CANADA LABOUR CODE
PART II
OCCUPATIONAL HEALTH AND SAFETY

International Longshore & Warehouse Union (ILWU)
applicant

and

Pacific Coast Terminals Co. Ltd.
respondent

and

Todd Campbell

health and safety officer

Decision No 02-016
July 30, 2002

Appeals officer Doug Malanka heard this case in Vancouver, British Columbia on December 3, 2001.

Appearances

Mr. Albert LeMonnier, ILWU, Local 500, representing Pacific Coast Terminals Co. Ltd. employees.
Mr. Thomas A. Roper, Q.C., representing Pacific Coast Terminals Co. Ltd.

[1] On May 28, 2001, Mr. Tony Coccia, Rotary Dumper (Dumper) Operator at Pacific Coast Terminal Co. Ltd. (PCT), began his shift at approximately 8:00 a.m. The building from which the Dumper is operated is located approximately 120 feet east of the Dumper. At approximately 8:30 a.m., Mr. Bill Hansen, an electrician at PCT, advised Mr. Coccia by two-way radio that smoke was emanating from the Scrubber stack of the Dumper and instructed him to cease dumping operations until the incident was investigated. At the time, Mr. Coccia had just dumped the second rail car in the unit train of sulphur.

[2] At approximately 9:30 a.m. Mr. Jim Cockburn, Operations Foreman, advised Mr. Coccia to resume dumping operations despite the fact that the cause of the smoke had not been determined. Mr. Coccia resumed operations for a short while, but at approximately 10:30 a.m., informed Mr. Cockburn that he refused to work because the cause of the smoke had not been determined and he feared that another event would occur.

[3] By way of background, it happens that PCT employees, Messrs. Kevin Freistad and David Morrow, previously refused to work on September 12, 2000 because PCT had just discontinued a longstanding practice at PCT of inspecting rail cars loaded with sulphur before the cars entered the Dumper to be overturned and emptied. The employees complained that, without the inspection and removal of loose rail car parts or metal debris from the rail cars prior to entering the Dumper, metal could fall from the rail cars and cause a spark that could ignite a sulphur dust explosion. The refusals to work were investigated by health and safety officer Martin Davey who decided, following his investigation, that a danger existed for the employees. Officer Davey issued a direction which read:

IN THE MATTER OF THE *CANADA LABOUR Code*
PART II - OCCUPATIONAL HEALTH AND SAFETY

DIRECTION TO EMPLOYER UNDER SUBSECTION 145(2)(*a*)

On September 12th, 2000 the undersigned safety officer conducted an inquiry following the refusal to work made by Kevin J. Freistadt and David Morrow in the work place operated by PACIFIC COAST TERMINALS CO. LTD., being an employer subject to the *Canada Labour Code*, Part II, at FOOT OF MURRAY STREET, P.O. BOX 37, PORT MOODY, B.C., the said work place being sometimes known as PCT.

The said safety officer considers that a condition in any place constitutes a danger to an employee while at work:

On September 12, 2000 Pacific Coast Terminals removed the job function of the individuals who inspected rail cars and collected debris that could be an ignition source in the dumper. This job was normally performed before the rail cars entered the rotary dumper.

An explosion in this building could be catastrophic. It is likely that dust conditions in a part of the rotary dumper building could be within the explosive limits of that material at some point during the dumping operation and this building, therefore, meets the

definition of "fire hazard area". It is reasonable to expect that all sources of ignition be kept out of the building during dumping operations and that, in fact, this is required. The sources of ignition in question are metals and other materials or loose rail car components found on rail cars that may enter the dumper building during the indexing and rotary operation. See the accompanying investigation report.

I accept the refusals of Mr. Morrow and Mr. Freistadt as being correct and find that operating the dumper without ensuring potential ignition sources, such as metal debris or loose metal rail car components, are removed from the rail cars thus allowing these potential ignition sources into the dumper building during dumping operations is a condition that constitutes a danger to the employee.

Canada Labour Code

124
125(*a*)(*o*)(*p*)(*s*)(*t*)(*u*)

125.1(*a*)(*b*)

Canadian Occupational Health and Safety Regulation:

2.1
2.l2(2)
10.8
10.9
17.11(1)

Therefore, you are HEREBY DIRECTED, pursuant to paragraph 145(2)(*a*) of the *Canada Labour Code*, Part II to protect any person from danger immediately.

Issued at Surrey, this 26th day of September 2000.

Martin W. Davey
Safety Officer
BC5841

To: PACIFIC COAST TERMINALS CO. LTD.
PACIFIC COAST TERMINALS CO. LTD.
FOOT OF MURRAY STREET
P.O. BOX 37
PORT MOODY, B.C.
V3H 3E1

[4] PCT appealed the direction and a review of the direction was held on December 14, 2000. As the Regional Safety Officer (RSO) who reviewed PCT's appeal, I decided that a danger did not exist, and rescinded the direction. The decision is identified as RSO Decision No. 01-010, April 10, 2001, and the following extracts are from the decision:

PCT forwarded a copy of all of its Reports to Dr. P.D. Clark, Director, Alberta Sulphur Research Ltd. for comment. He concurred with the conclusions of Protection Engineering Inc. and Genesis Engineering Inc. that the risk of a sulphur dust explosion

> is essentially non-existent. He also confirmed that the two sulphur dust studies conducted at PCT show that the dust levels are well below the limits which could cause a sulphur dust explosion either by spark or by hot ignition source.
>
> Based on the studies and reviews presented, and in the absence of facts to the contrary, I must conclude for the types of sulphur handled at PCT when British Columbia Research Corporation and the B.C. Research Inc. conducted their sulphur dust studies, that the design, construction and operation of the Dumper is capable of maintaining the concentration of sulphur dust in the Dumper below the LEL for sulphur, and of preventing a source of ignition in the Dumper from igniting the sulphur dust. This, of course, applies only as long as the dust suppression and dust collection systems in the Dumper are maintained and operated properly. It is also contingent on dust accumulations being washed down before they can accumulate and create a hazard, and surfactant being sprayed onto the sulphur on the conveyor belt below the Dumper.
>
> I additionally find that a danger of explosion of sulphur dust did not exist at the time of the investigation of the refusals to work by safety officer Davey. I conclude this because there was no evidence that the concentration of sulphur dust present in the Dumper at the time of the safety officer investigation exceeded the LEL for sulphur. In addition, there was no evidence that the dust suppression or dust collection systems were not operating properly at the time of the investigation. Moreover, there was nothing to show that the surfactant was not being sprayed on the sulphur below on the conveyor belt or that there were accumulations of sulphur dust in the Dumper.

[5] In this case, Mr. Todd Campbell, a health and safety officer at Human Resources Development Canada investigated Mr. Coccia's continued refusal to work. Mr. Coccia opined that to be sure that the work was safe, he needed the following assurances:

- The Dumper building and systems were operating as designed;
- The sides/platforms of the rail cars are checked for loose metal parts;
- There were no more "bad ordered" rail cars; and,
- The insides of the rail cars would be checked for rocks or metal parts

[6] Following his investigation, health and safety officer Campbell decided that a danger under the Code did not exist. He provided written notice of his decision to Mr. Coccia, Mr. James Gibney, Manager Operations, PCT, and Mr. Glen Bolkowy, Business Agent, International Longshore and Warehouse Union (ILWU), Local 500, on May 29, 2001. Copy included.

