Project Name:	12-07: Development of repair product for roller compacted concrete	**Start Date:**	2020-03-24
Project Number:	2016	**Completion Date:**	2020-12-31

Project Details:

Scientific or Technological Objectives:

[387] This project is a continuation of the BMQ parking lot covering project. Roller compacted concrete or BCR is a product that has experienced misfires following its arrival on the market some fifteen years ago. A BCR repair product was available but it was very expensive. According to Mr. Bertrand, BMQ decided to develop a repair product for this type of concrete that could be used for repairs in thin layers as well as in depth.

Field of Science/Technology:

Civil Engineering (2.01.01)

Project Details:

Intended Results: Improve existing processes
Work locations: Research Facility
Key Employees: Jacques Bertrand (Civil - PEng. (1970) / President)
Evidence types:

Scientific or Technological Advancement:

Uncertainty #1: Technological uncertainty

[396] According to the appellant, technological uncertainty existed because the only data available on this type of concrete came from California, where the climatic conditions are different and that the mixtures developed had to be compatible with the mobile concrete mixer. Mr. Mimoune misunderstood the project since he does not distinguish BCR as such from repair products for this concrete. The project made it possible to develop promising new products, which we continued to monitor in the years following the year in dispute. These activities therefore constitute SR&ED activities since they can be qualified as experimental development work undertaken in the interest of technological progress.

[397] According to the respondent, the activities cannot be qualified as SR&ED. According to Mr. Mimoune, the mixes had been developed in collaboration with the company that created the cements introduced in the tested mixes, namely CTS Cement. BMQ has neither modified the mixes nor developed new techniques for placing concrete. Repair products were available, and although they had to be adapted for use in the mobile concrete mixer, this is a normal obstacle in the industry. BMQ did not use the scientific method, according to him, since the procedures consisted mainly of consulting experts. Also, the respondent argued that discussions led directly to large-scale tests and that the scientific method was therefore not followed by BMQ. In addition,

Technology or Knowledge Base Level:

Activity #1-1: Activity 1 (Fiscal Year 2020)

Methods of experimentation:

[388] According to Mr. Bertrand, it is difficult to validate the durability of such a product without putting it to the test under real conditions, which include, for example, the passage of heavy vehicles, because laboratory tests are not enough not always to obtain a faithful representation of a product.

[389] BMQ therefore undertook to test repair products on its own slab made of BCR located in its parking lot. Two strips were dug in the BCR slab of the BMQ parking lot to test the products, that is to say that two small sections of the parking slab were demolished (two feet wide, twenty feet long and different depths, 25 and 125 millimeters respectively). One was demolished by scarification and the other using a jackhammer. Both are located in a part of the BMQ parking lot where heavy trucks regularly pass by to refuel.

[390] More specifically, three mixes of repair concrete were placed on the edges. According to Mr. Bertrand, the mixtures

tested were not "tablet" mixtures . The mixtures were all made of quick setting cement, but had variations in the type of cement and the admixtures used.

[391] The first mixture put in place was a mixture developed by BMQ in the 2000s. It was to serve as a point of comparison for the other two mixes. The second mixture was a self-consolidating concrete containing a type of cement that BMQ had only used for two years, as well as a superplasticizer and a colloidal adjuvant which gave the mixture its self-compacting property. Finally, the third mixture was experimental in nature and had the particularity of containing powdered acrylic latex. This mixture had been tested in the United States and used for the repair of concrete structures in this country. However, the expert consulted by Mr. Bertrand had confirmed that he did not believe that this concrete would perform well in the planned repairs.

[392] The cements used in the second and third mix came from the same supplier, CTS Cement, with whom BMQ planned the implementation of this project.

[393] Samples were taken during the installation of the repair products to check the adhesion by oblique shearing, the network of air bubbles, as well as the resistance to compression. According to Mr. Bertrand, two of the three mixtures can be used to make repairs to the BCR; however, the test mixture from the United States can only be used indoors since it did not meet the standards for durability testing.

[394] BMQ continued to observe the progress of the repairs carried out over the following years. Three years after the end of the tax year in dispute, BMQ has made tensile strength tests on cores taken from the selvedges to verify the adhesion of the mixtures to the concrete slab on which they were laid. . The testing of other repair products combined with different demolition techniques of the BCR slab was also done in the taxation years after the 2012 taxation year.

Results:

COSTS

[412] Thus, the salary expenses for which the deduction is claimed by BMQ should be reduced by a total amount of $ 2,715, representing the salaries for ineligible activities ($ 1,524) and the 10% reduction in expenses ($ 1,191). The total deductible salary expenses under section 37 and eligible for the calculation of the ITC is therefore $ 10,728.

[413] According to the documentary evidence filed at the hearing, the expenses for the materials totaled $ 494, representing the cost of the various mixtures tested within the framework of this project. However, according to Exhibit AR-1, the appellant has waived the right to claim the deduction of costs relating to mobile concrete mixers (that is, the 32 hours during which they were used). Given the concessions made by the parties, the total expenditure for the materials that are deductible under section 37 and eligible for the calculation of the ITC is therefore $ 494.

[414] Expenses related to subcontractors retained to perform laboratory tests are considered expenses for SR&ED activities, being expenses incurred in support of the project and directly related to the SR&ED work. However, the expenses incurred for the excavation of the slab of BCR should not be included as deductible expenses under section 37 and eligible for the calculation of the ITC, these being instead replaced by the replacement amount, since I consider that these expenses do not represent expenses directly related to the SR&ED work. Thus, taking into account the concessions made by the appellant and the exhibits produced, the expense of $ 1,917 for the subcontractors is deductible under section 37 and admissible for the calculation of the ITC

Conclusion:

a) Qualification of the project

[398] In the present case, the evidence demonstrated that relatively new cements were introduced into the mixtures tested and that the performance of the mixtures as BCR repair products was unknown in current industry techniques or practices. A mixture had actually been created by BMQ in 2009 and used to carry out repairs on the Champlain Bridge; another mixture, containing an acrylic latex, was an experimental concrete that had been tested in the United States and used in the repair of certain works in the United States; and another mixture had been used by BMQ since the early 2000s.

I consider that BMQ's objective in this project was to advance the procedures for repairing BCR slabs. The evidence showed that the characteristics of the repair concrete were not fixed at the outset; the objective was precisely to develop a concrete that can be used for repairs in thin layers as well as in depth. We therefore met the criterion of technological progress.

[399] In the present case, BMQ convinced me of the existence of a technological uncertainty in this project, which could not be dissipated by technical studies or usual procedures, since BMQ demonstrated that the probability of reaching the objectives sought were not known or determined in advance according to the technological knowledge usually available. Indeed, no large-scale test had been done to test the new BCR repair materials. BMQ could not therefore rely on technical studies or current practices to dispel this technological uncertainty. More specifically, one of the mixtures had never been tested or used in Quebec.

[400] Also, BMQ used the scientific method in the context of this project, having compared the results of the various mixtures placed under similar conditions; it also posed hypotheses.

DOCUMENTATION

[401] As in the case of the other projects, BMQ's tests can be partially reconstructed using its documentation, but a report compiling the tests and making it possible to follow BMQ's thinking throughout the project did not been done. However, even if BMQ did not prepare a detailed account contemporaneously with the tests, the documentation produced at the hearing and the testimonial evidence, particularly the testimony of Mr. Bertrand, demonstrated the progress of the activities.

RULING

[402] Thus, for these reasons, the activities carried out by BMQ in the context of this project constitute SR&ED activities.

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