden impairment. Due to the nature of their work, the latter is of particular importance for employees working in an SCP. Special attention should be paid to individuals whose medical condition puts them at risk of syncope, of significant physical incapacitation, or of sudden cardiac death.

Medical guidelines have been developed in order to evaluate and monitor the fitness for duty of individuals with cardiovascular disorders employed in an SCP in the Canadian railway industry.

CVD are common in North America. Accordingly, there are numerous physicians who have an interest in the diagnosis and treatment of these illnesses. In this document, the term specialist refers to a cardiologist or an internist.

When available, references are provided in Appendix I.

2. Basic considerations

The employment of individuals with a CVD in an SCP shall be guided by the following considerations:

- 2.1 Their medical history and physical examination;
- 2.2 The results of functional testing;
- 2.3 The nature of treatment; and
- 2.4 Their job description.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

3. Global risk assessment

Many factors must be taken into consideration when assessing fitness for duty of individuals working in an SCP and specifically their risk of sudden impairment. For example, there are numerous risk factors for ischemic heart disease (IHD). Some risk factors are modifiable and others are not. In an individual with IHD, the number of risk factors, the control of modifiable risk factors, the degree of left ventricular dysfunction and the number of coronary vessels involved must all be taken into consideration when assessing the risk for impairment.

This assessment of risk (global risk assessment) also applies to individuals without known IHD but who are at risk of developing IHD and to individuals with non-ischemic heart disease or other CVDs. Finally, the specific demands of the SCP must also be considered.

In certain circumstances, the Chief Medical Officer (CMO) of a railway company may require an individual with a CVD, who does not meet the requirements of these guidelines, to undergo an individualized fitness for duty assessment. The CMO must take into consideration the individual's medical history and physical examination, the results of functional testing, the nature of treatment, any relevant ability, skill or experience of the individual and the specific requirements of the position. All relevant information from the individual's treating physician(s) and specialist(s) must also be taken into consideration. The specific information to be provided to assist in an individualized global risk assessment is detailed in Appendix II. In some cases, the CMO may require that an individual be assessed by an independent physician or specialist appointed by the CMO.

4. Functional testing

4.1 Blood pressure measurements

An accurate assessment of blood pressure (BP) is important to determine whether anti-hypertensive therapy is required and to help determine the risk of CVD. Consequently, the use of a standardized measurement technique is highly recommended. **(1a)**

4.2 Ambulatory BP monitoring

Physicians should only use ambulatory BP monitoring devices that have been validated independently using established protocols.

Ambulatory BP monitoring should be considered for untreated individuals whenever an office-induced increase in BP is suspected, including individuals with mild to moderate BP elevations in the clinic, without target-organ damage. **(1c)**

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

It should also be considered for treated individuals suspected of having an office-induced increase in BP, including those with apparent resistance to drug therapy, symptoms suggestive of hypotension and fluctuating office BP readings.

4.3 Resting electrocardiography (ECG) abnormalities

Resting ECG may show abnormalities that justify additional medical evaluation. The most pertinent are:

- Non-sinus rhythm and extrasystoles. **(8a)**
- Right or left bundle branch block. **(2a)**
- Abnormal Q waves suggesting myocardial infarction **(2b)** and repolarisation abnormalities with ischemic changes. **(2c)**
- Left ventricular (LV) hypertrophy and /or strain. **(2d)**

ECG abnormalities should be part of an individualized global risk assessment with respect to sudden impairment.

Other ECG abnormalities are discussed under Section 5.2 on arrhythmias.

4.4 Echocardiography

Assessment of CVDs with ultrasound technique is a method currently widely used in numerous clinical settings. It is reliable, non-invasive and easily accessible.

The technique is useful in individuals with:

- Suspected remote silent myocardial infarction;
- Baseline ECG changes suggesting left ventricular (LV) hypertrophy and strain; and
- A history of LV systolic dysfunction.

Individuals with:

- Left ventricular end systolic (LVES) diameter of 5.0 cm or more; **(4a)**;
- Left ventricular ejection fraction (LVEF) equal to or less than 35%; **(4b)**;
- An echocardiogram showing 2+ or more of mitral or aortic valvular regurgitation; **(4c)**, or
- Significant valvular stenosis,

are at higher risk of sudden impairment.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

4.5 Stress tests

4.5.1 Stress electrocardiography (ECG)

Functional status is often expressed by measuring the maximal exercise capacity using a treadmill or a bicycling ergometer. The most commonly used treadmill exercise protocol is the Bruce protocol.

Exercise capacity may be expressed in ml/kg/min. of oxygen consumption, in watts, or in metabolic units called mets, one met being the basal energy requirement at rest. The oxygen cost per stage for the commonly used Bruce treadmill protocol is shown in Appendix III.

There is an accepted relationship between the average energy requirement of a job and the maximal level of exercise capacity shown by an individual. The average energy requirement for an 8 hour working period corresponds to 40% to 50% of the maximal exercise capacity of an individual. **(3a)** As an example, to qualify for a job requiring an average of 4 to 5 mets, a maximal exercise capacity of 10 mets is required. (See Appendix IV)

Based on the above, the expected maximal exercise capacity of individuals in an SCP has been set to 10 mets. **(3b)** Stress ECG should be clinically and electrically negative at 10 mets or at 9 minutes of the Bruce protocol (end of stage III). Individuals with a maximal exercise capacity of less than 10 mets require an individualized fitness for duty assessment by the Chief Medical Officer (CMO) of their railway company with input from their treating physician.

A blood pressure (BP) drop of 10 mm Hg or more in systolic BP on maximal exercise capacity warrants investigation with a stress MIBI or a stress echocardiogram to rule out silent coronary disease. **(3c)**

An abnormal BP response (BP rise of more than 8 mm Hg/met) must be reported as hypertension occurring on effort.

Ventricular arrhythmia occurring during exercise and increasing during the last 3 minutes of a stress test justifies a Holter monitoring and a stress MIBI or stress echocardiogram. **(3d)**

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

4.5.2 Stress echocardiography

Exercise echocardiography is an excellent way to observe ventricular function directly. Such information has been shown to add significantly to the diagnosis and often the localization of coronary artery disease (CAD).

The technique is especially useful in individuals with:

- Suspected remote silent myocardial infarction (MI).
- Baseline ECG changes that confound the evaluation of the ST segment such as severe LV hypertrophy and strain, left bundle branch block (LBBB), Wolf-Parkinson-White (WPW) syndrome.
- Cardiomyopathy, and
- Prior bypass graft surgery or MI.

4.5.3 Stress MIBI

Nuclear techniques are more and more used to improve the diagnostic certainty of CVDs and help to localize the diseased vessels. Tc 99m Sestamibi (MIBI) is becoming the preferred nuclear marker for stress testing. It is a flow marker that requires viable myocardial cells to take up the delivered tracer. Images reflect the myocardial perfusion at the time of injection rather than at the time of imaging. Discordance between stress and rest images can underline underperfused myocardial perfusion post stress, similarly to the stress echocardiogram which will delineate areas of reversible hypokinesia post stress. Sensitivity and specificity are similar with the two techniques.

4.6 Radionuclide cardiography

Radionuclide cardiography is a reliable method that is not affected by left ventricular (LV) remodeling and it should be obtained to confirm measurements in case of borderline abnormal LVEF following echocardiography.

5. Clinical Disorders

This section discusses individual cardiovascular disorders.

5.1 Abnormal blood pressure (BP)

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

5.1.1 Hypertension

Mild hypertension does not preclude an individual from working in an SCP. However, end organ damage to the heart, kidneys and brain as a result of chronic hypertension may affect an individual's ability to perform his/her duties in a safe manner. Individuals with end organ damage should be assessed on an individual basis.

Severe or uncontrolled hypertension can be associated with symptoms of dizziness, headaches and blurred vision. Severe or uncontrolled hypertension also increases the risk of stroke. Individuals with a systolic BP of 170 mm Hg or more and/or a diastolic BP 110 mm Hg or more are considered unfit to work in an SCP until their hypertension is under control (**1b-1d**). These individuals require follow up for at least 6 months to ensure appropriate management and control of their condition.

5.1.2 Hypotension

Individuals with symptomatic hypotension are considered unfit to work in an SCP until their hypotension is under control. Symptomatic individuals require follow up for at least 6 months to ensure appropriate management and control of their condition.

An isolated systolic BP of less than 95 mm Hg in an asymptomatic individual should be investigated further to minimize the risk of developing symptomatic disease.

5.2 Arrhythmias

5.2.1 Atrioventricular conduction abnormalities

Individuals with first degree AV block or Mobitz I heart block should be investigated with an Holter monitoring to rule out AV block of higher degree.

Individuals with a complete heart block or a Mobitz II heart block, that do not have a permanent pacemaker, are considered unfit to work in an SCP.

Asymptomatic pauses of 3 seconds or more during waking hours, or symptomatic pauses of 2 seconds or more are incompatible with employment in SCP.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

5.2.2 Bradyarrhythmias (8b)

Individuals with symptomatic bradyarrhythmias are considered unfit to work in SCPs.

Asymptomatic individuals with bradycardia of 40 beats/minute or less should be investigated to rule out an underlying medical condition. They should be assessed according to their medical condition.

Asymptomatic individuals with bradycardia of 40 beats/minute without an underlying medical condition require an individualized fitness for duty assessment by the CMO of their railway company with input from their treating physician.