[7] On June 7, 2001, Mr. Barry Washburn requested, pursuant to subsection 129.(7) of the *Canada Labour Code*, Part II (hereto referred to as the Code or Part II), that an Appeals Officer review health and safety officer Campbell's decision pursuant to subsection 146.1(1) of the Code. A hearing was held in Vancouver, British Columbia on December 3, 2001.

[8] Health and safety officer Campbell submitted a copy of his investigation report concerning the matter and testified at the hearing. His report and testimony will not be repeated here in totality but remains part of the file. I retain the following from his testimony and his report.

[9] Mr. Hansen told health and safety officer Campbell that he saw a column of smoke rise 20 to 30 feet into the air from the Scrubber stack of the Dumper building and also saw smoke issuing from the west end of the building. He did not hear any explosion. When he went to the Dumper to investigate the event, he observed Mr. Cockburn in the Dumper opening the hatch covers over the plenum. Smoke was issuing out of both the east and west hatch covers when they were lifted.

[10] Health and safety officer Campbell reviewed a 30-second time-lapse videotape from an externally mounted PCT video camera facing the west side of the Dumper building. The video recorded what appeared to be steam or smoke coming out of the Scrubber stack at 8:37 a.m.. This corresponded to the time when the second rail car was in the Dumper. At 08:38 a.m., a small amount of plume could still be seen on the video. Officer Campbell concluded from the video evidence that an airborne substance issued from the Scrubber stack of the Dumper for approximately 30 to 60 seconds.

[11] Health and safety officer Campbell learned from Mr. Dale Corrigal that he, Mr. Cockburn and Mr. Russ Ladd went into the Dumper to investigate the event. Mr. Corrigal stated that he checked the machinery in the Dumper for signs of overheating and found nothing. He stated that there was no sign of smoke, of burned sulphur dust or smoldering sulphur. He observed some sulphur and water behind the plenum, but found nothing to indicate that a fire or explosion had occurred.

[12] Mr. Corrigal *et al* then inspected the two rail cars that had been dumped prior to the event. On both rail cars, some front brake shoes located on the north side of the car on the front truck of wheels were completely worn away and the metal backing appeared to be in contact with the metal tread of the wheel. On the first car, there was some evidence that metal had been melted some time in the past.

[13] Mr. Gibney reminded health and safety officer Campbell of RSO Decision No. 01-010, dated April 10, 2001 and provided officer Campbell with a copy of the decision and with a copy of the engineering reports considered at that time. Relative to the refusal to work by Mr. Coccia, Mr. Gibney confirmed that the Dumper and associated safety features were all working properly at the time of the event at the Dumper. He added that the rail cars had sat for approximately 60 to 90 minutes prior to entering the Dumper. He postulated that, if any brake parts had heated in transit, the heat would have dissipated. In this regard, Mr. Bill Dutton, supervisor with Canadian National Railways, told health and safety officer Campbell that any faulty brakes on the hopper cars would have been disconnected until they were repaired so that they did not cause overheating of the brakes. In effect, there were no "bad ordered" rail cars in the unit train of sulphur.

[14] Health and safety officer Campbell testified that he relied heavily on the engineering reports referred to in RSO Decision No. 01-010, April 10, 2001 and the decision itself for deciding whether a risk of a sulphur dust explosion in the PCT Dumper constituted a danger for

employees. He noted that the event that occurred the morning of May 28, 2001 appeared to contradict the conclusions of the aforementioned reports. However, he postulated that this depends on whether or not containing or extinguishing a "flash" or explosion at its early stages is the same as saying that the dumping operation does not present an explosion hazard. Nonetheless, health and safety officer Campbell concluded that a danger did not exist.

[15] Prior to the hearing, Mr. LeMonnier submitted, as evidence, opinion letters from Dr. Kay Teschke, Ph.D., CIH, ROH, Professor and Director, Public, Environmental and Occupational Health Faculty Associate, School of Occupational and Environmental Hygiene, University of British Columbia, and Dr. Joel Bert, Ph.D., P. Eng., Professor, Department of Chemical & Biological Engineering, University of British Columbia regarding the engineering reports that PCT relied upon for confirming the safe operation of their Dumper. I retain the following from their documents.

[16] ILWU asked Dr. Teschke if the values given in the BC Research study for sulphur ignition and explosion were correct. ILWU also asked her if the methods and frequency of testing reported in the report are adequate to provide an accurate picture of the sulphur dust environment in the Dumper taking into account the various weathers and types of sulphur handled during the period of one year.

[17] Dr. Teschke wrote to ILWU on September 3, 2001 and advised them that she was not qualified to respond to their first question regarding the values given for sulphur ignition and explosion. She referred Mr. LeMonnier to Dr. Bert for this.

[18] With regard to the second question regarding the sampling strategy and measuring methods to provide an accurate picture of the sulphur dust environment in the Dumper, Dr. Teschke expressed concern with the 15-minute average sulphur dust concentration for estimating the maximum sulphur dust concentration present during the dumping process, and with the monitoring methods. I retain the following excerpts from Dr. Teschke's September 3, 2001 letter of reply:

- "…The appropriate averaging time should be based on the time an explosive concentration must be maintained in order to allow a spark to ignite it. An expert in dust fires and explosions should be able to guide Pacific Coast about this duration To prevent an acute event, the sampling duration must be shorter than the duration required for the hazardous event to occur."
- "…Given the typical ranges of environmental variability experienced in workplaces, the evidence suggests that there is a non-trivial probability that ignitable concentrations could be achieved in this work site. This indicates that continuous monitoring of the dust concentrations is warranted, with an alarm system attached."
- "…A remaining question is where to monitor."

- …A measurement method must also be selected. There are a number of "real time" (i.e., short response time) instruments available for measuring particulate levels. Whether their response time is quick enough would need to be determined." "…Another consideration is whether water droplets and other aerosols would need to be distinguished from sulphur dust to prevent too numerous false alarms."

[19] Dr. Teschke later wrote to ILWU on November 26, 2001. Her letter responded to comments that Genesis Engineering Inc. had made regarding her September 3, 2001 letter to ILWU. In this letter, Dr. Teschke confirmed:

- "…In their letter, Protection Engineering describe in detail the controls which are in place at Pacific Coast Terminals. They appear to suggest that the controls are so extensive that air monitoring need not be done. This is a question for a fire and explosion expert."
- "…Both Protection Engineering and BC Research indicate that ongoing short-term monitoring is not feasible."

[20] ILWU asked Dr. Bert to review the following documents and to comment on their scientific merit and on the potential for sulphur explosion. The documents reviewed by Dr. Bert included:

- Report on Human Resources Development Canada Direction to Pacific Coast Terminals Co. Ltd., prepared for PCT, Port Moody, B.C. by Protection Engineering Inc., Vancouver, B.C., dated November 22, 2000.
- An Analysis of the Explosion Hazard During Sulphur Dumping at Pacific Coast Terminals prepared for Pacific Coast Terminals, by Genesis Engineering Inc., dated November 24, 2000.
- Pacific Coast Terminal Sulphur Dust Study June-July, 2000, prepared for Pacific Coast Terminals by BC Research Inc. Vancouver, B.C., dated August 14, 2000.
- Pin and Wedge Practices, prepared for Pacific Coast Terminals by Dr. P.D. Clark, Alberta Sulphur Research Ltd., Calgary, Alberta, dated December 11, 2000.

