Federal Court of Appeal | Cour d'appel fédérale

Date: 20190709

Docket: A-69-18

Citation: 2019 FCA 203

CORAM: **PELLETIER J.A.**
DAWSON J.A.
WEBB J.A.

BETWEEN:

TETRA TECH EBA INC.

Appellant

and

GEORGETOWN RAIL EQUIPMENT COMPANY

Respondent

Heard at Toronto, Ontario, on January 14, 2019.

Judgment delivered at Ottawa, Ontario, on July 9, 2019.

REASONS FOR JUDGMENT BY: DAWSON J.A.

CONCURRED IN BY: PELLETIER J.A.
WEBB J.A.

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REASONS FOR JUDGMENT

DAWSON J.A.

[1] This appeal concerns the validity and potential infringement of two patents: one which discloses a system and method for inspecting railroad track, Canadian Patent 2,572,082 (082 Patent), and one which discloses a system and method for determining rail seat abrasion of a railroad track, Canadian Patent 2,766,249 (249 Patent). In order to situate the issues raised on this appeal it is necessary to understand broadly how railroads are constructed and maintained.

1. Background

[2] Railroads are generally constructed on a base layer of compacted, crushed stone material. A layer of gravel ballast is placed on top of the stone layer. Crossties are then laid in and on the ballast layer and two parallel steel rails are attached to the crossties with fasteners. More particularly, the base of each rail sits on a rectangular piece of steel called a tie plate. The tie

plate rests on, and is attached to, the crosstie. The tie plate is normally secured to the crosstie with fasteners. Those fasteners can be spikes, or various screws, clips and clamps. The rail is in turn secured to the tie plate with a fastener such as a spike. The tie plate is then able to distribute the forces from the rail base to the area of the crosstie below the tie plate.

[3] The majority of crossties in service today are made of wood. The purpose of the crossties is to maintain the lateral spacing of the rails. The crossties also distribute the axle loads from trains travelling over the rails to the ballast layer below the crossties and contribute to the cushioning effect of the entire track structure.

[4] Over time, environmental factors can, and do, cause the crossties to deteriorate until they require replacement.

[5] To manage the logistics of crosstie replacement and to quantify the need for new crossties, railroad inspectors attempt to grade, on a regular basis, the condition of crossties and the fastener system. The grading is most commonly carried out by a visual inspection done to identify crossties and fasteners that are rotten, broken, split or worn to the extent that their serviceable life is at its end.

[6] Historically, track inspection was performed by an inspector who walked along the track to inspect it. The inspector took measurements to evaluate and record the condition of the rail and fastener components. The process was time-consuming.

2. The parties and this litigation

[7] The respondent Georgetown Rail Equipment Company is the owner of the two Canadian patents briefly described above.

[8] The appellant Tetra Tech EBA Inc. is a competitor of Georgetown in the field of machine vision systems for railroad track inspection in Canada. Tetra developed a system for inspecting railroad track called the Three Dimensional Track Assessment System (3-D TAS).

[9] Georgetown commenced an action against Tetra alleging that the 3-D TAS infringed both of Georgetown's patents. Tetra defended the action, arguing that the 3-D TAS did not infringe either patent. It also issued a counterclaim in which it alleged that both of Georgetown's patents are invalid on the ground that, as of their respective priority dates, the inventions were obvious to a person skilled in the art of the subject matter of the patents.

3. The decision of the Federal Court

[10] For reasons indexed as 2018 FC 70, the Federal Court found that the patents were not invalid on the ground of obviousness. The Federal Court went on to find that the essential elements of each patent were present in the 3-D TAS so that Tetra's sale of the system to CN Rail and its support of the system infringed both patents. The Federal Court made no finding about remedy because, pursuant to a bifurcation order, only issues relating to liability were before the Federal Court.

[11] Tetra now appeals from the judgment of the Federal Court.

4. The issues on appeal

[12] While the parties argue a number of issues I would state the determinative issues before this Court to be:

1. Did the Federal Court err in finding that the 082 Patent was not invalid on the ground of obviousness?

2. Did the Federal Court err in construing the 249 Patent and in finding that the 249 Patent was not invalid?

[13] For the reasons that follow, I conclude that the Federal Court erred in law by failing to consider and analyze how the skilled worker would have applied the common general knowledge to the prior art. Had the Federal Court performed this exercise, it would have found that the differences between the prior art and the claims of the 082 Patent could be bridged by the skilled worker applying only the common general knowledge identified by the Court.

[14] I also conclude that the Federal Court did not err in its conclusion that the application of a tilt correction factor was not an essential element of the patent claims at issue in respect of the 249 Patent. However, the Federal Court erred by failing to find that the claims in issue on infringement, claims 7, 11 and 18 of the 249 Patent, were invalid on the ground that they were obvious.

5. Did the Federal Court err in finding that the 082 Patent was not invalid on the ground of obviousness?

A. The 082 Patent

[15] The 082 Patent is entitled "System and Method for Inspecting Railroad Track".

[16] Within the Patent, the "Background of the Invention" section states, in paragraph 0003, that:

> … railroad inspectors attempt to grade the condition of crossties and the fastener system on a regular basis. This grading is most often done with a visual inspection to identify crossties and fasteners that are rotten, broken, split, or worn to an extent that their serviceable life is at its end. The process of visual inspection is quite time consuming. In practice, inspection of the track is performed by an inspector walking along the track to inspect and record the conditions of the crosstie and/or fasteners, which are spaced approximately every 20-inches along the track. One particular North American railroad reports that a crew of 3 or 4 men can grade only about 5 to 7 miles of track per day.

[17] The "Summary of the Disclosure" section of the 082 Patent explains the system and method for inspecting railroad track disclosed in the Patent:

> … The disclosed system includes lasers, cameras, and a processor. The lasers are positioned adjacent to the track. The laser emits a beam of light across the railroad track, and the camera captures images of the railroad track having the beam of light emitted thereon. The processor formats the images so that they can be analyzed to determine various measurable aspects of the railroad track. The disclosed system can include a GPS receiver or a distance device for determining location data. The measurable aspects that can be determined by the disclosed system include but are not limited to: the spacing between crossties, the angle of ties with respect to rail, cracks and defects in surface of ties, missing tie plates, misaligned tie plates, sunken tie plates, missing fasteners, damaged fasteners, misaligned fasteners, worn or damaged insulators, rail wear, gage or rail, ballast height relative to ties, size of ballast stones, and a break or separation in the rail. The system includes one or more algorithms for determining these measurable aspects of the railroad track.

