

Medical Audit

Government of Newfoundland-Occupational Health & Safety Division

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ACRONYMS

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| ATS | American Thoracic Society standards |
| CNR | Cliffs Natural Resources |
| COPD | Chronic Obstructive Pulmonary Disease |
| CWP | Coal Workers' Pneumoconiosis |
| CXR | Chest X-rays |
| DLCO | Diffusing Capacity of the Lung for Carbon Monoxide |
| FVC | Forced Vital Capacity |
| FEV | Forced Expiratory Volume |
| FEF | Forced Expiratory Flow |
| GP | General Practitioner |
| ILO | International Labour Organization |
| IOCC | Iron Ore Company of Canada |
| JOSHE | Joint Occupational Safety Health & Environment |
| LWDS | Labrador West Dust Study |
| NIOSH | National Institute for Occupational Safety & Health |
| OCDRC | Occupational Chest Disease Review Committee |
| OEMAC | Occupational and Environmental Medical Association of Canada |
| OHS | Occupational Health and Safety |
| ORD | Occupational Respiratory Disease |
| PA | Posterior Anterior |
| PACS | Picture Archiving and Communication System |
| PFT | Pulmonary Function Test |
| PPD | Purified Protein Derivative |
| PHIA | Personal Health Information Act |
| PIPEDA | Personal Information Protection and Electronic Documents Act |
| RFP | Request For Proposal |
| SEG | Similar Exposure Groups |
| TB | Tuberculosis |
| TWA | Time Weighted Average |
| USW | United Steelworkers Union |
| WHSCC | Workplace Health Safety Compensation Commission |

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EXECUTIVE SUMMARY

INTRODUCTION

Medical audits identify strengths and weaknesses within workplace protocols, which serve as a benchmark to improve policy, employee training, and hazard identification. This assessment can often be achieved through thorough evaluations of occupational health & safety (OHS) program(s) and analyze whether these programs meet the current national/provincial legislation, regulations and safety guidelines.

In 2010, the Government of Newfoundland and Labrador issued an RFP for a medical audit of mining properties in response to a recommendation from the 2002 Labrador West Dust Study conducted by McMaster University. In their final report to the government McMaster University reported no new cases of silicosis, however they did recommend strengthening dust monitoring and surveillance along with various enhancements to the Newfoundland and Labrador Silica Code of Practice. The report also indicated that the true risk of silicosis from previous studies might be underestimated as silicosis rarely occurs earlier than 20 years from first exposure. The study recommended that the frequency of follow-ups should be increased and a study based on reading chest X-rays (CXR) would provide the necessary information concerning the extent of this issue. As a result, the Medical Audit - Mining Properties study was commissioned in November of 2010.

In February 2013, the project was awarded to Morneau Shepell (now Horizon Occupational Health Solutions) and consisted of four components:

- A. audit of CXRs using the International Labour Organization (ILO) Classification
- B. verification that the existing silica related health surveillance programs (i.e. CXRs, pulmonary function tests [PFT], medicals, etc.) at both IOCC and Wabush Mines (Scully) conform with established health surveillance protocols
- C. review of the existing protocols regarding the abnormal CXR hazard communication process for workers, to ensure they are given the necessary education for subsequent follow-ups
- D. development of physician, employer and employee silicosis information packages

STUDY

The first phase of the medical audit began with the recruitment of participants through the collection of names of current/former employees from the IOCC and Wabush Mines along with the recruitment of a physician with experience reviewing CXRs adhering to the ILO Classification. A variety of challenges were faced during the participant recruitment phase such as lack of updated contact information or lack of response to early recruitment campaigns. By the spring of 2015, 636 of a potential 7,106 (~9%) current and retired employees of IOCC and Wabush Mines were recruited for the medical audit. The average age of the participants was 65 years, with 502 (79%) being retired and 134 (21%) still working. Therefore, the fact that the study sample is not representative of the Labrador West mining properties current employees is an important consideration for data interpretation and a limitation to the current report. The data sampled also only represents 9% (636 of 7106) of the current/retried workforce at these work sites. All provided written consent and completed a health survey containing information related to health, work and years of dust exposure working in the mine(s). Participants also agreed to have their previously read CXR's reviewed by a Horizon consultant as part of the audit process.

During the physician recruitment phase, Horizon hired Dr. Jaan Roos, a respirologist with several years of experience working on silicosis panels and reading CXRs using the ILO Classification. The ILO Classification is a system of classifying CXRs for persons with silicosis in a systematic and reproducible manner. This ILO review method of CXRs is a different methodology from the traditional method used by radiologists. The use of this method was necessary to enable proper comparison to previous Labrador West dust studies/audits. This method is also recommended in the Newfoundland and Labrador Silica Code of Practice. The details of the ILO Classification review process for CXRs is described in the Appendix.

Without having any knowledge of exposure levels or medical history of the participants, the Horizon Medical Consultant reviewed all 636 participants CXRs and found a suspicion of silicosis in 35 (5.5%) participants and no suspicion in 601 (94.5%) participants. Thirteen of these 35 participants had self-reported silicosis on their health surveys, therefore only 22 participants were found with a new suspicion of silicosis. The Medical Consultant readings were meant for audit purposes, as all CXRs were previously reviewed and a diagnosis provided based on the medical investigations needed to confirm or rule out a diagnosis. Of note, 421 of the 502 (83.9%) retired workers had not had a recent CXR and therefore had to get one done in the audit. Eighteen of

the 22 new suspicions of silicosis were found in this group. The Consultant's findings are not diagnostic and were meant to highlight cases for further follow-up/investigation.

For confirmation of these 22 suspected silicosis cases, Horizon commissioned a third party, Independent Diagnostic Reader, Dr. Allen Kraut, to compare local radiologist findings with those of Dr. Roos. Based in Winnipeg, Dr. Kraut also has several years of experience in the mining industry. Dr. Kraut evaluated the initial CXR readings by local radiologists against those of the Horizon Medical Consultant and discovered that:

1. 12 of the 22 participants previously showed suspicion of silica exposure, but used different terminology in reporting
2. 5 participants did not previously show suspicion of silica exposure
3. the remaining 5 did not previously show suspicion of silica exposure potentially due to technical issues with CXRs

All participants received a letter indicating whether further physician follow up was recommended. While the primary objective of this audit was to explore the occurrence of silicosis through exposure to silica, any participant found with abnormalities detected in their CXR by the Horizon Medical Consultant were informed by letter and encouraged for follow up with their doctor.

The second objective of the Horizon medical audit was to review the health surveillance programs of IOCC and Wabush Mines. The purpose of this exercise was to verify whether the existing silica related health surveillance programs (i.e. CXRs, PFT, medicals, etc.) at both IOCC and Wabush Mines are/were in conformance with established health surveillance protocols (Newfoundland and Labrador Silica Code of Practice). Closely related, the third objective of the Horizon medical audit was to review the existing protocols at IOCC and Wabush Mines regarding the hazard communication process (due to abnormal CXRs) for workers, to ensure that their employees are given the necessary education for subsequent follow-ups.

For the purpose of the health surveillance program review, both mining properties provided their company health surveillance program documents to Horizon. The IOCC medical surveillance protocols were reviewed and found to be compliant with the Newfoundland and Labrador Silica Code of Practice (2006). Audit of the 60 participant medical surveillance files onsite at IOCC revealed 36 (60%) employees having retired before the current Newfoundland and Labrador Silica Code of Practice came into effect. The remaining 24 files showed that 75% had the required annual medical surveillance completed but the testing (PFT, CXR) were at intervals not always

as per the Newfoundland and Labrador Silica Code of Practice. Compliance has improved, however only since 2014 when IOCC implemented measures such as blocking the gate card for non-compliance. In regards to the hazard communication process at IOCC, these protocols are well defined in their program. The communication of abnormal results was verified during the audit of the medical surveillance files. Four files were found with abnormal CXR results and all four contained a note on file indicating that the patient was notified. Further follow up of these abnormal CXR results was not well documented in the files.