[21] Following his review of the documents, Dr. Bert disagreed with the conclusion reached by Protection Engineering and Genesis Engineering Inc. because they used the 15-minute average sulphur dust concentration measured by BC Research for estimating the maximum sulphur dust concentration present during the dumping process. He also questioned whether the monitoring locations include all representative areas such as the ends of the rail car where the ventilation and water sprayers may be less effective, and the fact that only two sets of samples were taken. I retain the following excerpts from Dr. Bert's replied to ILWU on September 17, 2001.

- "…One can reasonably expect that the sulphur dust concentrations during and immediately following dumping will be **much higher** than a 15-minute average concentration."
- "…Use of the 15-minute average sulphur dust concentration is simply inappropriate when assessing the potential for explosion (which can occur essentially instantaneously) in the PCT facility. On page 2, of the Genesis Engineering Inc. report, mention is made of the possibility (I would say "certainty") of instantaneously higher concentrations of sulphur dust compared to the 15-minute average concentrations as reported by BC Research." "…Brief periods of time may exist during which all the conditions required for an explosion (including sulphur dust concentrations between the lower and upper explosive limits.) may exist."

- "…Moreover, it is not clear to me that the most relevant areas for dust analysis have been monitored. Perhaps, due to the interference with dumpling, the concentration of sulphur dust in the immediate vicinity of the grate (which could possible be involved with fugitive spark generation resulting from mechanical impacts with debris or loose metal objects) has not been monitored. It is unclear to me that the locations that have been monitored include all representative areas related to the rail car; that is, the ends of the cars (where perhaps the ventilation and water spray may not act as effectively in controlling the dust as in the center of the car), as well as the middle of the car."
- "…two sets of samples can hardly be considered to be statistically relevant."

[22] Dr. Bert wrote again to ILWU on November 27, 2001 to respond to comments that Genesis Engineering Inc., Protection Engineering and BC Research had made on October 5, October 10 and 11, 2001 respectively, regarding his September 17, 2001 letter to ILWU. Specifically, ILWU had asked Dr. Bert to comment on the validity of computer models and on the use of water sprays for explosion control of sulphur dust particles. I retain the following from Dr. Bert's reply regarding the validity of computer models to estimate the maximum concentration of sulphur dust in the Dumper during the dumping procedure:

- "… Moreover, it is highly unlikely that Genesis Engineering Inc. as part of their computer modelling used all of the specific relevant information characteristic of the sulphur dumping facility at Port Moody. In particular, one can expect a complex flow pattern for both the sulphur particles and for the air in which these particles are entrained in the dumper facility (particularly in the chute and the hopper.)"
- "…In their response letter of 5 October 2001, Genesis Engineering Inc. supplies some information about the computer model that they used to predict dust concentration levels. The model they present corresponds to a simplistic ventilation model involving a pulse of dust concentration in a well-mixed and ventilated vessel. Several assumptions concerning this physical description of the dumping process remain questionable." "…Not only will the physical act of dumping sulphur create dust, but collision of sulphur particles with solid surfaces (grates, metallic walls, etc.) will also result in evolution of dust. The complex and highly turbulent air flow fields that Genesis Engineering Inc. alludes to in the dumper also have the ability to re-entrain sulphur dust particles, thereby creating even more dust. It may be difficult to assess the importance of these phenomena, but ignoring them is certainly inappropriate."
- "…Perhaps the most significant shortcoming in the description of their model is the lack of evidence for the "Maximum Dust Concentration During Dumping" (see Figure 1 in their report of 5 October 2001). This critical parameter is used as a value of the concentration during the dust pulse created during dumping."
- "…Essentially, the model presented by Genesis Engineering Inc. in their response of 5 October 2001 remains untested and invalidated and uses critical parameter (eg. maximum dust concentration during dumping) without justification. Therefore, the results of their computer modelling cannot be given much credence."
- "…This being the case, the response letter from Protection Engineering Inc. is similarly tainted and must likewise be given little influence."

[23] With regard to the second ILWU issue, the use of water sprays for explosion control of sulphur dust particles, Dr. Bert questioned the uniformity of the penetration of water spray throughout the sulphur dust and postulated the existence of dry pockets of sulphur dust within the Dumper. I retain the following from Dr. Bert's reply:

- "…It is **assumed** in all of these reports and responses, **but never proven**, that the water sprays penetrate the mass of sulphur being dumped and distribute uniformly throughout that sulphur in the Port Moody facility. A large amount of sulphur is dumped in a short period of time and while the outer border of sulphur facing

the sprays will no doubt be wetted, it is not obvious to me that the sulphur both within the central portion of the dumper and that on the side opposite the grate will be wetted sufficiently to prevent explosion. For that matter, there is no evidence that the sulphur relatively far from the proximity of the spray nozzles will be wetted at all in the short time that the sulphur is dumped to the conveyor belt. Once again the position taken by these groups relies on speculation and no hard measurements are provided to prove their contentions."

- "…On another matter, I am still concerned about the use of 15-minute average sulphur concentration to assess the explosively of the sulphur dumping process. While it may be difficult to make meaningful measurements in the dumper and nearby areas for short times, the use of a 15-minute average sulphur concentration is clearly inappropriate for the assessment of the possibility of explosion in the situation under consideration."

[24] Mr. LeMonnier's document book also included written submissions and a book of authorities. I retain the following from his written and oral submissions.

[25] There are still unanswered questions relative to the research papers referred to and provided by PCT. The questions include:

- The actual instantaneous sulphur dust levels when sulphur is dumped in the Dumper;
- The validity of the computer modelling to estimate actual instantaneous sulphur dust levels;
- The minimum concentration of sulphur dust in the Dumper for an explosion; and
- Whether small flash explosions would be hazardous to employees if they occur.

[26] A recurrence of the event that precipitated Mr. Coccia's refusal to work could jeopardize not only his safety, but that of other employees or persons who happen be inside the Dumper or nearby, such as a foreman, a maintenance worker, a switchman or an outside contractor.

[27] The event either occurred because ferrous debris fell from a rail car and created a spark, worn brakes on the rail car created a localized hot spot that ignited the sulphur dust, static electricity created a spark that ignited the sulphur dust, or a sulphur fire was already smoldering in the rail car when the rail car was dumped in the Dumper. Regardless of the cause, and whether or not the safety features mitigated an explosion, smoke, which would be almost pure toxic sulphur dioxide, was emitted. Health and safety officer Campbell did not consider the smoke or other PCT employees when he decided that a danger did not exist.

[28] It is especially important to inspect the rail cars in a unit sulphur train and remove debris from the ends of the rail cars because there are no water sprayers at ends of the Dumper and dry pockets of sulphur dust are possible in these locations. A sulphur dust explosion could occur should debris fall from either end of the rail car and create a spark in contact with metal in the Dumper that ignites a pocket of dry sulphur dust. The fact that metal buried in the sulphur in the rail cars gets through the Dumper and is collected on the magnet does not establish that a dust explosion originating from the ends of the Dumper is impossible.

[29] Sultran, a company located at BCR Marine Terminal, British Columbia, also operates a Dumper. Sultran's Dumper is not equipped with the safety features incorporated into the PCT Dumper, but Sultran ensures that its sulphur rail cars are inspected for faulty brakes and

that loose metallic debris is removed from the cars before the cars enter the Dumper. This underscores the importance of inspecting rail cars for faulty brakes and for removing debris from the ends of the car.

