IN THE SUPREME COURT OF NOVA SCOTIA

Citation: North Sydney Associates v. United Dominion Industries Ltd., 2005 NSSC 206

Date: 20050721
Docket: S.H. 173786
Registry: Halifax

Between:

NORTH SYDNEY ASSOCIATES, a limited partnership, acting through its general partner Norsyd Investments Inc. In receivership by its receiver **GOODMAN ASSOCIATES INCORPORATED**

Plaintiff

v.

UNITED DOMINION INDUSTRIES LIMITED, formerly carrying on business under the firm name and style of **ROBB ENGINEERING**, a body corporate

Defendant

Judge: The Honourable Justice Felix A. Cacchione

Heard: May 2 - 5, 9 -12, 2005, in Halifax, Nova Scotia

Counsel: David P.S. Farrar, Q.C., Colin D. Piercey and Donn L. Fraser, for the Plaintiff
Michael J. Wood, Q.C., Ronald S. Noseworthy, Q.C. and Cory J. Withrow, for the Defendant

By the Court:

[1] This action arises from remedial repairs made to open web steel joists hereinafter referred to as (the joists) manufactured by the Defendant and used in the fabrication of the North Sydney Mall. The Plaintiff's action, set out in the Statement of Claim dated September 10th, 2001 was brought both in contract and in tort. The Plaintiff, however, did not advance any argument based on contract.

[2] It claims the Defendant is liable in tort for economic loss representing the cost of repairs made to the joists to correct potentially dangerous deficiencies in those joists. It alleges the Defendant owed a duty to fabricate the joists in a workmanlike fashion and that the Defendant breached that duty by failing to ensure the joists were properly constructed. As a result, the Plaintiff claims it suffered damages in the form of the cost of repairing the joists.

[3] The defence filed July 26th, 2002, denies there was a contract in existence between the parties and that the joists were deficient.

[4] In the alternative the Defence states that if the joists were defective the defects were caused after fabrication and erection and not by its negligence. It further states that if any defects were caused by the Defendant's negligence those defects did not constitute an unacceptable risk to the public and that the repairs undertaken were excessive and resulted in betterment constituting unjust enrichment of the Plaintiff.

[5] The questions to be answered in these proceedings are the following:

1. Was there a contract between the parties and was it breached?

2. Were there defects in the joists manufactured by the Defendant and if so, were those defects simply shoddy workmanship or dangerous defects?

3. If defects did exist which were dangerous defects and were caused by the Defendant's negligence, did those defects pose a real and substantial danger to the occupants of the building?

4. Were the repairs undertaken by the Plaintiff required to alleviate the risk posed by the dangerous defects or merely to improve the quality of the workmanship?

5. Were the Plaintiff's remedial actions reasonable having regard to all the circumstances?

[6] The evidence presented at trial discloses that the North Sydney Mall was built in 1979 using design specifications and documents prepared by Murray Backler and Associates. The building was framed with steel beams and columns supporting open web steel joists, manufactured by the Defendant under the firm name of Robb Engineering. The metal roof and decking was supported by these joists.

[7] The mall opened to the public in 1980. No problems regarding the structural integrity of the building were encountered before remedial work on the joists was commenced in the early fall of 2001.

[8] As a result of the collapse of two roof structures in Newfoundland, in 1987 and 1995, which had been constructed using open web steel joists manufactured by Robb Engineering and because of concerns expressed by the Association of Professional Engineers and Geoscientists of Newfoundland (APEGN) regarding the structural integrity of certain roof structures, the Government of Newfoundland had all public buildings inspected. The inspections resulted in a finding that most of the buildings inspected contained open web steel joists with defective welds. A report prepared for the Government of Newfoundland's Department of Works, Services and Transportation concluded that buildings or portions of buildings constructed using open web steel joists manufactured by Robb Engineering could not be considered safe due to a general low quality of welding. The APEGN, advised its counterpart in Nova Scotia, the Association of Professional Engineers of Nova Scotia (APENS) in late 1996 of the Newfoundland experience.

[9] In March 1997 the Nova Scotia Department of Housing and Municipal Affairs issued a news release indicating it was reviewing a list of buildings in Nova Scotia built with open web steel joists supplied by Robb Engineering.

[10] In 1998 the owners of the North Sydney Mall through their property managers, the Hardman Group, had their building inspected by Vaughan Engineering. This firm prepared a report for the owners of the mall (Vaughan Report) dated September 1998 which outlined the results of its inspection. The Vaughan Report was tendered into evidence as Exhibit 1, Tab 3. The inspection consisted of a visual inspection of 250 joists or approximately 30% of the total joists used in this building. The inspection also consisted of a radiographic inspection or magnetic particle testing of 12 welds on each of 80 joists. The visual inspection showed few deficiencies, however, when the same welds were examined using the magnetic particle testing method, significant cracking was evident. Magnetic particle testing used in 17 locations revealed that in 12 of the 17 locations there were deficiencies including one area where no welds were found.

[11] The Vaughan Report recommended welding repairs be made as soon as possible and ideally before significant snow loads accumulated on the roof of the building. The report also suggested that if early snow falls occurred the snow would have to be removed from the roof to prevent possible failure of the joists. This report estimated the cost of remediation as being from 400,000 to 1.25 million dollars.

[12] The evidence of Gary Foster, Janet Carrigan, Paul Carrigan and Paulette Cox, all former mall managers at the North Sydney Mall during the period from 1987 to 2001 when the remediation was done, was that it was common practice to check the mall roof for snow accumulation during the winter. Mr. Foster, the mall manager between 1987 and 1989, testified that inspecting the roof for snow loads was a practice in place before he went to work at the mall. The mall maintenance personnel were directed to inspect the roof and remove snow which accumulated there. Snow removal was usually done using shovels, however, on some occasions snow blowers were also used.

[13] The evidence of Paul Carrigan and Gary Foster indicated that snow accumulation on the mall roof was dependent on wind direction and that snow tended to accumulate more around the heating ventilation and air conditioning units and the parapet of the roof than in other areas. Sometimes the mall parking lot would be covered with snow but there would be no snow on the roof. All the former mall managers were conscious of snow loads on the roof and the effect of these loads on the building hence their reason for monitoring the roof during snowfalls. Mr. Carrigan, the mall manager at time the Department of Housing and

Municipal Affairs advisory was issued in 1997, was concerned that snow loads could cause the mall roof to collapse.