Horizon also reviewed the Wabush Mines protocols however the documents did not include a copy of the medical surveillance assessment forms. This did not allow Horizon to determine if the requirements of the Newfoundland and Labrador Silica Code of Practice were included. The Wabush Mines medical surveillance files were not onsite at Wabush Mines and were also not available for auditing. The communication of abnormal CXR results was not defined in the Wabush Mines protocols and we were unable to verify any documentation in the files. As described above, the medical surveillance documents provided by Wabush Mines did not contain sufficient detail to verify if all of the elements were compliant with the Newfoundland and Labrador Silica Code of Practice (2006). The Wabush Mines documents referred to the Newfoundland and Labrador Silica Code of Practice and the required testing schedule; however, no specifics such as history, physical forms or respiratory questionnaire were included. Furthermore, Horizon could not verify if the elements of the medical surveillance program at Wabush Mines was in practice without the ability to audit the medical surveillance files.

The fourth and final objective of the project was to develop updated silicosis information packages. These informational booklets are designed to provide educational materials to key stakeholders, which include workers, physicians and employers. The material provides necessary information in regards to silicosis as well as the Newfoundland and Labrador legislative requirements for medical surveillance and reporting of suspected silicosis or other pneumoconiosis.

RESULTS

During the completion of our first objective, the audit of CXRs, we found 5 CXR suspicious of silicosis in need of further investigation. Horizon was unable to confirm a diagnosis without the full clinical review of the participant's work and health history. It has been several decades since most of these workers have had exposure to silica and since the latency period has elapsed, we can speculate that this would now be the timeframe in which silicosis cases would begin to appear. These retired workers were also exposed prior to the Silica Code of Practice coming into effect. In objectives two and three, it was difficult to determine if IOCC was compliant due to the sample size audited, but could make some minor adjustments to their program relative to the hazard communication process. We were unable to verify if Wabush Mines was compliant with the medical surveillance and hazard communication process due to lack of documentation and access to medical surveillance files.

RECOMMENDATIONS

- Explore the potential to designate one or two radiologists with a fellowship in chest radiology to read CXRs of workers with potential silica exposure.
- Request the services of one or two respirologists as consulting specialist(s) for any suspected cases of silicosis.
- Review the Newfoundland and Labrador Silica Code of Practice to ensure the medical surveillance sections and medical forms/certificates are relevant to best practices nationally and internationally.
- Update the roles and responsibilities within the Newfoundland and Labrador Silica Code of Practice.
- Determine requirements surrounding regular reviews/audits of medical surveillance files of active employees at workplaces, including the frequency of reviews/audits and the number of files to be included in each review.
- Review health surveillance screening procedures and processes at workplaces to ensure they are clearly defined and in keeping with the requirements of the Silica Code of Practice, and those workplaces are compliant in following these procedures.
- Establish a means of support, communication and education for physicians to comply with expectations surrounding the reporting of occupational diseases in NL.
- Provide further information and data to the physician community to enhance awareness in relation to occupational illness.

- Identify communication strategies for outreach to retirees to encourage medical follow up once they leave the workplace.
- Explore the opportunity to apply medical surveillance practices to other industries that present the risk of silica exposure.
- Review the use of the ILO classification system in evaluating the CXRs of workers.

MEDICAL AUDIT - MINING PROPERTIES**BACKGROUND AND SCOPE OF STUDY**

Iron ore mining has been carried out in Labrador West by the Iron Ore Company of Canada (IOCC) and Wabush Mines since the early 1960s. Silicosis, a type of pneumoconiosis, was initially diagnosed in the mining workforce in the mid-1970s. In 1982 a study of dust conditions and health related effects by the Labrador Institute of Northern Studies discovered 45 cases of pneumoconiosis through CXR evaluation and exposure history in the Labrador West iron ore mining industry. Subsequently, these findings lead to significant enhancements in dust control measures, dust monitoring and medical surveillance. By 1984 the Newfoundland and Labrador Silica Code of Practice was introduced, and it represented the best practice model(s) to address the risks associated with silica exposure. In 1991, a 10-year follow up study was completed and this study concluded that most of the recommendations made in 1982 were implemented, but an additional audit was recommended. This audit took place in 1995 and discovered 17 new cases of pneumoconiosis. As a result, an additional 23 recommendations were made which included industrial hygiene, dust related awareness and the medical audit of CXRs. By 1999, the government agreed to a two-phase study which was conducted by McMaster University. The first phase would require the analysis of dust sampling programs, the review of the Newfoundland and Labrador Silica Code of Practice and dust sampling. The second phase required the review of recent CXRs on file. After running a two-year study, McMaster University presented their final report to the government in 2002.

No new cases of pneumoconiosis or silicosis were discovered, however the recommendations from this report were to strengthen dust monitoring and surveillance programs along with enhancements to the Newfoundland and Labrador Silica Code of Practice. The report also indicated that the true risk of silicosis and pneumoconiosis from previous studies may be underestimated as the disease rarely develops earlier than 20 years from the start of exposure. Therefore, the study recommended that due to the potential latency effect of silicosis on workers, the frequency of follow-ups should be increased and a study based on reading CXRs would provide the necessary information concerning the extent of this issue. By 2006, the Newfoundland and Labrador Silica Code of Practice was updated and enhanced as a result of recommendations from the 2002 McMaster University report. In 2009, a steering committee was formed with representatives from IOCC, Wabush Mines, the United Steel Workers Union and the OHS Branch

of the Department of Government Services. In 2010 the Government issued an RFP for a medical audit of mining properties.

Service Newfoundland's Occupational Health & Safety Division awarded the project to Morneau Shepell in February 2013. In September 2014, Horizon Occupational Health Solutions acquired the occupational health division of Morneau Shepell. Throughout the report, any references to the contractor will be referred to as Horizon.

WHAT IS SILICOSIS?

Silicosis is a work-related lung disease that can develop after many years of inhaling silica dust in the air. Many workers that have silicosis show no signs of it. Some workers become disabled but rarely will a worker die due to silicosis.

Silicosis has no cure, but exposure to silica in the workplace can be prevented. This is important, as the effects of silicosis are irreversible and often progressive. Research shows that inhaling silica dust can also increase the risk of developing lung cancer and tuberculosis.

WHO CAN DEVELOP SILICOSIS?

Crystalline silica is one of the major components of soil, rock, sand, granite, and many other minerals. Silica dust is very light and can travel long distances while remaining airborne, like smoke, for a long time. Only the particles that are less than a tenth of a millimeter (10 microns) in diameter can reach the terminal airways and cause scarring at the level of the air sacs (alveoli). Larger particles are typically cleared in healthy nonsmokers by several bronchial defense mechanisms and do not cause permanent injury.

Workers are at risk of breathing silica dust if performing any of the following tasks:

- mining
- blasting, crushing, loading, hauling, or dumping rock that contains silica
- sandblasting
- drilling, chipping and hammering rock or other material that is made of silica
- demolition, dry sweeping or using compressed air to clean materials that contain silica
- foundry work
- stone working
- ceramic manufacturing

- construction activities/demolishing buildings

HOW CAN INDIVIDUALS DEVELOP SILICOSIS?

Individuals can only develop silicosis by breathing in silica. If crystalline silica dust is inhaled, the particles in the dust become trapped in air spaces in the lungs. The particles then cause lung tissue to become inflamed.

Nodules (clumps or clusters of cells) and scars (fibrous tissue) form around the trapped silica particles. This can take 10 to 15 years to ensue and even longer for the scars to show up on X-ray. If the nodules continue growing, more scars will form making it difficult for the individual to breathe. Silicosis is irreversible.

The risk and severity of silicosis depend on:

- the amount and duration of exposure
- the size of the dust particles (particles must be small enough to reach the lungs)

WHAT ARE THE TYPES OF SILICOSIS?

