

Construction Management Project Delivery Method:

A Case Study of the Centre Block
Rehabilitation Project

by
Sarah Laurena Selleck

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AUTHORS DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners. All information presented here within is public knowledge, and available through public sources.

I understand that my thesis maybe made electronically available to the public.

ABSTRACT

Buildings are no longer solely designed and the building of them overseen by architects during their construction. In a slow evolution over decades, the overall building process has transformed into a collaborative design system that engages construction management companies and consultants who work together (along with their clients) in a true integrated process. Such a comprehensive process is most applicable when it comes to heritage restoration projects. Heritage buildings typically have an extra layer of regulation since they have an underlying site and historical value that creates limitations during construction even when they are kept and restored or renovated. Such buildings, most of which are comprised of layered histories, must eventually function effectively to allow for the building's new intended use. During a historical project rehabilitation, conflicting decisions are often made to balance the historical built fabric with the modern building's requirements. The historical value and its intended use – combined with the complexity of today's building expectations and program logistics – influence and deeply underlie the overall building design process. This thesis intends to explore this modern process of integrated design on a specific heritage rehabilitation project: the Canadian Parliament Precinct's Centre Block. Located in the capital city of Ottawa, Centre Block is a national historical building and icon which is part of the Canadian parliamentary complex on Parliament Hill and one of the three buildings which forms the famous Parliamentary Triad. The focus of this thesis is on how modern construction methodology, typically through a construction management contract of some form, has redefined the role of the architect and the process of design development for large complex projects like Centre Block, as well as all of the building in the Parliamentary Precinct. Buildings, and especially historic buildings, in today's society must incorporate multi-disciplined modern building and functional specifications that work together in harmony with the historical value of the building to form a concise design vision and, very importantly, one that can be implemented effectively and on budget.

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To my husband for his patience through this process.

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And lastly, to my parents for their unconditional support.

May you never give up on your dreams.

Table of Contents

AUTHORS DECLARATION	iii
ABSTRACT	v
ACKNOWLEDGEMENTS	vii
LIST OF FIGURES	xiii
INTRODUCTION	1
Thesis Statement	2
The Renovation of Centre Block and the Construction Management Process	3
The Scope of the centre block project	9
Thesis Structure	17
CENTRE BLOCK: HISTORY OF THE HILL	21
CENTRE BLOCK:HISTORY OF THE HILL	21
The Long-Term Vision and Plan	28
Early Works Projects: LOGISTICS AND A DECADE OF STORAGE	39
New Build: The Visitor’s Welcome Centre Phase II	41
HERITAGE BUILDINGS: UNIQUE MERGING OF THE OLD AND THE NEW	51
A Complex Renovation	52
Heritage Value and Resource Management	53
The Library of Parliament	70

The Design Proposal.....	72
House of Commons Chamber - Design Decisions.....	73
House of Commons Chamber - Relationship.....	83
CONSTRUCTION MANAGEMENT: THEIR ROLE IN DESIGN DEVELOPMENT	87
Contract Types and Delivery Methods.....	88
MULTI-DISCIPLINED: THE MODERN DESIGN APPROACH OF CENTRE BLOCK	101
FUNCTIONAL ICON: TRANSFORMING A BUILDINGS PURPOSE	107
Understanding General Contractors.....	108
Managing Historical Records & Resources.....	110
Juxtaposing Interiors.....	111
Adaptable Space.....	114
CONCLUSION: CONSTRUCTION MANAGEMENT AND ITS LIMITATIONS	115
BIBLIOGRAPHY.....	125
Articles and Journals.....	125
Blogs.....	126
Books.....	128

List of Figures

Figure 1	Parliamentary Partners	8
Figure 2	Organizational Structure for Public Services and Procurement Canada	15
Figure 3	Organizational Structure	16
Figure 4	Parliamentary Precinct Boundaries	22
Figure 5	Falls of the Rideau River, at the Ottawa River, 1826 by Thomas Burrows	24
Figure 6	First Eight Locks of the Rideau Canal, the North entrance from the Ottawa River, 1834 by Thomas Burrows	24
Figure 7	Centre Block Floor Plan	26
Figure 8	Temporary Homes for Parliament	29
Figure 9	The First Five-Year Program in the Context of the Long-Term Plan	30-31
Figure 10	Long Term Vision and Plan move sequence	32-33
Figure 11	2006 Demonstration Plan	34-35
Figure 12	Parliamentary Precinct Area Plan	37
Figure 13	Greber Plan	38
Figure 14	Workers prepare stones from the Vaux Wall for storage	41
Figure 15	Visitor Welcome Centre Phase II - Blocking and Stacking	43
Figure 16	Entry Points to Parliament: Design Options	44-45
Figure 17	Centre Block with the Peace Tower	46
Figure 18	The Entrance to the Visitors Welcome Centre Phase 1	46

Figure 19	A bullet hole is seen in the wood frame as Secretary of State John Kerry enters the Library of Parliament-on-Parliament Hill in Ottawa, Canada	49
Figure 20	Excavation for the VWC Phase II in front of Centre Block	49
Figure 21	Workers remove decorative marble slabs from the wall of a room in the Centre Block	54
Figure 22	Interior stone blocks, each one tagged, are seen at the construction site	54
Figure 23	Masons remove heritage stones from the arch on the Senate porch	56
Figure 24	Interior Scaffold set-up in high heritage areas	56
Figure 25	Workers are removing the Baker Memorial from the House of Commons foyer	57
Figure 26	Some stone carvings are damaged by water leaks The huge chandeliers weigh 1,542 kilograms each .	57
Figure 27	Workers carefully dismantle the heritage chandelier that hung in the Senate Chamber.	58
Figure 28	A plaster specialist makes a silicone mold of plaster friezes in the Senate suite in September 2020	59
Figure 29	Worker climbs scaffolding stairs in the Chamber of the House of Commons during a tour of the Centre block renovations Wednesday December 2, 2020 in Ottawa	59
Figure 30	A worker scans the Memorial Chamber with a laser scanner in January 2020	60
Figure 31	A worker is pictured near Centre Block's rotunda on Dec. 12, 2019, working to install temporary mechanical, electrical, and environmental control systems in the building	60
Figure 32	Workers assess the condition of the ceiling of the Senate Chamber in February 2020	61
Figure 33	Individuals stand feet from the Rotunda ceiling	62
Figure 34	A digital imaging specialist does a 3D scan of a stone carving removed from the Senate porch entrance	63
Figure 35	Hall of Honour	64
Figure 36	Two workers wearing protective equipment remove painted fabric	65
Figure 37	Sir Winston Leonard Spencer Churchill by Yousuf Karsh, 1941	67
Figure 38	Interior of the Library of Parliament	71
Figure 39	Courtyard Circulation and Connections	72
Figure 40	West Block, Interim House of Commons	74
Figure 41	Potential concepts for the House of Commons chamber in Centre Block.	76-77

Figure 42	House of Commons Chamber Design Options	78
Figure 43	Empty House of Commons	80
Figure 44	Excavation of Visitors Welcome Centre Phase II	81
Figure 45	West Block, Interim House of Commons Concept	82
Figure 46	House Of Commons Seating Contract Types	89
Figure 47	Project Constraints	89
Figure 48	Contract Type	91
Figure 49	Delivery Method	92
Figure 50	Contract Types	92
Figure 51	Different Delivery Methods	94
Figure 52	Workers install plywood to protect the First World War altar in the Memorial Chamber	103
Figure 53	Plywood protects an ornate staircase in the House of Commons foyer	103
Figure 54	Centre Block's Bim Model	105
Figure 55	The sixth floor is taken down to its bones.	109
Figure 56	Louvre Pyramid	112
Figure 57	A rear veiw of Parliament Hill	118

“On the night of May 10, 1941, with one of the last bombs of the last serious raid, our House of Commons was destroyed by the violence of the enemy, and we have now to consider whether we should build it up again, and how, and when.

We shape our buildings, and afterwards our buildings shape us.

Having dwelt and served for more than forty years in the late Chamber, and having derived very great pleasure and advantage therefrom, I, naturally, should like to see it restored in all essentials to its old form, convenience and dignity.”

Winston Churchill
Former Prime Minister of the United Kingdom

In a speech in the House of Commons on October 28, 1943
In regards to replacing the bombed-out House of Commons chamber

INTRODUCTION

THESIS STATEMENT

Buildings are no longer solely designed and the building of them overseen by architects during their construction. In a slow evolution over decades, the overall building process has transformed into a collaborative design system that engages construction management companies and consultants who work together (along with their clients) in a true integrated process. Such a comprehensive process is most applicable when it comes to heritage restoration projects. Heritage buildings typically have an extra layer of regulation since they have an underlying site and historical value that creates limitations during construction even when they are kept and restored or renovated. Such buildings, most of which are comprised of layered histories, must eventually function effectively to allow for the building's new intended use. During a historical project rehabilitation, conflicting decisions are often made to balance the historical built fabric with the modern building's requirements. The historical value and its intended use – combined with the complexity of today's building expectations and program logistics – influence and deeply underlie the overall building design process. This thesis intends to explore this modern process of integrated design on a specific heritage rehabilitation project: the Canadian Parliament Precinct's Centre Block. Located in the capital city of Ottawa, Centre Block is a national historical building and icon which is part of the Canadian parliamentary complex on Parliament Hill and one of the three buildings which forms the famous Parliamentary Triad. The focus of this thesis is on how modern construction methodology, typically through a construction management contract of some form, has redefined the role of the architect and the process of design development for large complex projects like Centre Block, as well as all of the building in the Parliamentary Precinct. Buildings, and especially historic buildings, in today's society must incorporate multi-disciplined modern building and functional specifications that work together in harmony with the historical value of the building to form a concise design vision and, very importantly to assuage those managers who question maintaining older obsolete buildings, one that can be implemented effectively and on budget.

With Centre Block as well however, there is the problem of the building needing to adapt to new uses or an expansion of uses not foreseen in a building originally criticized when built as too big for its immediate needs. This is the main dilemma of this thesis and one that suggests the limits of an otherwise important and effective working methodology like construction management, one clearly capable of moving projects ahead effectively. In two situations in Centre Block's future, there is an evident struggle between the needs of respectful and sensitive restoration and renovation, and the more radical, much needed, overhaul of key aspects of the

building and its landscape: the new visitor's centre dug into the front lawn of the Triad, and the concept options for a radically expanded House of Commons (already over crowded into its original chamber). This is where the limits of construction management seem to emerge. The complex project is moving forward but there is no clear detachment from that process of discussions of at least two major design decisions that would typically, in the past, fall to the original traditional responsibility of the architect and the excellence of the design concept. Two separate but related problems emerge from this absence of design ambition. One is the diminishment of the touristic visitor experience, reduced to navigating a lightless underground complex. The other is the removal of major parts of the Centre Block west wall to accommodate a much larger Commons programme, a solution which runs counter to the heritage ethics of the process. This Commons design problem is considered by committees as part of a series of options with little anxiety over the reduction of an entire wall of the building when so much else of its heritage is so carefully and expertly handled. The thesis will examine the two design situations and seek to provide a critical overview of how construction management can be maintained as a working approach and adapted to more effectively provide not only excellence in design solutions but fold them better into the broad consensus building process.

THE RENOVATION OF CENTRE BLOCK AND THE CONSTRUCTION MANAGEMENT PROCESS

The Parliament of Canada's main building, Centre Block, is one of the greatest historical buildings in Canada and undoubtedly the most prestigious of Canadian institutions. As the central building of the Parliamentary Triad, Centre Block is the central focal point of Parliament Hill, for Canadians, the most memorable and the most recognizable area of the Parliamentary Precinct. This extensive government complex is the center of our country's political functions and also engages the public through the large front lawn, a series of walking paths along the Ottawa River and houses building tours for the public. Centre Block is the focal point of the three iconic Gothic Revival buildings that comprise the Triad and is widely recognized as a central iconic symbol of Canada and of our government, long being the main image on the now superseded Canadian dollar bill. In 2021, it is presently in the early stages of a long design, renovation and restoration project, a process that is expected to last at least a decade, possibly two. As part of this renewal of the buildings of the Parliamentary Precinct, design decisions are happening continuously as a central driving part of that process. New program requirements and upgrades are being made for the building's rehabilitation, the long term relocation and management of its functions as they are displaced by the renovations, and the construction of new programmes like an expanded visitor's centre. They are funded through the Federal

Government approval processes and handed down to the construction manager (CM) and designers to help facilitate the government's larger long term program.

The design decisions of the parliamentary building renewal process have been and still are being processed into an ongoing schematic design for, in this thesis case study, the Centre Block complex. Those decisions will eventually develop into working construction documents. In that process, the two overarching elements of the Centre Block Rehabilitation Project are its heritage value and its future requirements as a functioning government building. Centre Block is home to several government bodies including the Senate Chambers, the House of Commons, the Prime Minister's Office, and the Library of Parliament. Centre Block's heritage value comes from both a symbolic level through its architecture, and via its function as the working home to our national government. Historical landmarks that take the form of a functional building, such as Centre Block, inevitably require a more complex and difficult design integration for new uses and programs. This is because they must balance the history and the past and future function of the building. The Federal Government of Canada has set certain expectations for the project's design requirements. These expectations are limited to the current building and are balanced against the heritage constraints that exist to maintain the building's heritage value. This creates a unique building challenge during the revitalization to modernize the building, maintain its continuing and overall functionality, and anticipate the needs of the future. Beyond the traditional role of an architect in large projects, the expertise of a CM is required to help facilitate, direct and oversee such complex rehabilitation requirements. A CM is an additional expert whose management and practical building reach and breadth of experience can help facilitate these requirements.

Every project in construction has a type of delivery method which defines and shapes how the project gets built. This delivery method also defines the relationship of the parties involved in the project. The members usually involved in this simpler historically typical process include a client, an architect, and a builder. As projects become more complex these members offering expertise and who are involved in the delivery method contracts can grow to include engineers, consultants, and building subtrades. Before construction companies industrially started to diversify in various types of delivery methods, the most used delivery method was a design-bid-build relationship. This type of delivery method meant the design developed fully during the early stages of the process, and occurred before the project went out for pricing (or tendering). Then, after the price was fully accepted or defined, the construction would commence. This type of delivery method is a very linear approach to design and building. The design is complete and then the building begins.

As the industry adapted to new construction technology, and increasingly as all aspects became digitized through an expanded use at all stages of information technologies, higher

demand for compressed schedules, ways to reduce costs and deliver more complex designs, the delivery methods began to change to provide solutions to these new demands. From the birth of these requirements came a variety of different project delivery methods. Among the most popular is the construction management contract type. This changes the linear relationship of design development by bringing the general contractor on early with the architects and engineers to develop the design, constructability, cost and schedule early in the schematic design stage. It also means that since the contracts are in place early, construction commences alongside with design development. This integration and overlap of construction and design is extremely valuable for historical renovations, since it allows for uncovering and discovery of previously unknown as-built conditions while design is still being discussed, developed and finalized.

There are other project delivery methods which have developed that provide this same opportunity to redefine the older linear relationship of the design-bid-build method. These include the design-build and IPD delivery method types, however, construction management is the only option from all of those types that maintains two separate contracts with the Owner, contracts that separate the designer from the builder into two formal contract relationships with the Owner. For this and other reasons (like the contractual independence of the architect/designer), the actors in the building industry overall tend to favor the construction management delivery method over the other two non-linear types of design-build and IPD.

Renovations of historical buildings are some of the most difficult of complex construction projects. Every historical building has a heritage value which correlates to how easily the building and artifacts within could be replaced and modified. The higher the heritage value of the space, the more difficult it is to transform the building into a modern functional facility reflecting today's needs. Centre Block has one of the highest heritage values in Canada and its rehabilitation will be an unprecedented undertaking for the construction industry. The Centre Block restoration and modernization project is part of a group of other significant and essential construction projects being completed by the client (the Federal Government). They involve the Parliamentary Triad (Centre Block, West Block and East Block) and all of the government facilities located in the Parliamentary Precinct. All of this work is being undertaken by the Federal Government. The occupants of Centre Block, which is composed of departments known as the Parliamentary Partners, are the clients of the Centre Block building. However, the construction for Centre Block is overseen by a separate government department known as Public Service and Procurement Canada (PSPC) who act as a project manager for the Parliamentary Partners that occupy the building, and are contractually acting as the client for the designers and builders in the rehabilitation project. PSPC who manages the entire Parliamentary Precinct has multiple long-term construction objectives for the entire Precinct

and its many historical buildings. It is a massive series of heritage rehabilitation projects that has never been undertaken since the Triad buildings were originally built. For Centre Block and the rest of the Triad buildings this means the project must preserve their historical elements while repairing and updating them to modern standards of construction and eventual use. Establishing the design while maintaining the public heritage assets of the building requires a high degree of coordination between many design disciplines and approval from various bodies of government. The role of the CM assists with the building renovation through the selective areas of rehabilitation and new construction will be the main focus of this thesis. This will include a discussion of the main advantages of construction management contracts: starting early works projects, heritage assets removals and documentation, managing storage for long terms, large-scale excavations all prior to finalized design, reduction of the projects' overall schedule, and overall costs, and the overlapping creation of a variety of target deadlines for different aspects of the design.

The complex nature of protecting, preserving, removing and reinstating high heritage assets in the building, while also coordinating it around the new design requirements of the program, takes a substantial amount of work, coordination, and management that is suited to a large-scale experienced CM. Such an organization has the experience directing logistics and large groups and resources of manpower. An integrated modern design process under a construction management contract with an experienced general contractor is needed to successfully complete such a daunting complex project as Centre Block and the Parliamentary Precinct while maintaining the function of national government. The CM will help facilitate the complex design restrictions of the existing building and play a critical role in overseeing the projects budget and schedule. The broader construction management team brings organization, direction, skill and expertise to the complex process required.