5.2.3 Tachyarrhythmias

Individuals with symptomatic tachyarrhythmias or individuals with a history of ventricular tachycardia (VT) with or without a permanent implanted cardiac defibrillator (ICD) are considered unfit to work in an SCP. (8e)

Individuals who have been successfully treated with catheter ablation may be considered fit to work in an SCP provided Holter monitoring reveals no significant residual tachyarrhythmias. Prior to their return to work, they require an individualized fitness for duty assessment by the Chief Medical Officer of their railway company with input from their treating physician.

Individuals with runs of tachyarrhythmia of 5 seconds or more detected on Holter monitoring require an individualized fitness for duty assessment by the Chief Medical Officer of their railway company with input from their treating physician.

5.2.4 Wolf-Parkinson-White (WPW) Syndrome (8c)

Individuals with symptomatic WPW Syndrome are considered unfit to work in an SCP.

Individuals that have been successfully treated with catheter ablation may be considered fit to work in an SCP provided Holter monitoring reveals no significant residual tachyarrhythmias. These individuals require an individualized fitness for duty assessment by the Chief Medical Officer of their railway company with input from their treating physician.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

5.2.5 Pacemakers (8d)

Due to the risk of sudden impairment secondary to pacemaker failure, pacemaker dependant individuals are considered unfit to work in an SCP.

Individuals with a medical condition who require a permanent pacemaker, who are not pacemaker dependant, can work in an SCP provided there is no risk of pacemaker dysfunction from exposure to electromagnetic fields in the workplace as demonstrated by an Holter monitoring while performing their regular duties.

5.2.6 Ventricular tachycardia (VT) and implanted cardiac defibrillators (ICD) (8e)

Individuals with history of VT, with or without permanent ICD, are unfit to work in an SCP.

5.2.7 Sick sinus syndrome (SSS)

Individuals with symptomatic SSS are considered unfit to work in an SCP.

Individuals with SSS associated with a bradycardia of 40 beats/minute or less or a pause of greater than 3 seconds during waking time are also considered unfit to work in an SCP unless they have been treated with a permanent pacemaker. Prior to return to work in an SCP, they require an individualized fitness for duty assessment by the Chief Medical Officer of their railway company with input from their treating physician.

5.2.8 Atrial fibrillation (AF) and atrial flutter (8f)

Atrial flutter is often associated with AF and should be managed similarly.

Individuals with AF and with underlying medical condition must be evaluated according to the underlying disease (diabetes, hypertension, valvular disease, enlarged left atrium, coronary disease, age above 65, past history of cardiovascular accident (CVA)/transient ischemic attack (TIA), and congestive heart failure) and their associated risk of sudden impairment. In these individuals, Coumadin reduces the risk of emboli from 4.5% to 1.4% (a reduction of 68%) and it should be used.

Individuals with chronic AF without underlying medical condition (lone AF) require an individualized fitness for duty assessment by the Chief Medical

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

Officer of their railway company with input from their treating physician. In these individuals, ASA decreases the risk of emboli by 44% and it should be used.

5.2.9 Extrasystoles (8g)

Extrasystoles can be disregarded if they are asymptomatic and are not associated with underlying heart disease.

Individuals with frequent extrasystoles associated with an underlying heart disease require an individualized fitness for duty assessment by the CMO of their railway company with input from their treating physician.

5.3 Ischemic heart disease

IHD is by far the most common CVD. It is common for the terms IHD and coronary artery disease (CAD) to be used interchangeably.

The spectrum of IHD covers:

- individuals with risk factors for IHD
- asymptomatic disease (silent ischemia)
- stable angina,
- unstable angina,
- myocardial infarction and,
- post revascularisation procedures.

5.3.1 Risk factors to develop IHD

Individuals with multiple risk factors for IHD are at risk of developing symptomatic disease. They are also at risk of sudden impairment due to a coronary event.

The Framingham calculation of a 10 year risk of coronary disease is shown in Appendix IV. This algorithm is used to calculate the 10-year risk of an individual developing angina pectoris, unstable angina, non- fatal and fatal myocardial infarction (MI). The algorithm is used for individuals without diabetes mellitus or clinically evident cardiovascular disease. The calculation is conservative as it does not take into account individuals with new risk factors such as homocystein, abdominal obesity and insulin resistance. (5j)

Using this algorithm, any individual with a 10 year risk of a coronary event greater than 20% (2%/year) should have a global risk assessment. High risk

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

individuals are candidate for intensive risk factors intervention. They may require further assessment including stress echocardiography or stress MIBI. **(5a)**

The algorithm should not be used for individuals with diabetes mellitus. These individuals are considered to be at very high-risk of developing an ischemic event **(5b)**. Consequently, all individuals with diabetes mellitus ideally should have a global risk assessment including a stress echocardiogram or a stress MIBI.

5.3.2 Silent coronary artery disease

- a) Electrically positive stress ECG associated with either reversible hypoperfusion or reversible hypokinesia at 10 mets or less in absence of clinical angina precludes an individual from returning to work in an SCP. **(5f)**
- b) Individuals with known IHD should be submitted, every 4 years, to a stress echocardiogram or a stress MIBI in order to rule out residual ischemia. **(5a)**
- c) Rest ECG abnormalities suggesting CAD (Q-waves, ischemic T waves, ST depression) should trigger an investigation to rule out silent CAD.

5.3.3 Stable angina

Individuals with symptoms of angina are unfit to work in an SCP. Prior to their return to work, they require an assessment by a specialist. As part of this assessment, they require a stress echocardiogram or a stress MIBI. Individuals with reversible hypokinesia or reversible hypoperfusion at 10 mets or less of maximal exercise capacity require an individualized global risk assessment by the Chief Medical Officer of their railway company with input from their treating physician. They also require an annual follow-up report from their specialist regarding their fitness for duty in an SCP.

5.3.4 Acute coronary syndrome (unstable angina or non-Q MI) and acute MI

Individuals with acute coronary syndrome or acute myocardial infarction are considered unfit to work in an SCP for a period of 3 months from the date of the event. Prior to their return to work they require an assessment by a specialist. As part of this assessment these individuals require a stress echocardiogram or a stress MIBI. Individuals with reversible hypokinesia or reversible hypoperfusion at 10 mets or less of maximal exercise capacity require an individualized fitness for duty assessment by the Chief Medical Officer of their railway company with

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

input from their treating physician. They also require an annual follow-up report from their specialist regarding their fitness for duty in an SCP.

5.3.5 Variant angina (Prinzmetal’s angina)

Individuals with variant angina must be asymptomatic for 3 months before they can return to work in an SCP. **(5c)**. Prior to their return to work, they require an assessment by a specialist to confirm absence of symptoms.

5.3.6 Revascularisation procedures

5.3.6.1 Percutaneous transluminal coronary angioplasty (PTCA)

Individuals who have undergone PTCA are considered unfit to work in an SCP for a period of 2 weeks after the procedure. Prior to their return to work, they require an assessment by a specialist. As part of this assessment, they require a stress echocardiogram or a stress MIBI. Individuals with reversible hypokinesia or reversible hypoperfusion at 10 mets or less of maximal exercise capacity require an individualized global risk assessment by the Chief Medical Officer of their railway company with input from their treating physician. They also require an annual follow-up report from their specialist regarding their fitness for duty in an SCP.

Individuals with minor abnormalities on stress testing require individual global risk assessment of their risk of sudden impairment due to an ischemic event.

A stress ECG should be performed 3 months after a PTCA in order to rule out restenosis. **(5d)**

5.3.6.2 Coronary artery bypass graft (CABG)

Individuals who have undergone CABG are considered unfit to work in an SCP for a period of 3 months after the procedure. Prior to their return to work, they require an assessment by a specialist. As part of this assessment, they require a stress echocardiogram or a stress MIBI. Individuals with reversible hypokinesia or reversible hypoperfusion at 10 mets or less of maximal exercise capacity require an individualized global risk assessment by the Chief Medical Officer of their railway company with input from their treating physician. **(5e)**. They also

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

require an annual follow-up report from their specialist regarding their fitness for duty in an SCP.

Individuals with minor abnormalities on stress testing require individual global risk assessment of their risk of sudden impairment due to an ischemic event.

5.3.7 Global risk assessment for individuals with IHD

After an ischemic event, the risk of sudden impairment must be weighted by the medication used and the quality of the control of the risk factors. An average yearly risk of a new event after MI of 5% may decrease to 1% or increase to 10% and this has to be taken into consideration.

5.3.7.1 LV dysfunction and number of vessels involved

LV dysfunction and the number of vessels involved are the most powerful predictors of mortality and morbidity. The CASS registry reports a mortality rate 2.5 to 3 times greater for patients with abnormal LVEF. **(5g)**

5.3.7.2 Control of risk factors post MI

The subgroup analysis of the Coronary Artery Recurrent Event (CARE) study **(5h)** provides new information on the yearly event rate associated with the presence of risk factors following an MI. Men treated with Pravastatine after a MI had a yearly event rate of 5.3%; hypertensive patients had a rate of 5.7% while non-hypertensive had a rate of 4.7%; similarly, the rate was 6% for smokers and 5% for non-smokers; the rate was reduced by 40% when the LDL cholesterol was less than 3.2 mmol/l. The yearly mortality risk was 7.2% in individuals with diabetes and 4.8% in individuals without diabetes.