There are three major types of silicosis:

Chronic silicosis –This is the most common form of silicosis. Individuals can develop it after many years of contact with low levels of silica dust in the air. It is further subdivided into simple and complicated.

Simple silicosis – Individuals with simple silicosis often have no symptoms of the disease, however small nodules will appear on the CXR. Although this may never grow more serious, long-term exposure to silica dust can lead to complicated silicosis.

Complicated silicosis – This is seen when the nodules grow larger. The first set of symptoms may be shortness of breath with exercise, wheezing, or sputum that causes coughing, although some may experience no symptoms. Severe complicated silicosis can result in heart disease with lung disease, called cor pulmonale. Complicated silicosis can lead to progressive massive fibrosis (extensive scarring of the lung).

Accelerated silicosis – This variation is similar to chronic silicosis. It results from exposure to large amounts of silica dust over a shorter period. Nodules appear on an X-ray approximately 5

years after first exposure. It forms quicker with the lungs scarring sooner, meaning the condition can worsen rapidly.

Acute silicosis – Occurs where exposures are the highest and can cause symptoms to develop within a few weeks or up to 5 years. It can develop as a result of inhaling a large amount of silica dust over a few days or months. Signs of the disease are shortness of breath, fever, cough, and weight loss. While some people with the disease can have stable health in rare occasions it can lead to death.

OBJECTIVES OUTLINED BY MCMASTER UNIVERSITY

The purpose of this consulting service was to act upon the recommendations contained in a report generated by McMaster University in 2002 by carrying out the following responsibilities.

- A. Radiologist(s) to read, interpret, and report CXR findings from a group of current and/or former employees at both IOCC and Wabush Mines. *For this portion of the medical audit a qualified respirologist was used.*
- B. Verification that the existing silica related health surveillance programs (i.e. CXRs, PFT, medicals, etc.) at both IOCC and Wabush Mines are in conformance with established health surveillance legislated protocols.
- C. Review of the existing protocols regarding the abnormal CXRs hazard communication process for workers to ensure they are given the necessary education for subsequent follow-ups.
- D. Preparation of an information package for employers, workers involved in the screening process as well as physicians responsible for assessing and treating workers with silicosis (i.e. sub-clinical vs. clinical stages).

MEDICAL AUDIT DESIGN

The project began with a series of planning meetings to confirm the execution structure of the medical audit of mining properties. During the preparatory phase, Horizon met with key stakeholders to assemble the steering committee.

Throughout the entire medical audit, regular meetings with the steering committee occurred in order to assist with the recruitment efforts of study participants and also to support the

communication to employers, employees and relevant parties. Confidentiality agreements were developed in order to obtain lists of workers from IOCC and Wabush Mines, followed by the development of an enrollment kit for interested participants.

In preparation for the review of the mining properties' policy documents related to the medical surveillance and hazard communication process related to abnormal CXR, Horizon requested the documents from the mining properties and to have these reviewed by Horizon's Medical Director. Additionally, Horizon scheduled visits to the mining properties to audit the medical surveillance files in order to assess compliance.

Information packages on silicosis were prepared for physicians, employers and employees to provide guidance on the disease. The information packages include information on silicosis, the legislated medical surveillance and the reporting requirements. Each package is tailored to define the responsibilities of the physician, employer or employee.

This section will provide an overview of the study design with additional details provided in each respective section below.

A. Audit of CXRs using the ILO Classification

The first objective of the study was to audit CXRs. This consisted of six phases: preparatory phase, recruitment, data collection, CXR review, data analysis, and communication to participants.

The preparatory phase included:

- assembling the steering committee
- confidentiality agreements with both the Wabush Mines and IOCC to subsequently develop the list of potential participants from their current and/or former employee database
- enrolment kits for participants (**Appendix A**)
- consent form (**Appendix B**)
- health survey (**Appendix C**)

The recruitment phase included:

- enrollment packages mailed to all potential participants
- recruitment of a B-Reader or physician experienced in reading CXRs using the ILO Classification, as recommended by the Newfoundland and Labrador Silica Code of

Practice, to review the CXRs of the participants (the physician recruited is referred to as the 'Consultant' throughout the report) (**Appendix D**)

- recruitment of research/statistician, Dr. Farrell Cahill, to assist with the analysis of the patient health information along with the results from the ILO Classification forms

The data collection phase included:

- creation of a database to collect and track all relevant information submitted by participants in the enrollment kits
- development of a process to obtain the CXRs and determine the physical location of review
- review of the CXRs, as per the Newfoundland and Labrador Silica Code of Practice, utilizing the ILO Classification
- consultant's review of the participants CXRs were recorded on ILO Classification forms and subsequently transferred into the database
- collection of reference materials, such as the Newfoundland and Labrador Silica Code of Practice and other materials

The communication phase included:

- periodic updates to the Steering Committee
- telephone calls to participants by Horizon when additional information was required
- letters to participants indicating whether follow up is recommended
- phone calls by Horizon's Medical Director to participants where findings indicated possibilities of abnormalities

B. Verification of the existing silica related health surveillance programs (i.e. CXRs, PFT, medicals, etc.) at both IOCC and Wabush Mines (Scully) conform with established health surveillance protocols.

The medical surveillance program documents obtained from the mining properties were collected for review. The purpose of the review was to determine if the medical surveillance programs of the mining properties were in conformance with the Newfoundland and Labrador Silica Code of Practice.

The Newfoundland and Labrador Silica Code of Practice was used as the benchmark against the medical surveillance programs from the mining properties. **(Appendix E)**

Additionally, participants were randomly selected for Horizon to review their medical surveillance files at IOCC and Wabush Mines.

C. A review of the existing protocols regarding the hazard communication process of workers with abnormal CXRs to ensure they are given the necessary education for subsequent follow-ups.

Horizon reviewed the Newfoundland and Labrador Silica Code of Practice to determine the legislative reporting requirements for abnormal CXRs. Horizon then compared the policies from the mining properties against the Newfoundland and Labrador Silica Code of Practice. The reviewer provided comments during this comparison.

D. Physician, employer, and employee information packages

Information packages were developed for physicians, employers and employees. These information packages are meant to act as a guide document to each of the respective groups that should be informed of the silica legislative requirements. The packages include information on silicosis, the medical surveillance outlined in the Newfoundland and Labrador Silica Code of Practice (2006) and the reporting of suspected or known silicosis or other pneumoconiosis.

SCOPE ITEM 1- AUDIT OF CXRs USING THE ILO CLASSIFICATION

The first objective of the medical audit was to review the CXRs using the ILO Classification to assess the occurrence of silicosis through a method that is comparable to previous studies/audits. The original study design required Horizon to attempt recruitment of 7,106 potential participants. This section of the medical audit took the most time to complete. These activities included; mailing and receiving enrollment kits, collecting signed informed consents, collecting demographic/health related information, and the acquisition/review of the CXRs. Additionally, a significant amount of time was required to find a physician with the necessary experience in completing ILO Classification reports.

A. Preparation

Assemble steering committee

The steering committee included representatives from:

- Service NL Occupational Health & Safety Division
- Horizon Occupational Health Solutions
- Iron Ore Company of Canada (IOCC)
- United Steel Workers Union (USW) 5795 (IOCC)
- Wabush Mines (Cliffs Natural Resources)
- United Steel Workers Union 6285 (Wabush Mines)

Confidentiality agreements

Confidentiality agreements were signed with IOCC and Wabush Mines to obtain the lists of their employees. All Horizon staff working on this study also signed confidentiality agreements.

Current and former employee list

Employee lists were provided by the IOCC and Wabush Mines.

- Wabush Mines: current = 365 former = 1,686
- IOCC: current = 1,365 former = 3,690
- Total: current/former = 7,106

Development of enrollment kits

- Enrollment kit included; introductory letter, consent form, respiratory health survey questionnaire, and an enrollment form which collected medical/demographic information along with work history.
- *Enrollment kits could be completed by:*
 - *current workers*
 - *former workers*
 - *next of kin to deceased workers*
- The consent/authorization allowed Horizon to collect relevant health information, including historical CXRs. *If CXRs were out of date, participants were requested to obtain updated CXR that were coordinated by Horizon.*
- Administrative support was implemented by Horizon to support the audit with a dedicated 1-800 line, fax line, and email.