On renovation projects like Centre Block, CMs must provide investigations, temporary work, quality overviews, innovative executions, design strategies, and construction risk management while evaluating the financial and schedule aspects of the design. In a work of architecture, much like one needs a vision, a design, and skilled labour to complete a building in the traditional process, one also needs a master of coordination and execution in a complex work, which is the CMs' role. A construction management services contract will especially help the non-design practical and financial aspects of design development. With historical renovation projects, the CMs' involvement is increased to a much more tailored level through complex contract requirements. In the case of Centre Block (and most construction management contracts), the general contractor and consultants help drive the project; however, the final decisions in terms of maintaining the current building's history and making changes for its intended use must be made by the client. In the case of Centre Block, the client

is the Federal Government of Canada, a group that has its own complexities and hierarchical decision-makers, and this easily doubles the complexity.

In historical renovation projects, one of the first initial design roles is to facilitate the investigation of the existing structure, allowing all parties to understand the as-built conditions, current structural state, and identify any areas of concern for future use. The current condition of the building will impact both the schedule and budget requirements of the program. Such current conditions combined with the additional issues brought forward by heritage requirements will form the design basis of the eventual renovated and restored building, and establish the impact, easy, desired, or problematically difficult, that the new design will have on the original historic base building. As a heritage building, Centre Block today lacks any major modern design upgrades done in its history. Its overdue expected renovations will include a huge overall reshaping of all aspects of the building to meet modern functional expectations of running a national government. Before the project began, the focus on what needs to be upgraded had to be decided and this established a list of requirements. This list is continuously still under development and coordinated by an elaborate government branch that has created a Master Plan rehabilitation strategy for all aspects of the parliamentary buildings. Prior to this being formed, years of investigations, planning and studies were performed to help evaluate the criteria. The Centre Block Rehabilitation Project is one of many in this broader Master Plan. In turn, the Centre Block project has its own series of smaller enabling projects required to be completed before construction can begin. The requirement for enabling projects is typical of any large program.

The expectations that are specific to the Centre Block project include security requirements, mechanical/electrical integrated systems, user interfaces, upgraded interiors, and increased space for the House of Commons and Senate requirements. This is where effective collaboration from a construction management contractor will add true calculated value for the project. The CM along with all disciplines of design from architectural, civil, structural, mechanical, electrical and landscape will meet, discuss and review on both a design and a constructability standpoint. Originally, in a traditional construction contract approach, many of these sectors of design were fed through the architect as a final reviewer; however, now – in modern construction – these reviews and developments tend to be a round table approach. Members are weighed equally, and as the design develops the budget and schedule are developed in sequence with the CM. The relationship between all contractual parties on the project must be a marriage between contractor, architect and engineers. For the project to thrive, the design must be a combination of constructible details, current site conditions, and a cohesive vision, especially in a historical building fabric like Centre Block that respects the building's heritage. As the design develops, each phase will have a more detailed budget

associated with it. This allows the budget to gain accuracy as the design does.

A strong continuously working relationship between the general contractor, engineers, and architects is required on renovation projects where coordination of as-built conditions is key. The building renovation must merge the old building (with all of its limitations) with the new modernizing prerequisites. In addition to these complex design constraints, the Centre Block project is part of a Master Plan of the Federal Government's infrastructure vision. Centre Block is a Federal Government building; however, in the eyes of many Canadians, it is also a public building. The overarching vision of the grand Parliamentary plan that was created during the original formation of the government's infrastructure in Ottawa can be easily abandoned in new decisions made by the current government.

Moreover, and this is the issue in the two problems with construction management noted earlier, these design decisions do not stem from an overarching architect's vision, not even the clear wishes of a powerful client voice, but, rather, from a panel of voices that are looking for a functional space in the historic fabric. These design decisions respond to stakeholders that are spread across many branches of the government. They must weigh the heritage elements of Centre Block along with the government's request for functional spaces. As noted earlier, the biggest area of contradiction for these two broad strategic goals is in the redesign for the House of Commons. The CM can help guide the schedule requirements to trigger these design decisions but he cannot drive the basis of the design. In this way, the CM is a great facilitator to help ensure the projects' constructability and feasibility, but the manager's suggestions only play into the architect's proposals of systematic design. In a long lasting and complex project like Centre Block, and the design development of such modern complex projects today, are less dependent on an architect's grand vision and emerge from



Figure 1 Parliamentary Partners

Image retrieved from "Program Financial Performance - The Long Term Vision and ..." Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwpsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/vpl-t/vp/2018-2019/page-6-eng.html>.

more of a bottom up approach. This bottom up approach involving deeply all of the potential actors, aims to successfully create a well considered functional space for the various building stakeholders.

Such a bottom up approach to complex design involving overlapping bureaucracies also includes a budget at each stage of design is a key aspect of the modern design process. It's a fully collaborative design and work environment from start to finish, across multiple disciplines that mold a historical renovation project into a constructible reality. That reality must work within project constraints but fulfill the layered client's layered needs. This process also weighs heavily on the client-directed decisions. The government requirements set out for the project must be managed by PSPC and brought forth to the designers to be merged with the historical features of the building, and this can be a difficult task, especially in the high stone construction heritage areas in Centre Block. While construction is on-going, and design is developing, important design decisions often have to be made in historical projects in regards to current conditions and adaptability of the historical fabric. Delay in these decisions impacts the smaller projects in the big project and their design. These decisions often battle between creating a functional space and maintaining the heritage value.

Given the above considerations, and after a broad review of the Centre Block construction management process and its advantages, this thesis aims to critically review the limitations of a construction management contract with a complex client like the Federal Government and the processes needed to undertake a series of important design decisions. Is there an opportunity for a change in the current process that takes the widely accepted benefits of a construction management contract and modifies it to assist in decision making for complex clients creating the best possible design outcomes for both function and heritage, as well as enriching the public and institutional life of the national government building?

THE SCOPE OF THE CENTRE BLOCK PROJECT

Prior to starting this thesis, I had been working in the construction industry for over ten years with one of the largest general contracting companies in North America and still do. In my career experience on large, complex, multimillion-dollar projects across eastern Ontario, I have witnessed a shift in the role of the architect and the design process as a whole. The days of a complete design from one single entity, like the professional architect, are all but nonexistent in complex projects.

Prior to the present modernization of building design into construction management processes, the role of the architect and designer as a single entity was common practice.

Looking back historically at how the architecture profession started, it was actually from a combination of both a designer and builder. The original architects on projects like the Medieval cathedrals of Europe were the master builders. They were responsible for both the design and the construction of a project and in the beginning there were two types of master builders: the rule of thumb builder, and the iconic sacred builder. The first type of master builder would have extensive knowledge of design, construction, and the logistical and managerial expertise to oversee a project from inception to completion. Such a master builder's evolution is traced in a working text like *Conceptual Structural Design*¹. Here, the architectural profession's very roots are explained to engineers. The master 'rule of thumb' builders began their careers with a dedicated apprenticeship as a stonemason. They could over time and gained experience prove themselves in the art of handling stone, personnel, clients, financiers, materials, and structure. The second type of master builders, the religious master builders, also has very early roots in religious buildings. Their influence and expertise of sacred designs in churches and government institutions were led by the iconographic knowledge of the building requirements as a public and concrete manifestation of a story of faith. This pairing of builders drove the architectural styles of the European Middle Ages and are strictly formed from a religious perspective.

As materials, access, and knowledge evolved, so did the design and complexities of buildings. This increased complexity required a higher level of specialization outside of stonework. This along with other factors led to the separation of the designer and the builder as individual experts on a building project. The CM of today fits somewhere between these two original roles. They are not a direct master builder, an expert in a particular trade of masonry, electrical, mechanical, or structural discipline. As a manager, they have general construction knowledge of all aspects, but understand cost and constructability requirements for all areas. The separation out of construction processes of the role of the designer has continued to shift and evolve as the role of the CM on complex projects grew. Architects are now one piece of a multifaceted design and engineering team which work together alongside a general contractor and, in some instances, trade contractors on specialized areas to form the basis of a design.

Adding to the grouped complexity of the construction management team, the client for the Centre Block Rehabilitation Project, is not just one individual or company since Centre Block is a Federal building. It is controlled, managed and monitored by a branch of the Federal Government called Public Services and Procurement Canada (PSPC). They report up to multiple

¹ Larsen, Olga Popovic. *Conceptual Structural Design: Bridging the Gap between Architects and Engineers*. London: ICE Publishing, 2016.

Federal Government branches that act as the client of the project. PSPC is the overarching department responsible for this project. As the client layer of expertise and control, they answer to and must coordinate the project with many levels of government. "First approved in 2001, and subsequently updated in 2006, the Parliamentary Precinct LTVP is delivered by PSPC on behalf of the Parliamentary Partners (Senate of Canada, House of Commons, Library of Parliament, and Parliamentary Protective Service), as well as Office of the Prime Minister and Privy Council".²

Together, the bodies of government listed above become the key decision-makers in design to mold Centre Block into a modern government facility. They are the client. The government has formed a subcommittee for the Long-Term Vision and Planning of the Parliamentary Precinct known as the LTVP. This subcommittee is comprised of multiple individuals who sit several times a year to be briefed on the project by PSPC. They ensure that the plan is being met. This LTVP process is overseen by the stakeholders, including the Senate and House of Commons, who each have their own wish list for the project.

To understand the depth of the LTVP process, one should refer below to the public meeting minutes of the subcommittee for the Long-Term Vision and Plan of the project where PSPC answers to members of the Senate on construction, design, and progress for the project:

OTTAWA, Friday, June 12, 2020

The Subcommittee on Long-Term Vision and Plan ... report on the program of work for the Long-Term Vision and Plan for the Parliamentary Precinct...

...the mandate of this committee is to examine and report on the program of work for the long-term vision and the plan for the Parliamentary Precinct, including the rehabilitation of Centre Block, East Block and all other Senate-occupied buildings and to ensure we respect the heritage and the best interests of the Senate without compromising the integrity of security,

... the Long-Term Vision and Plan program, an initiative of immense scope that started in 2001 with the creation of the vision and a set of guiding principles for the future of the Parliamentary Precinct.

This Master Plan will shape the physical changes in the Parliamentary Precinct in order to meet the operational needs of Parliament, and to restore and modernize the parliamentary buildings while maintaining their heritage character.

² "Section 1 - The Long Term Vision and Plan - The Long Term ..." The Long Term Vision and Plan. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/vplt-ltvp/2014-2015/section1-eng.html>.

The most recent update to the LTVP took place in 2006, and we must now update it again in order to include evolving conditions and requirements, take advantage of new possibilities and reflect current government priorities. The updating exercise began in 2017 and should be complete in 2021. The Master Plan will look forward 15 years and also 50 years and will include a vision and guiding principles for the following aspects: facilities, environmental sustainability, traffic, mobility, urban planning, material handling, security, visitor experience, and connectivity. It will also include planning and design principles and a three-dimensional demonstration plan that will establish the boundaries, the buildings, and the projects to come, as well as the locations with potential for future development.

There are many stakeholders involved, each with different roles. The parliamentary partners are responsible for defining requirements, reviewing proposed designs and approving final design plans. There are a few organizations that may be consulted on specific design matters. These include the National Capital Commission, the Federal Heritage Buildings Review Office and Heritage Canada. These organizations provide advice approval as required. Finally, PSPC and its contractors are responsible for leading the LTVP program of work and delivering on the approved design plans. Our team works closely with PSPC and its contractors, and we strive to maintain a positive and collaborative relationship in the best interests of the Senate.

...Also proposed is an integrated governance structure in place for the LTVP projects. PSPC is the overall project authority for the Parliamentary Precinct and takes direction from the cabinet. The Senate and House of Commons are responsible for articulating requirements and monitoring that these are implemented by PSPC...

Moving forward successfully on these projects, and the transition towards an integrated parliamentary campus that was referenced earlier, rests on a high degree of collaboration and parliamentary consensus on a project vision and on many key decisions”³

The project started by PSPC issuing a “request for proposals to contract the services of an IPD lean design and construction consultant to design, implement and monitor a purpose-built project delivery model, which combines the principles of lean design and construction and IPD with CM (CM) delivery, in support of the Centre Block Rehabilitation project”⁴ PSPC, the branch

³ Senate of Canada. “Subcommittee on Long Term Vision and Plan.” Senate of Canada. Senate of Canada. Accessed February 13, 2021. <https://sencanada.ca/en/committees/ltvp/>.

⁴ “Section 1 - The Long Term Vision and Plan - The Long Term ...” The Long Term Vision and Plan. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/vplt-ltvp/2014-2015/section1-eng.html>.

of the government which manages the project on behalf of the parliamentary infrastructure branch, states that: "The Centre Block is the core building within the Parliament Hill complex, occupying a central position between the East Block, the West Block, the Library of Parliament and the emerging Visitor Welcome Centre [Which is a new Building under construction]. It is at the very heart of Canada's political and cultural landscape. It contains many overlapping identities, including as a place of governance, a forum for public engagement, a place of pilgrimage, a setting for national rituals and celebrations, and as a monument to Canadian achievements and sacrifices".⁵

The government recognizes all the iconic identities that the Centre Block building signifies including its identity as a Canadian monument and forum of public engagement. This is important because it is unique to the Centre Block building and Canadians. The government also recognizes that it is in a central position of the Master Plan.

The building's age, and the overall very basic historical construction method that it was built with, has lent itself up to now to be relatively untouched, and the building has been updated only on an 'as-needed basis' with minimal design updates. It was built using the mass stone wall construction method. This type of construction has a much longer life span than modern buildings. The construction methods and materials used on historic buildings such as stone and mass wall construction are meant to last for decades. When they do start to fail, it's typically on a grand scale and this is the state of Centre Block. The repair and reconstruction requirements reviewed to date are massive due to a long period of benign neglect, resulting today in an enormous construction undertaking that is not limited to one area of the building but is defined as the entire building. Centre Block's mass stone structure, after decades of neglect, has deteriorated and is poised to fail on many levels. From the government's perspective, "Both the Centre Block and adjoining Peace Tower require significant rehabilitation in the very near-term as many of its major systems and components will be at risk of critical failure by 2019, with total failure predicted by 2025".⁶

The CM is an essential requirement to the success of such a massive construction project because as you rebuild different components of the structure you have to coordinate how it will affect other areas of the building and the heritage valuables inside, all of this while the

⁵ "Section 1 - The Long Term Vision and Plan - The Long Term ..." The Long Term Vision and Plan. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/vplt-ltvp/2014-2015/section1-eng.html>.

⁶ "Section 1 - The Long Term Vision and Plan - The Long Term ..." The Long Term Vision and Plan. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/vplt-ltvp/2014-2015/section1-eng.html>.

building is still operating in its primary function of housing the parliamentary chambers and their related operations or managing suitable alternatives for a decade or more. “The Centre Block Rehabilitation is a complex, multi-faceted project comprising a series of sub-projects; all of which are interconnected and dependent upon each other. A comprehensive, efficient, and fully integrated project delivery (IPD) framework that is adaptable to ever-changing conditions and designed to synchronize all aspects of the design and construction throughout the life of the project (approximately eight to 12 years), is essential to the project’s ultimate success”⁷ in the opinion of the government. All members of the team recognized the in-depth design and construction integration required to execute the enormous and delicate scope.

The project itself is a sizable series of work packages and will undoubtedly be one of the most extensive renovation projects in Canada, in modern times. It has an anticipated schedule of eight to twelve years and the potential to reach fifteen to twenty years depending on the final design outcome. In essence, the project creates multiple smaller projects (work packages) covered under the program umbrella, that is, Centre Block. The project has one singular overarching design specification for all packages which is reviewed and discussed with the CM. This allows for dialogue and an agreed-upon construction standard to happen between consultant and contractor. This collaboration on specification requirements and design reviews is unique in construction management contracts (design-build and P3 contracts as well) and is highly successful.

In the government’s own words, this project must achieve a high degree of collaborative relationships and design. As such, they chose a construction management delivery method. The government aims to have a Master Plan which looks ahead fifty years. The requirements of a functioning government for the next five decades would be extensive, and it is still unclear if the design vision has yet captured this effectively in an architectural master plan. The project follows a massive approval structure with many different stakeholders and project requirements. The client’s general top-down structure mentioned earlier contains layers of the Federal Government that are informed by the controlling branch of government for the project (PSPC). The design part of this collective undertaking occurs when PSPC, in turn, has contracts with CENTRUS (an amalgamation of designers) and the CM (an amalgamation of general contractors) to complete the project. These amalgamations are due to the project’s large scale and staffing requirements. The project’s size and manpower meant that in order to provide the

⁷ “Section 1 - The Long Term Vision and Plan - The Long Term ...” The Long Term Vision and Plan. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/vplt-ltvp/2014-2015/section1-eng.html>.