[14] The evidence of these witnesses was that the roof was consistently monitored during the snow season to prevent the accumulation of significant snow loads.

[15] Following receipt of the Vaughan Report, the Hardman Group commissioned another engineering report, this time from ADI Limited (ADI). The ADI report dated January 1999 was tendered into evidence as Exhibit 1, Tab 5. The main purpose of this report was to re-inspect the 61 defective weld areas noted in the Vaughan Report. In its re-inspection ADI noted 62 areas where deficiencies were found. Not all deficiencies noted were recommended for remediation. ADI reported that 20 of 62 areas required remediation work because the deficiencies observed affected the structural integrity of the open web steel joists.

[16] ADI's report included the following observations concerning the joists and in particular the welds on those joists:

1. The overall quality of the weld was poor due to undercutting on the welds and chord members and in some instances both members.

2. Weld porosity.

3. Crater and cracks at the end of welds.

4. Inconsistent weld profiles and weld lengths.

5. Poor fit up between weld and chord members.

6. Lack of fusion.

7. Broken welds at web to chord connection points.

8. Cracks in welds at web to chord connection points.

9. No weld present at bar web to double angle chord connection at one location.

10. Damaged bottom chord angle with a notch cut into the angle at one location.

11. Cracks in the welded splice connection for the bottom chord angles.

[17] The areas requiring remediation were identified as those where there was insufficient length of weld and poor weld quality, locations where cracks appeared in the welds for the bottom angled splice connection, areas where cracks were completely broken at the web to bottom chord angle, non-existent weld at joint, weld fracture and loss of bottom angle section.

[18] The ADI report recommended a level II inspection of 100% of the joists in the roof structure be done using certified welding inspectors under the guidance of an experienced professional structural engineer. It advised the level II inspection should be visual only, with the exception of using magnetic particle testing on the bottom chord splice connection. These recommendations were made in light of ADI finding serious structural defects in the inspection of only 55 joists .

[19] As did the Vaughan Report, the ADI report also recommended the repairs be completed as soon as possible and that, in the interim, snow levels on the roof be monitored and snow not be allowed to accumulate.

[20] The Hardman Group obtained a third engineering report this time from Brandys McBride and Richardson (BMR). In its proposal for the provision of structural engineering services BMR suggested using certified welding inspectors in addition to a structural engineer because this would enable a thorough inspection of the joists to ensure that no serious defects were overlooked while saving on unnecessary repairs which would result if a global repair method was used.

[21] The Hardman Group retained BMR to do a level II inspection of 100% of the joists used in the construction of the mall. BMR was instructed to use certified welding inspectors as well as a structural engineer in conducting its inspection. BMR had conducted similar inspections in the past without the use of certified welding inspectors but because the Hardman Group wanted welding inspectors used BMR used them on this project.

[22] Beginning in the late fall of 1999 BMR conducted an inspection of all the joists in the North Sydney Mall. In April 2000 BMR prepared a report based on its

inspection of all the joists located in the North Sydney Mall (the BMR Report). The BMR Report was introduced as Exhibit 1, Tab 13.

[23] Prior to the preparation of its report, BMR found some original structural drawings for the North Sydney Mall. These drawings, prepared by Murray Backler & Associates in 1979, showed the live load design for the mall roof was 40 pounds per square foot (psf) which was below the 46.8 (psf) called for by the National Building Code in effect at the time the structural drawings were prepared and also lower than the 47.2 (psf) mandated by the National Building Code in force at the time the inspection was commenced.

[24] The BMR inspection was led by two engineers, Mark Reynolds and Scott Underhill. Scott Underhill, a structural engineer, was present for the entirety of the inspection and remediation phases of the project. He and Mr. Reynolds were assisted by two certified welding inspectors, Deon Walsh and George Crocker.

[25] Both George Crocker and Scott Underhill were called as witnesses by the Plaintiff at trial.

[26] The certified welding inspectors examined at close proximity each accessible weld on each joist with the use of pry bars, mirrors and degree of undercut gauges. Out of a total of 876 joists in the mall, approximately 80% of these were inspected using the welding inspectors. The remaining 20% of the joists were not examined during the time the inspectors were on site because these were inaccessible due to the presence of gyproc ceilings.

[27] The remaining 20% of the joists were examined, without the use of certified welding inspectors, by Mr. Underhill during the time when the remediation work was being done. He used the same method of inspection as did the welding inspectors, that is a visual examination of each weld on each joist using a pry bar, mirror and undercut gauge.

[28] Mr. Underhill testified that while the welding inspectors were looking at each weld he was making notes of which joist and which welds needed repairs. He also looked at some of the welds which the inspectors noted as being deficient.

[29] Mr. Underhill also examined all the accessible welds in the 20% of the joists he inspected alone.

[30] Mr. Underhill's evidence was that initially he recorded not only the location of the deficient welds but also types of deficiencies found by the inspectors. This, however, took a considerable amount of time since there were approximately 19 panel point welds to be inspected on the bottom chord of each joist. Because there were over 800 joists to be inspected in the building it was decided to simply record the location of each deficient weld and to mark it with a tag so it could be identified for repair once the remediation work commenced.

[31] Mr. Underhill personally observed cracked welds, missing welds, bent web members, welds that were completely fractured, porous welds and undercut welds. He also saw chords which came apart when a pry bar was used to put pressure on them.

[32] Mr. Underhill testified it was the welding inspectors' decision as to what welds should be repaired and that he never overruled their decision. He did not give the inspectors direction as to the capacity or size of welds required.

[33] The inspection done by Mr. Underhill alone coupled with the inspection done using certified welding inspectors resulted in a finding that 3381 bottom chord welds were defective. Of this number 3044 deficient welds were found by the inspectors and 337 by Mr. Underhill.

[34] Mr. Underhill testified that the top chord welds were not inspected visually because the roof of the building was sitting on the top chord making a visual inspection very difficult, however, they were tested by using a pry bar.

[35] It was Mr. Underhill's testimony that repairs were required because the fractured and partially fractured welds, missing welds and lack of fusion in welds made the welds inadequate. His evidence was also that the welds were integral to the structural integrity of the roof. He also testified that magnetic particle testing was used on some splices and deficiencies noted either through mag testing or visual inspection were repaired.