B. Recruitment

Participant recruitment

- From the current/former employment lists provided by IOCC and Wabush Mines, 7,106 persons were identified. However, due to the fact that 1,017 did not have a mailing address, only 6,089 enrollment kits could be mailed to the potential participants.
- Of the 6,089 enrollment kits mailed out Horizon was able to enroll potentially 989 of the eligible persons into the medical audit.
- Medical surveys and additional consent forms were mailed to the 989 eligible participants, but only 767 medical surveys were returned.
- Of the 767, a total of 636 signed the necessary consent and had a CXR available for review (there were 53 more people who signed a consent, but did not have a CXR readily available for the audit).

Horizon Consultant recruitment

- As part of the medical audit of CXRs, Horizon recruited a qualified physician with many years of experience reading CXRs with the ILO Classification. The physician was selected after consultation with the Steering Committee.
 - Dr. Jaan Roos is a respirologist with over 17 years' experience working as a consultant in cases of silicosis. Dr. Roos was recommended by 2 members of the board of directors of Occupational & Environmental Medical Association of Canada (OEMAC). *See resume in **Appendix F**.*
- The role of the Horizon Consultant was to review the CXRs using the ILO Classification and to complete an ILO report. He also provided an advisory role in the recommendation section of the report.
- A qualified physician, Dr. Allen Kraut, was also recruited to provide an independent 3rd party analysis. Dr. Kraut reviewed the ILO reports against the original reading of the radiologist to determine if there were similarities in what was being reported.
 - Dr. Allen Kraut is an Associate Professor in the departments of Community Health Sciences and Internal Medicine, at the University of

Manitoba. Dr. Kraut performs research in the field of occupational health concentrating in occupational diseases, has an outpatient occupational medicine clinic, and teaches undergraduate, graduate and practicing physicians in the field of occupational health.

C. Data collection

- Data was collected and entered into a database to track all relevant information submitted by participants in the enrollment kits, health surveys, consent forms, and the review of CXRs by the Horizon Consultant.
- Arrangements were made with WorkplaceNL and Eastern Health to obtain access to participants' CXRs as per participants signed confidentiality agreements. *Due to unavailability of facilities for reading CXR offsite, a radiology viewing room was arranged with Eastern Health to allow the consultant to review CXRs.*
- Participants who did not have CXR's as outlined by the Newfoundland and Labrador Silica Code of Practice 2006 were requested to have updated CXR's. Horizon attempted to gather these by collecting the necessary consent:
 - consent forms obtained from participants
 - consent forms sent to WorkplaceNL to gather old CXRs
 - consent forms sent to Eastern Health to obtain access to PACS
- The Horizon Consultant's review of CXRs was completed using the ILO Classification, without any symptom or exposure history. This is the recommended methodology of reading by the Newfoundland and Labrador Silica Code of Practice and this approach is necessary for medical audits to ensure the data can be compared to previous studies/audits which utilize this method.
- The ILO Classification, which uses a standardized set of CXRs which the patients CXRs are compared against, is a different methodology than the traditional method for radiologists. *The methodology of reviewing CXRs using the ILO Classification is fully described in the appendix.*

The data analysis for the audit of CXRs using the ILO Classification reports the incidence of silicosis suspicion among participants, along with their former employer and permanent

residence. In addition, these participants' employment data were also evaluated along with the duration in years worked in a mine as well as the numbers of years since retirement. This last evaluation is important to consider because not all subjects spent the same amount of time under the same Code of Practice. Silicosis has a significant latency, often taking more than 10-20 years to become detectable.

It is important to indicate to the reader that the Horizon Consultant was not provided with the exposure history because the review of CXRs was only for audit purposes. Therefore, a diagnosis would not be made based on these reports alone. Only upon further testing/review by a physician(s), taking into account personal health and/or occupational history, can a diagnosis be made. In addition, local radiologists do not employ the ILO Classification method for reading CXRs. All CXRs were read by a local radiologist and reported back to the ordering physician.

D. Data analysis

Data was collected from participant ILO Classification CXR review by the Horizon Consultant, and whether or not suspicion of silicosis was indicated.

A total of 636 individuals (IOCC = 492, Wabush Mines = 114, Both = 30), with a signed informed consent and an ILO Classification CXR review completed, participated in this portion of the medical audit. The ILO Classification CXR review revealed that 601 of the 636 participants (94.5%) did not show a suspicion of silicosis, but 35 participants (5.5%) did show suspicions of silicosis.

Regarding these 35 (31 - IOCC, 2 - Wabush, 2 - Both) participants, details are listed below.

- Thirteen of these participants were diagnosed with silicosis **before** the medical audit began.
- The x-ray reports of the subsequent 22 suspicions of silicosis were evaluated by an Independent Consultant, Dr. Allen Kraut, to compare the CXR ILO reports by Dr. Jaan Roos against the original CXR report by the local radiologist to determine if silica related exposures had been previously reported.
 - Evidence of silica exposure was previously identified in the CXRs for 12 of the 22 participants.
 - The CXRs of 5 participants had technical factors (e.g., under inflated and over exposed x-ray film) making it difficult to interpret the result.

- The CXRs of 5 participants were not previously identified as showing suspicion of silica exposure.

(Table 1). *Dr. Allen Kraut's detailed evaluation can be found in Appendix G.*

Table 1. ILO Classification CXR Review Results

| ILO Classification CXR Review Result | Number of Participants | Detailed Information |
|--------------------------------------|------------------------|--|
| No Suspicion of Silicosis | 601 | · 86 of 601 CXRs showed suspicion of dust exposure. |
| Suspicion of Silicosis | 35 | · 13 of 35 were already diagnosed with silicosis before the medical audit began. |
| | | · 12 of 35 CXRs previously showed suspicion of silica exposure. |
| | | · 5 of 35 CXRs did not previously show suspicion of silica exposure. |
| | | · 5 of 35 CXRs did not previously show suspicion of silica exposure due to possible technical issues with CXRs |

- Currently 33 of the 35 participants, which showed suspicion of silicosis, are still living and of those, 31 currently live in Newfoundland and Labrador, of which 11 reside in Labrador.
- The average age for the participants suspicious of silicosis was 67.7 years with a minimum age of 54 years and maximum age of 81 years.
- The average year these employees began work was 1970 with an earliest employment starting in 1960 and the most recent employment starting in 1990.
- The average number of years working in the mines from this demographic was 26.6 yrs.
- Regarding retirement: 18 of the 35 individuals in this demographic retired between 2000 and 2015 with the remaining 16 employees having retired

between 1974 and 1999. Twenty eight of the 35 retired in or before 2006, before the current Silica Code of Practice. One employee is still currently working (1988 – present).

- Regarding latency: 33 of the 35 participants started work before the implementation of the 1984 Newfoundland and Labrador Silica Code of Practice enhancements. Additionally, the average percentage of years worked before 1984 was 57.3%.

Overall, 5 of the 636 medical audit participants (< 1%) were suspected of having silicosis which was not previously indicated. *However, an additional five cases must be reviewed due to technical factors which may have influenced the interpretation.* Although the results do not represent a medical diagnosis, each participant was informed of their ILO report(s) finding via a letter. In addition, those individuals which did not demonstrate a suspicion of silica exposure but demonstrated another potential abnormality were also given a letter to encourage them to follow up with their physician.

Due to the fact that exposure history, medical history, symptoms, or other demographic information was not known to the Horizon Consultant for audit purposes, the indications of silicosis are not a diagnosis. Only upon further testing/review by a physician(s), taking into account personal health and/or occupational history, can a diagnosis be made.

