Project Name:	Beton - transportable concrete modular panels	**Start Date:**	2022-05-09
Project Number:	2221	**Completion Date:**	2022-11-30

Project Details:

Scientific or Technological Objectives:

Measurement	Current Performance	Objective	Has results?
Thickness (inches)	1	0.5	Yes
Strength (%)	100	100	Yes

The following example is based on the Tax Court of Canada judgement BETON WORKSHOP INC., and HER MAJESTY THE QUEEN, Jan 27, 2022.

e) the objective of the project claimed by the appellant was to manufacture transportable concrete panels, the thickness of which was to be reduced by half compared to that manufactured conventionally, and this:

without warping;

without generation of fractures;

with equal or greater compressive strength than panels made with conventional concrete;

with superior physical properties in terms of finish quality, porosity and mechanical strength;

Field of Science/Technology:

Civil Engineering (2.01.01)

Project Details:

Intended Results:	Develop new processes
Work locations:	Research Facility
Key Employees:	Frederic Tremblay (Beton Workshop) (History & Geography - BA (1990) / President of Beton)
Evidence types:	Samples, prototypes, scrap or other artefacts; Design of experiments; Records of trial runs

Scientific or Technological Advancement:

Uncertainty #1: As claimed = LOSS

f) to carry out this project, the appellant encountered technical uncertainties with respect to the choice of:

proportions of ingredients for concrete formulation;

chemical additives;

fiber types to achieve the desired surface finish and mechanical properties such as weight, porosity, compressive strength;

the method of making panels;

16] In order to achieve these objectives, the appellant had to overcome the following two major challenges:

a) develop a mixing and casting process so as to eliminate the formation of cracks and

b) determine chemical and physical parameters allowing to control the appearance of surface aggregates and to better control the color and the uniformity of the surface.

The most significant underlying key variables are:

ingredient proportions (unresolved), additives (unresolved), fibres types - weight, porosity, strength (unresolved), casting process (unresolved)

Technology or Knowledge Base Level:

Activity #1-1: Claimant arguments (Fiscal Year 2022)

Methods of experimentation:

(g) in an attempt to resolve the aforementioned technical uncertainties, the appellant used a trial and error (deduction) approach, involving the testing and experimentation of:

different concrete mix formulations by applying different types of chemical and fiber additives, such as nylon, metal, cardboard, glass sand, etc.;

a basic formulation using a new type of very thin fiber purchased in Japan;

different methods of preparations;

h) the work claimed by the Appellant also includes:

the making of a polymer mold for a hundred castings;

mold modifications;

addition of a standard cure sheet;

watering during the cure;

demoulding time

application of a release agent;

added sealant to prevent warping after 3 weeks;

thickness reduction to minimize internal stresses;

[17] During 2015, the Appellant carried out the following work, which is described in the CRA's SR&ED review report:

development of different concrete formulations by changing the percentage of ingredients;

development of a concrete recipe with few surface aggregates;

modification of the formulation by adding the additive which is the super plasticizer;

modification of the formulation by adding fly ash;

modification of the formulation by adding the shrinkage reducer;

design testing and concrete pour testing on a commercial site;

analyzes of results obtained in the laboratory and on a commercial site;

[18] While carrying out research activities, the appellant encountered the following technical problems, also described in the CRA's SR&ED review report:

the choice of the proportions of the ingredients for the formation of the concrete to obtain a polished surface, without cracking and of good color;

the choice of chemical additives;

the choice of casting method to obtain the desired results in terms of appearance and mechanical properties.

Results:

- Thickness: 0.5 inches (100% of goal)
- Strength: 100 % (100% of goal)

IN THE JUDGES VIEW:

(i) the Appellant has not identified or encountered any limitation of current technology and/or science in the development of concrete mixes and concrete panel manufacturing methods;

(j) the current state of science or technology, in the field of civil engineering, was sufficient to overcome the technical uncertainties encountered by the appellant;

(k) in its test log, the appellant made observations, for each of the tests, which do not demonstrate any measurement, hypothesis or analysis of a scientific or technological nature concerning, among other things:

warpage as a function of time;

the method of incorporating unknown compounds;

the relationship between the science or technology underlying the development of concrete panels and the unsatisfactory results of such testing;

Conclusion:

Documentation:

- Offline Documents: docs

Uncertainty #2: Documentation weaknesses

Technology or Knowledge Base Level:

Activity #2-1: Expert witness rebuttal (Fiscal Year 2022)

Methods of experimentation:

[25] More specifically regarding the modular panels project, Mr. Migneault (CRA expert witness) made the following comments:

the panel that the appellant is seeking to develop is a larger version than the one it already displayed in its available products (fibre-reinforced "concrete" panels measuring 2' x 4' and ½ or ¾ thick inches);

with the materials available, in particular at the level of adjuvants, the knowledge publicly available for the cure and the experience acquired by the appellant during the development of previous products, the appellant could obtain a panel with the targeted dimension of 4 x 8 feet with a thickness of ½ to ¾ inches;

at each stage of its work, the appellant proceeded by applying known solutions to resolve the technical problems encountered, without making assumptions aimed at addressing an uncertainty;

for lack of resources, the appellant did not examine the possible causes of failures;

the appellant did not produce statements concerning the flexural strength of its panels;

the series of tests aimed at determining the quantity of fibers are found in the experiment sheets without each test described being accompanied by quantitative measurements as to the effect of the addition of fibers in the cement formula; fiber types are also not identified in these tests;

the type of cement used for the tests is indicated in the readings but varies throughout the tests between three types and a combination of two of them without explanation of what is sought in these changes, with one exception;

the appellant did not seek to find the cause of the lack of durability of the moulds;

no quantitative measures are reported in the project description or in the experience sheets;

the methods of measuring the mechanical resistance (in compression and in bending) have not been identified and the

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values have not been reported;

for several tests, the formulation (quantity of cement, water and fibers) is not provided. In most cases, only the amount of cement (in terms of pockets) is indicated.

Results:

Conclusion:

Judge concluded:

[39] The analysis of the evidence reveals that the appellant did not adopt a scientific method in carrying out its research activities within the framework of its two projects.

Rather, the appellant proceeded to resolve its technical problems by trial and error methods without trying to understand or solve the problems associated with the technology used.

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