[36] Mr. Underhill recounted having previous experience in the inspection of buildings which contained Robb joists. Prior to working on the North Sydney project, Mr. Underhill had inspected approximately 40 to 50 buildings in New Brunswick, Prince Edward Island and Nova Scotia without the assistance of

certified welding inspectors. His evidence was that only three or four of these other buildings he inspected required remedial work. He referred to the types of deficiencies observed in the joists at the North Sydney Mall as being similar to the deficiencies found in other buildings he had previously inspected except that the deficiencies found in the North Sydney Mall were significantly worse than others he had seen.

[37] Mr. Underhill stated that he was present throughout the time the remediation work was done in order to ensure the repairs were done according to the specifications. His evidence was that no repairs were completed that did not have to be completed.

[38] Mr. Underhill agreed the North Sydney inspection could have been done without the use of certified welding inspectors but stated the decision to use the inspectors was made before the BMR firm was involved.

[39] George Crocker, one of the certified welding inspectors who inspected the joists at the North Sydney Mall, testified the inspection of the joists took five to six weeks to perform. His responsibility on this project was to inspect fabrication welds in order to determine if they met the standards of the Canadian Standards Association and the Canadian Welders Bureau. His evidence was that according to those standards a cracked weld automatically fails to meet the standards and is rejected irrespective of the size of the crack.

[40] Mr. Crocker described the method used to inspect a weld as consisting of first examining the weld visually to see if any cracks were present or if the weld was porous. He would then also use a pry bar to apply pressure to the weld in order to test the weld.

[41] He identified porosity as being the presence of gas pockets in the weld. He stated that not all porous welds were failed by the inspectors only the ones with huge amounts of porosity were failed. His testimony was that if a weld was questionable because of porosity he would discuss it with the other inspector and they would pass the weld.

[42] He testified to having seen huge amounts of undercutting which occurs when the non-weld material gets welded during the welding process. Mr. Crocker's evidence was that some of the undercuts were so severe they had burned through

the non-weld material, that is the steel member. According to Mr Crocker, undercuts are permissible under Code specifications if they are less than 1/32" deep. Undercut gauges were used to measure the depth of an undercut. In this case, however, Mr. Crocker testified that some of the undercuts were so bad that he did not have to worry about using a gauge to determine if they met the Code specifications.

[43] Mr. Crocker testified that the presence of a crater in a weld did not automatically mean the weld was failed. He only failed welds with craters if the weld was cracked. According to CSA standards, which he was using to assess the welds, if a weld has a crack in it, the weld does not meet the standard and must be failed.

[44] Mr. Crocker also testified that some panel points were completely lacking welds.

[45] He corroborated Mr. Underhill's evidence that initially each type of defect observed was recorded but that this process was, in his words "taking forever". They then moved to marking with a tag only those welds that failed to meet the standards and required repairs.

[46] Mr. Crocker testified that some splices were inspected using magnetic particle testing and all the ones so tested failed.

[47] This project was Mr. Crocker's first inspection of Robb joists. Subsequently Mr. Crocker inspected some 15 to 20 other buildings containing Robb joists. He described the Robb joists he viewed at the North Sydney Mall as being the worst of all the ones he had inspected.

[48] Mr. Crocker denied failing welds because of poor workmanship. His evidence was he failed the welds because of defects, some of which were caused by poor workmanship.

[49] John Richardson, a structural engineer with Brandys McBride and Richardson was qualified as an expert witness allowed to give opinion evidence concerning the methodology, inspection and remediation of joists.

[50] BMR was retained by the Hardman Group to prepare a proposal for a level II inspection using a structural engineer and certified welding inspectors. Although BMR had done other inspection jobs on joists without using welding inspectors, they used them on this project because the Hardman Group wanted certified welding inspectors to be part of the inspection team, as had been recommended by the ADI report.

[51] Mr. Richardson was on-site three or four times and examined some of the joists himself. He noted what he termed serious deficiencies, such as three or four missing welds and cracked welds. His evidence concerning the effect of missing welds was that the load getting from the centre to the end of the joist does not work and at some point the joist could fail. He also referred to the load on the joist being greatest at each end of the joist and that welds at the centre of a joist are smaller than those at the ends.

[52] He testified there were some very serious deficiencies requiring remedial work to be done and to be done quickly because of the concern of a roof collapse and the ensuing damage it might cause to both people and property. When the deficiencies were first observed by his engineering firm in the fall of 1999 they mentioned their concerns about a roof collapse to the Hardman Group.

[53] The inspection was conducted by Scott Underhill and Mark Reynolds, both engineers from the BMR firm, together with certified welding inspectors. They were specifically looking for missing welds, cracked welds, bent members and any deficiencies that would make the joists unsafe. Mr. Richardson introduced Exhibit 1, Tab 13 the report prepared by BMR in April 2000. This report contains a table of deficiencies. One example of deficiencies referred to by Mr. Richardson was at joist 14 where out of 16 or 17 panel points, there were 10 that were deemed unacceptable either because of a missing or cracked weld or a weld that was too small.

[54] Mr. Richardson's evidence was that defective welds affect the integrity of a structure, but it depends on the type of defect and what the load is at that particular point. If the defect is bad enough the load is not transferred and the forces overstress the member which causes buckling and bending. He also referred to the inspection of joist 393 where 14 bad welds were observed.

[55] It was Mr. Richardson's opinion that one missing weld could cause the roof to collapse.

[56] His evidence was that 3044 panel point welds on the bottom chords were deficient because of either no welds, cracked welds, or welds that were too small. As a result of finding so many bad welds on the bottom chords the engineers felt it prudent to weld the top three panel points at each end on each joist.

[57] Mr. Richardson personally observed one bottom chord where the members could be pulled apart by hand over a span of eight to ten feet. He also noticed others that could be pulled apart by hand, but were not as bad as the one previously mentioned. His evidence was that deficient welds and bent web members are so serious they could cause the roof to collapse. In his opinion it was a life-safety issue because if the snow load was large enough the roof could collapse.

[58] Mr. Richardson acknowledged that some of the welds which were repaired may not have required repair. He stated however the cost of determining that outweighed the cost of just doing the welds. He opined that the extra cost in determining the capacity of each weld would have been in excess of $200,000.00 just to do the inspection.