It appears that each major risk factor can alter the yearly rate of event by 5 to 10%, demonstrating that the post MI prognosis is mainly determined by LV function and extent of disease.

In the Secondary Prevention Reinfarction Nifedine Israeli Trial (SPRINT) study **(5i)** nevertheless, the yearly mortality rate post MI was 4% with no risk factor, 5.1% with 2 risk factors, 15% with 4 risk factors and 23% with 6 risk factors showing the additive effects of risk factors.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

Any yearly risk of cardiac event greater than 5.5% must be carefully examined as to the risk of sudden impairment given the nature of the duties of the concerned individuals.

5.4 Non ischemic heart disease

Non-IHD is less common than IHD. However, there are individuals with non-IHD who work in an SCP. The nature of the IHD, its natural history, and the associated functional impairment need to be taken into consideration when assessing fitness for duty in an SCP.

5.4.1 Valvular heart disease

In general, individuals with the following medical conditions require an individualized fitness for duty assessment by the Chief Medical Officer of their railway company with input from their treating physician:

- 5.4.1.1 Aortic stenosis with a valve area of less than or equal to 1.5 cm² and/or maximal transvalvular pressure gradient greater than or equal to 25 mm Hg. **(6a)**
- 5.4.1.2 Aortic regurgitation of 2+ or greater, diastolic blood pressure of less than 55 mm Hg, left ventricular ejection fraction (LVEF) of 40% or less, left ventricular end systolic (LVES) diameter greater than 5.5 cm. **(6b)**
- 5.4.1.3 Mitral stenosis with a valve area of less than or equal to 1.5 cm². **(6b)**
- 5.4.1.4 Mitral regurgitation (with or without mitral valve prolapse) of 2+ or greater, LVES diameter greater than 4.5 cm, LVEF of less 50%. **(6b)**
- 5.4.1.5 Left atrial dilation more than 45 mm. **(6c)**

Mitral valve prolapse with mitral regurgitation of less than 2 does not preclude employment in an SCP.

Once valvular disease is diagnosed, echocardiography should be performed every 2 years.

In order to monitor any progression of their disease, individuals with milder forms of valvular disease require an echocardiography at least every 3 years.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

5.4.2 Valve replacement surgery

Individuals who have had valve replacement surgery are considered unfit to work in an SCP for a period of 3 months after the procedure. Prior to their return to work, they require an assessment by a specialist to determine their functional status. Regarding their fitness for duty, they require an individualized assessment by the Chief Medical Officer of their railway company with input from their treating physician.

Individuals who have had valve replacement surgery require an annual assessment by their specialist to rule out late complications of their surgery. They also require an echocardiogram every 2 years, showing no significant prosthetic valvular dysfunction and no significant (2+ or more) central or paraprosthetic leakage **(6d)**.

5.4.3 Congenital heart disease

In general, individuals with the following medical conditions are considered unfit to work in an SCP. In order to determine their fitness for duty, they require an individualized assessment by the Chief Medical Officer of their railway company with input from their treating physician:

- 5.4.3.1 Atrial septal defect ASD with left to right shunt greater than or equal to 2. **(6e)**
- 5.4.3.2 Aortic coarctation or surgery for aortic coarctation associated with hypertension. **(6f)**
- 5.4.3.3 Pulmonary stenosis with maximal valvular gradient greater than or equal to 50 mm Hg. **(6g)**
- 5.4.3.4 Ventricular septal defect (VSD) with pulmonary/systemic flow greater than or equal to 1.5.

Individuals who have had surgery for a VSD are considered unfit to work in an SCP for a period of at least 6 months following the procedure. **(6h)** They require an individualized fitness for duty assessment by the Chief Medical Officer of their railway company with input from their treating physician.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

5.4.3.5 Residual pulmonary hypertension after congenital heart disease surgery with a pulmonary artery pressure as estimated by an echocardiogram greater than or equal to 40 mm Hg at rest.

5.4.4 Cardiomyopathies

The cardiomyopathies include idiopathic hypertrophic subaortic stenosis, hypertrophic cardiomyopathy, non-ischemic congestive cardiomyopathy and restrictive cardiomyopathy. Individuals with symptomatic cardiomyopathy of any type are unfit to work in an SCP. Individuals with the following conditions are also considered unfit to work in an SCP.

5.4.4.1 Idiopathic hypertrophic subaortic stenosis **(7a)**

5.4.4.2 Hypertrophic cardiomyopathy with any intraventricular gradient, if:

- the LV mass is greater than 150 grams/m² **(7a)** or;
- the septum and the posterior wall measure both 15 mm or more in end diastole. **(7a)**.

5.4.4.3 Non ischemic congestive cardiomyopathy if:

- LVEF is less than or equal to 35%, **(4b)** or;
- LVES diameter is greater or equal to 5.0 cm. **(4a)**

5.4.4.4 Restrictive cardiomyopathy or any other form of infiltrative cardiomyopathy. **(7b)**

5.4.5 Pericardial disease

Individuals with acute pericarditis incompatible with employment in an SCP cannot return to work in an SCP until the pericardial fluid effusion is less than 3 mm.

Individuals with chronic pericarditis require an individualized fitness for duty assessment by the Chief Medical Officer of their railway company with input from their treating physician before they can return to work in an SCP. **(7c)**.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

5.4.6 Heart transplant

Individuals who have had a heart transplant are generally considered unfit to work in an SCP. Prior to their return to work, they require an individualized fitness for duty assessment by the Chief Medical Officer of their railway company with input from their treating physician. **(7d)**

5.4.7 Congestive heart failure

Individuals with a LVEF of less than or equal to 35% **(4b)** and/or a LVES diameter greater than or equal to 5.0 cm **(4a)** are considered unfit to work in an SCP.

5.4.8 Abdominal aortic aneurysm **(9)**

Individuals with an abdominal aortic aneurysm greater than or equal to 4 cm are considered unfit to work in an SCP.

Individuals who have had surgery to correct an abdominal aortic aneurysm are considered unfit to work in an SCP for a period of 3 months after the procedure.

5.4.9 Vaso-vagal syndrome **(10)**

Individuals with syncope, dizziness or other symptoms that are of vaso-vagal origin are considered unfit to work in an SCP.

Asymptomatic individuals with a past history of vaso-vagal syndrome are fit to work in an SCP provided they have been treated, a tilt-test is negative, and they have been asymptomatic for at least 6 months. These individuals also require an individualized fitness for duty assessment by the Chief Medical Officer of their railway company with input from their treating physician.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

APPENDIX I

REFERENCES

1. Blood pressure (BP)

- 1a) www.chs.md (Website of the Canadian Hypertension Society)
- 1b) If 40% or more of the BP readings are above 135/85, there is a 5 fold likelihood of developing cardiac vascular events

American Heart Journal 1989; 118 : 782 and Hypertension 1998; 31 : 712

- 1c) Office-induced increase in BP affects 20 to 25% of individuals with diastolic BP between 90 and 104 mm Hg.

Ref.: JAMA, 1998; 255 : 225

- 1d) Framingham data showed that a systolic BP of 170 mm Hg corresponds to the 90th percentile and to a 2 fold increase in overall mortality.

Ref.: Lancet 2000; 355 : 175-180 and Journal of Inst. Actuaries 1979; 196 : 15

A diastolic BP of > 110 mm Hg is associated with a 2.5 fold increase in all-cause mortality

Ref.: Society of Actuaries and ALIMBA, Blood Pressure Study, Boston, 1980

2. Resting ECG abnormalities other than arrhythmias

- 2a) Bundle Branch Blocks (BBB)

Left or right BBB is associated with a 1.5 to 2 times normal mortality.

New onset of left BBB is associated with a 10 times normal mortality.

Ref.: Brackenridge's Medical Selection of Life Risk, Stockton Press Publication, 1998.

BBB on ECG justifies medical assessment in order to rule out significant CVD.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

2b) Silent myocardial infarction

A new Q wave on ECG without any other clinical manifestation is associated with a 4.5 times normal mortality and therefore justifies an echocardiogram (see 3.3)

Ref.: European Heart Journal, 2000; 21 : 1052-1067

2c) Ischemic T waves are associated with a 2 to 3 times normal mortality and justify assessment in order to rule out significant coronary disease.

Ref.: Whitehall study

2d) Left ventricular hypertrophy and/or strain is associated with 1.5 to 6 times normal mortality.

Ref.: Brackenridge's Medical Selection of Life Risk, Stockton Press Publication, 1998.

3. Stress ECG

3a) L.N. Matheson, Functional Capacity Evaluation in Disability Evaluation, American Medical Association Demeter, Anderson, Smith Ed. Mosby Publishing – St-Louis, USA. pp: 168-188

3b) The normal maximal exercise capacity varies with age, gender, and fitness level. For an average fitness level, age-dependant maximal capacity in the general population can be predicted from the formula:

$$\text{Predicted Mets} = 18.0 - 0.15(\text{age}). \text{ (See Table 1)}$$

Ref.: JACC, 1993; 22 : 175-182

Table 1

AGE	METS	AGE	METS
20	= 15	45	= 11.2
25	= 14.3	50	= 10.5
30	= 13.5	55	= 9.75
35	= 12.5	60	= 9
40	= 12		

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

Table 1 is consistent with the 1% decrease in exercise capacity per decade After age 25, published many years ago

Ref.: JAP, 1981; 51 :634-64

The performance standard of maximal exercise capacity for a SCP has been set to 10 mets. According to a field study performed during the fall season at CN on 10 individuals (average age: 42) in yard positions, it has been found that the average energy expenditure of these individuals was 3 mets. Among 19 different tasks, 10 (53%) were requesting more than 4 mets. The maximum energy level of exercise during a 8 hour shift was 8 mets.