It must be pointed out that data is also heavily weighted toward IOCC, with 492 of the 636 participants from IOCC and 114 from the Wabush Mines along with 30 who worked at both sites. In addition, care must be taken when trying to extrapolate the findings of the current medical audit to those currently working in the Labrador West mining properties. The data above clearly shows that the study sample is much older than the current working employees where 502 of the 636 participants were already retired and the average age of the employees still currently working is 62 yrs. Of note, 421 of the 502 (83.9%) retired workers had to get a new CXR since the medical audit began (October 2013) and 18 of the 22 non-self-reported suspicions of silicosis were found in this group. Therefore, the fact that the study sample is not representative of the Labrador West mining properties current employees is an important consideration for data interpretation and a limitation to the current report. The data sampled also only represents 9% (636 of 7106) of the current/retried workforce at these work sites.

E. Communication of finding to participants

The ILO CXR reports were reviewed by Horizon's Occupational Health Physician:

1. When CXRs returned with urgent abnormal result, the Horizon Medical Director called participants and a copy of the CXR report was sent to the participant for follow up with their general practitioner (GP).
2. If the CXR was abnormal but not requiring urgent follow up a copy of the CXR report was sent to the participant for follow up with their GP. A later phone call was made by Horizon administrative staff to ensure participants received a copy of the report and understood the need to follow up with their GP.

All CXR's reviewed were previously read by a radiologist in the past with reports being sent to the ordering physician. Relative to this study, reports were sent to the participant as to the presence or absence of silicosis and/or the presence of any incidental findings which encourage surveillance.

Prior to sending letters to participants, Horizon:

- reviewed medical history on file,
- requested WHSCC claims information when required and,
- telephoned participants for additional information on new investigations or diagnosis, when required.

The results of the review of CXR by Horizon's Consultant were provided to the participants in writing. Participants were also made aware the independent review of their CXR readings was meant for audit purposes and the information in the letter does not provide a diagnosis. The letters are attached in the **Appendix H**.

F. Limitations of the audit

Recruitment of current and former employees from IOCC and Wabush Mines included approximately 7,106 employees, which resulted in a total of 636 participants with both a signed consent and a reviewed ILO report, in the CXR audit. The majority of the participants were retired and the average age was 65.

Key Considerations

- Recruiting participants proved to be very challenging. Due to the data being heavily weighted toward IOCC (77%) vs. Wabush Mines (23%) caution must be taken when attempting to extrapolate the findings to the Wabush mines
- A large percentage of the participants in the audit were retired and does not represent the current workforce. This is due to the fact that 502 of the 636 participants (79%) were already retired and the average age of the employees still currently working was 62 years. Since the study sample is not representative of the Labrador West mining properties current employee base it is an important consideration for data interpretation and a limitation to the current report.
- Access to the Picture Archiving and Communication System (PACS) to review CXRs from out of province would have been more efficient if digital CXRs were sent to the NL PACS.
- WorkplaceNL search for related claims is a manual process in which data was not easily accessible.
- In any mass surveillance program, it would be most effective to collect as much data/results as possible for review by the attending physician, or nurse. The data along with the worker should be examined together by a physician or occupational nurse experienced in occupational disease and respiratory to arrive at the best provisional diagnosis, and continued with a follow-up plan if the diagnosis remains obscure or the data is bordering normal. Reporting requirements for abnormal results should be clearly defined by the silica code of practice and additional resources should be available for consultation purposes.

SCOPE ITEM 2- VERIFICATION THAT THE EXISTING SILICA-RELATED HEALTH SURVEILLANCE PROGRAMS (i.e. CXRs, PULMONARY FUNCTION TEST [PFT], MEDICALS, ETC.) AT BOTH IOCC AND WABUSH MINES (SCULLY) CONFORM WITH ESTABLISHED HEALTH SURVEILLANCE PROTOCOLS.

A. Preparatory Phase

In preparation for the review of the health surveillance programs at IOCC and Wabush Mines, Horizon anticipated requiring access to the health surveillance program documents from both mining properties. In order to verify if health surveillance programs were put into practice, Horizon also anticipated auditing the employee's (participant's) health surveillance files.

A written consent was required to review the medical surveillance files at the mining properties. Horizon decided that the original consent signed by participants did not clearly outline the physical audit of the medical surveillance files at the mining properties. Therefore, IOCC and Wabush Mines were consulted to define the new consent form for this purpose. IOCC had a consent form, which was meant for accessing the medical surveillance files, hence that consent form was selected and used for the audit of files. A similar consent was developed for use at Wabush Mines. Participants were randomly selected and sent the consent form. Horizon obtained 60 consents from IOCC participants and 12 from Wabush Mines.

Horizon also obtained the medical surveillance policy documents from IOCC and Wabush Mines. The documents were reviewed in terms of the required medical surveillance components, as outlined in the Newfoundland and Labrador Silica Code of Practice, 2006. The Newfoundland and Labrador Silica Code of Practice, 2006, was reviewed and is summarized below.

Newfoundland and Labrador Silica Code of Practice

The present Newfoundland and Labrador Silica Code of Practice was established in 2006. As per 1.0 of the Code, "The purpose of this code of practice is to control occupational exposure to silica to levels as low as reasonably achievable to minimize the risk of occupational disease when elimination is not possible." It is intended "to provide a framework for managing silica dust in the workplace. This shall be achieved

through the implementation of an ongoing program consisting of silica hazard identification, evaluation, control, and workers surveillance.”

The code is prescriptive relative to the elements of the program, which minimally include:

- dust exposure characterization/assessment
- evaluation of exposure levels
- dust control
- dust hazard awareness training
- personal protective equipment/respiratory protection
- medical surveillance
- record keeping

Prior to the establishment of the 2006 Newfoundland and Labrador Silica Code of Practice, the surveillance rules were set in 1984 as the Code of Practice for the Prevention of Silicosis. As part of the scope of this audit, Horizon was tasked with verifying that the existing silica-related surveillance programs of IOCC and Wabush Mines conform to established health surveillance protocols. Therefore, efforts were concentrated on the sixth element of the Code - medical surveillance, which is the established protocol for the province of Newfoundland and Labrador.

The information was gathered by requesting that both companies provide their medical surveillance protocols, as well as interviews with the company health care professionals and audits of the medical surveillance files, where available.

Review of Silica Medical Surveillance Requirements as Per Newfoundland and Labrador Silica Code of Practice (2006)

The employer is required to establish and maintain a system for surveillance of the health of employees exposed to silica dust in accordance with the Newfoundland and Labrador Silica Code of Practice. The Code recommends silica surveillance for all workers exposed to silica levels > 0.025 mg/m³ 8 hrs Time Weighted Average (TWA). The employer determines through the company's silica control program which employees require silica health surveillance. The employer is required to keep a log of every employee sent for medical examination and shall not employ the worker in a silica process unless they have written notification from a medical practitioner that the employee is fit for that work.

The initial medical examination for employees includes:

- a medical history and physical examination emphasizing the respiratory system
- an occupational history

- a respiratory questionnaire
- PFT's
- CXR

The periodic medical examination for employees to be done on an annual basis includes:

- a medical history and physical examination emphasizing the respiratory system
- an updated occupational history
- a respiratory questionnaire
- pulmonary function tests
- CXR in accordance with the schedule set out in the Newfoundland and Labrador Silica Code of Practice
- skin testing for tuberculosis should be considered for all individuals with CXR evidence of silicosis (1/0 or greater under ILO Classification)

The employee is to be informed of the results of testing with an explanation of results.

The employer is to be advised of the general outcome of the surveillance and whether any remedial actions are required.

The Newfoundland and Labrador Silica Code of Practice requires that the Chief Occupational Medical Officer is advised if any adverse outcomes relative to silica exposure is found. (At this time there is no Chief Occupational Medical Officer in NL)

B. Data Collection and review

Review of IOCC medical surveillance policies

The Horizon Occupational Health Nurse visited the IOCC site on Dec 12th, 2014 meeting with the Superintendent of Medical Services & Injury Management along with the Nurse Advisor, Occupational Health Services. The Superintendent of Medical Services and Injury Management provided the IOCC medical surveillance protocols for review by Horizon, as part of the Labrador West Medical Audit.