[30] Rail cars should be inspected and debris capable of creating a spark in the Dumper removed therefrom in accordance with Section 122.2 of the Code. Section 122.2 reads:

> "Preventive measures should consist first of the elimination of hazards, then the reduction of hazards and finally, the provision of personal protective equipment, clothing, devices or materials, all with the goal of ensuring the health and safety of employees."

[31] Items 3-2.5 and 3-2.6 of NFPA 655 Standard for Prevention of Sulphur Fires and Explosions, 1993 Edition, require that all electrical wires and devices in the Dumper must be intrinsically safe so that a spark from the electrical equipment can not initiate a sulphur fire or explosion. Item 2-6.2 of the same NFPA Standard further specifies that:

> "All machinery shall be installed and maintained in such a manner that the possibility of frictional sparks is minimized."

[32] Section 10.8 of the *Canada Occupational Health and Safety* (COHS) *Regulations* requires the inspection of rail cars and removal of debris capable of causing a spark in the Dumper to reduce the explosive hazard associated with sulphur dust to a minimum. Section 10.8 reads:

> "Every hazardous substance stored, handled or used in a work place shall be stored, handled or used in a manner whereby the hazard related to that substance is reduced to a minimum."

[33] The current definition of danger in the Code accommodates situations where the danger may occur at some time in the future.

[34] Prior to the hearing, Mr. Roper submitted a document that contained PCT's Reply Submission, Book of Documents and Appendix to Book of Documents. The Book of Documents included letters from Carlito Cabahug, P. Eng., Fire Protection Consultant, Protection Engineering, Lesley McCormick, M. Sc., Senior Occupational Hygienist of BC Research Inc., and Genesis Engineering Inc.. The letters commented on the opinions that the ILWU had obtained from Dr. Teschke and Dr. Bert. I retain the following from C. Cabahug's letter dated October 10, 2001:

- "…The Theske opinion was based on the BC Research report and an HRDC report. It does not indicate that there was an evaluation of the Protection Engineering Report of November 22, 2000, the Genesis Engineering Inc. report of November 24, 2000…" "...It did not take issue with or even address the impact of the water dust/explosion control system."
- "…The Bert opinion also expresses concerns regarding the use of the 15-minute average to determine the maximum dust concentrations. It also contains suggestions for additional attention to the ends and middle of the dump."

- "…The comments are based on simplistic evaluation of results presented in the Protection Engineering report of November 22, 2000, the Genesis Engineering report of November 24, 2000, and other supporting reports. The comments provided do not correspond with the actual behaviour of the sulphur dust particles taking place at PCT rotary dumper, the associated dust suppression measures, the actual process operation as a whole, and the relevant fire protection standards which are provided in the facility based on the Fire Code and the NFPA standards."
- "…The opinions ignore four significant points in the Genesis Engineering Inc. and Protection Engineering Inc. reports. They are:"

1) Computer Modelling.

   - "…Computer modelling is an essential tool for predicting the results of a simulated event or scenario."
   - "…Modelling dust concentration takes into account the particle sizes, terminal velocities, particle densities etc., which accurately estimate the maximum instantaneous dust density."
   - "…Contrary to the opinions, the reports do not use of the 15-minute average sulphur dust concentration as the dust concentration for the evaluation of explosive hazard. They have been conservatively modeled to result in concentrations 20 times the average."

2) Spray System.

   - "…With sufficient water droplet density in a sulphur dust atmosphere, an explosion is impossible regardless of the amount of sulphur dust. With sufficient water, the upper and lower explosive limits coincide so that there is no explosive range. The droplet level exceeds this level."
   - "…There is a substantial moisture dispersed on the air in the order of 20% to 50% present in sulphur dusts suspension. The presence of moisture in the air is a passive fire protection measure created during the process of dumping to prevent occurrence of fire and dust explosion."

3) Satisfying Codes and Standards

   - "…The Fire Code and various NFPA Standards have developed approaches for addressing potential explosive conditions in such facilities. This facility conforms to these Standards. Vague statements in the opinions that explosive ranges may be exceeded are not supported."

4) Visual Confirmation

   - "…During the actual dumping operation there is a minimal impairment of visibility inside the dumper building due to the effective dust management. The visibility supports the analysis provided by Genesis."

Discussion:

- "…The concentrations for explosions noted vary considerably. The 2 g./m^3 limit is based on a high energy spark." "…Tramp metal creates mechanical energy which can ignite an explosion only at higher concentrations. The SFPE Handbook of Fire Protection Engineering states that sulphur dust requires a concentration of 30 g./m^3 for explosive conditions. Based on the mixture of particle sizes, it is likely that the concentrations are even higher than 30 g./m^3."
- "…During the dump, the most of the material is going in a very high density pour. The sulphur density will be well above the explosive limit for most of the dump. Away from the dump the air remains relatively dust free and is below the explosive level. It is only at the interface between the high and low density areas that the dust density is within the explosive level. The sulphur is being wetted at this interface area. The water droplets in the interface area coat many of the sulphur

particles and act as an energy buffer for the remaining particles in a manner similar to exceeding the upper explosive limit; the water will absorb energy from any sulphur reaction with the air to prevent the runaway, catastrophic explosion."

- "…The Theske opinion recommends providing "real time" or on-line analyzer to detect instantaneous concentration of sulphur dust suspension. This is not practical and feasible."
- "…Maintaining an on-line instrument in such a moist environment with potential caking and agglomeration of sulphur particles is very difficult and has no benefit."
- "…The substantial addition of water through fog spraying during dumping suppressed significantly the formation of dust in air suspension. Explosion is prevented by mitigating the formation of dust cloud. This is the primary objective in the application of water sprays."
- "…With sufficient water droplet density in a sulphur dust atmosphere, an explosion is impossible regardless of the amount of sulphur dust."

[35] I retain the following from Mr. McCormick's letter dated October 11, 2001 who commented for BC Research Inc. on the opinions that the ILWU had obtained from Dr. Teschke and Dr. Bert:

- "…In conclusion, BC Research recognizes that both Dr. Teschke and Dr. Bert present valid comments with respect to the monitoring method used by BC Research, however, both failed to take into account the current limitations of technology. Secondly, with respect to the sampling locations, the locations were chosen based on where the worst case concentration would likely be present and where a monitoring device could actually be placed." "…As for the number of samples, additional samples can always be collected, however, it is BC Research's opinion sufficient information exists to be able to extrapolate a worse case concentration and draw conclusions about the risk of an explosion."
- "…In total, 53 short term ambient samples have been collected in the No. 3 Car Dumper House since 1989."
- "…It is BC Research's opinion based on the sampling data by BC Research and engineering calculations conducted by Genesis Engineering Ltd., that it has been demonstrated that the moisture/water levels in the No. 3 Car Dumper are sufficient to prevent an explosion even if the dust concentrations present approach or exceed the Lower Explosive Level for sulphur for brief periods."
- …Even if the levels of water used at the time of the in 2000 were not sufficient, two additional water spray systems have been installed since the 2000 study in response to recommendations made by BC Research which would further reduce this possibility."
- "…In addition, based on Protection Engineering Inc.'s report of November 22, 2000, it is BC Research's opinion that it has been demonstrated that the equipment has sufficient safe guards to ensure that the use of moisture as a control method will not fail."