[59] It was his opinion that snow loads on the roof are all dependent on wind direction and snow density.

[60] His evidence was that he was never contacted by the defence expert Mr. Comeau to discuss his report.

[61] He stated that while the fact the mall had stood for 20 years without collapse had some impact on his conclusions, it did not affect them in light of the defects that were noted.

[62] During his inspection he did not note any deflexions or sagging in the structures, nor did he see any deformations.

[63] His evidence was that 21 % of all the welds on the bottom chord were serious enough to require repairs. He testified even though the building remained standing despite 21% of bottom chord weld being deficient, that did not mean the building was safe and not in need of repair.

[64] He was of the view that the roof had never had a snow load on it in the amount for which it was designed and this was the reason he saw no deformations or a roof collapse.

[65] Mr. Richardson testified he and his firm conducted a review of all the Sobeys' owned buildings which contained Robb manufactured open web steel joists. There were 40 such buildings and no deflexions were noted in any of them. Only three of the approximately 40 buildings inspected for Sobeys required repairs and these were all shopping centres namely the Bridgewater Mall, the Evangeline Mall and the Summerside Mall.

[66] In his inspection of the Bridgewater Mall, he noted deficiencies such as missing welds, small welds and broken web members. His evidence was the welds which he observed at the Bridgewater Mall were not nearly as bad as the ones he saw at the North Sydney Mall. He acknowledged that most of the welds examined during the Sobeys' inspections were good but stated that was not the case in the North Sydney Mall.

[67] He agreed that magnetic particle testing was not used on any other inspection done by his firm. His evidence was that such testing provides more information about the capacity of a weld than does a visual inspection and that had it not been for the magnetic particle testing, BMR would not have known about small cracks.

[68] Mr. Richardson was not able to testify as to the total number of non-existing welds present at the North Sydney Mall, however he stated that during the three or four hours he was there conducting an inspection, he saw five or six non-existing welds. He provided an example where he noted welds on one side of an angle welding up to the web, but not on the other side. He estimated there were between 10 and 50 non-existent welds out of a total of approximately 15,000 welds. His evidence was that while statistically this may not have been a significant number, the presence of one missing weld was significant from a structural engineer's perspective.

[69] He referred to a crater crack as being a small crack of not much significance from a structural point-of-view, however a cracked weld was, in his opinion, significant to the structural integrity of the joist. He could not give an exact

number of cracked welds present. His evidence was that the most common problem was weld size or small welds. He testified that weld sizes vary depending on their location on the joist. The welds are larger at the end of the joist and smaller at the centre because the load is greatest at the end of the joist. His testimony was that some welds were so small as to have no capacity to carry a load. His evidence was that the welds at particular panel points were all different in width, thickness and length.

[70] It was Mr. Richardson's opinion that both porosity and undercut problems could affect the structural capacity of a weld.

[71] Mr. Richardson testified that the North Sydney joists were significantly worse than the typical Robb joists he had inspected. He stated the joists at the North Sydney Mall were the second worse he had seen in the 60 or 70 inspections he had conducted on similar joists. The North Sydney situation was much worse than either the Summerside or Bridgewater projects where remediation work had also been done. He indicated what was seen in North Sydney was worse than all the Sobeys stores inspected by him or his firm.

[72] While he agreed that some of the top chord end panel points may not have needed re-welding, and that a significantly larger amount of work was done in North Sydney than on other jobs, he was of the opinion that it was necessary from an engineer's perspective, to re-weld the top three panel points on each joist because this is a critical loading point on the joist. He stated that the bottom chord welds were so bad in North Sydney that the engineers did not want to take a chance with the top chord panel points which were not accessible for visual inspections.

[73] Michel Comeau, a structural engineer, was called by the defence and qualified to give opinion evidence regarding the design and function of open web steel joists and their components including welds and also the investigation and remediation of open web steel joists manufactured by Robb Engineering.

[74] Mr. Comeau testified he conducted an inspection of approximately 10 buildings containing these joists and repairs were made to approximately half of those buildings. The method used in those inspections was to review the building documents and then inspect 25 to 30% of the joists to see if there were any distortions and to visually inspect the welds for the presence of any defects such as cracks, undercutting and porosity.

[75] In order to determine if the size of a weld was sufficient he would do an analysis to calculate the size of the weld needed to carry a specific load. The loads are determined through the National Building Code and the design documents.

[76] The calculation done to determine the size of a weld needed to carry a specific load would be done by measuring the geometry of the joists in the field and then using a computer program to measure the forces on those joists. Reference would then be made to the Canadian Standards Association, Standard No. W59 which sets the capacity for welds. Once this calculation is completed it provides the required size of a weld needed to carry a particular load.

[77] His evidence, like that of Mr. Richardson, was that welds are smallest at the centre of the joist and get longer towards the end and that the loads for both top and bottom chords are in essence the same.

[78] Once the weld size is determined for a particular load it could then be compared to what was observed in the field. His evidence was that if there was a crack in the weld, the length of the crack could be discounted from the size of the weld and the remainder would constitute the effective weld.

[79] His evidence was that the same approach could be used with craters in a weld, that is, the size of the crater would be subtracted from the size of the weld and the remainder would represent the effective weld.

[80] Mr. Comeau testified that undercutting is where the non-welded material gets melted during the welding process. He stated this can reduce the capacity of the member. In looking at undercuts he would look for the severity of the undercut to see if it affected the capacity of the joists. His evidence was that he, in the past, had rejected welds for inadequate size and because of the presence of cracks, but not for porosity and rarely for undercutting.

[81] Mr. Comeau would use a pry bar to see if a web could be moved from the chord and if it could be moved then it represented deficient welds. His remediation of such deficient welds would be to reinforce the weld with a plate or to have the weld itself replaced by grinding out the defective weld and re-welding it.

[82] He conducted an examination of some joists at the North Sydney Mall in approximately October 2004. His inspection consisted of looking at approximately 30 joists and approximately 15 to 20 % of the panel points on those joists.

[83] Mr. Comeau testified that he, in the past, had not required repairs to spliced welds because of weld deficiencies but only where one of the two angle lengths did not line up with the other.