IOCC onsite clinic staff confirmed they have completed medical surveillance for silica since the clinic has been on site. The current updated protocols were signed off in 2008, which is after the Newfoundland and Labrador Silica Code of Practice was released by the Government of Newfoundland and Labrador in 2006. A change was made from annual to less frequent CXR's based on recommendations after the Labrador West Dust Study was completed by McMaster

University in 2002. In some cases annual CXR may be required due to the number of years of exposure or clinical findings.

- every 3 years for employees with normal CXR
- every 1 to 3 years with normal CXR and greater than 20 years of exposure (at the physician's discretion)
- annually with CXR evidence of silicosis, massive exposure, or positive tuberculin test
- a CXR is recommended upon termination of employment

The Newfoundland and Labrador Silica Code of Practice 2006 requires:

- CXR frequency:
 - Every 3-5 years or at the physician's discretion assuming previous CXR was normal, and less than 20 years of exposure.
 - Every 1-3 years with normal CXR and greater than 20 years of exposure (at the physician's discretion).
 - Annually with CXR evidence of silicosis (ILO 1/0 or greater or ILO results A, B, or C large opacities), massive exposure, or positive PPD test (TB skin test).
 - A CXR shall be recommended upon termination of employment and this recommendation shall be documented in writing.

The following documents provided by IOCC were reviewed:

- **OH-E13-34** – Medical Surveillance Standard – This standard applies to medical surveillance for exposures both based on the Newfoundland and Labrador Silica Code of Practice and the Canadian Railway Safety Act. It covers employees and contractors, including pre-placement, those transferred to jobs with different exposures, as well as those employees requiring periodic examinations. The components of the testing include surveillance for silica as well as other exposures in that workforce. Copies of hygiene monitoring, similar exposure groups (SEG's), work history, and past exposures are made available. Reporting of abnormal results or trends is addressed to: the employee's manager relative to any appropriate accommodations; managers are notified of adverse trends in specific areas being reported to the employer; and, with the employee's consent, significant findings on medical assessment being communicated to the personal physician.

- **OH-E13-35** – Medical Surveillance Procedure – This procedure outlines occupational health services responsibilities. It notes the requirement of annual medical surveillance for workers in jobs with dust exposure.
- **OH-E13-38** – Newfoundland and Labrador Silica Code of Practice – This document outlines the components of the health assessment required as per the Newfoundland and Labrador Silica Code of Practice. It includes the following:
 - occupational history
 - annual respiratory questionnaire
 - annual pulmonary function/spirometry
 - CXR – 1 to 3 years
 - annual medical history and physical examination focusing on the respiratory system
 - the keeping of records for 40 years from the date the worker ceases employment with IOCC

HORIZON'S COMMENT: Note is made that the Newfoundland and Labrador Silica Code of Practice (2006) recommends CXR's every 3 to 5 years for workers with less than 20 years exposure. The Newfoundland and Labrador Silica Code of Practice recommends that records are kept in a secure place for the longer of:

- a) the period of 40 years from the time such records were first made
 - b) the period of 20 years from the time the last of such records were made
- **OH-E13-39** – Medical Surveillance CXR + CXR requisition – This document outlines the frequency of CXR's:
 - every 3 years for employees with normal CXR
 - every 1 to 3 years with normal CXR and greater than 20 years of exposure (at the physician's discretion)
 - annually with CXR evidence of silicosis, massive exposure, or positive tuberculin test
 - a CXR is recommended upon termination of employment

All abnormal results are reviewed by the IOCC physician with the individual employee; referrals are made and recommendations for follow-up given.

- **OH-B7-35** – Medical Surveillance Procedure – This procedure includes medical surveillance for other exposures besides silica. It covers annual medical surveillance, pre-hire/return to work, and termination.
 - Consents for medical assessment
 - Periodic Health Assessment – The forms include respiratory questions; questions relative to other occupational exposures; a complete history as well as a respiratory system focused history; a physical examination; PFT's, Audiogram, and CXR (if required). The form has an area to outline what referrals are needed, the concerns, and any recommendations required. This form is used for silica surveillance as well as surveillance for other exposures in the workplace.
- **OH-E13-36** – Spirometry and PFT Questionnaire – Spirometry includes the measurement of forced vital capacity (FVC), the forced expiratory volume in the first second (FEV1), and other forced expiratory flow measurement such as the FEF 25-75%.

HORIZON'S COMMENT: The Newfoundland and Labrador Silica Code of Practice recommends measurement of diffusing capacity, although that is not readily available through screening spirometry. It generally requires hospital-based pulmonary function testing.

- **IOCC New Employee Orientation** – A copy of the slides relative to silica in the New Employee Orientation Presentation was reviewed.
- **Green Card Orientation** – A copy of the slides relative to silica in the IOCC Induction: Green Card (contractors) was reviewed.
- **Health Records Archives** – Records are kept for 30 years for administrative personnel from the date the employee ceases employment with IOCC. Records for operations personnel are kept 40 years from the date the employee ceases employment with IOCC.
- **Retiree Medical Notification** – IOCC sends out a letter and CXR requisition to retirees that encourages them to continue to do annual medical surveillance. If the retiree still lives in Labrador West they can avail of the service at IOCC and if they have relocated they are encouraged to follow up with their family physician for pulmonary assessment and CXR in keeping with the Newfoundland and Labrador Silica Code of Practice.

Audit of IOCC Medical Surveillance Files

A site visit was made to IOCC on March 21-22, 2016 for the purpose of auditing medical surveillance charts of participants. IOCC provided a company-specific consent form which is used for the sharing of information on the medical surveillance files. Participants were randomly selected and sent the consent form to sign. The consents for the audit of the medical surveillance files was provided to IOCC in advance of the visit. In total, 60 charts were audited upon the site visit. Horizon also obtained the following additional information which relates to which employees receive miner's medicals done onsite at IOCC:

Miner's medicals are completed for IOCC employees and Category 1 Contractors onsite. Other categories of contractors complete their medicals with their own medical services providers.

Category 1 contractors work under the supervision of the business or functional group on a temporary contract within existing operations. In essence, this worker would be a replacement person, and includes both:

- individuals employed through a labour organization
- individuals engaged on contracts and fully integrated within existing operations which were not reported on a daily basis to a contracting company but are managed directly by IOCC staff (e.g. an office administrator or maintainer employed through a labour hire company, project managers)

Category 2 contractors are companies or individuals engaged for a discrete project, which is carried out in a designated area separate from existing operations.

Category 3 contractors are companies or individuals engaged under contract to carry out specific tasks or provide specified services within existing operations areas.

Prior to 2009, the medicals were completed by an internal physician and after 2009, the IOCC registered nurses completed the medicals under the direction of the company's occupational physician. Not all miners' medicals are reviewed by the IOCC physician; only those with any flagged concerns by the nurses. As of September 2015, there were a total of 1662 IOCC employees, 44 Category 1 Contractors, and approximately 130 students for summer intake, all of whom would require a Miners Medical which are conducted by the three IOCC registered nurses

on an annual basis. With this volume of Miner's Medicals completed each year at IOCC, it is not viable for the physician to complete the medicals or to review each one of the medicals completed by the nurses. The physician reviews all CXR reports and medicals of concern, noted by the nurses.

Spirometry is done on site using a Roxon Spirolab II and a Roxon Spirolab III, calibrated on a daily basis. The diffusing capacity, DLCO, is not measured. This test is only available at the hospital.

It was reported that their purified protein derivative (PPD) skin testing process for tuberculosis is in line with the Newfoundland and Labrador Silica Code of Practice if it is deemed necessary, following the medical history and physical examination or, upon CXR evidence of silicosis. However, upon auditing files onsite, it is noted that this test has not been documented in the charts. If required, the nurses mentioned that they would arrange through the local public health nurse.