(underlining added)

[18] The rail defect described as “sunken tie plates” is relevant to this appeal as it relates to the 082 Patent. The Patent provides no definition or explanation of what is meant by “tie plates” or “sunken tie plates”. Georgetown’s expert, Dr. Harley Myler, explained that a tie plate is sunken when it has worn down the crosstie beneath it so that the lower surface of the tie plate is below the surrounding top surface of the crosstie. This defect is sometimes also referred to as “plate cut” (Exhibit P004, Appeal Book, page 449). Dr. Myler’s explanation of what the term “sunken tie plates” means is not controversial.

[19] The 082 Patent goes on to summarize a number of embodiments of the disclosed invention. Thereafter follows a detailed description of specific embodiments which are to be read in conjunction with accompanying drawings. The 80 claims of the Patent follow.

[20] The 082 Patent acknowledged that:

- railroad inspection was not new, and most often inspections were done visually (paragraph 0003);
- devices for inspecting rail were known in the art, and software for analyzing and organizing data obtained with such devices was known in the art (paragraph 0004);
- systems were known in the art for inspecting rails; one enumerated system surveyed the infrastructure on railways, and another enumerated system measured rail gauge using lasers (paragraph 0005);
- once a system captured images and produced a three-dimensional scan of the track bed, known techniques could be applied to determine the presence or absence of a crosstie in the scan (paragraph 0046), the angles of the crosstie

relative to the rail (paragraph 0047) and the existence of a break in the rail (paragraph 0049); and,

- techniques for obtaining substantially accurate geographical location and time data were well-known in the art (paragraph 0037).

B. The asserted error

[21] Tetra alleges that the 082 Patent is invalid because the subject matter of its claims would have been obvious to a person skilled in the art on the Patent's priority date.

[22] Georgetown responds that:

- the Federal Court found that the person skilled in the art was not a person with a working knowledge of railways and track inspection techniques; and,
- although defects such as plate cut and rail seat abrasion were defects known to "railway people", these defects were not held by the Court to be within the common general knowledge of the person skilled in the art.

[23] As illustrated by Georgetown's response to the allegations of invalidity, at the heart of this dispute are the findings of the Federal Court about the qualifications of the skilled worker and the common general knowledge possessed by the skilled worker.

C. Applicable legal principles

[24] Before turning to the reasons of the Federal Court, it is helpful to remember that patents are not addressed to ordinary members of the public. Rather, they are addressed to a worker skilled in the relevant art (*Free World Trust v. Électro Santé Inc.*, 2000 SCC 66, [2000] 2 S.C.R.

1024, at paragraph 44). This reflects paragraph 27(3)(*b*) of the *Patent Act*, R.S.C. 1985, c. P-4 which requires that a patent for an invention must, among other things:

> … set out clearly the various steps in a process, or the method of constructing, making, compounding or using a machine, … in such full, clear, concise and exact terms as to enable any person skilled in the art or science to which it pertains, … to make, construct, compound or use it
>
> (underlining added)

[25] In *Free World Trust* the Supreme Court adopted, at paragraph 44, the following description of a worker skilled in the art:

> a hypothetical person possessing the ordinary skill and knowledge of the particular art to which the invention relates, and a mind willing to understand a specification that is addressed to him.

[26] The identification of the ordinary person skilled in the art should be consistent with the specification of the patent (*Janssen-Ortho Inc. v. Novopharm Ltd.*, 2006 FC 1234, 301 F.T.R. 166, at paragraph 90, aff'd (not on this specific point), 2007 FCA 217, 366 N.R. 290).

[27] It is the "common knowledge" shared by competent "ordinary workers" that is brought to bear by the skilled worker (*Free World Trust*, paragraph 44).

[28] The common general knowledge of the hypothetical skilled worker includes what the person may reasonably be expected to know and to be able to find out (*Novopharm Limited v. Janssen-Ortho Inc.*, 2007 FCA 217, 366 N.R. 290, at paragraph 25).

[29] The relevance of the common general knowledge is as follows: if the difference between the inventive step and the prior art can be bridged by the skilled worker using only the common general knowledge of such a person the "invention" is obvious (*Ciba Specialty Chemicals Water Treatments Limited v. SNF Inc.*, 2017 FCA 225, 152 C.P.R. (4th) 239, at paragraph 62, citing *Bristol-Myers Squibb Canada Co. v. Teva Canada Ltd.*, 2017 FCA 76, 146 C.P.R. (4th) 216, at paragraph 65).

[30] In *Apotex Inc. v. Sanofi-Synthelabo Canada Inc.*, 2008 SCC 61, [2008] 3 S.C.R. 265, at paragraph 71, Justice Rothstein, writing for the Court, explained that if the history of the invention demonstrated that the inventor "reached the invention quickly, easily, directly and relatively inexpensively, in light of the prior art and common general knowledge" this might constitute evidence supporting a finding of obviousness. This is because that course of conduct would suggest that a skilled worker using only the common general knowledge and the prior art would have acted similarly and would have reached the same result.

[31] After this brief review of the relevant legal principles, I turn to the reasons of the Federal Court with particular attention to the Court's finding about the qualifications of the skilled worker and the common general knowledge possessed by the skilled worker.

D. The reasons of the Federal Court

i. The skilled worker

[32] The Federal Court received expert evidence about the qualities possessed by the hypothetical skilled worker.

[33] Dr. Myler, Georgetown's expert, opined that:

> 28. In my opinion, these patents are addressed to an electrical or computer engineer who has at least three (3) years experience working with image processing systems or a Masters degree, and with a working knowledge of railways and track inspection techniques.

[34] Tetra's expert, Sébastien Parent, opined that:

> 21. In my opinion, the addressee of Patent '082 is a person with a degree in engineering or physics with 5-7 years of experience in the field of machine vision.
>
> 22. I would say that the person skilled in the art for Patent '249 would also be a person with a degree in engineering or physics but with less practical experience given the more restricted application of Patent '249 and the fact that even more information had become known in the field of machine vision between the publication dates of Patent '082 and Patent '249.

[35] Neither expert tied their opinion about the qualities possessed by the skilled worker to the language of the patents' specifications.