[84] He confirmed, as did Mr. Richardson and Mr. Underhill that, the required capacity of a weld in a joist is greater at the side than in the centre of the joist. He could not say if re-welding the top three welds at each end of the joist was necessary in this case. He noted, during his inspection, that although the top three end panel points were repaired, the panel points on the bottom chord were not repaired even though the forces are the same for the top and bottom chords. His evidence was that the bottom chord panel points at each end should have been repaired but were not. He however agreed in cross-examination that the bottom chord end panel points he saw did not need remediation.

[85] At page 6 of his report (Exhibit 8) he made reference to weather data indicating the roof of the mall had undergone and successfully resisted large snow loads up to design values prior to the repair program. He acknowledged however that he had no personal information of how much snow was on the roof at any given time.

[86] In cross-examination Mr. Comeau agreed that any observations he testified to in court could have been made back in 2001 had he been instructed to do so. He also acknowledged he could have met with the people from BMR before repairs were undertaken to discuss the proposed remediation but did not.

[87] He stated he reviewed the three engineering reports and as a result knew the extent of work that was to be done and that certified welding inspectors would be used. His evidence was that there was nothing unusual about how the remediation was to be done. In his opinion, however, there was an excessive amount of work done.

[88] He was aware of the Plaintiff’s interest in his views as to how the remediation was to be done prior to it being effected and in particular he was aware the Plaintiff wanted to know if the proposed remediation was excessive.

[89] His expert report was based on an inspection of approximately 30 joists during a one-day period.

[90] Mr. Comeau testified that cracked welds have a potential of undermining the structural integrity of a weld and that cracks are never appropriate on a weld. His evidence was that if a crack gets bigger, the capacity of the weld is reduced. His approach, upon noticing a crack in a weld, would have been to measure the crack with a tape measure and then perform a calculation to determine what the capacity of the remainder, that is the non-cracked portion, of the weld was. He acknowledged this would take some time to do especially with over 800 joists present in the building.

[91] He agreed with the other engineering reports that recommended remediation be done before the snow season.

[92] Of the approximately 30 joists he inspected he only looked at approximately 20 to 25 % of the welds on those joints. He admitted that not all the joists in the building were of the same dimension as the ones he inspected and he could not say how many joists in the building were of the same size that he measured and used in his calculations.

[93] Mr. Comeau agreed that a 1½ inch weld was too small, but could not say how many of these there were. Since he did his inspection after the repairs had been done, he could not tell which repaired weld had either been cracked, missing or broken. He admitted he could have done this had he gone down to inspect the building before repairs were done.

[94] Mr. Comeau described porosity as being gas inside the weld. He agreed that porosity cannot be detected simply by observing a weld.

[95] With respect to welds which could not be visually inspected such as the top chord welds, Mr. Comeau suggested that an approximation of the length of a weld could be done by touching it with a finger. He agreed however that this method would not be as precise as measuring the weld.

[96] His evidence was that BMR should have measured the length of each crack on each cracked weld on each joist and then done an individual calculation of each of those to see if the weld had a proper capacity.

[97] Mr. Comeau, in prior inspections he conducted, did not use magnetic particle testing. He agreed it would be of concern to him if a splice, having been tested using magnetic particle testing, failed the test. It would also be of concern to him if a chord could be pulled apart by hand.

[98] He estimated that a visual examination of each weld takes approximately three to four minutes and longer for welds on the top chord.

[99] Mr. Comeau also acknowledged it would be of concern to him if 21 defective welds were found on one joist.

[100] In his conclusions, at page 7 of his report, Mr. Comeau stated:

> ...Before the inspection program, the roof was subjected to heavy snow loading, including an "all time extreme" ground snow load event in 1992. **(My emphasis added)**

[101] At trial, however, he could not say that the roof at the North Sydney Mall was subjected to the heavy snow load referenced in his report.

[102] The Plaintiff's claim is a tort for pure economic loss in the form of costs incurred in repairing alleged deficiencies in the structure of the North Sydney Mall.

[103] The burden carried by the Plaintiff is set out in *Winnipeg Condominium Corporation #36 v. Bird Construction*, [1995] 1 S.C.R. 85, the leading case on the recoverability in tort for economic loss. As in the present case the *Winnipeg Condominium* case dealt with a situation where there was a lack of privity of contract between the parties. In that case, a contractor was found liable in tort to the subsequent purchaser of a building when a large slab of concrete cladding fell from the side of the building. The Court held that the owner was able to recover the reasonable costs of putting the building into a non-dangerous state.

[104] What must be established in order to ground a duty in tort to subsequent purchasers of a building for the cost of repairing a defect was stated by LaForest, J. at page 116 as:

> ...the reasonable likelihood that a defect in a building will cause injury to its inhabitants...

[105] Justice LaForest went on to say that the defect must pose a "real and substantial danger" to the inhabitants of the building.

[106] The burden of proof is always on the Plaintiff to demonstrate that there is a serious risk to safety, that the risk was caused by the contractor's negligence and that the repairs are required to alleviate the risk: Winnipeg Condo page 125.

[107] The Plaintiff is required to show that the defects are dangerous. Proof of shoddy or substandard workmanship is not sufficient. It must be proven that the defect poses a real and substantial danger.

[108] If the Plaintiff proves a serious risk to safety which was caused by the contractor's negligence and that repairs were required to alleviate the risk, then the Plaintiff is entitled to recover the reasonable cost of repairing the defects and putting the building back into a non-dangerous state: *Winnipeg Condo*, page 102.

[109] The extent of the Defendant's liability is limited to the costs of repairing the dangerous defect and mitigating the danger: *Winnipeg Condo* page 125.

[110] The duty in tort flows from the contractor's duty to ensure that the building meets a reasonable and safe standard of construction: *Winnipeg Condo* page 105.

[111] Justice LaForest stated at page 116:

> ...the reasonable likelihood that a defect in a building will cause injury to its inhabitants is also sufficient to ground a contractor's duty in tort to subsequent purchasers of the building for the cost of repairing the defect if that defect is discovered prior to any injury and if it poses a real and substantial danger to the inhabitants of the building. In coming to this conclusion, I adopt the reasoning of Laskin J. In *Rivtow*, which I find highly persuasive. If a contractor can be held liable in tort where he or she constructs a building negligently and, as a result of that negligence, the building causes damage to persons or property, it follows that

> the contractor should also be held liable in cases where the dangerous defect is discovered and the owner of the building wishes to mitigate the danger by fixing the defect and putting the building back into a non-dangerous state. In both cases, the duty in tort serves to protect the bodily integrity and property interests of the inhabitants of the building.