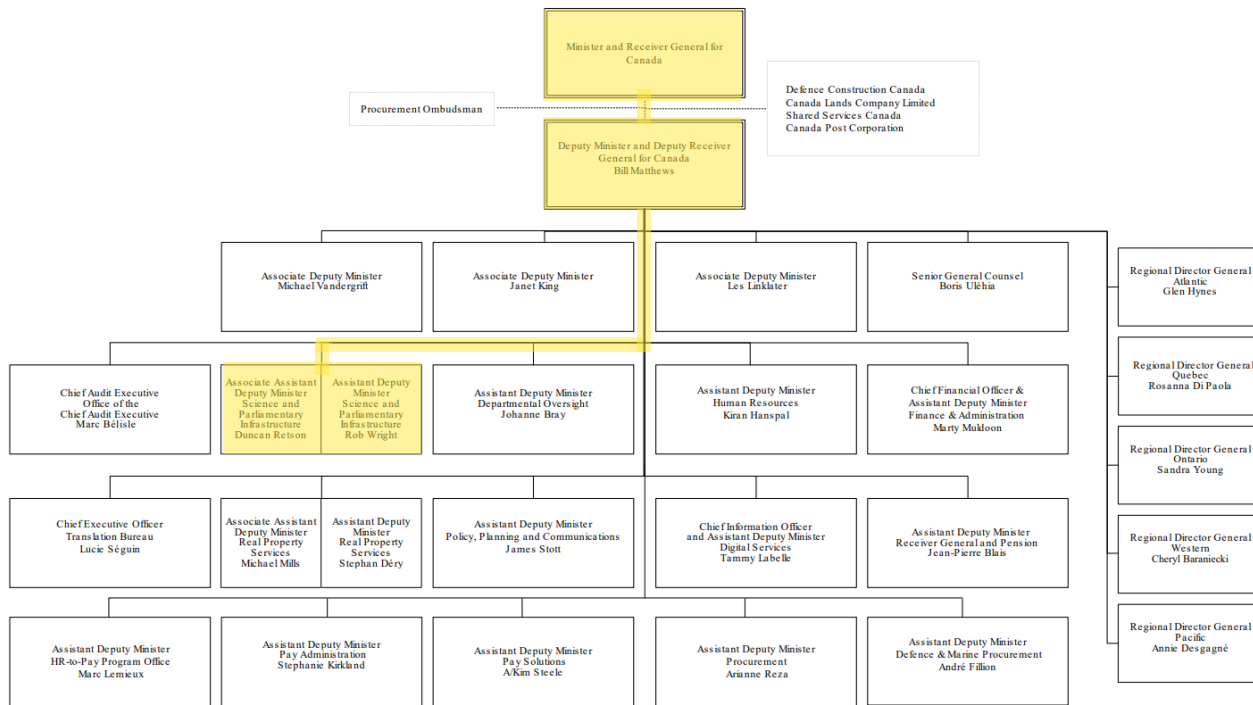


Figure 2 Organizational structure for Public Services and Procurement Canada

Image retrieved from "Book 1: Introduction to Public ... - Tpsgc-Pwgsc.gc.ca." Public Services and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/trans/cahiersinfoministre-ministertransmaterial/livre1-book1/index-eng.html>.

scale needed to create an effective process moving forward for years, not one company had the required resources to complete the project on their own and a joint venture company was created between two current individual companies to bid on the project. This multiple layering has also trickled down to subcontractors, who in some cases can be an amalgamation of two different companies to have the resources for the work as in the case of CENTRUS for design services. This consolidation of multiple actors is typical on large projects, but even more so on historical projects like Centre Block where the scale of operations and consequent access to a specific range of skills is required and unprecedented.

The PSPC team at all levels is coordinating with CENTRUS (the design team) and PCL/ED (the construction team), both of which have their own operating structure. Roles and staffing requirements are typically spelled out in the contract. Contracts will list required positions from the constructor to facilitate the project. It is not uncommon for contractors to name experienced individuals during the bid process who will hold key positions on the project. The individuals who make up each team: PSPC, the designers, and CMs are ironically (in the modern era of construction) most all from the same educational beginnings. They hold engineering or architectural degrees from a university or college diplomas in the architectural or engineering field. The vast difference between them is their obtained experience, whether theoretical or

practical construction management or design. Experience on similar projects is still a highly valued skill set and is still one of the most highly regarded qualities in today's industry, and this carries through to the ages of the first master builders. The structure of PSPC is enormous, and they are not even the true client, and the mass structure of PSPC in its nature trickles down to both the design and construction teams. The bodies of government listed above, as the nominal clients become the key decision-makers in design to mold Centre Block into a modern government facility.

The potential for averaging decisions in the above complicated overlapping set of relationships then opens the thesis question noted earlier of who is actually driving the design and making the huge design decisions which come with complex projects like Centre Block. In all of this complexity, how truly open are these decisions despite the group processes, and what is the emerging quality of the design solutions, Some of those decisions are explored in this thesis focusing on two key ones that seem to put the design decision processes into a problematic view: the design of the entrance into the new Visitors Welcome Centre Phase II, and the options for solutions to solve the long term need for expanded House of Commons seating capacity.

Within this pool of individuals, the legal requirements for engineers and architects within the Ontario Building Code are defined by the requirements of the law. The CM is held to a different legal requirement of the "Green Book," which is Ontario's health and safety legislation relevant to the construction industry and contractors. A CM must sit at the table

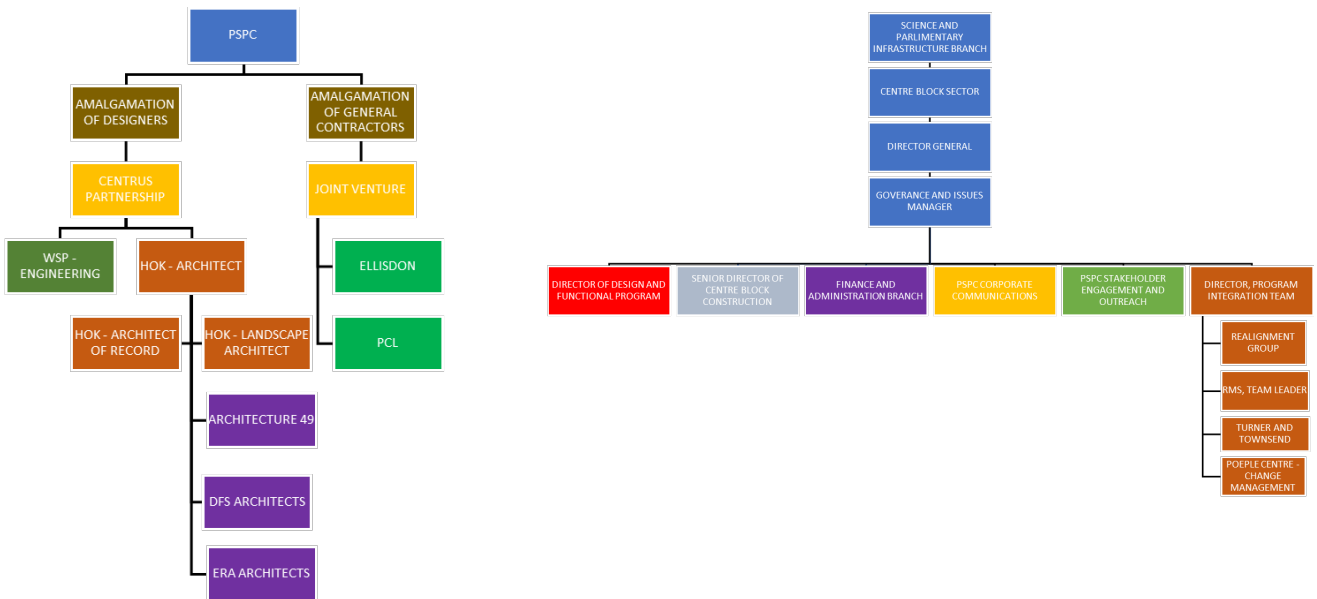


Figure 3 Organizational structure. The top shows the structure for Public Services and Procurement Canada from the Science and Parliamentary Infrastructure Branch down to the Centre Block Project. The bottom shows the contract structure of PSPC to the designers and contractors.

Information from author

with the designers and client to facilitate the project within the set budget and schedule. This relationship has evolved because all individual roles have developed due to modern design requirements. From their own words, a CM's role is "from small renovations to complex billion-dollar projects; from modular construction to advanced digital technologies, to cutting-edge sustainability, [the CM] has you covered. [they] redefine full-service and bring expertise across all project types, at all scales, and under all procurement models. As innovative solution providers and construction specialists, [they] leverage [their] expertise to customize the right approach for your project, maximizing value for the best price. Flexible, focused and innovative: we're focused on achieving your project vision and business goals"⁸ .

This shift in the industry and ever-growing role of the general contractor has shifted a large portion of control, power and liability that once was held in majority by the architect. The evaluation of this shift I believe was critical to allow for complex projects to be successful in schedule, budget, and constructability. In the document Design-Assist: Getting Contractors Involved Early' it is noted that "recent trend in delivery methods towards teamwork approaches to design and construction"⁹ is a movement in the industry. This movement is a key criteria to modern large-scale projects which must weigh heritage value against modern building upgrades. The question must be asked can the construction management process be improved even further, is there an opportunity to discover how a new management delivery method, or additional layer of contract, might help drive the layers of decision making that need to happen and when they happen.

THESIS STRUCTURE

The thesis argues that the future of large complex projects is going to be an integrated project delivery method rather than design-bid-build system. Such an integrated approach will involve heavy integration between architects, engineers, and general contractors. In this project delivery context, the iconic importance of the Centre Block building means the decision-making process of design development will automatically add an additional layer of project requirements. It will also mean the stakeholders and bottom-up consultation required will be more complex than just with regular new build projects. Threaded into this already complex system is the strong heritage conservation component of the project which is reflected through its history of design conception. To understand Centre Block, is to understand the great Parliamentary Precinct and its historical value. To do this, one first must understand the

⁸ "PCL Constructors." English (US). PCL Constructors. Accessed February 13, 2021. <https://www.pcl.com/ca/en/great-plains-power-station>.

⁹ Andre, Gregory R. "Design-Assist: Getting Contractors Involved Early." https://files.klgates.com/files/publication/055ae3ba-ecb7-43d0-be9b-412fb235407b/presentation/publicationattachment/e4e0432e-8ae0-4656-824e-48d6a7619d36/design-assist-getting-contractors-involved-early_091912.pdf, September 2012.

Block's location, and the history of the landscape for which it was built.

The Master Plan for the Parliamentary Precinct developed over time, and today is the work of a government body called The Long-Term Vision and Planning committee (the LVTP). The future of the parliament buildings is controlled and directed by them. Their vision includes a new building set to be constructed and the temporary relocation of parliamentary services to allow for Centre Block to be closed for construction. The design of this new building, The Visitor Welcome Centre is set to be completed in phases. In this thesis, the enabling works projects and Phase II will be elevated and examined against the hill's original architectural vision and the modern security requirements for the government and public to co-exist. This understanding of the history of the Hill, the long-term Master Plan and the series of sub-projects required as the greater picture of the Centre Block Rehabilitation project are outlined in the thesis section: History of the Hill.

After the general conception of the hill is understood, the thesis will dive into the specific functions of Centre Block as a historic building and what is considered a historical asset for the project. The role of the construction manager on the removal, protection and documentation of the historical elements within the project will be examined. An in-depth look at the facility, its heritage components, and how this has affected the construction managers' role in the project will be reviewed along with the Library of Parliaments' previous renovation and the current design proposal for the building.

Next, the current contract structure of Centre Block will be broken down to understand the contractual differences of building contract types and their delivery methods. An in-depth understanding of the unique government structure that is the client for the Centre Block Rehabilitation Project and how this type of contract delivery method, being construction management, will play a vital role in its success.

The project's success also hinges on understanding the existing building structure. The construction management design-assist approach. The complex heritage building renovations go beyond just the design; they must dive into the building's health and how it is monitored. This includes in-depth investigation studies to see actual conditions of existing bedrock, existing steel surveys, and structural vibration monitoring, all involving the contractor, designers, and client, in a modern integrated design approaches chapter of the thesis will explore what is currently being done and how, on the Centre Block Revitalization project from investigation expectations, 3D modeling and site-specific studies by a team of designers, contractors, historians, and consultants.

Understanding how a general contractor operates and understanding their perspective is explored in the final chapter. This is done by reviewing how they use the general specification

sections to micromanage scope of subcontracts to specific skills or trades. This chapter also explores the managing requirement of historic building renovations. The end result of the final design will lead to a juxtaposing series of interior spaces. It will explore the modern additions against historical high heritage areas and this contradiction of interior spaces.

The thesis will explore the new building of the Visitors Welcome Centre Phase II and its design issues of how to create an entrance for this underground complex from the public front lawn. Along with this design issue, there is another more substantial design resolution of what to do with the House of Commons seating. Three different proposals set forth to the public will be evaluated.

In the Conclusion, the thesis will re-evaluate the Centre Block design requirements and how certain key decisions are being made and how there is something missing in the design discourse with a construction management delivery method. With CM, the old days of a grand vision from individuals like Haussmann in the design overhaul of Paris in the 19th century are not the driving design factor anymore. How can one make key design decisions, and still fulfill the client's prerequisite and preserve the unique historical value of the building? More than likely there are a variety of options that only need a platform to fully be developed on. Shaping a functional iconic building into a modern government facility must be undertaken in an integrated process. Such an integration is fundamentally driven by a bottom-up approach to decision making especially from the client side. Such a situation appears to be a block to the current lack of inspiring design options, again, especially in a national icon. Can the type of artistic and social vision that once lived in the historic examples of master architects, like the ones that created the Centre Block and the Parliamentary Triad be applied to the new modern project delivery methods without disrupting their characteristic fundamental core efficiency and important bottom up consultative processes?

The thesis will re-evaluate Centre Block's major design requirement for the House of Commons and how if a hybrid construction management delivery method incorporating a stronger design ethos existed it might provide design solutions to this and other complex issues outside of the present restrictive client structure. If this opportunity existed then there would be a variety of options for each design problem presented with the ability to see multiple design directions. This platform would engage as design decisions arise from the exposed site conditions or schedule requirements created in a construction management process. In early stages of the project, under a construction management contract the building is removed in layers and is in a constant state of providing critical information to designers. Is there a variety of options to solve design issues that just need a platform to facilitate them? This platform would identify the multiple solutions by putting the correct professions in a contract position to help guide practical solutions for the client. The development of large projects

throughout history has changed, much as the master builder has changed. It is less likely to be a grand vision from an architect or prime minister, and more likely to be derived from a bottom up consultation. The limitation of a construction management contract has been exposed. How can it be adjusted to assist in providing multiple solutions to complex project design issues?

CENTRE BLOCK: HISTORY OF THE HILL

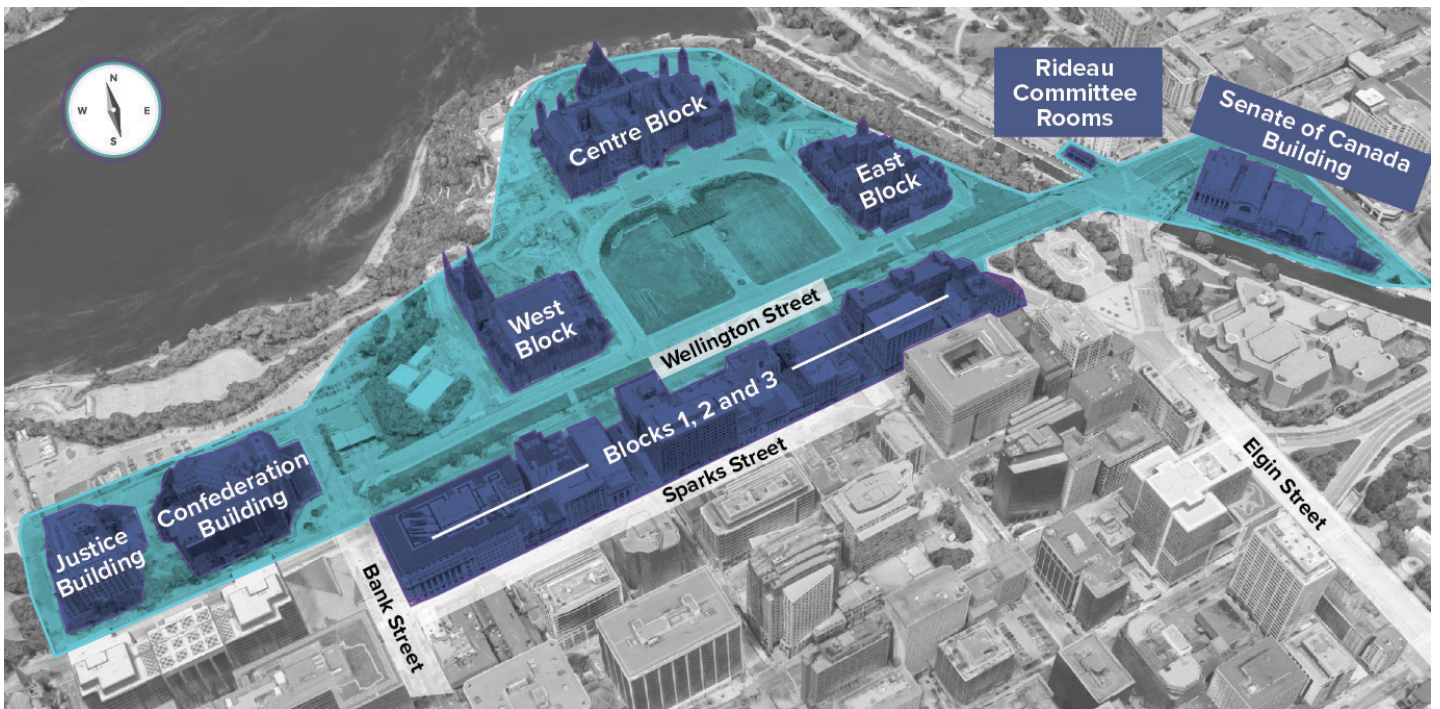


Figure 4 Parliamentary Precinct Boundaries

Image retrieved from "Program Financial Performance - The Long Term Vision and ..." Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/vplt-ltvp/2018-2019/page-6-eng.html>.