[36] After observing that the "critical difference" between the parties' positions was the degree to which the skilled worker "must possess a working knowledge of railways and track inspection techniques" (reasons, paragraph 66), the Federal Court concluded that it preferred

Tetra's expert's articulation of the skilled worker's qualities. The Federal Court reasoned, at paragraph 67:

> … Every claim of the 082 and 249 Patents is premised on the use of machine vision. It follows that the POSITA must understand the use of machine vision to inspect surfaces. The Patent refers to "tool boxes" and "known software packages", both of which potentially encompass machine vision and image processing beyond the context of railways. Indeed, the 082 Patent acknowledges that the techniques may be applied in other contexts. A knowledge of railways is therefore ancillary to a knowledge of the manner in which machine vision techniques may be applied in different contexts.
>
> (underlining added)

[37] When one compares the competing evidence of the experts, the Court was rejecting the submission that the notional skilled worker does not understand machine vision outside of the context of railways.

[38] Contrary to Georgetown's submission on this appeal, the Federal Court did not find that the skilled worker is not a person with a working knowledge of railways and track inspection techniques. Rather, the skilled worker possesses a knowledge of railways that is "ancillary" to a knowledge of the application of machine vision techniques.

[39] The word "ancillary" means:

- "Supplementary; subordinate" (*Black's Law Dictionary*, 9th ed.).
- "Providing essential support to a central service or industry; associated, secondary" (*Canadian Oxford Dictionary*, 2d ed.).
- "Subservient, subordinate; auxiliary, providing support; now esp. providing essential support or services to a central function or industry" (*Shorter Oxford English Dictionary*, 6th ed.).

[40] Thus, I read the reasons of the Federal Court as stating that the skilled worker has sufficient knowledge of railways and track inspection techniques to be able to apply machine vision techniques to rail inspection. This is consistent with the Federal Court's conclusion, at paragraph 86, that the "primary focus" of both the 082 and 249 Patents "is the use of machine vision to address well-known challenges associated with the inspection of railway tracks." (underlining added). The skilled worker is required to understand those challenges.

[41] The Federal Court's conclusion is also consistent with the language of the specification of the 082 Patent. As set out in paragraph 17 above, the 082 Patent contains a detailed description of the matters that can be measured by the system disclosed in the Patent, including a list of rail defects that could be detected. These defects include "missing tie plates, misaligned tie plates [and] sunken tie plates". As these terms are not defined or explained in the 082 Patent, it follows that the skilled worker is required to understand the technical meaning of the words used in the Patent. In this case, this requires the skilled reader to understand the meaning of the defects described in the Patent, including sunken tie plates.

ii. The common general knowledge of the skilled worker

[42] At trial, Tetra's expert opined that the skilled worker need not be an expert in the particular field that machine vision techniques were to be applied to. Instead, working with the client, or end-user, the skilled worker would determine the targeted goal of the system. This would guide the skilled worker in identifying the important visual features to analyze.

[43] Fundamentally, the skilled worker would learn what the client wanted to inspect and what anomalies were to be identified. The skilled worker would then conduct a survey of the existing image acquisition techniques that could be used to meet the client's objective.

[44] Georgetown conceded at trial that the skilled worker would be familiar with machine vision lighting techniques and the general techniques used to scan surfaces using cameras and a light source. However, Georgetown did not agree that the skilled worker would be familiar with the specific application of this technology to the inspection of pavement, roads and railway tracks (reasons, paragraph 83).

[45] The Federal Court had "no hesitation in adopting the approach advocated by Tetra." (reasons, paragraph 86). At paragraph 86 the Federal Court wrote:

> … I see no reason to limit the assessment of the common general knowledge of the POSITA to prior art existing within the limited context of railways. The primary focus of both the 082 Patent and the 249 Patent is the use of machine vision to address well-known challenges associated with the inspection of railway tracks. The POSITA would therefore look to the application of machine vision to the inspection of railways, as well as other comparable surfaces such as roads and pavement.

[46] This finding is consistent with the wording of the 082 Patent. Paragraph 0024 of the 082 Patent states, in part, that "the disclosed system and method can be used in other areas and in industries where surfaces or components require inspection. For example, the disclosed inspection system and method can be used to inspect roads, electrical lines, piping, or other networks or systems."

[47] The Federal Court found the potential application of machine vision to the inspection of railways "would clearly form a part of the common general knowledge." (reasons, paragraph 89). The Federal Court also noted that it was "common ground between the parties that machine vision and 3D triangulation techniques, assisted by software, were available and commonly used to examine height differences and other elements of various surfaces." (reasons, paragraph 137).

[48] At paragraph 90, the Federal Court found as follows:

> I therefore conclude that, at a minimum, the POSITA would have understood the following as common general knowledge at the relevant dates for claim construction:
>
> (a) optical 3D sensors and 3D laser triangulation could be used to determine the appearance of an object under normal circumstances, and then detect and measure any anomalies or other features of interest;
>
> (b) surfaces could be inspected and defects could be identified using a system with the following attributes:
>
> i. triangulation with infrared lasers and cameras;
>
> ii. a beam of laser light with an angular expanse;
>
> iii. mounted on a vehicle;
>
> iv. adapting the acquisition configuration (geometry) and number of devices to the need;
>
> v. including an optical encoder and a GPS for geographic coordinates;
>
> vi. including an inclinometer for gradient and camber;
>
> vii. correcting the profile for roll and pitch of the vehicle;
>
> viii. including a real-time processor for feature detection;
>
> ix. including a storing device; and
>
> x. including a post-processing device to extract and classify features; and

> (c) a machine vision system with these attributes could be used to inspect railway tracks and their components in order to identify defects.
>
> (underlining added)

[49] Georgetown's submission that the skilled worker did not possess knowledge of rail defects such as plate cut and rail seat abrasion is contrary to the Federal Court's finding that the skilled worker's common general knowledge included knowledge that machine vision systems could be used to inspect and identify rail defects.

[50] As previously explained, the skilled worker has sufficient knowledge of railway and track inspection techniques to be able to support the application of machine vision techniques to rail inspection. The skilled worker's common general knowledge includes knowledge that a machine vision system could be used to identify rail defects. Implicit in this finding is that the skilled worker has sufficient knowledge of the enumerated rail defects so as to be able to understand that a machine vision system would apply to, and be able to identify, these defects.

[51] Having reviewed the findings of the Federal Court with respect to the skilled worker and the common general knowledge, I now turn to its validity analysis in respect of the 082 Patent.

iii. The finding of validity

[52] As the Federal Court correctly noted at paragraph 52 of its reasons, at trial Tetra alleged that the 082 and 249 Patents were invalid because, based on the existing common general knowledge, the claims would have been obvious to the skilled worker.