[36] I retain the following from the Genesis Engineering Inc. letter dated October 5, 2001 which replied to the letters from Dr. Teschke and Dr. Bert:

- "…To the best of this writer's knowledge, (I've been in the business of using and developing air pollution monitoring instrumentation for over 25 years) there are no commercially available instruments that can measure the maximum "instantaneous" sulphur dust concentrations within the Dumper."
- "…The output from the computer model is the maximum dust concentration during dumping, which corresponds to the "burst" of dust assumed to enter the building with the ventilation of air. The actual concentration within the Dumper air would be less than this due to turbulent mixing."

- "…It may be true that the maximum estimated short-term concentrations, using the above computer model, might exceed the "usual standard of 20% of the Lower Explosive Limit (LEL)" for dry sulphur dust. However, the literature values for LEL vary widely and all reported LEL values are based upon dry sulphur dust. The presence of moisture rapidly quenches the sulphur combustion reaction, much as water quenches the ignition of kindling wood or paper."
- "…The well-developed science of thermodynamics can be used to calculate LEL values for different amounts of moisture. An energy balance dictates that the heat released by sulphur combustion must equal the heat required to evaporate the water and heat the mixture of water vapor, air, and combustion products up to the final combustion temperature (referred to as the Minimum Adiabatic Flame Temperature, or AFT). If this calculated final combustion temperature is greater or equal to the minimum temperature required to sustain combustion (referred to as Auto Ignition Temperature or MAIT), then combustion is possible. Greater concentrations of sulphur dust add more "fuel to the fire", resulting in a higher final temperature, a more rapid reaction rate, and a possible detonation. But if the final temperature is less than the MAIT, then no ignition or combustion is possible."
- "…So the modeling strategy used by Genesis Engineering was to calculate, for a given sulphur dust concentration and moisture level, the Adiabatic Flame Temperature and then to compare this value with the literature values for Minimum Auto Ignition Temperature."
- "…when the sulphur dust is dry… the Minimum Auto Ignition Temperature… is crossed at a sulphur concentration of about 28 grams/m^3. This is similar to the National Fire Protection Agency (NFPA-68) value of 30 grams/m^3."
- "…When moisture is present, conditions for sulphur ignition become more onerous. …the…MAIT…at approximately 40 grams/m^3. When 2 grams of water are present for every gram of sulphur dust…the LEL increases to about 80 grams/m^3. It is evident that ignition is not possible when there is 4 grams of water present for every gram of sulphur dust…."
- The presence of moisture not only makes ignition more difficult but also greatly decreases the rate of combustion of the dust once it ignites."
- "…The combustion rate is seen to increase exponentially with temperature. At low temperatures, or when significant moisture is present [i.e., 4 grams/m^3] ignition and combustion is not possible." [My reference to from following paragraph]
- "…Literature values for the Lower Explosive Limit (LEL) for sulphur dust vary widely. All values are only applicable to dry sulphur dust. The presence of moisture will increase the LEL."
- "…The maximum sulphur dust concentration in the Pacific Coast Terminal's Dumper was estimated by Genesis Engineering (Nov.24/00) to be 5.26 grams/m^3. This is 19% of the calculated LEL for dry sulphur. However, the moisture level associated with the sulphur was also estimated in the same report to be 21 grams of water/gram of sulphur dust. The moisture level is well above the value where combustion of sulphur, no matter what the concentration or ignition source, is possible (approximately 4 grams water/gram of sulphur dust. Subsequent to the above report, two additional spray bars have been installed in the Pacific Coast Terminal's Dumper. Therefore the moisture ratio now, if the maximum sulphur concentration remained the same, would be 63 grams of water/gram of sulphur dust. Clearly, sulphur ignition is impossible under these conditions."

[My underlined for emphasis.]

[37] I retain the following from the testimony of Mr. Gibney at the hearing:

- Before rail cars enter the Dumper, they are inspected by a checker, a switchman and a foreman. In addition, the Dumper operation cab is located approximately 15 to 20 feet above the rail cars approximately 2 and 1/2 rail car lengths before the Dumper. No one reported observing smoke issuing from the rail cars before the cars entered the Dumper;
- A video camera is located above the rail cars before cars enter the Dumper and another is located in the dumper itself. The images are available at different PCT sites. No one reported observing smoke issuing from the rail cars before they were dumped;

[38] I retain the following from Mr. Gordon J. Esplin's testimony at the hearing:

- He has visited the PCT Rotary Dumper several times;
- He relied on the data provided by BC Research Inc. and PCT for the computer modeling;
- To go to a more sophisticated model, as suggested by Dr. Bert, you would require more data. Since more data did not exist, his model was based on the available data;
- Since there is a lot of unknown data, he used a conservative model to estimate the maximum concentration of sulphur dust during dumping;
- Wetting of the sulphur results from the turbulence produced during the dumping of the sulphur mass, the ventilation system and the high velocity water sprays;
- It is theoretically possible to have parcels or pockets of dry dusty air but unlikely. For ignition, the concentration of sulphur dry dusty air pocket would have to be very high, above the LEL, and be in contact with the source of ignition. The probability of a source of ignition in a Dumper is also very low. The probability related to both things happening at the same critical moment is lower that the individual probabilities;
- If ignition were to occur, the effect would be an isolated localized explosion that could not propagate. So if all conditions occurred, there could be a localized burp that could not propagate into the rest of the dust mass because the dust mass is saturated with water.

[39] Mr. Roper's document book also included written submissions and a book of authorities. I retain the following regarding his written and oral submissions.

[40] There is no basis for the Appeal and it should be dismissed for the following reasons:

- The reasons set out in the appeal are not those provided by the worker to justify his refusal to work;
- All of the issues raised on appeal were previously addressed and resolved against the position now taken by the Union, in the Decision of RSO Malanka (Decision No. 01-010) dated April 10, 2001.;
- The evidence does not support the existence of a "danger" as defined in the Code.

[41] The risk of a sulphur dust explosion within the Dumper has been eliminated by the safety systems at PCT which include:

- Dust suppression system (fog nozzles),
- Dust collection system (wet scrubbers), and
- Subsequent chemical treatment.

[42] The comments by Dr. Teschke and Dr. Bert pose lots of questions but do not provide answers. Dr. Teschke opines that the15-minute sampling time is not appropriate for determining maximum sulphur dust concentrations and that it is necessary to measure instantaneous concentrations in the Dumper. For his part, Dr. Bert questions the efficacy of the water spray system and opines that there could be pockets of dry sulphur dust where instantaneous concentrations are high.

[43] Experts consulted by PCT reviewed comments by Dr. Teschke and Dr. Bert for the union and confirmed their previous conclusions that the operation of the safety systems at PCT maintains the atmosphere in the Dumper at limits that negate the possibility of a sulphur dust explosion.

[44] Since Mr. Coccia's refusal to work, two additional spray bars have been installed. With this, Genesis Engineering Inc. concluded that, if the maximum sulphur concentration remained the same, the moisture ratio would be 63 grams of water/gram of sulphur dust making a sulphur ignition impossible.

[45] The suggestion that a flash or explosion occurred, perhaps caused by a static electric discharge, is not supported by the evidence. It is more likely that a fire occurred the morning of May 28, 2002 which was handled appropriately by the suppression systems in place.

[46] As established in the Welbourne case, for a finding of "danger" under the current Code, there must be objective evidence that a hazard, condition is reasonably likely to occur in the future and will cause injury of illness before it can be corrected. The evidence in this case does not support the existence of a "danger" as defined in the Code.