During the audit it was noted that the medical surveillance was irregular (not annual) in frequency prior to 2000. These years of medical surveillance pre-dated the current Newfoundland and Labrador Silica Code of Practice (2006). The IOCC nurses advised there was an issue with compliance until measures were implemented at IOCC to ensure compliance. In 2014 IOCC began blocking the employee's gate card if aspects of the medical surveillance were incomplete, ie. CXR.

The current set of forms used for the miner's medical surveillance at IOCC came into effect around 2007; prior to that the occupational history is limited. The respiratory questions prior to this date were combined with the medical history rather than a separate questionnaire. Many charts had miner's medical certificates on file however, miner's medical certificates have not been completed since the nurses began the medicals in 2009.

Of the participant charts audited, 36 of 60 (60%) were retired before the Newfoundland and Labrador Silica Code of Practice came into effect in 2006. For the audit, Horizon focused mainly on the medical surveillance files of 24 (40%) participants with medicals after the current Newfoundland and Labrador Silica Code of Practice 2006. Twenty-four of the files audited were of participants who were actively undergoing medical

surveillance after the new Newfoundland and Labrador Silica Code of Practice (2006) came into effect. Relative to the frequency of medical surveillance in the 24 employee charts applicable after 2006: 18 of 24 files (75%) had annual medical surveillance, 3 had medical surveillance every 1-3 years, 2 participants had medical surveillance at irregular intervals, and 1 employee (who retired in 2011) did not have any medicals on file, only CXR from early years.

In all files audited, an occupational history was documented, but in years prior to 2006, the occupational history may have been limited to job title and number of years worked at the mine. A respiratory questionnaire or questions were included in the medical in 20 of 24 charts. The Silica Code of Practice requires pulmonary function tests (PFT) to be completed annually; in the files audited, 14 of 24 had annual PFT on file, and the remainder of the participants had a PFT completed at irregular intervals. CXRs were completed at the required interval as per the Code in 20 of 24 participants. Four of the remaining participants had CXR completed at irregular intervals. The communication of abnormal results was verified in the audit of the medical surveillance files, which showed four files with abnormal CXR results that had a note on file noting the patient was notified. Further follow up of these abnormal CXR results was not well documented in the files. There was no evidence on file that a copy of the report (i.e. CXR) was given to the employee to follow up with the GP.

Review of Cliff's Natural Resources- Wabush Mines Medical Surveillance Policies

Cliff's Natural Resources is the company that operated the mine at Wabush Mines or otherwise known as Scully Mine. The medical surveillance documents provided by Wabush Mines were reviewed:

- Cliffs Medical Surveillance **WKP-IH-003** – Medical Surveillance – This document reviews the Cliffs Industrial Hygiene Standard for Medical Surveillance for North American Operations. It is a two page document outlining the scope, responsibilities, and the components of site specific programs. The site-specific programs contain the following headings: Job Classifications Medical Surveillance Methods; Pre-Employment Exams and Post Absence Exams; CXR Procedure; Mandatory Physical Exams; Physical Exam at Employment Termination; Medical Evaluation Interpretation, and Employee Exposure/Workplace Monitoring.

- Wabush Mines/Scully Mines Respirable Dust Control Program – *the objective of this program is to ensure all employees are aware of potential respirable dust hazards and understand the actions that are required to be taken to protect themselves and their coworkers.* This program includes:
 1. Medical Surveillance – All employees must complete a physical examination and CXR prior to employment. While employed at Wabush Mines, a follow up physical examination and CXR shall be conducted at twelve month intervals or as prescribed by the Newfoundland and Labrador Silica Code of Practice. Employees' Miner's Medical Certificates will be maintained in the employee file by the first aid attendant. This individual will also notify the employee of the time for the annual medical and CXR.
 2. Engineering Controls
 3. Respirable Dust Monitoring
 4. Respiratory Equipment – The sampling program is used to determine the level of respiratory protection required by each employee in all work areas. The first aid attendant determines the level of respiratory protection required by each employee for all work areas and conducts respirator fit testing for each employee on an annual basis.
 5. Record Keeping – This refers to the location of stored records however, does not refer to the length of time they will be kept.
 6. Worker Education – All workers shall be trained in the properties of silica dust and how it may affect their health. This is accomplished using a computer based training program. Workers will also be trained in respiratory protection. The training department is responsible for maintaining a record of the name and date of training for all employees in the program.
- Cliffs Respiratory Protection Program – The objective of this program is to prevent respirable exposures when engineering and work practice controls are not feasible. The document defines roles and responsibilities; hazard assessment; respiratory protection equipment; respirator selection; respirator fit testing; respirator training; respirator use; cleaning inspection, maintenance, and storage of respirators; health surveillance of respirator users; program evaluation; record keeping; and applicable forms. It was last revised on June

14th, 2013. Relative to “Health Surveillance of Respirator Users”, it states that the attending physician will determine whether or not an employee can wear a respirator without physical or psychological risk.

HORIZON'S COMMENTS: A copy of the initial and periodic health assessment was not provided, therefore from review of the protocols provided by Wabush Mines, it is not possible to determine whether the components of 9(4), page 11 of the Code, the Initial Health Assessments and 9(5), page 12, Periodic Health Assessments were included in the annual assessment. It was also not possible to determine if a respiratory questionnaire is included in the pre-placement and periodic assessments. Consequently, Horizon is unable to verify if the medical surveillance program at Wabush Mines is compliant with the Newfoundland and Labrador Silica Code of Practice (2006).

Audit of Wabush Mines Medical Surveillance Files

Wabush Mines is no longer operating. The medical files are kept in the office of the former company physician and were not available for auditing by Horizon.

On Dec 11th, 2014 the Horizon's Occupational Health Nurse (OHN), met with the Wabush Mines Nurse, at which time the nurse was in the process of completing exit medicals on the former Wabush Mines employees. There were no medical surveillance files on site to review but the nurse provided some detail around the exit medicals performed due to the mine closure.

In December 2014, Horizon's Medical Director made attempts regarding access to the miner medicals for Wabush Mine employees with no success.

In Jan 2015, Horizon recruited an independent physician, Dr. Stephen Crummey, to help facilitate access to miner medicals for Wabush Mine employees for the medical audit. However, these efforts were unsuccessful.

On August 13th, 2015 the Horizon's occupational health nurse visited Wabush Mines and met with the Section Manager, Safety & Training Mining Operations, who escorted her for an onsite visit. Only two employees remained onsite at Wabush Mines at that time.

The Section Manager, Safety & Training Mining Operations, also provided information that is a pertinent component of the miner's medical:

- The spirometry unit at Wabush Mines is a Medical International Research (MIR) / Spirolab 111, with color liquid crystal display (LCD).
- All employees, regardless of their occupation, were required to have an annual medical done which included a PFT, CXR, eyes & ears exam. Screening tests were completed prior to the company physician meeting with them.
- Persons retiring could also avail of this process.
- The company physician handled the follow up of CXR results.

As described above, the medical surveillance documents provided by Wabush Mines were not of sufficient detail to verify whether all of the elements were compliant with the Newfoundland and Labrador Silica Code of Practice (2006). The Wabush Mines documents referred to the Newfoundland and Labrador Silica Code of Practice and schedule but the specifics, such as history, physical and respiratory questionnaires, were not included. Horizon could also not verify if the elements of the medical surveillance program at Wabush Mines were put into practice without auditing the medical surveillance files.

SCOPE ITEM 3- A REVIEW OF THE EXISTING PROTOCOLS REGARDING THE HAZARD COMMUNICATION PROCESS, DUE TO ABNORMAL CXRs, FOR WORKERS TO ENSURE THEY ARE ALL BEING GIVEN THE NECESSARY INFORMATION FOR SUBSEQUENT FOLLOW-UPS.