[53] On this appeal Tetra argues that, notwithstanding the Court's acknowledgement at paragraph 52 of its reasons that Tetra was relying on the common general knowledge, when the Federal Court came to conduct its validity analysis it focused only on six specific prior art references. These references were six patents and articles discussed by Tetra's expert in his report-in-chief as evidence of the prior art. The six patents and articles were each attached to Mr. Parent's report (SP-09 to SP-14).

[54] This submission makes it necessary to review the Court's analysis to see if the Court's analysis was so constrained, bearing in mind that the Court's reasons are to be read fairly as a whole; the reasons are not to be parsed.

[55] The Federal Court accepted that the claims of the 082 Patent may be separated into three groups, each group containing three independent claims:

- Group 1-claims 1, 22 and 43: relating to methods and a system to determine the distance between crossties;
- Group 2-claims 16, 37 and 58: relating to methods and a system to detect misaligned or sunken tie plates; and,
- Group 3-claims 64, 65 and 66: relating to methods and a system to identify a break in a rail (reasons, paragraph 121).

[56] At trial, Georgetown alleged infringement only in respect of the claims contained in Group 2. However, all of the claims were relevant to Tetra's counterclaim which sought a declaration of invalidity of all of the claims of the 082 Patent.

[57] The Court began its validity analysis by correctly referencing the applicable legal principles (reasons, paragraphs 109 to 115). After referencing its findings concerning the attributes of the skilled worker and the state of the common general knowledge, the Court turned to the inventive concept of the 082 Patent.

[58] The Court defined the inventive concept of the 082 Patent at paragraph 129 of its reasons as follows:

- Group 1 (distance between crossties): a machine vision system that measures the distance between ties by counting the number of frames and using the speed of the vehicle to calculate the distance.
- Group 2 (misaligned or sunken tie plates): a machine vision system that (a) analyzes a frame of the many images having a region of interest; (b) determines the presence of a tie plate in the region of interest; (c) determines the crosstie contour and tie plate contours; (d) compares the orientation of the crosstie contour and orientation of the tie plate contour; and (e) determines whether the tie plate is misaligned or sunken based upon the comparison.
- Group 3 (break in a rail): a machine vision system that measures the gap between adjoining rails by counting the number of images taken between the ends of the rails and using the speed of the vehicle to calculate the gap distance.

[59] Under the heading “Differences between the Prior Art and the Inventions”, the Court noted Georgetown’s concession that “the prior art cited by Tetra demonstrates that machine vision systems were available at the relevant times to capture images of railway track bed components, and to measure their relative positions.” However, Georgetown submitted that none of the prior art would have led a skilled worker to build a laser vision system to detect sunken tie

plates or rail seat abrasion, or to use the precise series of steps or calculations claimed in the 082 Patent and 249 Patent.

[60] The Court then turned to consider charts prepared by Georgetown's expert which were said to summarize the elements of the 082 Patent and 249 Patent that were missing from the prior art cited by Tetra. These charts were confined solely to consideration of claim elements that were said by Georgetown to be missing or not referenced in the six patents and articles attached to Tetra's expert's report as evidence of the prior art. At paragraph 136 of its reasons, the Court accepted Georgetown's "characterization of the differences between the prior art and the claimed inventions". Nowhere did the Federal Court consider if claimed elements of the 082 Patent were within the common general knowledge of the skilled worker. The Court then went on to consider whether the differences between the claimed inventions and the six patents and articles cited by Tetra's expert were obvious or required invention.

[61] The Court's ultimate conclusion is contained in paragraphs 146 and 147 of its reasons:

> 146. It is true that, prior to 2004, machine vision and 3D triangulation techniques, assisted by software, were available and commonly used to examine height differences and other elements of various surfaces. The prior art cited by Tetra includes several documents that applied this technology in the context of railways. However, none of the prior art identifies plate cut or rail seat abrasion as problems to be solved, or suggests solutions similar to those disclosed by the 082 and 249 Patents.
>
> 147. As noted by Georgetown, plate cut and rail seat abrasion are phenomena that are hidden when viewed from above, because they occur underneath components that are visible from above. Both patents solve this problem by comparing the height of the tie with the height of another track component: the tie plate and rail base, respectively. The 249 Patent also includes an algorithm for increasing the accuracy of the rail seat abrasion measurement by accounting for tilt. Neither the existence of these problems nor the patents' proposed solutions are evident in the prior art. Nor could they have been arrived at without inventive insight.

(underlining added)

E. Did the Federal Court err?

[62] As explained above, the Federal Court's analysis of the differences between the prior art and the invention disclosed in the 082 Patent was confined to its analysis of charts prepared by Georgetown's expert. Those charts in turn were confined to consideration of the teachings of the six patents and articles attached to Tetra's expert's report as evidence of the prior art. The Federal Court then went on to consider whether the differences between the prior art and the invention identified by Georgetown's expert were obvious.

[63] Missing from the Court's analysis was any analysis of how the skilled worker would, based on the common general knowledge, have responded in the light of the prior art. This was an error of law. The Federal Court never performed the exercise of looking at the prior art and seeing how the skilled worker, when faced with it, would have addressed the well-known challenges associated with the inspection of railway tracks and drawn from their common general knowledge. Had the Federal Court performed this exercise, it would have found that the differences between the prior art and the claims of the 082 Patent could be bridged by the skilled worker applying only the common general knowledge which the Court had previously identified.

[64] At trial, Tetra submitted that it would have been obvious for the skilled worker to use 3-D triangulation to inspect different features of a railway bed. Georgetown responded that the prior art did not mention plate cut as a problem to be solved, and did not provide a means of determining plate cut using a machine vision system.

[65] The Federal Court rejected Tetra's submission on the basis that the prior art did not identify plate cut as a problem to be solved, or suggest a solution similar to that disclosed in the 082 Patent (reasons, paragraph 146).