- 3c) A decrease of 10 mm Hg or more of systolic BP may indicate transient LV dysfunction and justifies further assessment.

Ref.: Braunwald’s Heart Disease, WB Saunders Publication, 2001, p.152.

- 3d) New England Journal of Medicine 2000; 343: 826-833

4. Echocardiogram

- 4a) LVES diameter

A LVES diameter above 5.0 cm is associated with a 2.7 fold increase in all-cause mortality.

Ref.: JACC, 2000; 35 : 1237

- 4b) LVEF

A LVEF of less than 35% is associated with, at least, a 1.8 fold increase in all-cause mortality

Ref.: JACC, 2000; 35 : 1237

- 4c) 2+ mitral or aortic regurgitation is associated with an increase of all-cause mortality.

Ref.: Circulation 2001; 103 : 1759

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

5. Ischemic Heart Disease

- 5a) The Canadian recommendations to treat dyslipidemia consider risk above 2%/year as a high risk.

Ref.: CMAJ 2000; 162 : 1441.

High risk asymptomatic individuals have a risk for coronary event equal or greater than 20% in 10 years (25% of US adult population).

Ref: Circulation, 2001; 104: 1863-1867.

- 5b) Individuals with diabetes have similar yearly rate of CV events (4%) as those who already have CV symptoms.

Among the 9,297 individuals of the HOPE study, those without diabetes but with known cardiovascular disease had a 16.5% rate of cardiovascular events in 4 years. The 3,577 individuals with diabetes had a 19.8% rate of cardiovascular events during the same period.

Ref.: New England Journal of Medicine 2000; 3423: 145-153.

- 5c) In most individuals with Prinzmetal's angina who survive an infarction or the initial 3 to 6 month period of frequent episodes, the condition stabilizes and symptoms and cardiac events tend to diminish with time.

Braunwald's Heart Disease, 6th Ed. Saunders, 2001; p. 1328.

- 5d) Most restenosis after PTCA usually occur within the first 3 month period following the procedure

Ref.: Circulation, 1988, 77: 361-371.

- 5e) Coronary artery bypass graft (CABG)

MIBI stress test showing reversible hypoperfusion is associated with a 2.9 fold increase in CV events. These occur within 1 year in .5% of individuals with normal MIBI and in 7% of those with abnormal MIBI.

Ref.: Circulation 1994; 89 : 615

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

5f) Silent Coronary Disease

The 7 year risk of myocardial infarction is 20% in individuals with silent myocardial ischemia and 18% in individuals with both ischemic changes and angina during exercise testing

Ref.: American Journal of Cardiology 1988; 62 : 1155.

Asymptomatic ischemia has a significance similar to that of symptomatic ischemia.

Ref.: Braunwald’s Heart Disease, Saunders, 2001, p. 1332.

The prognosis “warranty” for normal stress myocardial perfusion images is believed to expire after 1.5 to 2 years.

Ref.: Journal of American College of Cardiology, 1988: 32-57

5g) Cass Registry 15 year follow-up

Ref.: JACC, 1995; 25 : 1000

Yearly Event Rate

		<u>Extent of disease</u>	
		2 vessels	3 vessels
LV Function	1 vessel		
Normal	1.5%	2.1%	3.5%
Abnormal	3.5%	6.2%	10.5%

5h) CARE Study

Ref. : NEJM, 1996; 335 : 1001

Probabilities of CV events post MI

Average risk	=	5.3% per year
Hypertension	=	+ or - .5%
Smoking	=	+ or - .5%
LDL at 3.2 mmol/l	=	+ or - 1%
Diabetes	=	x 2

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

- 5i) SPRINT Study
 Ref.: European Heart Journal 1988; 9 : 354-64

Yearly post MI mortality rate

Average	=	4.8%
No risk factor	=	4.0%
2 risk factor	=	5.1%
4 risk factor	=	15%
6 risk factor	=	23%

- 5j) Abdominal obesity associated with high triglycerides is a marker for an atherogenic metabolic triad (hyperinsulinemia, elevated apoB and small dense LDL) and is associated with a high risk of CAD.

Circulation 2000; 102: 179-184

6. Non ischemic Heart Disease

- 6a) Aortic stenosis

Mild aortic stenosis has a faster course towards reduction of the valve area. Faster progression was observed in individuals with valve area of 1.4 cm², peak valvular pressure gradient of 22 mm Hg and peak velocities across the valve area of 2.8 m/sec.

Ref.: Circulation, 2000; 101 : 2497

- 6b) ACC/AHA Guidelines for the management of individuals with valvular heart disease

Ref.: JACC, 1998; 32 : 1486

- 6c) Prognosis of left atrial dilation

Ref.: JACC, 2000; 35 : 1237

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

6d) Valvular surgery

Prosthetic valve dysfunction occurs more frequently with biological prosthesis and should be carefully monitored.

Leakage of prosthetic valve is rare (< 1%/year) but can lead to symptoms and sudden impairment.

Complications of prosthetic valve average 5%/year.

Ref.: Current Problems in Cardiology, 2000; : 1-154

6e) Atrial septal defect (ASD)

75% of individuals with significant left to right shunt are symptomatic when reaching the 5th decade and significant ASD should be closed as soon as diagnosed in the adult.

Ref.: Braunwald's Heart Disease, 6th Ed., Saunders 2001; p. 1593.

6f) Aortic coarctation

Residual hypertension is common after correction of aortic coarctation due to a reset of the baroreceptors.

Ref.: Braunwald's Heart Disease, 6th Ed. Saunders 2001; p.1601.

6g) Pulmonary stenosis

Peak pressure gradient across the aortic valve of 50 mm Hg or more is an indication for surgical correction or balloon intervention.

Ref.: Braunwald's Heart Disease, 6th Ed. Saunders 2001; p. 1602

6h) Ventricular septal defect (VSD)

A pulmonary/systemic flow ratio greater than 1.5 is an indication for surgical correction in the absence of irreversible pulmonary hypertension.

Ref.: Braunwald's Heart Disease, 6th Ed. Saunders 2001; p. 1595

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

7. Cardiomyopathies

- 7a) Idiopathic hypertrophic subaortic stenosis and hypertrophic cardiomyopathy.

Death is most often sudden in hypertrophic cardiomyopathy

Ref.: Braunwald's Heart Disease, 6th Ed. Saunders 2001; p.1770.

- 7b) Restrictive cardiomyopathy

Syncope and arrhythmia are common in infiltrate or restrictive Cardiomyopathy.

Ref.: Braunwald's Heart Disease, 6th Ed. Saunders 2001; p. 1779.

- 7c) Pericardial disease

Acute pericarditis

Pain is associated with acute pericarditis. Large pericardial effusion might be associated with sudden impairment due to cardiac tamponade.

Ref.: Braunwald's Heart Disease, 6th Ed. Saunders 2001; p 1835

Chronic pericarditis

Dyspnea and right sided heart failure are observed in chronic pericarditis.

Ref.: Braunwald's Heart Disease, 6th Ed. Saunders 2001; p. 1852

- 7d) Heart transplant

Heart transplant may be associated with early or late rejection and complication of immuno-suppressive therapy add to the risk, even in the absence of rejection.

- 7e) Congestive heart failure

Heart failure secondary to systolic or diastolic dysfunction share a common symptomatology and risk of sudden impairment due to dyspnea or arrhythmia.

Ref.: Braunwald's Heart Disease, 6th Ed, Saunders 2001; p.538

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

8. Arrhythmias

- 8a) Non sinus rhythm is associated with a mortality of 1.75 to 2 times normal.

Extrasystoles might be secondary to undiagnosed cardiopathy and justify assessment in order to rule out CVD. If no underlying disease is found, isolated extrasystoles carry a normal prognosis.

Ref.: Brackenridge's Medical Selection of Life Risk, Stockton Press Publication, 1998.

- 8b) Bradyarrhythmia

A permanent pacemaker is indicated for symptomatic individuals with heart rate of less than 40/minute or pauses longer than 3 seconds during waking hours

Ref.: Braunwald's Heart Disease, 6th Ed. Saunders 2001: p. 777

- 8c) Wolf-Parkinson-White (WPW)

Paroxysmal tachycardia occurs in 20 to 36% of individuals with WPW and rapid atrial fibrillation may lead to sudden impairment. Catheter ablation of the Kent bundle is the treatment of choice.

Braunwald's Heart Disease, 6th Ed. Saunders 2001; p. 855

- 8d) Pacemakers

Many reports on interference of pacemaker function with electromagnetic fields (EMF) (mainly anti-theft devices) do not represent the safety of such devices implanted for over 40 years.

Field tests are recommended for pacemakers recipients working in EMF environment.

Ref.: Cardiac arrhythmia and device therapy, I.E. Ousyshcher, Ed. Futura Publishing Comp., 2000.