[112] It is necessary for the Plaintiff to establish that the danger is real. As stated by Finch C.J.B.C. in *M. Hasegawa & Co. v. Pepsi Bottling Group (Canada) Co.*, [2002] 213 D.L.R. (4th) 663 at page 676:

> With respect, a test of perceived as opposed to actual danger is, in my view vague, overbroad, and impractical. The plaintiff does not suggest whose perception should govern, or how a trier of fact could, on any reasoned basis, choose between evidence of differing perceptions of risk. I would accept as sound the premise that the policy of the law should encourage the production and distribution of food products that are wholesome, and not a danger to health. But whether a food product is an actual danger is a matter upon which scientific opinion, however uncertain it may sometimes be, can be offered, tested and weighed. A test of "perceived" danger is, however, no test at all. Perception is not a matter susceptible of proof, or disproof, by evidence.

[113] The Plaintiff is not required to establish that there was imminent harm as a result of the negligence in order to found liability. As Klebuc stated in *Roy v. Thiessen*, [2003] 10 W.W.R. 662 at page 683:

> In my opinion, construction defects resulting from a contractor's or developer's negligence need not create an imminent risk of harm if the harm created thereby is real and substantial and endangers the safety of occupants of a defective building during its useful life. Public policy and the provisions of the *Building Act* oppose the postponement of remedial work until an imminent risk of harm is evident. More specifically, the requirement of an imminent risk of harm would encourage owners to postpone carrying out remedial work out of fear they may be unable to recover their costs if they promptly and prudently ameliorate a real and substantial harm...

[114] While the Plaintiff bears the burden of proving both the fact that damages were suffered and the quantum of those damages, the burden is on the Defendant if he alleges that the Plaintiff could have and should have mitigated its loss.

[115] In Red Deer College v. Michaels, [1976] 2 S.C.R. 324 Laskin C.J.C. said at p.331:

> ...If it is the defendant's position that the plaintiff could reasonably have avoided some part of the loss claimed, it is for the defendant to carry the burden of that issue, subject to the defendant being content to allow the matter to be disposed of on the trial judge's assessment of the plaintiff's evidence on avoidable consequences.

[116] The standard of conduct which a Plaintiff must attain when assessing what steps should have been taken by him is set out in McGregor on Damages16th edition, Sweet and Maxwell London 1997 at page 326. McGregor quotes from Lord MacMillan's decision in the *Banco De Portugal v. Waterlow and Sons Limited*, [1932] A.C. 452 at 506 as follows:

> ...Where the sufferer from a breach of contract finds himself in consequence of that breach placed in a position of embarrassment the measures which he may be driven to adopt in order to extricate himself ought not to be weighed in nice scales at the instance of the party whose breach of contract has occasioned the difficulty. It is often easy after an emergency has passed to criticize the steps which have been taken to meet it, but such criticism does not come well from those who have themselves created the emergency. The law is satisfied if the party placed in a difficult situation by reason of the breach of a duty owed to him has acted reasonably in the adoption of remedial measures and he will not be held disentitled to recover the cost of such measures merely because the party in breach can suggest that other measures less burdensome to him might have been taken.

[117] The following facts have been established from the testimony of the witnesses and the documentary evidence presented at trial. No contract existed between the parties. The claim advanced by the Plaintiff, based on the evidence presented, is in tort for economic loss. The amount claimed by the Plaintiff for repairs is $553,327.28. The North Sydney Mall was built in 1979 and opened to the public in March 1980. The structure was framed with steel beams and columns which supported open web steel joists manufactured by the defendant. A metal decking or roof sat on the joists.

[118] The joists consisted of a top and bottom chord made from double lengths of angle iron with solid round bars in between called web members. The web members are connected to the top and bottom chord by means of welds. Where the web member meets the chord is referred to as a panel point. In a 40 foot long joist

there are approximately 19 or 20 top and bottom panel points. Not all the joists in the construction of this building were of the same size.

[119] A total of 876 joists were used in the construction of the mall. All joists were inspected either by certified welding inspectors working with structural engineers or by a structural engineer alone before the remediation work was done. Deficiencies in the bottom chord panel points were noted in 743 of the 876 joists. A total of 3381 deficiencies existed in the bottom chord panel points alone.

[120] Few joists did not have any deficiencies in the bottom chord panel points. While some joists had only one or two bottom chord panel point defects, 332 joists had five or more such defects. There were 64 joists with 10 or more defects in the bottom chord panel points. Some joists had as many as 21 bottom chord panel point defects.

[121] Defects in the bottom chord splices and top chord splices, bent web members, bent bottom chord and pinched bottom chord were also present. Five joists numbered 326(f), 369(a) and (d), 568(b) and 560(u) had defects in the three panel point welds at each end of the bottom chord. The load is the greatest at each end of the joist. The load on the top and bottom chords at each end of a joist is about the same.

[122] The vast majority of the deficiencies found related to the welds on the bottom chord panel points. The top chords on the joists were not visually inspected because the metal roof was sitting on them, but they were tested with the use of a pry bar.

[123] A visual inspection of the top chord would have been a very costly proposition entailing approximately an extra 1000 hours of inspection work at a cost of $100.00 per hour for a structural engineer. The cost would have been higher if a certified welding inspector was also used.

[124] The deficiencies found on the bottom chords consisted of cracked welds, missing welds, welds that were completely fractured, porous welds and undercuts, where the weld cut into the chord. Not all porous welds were repaired. Only those with huge amounts of porosity were marked for remediation.

[125] Some of the undercuts were so severe that they had burned through the steel member to which the web member was attached. Undercuts can affect the load bearing capacity of a member.

[126] Not all deficiencies were serious enough to warrant repairs. Repairs were made to serious deficiencies which affected the structural integrity of the joists such as welds which were of insufficient size, cracked welds, broken welds, non-existent welds and welds for the bottom angled splice connection.

[127] The live load design for the roof, of 40 pounds per square foot was less than the 46.8 (psf) called for in the National Building Code in place at the time the mall was designed and less than the 47.2 (psf) called for at the time of remediation.