[66] However, the Federal Court had previously found that the skilled worker would possess an ancillary knowledge of railways, a finding supported by the fact that the 082 Patent does not define the defects being identified, requiring the skilled worker to understand their technical meaning. The Federal Court had also found that the skilled worker's common general knowledge included, at a minimum, knowledge that a machine vision system could be used to inspect railway tracks and their components in order to identify defects. This finding necessarily requires the skilled worker to have sufficient knowledge of defects such as plate cut so as to be able to understand that a machine vision system could identify plate cut. As the skilled worker was armed with this knowledge, it was unnecessary for the prior art to identify plate cut as a problem to be solved. It was similarly unnecessary for the prior art to suggest a solution similar to that taught by the 082 Patent.

[67] As the Federal Court stated at paragraph 147 of its reasons, set out above, plate cut is a phenomenon that is hidden when viewed from above because it occurs under the tie plate. The 082 Patent solved this problem by comparing the height of the crosstie with the height of the tie plate.

[68] This was the very measurement human inspectors took when trying to identify plate cut. As Georgetown's chief operating officer testified:

> It was a purely manual assessment by a walking inspector. … If that plate, for instance, was sunken into the tie such that it was even to the plane of the tie, a walking inspector would say "I've got about 3/8ths of an inch of plate cutting," knowing the thickness of that plate.
>
> (Appeal Book, page 2547, lines 2 to 10)

[69] This exercise was the same determination of relative height that the Federal Court found the 082 Patent applied to solve the problem of plate cut being hidden when viewed from above.

[70] To similar effect was Georgetown's expert witness who opined, when construing the 082 Patent, that:

> Track degradations of concern can be identified via an evaluation of track geometry, which is the method described in the patents at issue, where a three dimensional model of the track is constructed using optical means from which track anomalies can be determined. <u>This process is mimetic with respect to what human inspectors do when they visually evaluate track for missing or disrupted fasteners, degradations to ties from tie plate cutting and rail seat abrasion</u>, ballast integrity and composition, as well as other issues related to a compromised track geometry. …
>
> (Expert Report, Exhibit P004, Appeal Book, page 418, paragraph 27)
>
> (underlining added)

[71] Therefore, there was nothing novel or inventive in using well-known technology to mimic the human inspector who compared the height of the tie with the height of the tie plate to detect plate cut.

[72] Put another way, given the Federal Court's finding that, prior to the priority date of the 082 Patent, machine vision and 3-D triangulation techniques, assisted by software, were

available and commonly used to examine height differences of various surfaces, it was not inventive to use a machine vision system to detect and measure tie plate defects.

F. Conclusion on the 082 Patent

[73] The Federal Court erred in failing to declare the 082 Patent to be invalid on the ground that it was obvious. It follows that the Court erred in finding the 082 Patent to have been infringed by Tetra.

6. Did the Federal Court err in construing the 249 Patent and in finding that the 249 Patent was not invalid?

A. The 249 Patent

[74] The 249 Patent is entitled “Tilt Correction System and Method for Rail Seat Abrasion”.

[75] Normal railroad traffic causes friction between crossties and rails. Friction at the point where the rail seats against the tie causes wear known as rail seat abrasion. Rail seat abrasion directly impacts the life of a crosstie by causing it to loosen from the rail. The problem of rail seat abrasion is most acute when concrete crossties are used (Expert Report, Dr. Myler on Claim Construction, Exhibit P004, Appeal Book, page 471, paragraph 137).

[76] When concrete crossties are used, the rail base rests on a rail pad, which in turn rests on the top surface of the concrete crosstie. These rail pads, usually made of a polymer, provide a layer of protection between the rail base and the surface of the concrete crosstie. In the context of

concrete crossties, rail seat abrasion occurs when rail vibration caused by trains wears down the rail pad and, if the rail pad is worn away, the top of the crosstie.

[77] Within the Patent, the "Field of the Invention" section states that the invention "relates generally to systems and methods for inspecting railroad surfaces and, more particularly to systems and methods for determining rail seat abrasion via the utilization of tilt correction algorithms." (paragraph 0002) (underlining added).

[78] The "Summary of the Disclosure" section of the 249 Patent explains the systems and methods for determining rail seat abrasion of a railroad track disclosed in the Patent:

> … Embodiments of the disclosed system includes an inspection system comprising lasers, cameras, and processors adapted to determine whether rail seat abrasion is present along the track. The processor employs a mathematics based algorithm which compensates for tilt encountered as the inspection system moves along the track. (paragraph 0009)
>
> (underlining added)
>
> …
>
> By mounting measurement devices on the inspection vehicle that traverses the track, taking precise measurements of the height of the rail and the tie, and adjusting these measurements for any expected tilt encountered, instances of rail track abrasion can be predicted without the need for hazardous raising of rails for unreliable and time-consuming manual measurements, … (paragraph 0011)
>
> (underlining added)

[79] However, this said, paragraph 0012 cautions that this summary "is not intended to summarize each potential embodiment or every aspect of the subject matter of the present disclosure."

[80] The 249 Patent goes on to provide a brief description of the drawings contained in the Patent and a detailed description of the illustrative embodiments. In paragraphs 0072 to 0080 the Patent explains that in order to measure rail seat abrasion with greater accuracy, the tilt or lean in the railroad tracks must be taken into account. Thus, the Patent teaches:

> In yet another exemplary embodiment of the present invention, rail seat abrasion may be predicted with a high level of accuracy. This embodiment utilizes the image data previously described and the application of algorithms that adjust for vehicle tilt. As inspection system 30 moves along the track, it may encounter curves or bends in the track which result in a suspension lean of the system 30 as it moves through the curve. This lean results in the railroad track itself leaning either to the left or right in the field of the camera's 50 view. The resulting measurement data is used to target which ties should be physically inspected for rail abrasion. However, the leaning, or tilt, must be taken into account when identifying ties to be inspected for rail seat abrasion, as will be described below. (paragraph 0072).
>
> … In order to determine whether rail seat abrasion is present, height measurements of each rail must be taken in accordance with the methods previously described. However, in this example, the height of right rail 12 would appear taller than left rail 12, resulting in skewed data measurements. Accordingly, during significant empirical and mathematical research for the present invention, a standard tilt correction factor of 0.12 was determined. This tilt correction factor is incorporated into algorithms of the present invention in order to adjust for tilt caused by variations in vehicle suspension, rail height placement standards, and other factors unrelated to rail seat abrasion. (paragraph 0073).
>
> (underlining added)
>
> …
>
> Thereafter, at step 102, inspection system 30 records the uncorrected H^{Lrail}, H^{Rrail}, H^{Ltie}, and H^{Rtie} height measurements of rails 12 and tie 10 based upon the pixel value of each. Then, at step 104, the processor of inspection system 30 derives the tilt correction factor (TC) based upon the following equation:
>
> $$TC = (H^{Lrail} – H^{Rrail}) (.12)$$
>
> (paragraph 0075) (underlining added)
>
> Thereafter, at step 106, the actual Δ (i.e., the distance/difference between two points) is determined for both the right and left rail bases based upon the following equation:

$$\Delta^{leftRail} = (H^{Lrail} – H^{Ltie}) – TC$$

$$\Delta^{rightRail} = (H^{Rrail} – H^{Rtie}) + TC$$

The result is the actual Δ between the rail base height and tie elevation for both the right and left rails. …