- 8e) Ventricular tachycardia and defibrillation

The nature of arrhythmia justifying implantation of cardiac defibrillators, the underlying LV function and the possible device dysfunction are associated with a risk of sudden impairment.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

Ref.: Current Problems in Cardiology 1997 : 22

8f) Atrial fibrillation/flutter

Braunwald's Heart Disease, 6th Ed. Saunders 2001; p. 834.

8g) Extrasystoles

Frequent extrasystoles may be associated with the occurrence of sustained supraventricular or ventricular tachyarrhythmia which might cause sudden impairment. Braunwald's Heart Disease, 6th Ed. Saunders 2001; p. 829

9. Abdominal aortic aneurysm

Abdominal aortic aneurysm is the most frequent. Recommendation of the Society for Vascular Surgery and the International Society for Cardiovascular Surgery is for elective repair of aneurysm of 4 cm or larger although many surgeons still consider 5 cm or more to be the indication for surgery.

Ref.: Journal of Vascular Surgery 1992; 15 : 1046

Mayo Clinic Proc. 2000; 75 ; 395.

10. Vaso-vagal syndrome

In vaso-vagal syncope, it is considered that if the individual remains asymptomatic, driving can be resumed several months later, 6 months being the commonly recommended waiting period.

Ref.: Braunwald's Heart Disease, 6th Ed. Saunders, 2001: p. 939.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

APPENDIX II

GLOBAL RISK ASSESSMENT INVENTORY

- a) Family history of 1st degree relatives as pertaining to coronary artery disease.
- b) Lipid profile.
- c) Smoking.
- d) Diabetes mellitus.
- e) Hypertension.
- f) Body mass index.
- g) Abdominal girth measurements in cms.
- h) History regarding lifestyle as it applies to activity level.
- i) Estimation of compliance with treatment and recommendations



Section: 4

Version: 1.0

Title: RAILWAY MEDICAL GUIDELINES

Subsection 4.6 – Cardiovascular Disorders

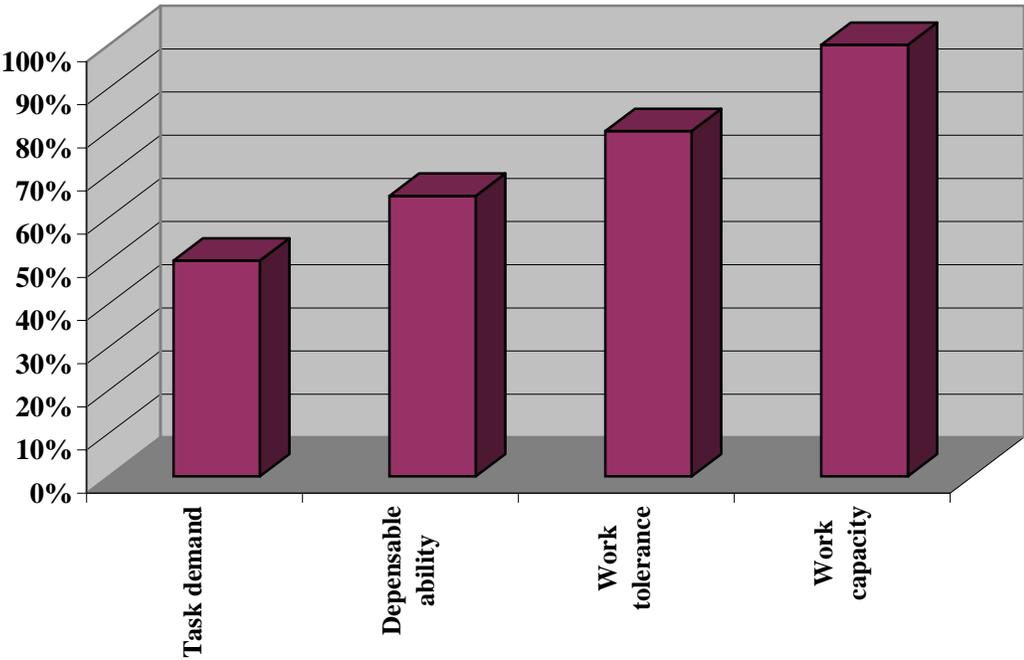
APPENDIX III

**THE OXYGEN COST PER STAGE FOR THE COMMONLY USED
BRUCE TREADMILL PROTOCOL**

O ² COST ml/kg/min	METS	BRUCE PROTOCOL		
		3 MIN STAGES		
		mph	% gr	Stage
		5.5	20	
56.0	16	5.0	18	5
52.5	15			
49.0	14			
45.5	13	4.2	16	4
42.0	12			
38.5	11			
35.0	10	3.4	14	3
31.5	9			
28.0	8			
24.5	7	2.5	12	2
21.0	6			
17.5	5	1.7	10	1
14.0	4			
10.5	3			
7.0	2			
3.5	1			

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

APPENDIX IV



Distinctions among work capacity, work tolerance, dependable ability, and task demand.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

APPENDIX V

Framingham calculation of 10-year risk of coronary disease
Use to calculate short-term CHD risk in patients without diabetes mellitus or clinically evident cardiovascular disease.

STEP 1: AGE		RISK POINTS	
YEARS	MEN	WOMEN	
30-34	-1	-9	
35-39	0	-4	
40-44	1	0	
45-49	2	3	
50-54	3	6	
55-59	4	7	
60-64	5	8	
65-69	6	8	
70-74	7	8	
STEP 2: TOTAL CHOLESTEROL			
(mmol/L)			
<4.14	-3	-2	
4.15-5.17	0	0	
5.18-6.21	1	1	
6.22-7.24	2	2	
≥ 7.25	3	3	
STEP 3: HDL-C			
(mmol/L)			
<0.90	2	5	
0.91-1.16	1	2	
1.17-1.29	0	1	
1.30-1.55	0	0	
≥ 1.56	-2	-3	
STEP 4: SYSTOLIC BLOOD PRESSURE			
(mm Hg)			
<120	0	-3	
120-129	0	0	
130-139	1	1	
140-159	2	2	
≥ 160	3	3	
STEP 5: SMOKER			
No	0	0	
Yes	2	2	
STEP 6: (SUM 1-5)		POINTS	
Age			
Cholesterol			
HDL-C			
Blood Pressure			
Smoker			
TOTAL POINTS			

STEP 7: CALCULATE RISK *		
RISK POINTS	10 YR RISK MEN	10 YR RISK WOMEN
1	3%	2%
2	4%	3%
3	5%	3%
4	7%	4%
5	8%	4%
6	10%	5%
7	13%	6%
8	16%	7%
9	20%	8%
10	25%	10%
11	31%	11%
12	37%	13%
13	45%	15%
14	≥ 53%	18%
15		20%
16		24%
17		≥ 27%

STEP 8: COMPARE CHD RISK **		
AGE	MEN AVERAGE	LOW
30-34	3%	2%
35-39	5%	3%
40-44	7%	4%
45-49	11%	4%
50-54	14%	6%
55-59	16%	7%
60-64	21%	9%
65-69	25%	11%
70-74	30%	14%
AGE	WOMEN	
30-34	<1%	<1%
35-39	<1%	<1%
40-44	2%	2%
45-49	5%	3%
50-54	8%	5%
55-59	12%	7%
60-64	12%	8%
65-69	13%	8%
70-74	14%	8%

Note that the Framingham tables underestimate CHD risk if LDL-C>6.0 mmol/L

* Risk of CHD outcomes including angina pectoris, unstable angina, nonfatal MI and coronary death over subsequent 10 years for a Framingham Study participant with that specific risk score.

** Risk of a participant with "optimal" risk factors.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

USE OF FRAMINGHAM CALCULATION

A man aged 52 (+ 3 points) with a total cholesterol of 5.2 mmol/L (+ 1 point), with a HDL cholesterol of 0.8 (+ 2 points), with a systolic blood pressure of 160 mmHg (+3 points) who smokes (+ 2 points) is totaling 11 risk points.

According to the calculate risk in step 7, this man has a 10 year risk of ischemic event of 31% which is 2.2 times the average risk of a man of his age who has, according to the compare CHD risk of 14% as seen in step 8.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.6 – Cardiovascular Disorders	

APPENDIX VI

ACKNOWLEDGEMENTS

The RAC would like to acknowledge the contribution of:

Dr François Sestier, MD, PhD, FACC

Associate Professor
 Department of Medicine
 University of Montreal

Director
 Insurance Medicine Program
 University of Montreal

Staff Cardiologist
 Centre Hospitalier Universitaire de Montréal (Notre-Dame)
 Montreal

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.7 – Diabetes	

**MEDICAL GUIDELINES FOR THE EMPLOYMENT OF INDIVIDUALS WITH
DIABETES IN A SAFETY CRITICAL POSITION IN THE
CANADIAN RAILWAY INDUSTRY**

1. Introduction

Canadian railway employees who work in a Safety Critical Position (SCP) operate or control the movement of trains. Physical and mental fitness is mandatory. Impaired performance due to a medical condition could result in a significant incident affecting the health and safety of employees, the public, property or the environment.

Diabetes, if not well controlled, can cause sudden or gradual impairment of alertness, judgement, the senses or motor function. Hypoglycemic episodes and hypoglycemia unawareness are of particular concern. A severe hypoglycemic episode is defined as one which results in an impairment of alertness, judgement, the senses and/or motor function, a loss of consciousness or one requiring outside assistance.