[128] Non-welding related deficiencies such as bent web members and bent bottom chords were also present. However, some of these occurred during transportation and erection. I accept Mr. Underhill's evidence that the portion of repairs which could be attributed to deficiencies as a result of erection, transportation to the site and for design Codes was estimated to be 0.3%.

[129] Three joists had bottom chords which were bent and seven joists had bent web members. These types of defects also affected the structural integrity of the joists. Some bottom chord members were missing enough welds so as to allow the bottom chord members to be pulled apart by hand. One of these bottom chords could be pulled apart for a distance of eight to ten feet.

[130] Missing welds and bottom chord members which can be pulled apart by hand are serious deficiencies. One missing weld could cause a roof collapse.

[131] I accept the evidence of Mr. Richardson and Mr. Underhill with respect to what they personally observed, that is the presence of cracked welds, missing welds, welds which were completely fractured and welds which had undercut the chord member.

[132] The Plaintiff did not have the remedial work done in 2000 because it did not have the financial resources needed. On October 26th, 2000 Goodman Rosen Incorporated (Goodman, a trustee in bankruptcy) was appointed receiver of rents but could not deal with remediation work under the terms of its appointment.

[133] On June 20th, 2001 Goodman was appointed full receiver. Possession, control and management of the mall from that point was in the hands of Goodman. Goodman entered into a management contract with the Hardman Group and authorized them to obtain refreshed bids on the cost of the remedial work recommended in the engineering reports previously obtained by the Hardman Group.

[134] The Receiver was aware of roof collapses in Newfoundland involving Robb joists. He wanted to have the remedial work done for safety reasons and for financial issues on re-sale of the mall. He was interested in having the repairs done before the busiest time of the year, the Christmas season.

[135] While it would have been nice to have the Defendant's comments on the proposed remediation it would not have affected the Receiver's decision to have the remediation done. The Defendant's input might have affected how some of the work was to be done but not the fact that it had to be done for health and safety reasons.

[136] The original start date for the work was August, 2001 but it was changed to September 1st because the Plaintiff had not heard from the Defendants.

[137] The scope of the proposed remedial work was determined prior to the Receiver's appointment. On the basis of the engineering reports read and conversation had with various people including Mr. Richardson, the Receiver was concerned about a roof collapse. His approach to the situation he found at the North Sydney mall was prudent not extra cautious.

[138] The evidence of Mr. Comeau, the Defence expert, is given less weight than that of Mr. Richardson and Mr. Underhill for several reasons. The first being that Mr. Comeau, having been given the opportunity to observe the defects before the remedial work began and knowing that the Plaintiff was interested in his opinion about whether the proposed work was excessive, did not personally see the defects.

[139] Secondly his inspection, carried out in October 2004 after the remedial work had been completed, involved looking at a total of approximately 30 joists in five locations. He inspected approximately 15 to 20% of the panel points on those joists. If one accepts that a joist contains approximately 20 panel point welds on the bottom chord member it means Mr. Comeau viewed only 4 panel points welds

on each joist he inspected compared to Mr. Underhill who looked at all the bottom chord panel point welds in approximately 175 joists he inspected.

[140] Thirdly, Mr. Comeau's evidence concerning the determination of a proper weld size by measuring the geometry of the joists then using a computer program to measure the forces on the joists and then referring to the CSA Standard W59 in order to determine the required weld size needed to carry a particular load, is unreasonable when one considers that 876 joists were used to construct the mall. Each joists contained approximately 20 panel point welds on the bottom chord alone. His approach would require either a visual estimation or measurement of each weld to determine if the weld size noted was appropriate for the particular load on the joist.

[141] His approach to determining if welds with craters or cracks present were sufficient to carry a particular load was also unreasonable. Mr. Comeau would have each crack measured and the size of the crack subtracted from the weld. The remaining weld would constitute the effective weld. This would then be compared to the calculated size of the required weld needed for a particular load to determine if the remaining effective weld was sufficient. This individual calculation approach involving a structural engineer would, in my opinion, be a time consuming and costly process given his evidence that it would take three to four minutes just to do a visual inspection of each bottom chord weld and longer for the top chord welds.

[142] Fourthly, Mr. Comeau's opinion that he rarely rejected welds for undercutting reasons is of little value in the present case because the undercuts observed by the Plaintiff's witnesses were so severe that they had burned through the chord member. Such undercuts reduced the load bearing capacity of the chord member.

[143] Fifthly, Mr. Comeau's second conclusion contained in his report that before the joists were inspected by BMR "the roof <u>was subjected to</u> heavy snow loading, including an all-time extreme ground snow load event in 1992" is unfounded and speculative. He could not say under oath that the roof was ever subjected to the heavy snow load referred to in his report. His willingness to describe in his expert's report as fact something which was not is telling as to his credibility and the reliability of his evidence. His reported conclusion that "a quantity of the top chord welds which were repaired likely would not have required any repairs" is

speculative and ignores the fact that five joists had defects in the thee panel point welds at each end of the bottom chord.

[144] Finally, Mr. Comeau's evidence that the size of welds, which could not be visually inspected, such as the top chord welds, could be approximated by touching the weld with a finger is at best a very imprecise method to be used by an expert whose work requires precision. This evidence by itself leads me to question the accuracy and reliability of Mr. Comeau's evidence as a whole.

[145] I am not prepared, for reasons set out above, to attach any weight to Mr. Comeau's opinion that the remedial work carried out by the Plaintiff was excessive.

[146] The totality of the evidence establishes that there were serious defects in the open web steel joists and those defects affected the structural integrity of the joists in that the load capacity of the joist was reduced to unacceptable levels. Remediation work was necessary in order to prevent the roof from collapsing.

[147] Three separate engineering firms inspected some or all of the joists and all found missing welds. All three engineering firms independently reached the same conclusion that repairs to the joists were necessary in order to prevent the failure of the joist. All agreed that the work had to be done before the roof was subjected to snow loads.

[148] Snow loads on the roof were consistently monitored by the management and maintenance personnel of the mall. Snow was not allowed to accumulate on the roof. When snow was present on the roof it was affected by wind direction and tended to accumulate near the heating ventilation and air conditioning system and the parapet of the roof. The roof was never subjected to heavy snow loads even during record setting ground snow load events.