(paragraph 0076) (underlining added)

Then, at step 108, the rail seat abrasion value ("RSA") for the right and left rail bases is determined based upon the following formula:

$$RSA^{Lrail} = (32/54) – (\Delta^{leftRail} / 50)$$

$$RSA^{Rrail} = (32/54) – (\Delta^{rightRail} / 50)$$

…

(paragraph 0077) (underlining added)

[81] Georgetown alleged infringement of claims 7, 11 and 18 of the 249 Patent. Claim 7 is an independent claim of a method for determining rail seat abrasion of a railroad track. Claim 11 is a dependent claim of claim 7. Claim 18 is an independent claim of a system for determining rail seat abrasion of a railroad track.

B. The asserted errors

[82] The Federal Court construed the claim element "actual delta" to mean the difference between two points.

[83] Tetra asserts that this construction is contrary to the explicit teachings of the 249 Patent which define "actual delta" to include tilt correction. Tetra asserts in the alternative that to the extent that claims in the 249 Patent do not require tilt correction, those claims are obvious. Without tilt correction, the claims of the 249 Patent relate primarily to an algorithm for

measuring a height difference between a crosstie and a rail base. This, Tetra asserts, was already obvious at the time of the 082 Patent. Tetra further argues that the 249 Patent is obvious in light of the 082 Patent.

[84] Georgetown responds that there was ample evidence at trial to substantiate the finding that the 249 Patent was not obvious.

C. Applicable legal principles

[85] As the Federal Court correctly noted, the 249 Patent is to be construed in an informed and purposive way.

[86] A Court may look to the whole of the specification to understand what a word or term used in a claim means or to confirm a construction arrived at by consideration of the language of the claims. However, parts of the specification may not be borrowed from to enlarge or contract the scope of the claim as written (*Whirlpool Corp. v. Camco Inc.*, 2000 SCC 67, [2000] 2 S.C.R. 1067, paragraph 52).

[87] The construction of a patent is a question of law to be ascertained by the Court with the assistance of a skilled reader. The Court is required to identify "the particular words and phrases in the claims that describe what the inventor considered to be the 'essential' elements of his invention." (*Whirlpool*, paragraph 45).

[88] Because patents are addressed to a worker skilled in the relevant art, the role of the expert witness is to assist the Court by providing expert evidence on the technical meaning of the terms and concepts used in the patent so as to put the Court in the position of a person skilled in the art at the relevant time (*Free World Trust*, paragraph 51).

[89] As claims construction is a question of law, the Court is not bound by the expert evidence (*Whirlpool*, paragraph 61). It follows that the Court must keep its "eyes on the words of the claim themselves and not let the experts dictate the conclusion." (*RhoxalPharma Inc. v. Novartis Pharmaceuticals Canada Inc.*, 2005 FCA 11, [2005] 3 F.C.R. 261, at paragraph 53).

D. The reasons of the Federal Court

[90] The Federal Court's claims construction is found, for both patents, at paragraphs 61 to 108 of the Court's reasons. After setting out the applicable legal principles and relevant dates, the Court made its findings defining the qualifications of the skilled worker and the common general knowledge of the skilled worker. The Court then turned to an analysis of four "disputed terms" contained in the 082 Patent and one disputed term found only in the 249 Patent. The one disputed term in the 249 Patent was the term "actual delta".

[91] After setting out the parties' competing interpretations of the term "actual delta", the Court concluded:

> 107. According to the "Summary of Invention" contained in the 249 Patent, the invention comprises "an inspection system comprising lasers, cameras, and processors adapted to determine whether rail seat abrasion is present along the track. The processor employs a mathematics based algorithm which compensates for tilt encountered as the inspection system moves along the track". I agree with

> Georgetown that a plain reading of the 249 Patent does not contemplate that compensation for tilt will always be necessary as the system moves along the track. Instead, the system compensates for tilt only when this phenomenon is "encountered".
>
> 108. It follows that the algorithm for determining the actual delta does not necessarily require a consideration of [tilt correction] in all circumstances where the system is used. I therefore prefer the construction of "actual delta" advocated by Georgetown.
>
> (underlining added)

[92] At paragraph 158 of its reasons the Court observed that the parties had agreed that all elements of the claims in issue were essential.

[93] The Federal Court then turned to consider the issues of validity and infringement.

[94] With reference to the 249 Patent and the issue of validity, the Court correctly observed that Tetra alleged that the 249 Patent was invalid because, based on the existing common general knowledge, it would have been obvious to the skilled worker (reasons, paragraph 52). Later in its reasons the Federal Court noted that Tetra also argued that the 249 Patent was obvious because there were no inventive elements or steps that were not already disclosed by the 082 Patent (reasons, paragraph 140).

[95] The Court began its invalidity analysis by defining the inventive concept of the 249 Patent to be:

> a machine vision system that (a) analyzes images; (b) determines the heights of the left and right rail bases, and left and right crossties, applying [tilt correction] as needed; and (c) determines the presence of rail seat abrasion using those measurements.

(reasons, paragraph 129)

[96] The Court then engaged in the analysis described above at paragraphs 59 and 60.

[97] Its ultimate conclusion on validity is found in paragraphs 146 and 147 of the Court's reasons, quoted above at paragraph 61.

[98] With reference to the 249 Patent and the issue of infringement, the Court then moved to consider whether the 3-D TAS system "determines an actual delta between the rail base and the crosstie". The Court noted Tetra's assertion that its system does not address the height differences between the left and right rail heads. In Tetra's submission, there was no need for its system to make this adjustment because the minor differences in rail height caused by any transverse tilt of the camera did not affect the degree of precision required by its customer.