A. Preparatory phase

In preparation for the review of existing protocols regarding the hazard communication process due to abnormal CXR, Horizon prepared to review the health surveillance programs of both mining properties. Additionally, to verify if any existing protocols by the mining companies were put into practice, an audit of the medical surveillance files of participants would be required.

Review and summary of Newfoundland and Labrador Silica Code of Practice, 2006

The Newfoundland and Labrador Silica Code of Practice (2006) requires that the results of health surveillance be communicated to the employee. In the case of employees with abnormal results the physician "consults with employees where necessary about the results of an employee's

health surveillance and advises on any explanation and treatment, preventive measures or rehabilitation”. Based on the surveillance results, the physician determines whether “a trend is significant and whether this indicates an unacceptable level of exposure to silica”. If remedial action is required the employer is notified, while maintaining the employee’s medical confidentiality.

The Silica Code of Practice indicates that the Chief Occupational Medical Officer, Government of NL, must be made aware of any adverse effects arising from silica exposure as per the OHS Act/Regulations and WorkplaceNL Act/Regulations. As the province does not have a Chief medical examiner, the physician should instead report to WorkplaceNL and the Occupational Health and Safety Branch of Service NL.

Silica Code of Practice, 2006: Medical Surveillance

9. (6.) 8. 8) The Physician’s responsibilities shall include but not be limited to:

- notify the Division’s Chief Occupational Medical Officer of any adverse effect arising from silica exposure as required under the OHS Act/Regulations and WHSCC Act/Regulations.

B. Data collection and review

Review of IOCC Health Surveillance Policies / Procedures Regarding Abnormal CXRs

The following documents provided by IOCC were reviewed for follow-up:

- **OH-E13-34** – Medical Surveillance Standard – Reporting is addressed relative to any appropriate restrictions or adverse trends in specific areas being reported to the employer, and, with the employee’s consent, significant findings on medical assessment being communicated to the personal physician.
- **OH-E13-38** – Newfoundland and Labrador Silica Code of Practice – This three page document provides an overview of the medical surveillance in accordance with the Newfoundland and Labrador Silica Code of Practice. Reference is made to responsibilities and the documents used in reference to carrying out the requirements of the Code.
- **OH-E13-39** – Medical Surveillance CXR – All abnormal results are reviewed by the IOCC physician with the individual employee; referrals are made and recommendations for follow-up given.

- **OH-B7-37**– Medical Surveillance Testing – This is a two page document outlining the purpose, process, accountabilities, and references. The scope, definitions, and supporting documentation sections do not have any information. It appears as a general surveillance document given audiometry is included. It does mention the medical surveillance database with information related to notices, medicals completed and CXR information; this is important relative to tracking surveillance information over time.
- Health Records Archives – This is a two page document that speaks to storage of records and record retention. Records are kept for 30 years for administrative personnel from the date the employee ceases employment and 40 years for operations personnel from the date the employee ceases employment.

HORIZON'S COMMENT: This is a higher standard than the requirements of the Newfoundland and Labrador Silica Code of Practice.

IOCC Mine Orientation: Included slides on personal protective equipment (PPE) requirements; light vehicle driving policy; Rio Tinto Health & Safety Practices; Respiratory Equipment; Respiratory Protection focus; Silica Dust; Silica Hazard.

Green Card Induction: Included slides on PPE/Respiratory Protection; Silica Dust; Silica Hazards; Silica Video & Discussion; Other types of contaminants; Facial hair guideline.

These documents provide the employees with very relevant information on the hazards of silica and the expected PPE to be worn.

During the audit of medical surveillance files at IOCC, 4 of 24 files with abnormal CXR had notes documenting the communication to the worker. It is evident in the files that employees were notified of abnormal results however, there is little documentation to suggest that any follow up was completed by the employee. There was no evidence on file that a copy of the report (i.e. CXR) was given to the employee to follow up with their GP.

Review of Wabush Mines Health Surveillance Policies / Procedures Regarding to Abnormal CXRs

The documents supplied to us did not have a procedure for the follow-up of abnormal CXRs.

No documentation relative to follow up of abnormal CXR was provided by Wabush Mines and Horizon was unable to audit the files to determine if this was documented in the files.

SCOPE ITEM 4- PHYSICIAN, EMPLOYER, AND EMPLOYEE INFORMATION PACKAGES

Information packages have been developed for employees, employers and physicians.

The **physician's information packages** were developed to provide information to physicians as to the types of occupations associated with silica-related diseases, the components of medical surveillance for workers exposed to silica as per the Newfoundland and Labrador Silica Code of Practice (2006), the types of diseases related to silica exposure, as well as the diagnosis and management. References are included should the physician requires further information. **(Appendix I)**

The **employee information packages** were developed to provide the worker with information on the effects of silica dust exposure, to emphasize prevention and surveillance, to give clinical information relative to the symptoms, diagnosis, and treatment of silicosis, as well as to note the importance of employer notification relative to any accommodations necessary, and reporting to WorkplaceNL. **(Appendix J)**

The **employer's information packages** were developed to assist employers identify workers who require medical surveillance and their obligations under the Newfoundland and Labrador Silica Code of Practice. **(Appendix K)**

RECOMMENDATIONS

- Explore the potential to designate one or two radiologists with a fellowship in chest radiology to read CXRs of workers with potential silica exposure.
- Request the services of one or two respirologists as consulting specialist(s) for any suspected cases of silicosis.
- Review the Newfoundland and Labrador Silica Code of Practice to ensure the medical surveillance sections and medical forms/certificates are relevant to best practices nationally and internationally.
- Update the roles and responsibilities within the Newfoundland and Labrador Silica Code of Practice.
- Determine requirements surrounding regular reviews/audits of medical surveillance files of active employees at workplaces, including the frequency of reviews/audits and the number of files to be included in each review.
- Review health surveillance screening procedures and processes at workplaces to ensure they are clearly defined and in keeping with the requirements of the Silica Code of Practice, and those workplaces are compliant in following these procedures.
- Establish a means of support, communication and education for physicians to comply with expectations surrounding the reporting of occupational diseases in NL.
- Provide further information and data to the physician community to enhance awareness in relation to occupational illness.
- Identify communication strategies for outreach to retirees to encourage medical follow up once they leave the workplace.
- Explore the opportunity to apply medical surveillance practices to other industries that present the risk of silica exposure.
- Review the use of the ILO classification system in evaluating the CXRs of workers.

REFERENCES

1. "Crystalline Silica Exposure" Health Hazard Information for General Industry Employees, OSHA Publications 3176, 2002 (revised)
2. The Dangers of Breathing Silica Dust, WorkSafe BC, Bulletin WS 2009-04
3. Health Effects: Silica on Construction Projects, Ontario Ministry of Labour, April 2011
4. Safe Work Australia, Crystalline Silica – Baseline Health Monitoring Before Starting Work in a Crystalline Silica Process
5. Bastarache, Edouard. Silicosis and Screening. Taken from Digitalfire Hazards Database
6. Health Surveillance in Silica Exposed Workers. Health and Safety Laboratory for the Health and safety Executive 2010 Research report RR827. Available from Her Majesty's Stationary Office, Norwich, Great Britain
7. Alvarez FA, Gonzalez CM, Martinez AQ, Perez JJB, Fernandez LC, and Fernandez AP: Guidelines for the Diagnosis and Monitoring of Silicosis. Archives of Bronchology 2015; 51 (2): pp 86-93.
8. Occupational Health & Safety Newfoundland and Labrador, Occupational Health and Safety Act- Silica Code of Practice: Sept 30, 2006.

APPENDIX

- A. Enrolment forms
- B. Consent form
- C. Health surveillance forms
- D. ILO Classification
- E. Newfoundland and Labrador Silica Code of Practice
- F. Dr. Roos' Resume
- G. Dr. Kraut's Report
- H. Letters to participants
- I. Physician Brochure
- J. Employee Brochure
- K. Employer Brochure
- L. Horizon flowchart for Miner's medicals
- M. Miner's Medical Surveillance Certificate