

Specialist Consulting Services for the Conservation of Heritage Structures & Older Buildings



**Condition Assessment, Investigation & Testing
Strategy & Specification Development
On-site Project Reviews**



Paul Jeffs ~ Profile



As principal of PJ Materials Consultants Limited, Paul Jeffs specializes in the conservation of masonry structures. Prior to forming the operation in 1989, he was employed for over 25 years within the construction industry around the world. For the last eighteen years of this time he was employed by a multi-national group headquartered in the United Kingdom which manufactured a vast range of materials and products for construction-related industries.

Consulting Services for the Conservation of Heritage Structures

Paul Jeffs has conducted investigations and building condition assessments and reported on the conservation of heritage structures and older buildings under such authorities as PWGSC, Parks Canada, (Atlantic Region), Region of Peel, Ont, Mount Allison University (NB), the University of New Brunswick, Canadian Coast Guard (NF), the Ministry of Transportation, Ontario, City of Belleville, City of Fredericton, and the City of Hamilton.

Investigations have included the review of existing conditions - utilizing non-destructive testing techniques where appropriate - identification of repairs, replacements and/or restoration of building components, including identification of potential costs for such work. Paul also specialises in cause analysis and the development of conservation strategies which address the causes as well as the result of deterioration, damage and/or deficiencies. When appropriate, strategies have been developed and implemented to comply with the appropriate Heritage Foundation authority's requirements and the guiding principles of Parks Canada's "Standards & Guidelines for the Conservation of Historic Places in Canada". Paul has also developed or assisted in the development of specifications and contract documents, managing the bidding and award processes and providing review services for the project.

PJ Materials Consultants Limited has provided consulting or sub-consulting services for the investigation and/or conservation of many National Heritage Structures and historically significant structures, including, Cape Race Lighthouse, Nfld, Church of Our Lady Immaculate, Guelph, Ontario, Brampton Heritage Complex, the Old Arts Building, UNB, Saint John Carleton Martello Tower, New Brunswick, the City Halls of Belleville & St Catharines, Ont., Fredericton, N. B., & Halifax, N.S., Dingle Memorial Tower, Halifax, N.S., and the Owens Art Gallery, Sackville, N.B. PJ Materials Consultants Ltd received the City of Fredericton Development Committee's 2011 award in recognition of its contribution to the historic preservation of City Hall Fredericton. Sub-consulting services have been provided for Federal Buildings in Toronto, (ON), Windsor, (ON), Brantford (ON) and Fredericton (NB).

Educational Services

Paul provides technical training across Canada through the Continuing Technical Education Division of Dalhousie University. He has also been an instructor for the Professional Development Centre of the University of Toronto providing course modules and special event courses as part of their Building Science Certificate Program. He has also presented for many organizations, such as the Capital Projects & Design, Precinct Properties Branch of the Legislative Assembly of Ontario, the National Capital Commission, the Canadian Society for Civil Engineering and the Ontario Building Envelope Council (Toronto & Ottawa Chapters). Training courses and technical seminars include such topics as Construction, Restoration, Reconstruction & Maintenance of Masonry Structures; Conservation of Heritage Structures & Older Buildings, Modern Concrete Materials & Practices, and Concrete Repair & Protection. He has been a guest lecturer at several Canadian universities, he has authored and presented papers at many national and international conferences and has been a regular presenter of technical training courses in the Middle East.

Technical Articles

Paul Jeffs has authored numerous technical articles, including: "Core Rubble Grouting of Heritage Structure Masonry Walls & Foundations Using Grouting Techniques ~ Canadian Case Studies" *9th Canadian Masonry Symposium*; Fredericton, NB, 2004; "Building Masonry with Natural Stone", *Construction Canada*, November, 2003; "Stabilizing Cracked Masonry" *Construction Canada*, January 2007; "Cape Race Lighthouse ~ A History of Restoration", *Construction Canada*, May 2007; "A Tale of Two Towers", *Construction Canada*, November 2008; "Masonry Restoration ~ The Importance of Cause Analysis", *Construction Canada*, November 2010. "Modern Materials & Techniques for Historic Masonry Structures" *Pushing the Envelope Canada* (OBEC) Spring 2011.