Medical guidelines have been developed in order to evaluate and monitor the fitness for duty of individuals with diabetes employed in an SCP in the Canadian railway industry.

Individuals with diabetes working in an SCP must be monitored closely. They must report any changes in the treatment of their diabetes to the Chief Medical Officer (CMO) of their railway company. This includes changes in the type and dose of their medication and a change in the number of insulin injections. They must also report any severe hypoglycemic episode. All employees with diabetes will be assessed individually with respect to their suitability for a particular SCP.

Background information on diabetes and fitness for duty issues are provided in Appendix I, II and III.

2. Basic considerations

The employment of an individual with diabetes in an SCP shall be guided by three considerations:

- 2.1 The diabetes history (e.g., type of diabetes, presence of complications, adherence to treatment protocols, reaction to treatment).

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.7– Diabetes	

2.2 The method of treatment of the diabetes (e.g., diet, oral anti-hyperglycemic agents and insulin).

2.3 The nature of the job.

3. Fitness for duty criteria

Individuals with diabetes will be eligible to work in an SCP provided they meet the following criteria:

3.1 No severe hypoglycemic episode (as defined in the introduction) in the last 2 months

3.2 No severe hypoglycemic episode in the last 12 months that has not been investigated by the treating physician

3.3 Not experiencing hypoglycemia unawareness

3.4 Must be in a stable state. An unstable state is defined as:

- a) an HbA1c equal or greater than 200% of the upper limit of the normal laboratory range;
- b) more than 10% of blood glucose self-monitoring values below 4 mmol/L. To provide evidence of this, the individual must comply with all monitoring requirements applicable to employees with diabetes; and
- c) a recent change in the number of insulin injections and/or a change in the type of insulin. The unstable state will be considered to last at least one month after such a change. The individual will need to be assessed at monthly intervals and cannot return to work in an SCP until a stable state has been reached.

3.5 Perform adequate blood glucose self-monitoring as specified in these guidelines.

3.6 Demonstrate a knowledge of managing diabetes, particularly insulin adjustment and understand how to avoid and treat hypoglycemic events.

3.7 Be free of diabetic complications which might impair ability to work safely, including significant vascular or neurological complications, and significant visual impairment.

3.8 An individual who is commencing insulin must attain a stable state (as defined in Section 3.4), for a period of 3 months before being considered fit to work in an SCP.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.7– Diabetes	

The individual must also meet all of the above fitness for duty criteria. To provide evidence of this, the individual must comply with all monitoring requirements applicable to individuals with diabetes treated with diet and insulin.

4. Monitoring requirements

Each of the following three categories of individuals with diabetes requires specific medical monitoring:

- 4.1 Individuals treated by diet alone, or by diet and oral anti-hyperglycemic agents except insulin secretagogues (sulfonylureas and meglitinides)
- 4.2 Individuals treated with diet and insulin secretagogues (sulfonylureas and meglitinides)
- 4.3 Individuals treated with diet and insulin.

5. Essential monitoring requirements for individuals treated with diet alone, or by diet and oral anti-hyperglycemic agents except insulin secretagogues (sulfonylureas and meglitinides)

- 5.1 Attendance at a diabetes education centre since the onset of disease or within the six months prior to commencing work in an SCP
- 5.2 Annual ophthalmic examination with a report (by an ophthalmologist or optometrist) including visual acuity, colour vision, visual fields and a retinal examination through dilated pupils
- 5.3 Annual review by their treating physician including:
 - a) the completed medical report for employees with diabetes working in an SCP (Appendix IV);
 - b) a physical examination;
 - c) the yearly ophthalmic report (as described above at Section 5.2);
 - d) a review of HbA1c level(s);
 - e) a review of yearly resting ECG; and
 - f) the treating physician's opinion regarding the individual's fitness for duty in an SCP (based on the criteria described in Section 3).

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.7– Diabetes	

5.4 The employee shall report immediately to the CMO the initiation of any insulin secretagogue or insulin therapy (as this may increase the risk of an unstable state), and any severe hypoglycemic episode as defined in the introduction.

6. Essential monitoring requirements for individuals treated with diet and insulin secretagogues (sulfonylureas and meglitinides)

In addition to the essential monitoring requirements of Section 5, the following are additional requirements for these individuals:

6.1 Blood glucose monitoring as follows:

- a) using a memory meter that can be down-loaded for further review;
- b) glucose readings performed at least 8 times per week. The measurements must cover the whole day, by including measurements before or after each meal, and at bedtime. At least half the measurements must be done during a working shift;
- c) the individual must maintain a record of down-loaded glucose meter logs from the previous six months; and
- d) glucose values must be maintained above 4 mmol/L, with additional food being taken when glucose is less than 4 mmol/L.

6.2 Annual review by the treating physician of the previous 3 months down-loaded glucose meter logs which are to be submitted with the medical report as per Section 5.3.

6.3 Copy of the previous three months down-loaded log provided to the CMO every 6 months by the individual.

6.4 The individual shall report immediately to the CMO any modification in oral anti-hyperglycemic agent regimen (including initiation, dosage increase, change in monotherapy, or initiation of/or change in combination therapy), initiation of insulin therapy, and any severe hypoglycemic episode as defined in the introduction. Recommendations for the treating physician on the use of oral hypoglycemic medications are included at Appendix III. An individual must also meet the eligibility criteria of Section 3.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.7– Diabetes	

7. Essential monitoring requirements for individuals treated with diet and insulin

In addition to the essential monitoring requirements of Sections 5 and 6, the following are additional and/or modified requirements for these individuals:

- 7.1 At the 6 month point of each year, the individual will require review by the treating physician with submission of Part 1 of the medical report for employees with diabetes (Appendix IV) to the CMO.
- 7.2 Annual review by a specialist in diabetes with submission to the CMO of the complete medical report for employees with diabetes (Appendix IV). This report must include all of the components specified in Section 5.3.
- 7.3 Every 3 months, the individual is to provide the CMO with a copy of the down-loaded glucose meter logs.
- 7.4 The individual shall report immediately to the CMO any change in the number of insulin injections per day (including initiation). The individual must also report any severe hypoglycemic episode as defined in the introduction. Any individual commencing insulin must meet the eligibility criteria of Section 3.8.

8. Hypoglycemia Prevention Strategy

As a condition of employment in an SCP, each individual will be required to take every possible measure to avoid hypoglycemia. Individuals requiring insulin therapy must carry a source of rapidly absorbable glucose at all times. Hypoglycemia prevention strategies, including oral hypoglycemic medication recommendations, are discussed in Appendix III. These strategies must be tailored to the individual with the guidance of the treating physician.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.7– Diabetes	

APPENDIX I

BACKGROUND INFORMATION ON DIABETES

- INTRODUCTION

Diabetes is a complex disorder involving the elevation of blood glucose and the disturbance of other metabolic functions resulting in associated vascular complications. Diabetes is traditionally divided into two main groups based on the cause of the diabetes. Type 1 diabetes (previously known as insulin-dependent diabetes (IDDM)) is caused by the destruction of the pancreas with a total loss of insulin secretion. The initial damage to the pancreas may have commenced several years prior to initial diagnosis. As insulin levels fall, the individual may present with acute symptoms of excessive thirst, weight loss and eventually major deterioration and death. In the individual with Type 1 diabetes, insulin treatment is essential to maintain life.

Type 2 Diabetes (previously known as non-insulin dependent diabetes (NIDDM)) has a separate set of abnormalities that lead to an elevation of blood glucose. The body develops resistance to insulin and eventually blood glucose levels become elevated. Type 2 diabetes is more common in the older age group and frequently these individuals are overweight. Type 2 diabetes may remain undetected for many years without obvious symptoms.

In both Type 1 and Type 2 diabetes, the major concern relates to abnormal blood glucose levels and associated abnormalities. The individual with diabetes is susceptible to vascular complications. These exist in two major forms, macrovascular complications which involve the large blood vessels, and microvascular complications which involve small blood vessels. In macrovascular disease, the larger blood vessels will become altered and eventually occluded in a process known as atherosclerosis. This will affect key organs such as the heart (coronary artery disease), the brain (cerebrovascular disease), the aorta and the peripheral circulation (peripheral vascular disease).

Microvascular disease involves the small vessels, which provide blood supply to major organs such as the eyes, kidneys and nerve. Damage to the eyes (diabetic retinopathy) is now the most common cause of blindness among young people in the western world. The back of the retinae will become progressively damaged and while sight is preserved initially, at a later stage, vision will decrease and there may be eventual blindness. Treatment requires early detection, thus necessitating regular review of the eyes by an eye specialist, and if retinopathy is present, laser surgery becomes essential to protect vision.

Damage to the kidneys (diabetic nephropathy) is identified by an initial leakage by the kidneys of small amounts of protein. Gradually, kidney function will fail associated with excessive loss of protein and elevation of metabolic by-products. As the kidney fails, the

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.7– Diabetes	

individual may eventually require dialysis unless intervention can be made by renal transplantation. Diabetes now represents one of the most common causes of renal failure providing the greatest need for dialysis or transplantation.