[99] The Federal Court rejected Tetra's submission. The Court's conclusion is found at paragraphs 185 and 186 of its reasons:

> 185. In the discussion of Claims Construction, above, I have found that the 249 Patent does not contemplate that compensation for tilt will always be necessary as the system moves along the track. Instead, the system compensates for tilt only when this phenomenon is "encountered".
>
> 186. I therefore conclude that the 3DTAS determines the difference, or the "actual delta", between the rail base and the crosstie in the manner described in the 249 Patent. The algorithm for determining the actual delta disclosed in the patent does not require a consideration of [tilt correction] in all circumstances. The claims of the 249 Patent encompass the detection of rail seat abrasion even when the track is level.
>
> (underlining added)

E. Did the Federal Court err?

i. The construction of the 249 Patent

[100] As explained in the above discussion of the reasons of the Federal Court, the Court's conclusion that the 3-D TAS infringed the 249 Patent was premised upon its construction of the term "actual delta". The Court's construction of this term is found at paragraphs 107 and 108 of its reasons, which are set out above at paragraph 91.

[101] The Court relied upon Georgetown's expert's opinion about the plain meaning of the "actual delta" and upon paragraph 0009 of the Patent's disclosure to reach its conclusion. Paragraph 0009 is set out in material part at paragraph 78 above. Paragraph 0009 describes a system "adapted to determine whether rail seat abrasion is present". The system's processor does this by employing "a mathematics based algorithm which compensates for tilt encountered as the inspection system moves along the track."

[102] The Court reasoned from this statement that the 249 Patent "does not contemplate that compensation for tilt will always be necessary as the system moves along the track. Instead, the system compensates for tilt only when this phenomenon is 'encountered'." (paragraph 107).

[103] This was not a purposive construction of the relevant claims of the Patent. Where any ambiguity exists in the language of a claim recourse to the disclosure portion of the specification is permissible. However, the language of the claims cannot be ignored. Nor, as stated above, can

a court rely on expert testimony while failing to have proper regard to the words of the relevant claims.

[104] I begin the construction exercise with the Patent's disclosure, mindful that while claims may be construed with reference to the entire specification, the disclosure may not be used to enlarge or contract the scope of a claim as written.

[105] The Detailed Description of Illustrative Embodiments commences at paragraph 0031 of the Patent and continues to paragraph 0086. The first reference to an embodiment that utilizes an algorithm that adjusts for vehicle tilt is found in paragraph 0072.

[106] Paragraph 0072 commences "[i]n yet another exemplary embodiment of the present invention, rail seat abrasion may be predicted with a high level of accuracy." Thus, while other embodiments predict rail seat abrasion without adjusting for tilt, the teaching of the Patent is that an embodiment that adjusts for tilt predicts rail seat abrasion with a higher degree of accuracy, particularly when tilt is encountered.

[107] As the Federal Court's construction was made without explicit reference to the claims of the Patent said to be infringed, I turn now to these claims.

[108] Claim 7 of the Patent is an independent claim of a method for determining rail seat abrasion. Claim 7 is one of the three claims Georgetown alleges was infringed by Tetra. Claim 7 states:

> 7. A method for determining rail seat abrasion of a rail road track, the method comprising the steps of:
>
> (a) determining a height of a left rail base, right rail base, left crosstie and right crosstie, determining vertical pixel counts for each of the heights of the left rail base, right rail base, left crosstie and right crosstie and normalizing the vertical pixel counts based upon a measurement index;
>
> (b) recording the heights of the left rail base, right rail base, left crosstie and right crosstie;
>
> (c) determining an actual delta between the left rail base height and the left crosstie height and determining an actual delta between the right rail base height and the right crosstie height; and
>
> (d) determining a rail seat abrasion value for the right and left rail bases.

[109] At trial, Georgetown's expert agreed in cross-examination that "actual delta" was not a term that would be known to the skilled worker (Myler Cross-examination, Appeal Book, page 2475, line 17 through page 2476, line 2). Given that the term was not a term of art, it follows that the term should be interpreted in the light of the disclosure. Paragraph 0076 of the Patent provides the only explanation of what an "actual delta" is.

[110] Paragraph 0076 teaches that the actual delta is "the distance/difference between two points" (as found by the Federal Court).

[111] Georgetown argues that claim 8 aids in construing claim 7 of the Patent.

[112] Claim 8 is as follows:

> The method of claim 7 further comprising (e) determining a tilt correction factor.

[113] Georgetown argues that the principle of claim differentiation presumes that patent claims are drafted so as not to be redundant. Thus, different claims have different scopes. Independent claims are understood to include more than dependent claims; a limitation in the dependent claim should not be read into the independent claim.

[114] Dependent claim 8 adds a limitation to independent claim 7: a tilt correction factor must be determined. It follows that determining a tilt correction factor is not a necessary element of claim 7.

[115] Therefore, I accept Georgetown's submission that the method taught and claimed in claim 7 does not require the determination of a tilt correction factor. The "actual delta" referred to in claim 7 is simply the distance or difference between two points.

[116] Claim 11, the second claim alleged to be infringed, provides:

> A method as defined in claim 7, wherein step (d) is accomplished based upon the actual delta for the right and left rail bases.

[117] This dependent claim again requires the calculation of an actual delta which is simply the distance or difference between two points. It does not require the application of the tilt correction factor in order to determine the actual delta or rail seat abrasion.

[118] The final claim said to be infringed is claim 18:

> A system for determining rail seat abrasion of a rail road track, the system comprising:

> at least one light generator positioned adjacent the rail road track, the light generator adapted to project a beam of light across the rail road track;
>
> at least one camera positioned adjacent the rail road track for receiving at least a portion of the light reflected from the rail road track and for generating at least one image representative of a profile of at least a portion of the rail road track, and
>
> at least one processor adapted to perform the steps comprising:
>
> analyzing at least one image;
>
> determining a height of a left rail base, right rail base, left crosstie and right crosstie, determining vertical pixel counts for each of the heights of the left rail base, right rail base, left crosstie and right crosstie and normalizing the vertical pixel counts based upon a measurement index; and
>
> determining whether rail seat abrasion is present along the rail road track.

[119] This is an independent claim for a system for determining rail seat abrasion. The system claimed includes a processor adapted to determine a height of a left rail base, right rail base, left crosstie and right crosstie, determine vertical pixel counts for each of the heights of the left rail base, right rail base, left crosstie and right crosstie and normalize the vertical pixel counts based upon a measurement index. The processor must also determine "whether rail seat abrasion is present".