Consulting Services

● Investigation & Analysis

Troubleshooting
Cause Investigation
On-site Testing
Laboratory Analysis

● Recommendations

Materials
Methods
Applications



● Project Management

Budget Review
Specifications & Bid Documents
Contract Documents
Inspection & Testing

● Specialist Services

Expert Testimony
Dispute Resolution
Insurance Investigation

● Specializing in:-

Construction Materials Technology
Concrete Repair & Protection
Durable Concrete Mix Design
Restoration of Masonry Structures
Restoration of Heritage Structures
Special Materials Technology
Concrete Slabs on Grade
Specialist Grouting Applications

Structural Review, Analysis & Engineering and
Specialist Computer-aided Testing and Monitoring
Services can be supplied through associated companies



Technical Training



Special seminars and training courses, which feature the design, specification, construction, protection and restoration of concrete and masonry structures, are provided across Canada in association with the Continuing Education Division of Dalhousie University and throughout the Middle East with Promis Project Management Engineering Systems, Dubai, United Arab Emirates. Courses in other countries are available by arrangement.

For information regarding the latest courses please visit our web site at www.pjmc.net and click on "What's New".



- **Technical Training Courses**
- **Technical Workshops and Seminars**
- **In-House Presentations**
- **On-Site Training**



- **Customized Courses**
- **Conference Presentations**
- **Corporate Seminars**

All topics are presented using digital projection and customized manuals are provided to all attendees.

Specialist Consulting Services for the Construction, Investigation,
Restoration & Protection of Concrete & Masonry Structures

TECHNICAL TRAINING COURSES

The courses detailed below are offered as public courses - or they can be provided
as customized in-house courses

(Please check out our web site for future course topics, dates and locations)

Concrete Practice & Technology

Provided as one-day
separate modules up
to five-days total



Designing, Specifying and Constructing Concrete Slabs on Grade

A one or two-day
course



Investigating & Monitoring Concrete Problems

A one or two-day course



Designing & Implementing Effective
Strategies for

Concrete Repair & Protection

(Getting it Right the Second Time!)

A two-day course



Modern Concrete Materials & Practices (Part One)

Mistakes, Mis-Uses
& Misconceptions

The first two day course
in a series



Modern Concrete Materials & Practices (Part Two)

Confusion, Conflict &
Controversy

The second two day course
in a series



Restoration, Reconstruction & Maintenance of Masonry Structures

A two-day course



The Latest Materials, Techniques & Practices for the Conservation of Heritage Structures & Older Buildings

A two-day course



Project Profiles

The projects detailed below are two examples of restoration projects for which PJ Materials Consultants was the Prime Consultant
(Please check out our web site for additional examples)

Cape Race Lighthouse

Constructed in 1905 and situated in Newfoundland, Cape Race Lighthouse is the oldest reinforced concrete light-tower in North America. The tower underwent three major attempts at restoration in 1937, 1969 and 1983 - the first two projects based on adding an extra layer of concrete to the original tower. All of these attempts failed to address the original causes of the accelerated deterioration and damage and the tower continued to suffer the effects of cracking, freeze-thaw damage and corrosion of embedded reinforcing steel. In 1995, the tower was closed to the public due to the potential hazards of falling concrete debris.

In 1996, PJ Materials Consultants carried out a detailed investigation of the tower's condition and devised and implemented a new restoration strategy on behalf of the Canadian Coast Guard. The restoration work, which was completed in 2000, included the installation of vertical joints, installed through the outer layer of concrete, to better accommodate differential movement. The strategy also included the installation of helical stainless steel masonry ties, the repair of deteriorated concrete and the application of a breathable, waterproof coating. The strategy also included a monitoring programme which determined the appropriateness of coating the concrete after a period of forced drying.