Damage to the nerves (diabetic neuropathy) occurs due to poor blood supply to the smaller nerves. In the early stages, damage to the nerves may result in severe, unremitting pain in individual nerves, but later, nerve tissue dies and there will be a loss of function of the nerve. This is identified by loss of function of muscles, the bowel and/or genitourinary system. A loss of sensation and poor circulation, which are frequently found together, may lead to increased risk of infection in the lower limbs and the eventual development of gangrene and amputation of the limb.

These vascular complications are accelerated by associated risk factors that are frequently present with diabetes. Both hyperlipidemia (high fat levels) and hypertension (high blood pressure) are more commonly found in patients with diabetes and will lead to an increased rate of atherosclerosis and damage to eyes and kidneys.

- **TREATMENT**

The key goals of treatment include:

- a) achieving the lowest possible glucose level without causing hypoglycemia
- b) detecting and treating the associated risk factors, and
- c) preventing, detecting and treating vascular complications at an early stage.

Glucose Control:

It has now been established that elevated blood glucose levels play an important role in the development of vascular complications of diabetes. A major research study, The Diabetes Care and Complications Trial (DCCT), proved that elevated levels of glucose are an essential component in the development of the vascular complications of diabetes. One of the key measurements used in the study was the hemoglobin A1c, HbA1c, which reflects an estimate of the previous three months of glucose levels. It was found that when intensive therapy reduced HbA1c from 9.0 to 7.1% (normal less than 6.1%), the risk of developing diabetic vascular complications and their rate of progression was reduced by 50 to 75%. Similar findings were found in the recently published United Kingdom Prospective Diabetes Study (UKPDS) of Type 2 diabetes. The results of the DCCT and UKPDS have further emphasized the need for the clinician to achieve the most ideal blood glucose control in each individual.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.7– Diabetes	

Education:

An essential component in the management of both Type 1 and Type 2 diabetes is the use of diabetes education programs where individuals will learn to understand all aspects of their diabetes and treatment.

The person with diabetes will be taught the key aspects of dietary management and how to take medications appropriately. Many learn sophisticated skills that will enable them to adjust their food, activities and medications to achieve satisfactory levels of glucose control. The diabetes centre will also teach the patient the use of one of the most important tools in managing diabetes, the self-glucose monitor. This requires the patient to prick the finger and place a drop of blood on a glucose strip where it is read in a small glucose meter. The technique is accurate to within 15% of the real value of blood glucose and readings can be completed within one minute. The equipment is small and can easily fit into a pocket or purse. The individual must be instructed as to how to use the meter and the meter should be calibrated at regular intervals against a laboratory plasma glucose value. Self-glucose readings can be done at any time of the day to determine the level of blood glucose and to anticipate changes in blood glucose resulting from different food intake and exercise levels.

Most new glucose meters have a data port which allows for down-loading of the glucose measurements taken in previous weeks. The dates and times of the glucose readings are recorded with the meter thus allowing for an independent review of the diabetes management and the frequency of the glucose testing by the patient.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.7– Diabetes	

Treatment of Type 1 Diabetes:

Injection of insulin is the key treatment for the person with Type 1 diabetes. Insulin is given in multiple injections to allow for different circumstances throughout the day. It has to be given prior to food to help dispose of the food after absorption. The dose of insulin will vary with the type of food being eaten. Prior to exercise, the insulin dose will need to be reduced as blood glucose will frequently fall after exercise. Insulin may need to be increased at times of stress or infection because blood glucose can rise at these times. Different types of insulin are often used either singularly or in combination. In general, the types of insulin can be divided into fast-acting insulin: Toronto, R and Humalog; intermediate-acting insulin: NPH; and long-acting insulin: Ultra-Lente. Originally, insulin was given as a once or twice a day injection. It is now recognized with the use of glucose meters and the newer forms of insulin, that insulin can be administered to suit the needs of the patient.

More flexible routines such as three insulin injections/day permit tighter and more even glucose control. Fast-acting insulin is often mixed with intermediate-acting insulin at breakfast to provide better glucose control between breakfast and supper. Fast-acting insulin is then given alone at supper and an intermediate or longer-acting insulin is given at bedtime. Many different insulin regimens are being employed to meet the individual needs of the person with diabetes. When individuals have varied lifestyles involving changing work, exercise and leisure activities, then more intensive insulin regimens may be more suitable. In these situations, fast-acting insulin will be given before each meal with NPH or ultra-lente at bedtime. The use of insulin lispro before meals has been shown to reduce the frequency of hypoglycemic episodes when compared to regular insulin, particularly at night. The use of insulin pumps can also be used for intensive insulin therapy.

Insulin can be drawn from an ampoule by a syringe and mixed as necessary or it can be given by a small injection device, known as the insulin pen. The insulin pen is small and light, and can usually hold enough insulin for a week.

Intensive research is now under way to develop insulin that will act over a longer period of time without causing sudden glucose changes as well as drugs that will help the action of insulin.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.7– Diabetes	

Treatment of Type 2 Diabetes:

A diabetes education program and an understanding of diabetes management and the risk of complications are important in the treatment of type 2 diabetes. In the overweight individual, every effort is made to achieve ideal weight and the individual is encouraged to take part in a suitable exercise program. Frequently, this is the only treatment required for many years. As blood glucose levels rise, however, oral medication will need to be introduced as the first phase of controlling the elevated blood glucose. Several drugs are now available and new therapies are expected in the near future. The following classes of drugs are used extensively in the management of Type 2 diabetes.

- a) Insulin secretagogues: sulfonylureas (glyburide, gliclazide, tolbutamide, chlorpropamide) and meglitinide analogues (repaglinide, nateglinide). These drugs stimulate the pancreas to make extra insulin. They help control the rise in blood glucose. In some individuals, they may lead to the unfortunate side effect of weight gain. Because of the increased output of insulin, the patient is at increased risk of low blood glucose (hypoglycemia). The meglitinides, because of their shorter duration and earlier time of action, may have an advantage over the sulfonylureas in reducing the severity and frequency of hypoglycemic events, especially when meals are delayed or skipped.
- b) Biguanides (metformin): This drug alters the sensitivity of the cells to insulin, thereby improving the action of insulin and also reducing the amount of extra glucose produced by the body. It can cause abdominal upsets but will rarely cause hypoglycemia.
- c) Alpha-glucosidase inhibitors (acarbose, miglitol): These drugs delay the absorption of food after meals, thus reducing the high levels of glucose in the post-absorptive state. They also may cause abdominal upset but, when used as monotherapy, will rarely cause hypoglycemia.
- d) Thiazolidinediones and specific insulin sensitizers: rosiglitazone and pioglitazone. These drugs increase the action of insulin leading to better glucose control but they can cause weight gain and fluid retention. When used as monotherapy, they will rarely cause hypoglycemia.
- e) Insulin: When diet, exercise and oral agents fail to control blood glucose, insulin must be used to achieve good blood glucose control. Because of the insulin resistance in Type 2 diabetes, large quantities of insulin are required and this may place the patient at risk for hypoglycemia.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.7– Diabetes	

- **COMPLICATION OF TREATMENT: HYPOGLYCEMIA**

Brain and nerve cells require a continuous supply of glucose as they cannot make their own. Any fall in blood glucose will compromise brain and nerve activity. The symptoms of hypoglycemia relate to both the changes in activity of these tissues and the physiologic responses of the body attempting to correct the developing hypoglycemia.

As an individual develops hypoglycemia, several symptoms will become apparent, warning of the falling levels of glucose. Initially, the individual may feel hungry, weak and tired. Tingling in the extremities such as fingers, toes and the nose may be present as well as muscle weakness. Excess perspiration can occur and the individual may be shaky and anxious. As the levels of glucose fall, the individual will have difficulty in thinking, with increasing confusion, difficulty in speaking and blurred or double vision. If hypoglycemia persists, the individual may experience an epileptic seizure and/or become unconscious.

The body has a series of hormones which will act to counter-regulate the fall of blood glucose and protect the person from severe hypoglycemia. These hormones help to provide the warning signals of impending low blood glucose thus enabling the person to take corrective action. Some individuals may lose the ability to recognize that their blood glucose is becoming low, which is a serious and dangerous condition known as hypoglycemia-unawareness. The key drugs that will precipitate hypoglycemia are insulin and the insulin secretagogues (sulfonylureas and meglitinides). Hypoglycemia unawareness may also be caused by the frequent occurrence of mild hypoglycemic events and damage to the nerves (autonomic neuropathy).

Alcohol also may contribute to a sudden drop of blood glucose in the person with diabetes and may also prevent the normal recovery response of the body to hypoglycemia, causing a more severe and longer lasting hypoglycemic event to occur. Some blood pressure drugs (beta-blockers) may also prevent the person from recognizing the impending hypoglycemia.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.7– Diabetes	

APPENDIX II

FITNESS FOR DUTY ISSUES RELATED TO DIABETES

- DOES THE PERSON WITH DIABETES PRESENT AN INCREASED SAFETY RISK AS AN EMPLOYEE?

The major concern for the person with diabetes and the employer is hypoglycemia with the associated decrease in mental and physical functioning. In terms of general health, the modern aggressive approach to prevention, detection and treatment of vascular complications has considerably reduced the impact of diabetes on the affected individual.

It has become a valid argument that the person with diabetes who follows a program of regular exercise, a proper diet, correct use of medications and regular physician reviews, can be considered at less risk than the employee who may smoke, be overweight, not exercise and not receive regular assessment for the vascular risk factors such as hypertension, hyperlipidemia or even diabetes.