Centre Block is the central parliament building of the Parliament Triad. It is the focal point of the greater parliamentary building boundaries, which is the stage for Canadian politics along the Ottawa River. It receives millions of visitors a year, has its own law enforcement and encompasses a large portion of the downtown core of the city of Ottawa. The governments Master Plan is tracked as "The Long-Term Vision and Plan [which] is a joint undertaking between PSPC and Parliament through which [they] have achieved much success together. In the past several years, [they] have restored and modernized many heritage buildings that now serve as modern core parliamentary facilities, including the Sir John A. Macdonald and Wellington Buildings, the West Block and, of course, the Senate of Canada Building."¹⁰

The City of Ottawa was not the first choice for Canada's Capital and hence the home to our government. In the first 26 years, before confederation in 1867 the 'Province of Canada's capital city had changed six times. At that point the capital alternated between Toronto and Quebec every four years. In 1857, the current location was chosen when Queen Victoria named Barrack Hill (as it was known at the time), as the capital of the provinces. Ottawa's location away from the American border and easily defendable location made it a strategic location against attacks. It became official on February 17, 1858 and triggered the building of the permanent legislative on the 25-acre hill top. This triggered the start of the master-planned city that would house the entire Federal Government's infrastructure. By any country's standard, it was a grand infrastructure plan for the government's epicenter.

The location chosen, Barrack Hill has held significance in the early history of Canada. First with the First Nations who held the limestone outcrop as a landmark on the Ottawa River, and then with European traders who migrated up the river from the St. Lawrence River corridor. Ottawa known then, as Bytown, named after its founder Colonel John By, the British military engineer and commander of the forces sent to survey the Rideau Canal waterway. It culminated near and circumvented the Rideau Falls. By also established a military garrison. The new town expanded and started as a lumber epicenter due to its location. Barrack Hill was already owned by the Crown and was the site of a military barracks. The barrack's foundation still exists today as an archeological site.

After the Crown had chosen the location, the Department of Public Works in 1859 organized a competition for architects to submit designs for Centre Block, East Block, West

¹⁰ Parliamentary Precinct. "BUILDING ON A SOLID FOUNDATION A New Approach to Implementing the Long Term Vision & Plan." LTVP Design. Parliamentary Precinct, Ottawa, 2007. <https://www.aapc-csla.ca/sites/csla-aapc.ca/files/Advocacy/BOSF.pdf>.



Figure 5 Falls of the Rideau River, at the Ottawa River, 1826 by Thomas Burrows

Image retrieved from Burrows, Thomas. "File:Falls of the Rideau River, at the Ottawa River, 1826 ..." Archives of Ontario . Accessed January 13, 2021. https://commons.wikimedia.org/wiki/File:Falls_of_the_Rideau_River,_at_the_Ottawa_River,_1826.jpg.



Figure 6 First Eight Locks of the Rideau Canal, the North entrance from the Ottawa River, 1834 by Thomas Burrows

Image retrieved from Burrows, Thomas. Rideau Canal - A History of the Rideau Lockstations: Ottawa Lockstation. Archives of Ontario. Accessed January 13, 2021. <http://www.rideau-info.com/canal/history/locks/h01-08-ottawa.html>.

Block, and the Governor's residence at the Chaudiere Falls in the Ottawa River. It was a natural break point for cut log navigation downstream to the St. Lawrence River. The final winner was chosen by the Governor General at the time, and in total they had 298 proposals. There were two separate designs chosen, the first was for Centre Block. This was led by Thomas Fuller and Chilion Jones; the second proposal was for East and West Block, which was led by Thomas Stent and Augustus Laver. Both were in the Gothic Revival style, which contradicted the Neo-classic architecture of the United States Capital in Washington and reflected the fashion in Great Britain for Gothic Revival architecture in its own Houses of Parliament in Westminster. A fire in 1916 destroyed the Centre Block building with the exception of the Library of Parliament. It was rebuilt by John A. Pearson and collaborator Jean Omer Marchand of Montreal in 1916. The Centre Block design was a less flamboyant Gothic Revival characteristic of the early 20th century. The surviving East and West Blocks and the Parliamentary Library which survived are in the earlier late 19th century style. It contains the original House of Commons, Senate chambers, offices of Parliament, Hall of Honour, memorial chambers, the original Library of Parliament and the Peace Tower (which was built to commemorate the end of the First World War). The Peace Tower, along with the LOP, are the shining jewels of the buildings exterior.

Thomas Fuller was the lead architect for the original Centre Block building prior to the fire of 1916. The Fuller family has a long-standing history in the construction industry in Ottawa. Thomas Fuller's son, Thomas W. Fuller, was also an architect and appointed Chief Architect in 1927 of the Centre Block Building. His son, Thomas G. Fuller is a landmark name in the Ottawa Construction industry, and spent more than 50 years as a General Contractor in Ottawa. In 2002, his company Thomas Fuller Construction Co. Limited (established in 1958) was awarded the contract for the Library of Parliament Rehabilitation Project. This project was also part of the LTVP. Its rehabilitation pre-dated the revitalization of the main building by almost 16 years. Though Ottawa is a city with a population of roughly 1 million people, in the construction sector it is a small community of businesses with long-standing relationships between companies. Many of these companies are connected to the large amount of heritage construction work in Ottawa which correlates directly to the many buildings owned and operated by the Federal Government. Due to the large quantity of heritage stone buildings in the city it also has a strong stone mason work force. The majority of the union stone mason companies reside within the city of Ottawa due to the on-going and continuing work by the Federal Government to maintain and restore these buildings.

The buildings of Centre Block are comprised of a variety of stone types. The majority of the exterior stone was local Nepean sandstone, Red sandstone, and Ohio freestone, with some Wallace sandstone and Berra sandstone as well. In the renovation of this landmark, there are great efforts being made to match the existing stone façade from new quarries since the original quarries are closed. The desire to match the original stone drives the search to find

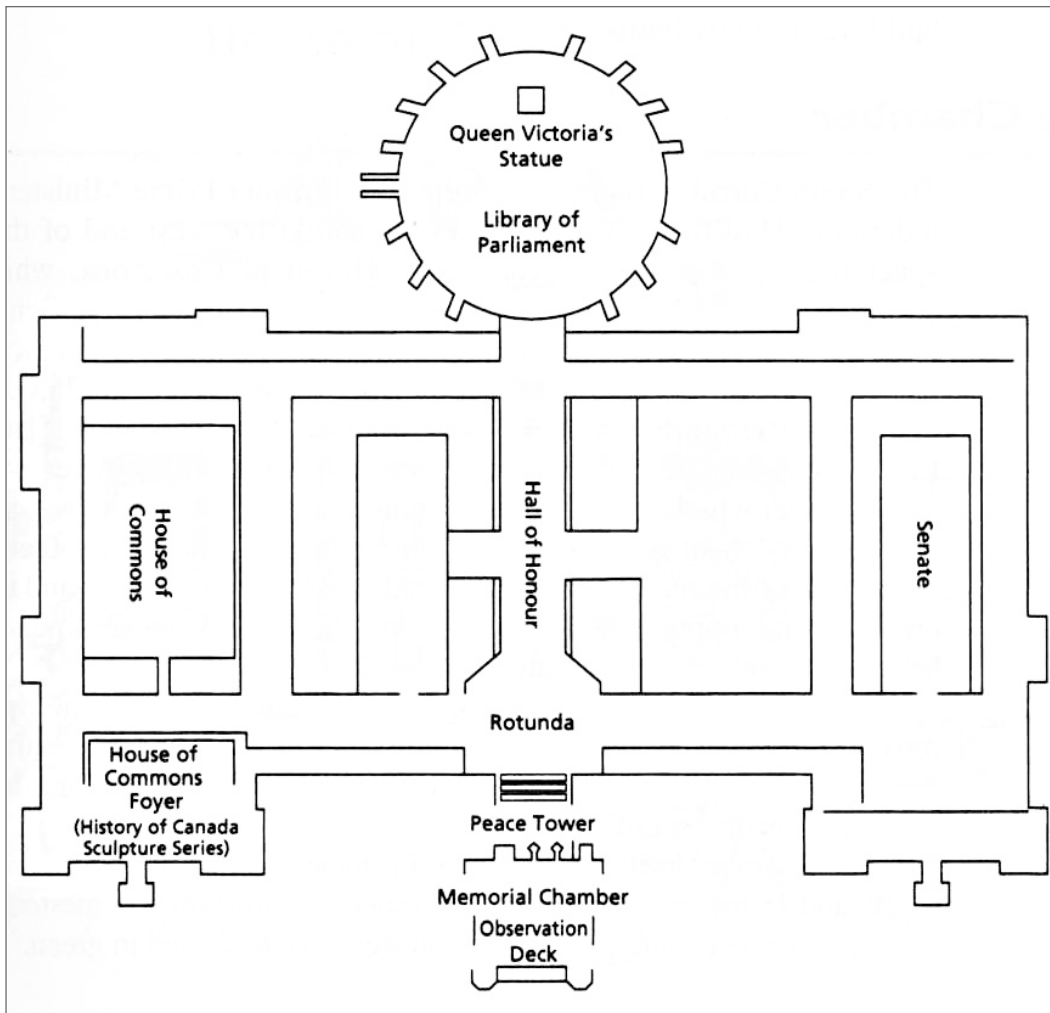


Figure 7 Centre Block Floor Plan

Image retrieved from "6. The Physical and Administrative Setting." *The Physical and Administrative Setting - The Parliament Buildings and Grounds*. Library of Parliament. Accessed January 13, 2021. <https://www.ourcommons.ca/MarleauMontpetit/DocumentViewer.aspx?DocId=1001&Language=E&Sec=Ch06&Seq=3>.

quarries that have similar stone esthetics.

Along with finding replacement stone sources it is important to note a major difference of Centre Block from its two other Triad buildings. Since Centre Block was re-built in 1916 to 1920 from the fire, the construction of the building differs from that of the original East Block and West Block. Centre Block's design was kept similar to the original, but the newly developed structural techniques and materials were used from that time period. This meant the exterior stone was no longer load-bearing for the building but a thick cladding finish. The building envelope is compressed of load-bearing interior brick masonry walls with a steel frame support and clad in stone on the exterior. The new building after the fire was larger and another story higher. To avoid fire again, the interior walls were typically finished with limestone and marble floors. The floor structure of the building is comprised of flat terra cotta arches with a concrete topping supported on structural steel beams. The majority of the floors are supported on load-bearing masonry walls except for some larger volumes which are support on steel columns. As construction continues on Centre Block, it was discovered they had built the new 1916 building on the original crumbling stone foundation from after the fire. The state of this foundation is crumbling and must be upgraded and reinforced.

When the Parliamentary Triad buildings were under construction, it was thought they were too large for the sparsely populated 'Province of Canada.' The Dominion of Canada was formed in 1867, and in 1870 when the Parliament was still under construction, Canada grew by adding in new provinces and territories. The Parliamentary buildings after that were considered to be too small.

THE LONG-TERM VISION AND PLAN

For the redevelopment of Centre Block to commence, the entire government framework of politicians, civil servants and related employees that used the building had to be relocated before any construction could begin. This was a large undertaking that displaced the current House of Commons, Senate, and government staff for a long-term relocation elsewhere in the city. Long-term in the framework of the Parliamentary Precinct project including Centre Block is anywhere from ten to twenty five years, which could be the entire employment lifetime of some of the staff. In order to facilitate the entire redevelopment of the Parliamentary Hill complex, 'temporary' facilities had to be created for the fifteen plus years that the current Centre Block building will be under construction. The Long-Term Vision and Plan subcommittee issued a large relocation plan which included extensive renovations to existing federal buildings so they could temporarily house a portion of the relocated staff all around the downtown core of Ottawa.

The overall goal of the LTVP is a major undertaking of planning, assessment, and merging the historically evolved building group with the new modernized facility requirements. This design must be approved on a Federal Government infrastructure level and co-exist with the historic architectural style it resides in. The design itself is a slow process of democracy where decisions are not easily made, and progress for the final design can take years. In a sense, the full design of Parliamentary Hill is a massive program, that is a larger version of the same process the Centre Block Rehabilitation Project as a building must undergo. The program for the Parliamentary Precinct is a grand-scale game of chess. It includes multiple buildings and government facilities within the entire program being rebuilt or renovated either as a final state or a temporary vicinity.

There are multiple move sequences for each stage of the program, to which they have broken down into five-year plans. The five year move sequence required to empty the current Centre Block building requires massive rearrangement from a number of government buildings in downtown Ottawa. From Centre Block functions were moved to the Wellington Building, West Block, the Government Conference Centre, 1 Rideau Street, and a few other locations. An example of this relocation is the Members of Parliament from West Block have been relocated into renovated facilities in the Valour Building. West Block now houses the temporary House of Commons which was in Centre Block, and the Senate was relocated to the Government Conference Centre. These relocations are temporary until Centre Block is complete and date back to planning strategies from the year 2000 (nearly 21 years ago). They are a series of chess moves to allow for the relocation of all services from West Block, then Centre Block and East Block so construction can start on the empty buildings. West Block, East Block and Centre Block are central buildings to parliament and their rehabilitation was the first priority for the LTVP.

These interim (temporary) relocated offices of government had to occur for construction to commence on Centre Block. If you examine the history of the development of parliament, it is clear that since its inception there has always been a long-term Master Plan for the Parliamentary Precinct. This Master Plan is now being re-envisioned. The original Master Plan began in 1912, but the most influential plan was from Jacques Greber in 1938 and 1950 who addressed the precinct's relationship to the town. As the country grows, the parliamentary requirements evolve, and so does the long-term planning of the Precinct. In 2001 a review was conducted, that pulled from the 1987 area plan prepared by duToit Allsopp Hillier. From this 1987 plan, a new vision statement and set of guiding principles were created for the current government to follow. Coined the "Long Term Vision and Plan," the LTVP was updated and approved in 2007. It establishes current and future updates required and the series of projects to achieve them.

The Long-Term Vision and Plan is comprised of 3 components:

- 1 The Vision and Principles

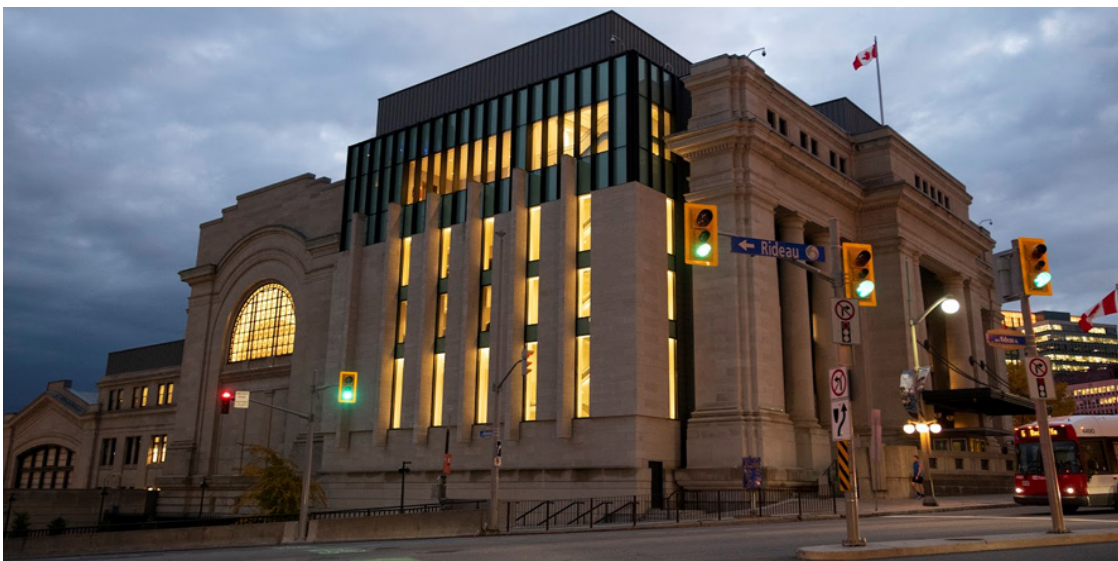
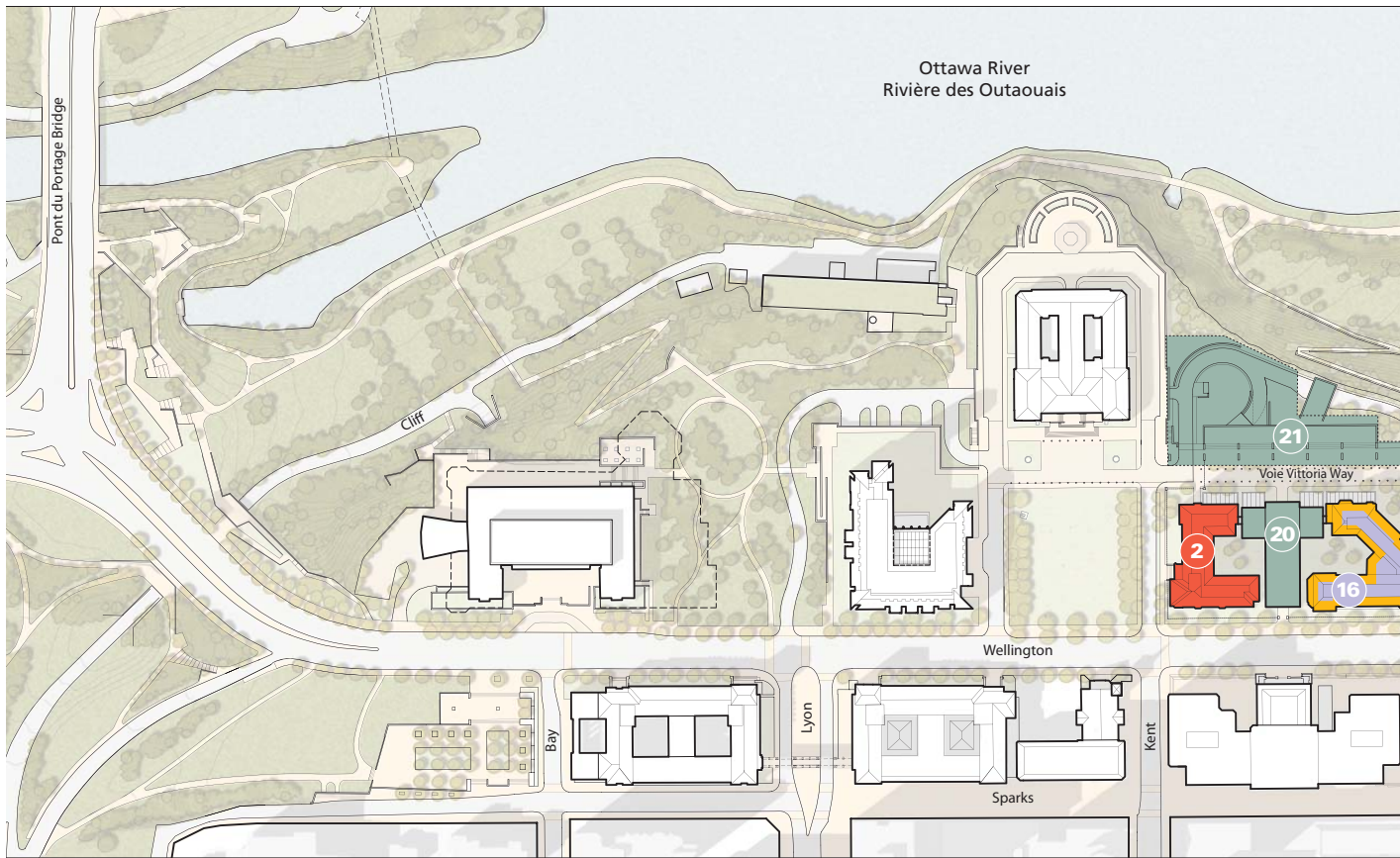