Owens Art Gallery



Situated on Mount Allison University's beautiful campus in Sackville, NB, the Owens Art Gallery is the oldest university museum and art gallery in Canada. Constructed in 1895, the art gallery underwent a major renovation in 1971 which included replacement of the roof. Unfortunately, this caused considerable damage to the inner core rubble of the masonry which - together with decades of water infiltration through joints - led to cracking and displacement of masonry units.

The cause of the problem became apparent when a detailed investigation revealed that the roof structure stub columns had been located over the inner core rubble - resulting in an overload of columns and masonry. The remedy was to transfer the load to new columns constructed to be supported by the structural back-up masonry. The columns supporting unique terra cotta friezes were then removed and repairs carried out before their replacement. The cracked masonry units were then repaired and stainless steel helical reinforcing rods inserted and hidden within selected horizontal joints to strengthen the damaged masonry. Finally, the masonry was cleaned using a mild abrasive cleaning system selected to remove heavy soiling without causing damage to the underlying substrate.

Project References

Hart Hall Building - Mount Allison University, New Brunswick

This campus building had suffered extensively from cracking of masonry units - considered predominantly to be caused by poor design of lintels and sills which did not project sufficiently across the window jamb units. An investigation determined that the problems were being compounded by deterioration of the inner core rubble within the foundation walls. The restoration strategy included below grade waterproofing, stabilizing the foundation walls using cellular foam grouting techniques, installing horizontal joint reinforcing to counter the design deficiencies and complete repointing of the masonry units.

Client: Mount Allison University, Sackville, New Brunswick



Saint Louis Convent, Waterloo, Ontario - Constructed in 1895

The convent is a brick masonry structure supported on a double wythe foundation wall. In 2000, PJ Materials Consultants investigated the cause of masonry damage and identified that the problem was related to deterioration of the inner core rubble within the below grade foundation walls. A restoration strategy was devised which included below grade waterproofing, grouting of the inner core, installation of helical stainless steel masonry ties, repair of a cracks and repointing of cracked and deteriorated masonry joints.

Client: St. Louis Parish Church, Waterloo, Ontario



County of Peel Jail (now a Museum), Brampton, Ontario - Constructed in 1866

As part of the Brampton Heritage Complex restoration programme, PJ Materials Consultants devised and supervised an appropriate strategy to address concerns regarding cracking and deterioration of masonry joints of the old jail building. The work - carried out in two stages during 2001 - included the installation of helical stainless steel masonry ties, installation of lintel joint reinforcement, crack repair and complete repointing of all masonry joints.

Client: Region of Peel, Brampton, Ontario

Peel County Courthouse (now Municipal Offices) - Constructed in 1866

Also part of the Brampton Heritage Complex, the old courthouse building had suffered from deteriorated joints and cracked masonry. PJ Materials Consultants carried out a detailed investigation of the exterior of the building, devised an appropriate restoration strategy, prepared technical specifications and supervised the work. The restoration project, which was carried out in two stages during 2000 and 2001, included the installation of helical stainless steel masonry ties, crack repair and repointing of foundation wall masonry joints.

Client: Region of Peel, Brampton, Ontario



Clock Tower, Old Port of Montreal - Constructed from 1919

PJ Materials Consultants provided sub-consulting services to the Prime Consultants - who were retained by Public Works & Government Services, Canada - to assist in the development of a restoration strategy and to provide on-site advice for the restoration of this historical monument. Carried out in 2001, the work primarily consisted of removal of the old stucco coating, repair of concrete and parged concrete masonry units and the application of a new breathable, elastomeric coating.

Client: Duschenes & Fish Architects, Montreal, PQ

Project References

New Residence Hall - New Brunswick

PJ Materials Consultants Limited were retained as Stone Consultant to the Prime Consultant to develop specifications and source the red sandstone masonry units and buff window and door surround units and to provide technical advice for the masonry construction of this beautiful new campus residence building.