- EMPLOYMENT OF THE WORKER WITH DIABETES IN A SAFETY CRITICAL POSITION

A Safety Critical Position in the Canadian railway industry is one with the highest potential impact on public safety. They include those employees who operate trains or heavy on-track equipment operated as a train as well as those who control the routing of trains. As such, the occupational requirements do vary, ranging from physical work to the monitoring of a computer terminal or dispatching console.

The key concern for the worker with diabetes in a Safety Critical Position is related to maintaining a stable blood glucose. This is particularly important during times of increased exercise, when blood glucose may fall, and when there may be a delay in access to food.

People with diabetes are most at risk in the following circumstances:

- a) insulin users;
- b) users of secretagogues (sulfonylureas and meglitinides);
- c) hypoglycemia unawareness; and
- d) previous history of serious vascular concerns, e.g. coronary artery disease, retinopathy.

Each Safety Critical Position will have specific demands related to the job description. In addition, different collective agreements exist as to specific hours of work, time off and recall schedules. Generally, the running trades employee is entitled to a minimum of six hours off

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.7– Diabetes	

after completing a shift and may claim up to twenty-four hours delay before commencing the next shift.

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.7– Diabetes	

APPENDIX III

HYPOGLYCEMIA – PREVENTION STRATEGIES

Hypoglycemia is one of the most important concerns for individuals working in a Safety Critical Position. It is well recognized that the sulfonylureas (insulin stimulating drugs) are the most potent of the oral therapies in promoting hypoglycemia. Recently, new drugs have become available for the management of Type 2 diabetes: the insulin secretagogues (meglitinides) and the insulin sensitizing drugs. These drugs are further described in Appendix I.

At the discretion of the treating physician, the following recommendations regarding treatment of Type 2 diabetes could be implemented:

- a) When commencing oral drug therapies for the first time, the drugs of choice would be metformin or an insulin-sensitizing agent such as rosiglitazone or pioglitazone.
- b) If an insulin secretagogue is required, the use of meglitinides (repaglinide or nateglinide) would be preferable.
- c) If drug combinations are required, the ideal combination might include metformin/insulin sensitizing drugs/meglitinides.

Other hypoglycemic prevention strategies include any of the following:

- a) The blood glucose must be kept at a level high enough that hypoglycemia does not occur but not so high as to lead to an increased incidence rate of vascular complications
- b) The individual must have extensive knowledge regarding management of his/her own diabetes and understand the concerns of both hypoglycemia and hyperglycemia.
- c) The individual will need to establish a routine that will include regular meals and snacks. This does not preclude shift work or irregular hours.
- d) The individual must undertake regular self-glucose monitoring using a memory-equipped meter which will be done prior to meals and before reporting for duty.
- e) The individual must know how to adjust medications, particularly the use of sulfonylureas, meglitinides and insulin in accordance with meal routine and activities.
- f) Regular medical assessments must be undertaken to review glucose control, treatment, risk factor assessment and review of potential vascular complications, including retinopathy, nephropathy, hypertension and hyperlipidemia.



Section: 4

Version: 1.0

Title: RAILWAY MEDICAL GUIDELINES

Subsection 4.7– Diabetes

- g) Individuals on an insulin secretagogue (sulfonylureas and meglitinides) should be encouraged to review their therapy with their diabetes physician to determine whether it is appropriate to be transferred to an equally efficacious and safe oral agent which only rarely causes hypoglycemia (i.e. other than insulin secretagogues (sulfonylureas and meglitinides)).
- h) Supplies required at all times while working include self-monitoring equipment and a source of rapidly absorbable glucose.



Section: 4

Version: 1.0

Title: RAILWAY MEDICAL GUIDELINES

Subsection 4.7– Diabetes

APPENDIX IV

MEDICAL REPORT FOR INDIVIDUALS WITH DIABETES

EMPLOYEE INFORMATION (To be completed by employee)

Name: _____ Employee Number: _____
Address: _____
City: _____ Postal Code: _____
Tel. No. (Home): _____ Telephone No. (Work) : _____
Job Title: _____ Supervisor Name: _____
Job Location: _____

EMPLOYEE CERTIFICATE OF INFORMATION AND RELEASE FOR PHYSICIAN TO REPORT MEDICAL INFORMATION

I, the undersigned, acknowledge that the position which I hold is of a safety critical nature and that it is incumbent on me to report any medical condition that may constitute a threat to safe railway operations. I declare that the information that I have provided or will be providing to the treating physician is truthful and complete. I will report any serious new hypoglycemic episode to my physician and to the Chief Medical Officer. A significant hypoglycemic episode is defined as one which results in an impairment of alertness, judgment, senses and/or motor function, a loss of consciousness or which requires outside assistance. If I change positions, I will take a complete copy of my medical file related to diabetes with me for any further medical examination. I hereby authorize any physicians, hospital, medical clinic or other medical service provider to release to the office of the Chief Medical Officer any information concerning any medical condition that may be related to my diabetes that may constitute a threat to safe railway operations. I understand that this information will be reviewed for the purpose of making a fitness for duty determination.

Signature of Employee: _____ Date: _____

INSTRUCTIONS TO PHYSICIAN:

Physicians assessing individuals occupying a Safety Critical Position declared by Canadian Federal Regulations are responsible under the Railway Safety Act to notify the railway Chief Medical Officer if an employee has a medical condition that could be a threat to safe railway operations. This individual is a Railway employee that has been diagnosed with diabetes. You are asked to complete Part 1, Part 2 (except the 6 month treating physician submission for an individual using insulin), and the Conclusion.



Section: 4

Version: 1.0

Title: RAILWAY MEDICAL GUIDELINES

Subsection 4.7– Diabetes

PART 1 -

MEDICATIONS

Please include the name, start dose and current dose of each hypoglycemic oral medication

Name	Start Dose	Current Dose
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

For Insulin users, specify type(s) of insulin and schedule of injections

Type(s) of insulin	Schedule of injections
_____	_____
_____	_____
_____	_____
_____	_____

Any change in the number of injections in the last 6 months? Yes:___ No:___

List all other current medications:

_____	_____
_____	_____
_____	_____
_____	_____

HYPOGLYCEMIA

Is the employee familiar with the symptoms of hypoglycemia? Yes No

Does the individual recognize them at the time of an episode (warning signs)? Yes No

Can the individual explain the cause of the episode? Yes No

Is the individual capable of treating it quickly? Yes No

What type of sugar does the individual have available while at work?

Was the individual carrying that type of sugar at the time of your examination? Yes No

- Have there been episodes in the past 12 months:
- a) that have required hospitalization? Yes No
 - b) that have required an emergency visit? Yes No
 - c) that came on suddenly? (without warning signs) Yes No
 - d) that reduced concentration or readiness at work? Yes No
 - e) that have required someone else's assistance? Yes No



Section: 4

Version: 1.0

Title: RAILWAY MEDICAL GUIDELINES

Subsection 4.7– Diabetes

f) that caused a loss of consciousness? Yes No

If you answered yes to any of questions (a) to (f), please describe the episodes, dates, causes and any of the other characteristics or circumstances:

Average number of minor hypoglycemic episodes (recognized and treated by the patient) per month:

Average number of blood sugar level tests done per day and schedule:

Is patient using a memory meter that can be downloaded for further review: Yes No

If so,

using two to three week periods, are more than 10% of the results below 4 mmol/l or above 15 mmol/l?

Yes No

MEDICAL HISTORY

Is there a history, symptoms or signs of:

- a) ophthalmic disease? Yes No
b) cardiovascular disease? Yes No
c) neurological impairment? Yes No
d) renal disease? Yes No
e) other? (specify) Yes No

Comments:

PART 2 – Must be completed as part of the 12 month report by the family physician or specialist:

OTHER REQUIREMENTS

ECG: A recent resting ECG report must be appended to this report.

HbA1c: A HbA1c done within the last 3 months must be included. This result is _____ (lab normal range _____)

Vision Report: A report from the vision specialist (ophthalmologist or optometrist, who has examined the applicant within the last year) must be included. (If not included, date planned / done _____).



Section: 4

Version: 1.0

Title: RAILWAY MEDICAL GUIDELINES

Subsection 4.7– Diabetes

PHYSICAL EXAMINATION

Blood pressure: lying down _____ upright _____ HR: _____

Body System	Normal	*Abnormal	Not Examined	*If abnormal, please comment:
Retinae	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
ENT/Thyroid	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Peripheral vascular	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Cardiovascular/ carotid arteries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Respiratory	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Abdomen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Neurological	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Integumentary	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Musculoskeletal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Lymph Nodes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Genital-urinary	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Other – specify:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

	Section: 4	Version: 1.0
	Title: RAILWAY MEDICAL GUIDELINES	
	Subsection 4.7– Diabetes	

APPENDIX V

ACKNOWLEDGEMENTS

The RAC would like to acknowledge the contribution of:

Dr. Stuart A. Ross Mb ChB FRACP FRCP(C)
 Clinical Professor of Medicine
 University of Calgary

Dr Jean-François Yale, MD, CSPQ(Endo)
 Associate Professor, McGill Nutrition and Food Science Centre
 Director, Metabolic Day Centre, Royal Victoria Hospital, Montreal