Figure 8 Temporary Homes for Parliament

Image retrieved from "Follow the Rehabilitation of the Parliamentary Buildings ..." Public Service and Procurement Canada. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/index-eng.html>.



First Five-Year Program (2007–2012)

Work Previously Completed

- 1. East Block 1910 Wing:**
Renovations to rebuild the interior of the wing and restore the masonry and roof.
- 2. Justice Building:**
Renovations to create 85 parliamentary offices.
- 3. Library of Parliament:**
Full interior and exterior restoration of the heritage building and the addition of new below-grade space.
- 4. The Peace Tower:**
Restoration of exterior masonry to address deterioration.

Major Capital Program

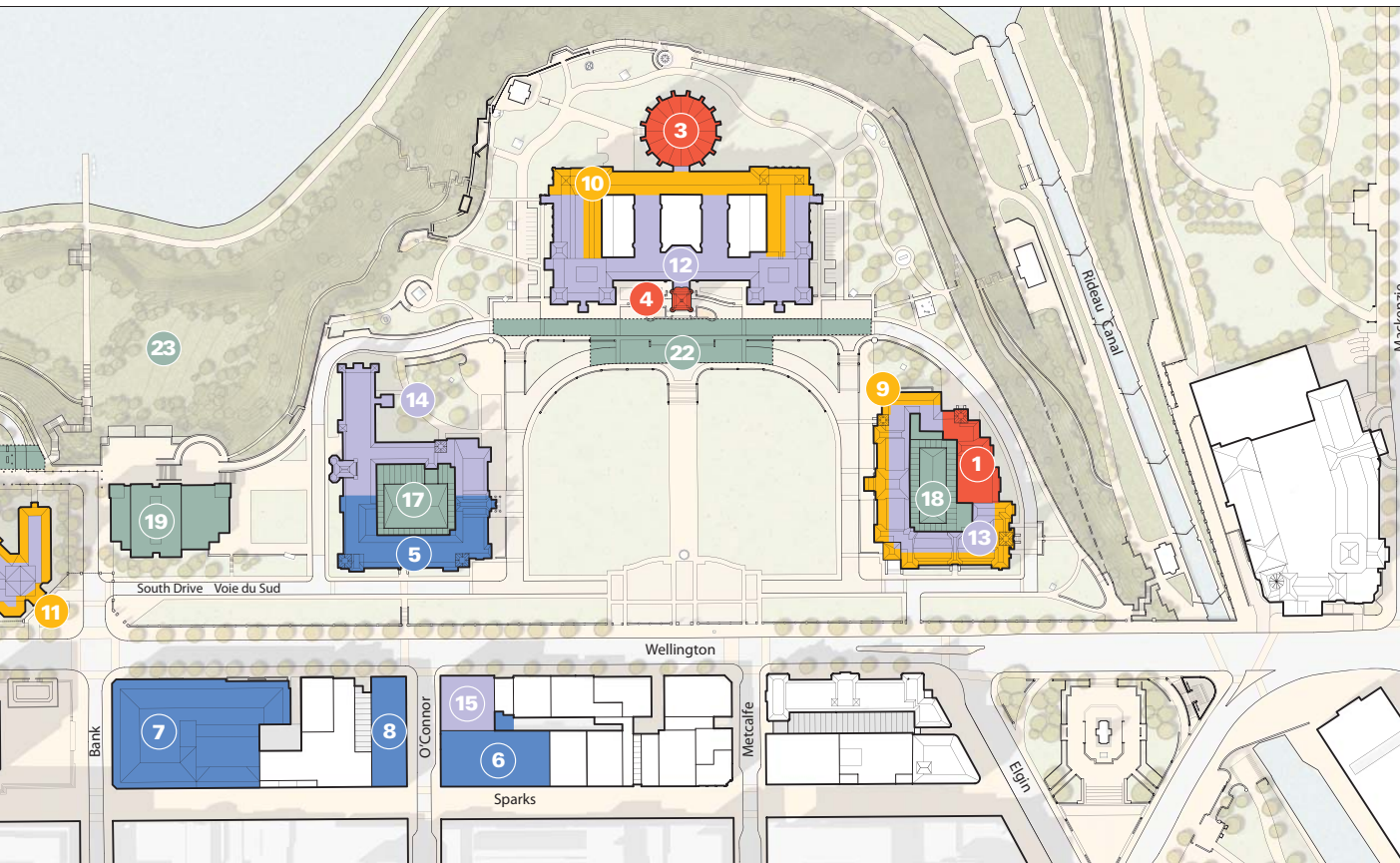
- 5. West Block Restoration:**
Begin construction on exterior stabilization, removal of asbestos and mechanical/electrical systems. Undertake design for interior renovations and infill of the courtyard.
- 6. La Promenade:**
Construction of offices for the interim relocation of Parliamentarians and interim space for three committee rooms.
- 7. Wellington Building:**
Construction of offices for the interim relocation of Parliamentarians and interim space for ten committee rooms.
- 8. Former Bank of Montreal Building:**
Construction of the permanent relocation of Confederation Room (Room 200) from the West Block.

Recapitalization Program

- 9. East Block:**
Exterior envelope repair of the 1867 wing with an initial focus on the north-east tower and the south-east corner.
- 10. Centre Block:**
Rehabilitation of portions of the roof and ventilation towers.
- 11. Confederation Building:**
Repairs to the entire building envelope, including masonry, windows and roof.

Figure 9 The First Five-Year Program in the Context of the Long-Term Plan

Image retrieved from Parliamentary Precinct. "BUILDING ON A SOLID FOUNDATION A New Approach to Implementing the Long Term Vision & Plan." LTVP Design. Parliamentary Precinct, Ottawa, 2007. <https://www.aapc-csla.ca/sites/csla-aapc.ca/files/Advocacy/BOSF.pdf>.



Later Phases

Restored in Later Phases

- 12. Centre Block Restoration:**
Restoration of heritage elements and full renovation and upgrade of building systems to extend service life and improve operations.
- 13. East Block Restoration:**
Renovations and upgrading of the 1867 wing to provide extended service life and improved accommodations for Parliamentarians.
- 14. West Block Restoration:**
Renovations started in the first five-year program to be completed in the second five-year program.
- 15. Victoria Building:**
Renovations and upgrading to provide office accommodations for support operations of the Parliamentary Partners.
- 16. Confederation Building:**
Renovations and upgrading to provide extended service life and improved accommodations for Parliamentarians.

New Buildings in Later Phases

- 17. West Block Infill:**
Excavation and construction in the courtyard to accommodate the interim House of Commons Chamber and related functions. To be constructed in conjunction with the West Block Restoration project.
- 18. East Block Infill:**
Excavation and construction in the courtyard to accommodate the interim Senate Chamber and related functions. To be constructed in conjunction with the East Block Restoration project.
- 19. West Terrace Pavilion:**
Modest development of the area west of the West Block at Bank Street for committee rooms and parliamentary offices.
- 20. Confederation/Justice Infill:**
Development of a link between the two existing buildings to give the sense of a single crown pavilion and provide substantial new floor space without introducing another prominent building to the area.
- 21. Vittoria Way Underground Facility:**
Removal of the Supreme Court Annex building and construction of below-grade materiel handling, parking and support facilities north of Vittoria Way, including a Vehicle Screening Facility tucked into the contours of the river valley.
- 22. Visitor Welcome Centre:**
The development of a Visitor Welcome Centre and associated security screening located below the Peace Tower Forecourt.
- 23. Bank Street Valley:**
The removal of existing surface parking and reshaping of the valley edge to a concave form, directly oriented to Bank Street at its centre.

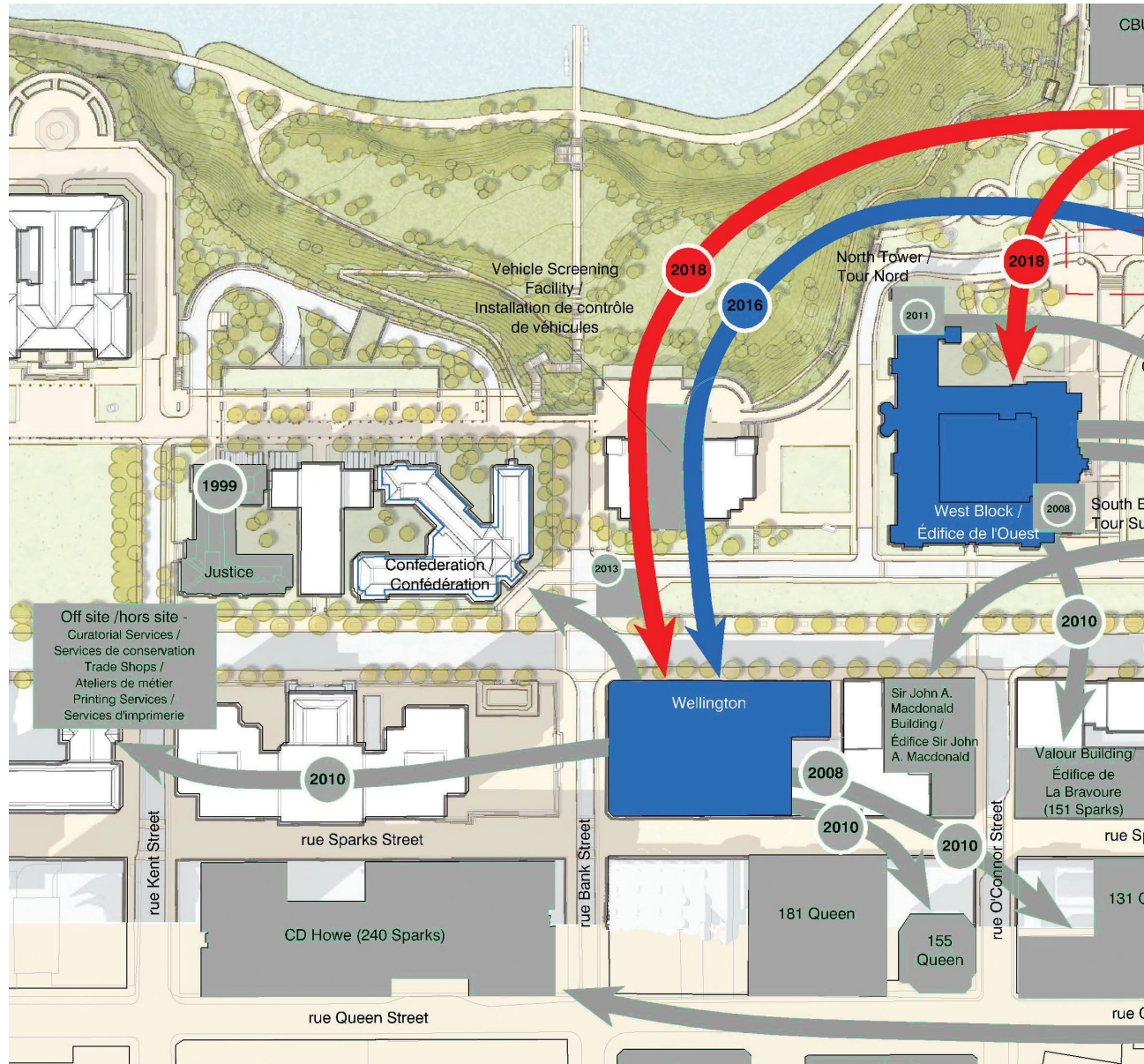
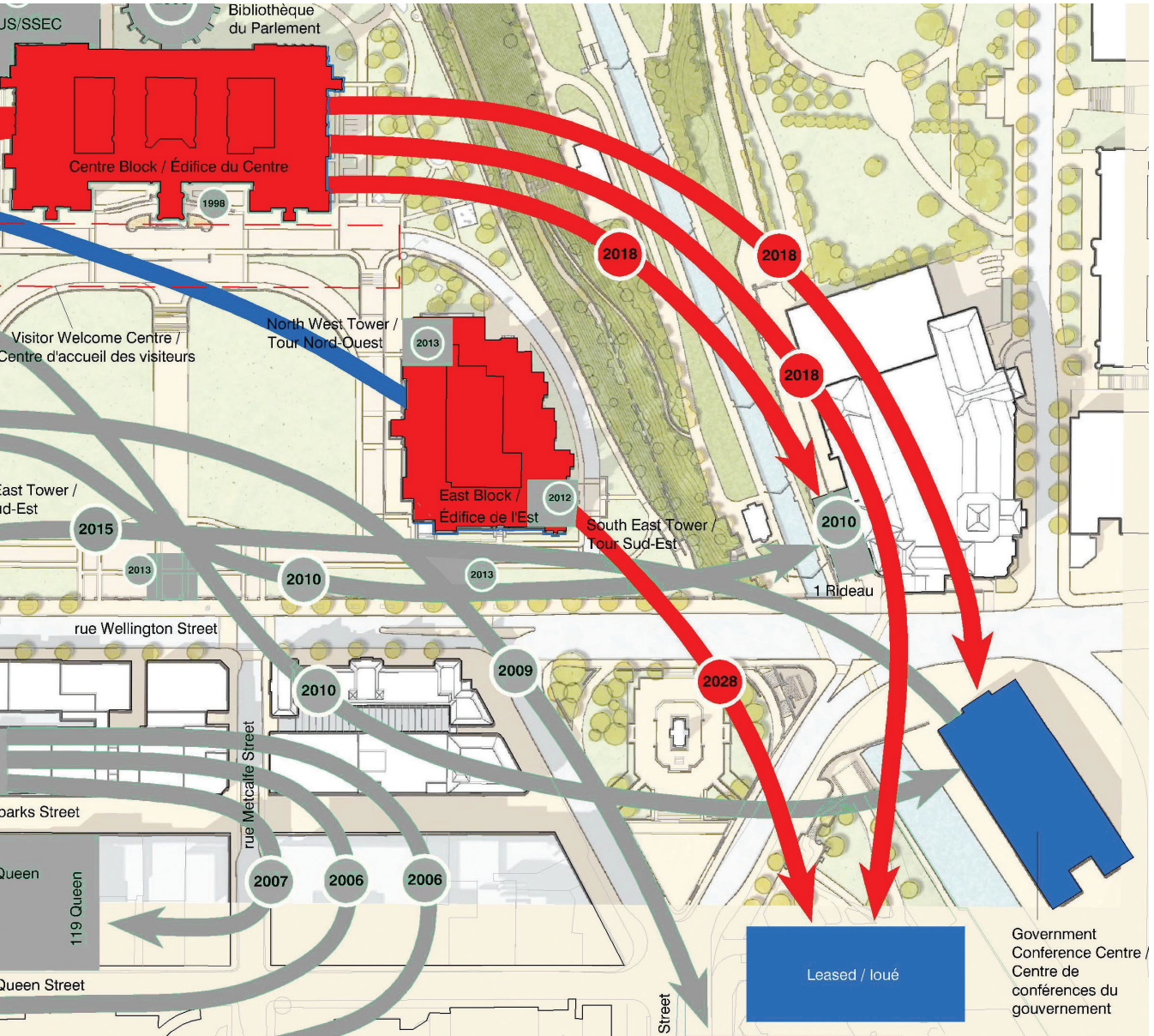


Figure 10 Long Term Vision and Plan move sequence. Image retrieved from "Section 1 - The Long Term Vision and Plan - The Long Term ..." The Long Term Vision and Plan. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/vpit-ltvp/2014-2015/section1-eng.html>.