Client: Mount Allison University, NB



Convocation Hall Building - New Brunswick

The sandstone cladding panels and columns were suffering the effects of inadequate movement accommodation due to the use of a hard cement mortar to joint the units. The consulting services provided by PJ Materials Consultants Limited were retained to develop and implement a strategy to correct this problem. This included cutting out the mortar and installing a more appropriate elastomeric joint sealant.

Client: Mount Allison University, New Brunswick



Marjorie Bell Music Conservatory, New Brunswick



The masonry walls of this attractive sandstone building suffered from cracking and many attempts had been made to repoint the step-crack patterns at several locations - each attempt failing to cure the problem. After an investigation by PJ Materials Consultants, it was determined that the original design lacked sufficient expansion joints to facilitate all of the movement due to temperature change. The answer was to "stitch" the cracks and install joints at key locations and install an elastomeric joint sealant that blended with the natural appearance of the sandstone. Following this work, which was carried out in 2000, the masonry has remained crack-free.

Client: Mount Allison University, New Brunswick

The Dunn Physics, Engineering & Geology Building, NB

The consulting services of PJ Materials Consultants were retained to develop specifications and assist in the sourcing and fabrication of the red sandstone masonry units and buff window and door surround units required for this attractive campus building. A quality assurance programme was also developed to provide for winter seasoning of the quarried stone prior to fabrication and outside storage.

Client: Mount Allison University, Sackville, NB



Flemington Building, Sackville, New Brunswick

Problems were encountered with this beautiful red sandstone building. Rainwater leaked to the interior and continually caused damage to decorations, although it was not obvious where water actually infiltrated. An investigation by PJ Materials Consultants revealed that the source of the problem was deteriorated mortar joints between the coping stone units on the gable ends as well as damaged flashings. Problems of leakage to the interior ceased once these defects were corrected.

Client: Mount Allison University

Project References



University Chapel - Constructed in 1975

The stone window units on three sides of this beautiful contemporary style place of worship were suffering from inadequate movement accommodation - largely due to the use of a hard cement mortar when they were installed. As a result, many of the units suffered from damage and rainwater infiltrated to the interior at some location. After an investigation by PJ Materials Consultants Limited, a restoration strategy was devised which has resolved the problem. Many of the units were secured in place using semi-flexible stainless steel ties and the hard mortar was cut out and replaced with an elastomeric sealant.

Client: Mount Allison University, Sackville, New Brunswick.

Gairdner Fine Arts Building - Constructed 1971

This campus building suffered badly from inadequate accommodation of movement, even after a major attempt at restoration during the early 1990's. As a result of the poor movement accommodation, concrete columns were badly deteriorating and water infiltration entered the building through cracks. Following a comprehensive study of the problem by PJ Materials Consultants Limited, a strategy was implemented which created a sliding movement joint within the structural steel beam spanning the columns. Hard cement mortar was removed from cladding panel joints which were sealed with an elastomeric sealant and movement accommodating joints were formed between column lifts.

Client: Mount Allison University, Sackville, New Brunswick.



Cranewood House, Sackville, NB - Constructed from 1836

PJ Materials Consultants were retained to develop a restoration strategy and to supervise the first phase of the exterior restoration of historical Cranewood House - once the home of William Crane, a member of the New Brunswick legislature in the early 1800's. Carried out in 2000, the restoration work predominantly included localized repointing of the sandstone masonry joints using a lime-based mortar, but also required reconstruction of the main entrance porch, and localized pinning of damaged or dislodged sandstone window mullion units using stainless steel masonry ties.

Client: Mount Allison University, Sackville, New Brunswick

Memramcook Institute, NB. - Constructed from 1864

PJ Materials Consultants Limited provided sub-consulting services to the Prime Consultant, who was retained by N.B. Dept of Supply & Services, to provide assistance during the investigation of deteriorated masonry and to provide technical advice during the development of a restoration strategy and specifications. The major restoration work is being carried out in several phases over several years. The first phase, which was carried out in 2000, included the complete replacement of the outer brick wythe of one elevation of the building and the rebuilding of the corner of another elevation - including the repair of damaged sandstone quoin units.