****

[47] According to the evidence in the case, at least five things changed since my aforementioned decision of April 10, 2001. Not in any specific order, there was the unexplained event at PCT that occurred the morning of May 28, 2001, when fumes or smoke issued from the Scrubber stack of the Dumper for approximately thirty to sixty seconds while a rail car of sulphur was being dumped therein. Following the May 28, 2001 event, the ILWU consulted with Dr. Teschke and Dr. Bert and questioned the engineering reports that PCT relied on for concluding operations at their Dumper were safe. These reports were also referred to in RSO Decision No. 01-010, April 10, 2000. Following health and safety officer Campbell's investigation of the May 28, 2001 event, PCT added additional water spray bars to the far side of the Dumper. As noted by health and safety officer Campbell, PCT was not inspecting the rail cars to remove loose rail car parts or metal debris from exterior of the rail cars prior to the unit train being processed through the Dumper at the time of the refusal to work. Finally, the definition of danger in the Code was revised in September of 2000.

[48] Thus, the issue before me now is whether or not a risk of sulphur dust explosion existed in connection with the operation of the PCT Dumper that constituted a danger under the Code for Mr. Coccia or any other PCT employee. I must also decide if a danger existed for PCT employees relative to being exposed to toxic airborne hazardous substances should a sulphur dust explosion occur in the Dumper and be extinguished before it propagated. The question of exposure to toxic combustion products from a conventional sulphur fire were not raised in connection with this review. For deciding this, I must review the Code and the objective facts in the case, including the above noted occurrences.

[49] In September 2000, the definition of danger was amended. Appeals officer Cadieux commented on the new definition in the case of Welbourne and Canada Pacific Railway Company, Decision No. 01-008, dated March 22, 2001. He stated that under the current definition of danger, danger can also be prospective to the extent that the hazard, condition or activity is capable of coming into being and is reasonably expected to cause injury or illness to a person exposed thereto before the hazard, condition can be corrected or the activity altered, but the concept of reasonably expectation excludes hypothetical or speculative situations. He wrote in paragraphs 15 to 19 of the decision:

> [15] "Danger" is defined at subsection 122(1) of the Code as follows:
>
> *"danger" means any existing or potential hazard or condition or any current or future activity that could reasonably be expected to cause injury or illness to a person exposed to it before the hazard or condition can be corrected, or the activity altered, whether or not the injury or illness occurs immediately after the exposure to the hazard, condition or activity, and includes any exposure to a hazardous substance that is likely to result in a chronic illness, in disease or in damage to the reproductive system.*
>
> *"danger" Situation, tâche ou risque - existant ou éventuel - susceptible de causer des blessures à une personne qui y est exposée, ou de la rendre malade - même si ses effets sur l'intégrité physique ou la santé ne sont pas immédiats -, avant que, selon le cas, le risque soit écarté, la situation corrigée ou la tâche modifiée. Est notamment visée toute exposition à une substance dangereuse susceptible d'avoir des effets à long terme sur la santé ou le système reproducteur.*
>
> [16] This new definition of danger is similar to the previous definition of danger that existed in the pre-amended Code, which read:
>
> *"danger" means any hazard or condition that could reasonably be expected to cause injury or illness to a person exposed thereto before the hazard or condition can be corrected.*
>
> [17] The current definition of "danger" sets out to improve the definition of "danger" found in the pre-amended Code, which was believed to be too restrictive to protect the health and safety of employees. According to the jurisprudence developed around the previous concept of danger, the danger had to be immediate and present at the time of the safety officer's investigation. The new definition broadens the concept of danger to allow for potential hazards or conditions or future activities to be taken into account.

This approach better reflects the purpose of the Code stated at subsection 122.1, which provides:

> *122.1 The purpose of this Part is to prevent accidents and injury to health arising out of, linked with or occurring in the course of employment to which this Part applies.*

[18] Under the current definition of danger, the hazard, condition or activity need no longer only exist at the time of the health and safety officer's investigation but can also be potential or future. The New Shorter Oxford Dictionary, 1993 Edition, defines "*potential*" to mean "possible as opposed to actual; capable of coming into being or action; latent." Black's Law Dictionary, Seventh Edition, defines "*potential*" to mean "capable of coming into being; possible." The expression "*future activity*" is indicative that the activity is not actually taking place [while the health and safety officer is present] but it is something to be done by a person in the future. Therefore, under the Code, the danger can also be prospective to the extent that the hazard, condition or activity is capable of coming into being or action and is reasonably expected to cause injury or illness to a person exposed to it before the hazard or condition can be corrected or the activity altered.

[19] The existing or potential hazard or condition or the current or future activity referred to in the definition must be one that can reasonably be expected to cause injury or illness to the person exposed to it before the hazard or condition can be corrected or the activity altered. can be corrected or the activity altered. Therefore, the concept of reasonable expectation excludes hypothetical or speculative situations.

[50] In connection with this, I wrote in the case of Correctional Service of Canada, Drumheller Institution and Mr. Larry DeWolfe, Decision No. 02-005, dated May 9, 2002 the following:

> [39] While I agree with my colleague's findings in this case, I believe there is a need to elaborate on his findings to address arguments made by Mr. Fader in this case. Specifically, Mr. Fader argued that, for a danger under the Code, the circumstances related to a potential danger must exist at the time of the investigation by the health and safety officer.
>
> [40] According to subsection 129.(1) of the Code, when a health and safety officer is notified that an employee is continuing to refuse to work, the health and safety officer is required to investigate or cause another officer to investigate the refusal to work without delay. On completion of the investigation, the investigating officer is required, pursuant to subsection 129.(4), to decide whether or not a danger under the Code exists. If the officer decides that a danger exists, then the officer is required by subsection 129.(6) to issue a direction pursuant to subsection 145.(2) requiring the employer to, amongst other things, take measures to correct the hazard or condition or alter the activity, or to protect any person from the danger. The officer is also required to issue a direction to the employee(s) in question to cease the work in question until the employer complies with the officer's direction under 145(2)(*a*). If the officer decides that a danger does not exist, then according to subsection 129.(7), the employee is not entitled under section 128 to continue to refuse to work. The officer is clearly deciding whether or not a danger under the Code exists at the time of his or her investigation and, relative to subsection 145.(2.1), whether or

not the employee(s) may work in a place or do the work in question. Subsections 129.(1), (4), (6) (7) and 145.(2) and 145.(2.1) read:

> 129.(1) On being notified that an employee continues to refuse to use or operate a machine or thing, work in a place or perform an activity under subsection 128(13), the health and safety officer shall without delay investigate or cause another health and safety officer to investigate the matter in the presence of the employer, the employee and one other person who is
> (*a*) an employee member of the work place committee;
> (*b*) the health and safety representative; or
> (*c*) if a person mentioned in paragraph (*a*) or (*b*) is not available, another employee from the work place who is designated by the employee.
>
> 129.(4) A health and safety officer shall, on completion of an investigation made under subsection (1), decide whether the danger exists and shall immediately give written notification of the decision to the employer and the employee.
>
> 129.(6) If a health and safety officer decides that the danger exists, the officer shall issue the directions under subsection 145(2) that the officer considers appropriate, and an employee may continue to refuse to use or operate the machine or thing, work in that place or perform that activity until the directions are complied with or until they are varied or rescinded under this Part.
>
> 145.(2) If a health and safety officer considers that the use or operation of a machine or thing, a condition in a place, or the performance of an activity constitutes a danger to an employee while at work,
> (*a*) the officer shall notify the employer of the danger and issue directions in writing to the employer directing the employer, immediately or within the period that the officer specifies, to take measures to
> (i) correct the hazard or condition or alter the activity that constitutes the danger, or
> (ii) protect any person from the danger; and
> (*b*) the officer may, if the officer considers that the danger or the hazard, condition or activity that constitutes the danger cannot otherwise be corrected, altered or protected against immediately, issue a direction in writing to the employer directing that the place, machine or thing or activity in respect of which the direction is issued not be used, operated or performed, as the case may be, until the officer's directions are complied with, but nothing in this paragraph prevents the doing of anything necessary for the proper compliance with the direction.
>
> 145.(2.1) If a health and safety officer considers that the use or operation of a machine or thing by an employee, a condition in a place or the performance of an activity by an employee constitutes a danger to the employee or to another employee, the officer shall, in addition to the directions issued under paragraph (2)(*a*), issue a direction in writing to the employee to discontinue the use, operation or activity or cease to work in that place until the employer has complied with the directions issued under that paragraph.
>
> 129.(7) If a health and safety officer decides that the danger does not exist, the employee is not entitled under section 128 or this section to continue to refuse to use or operate the machine or thing, work in that place or perform that activity, but

> the employee, or a person designated by the employee for the purpose, may appeal the decision in writing to an appeals officer within ten days after receiving notice of the decision. [Underlined for emphasis.]
>
> [41] For deciding if a danger exists, the health and safety officer must consider all aspects of the definition of danger and, on completion of his or her investigation, decide if the facts in the case support a finding of danger under the Code. This determination must be done on a factual basis and the facts must be persuasive since the right to refuse and danger provisions under the Code are considered to be exceptional measures. For a health and safety officer to find that a danger under the Code exists at the time of his or her investigation in respect of a potential hazard or condition, as in this case, the facts in the case must be persuasive that:
>
> - a hazard or condition will come into being;
> - an employee will be exposed to the hazard or condition when it comes into being;
> - there is a reasonable expectation that the hazard or condition will cause injury or illness to the employee exposed thereto; and
> - the injury or illness will occur immediately upon exposure to the hazard or condition.

[51] As in the above, I must also consider all aspects of the definition of danger, and decide if the objective facts in this case support a finding of danger under the Code.

[52] I indicated in paragraph 3 that employees at PCT previously exercised the right to refuse work on September 12, 2000, because they feared a sulphur dust explosion in the rotary Dumper at PCT. At the hearing held on December 14, 2000, to review the employees' appeal of the health and safety officer's decision of no-danger, PCT proffered several expert reports to show that a danger of explosion did not exist relative to the operation of their Dumper. The reports, which are listed below, were unanimous in their conclusion that a risk of a sulphur dust explosion in the Dumper was remote due to the low concentration of sulphur dust present in the Dumper as measured by BC Research, and because of the contribution of water to mitigate a sulphur dust explosion. The reports, which were also referred to in this hearing, included:

i. Report entitled, "PCT Sulphur Dust Study March, April 1992, dated May 15, 1992" prepared by the Air Quality Group, British Columbia Research Corporation, Vancouver, B.C.;
ii. Report entitled, "Pacific Coast Terminal Sulphur Dust Study, June - July, 2000, dated August 14, 2000, prepared by the Occupational & Environmental Risk Management Group, BC Research Inc., Vancouver, B.C.;
iii. Copy of Report entitled, "Report On Human Resource Development Canada Direction To Pacific Coast Terminals Co. Ltd." prepared by Protection Engineering Inc., Vancouver, B.C.;
iv. Report entitled, "An Analysis of the Explosion Hazard During Sulphur Dumping at Pacific Coast Terminals, dated November 24, 2000," prepared by Genesis Engineering Inc.; and,
v. Letter from Dr. P.D. Clark, Director of Research, Alberta Sulphur Research Ltd., dated August 22, 2000, on the subject of "Sulphur Dust Study Reports".;

[53] With regard to the unexplained event that occurred on May 28, 2001, health and safety officer Campbell opined that the smoke observed could have resulted from:

- A sulphur fire already smouldering in the rail car that was extinguished when it was dumped in the Dumper as a result of the safety features connected with the operation of the Dumper;
- A sulphur fire already smouldering in the rail car ignited sulphur dust in the Dumper which was extinguished as a result of the safety features connected with the operation of the Dumper;
- Tramp metal fell from the rail car and caused a spark when it struck a metal surface in the Dumper.
- The sulphur dust was ignited by internally generated static electricity when the sulphur was dumped in the Dumper;
- The worn brake shoes on the rail car were hot and ignited the sulphur dust;

[54] He further remarked that, if the event was an explosion, its occurrence appeared to contradict the consultants engaged by PCT to assess the explosion hazard at the Dumper depending on what is meant by an "explosion" hazard and whether or not containing or extinguishing a "flash" or explosion at an early stage is the same as controlling the explosion. Notwithstanding his reflections, he concluded from his investigation of the refusal to work that there were insufficient objective facts to determine whether the event constituted a fire or an explosion. I agree with this assessment.

[55] The question of whether or not a combustion or explosion hazard exists in connection with the operation of the Dumper at PCT is a technical question. Not having expertise in the field of dust explosions, I had to rely heavily on the technical information and arguments provided by the experts involved. For this reason, I appreciate the quality of they evidence provided.

[56] Following the event and refusal to work by Mr. Coccia, the ILWU consulted with Drs. Theske and Bert. I have already quoted them extensively and will not repeat the text here. However, essentially, their concerns related to:

- The sampling strategy used to measure sulphur dust concentration in the Dumper. This included concerns with respect to the 15-minute sampling, sampling locations, sampling frequency and total number of samples measured;
- The computer modeling used by Genesis Engineering Inc. to estimate the maximum instantaneous sulphur dust concentration during a dump; and,
- The lack of evidence that the wetting of the bulk sulphur during a dump is complete. Dr. Bert questioned whether the wetting extended to the middle of the sulphur mass, the south side of the Dumper where there were no sprayers at the time of the event, and at the ends of the rail cars.

[57] BC Research, Protection Engineering, and Genesis Engineering all responded to the questions raised by Drs. Theske and Burt regarding the sampling strategy used. I have already quoted them extensively and will not repeat the text here. However, they confirmed their earlier positions that the risk of a sulphur dust explosion at the PCT Dumper is remote if all of the safety systems are operating properly.

[58] Mr. Esplin of Genesis Engineering Inc. also testified at the hearing and referred to his report to PCT on October 2, 2001. He testified that the use of the computer model was to estimate the maximum instantaneous sulphur dust concentration during a dumping cycle, a value that cannot be measured. He conceded that model is not as sophisticated as that proposed by Dr. Bert, but it is based on the data that was available. He held that the estimation for the instantaneous sulphur dust concentration during a dumping cycle is a worst case scenario using a very conservative model. Mr. Esplin also referred to the copious amount of water delivered by the spray nozzles and held that with 4 grams of water per gram of sulphur dust combustion or an explosion is not possible. He testified that the PCT Dumper delivered 21 grams of water prior to the event, and with the additional spray bars on the south side of the Dumper, now delivered 63 grams of water. He held that, with this amount of water, combustion or an explosion in the Dumper is impossible.