[120] Claim 18 is to be distinguished from claim 1 of the Patent:

> A system for determining rail seat abrasion of a rail road track, the system comprising:
>
> at least one light generator positioned adjacent the rail road track, the light generator adapted to project a beam of light across the rail road track;
>
> at least one camera positioned adjacent the rail road track for receiving at least a portion of the light reflected from the rail road track and for generating at least one image representative of a profile of at least a portion of the rail road track, and

> at least one processor adapted to perform the steps comprising:
>
> analyzing the at least one image; and
>
> determining whether rail seat abrasion is present along the rail road track, wherein, when determining whether rail seat abrasion is present, the at least one processor compensates for a tilt of the rail road track.

[121] Claim 1 is another independent claim for a system for determining rail seat abrasion of a rail road track. It differs from claim 18 in one material respect: claim 18 does not compensate for any tilt of the rail road track.

[122] Thus, the 249 Patent teaches and claims two distinct systems and methods for determining the presence and extent of rail seat abrasion. The first uses positional data of the rail with respect to the crosstie, and also teaches and claims at least one processor that compensates for a tilt of the rail road track (claims 1 and 12). The second system and method does not compensate for tilt (claims 7 and 18). It is a system and method that uses the 3-D data describing the geometry of the track and its components to determine the difference in height between the rail base and the crosstie. Because rail seat abrasion causes the height of the rail to lessen as the tie abrades, the height differential is proportional to rail seat abrasion. More precisely, when there is no rail seat abrasion the height difference between the rail base and the crosstie will be a nominal value. After abrasion has occurred, the height of the rail will decrease and the difference in height between the rail base and the crosstie will be less than the nominal value.

[123] It follows that, correctly construed, the determination of an actual delta based upon the application of a tilt correction factor was not an essential element of each claim asserted to be infringed (claims 7, 11 and 18).

[124] Having found that the claims alleged to be infringed, claims 7, 11 and 18, did not require the application of a tilt correction factor, the next inquiry is whether claims 7, 11 and 18 of the 249 Patent were invalid on the ground of obviousness.

ii. Correctly construed, were claims of the 249 Patent invalid?

[125] While Tetra alleges that the entire 249 Patent is invalid, my analysis centers on the claims said to be infringed, claims 7, 11 and 18.

[126] The Federal Court found, at paragraph 86 of its reasons, that the primary focus of both the 082 and the 249 Patents is the use of machine vision to address "well-known challenges" associated with the inspection of railway tracks. The Court's findings, at paragraph 90, regarding the common general knowledge of the skilled worker apply equally to the 249 Patent: that, at a minimum, a machine vision system could be used to inspect railway tracks and their components in order to identify defects.

[127] The Federal Court found, at paragraph 147 of its reasons, that the 249 Patent solves the problem of rail seat abrasion by comparing the height of the crosstie with the height of another track component, the rail base, and that it also includes an algorithm for increasing the accuracy of the rail seat abrasion measurement by accounting for tilt. The Court found that these proposed solutions were not evident in the prior art and that they could not have been arrived at without inventive insight.

[128] I have construed claims 7, 11 and 18 not to require the determination of an actual delta based upon the application of a tilt correction factor. Instead, the system and method taught by these claims determines the difference in height between the rail base and the crosstie. The height differential is proportional to rail seat abrasion.

[129] In addition, I have previously concluded that it was obvious at the time of the 082 Patent to use machine vision to measure height differences between the height of a crosstie and the height of a tie plate.

[130] The difference between the claims of the 082 Patent and claims 7, 11 and 18 of the 249 Patent is the reference point: for the 082 Patent the reference point is the height of the tie plate, for the 249 Patent it is the height of the rail base. There was nothing inventive at the time of the 249 Patent in choosing the rail base height as the reference point for calculating a height differential and determining rail seat abrasion. It follows that claims 7, 11 and 18 of the 249 Patent are obvious and that the Federal Court erred in failing to find those claims to be invalid.

F. Conclusion on the 249 Patent

[131] The Federal Court erred in failing to declare claims 7, 11 and 18 of the 249 Patent to be invalid on the ground that they were obvious. It follows that the Court further erred by finding these claims to have been infringed by Tetra.

[132] At trial, Tetra argued that all of the claims of the 249 Patent are invalid on the ground of obviousness. This requires consideration of whether the claims of the Patent that compensate for the tilt of the rail road track are obvious.

[133] This issue is largely factual and should be reconsidered by the Federal Court which is better placed to consider the factual question of whether the differences between the prior art and the inventive concept of the claims of the 249 Patent would have been obvious to the skilled worker applying the common general knowledge. In addition to being fact driven, this was not an issue argued in sufficient detail before us.

7. Conclusion and costs

[134] For these reasons, I would allow the appeal and set aside the judgment of the Federal Court. Pronouncing the judgment that ought to have been pronounced, I would dismiss Georgetown's claim for infringement and allow Tetra's counterclaim in part. I would declare Canadian Letters Patent 2,572,082 and claims 7, 11 and 18 of Canadian Letters Patent 2,766,249 to be invalid. I would remit to the Federal Court for redetermination in accordance with these reasons the issues of the validity of the remaining claims of Canadian Letters Patent 2,766,249. As Tetra has been substantially successful on appeal I would award it its costs in the Federal Court.

[135] As for the costs in this Court, while each party sought increased costs in the event that they were successful, each agreed that a reasonable lump sum payment for costs in this Court

would be a lump sum of $10,000. This sum approximates fees calculated on the basis of Column IV of the Tariff and disbursements in the approximate amount of $2,000.

[136] I see no basis not to assess fees in this Court on the basis of Column IV. It follows that I would award the costs of this appeal to Tetra fixed in the lump sum of $10,000 on account of fees, disbursements and taxes.

"Eleanor R. Dawson"
J.A.

"I agree.
J. D. Denis Pelletier J.A."

"I agree.
Wyman W. Webb J.A."

FEDERAL COURT OF APPEAL

NAMES OF COUNSEL AND SOLICITORS OF RECORD

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APPEARANCES:

Bruce Stratton Bob H. Sotiriadis Bentley Gaikis	FOR THE APPELLANT
Donald M. Cameron Anastassia Trifonova	FOR THE RESPONDENT

SOLICITORS OF RECORD:

Robic, LLP Montréal, Quebec	FOR THE APPELLANT
Bereskin & Parr LLP Toronto, Ontario	FOR THE RESPONDENT