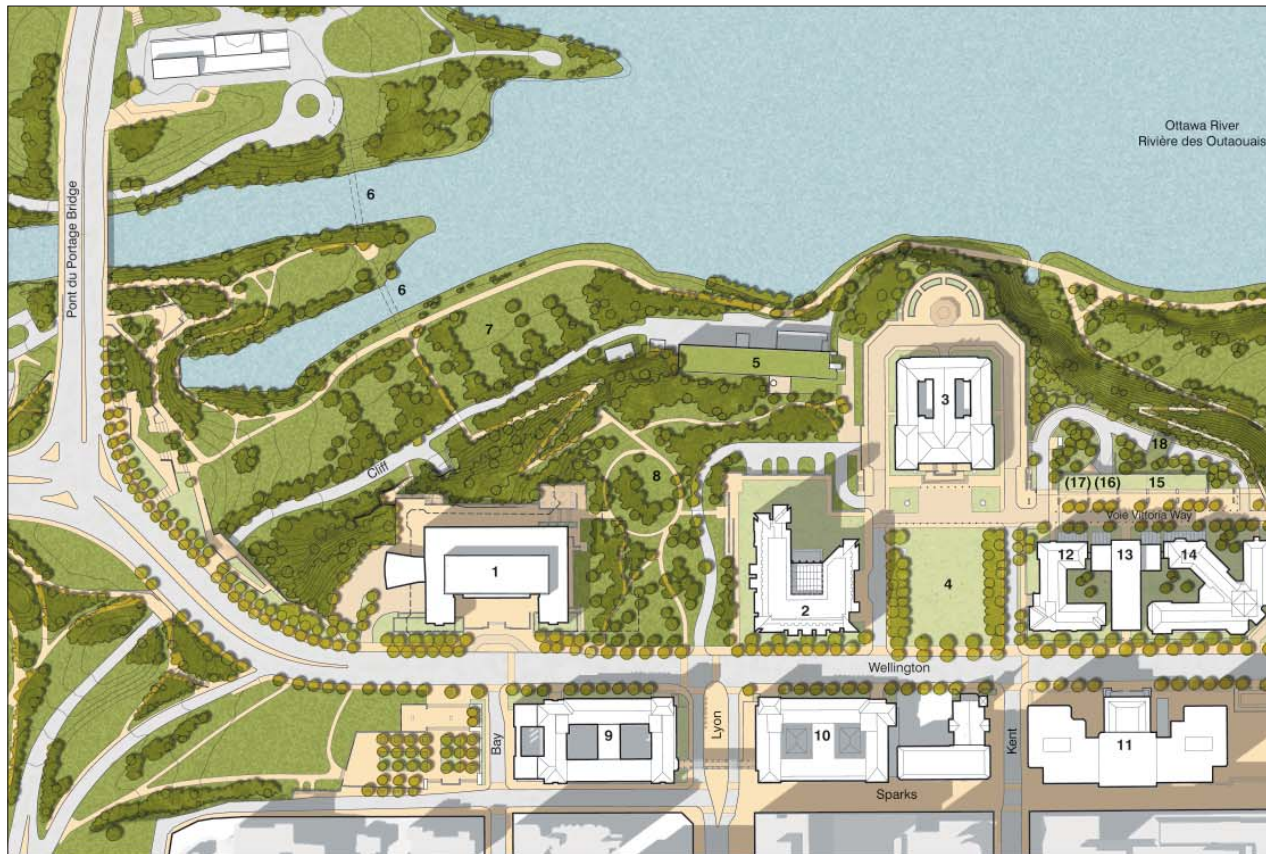
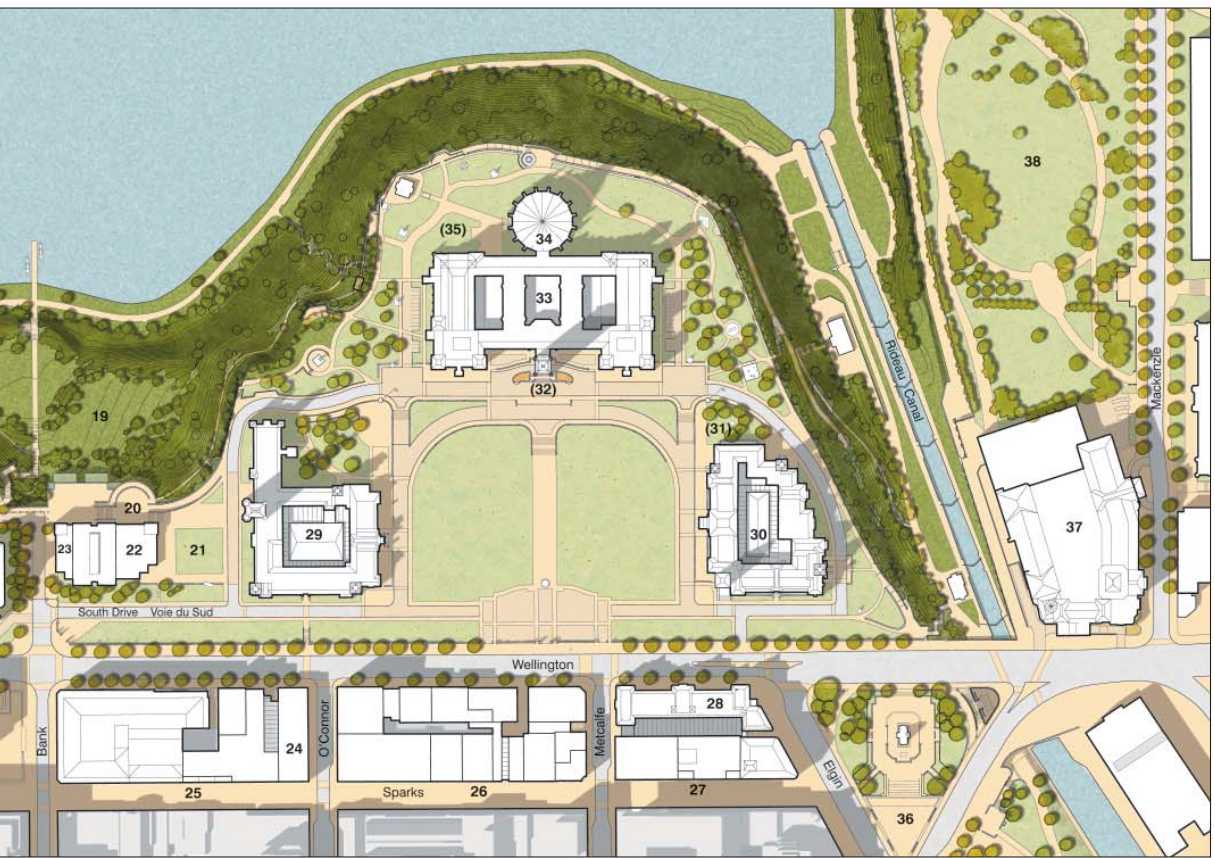


Figure 11 2006 Demonstration Plan

Image retrieved from "BUILDING ON A SOLID FOUNDATION A New Approach to Implementing the Long Term Vision & Plan." LTVP Design. Parliamentary Precinct, Ottawa, 2007. <https://www.aapc-csla.ca/sites/csla-aapc.ca/files/Advocacy/BOSF.pdf>.



The vision and principles are a statement developed in 2000 and confirmed in 2007 outlining the significance of the parliamentary precinct and a symbol for the country.

2 The Demonstration Plan

Outlining the intent and possibilities of the site as a whole, as the challenges of growth are weighed against the change within the Precincts.

3 The Implementation Framework

This item focuses on getting the work done and establishes shorter term objectives.

The precinct and Master Plan embodies the majority of the institutional downtown core of Ottawa. The central front lawn and axis between East Block, Centre Block and West Block is the key open focal point of the Parliament complex for the public and what demands the greatest public awareness. The space between the buildings is called the front lawn, an open area between the Triad buildings. It is used as a public gathering space during national celebrations and allows Centre Block to be the main focal point. This entire landscape is controlled by the LTVP, which can be summarized as a huge program of projects, in five-year stages. The government has gone to great lengths to follow the 1987 grand plan, with the exception of one new major building shown on the north side of Wellington Street – item 22, The Visitor Welcome Centre. This new building will be built underground, below the current front lawn area, and connect all three Triad buildings underground. The first phase is complete and the second phase has started.

To accommodate for the growing country's government, the Langevin Block was built on Wellington Street directly across from the Hill. The Precinct has become an area of evolving design plans that is continually adapting over time. The long-term planning of the Parliamentary Precinct began in Ottawa with the Improvement Commission created in 1899. The commission is known today as the National Capital Commission. The first large-scale planning design for the parliamentary area was in 1903 with the Todd Plan. The Todd Plan was a large-scale vision of how the city could grow and was followed by multiple subsequent plans including the Holt Report in 1915. Frederick Todd was a landscape architect who predicted urban structural growth. His plan for Ottawa was a comprehensive report on the growth of Ottawa as a nation's capital. He created many designs that dealt with parks, open spaces, and populated naturalistic landscape designs. To Todd, the capital's location created a great opportunity to build not only a great city but also a city of unusual beauty. He created a strong forward sighted plan that he believed would grow alongside the country. Although little was done to implement the Todd Plan, all of its major recommendations would find their way into other plans that were implemented in various degrees.

In 1913, years after the release of the Todd Plan, the Federal Plan Commission created a comprehensive design for Ottawa and Hull that was chaired by Herbert Holt. Known as the Holt Report, it was released in 1915. The Holt Report was a plan drafted by Edward Bennett, influenced by the original Todd Plan. It reinforced the ideas of open parks, connected public spaces and the 'city beautiful' traditions that can be seen in both of Todd's and Bennett's planning designs. Since the original Todd and Bennett plan, the Parliamentary Precinct has gone through many different hands and proposals that all are based on that original vision of Todd's. The precinct has become an area of evolving plans that is continuously adapting to the technological and social political atmosphere surrounding it. Even though the Todd Plan was never created, its important because it established the foundation in 1912, and its influence carries through. The subsequent plans that were developed by various individuals after Todd's were implemented in various pieces but never as a holistic vision.

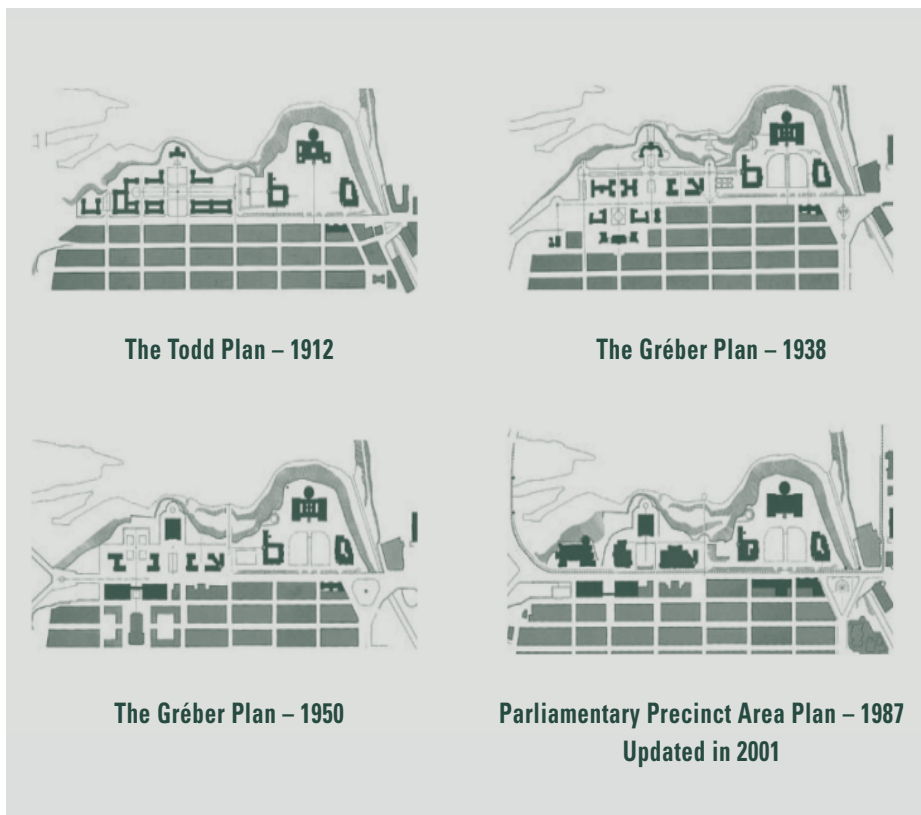


Figure 12 Parliamentary Precinct Area Plan

Image retrieved from "BUILDING ON A SOLID FOUNDATION A New Approach to Implementing the Long Term Vision & Plan." LTVP Design. Parliamentary Precinct, Ottawa, 2007. <https://www.aapc-csla.ca/sites/csla-aapc.ca/files/Advocacy/BOSF.pdf>.

The most notable of these plans is the Gerber Plan from 1938. "In 1937, Jacques Gréber received his first mandate from Prime Minister MacKenzie King- to determine the location of a commemorative monument for the First World War. Gréber, who favoured Major Hill's Park, was later convinced that Connaught Square should be home to the new monument, which was so prized in the eyes of MacKenzie King. The "gaping hole" in the middle of downtown caused by the Russell House fires (1928) and City Hall (1931) became instantly four times bigger as the exit of Knox church, the old post office (as well as a number of other buildings) were sealed: they had to leave in order to prevent shadowing on the magnificent monument".¹¹

Twelve years later Gréber was requested to develop what is known now as the 'Greber Plan'. It was stalled by the Second World War but began again in 1945 due to the request of MacKenzie King. The plan itself had some successful and failed ideas. The later was driven by the modernization of the time period, his idea to decentralization of Federal Government buildings, the automobile as being a central priority with widening of roads and ideas such as avoiding street parking. On the successful note, the Greenbelt and Gatineau Park, are examples of positive elements that have been beneficial for residents from the Greber Plan. Today, the NCC is currently undertaking a massive study to review the plan of Ottawa, and land use specifically for its parkway network, which is somewhat a rejection of Gréber's vision.

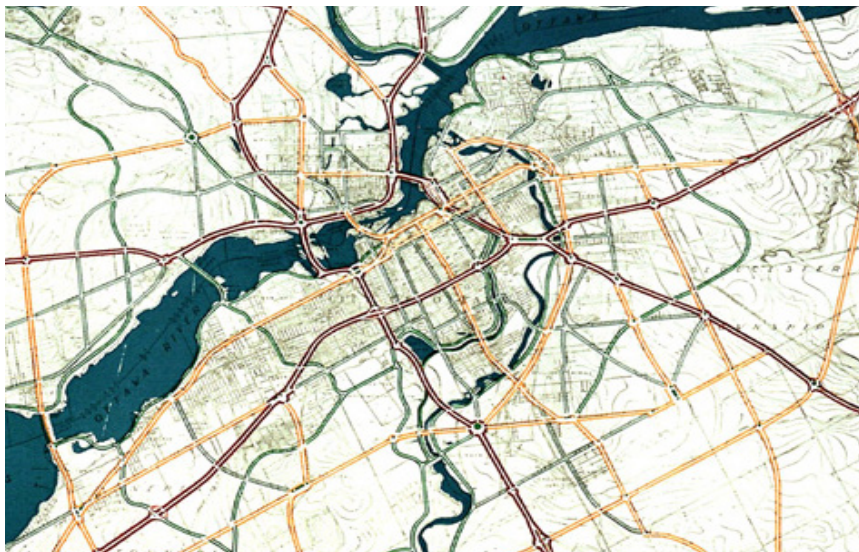


Figure 13 Greber Plan

Image retrieved from Laquerre, Alexandre. "Ottawa Past & Present." *The Gréber Plan - Ottawa Past & Present*. Accessed May 13, 2021. <http://www.pastottawa.com/greber/>.

¹¹ Laquerre, Alexandre. "Ottawa Past & Present." *The Gréber Plan - Ottawa Past & Present*. Accessed February 13, 2021. <http://www.pastottawa.com/?menu=greber>.

EARLY WORKS PROJECTS: LOGISTICS AND A DECADE OF STORAGE

In major construction projects, before they can begin there is usually a series of smaller projects required to facilitate the start of the main work. These are called enabling projects or sometime early work projects. The Centre Block Rehabilitation Project is no different in this aspect compared to large programs. The smaller work packages can be done on the same or separate contract and are usually done by the same general contractor under the construction services contract already in place. The LTVP lays out the massive coordination required to move the government facilities from Centre Block to temporary locations to empty the building. After this there is still a series of enabling packages that must be completed before the start of construction can begin.

One of the largest and publicly known of these projects is the Vaux Wall removal. The Vaux wall is a beautiful multiple storey stone retaining wall with a central staircase and vehicle ramps. It brings vehicles and pedestrian traffic up from the front lawn to the entrance of Centre Block. The wall is one of the remaining original features of the building. It provided a main staircase and promenade entryway up to the Peace Tower. The wall is named after the famous architect Calvert Vaux who was Fredrick Law Olmsted's partner in the design of Central Park in New York City. Vaux was the designer of architectural masterpieces like Bethesda Terrace in the park. The Vaux's retaining wall was designed for Parliament in the 1870s and had remained mostly untouched until now. As part of early works projects of the Centre Block Rehabilitation Project, the Vaux Wall is required to be temporarily removed. Temporary again in terms of this project is not an ordinary timeline. It is a term that takes on a new meaning. Temporary in this case means anywhere from ten-twenty years. Centre Block will probably be the only project in many trade workers, supervisors, contractors, and engineer's careers. Some may even spend their entire career on a Parliamentary Precinct project.