[59] However, Mr. Esplin conceded that, while unlikely, it is theoretically possible for parcels of dry dusty air to exist in the Dumper. He held that it was even more unlikely that such a dry parcel of dusty air could result in combustion or an explosion because an unlikely ignition source would have to contact the air at the moment when the concentration of sulphur dust exceeded the LEL.

[60] Having carefully reviewed and considered the technical evidence presented in the case by both sides, I am, on balance, persuaded that the risk of explosion in the PCT Dumper is mitigated by the safety features connected with the Dumper which include the dust suppression and collection systems and the addition of a chemical surfactant. While Drs. Theske or Burt raised some interesting questions regarding the sampling strategy and collection by BC Research, and the reliability of the estimation of the maximum concentration of sulphur dust during a dumping cycle by Genesis Engineering Inc., neither, in my view, effectively challenged the mitigating effect of the copious amount of water sprayed into the system, except to hold that the water spray may not be penetrating the full sulphur mass. However, Dr. Bert did not comment on the probability of the occurrence of a dry pocket or pockets of dusty air in the Dumper, or on the likelihood that their occurrence would result in a sulphur dust explosion in the Dumper. Since, there was no evidence that the safety features at the PCT Dumper were not functioning properly at the time of the event or the time of health and safety officer Campbell's investigation, or that any of the safety features were expected to fail in the future, I find that a danger of sulphur dust explosion did not exist for Mr. Coccia or another PCT employee.

[61] Notwithstanding my above finding, the event of May 28, 2001 established that a potential risk of exposure to toxic airborne substances existed in respect of the operation of the Dumper. Whether or not the May 28, 2001 event was a mini sulphur dust explosion that was extinguished by the water sprayers, there is no question, as evidenced by PCT video, that the event resulted in the release of a significant amount of airborne substance into the air. The fact that smoke issued from the west end door of the Dumper strongly suggested that the smoke from the flash or burp overwhelmed, at least momentarily, the dust suppression and

collection system of the Dumper. Mr. LeMonier insisted employees could well have been employed in the Dumper at the time of the event and that the products of combustion of sulphur are toxic. He held that the risk of exposure to toxic fumes during such an event constitutes a danger under the Code. The MSDS submitted by Mr. LeMonier confirms that toxic sulphur dioxide would be expected.

[62] However, while the event established that a hazard may have existed for employees relative to exposure to toxic smoke, I cannot agree with Mr. LeMonier that the hazard constituted a danger under the Code. There was no objective evidence presented in the case to persuade me that it was reasonable to expect that the event would reoccur immediately or sometime in the future, that an employee would be exposed to a hazardous airborne substance if the event were to reoccur, or that toxic smoke would be produced in such concentration that an employee exposed thereto would be injured or made ill before it the hazard could be corrected. Therefore, I cannot find that the hazard constituted a danger under the Code. In my view, the danger anticipated by Mr. Coccia in this regard was speculative and not one that is covered under the Code.

[63] However, notwithstanding that I have confirmed the decision of health and safety officer Campbell that a danger did not exist, the event established that a potential hazard existed relative to PCT employees being exposed to toxic airborne substances should a similar event occur. Thus, PCT was required under the Code to ensure that the health and safety of its employees was protected from the hazard. Perhaps this is why PCT added water spray bars on the other side of Dumper following the event. However, it is not clear to me that PCT established that this measure eliminated the hazard. Mr. Esplin testified at the hearing that, while highly unlikely, it is theoretically possible for a dry parcel of dusty air to occur in the Dumper. In connection with this, Dr. Bert pointed out that there are no water sprayers in the Dumper at the ends of the rail cars. Mr. Esplin replied that, in the highly unlikely case that a dry pocket of dusty air existed and was ignited by an ignition source; the resultant combustion or explosion would be extinguished by the water before it could propagate. However, it was not clear from his reply whether such a “burp”, if it occurred, would be capable of releasing sufficient airborne combustion products to overwhelm the safety features at the Dumper and to expose employees to an airborne hazardous substance. Unless and until PCT has satisfied itself on this point, and this is something a health and safety officer may wish to pursue, the Company may need to take additional measures to ensure that PCT employees are protected from the hazard. This could include reinstating the inspection of the rail cars prior to their entering the Dumper to remove debris from the ends of the cars capable of creating an ignition source. As Mr. LeMonier argued, section 10.8 of the *Canada Occupational Health and Safety Regulations* requires that hazardous substances be stored, handled or used in a manner that reduces the hazard related to the substance to a

minimum. This would include reducing the amount of debris on a rail car capable of creating a spark if the current safety measures connected with the operation of the Dumper are not capable of eliminating the risk of such exposure.

_____

Douglas Malanka
Appeals Officer

APPENDIX

Investigation of Refusal to Work – Decision of NO DANGER

On May 28, 2001, I visited the work place located at 2701 Esplanade Street, Port Moody for the purpose of conducting an investigation following the refusal to work made by Tony Coccia. During that visit, I was accompanied by Mike Sanders, Health and Safety Officer.

Please be advised that pursuant to subsection 129(4) of the *Canada Labour Code*, Part II, the undersigned health and safety officer considers that a danger does not exist.

Also, please be advised that, pursuant to subsection 129(7) of the *Canada Labour Code*, Part II, the aforementioned employee is not entitled under section 128 or section 129 to continue to refuse to the use or operation of a machine or thing.

Finally, be also informed that, pursuant to subsection 129(7), the aforementioned employee, or a person designated by the employee for the purpose, may appeal the said health and safety officer's decision in writing to an appeals officer within ten (10) days after receiving this notice.

A full report of the undersigned health and safety officer's decision will be provided to the employer and employee forthwith.

SUMMARY OF APPEALS OFFICER DECISION

Decision No.: **02-016**

Applicant: International Longshore & Warehouse Union (ILWU)

Respondent: Pacific Coast Terminals Co. Ltd.

KEY WORDS:

Rotary Car Dumper, scrubber stack, sulphur dust, dust explosion, unexplained event, smoke, water fogging, ventilation system, dry pockets, sulphur dioxide, toxic hazardous substance, computer model, sampling strategy and methodology, maximum sulphur dust concentration, source of ignition, rail cars, burp.

PROVISIONS:

Code: 122, 122.1, 122.2, 128, 129, 145, 146
Regulations: 10.8

SUMMARY:

On May 28, 2001, Mr. Tony Coccia, Rotary Dumper (Dumper) Operator at Pacific Coast Terminal Co., Ltd (PCT) began his shift at approximately 8:00 a.m.. At approximately 8:30 a.m., Mr. Bill Hansen, an electrician at PCT, advised Mr. Coccia by two-way radio that smoke was emanating from the Scrubber stack of the Dumper and instructed him to cease dumping operations until the incident was investigated. At approximately 9:30 a.m. Mr. Jim Cockburn, Operations Foreman, advised Mr. Coccia to resume dumping operations despite the fact that the cause of the smoke had not been determined. Mr. Coccia resumed operations for a short while, but at approximately 10:30 a.m., informed Mr. Cockburn that he refused to work because the cause of the smoke had not been determined and he feared that another event would occur.

Following his review of the facts, the appeals officer confirmed the decision of health and safety officer Campbell that a danger under the Code did not exist for Mr. Coccia, or other PCT employees.