Client: Arthur Arseneau Architects, Sackville, New Brunswick



Project Profile

The project detailed below is a further example of restoration projects for which PJ Materials Consultants were the Consultants
(Please check out our web site for additional examples)

Saint Louis Parish Church Convent, Waterloo, Ontario

This 100-year old convent suffered badly from cracks within the brick masonry and there had been many attempts at repair over the years - all of them failing, with the result that rainwater continually entered the masonry assembly.



An investigation carried out by PJ Materials Consultants determined that the most likely cause of the problem was below grade water infiltration. Rainwater was penetrating through deteriorated mortar joints in the rubble stone foundation wall to cause disintegration of the inner core rubble lime binder. This in turn was causing lack of adequate restraint to stresses developed during extremes of temperature change, resulting in differential movement and settlement, to ultimately cause the cracking problems.



A restoration strategy was devised which included below grade waterproofing, grouting of the voids within the foundations walls using a lightweight cellular foam, the installation of stainless steel masonry ties across the foundation wall and across cracks within the brick masonry and finally cutting out and repointing all cracked mortar joints. In spite of several severe winters and the extremes of temperature, the masonry has remained crack-free and the basement is now dry.

Specialist Consulting Services for the Restoration and
Protection of Concrete & Masonry Structures

Partial List of Clients

PJ Materials Consultants are proud to have served the following companies and organizations

CN Rail, Toronto	Town Hall Sackville, NB
City of Toronto,	Dalhousie University
Region of Peel, Brampton, Ontario	Carlton Group, Sarnia, Ont
Royal Bank, Montreal	Place Des Jardins, Montreal
Public Works Canada, Hull, Quebec	Marathon Realty, Toronto
Toronto Real Estate Board, Don Mills	Westcoast Energy, Fort St John, B.C.
Toronto District Heating Corporation	E.S. Fox Ltd., Niagara, Ont
Consultants BPR, Quebec	Dubrick Property, Kitchener, Ont
M.S. Yolles & Partners, Toronto	Graham Construction, Saskatoon
Windsor-Essex Housing Corporation	Laskey Properties, London, Ont
County of Lambton, Ontario	N.B. Dept of Transportation, NB
PWGSC/Canadian Heritage/Parks Canada	Mount Allison University, NB
Strait Crossing Inc., P.E.I.	Autoport Ltd., Halifax
First Moncton United Baptist Church	Canadian Coast Guard, NF
National Capital Commission, Ottawa, Ont	Harbour Station, Saint John, NB
Ellis-Don Construction, London, Ont	Sze Straka, Waterloo, Ont
Unit Part Company, Oklahoma City	Design Alaska, Fairbanks, Alaska
Beaverbrook Art Gallery, Fredericton, NB	Saint Louis Church, Waterloo, Ont
Duschenes & Fish Architects, Montreal	Arthur Arseneau Architect, Sackville, NB
Omers Realty Management Corporation	Stackpole Limited, Stratford, Ont
Avenor Inc., Gatineau, Quebec	Professional Arts Building, Moncton, NB
Regional Municipality of Ottawa-Carleton, Ont	Diocese of Sault Ste Marie, Sudbury, Ont
University of New Brunswick, Fredericton, NB	Church of Our Lady, Guelph, Ont
Diocese of Hamilton, Ontario	University of Toronto, Ont
Ministry of Transportation, BC	Grand River Authority, Ont

For examples of past projects, please
visit our web site on www.pjmc.net
and click on "Case Studies"

**Specialist Consulting Services for the
Conservation of Heritage
Structures & Older Building**



For more information, please contact:-

PJ Materials Consultants Limited

11 Wagoners Trail
Guelph, Ontario
Canada, N1G 3M9

Telephone: (519) 767-0702
Facsimile: (519) 821-2870
E-Mail: pjeffs@pjmc.net
Web Site: <http://www.pjmc.net>