The reason it is important to understand the longevity of the work is that for projects such as the Vaux wall, once it has been removed it must be reinstated after the main project has finished, at the end of the project. The wall was surveyed, cataloged and removed piece by piece. Once removed, it allows for the construction of the Visitors Welcome Centre Phase II. A new building on parliament hill being built directly under the Vaux Wall.

This is very detailed architectural heritage specialist work and the CM must oversee the recording, repairs, organization, crating and transportation of each individual stone from the wall so it can be stored at a facility until its reinstatement. The CM has their own heritage consultants to help in the review and quality of this process, to preserve and protect the heritage stones and oversee any necessary repairs or even replacement should a stone have deteriorated over

time. The crating and temporary storage requirements for each piece of stone is a detailed design to protect each item and ensure its safety over the long period of vacancy. Depending on the type of stone the crate requirements change from a metal mesh crate to a wood crate. Depending on the stones heritage value and how easily it is affected by the weather, the crates are either stored at an interior or exterior government-run facilities. Each stone is given an ID number from the architect and the sub-ID-number which comes from the subcontractor. Each stone has a record documenting its size, shape, type, weight, and character so it can be tracked. This information is submitted for the record but also provided with each crate shipment which is barcoded, scanned, and labeled. An enormously complex work made more complex by the decade long time frame needed for storage. Truly a work of maintaining a managerial memory over the span where individuals may retire or move on to other work.

The Vaux wall project is one example of many on how heritage assets were removed, piece by piece, crated, and transported off-site for long-term storage. The Vaux Wall is comprised of many components and included sculptural stones that were all carved and shaped by hand. The stone is delicate and detailed with geometric work, and the wall removal was a slow and careful process by stone masons. Each crate prior to site transportation was inspected by multiple stakeholders to ensure compliance with the specification on quality, labeling, placing, wrapping, and crating.

The Vaux wall was one of the first projects that removed the existing stone from the site to be tagged, crated and stored. This process of cataloging, recording, identifying, tagging, crating and then final shipment off-site will be the broader process used for all available heritage items in the building. These items include pieces which were stand-alone assets or elements that formed part of the building, such as the marble floor, wall trim, and stone arches. Currently there are approximately 22,000 heritage elements still in place in Centre Block, with about half to be restored onsite and half carefully removed and conserved offsite. These off-site locations were projects onto themselves. They are a combination of interior and exterior storage locations, some with high-security temperature controlled environments that act as holding areas for 10-15 years until they can be reinstalled in place once the building is ready. The Vaux wall was meticulously numbered, cataloged and transported to one particular storage facility in Gatineau. The whole dismantling of the building, piece by piece, is a master logistics project tied to a long-term reinstallation plan.



Figure 14 Workers prepare stones from the Vaux Wall for storage

Image retrieved from "Latest Progress on the Centre Block Project - The Centre ..." The Centre Block project; Latest progress on the Centre Block project. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/edificeducentre-centreblock/progres-progress-eng.html>.

NEW BUILD: THE VISITOR'S WELCOME CENTRE PHASE II

The Visitor's Welcome Centre Phase II is the next new building within the Parliamentary Triad. As part of the LTVP vision, the building, which is the main public entrance on the Hill, will be completely underground. This is a bold design move to excavate the front lawn to build an underground structure in bedrock. The construction for the Phase II project involves massive excavation of the limestone outcrop. The project has been coined the 'big dig.' By both hoe-ram and blasting techniques, the bedrock is being removed deep into the outcrop. This new underground complex will eventually connect all three Triad buildings underground, provide additional security measures, house program support space and provide a new public entry point into Centre Block via tunnel access into the courtyards. Although it acts as a major

design solution to many upgrade requests, it does not address a lot of the main concerns of the modernization needs. Primary among these main concerns are the size and space requirements for the House of Commons which will be reviewed and analyzed in a later chapter of this thesis..

Phase I of the Visitors Welcome Centre was completed adjacent to West Block and is shown in light grey in Figure 15. It is only a portion of the final underground complex that is designed for the hill. That current entrance is very subtle, so you don't know it's there hiding under the stone promenade that blends itself into the Vaux Wall. This first phase of the VWC was a four-level underground complex designed to blend with the historical structures and natural surroundings of Parliament Hill. The Phase II of the underground complex is extensive in its size. The designers have relied on making a massive underground complex as the solution to the Federal Governments increased space and security needs for the building.

The first phase of construction is complete on the VWC and open to the public and the second, much larger phase is on-going as part of the present Centre Block Rehabilitation Project. Design options are still being explored by the government even though excavation and construction have started. As part of a construction management contract, it was recognized that the excavation would take years, and as such, could begin prior to the final design. This is common practice with construction management contracts that see the length of work required, which can take longer than design development. It is a strategy to allow construction to start as soon as possible. It also allows the designer more time to develop their plans. For the building's design which is still in flux, all entry points into the new underground facility will be via the north end of the front lawn. The new upgraded and revised entrances will run underneath the historical Vaux Wall and their location and quantity are still being decided. The debate is whether there should be a consolidated entrance for both public and government or separate ones. The separate entrances currently would be divided into three entry points: one for the public, one for the House of Commons, and one for the Senate.

At this point, the government has not publicly announced the entry point that will occur from the front lawn into the new Visitors Welcome Centre Phase II. The three options being reviewed are presented Figure 16. The decision to have one consolidated entry or separate entrances for public and government must be made in the government's public policy system of decision-making between PSPC and the branches of the Federal Government that form the Parliamentary Partners. The partners may not agree on one option, resulting in conflicting requests to PSPC.

The main argument for the shared entrance is that the beauty and the grandeur of Parliament Hill comes from the fact that the public can walk in the same path as the Prime Minister, up the exterior stairs and through the Peace Tower. This entrance's present grandeur is outstanding. From the entryway inside, the public can make their way into the Rotunda, which is a captivating experience the public should not be denied. Part of the beauty of the building is how

- Main Entry
- Committee Rooms
- Support & Operations
- Visitor Experience

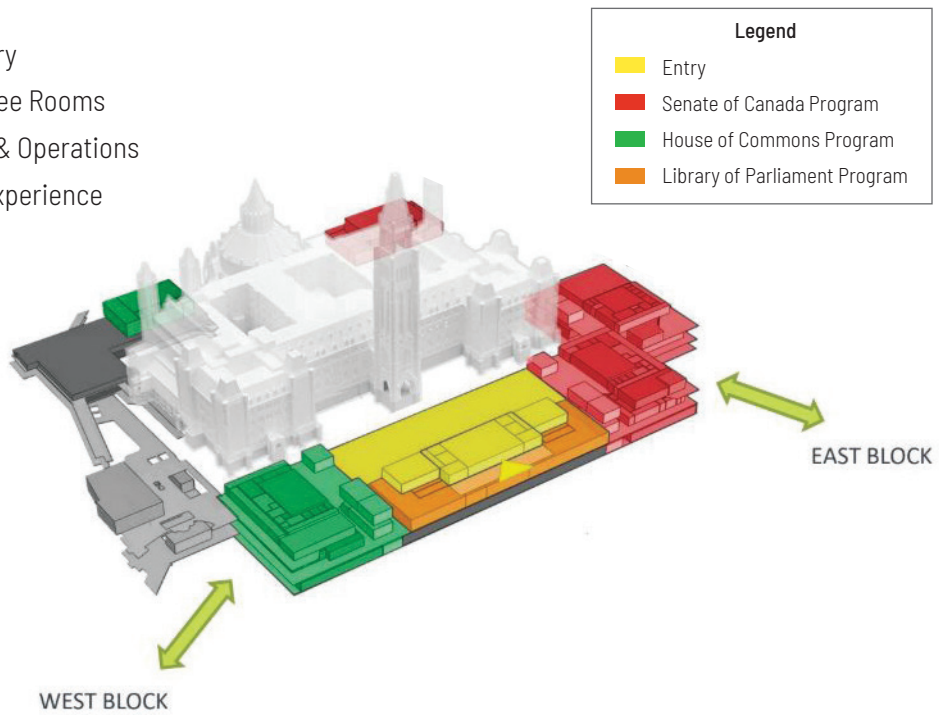
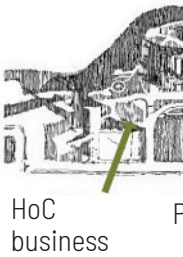
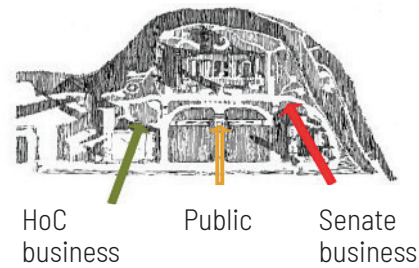


Figure 15 Visitor Welcome Centre Phase II - Blocking and Stacking

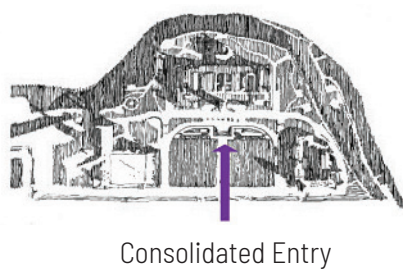
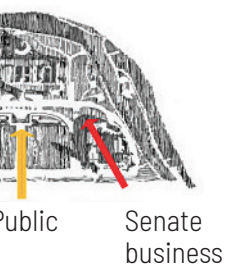
Image retrieved from Lim, Jolson. "Determining Commons Chamber Size a Crucial next Step in Centre Block Rehab, Officials Say." *iPolitics*, February 19, 2020. <https://ipolitics.ca/2020/02/18/determining-commons-chamber-size-a-crucial-next-step-in-centre-block-rehab-officials-say/>.



Separate business and public entrances Entry is projected south into the Great Lawn	Separate business and public entrances Entry is adjacent
Accommodates a large visitor welcome centre	Reduces entry level footprint
Increase security & operating costs without security enhancement in comparison to a single entry	Increase security & operating costs without security enhancement in comparison to a single entry
Complicates wayfinding	Complicates wayfinding
Reduces available space on historic Great Lawn	Maintains the Great Lawn
Significant intervention into key heritage-defining element	Lower impact to key heritage element
Most costly to construct	Lower cost to construct

Figure 16 Entry Points to Parliament: Design Options

Image retrieved from Lim, Jolson. "Determining Commons Chamber Size a Crucial next Step in Centre Block Rehab, Officials Say." *iPolitics*, February 19, 2020. <https://ipolitics.ca/2020/02/18/determining-commons-chamber-size-a-crucial-next-step-in-centre-block-rehab-officials-say/>.



Two separate public and business entrances to the Vaux Wall	Consolidated parliamentary business and public Entry integrated into Vaux Wall
	Reduces VWC entry-level footprint
Without security enhancement in	Reduces operating costs
	Simplifies wayfinding
	Maintains the Great Lawn
	Lower impact to key heritage element
	Lowest cost to construct



Figure 17 Centre Block with the Peace Tower under construction in April 1922

Image retrieved from "History of the Hill - Canada's Parliamentary Precinct - PWGSC." Public Service and Procurement Canada. Accessed February 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/histoire-history/index-eng.html>.



Figure 18 The Entrance to the Visitors Welcome Centre Phase 1

The Visitor Welcome Centre Phase 1 addition is a new 60,000 square foot underground facility located at the North side of the West Block building on Parliament Hill. This facility consists of four levels below grade with connections to the Centre Block, West Block and future phases of the Visitor Welcome Centre.

Image retrieved from "Visitor Welcome Centre Phase 1." Moriyma & Teshima Architects, October 26, 2020. <https://mtarch.com/projects/visitor-welcome-centre-phase-1/>.

you experience the detail of the sequence of Gothic Revival that were originally designed for a separate flow through the building. The atmosphere created within the presence of Centre Block is unique and should be treasured as a 'public experience.' Prior to construction, past Centre Block tours would welcome the public with open arms through the impressive peace tower archway, but this will all change after the implementation of the LTVP strategy. The new driving factor of the new modernizing construction of the VWC Phase II building and part of the design strategy, I believe, is the requirement of security. In very recent events both in the past couple of years in Ottawa and in the past year of the United States of America, security has become a major design decision in government buildings.

As an example, the Triad is the representation of the Canadian democratic system, but these three buildings are also the literal areas for government, which means they are prone to terrorist attacks, protests, and public displays of all kinds to act as measures taken against or for our country.

Pushing the security agenda to the forefront, there was a series of shootings at Parliament Hill, and a fatality of a Canadian soldier on duty at the Canadian National War Memorial on October 22, 2014. The shooters who entered Centre Block did so without much resistance. The intruder was able to fire off shots from within Centre Block, and a bullet hole today still exists within the interior walls of the building. The idea of a public institution that does belong to the people of Canada, that also provides easy public access raises security concerns for those public sector employees' that must work in the building. It becomes a fine line of public access rights, employee safety, and the country's perspective of its governments' order.

For those promoting not using the main archway entry usually used in the past as the main entrance point to the new building, the entire concept of hiding a structure under the front lawn of the Parliamentary Triad is an interesting and bold design concept. As the only new building on the Parliamentary Triad, it has been completely hidden from sight. It's the first new parliamentary building in almost hundred years and it will appear, when finally built, as though it's not even there. This contradicts all other Triad parliament buildings, whose monumentality demand attention through their emblematic Gothic Revival architectural style and their uniqueness as landmarks from both the city and river views. The question that arises is simple as far as public symbolism is concerned, is this decision in line with the grand original vision and worthy enough as the public entrance experience to Centre Block? It is something currently worth questioning.

Functionally, the new building will be the main public area of the Parliamentary Triad and funnel the public down underground to process through security while the politicians occupy the majority of the building and the grand beauty of the original Centre Block structure. In a sense, it's a cliché of the diplomatic process for which it represents. "The politics of Canada

function within a framework of parliamentary democracy and a federal system of parliamentary government with strong democratic traditions. ... Canada is described as a “full democracy”, with a tradition of liberalism, and an egalitarian, moderate political ideology.”¹² Unfortunately for history and the display of democratic rights in Canada, the new building by its location and separation of parliamentary and public traffic takes the best part of the building away from the main public entrance, which has always been open to Canadians.

The Parliamentary Precinct and the main hill of Centre Block has always been a natural and now architectural wonder that captivates bystanders. The original building designs of the Parliamentary Triad were highly successful and still, today, are enjoyed and loved by Canadians. There is a great history, atmosphere, and public symbolisms in the architecture that holds the vision of our country’s government and democracy to a high standard of beauty and tradition. It comes down to a question of government and security. Are the buildings public property for the public experience, or must they be adapted for protected government employees. As I believe security and space are the driving design factors.

¹² Quote from Lim, Jolson. “Determining Commons Chamber Size a Crucial next Step in Centre Block Rehab, Officials Say.” iPolitics, February 19, 2020. <https://ipolitics.ca/2020/02/18/determining-commons-chamber-size-a-crucial-next-step-in-centre-block-rehab-officials-say/>.



Figure 19 A bullet hole is seen in the wood frame as Secretary of State John Kerry enters the Library of Parliament-on-Parliament Hill in Ottawa, Canada

Image retrieved from May, Kathryn. "Heritage Experts Review Bullet Damage in Centre Block." ottawacitizen, October 21, 2015. <https://ottawacitizen.com/>.



Figure 20 Excavation for the VWC Phase II in front of Centre Block

Image retrieved from Helmer, Aedan. "An Elaborate Sequence of Projects' in Restoration of Parliament Hill's Historic Centre Block." ottawacitizen. Ottawa Citizen, December 21, 2020. <https://ottawacitizen.com/news/an-elaborate-sequence-of-projects-in-restoration-of-parliament-hills-historic-centre-block>.

**HERITAGE BUILDINGS:
UNIQUE MERGING OF THE OLD AND THE NEW**

A COMPLEX RENOVATION

There are many areas of the building which are failing. Short-term solutions were no longer practical or feasible, and this is part of what drove the project requirements. Along with an outdated copper roof which is believed to fail in the foreseeable future, the exterior mortar is crumbling, and there are sculptures and stain glass windows that need repair. Due to the building's age on the interior, there are many building materials made of asbestos-containing items that should be removed. Another area of current failure is the mechanical, electrical, and security system of the building, which are outdated, and the ventilation system currently in use will soon be unreliable.

The first stage in the renovation is preparing the interior of the building for construction, which is a unique task related to high heritage renovation projects. Heritage items that are not removed are fully protected in place; some items are disposed of and replaced where others must be restored. After the heritage elements are carefully uninstalled, the interior finishes of the building can be removed (which involves extensive abatement work) before general demolition can commence. All interior finishes that can be removed are horse-hair plaster, marble and stone, metal works, windows, doors, and heritage woodwork. This will expose the structural brick and steel support of the building for review and restoration.

HERITAGE VALUE AND RESOURCE MANAGEMENT

Although Centre Block is undergoing a huge renovation, its historical value and historical elements during its rehabilitation are the highest priority to both the client, designers, and CM. The full design is a balance of the old with what the needs of the future will be. The unique historical, gothic elements that exist within Centre Block are the fundamental elements that transform it from a government facility to an iconic image for our country. Its distinguished location on the hill, its prominent location in the Parliament Triad, and similar gothic style structures of East Block and West Block make Centre Block the main jewel of the architecture on the Hill.