[149] The Defendant questioned whether there was any evidence presented of a danger and a requirement to repair in order to alleviate the risk. The evidence supporting a finding that the defects found posed a real and substantial danger to the inhabitants of the building comes from the three engineering firms who inspected the mall and from the witnesses Richardson, Underhill and Crocker.

[150] All three engineering firms noted that the defects found in the joists compromised or affected the structural integrity of the joists. These defects, previously referred to, included missing welds, cracked welds, broken welds and welds of insufficient size. The number of deficiencies found, in excess of 3300 together with the fact that 743 of the 876 joists contained deficiencies and that 64 of those joists had 10 or more deficiencies with one joist having as many as 21 deficiencies all give credence to Mr. Richardson's concern about the roof collapsing. Mr. Richardson's opinion that even one missing weld could cause the roof is strengthened by the number of defects found. I find that the nature and combination of the deficiencies in the joist together with the under-design of the roof load capacity was sufficient enough to decrease the safety margin afforded to the inhabitants of the building under the National Building Code, the CSA and the CWB standards thereby exposing them to increased risk of harm beyond that considered reasonable in our community. This, in my opinion, is sufficient to meet the test of real and substantial danger set out in *Winnipeg Condominium Corporation No. 36 v. Bird Construction Company*.

[151] The Defendant accepts responsibility for the cost of repairing missing welds, welds which were completely cracked and welds that had insufficient capacity to carry the loads for which they were designed. This would appear to be an admission that the Defendant was negligent in fabricating the joists and that such defects existed. Accepting responsibility for the cost of such repairs is, in my opinion, an acknowledgement that those defects were dangerous defects which constituted a real and substantial danger given that the Plaintiff cannot recover costs associated with merely improving the quality of the building. Even if I am wrong in this conclusion the preponderance of evidence establishes that missing welds, broken welds and welds of insufficient size affected the structural integrity of the roof to such degree as to make the joists supporting the roof unsafe and dangerous.

[152] The Defendant argues that no engineering analysis was done to determine the capacity of the defective welds observed. It is submitted that such an analysis is the key to determining if there was a risk posed by the defective welds. The suggested analysis would have been time-consuming and costly given that over 3300 defects were found. I accept that some welds were rewelded during the remediation which may not have required repair. I also accept, however, that the cost of determining by engineering analysis which of those welds did not need repair would have outweighed the cost of simply doing the repair.

[153] The Defendant also submits that there is no evidence of structural defects in the welds which were repaired. This submission ignores the preponderance of evidence which establishes that missing welds, cracked welds, and welds of insufficient size all affect the structural integrity of the roof joists. The fact that some bottom chord members could be pulled apart by hand, including one which could be pulled apart over a distance of eight to ten feet belies the assertion that there was no evidence of structural defects. In addition, the Defendant's expert witness agreed that cracked welds have the potential of undermining the structural integrity of the weld and that the larger the crack the more reduced is the capacity of the weld. He also agreed that cracked welds should never be tolerated. If cracked welds affect the capacity of the weld it follows that missing welds or completely fractured welds affect the structural integrity of the joist.

[154] It is the Defendant's position that the evidence presented does not establish a risk or danger. With respect I cannot agree. The Plaintiff's evidence, which I accept, clearly shows that the missing and cracked welds were of a serious enough nature to cause a roof collapse. The analogy used was that of a house of cards. If one card is removed it affects the integrity of the entire house. I have no doubt that the diligence of the mall personnel in monitoring snow loads on the roof and removing snow from the roof is the reason why the potential of a roof collapse did not become a reality.

[155] That there was a clear risk of danger comes from both the evidence of the Plaintiff and the Defendant. The Defendant's expert, Mr. Comeau, did not suggest that no repairs were required but only that the repairs made were excessive. The Plaintiff's evidence clearly establishes a risk of danger given the number and types of defects found during the inspections and that those defects affected the structural integrity of the joist system used to support the metal roof structure.

[156] No evidence was led by the Defendant as to a less costly alternate method of remediation which could have been used by the Plaintiff. I am of the view that the method advanced by Mr. Comeau to be used in determining the load capacity of cracked welds through an individual mathematical calculation would have been much more time-consuming and costly.

[157] The Defendant argues that Mr. Richardson's opinion concerning the deficiency of welds and their effect on the structural integrity of the joists was

based solely on the Geocon Report. I cannot agree with this submission since Mr. Richardson's opinion was based not only on that report, but also on his personal observation of the welds or lack of welds made onsite together with his prior experience in dealing with similar situations in a great number of other structures which used the same type of joists. His opinion was also formed as a result of input from Mr. Underhill who was present onsite throughout the entirety of the inspection and remediation.

[158] The Defendant in its closing argument accepts that on the issue of mitigation it bears the burden once the Plaintiff has proven that the welds were dangerous and in need of repair. As stated previously, I find that the welds in question did pose a real and substantial danger which required repair. The preponderance of evidence leads me to this conclusion.

[159] Mr. Richardson who had performed inspections on numerous other buildings involving Robb joists found the joists in issue here worse than the typical Robb joists he had seen in other buildings. He described these joists as being the second worst he had seen in 60 or 70 similar jobs. He termed these joists to be significantly worse than others he dealt with. Mr. Underhill had inspected 40 to 50 other buildings which contained Robb joists before working on the one in issue in these proceedings. He testified that the deficiencies he observed in this case were similar to deficiencies he had observed in other inspections except that the deficiencies in the present case were significantly worse than those others.

[160] Mr. Crocker, the certified welding inspector, described what he saw in this inspection as "probably one of the worst welding jobs" he had seen to date.

[161] I conclude, having regard to all the circumstances, that the Plaintiff's remedial actions were reasonable. The Plaintiff offered the Defendant an opportunity to have input on the remedial work prior to its commencement. The Defendant did not accept this offer. It cannot, at this stage, argue that the remedial work was unreasonable or excessive.

[162] The Defendant has led no acceptable evidence to show that the Plaintiff acted in an unreasonable fashion. The Defendant has not established how and to what extent the loss claimed could have been minimized.

[163] Accordingly the Plaintiff shall have judgment in the amount of $553,327.28 together with prejudgment interest. Unless counsel wish to address me separately on the issue of prejudgment interest I would award interest at a rate of 2.5% annually from December 31st, 2001 to the date of judgment. The Plaintiff will also have its costs in the event.

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Cacchione J.