The design and construction follow the gothic architectural style of a symmetrical floor plan with two inner courtyards, and a series of inclusive spaces reflective of the gothic architectural style. The roof is made from copper which over time reacts with the air and oxidizes into a dirty green to which we are accustomed to seeing. The steel frame construction of the building is infilled with bricks and terracotta tile, masked by a beautiful stone cladding on both the interior and exterior. The stonework includes sculptural elements throughout the exterior, along the entrance and atop the Peace Tower. The delicate details of the stonework coupled with the sheer size of the building and meticulous architectural details leave a memorable experience to anyone within the space. The building and experience it provides is truly a unique Canadian parliamentary experience. Until you are there in person, the size, quantity and detail of the craftsmanship of the wood, plaster and stonework cannot be truly appreciated.

It's important to understand that there is a range of new construction scheduled for Centre Block, nonetheless at the end of the day, it is a rehabilitation project not a new build. The project will include the following elements, due to the building's heritage designation:

- restoration of the building envelope
- security mitigation measure
- seismic upgrade
- new mechanical
- electrical
- vertical systems
- new parliamentary offices
- broadcast-capable committee rooms
- complete fit-up of the entire building
- restoration of designated heritage spaces



Figure 21 Workers remove decorative marble slabs from the wall of a room in the Centre Block

Image retrieved from "Centre Block Stories and Videos - The Centre Block Project ..." Photo gallery - Canada's Parliamentary Precinct. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/edificeducentre-centreblock/histoires-stories-eng.html>.



Figure 22 Interior stone blocks, each one tagged, are seen at the construction site

Image retrieved from Helmer, Aedan. "An Elaborate Sequence of Projects' in Restoration of Parliament Hill's Historic Centre Block." *ottawacitizen*. Ottawa Citizen, December 21, 2020. <https://ottawacitizen.com/news/an-elaborate-sequence-of-projects-in-restoration-of-parliament-hills-historic-centre-block>.

- conservation of exterior and interior masonry, wood, plaster, paint, art glass, fabric, and metals.¹³

The Heritage of the building and its components (known as Heritage Assets) are scanned, cleaned, tagged, documented, and stored prior to any construction.

The Centre Block CM has a heritage team to oversee the: transport, cleaning, crating, and restatement of all of the heritage assets of Centre Block, as Centre Block is itself a Heritage item.

Once the keys were given to the CM, there were some 22,000 heritage assets which will be protected, moved, stored, and reinstated at the end of the project. A certain cleanliness, humidity, and temperature control was undertaken by the CM after the building was turned over for construction which included protecting anything of value that remained in the building. Heritage protection is one of the top priorities of the project, and the CM is contractually tied to heritage asset protection and safe keeping. Heritage assets range from expensive to priceless; certain items, if damaged could not be replaced. This understanding is key and allows the CM to mitigate the risk associated with each scope of work. The CM, its heritage team, the heritage consultants, and the designers work together as a team to ensure all assets are removed and stored.

It's important to understand the heritage materials in the building tell a story about Canada and the history of the nation. People all over the world travel to Canada to see Centre Block. The main reason for doing a rehabilitation program, is to repair damage over the last hundred years to these items and to bring the building back to its former glory. It would be cheaper and quicker to rebuild however that would negate the project's purpose and inability to facilitate the governments' modern requirements of the building.

Heritage assets on the project is divided into three subcategories. Heritage assets, heritage sub-assets, and heritage items vary depending on how easily they can be removed from the building.

Heritage materials range from the following:

- fine woodwork
- plaster
- ironwork
- metalwork
- masonry

¹³ Information provided by "Centre Block Stories and Videos - The Centre Block Project ..." Photo gallery - Canada's Parliamentary Precinct. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/edificeducentre-centreblock/histoires-stories-eng.html>.



Figure 23 Masons remove heritage stones from the arch on the Senate porch

Image retrieved from "Centre Block Stories and Videos - The Centre Block Project ..." Photo gallery - Canada's Parliamentary Precinct. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/edificeducentre-centreblock/histoires-stories-eng.html>.

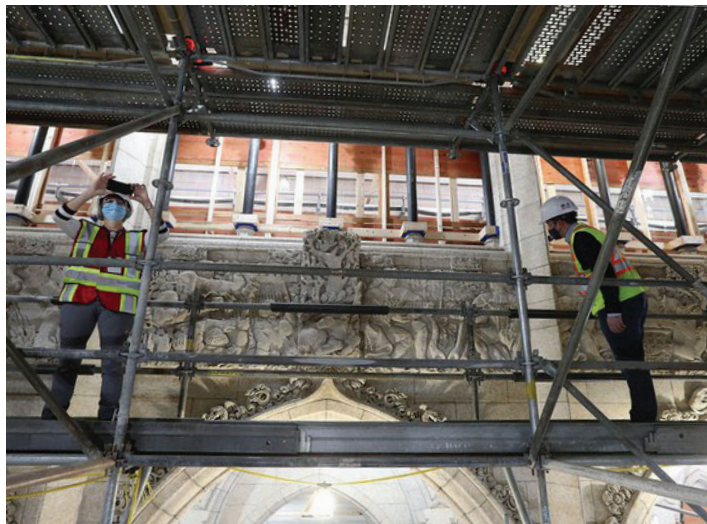


Figure 24 Interior Scaffold set-up in high heritage areas

Image retrieved from Helmer, Aedan. "An Elaborate Sequence of Projects' in Restoration of Parliament Hill's Historic Centre Block." *ottawacitizen*. Ottawa Citizen, December 21, 2020. <https://ottawacitizen.com/news/an-elaborate-sequence-of-projects-in-restoration-of-parliament-hills-historic-centre-block>.



Figure 25 Workers are removing the Baker Memorial from the House of Commons foyer

Image retrieved from "Centre Block Stories and Videos - The Centre Block Project ..." Photo gallery - Canada's Parliamentary Precinct. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/edificeducentre-centreblock/histoires-stories-eng.html>.



Figure 26 Some stone carvings are damaged by water leaks

Image retrieved from "Centre Block Stories and Videos - The Centre Block Project ..." Photo gallery - Canada's Parliamentary Precinct. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/edificeducentre-centreblock/histoires-stories-eng.html>.

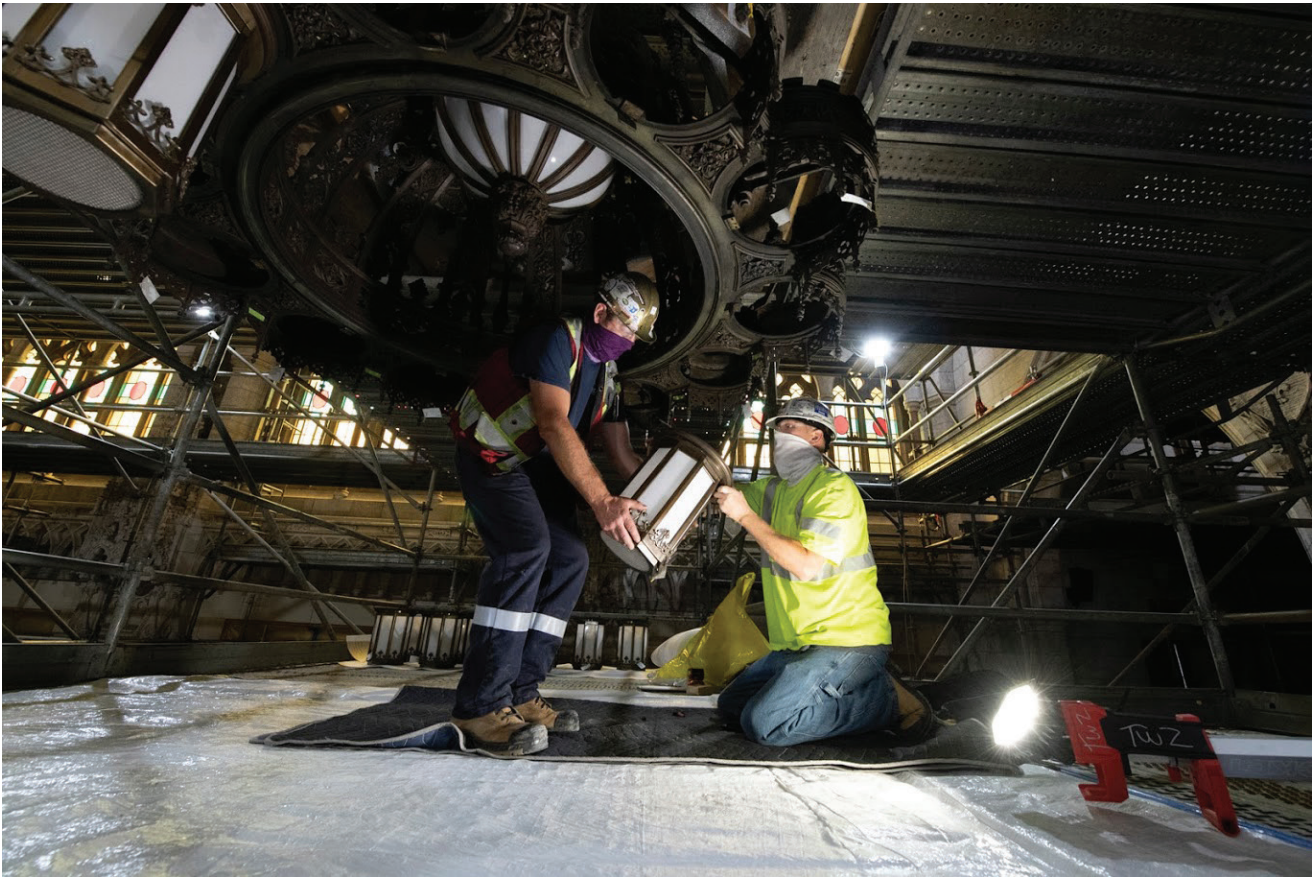


Figure 27 Workers carefully dismantle the heritage chandelier that hung in the Senate Chamber. The huge chandeliers weigh 1,542 kilograms each

Image retrieved from "Centre Block Stories and Videos - The Centre Block Project ..." Photo gallery - Canada's Parliamentary Precinct. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/edificeducentre-centreblock/histoires-stories-eng.html>.



Figure 28 A plaster specialist makes a silicone mold of plaster friezes in the Senate suite in September 2020

Image retrieved from "Centre Block Stories and Videos - The Centre Block Project ..." Photo gallery - Canada's Parliamentary Precinct. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/edificeducentre-centreblock/histoires-stories-eng.html>.

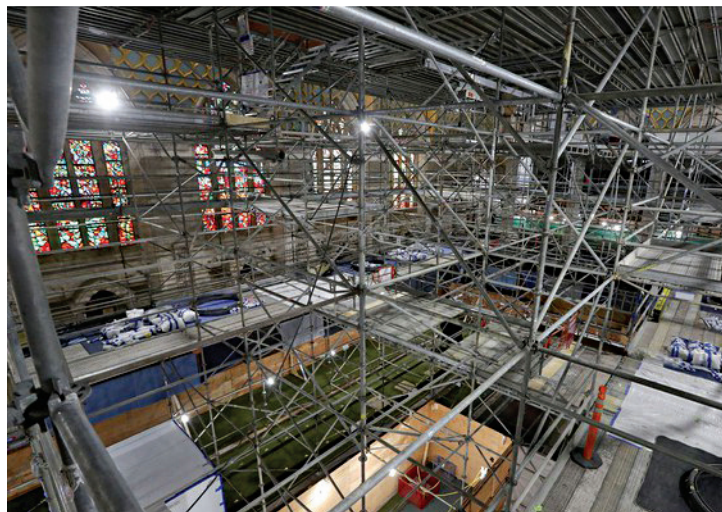


Figure 29 Worker climbs scaffolding stairs in the Chamber of the House of Commons during a tour of the Centre block renovations Wednesday, December 2, 2020, in Ottawa

Image retrieved from Fleming, Tyler. "Stories Carved into Stone: Inside the Renovation of Centre Block." Ottawa, December 16, 2020. <https://ottawa.ctvnews.ca/stories-carved-into-stone-inside-the-renovation-of-centre-block-1.5232696>.



Figure 30 A worker scans the Memorial Chamber with a laser scanner in January 2020

Image retrieved from "Centre Block Stories and Videos - The Centre Block Project ..." Photo gallery - Canada's Parliamentary Precinct. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/edificeducentre-centreblock/histoires-stories-eng.html>.

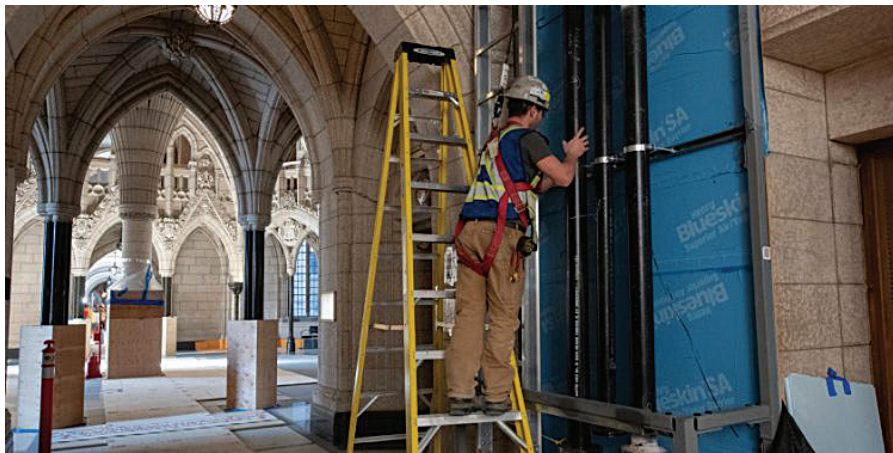


Figure 31 A worker is pictured near Centre Block's rotunda on Dec. 12, 2019, working to install temporary mechanical, electrical, and environmental control systems in the building

Image Retrieved from "Centre Block Stories and Videos - The Centre Block Project ..." Photo gallery - Canada's Parliamentary Precinct. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/>



Figure 32 Workers assess the condition of the ceiling of the Senate Chamber in February 2020

Image retrieved from "Centre Block Stories and Videos - The Centre Block Project ..." Photo gallery - Canada's Parliamentary Precinct. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/edificeducentre-centreblock/histoires-stories-eng.html>.

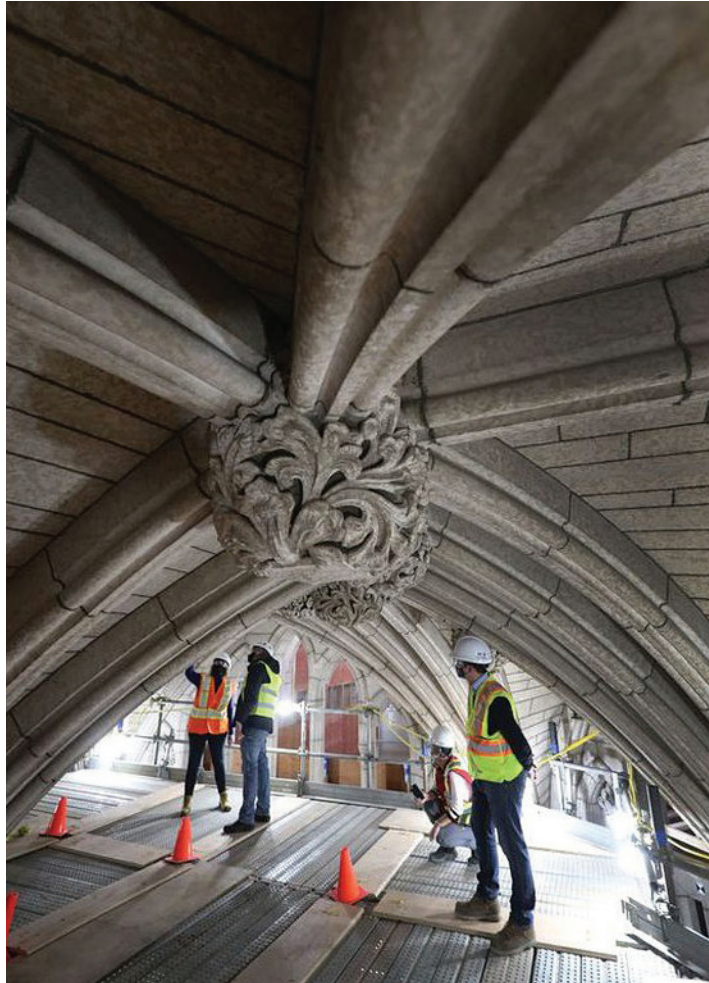


Figure 33 Individuals stand feet from the Rotunda ceiling

Image retrieved from Helmer, Aedan. "An Elaborate Sequence of Projects' in Restoration of Parliament Hill's Historic Centre Block." ottawacitizen. Ottawa Citizen, December 21, 2020. <https://ottawacitizen.com/news/an-elaborate-sequence-of-projects-in-restoration-of-parliament-hills-historic-centre-block>.



Figure 34 A digital imaging specialist does a 3D scan of a stone carving removed from the Senate porch entrance

Image retrieved from "Centre Block Stories and Videos - The Centre Block Project ..." Photo gallery - Canada's Parliamentary Precinct. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/edificecentre-centreblock/histoires-stories-eng.html>.



Figure 35 Hall of Honour

Image retrieved from "Hall of Honour." Hall of Honour - History, Arts and Architecture - House of Commons. House of Commons. Accessed February 13, 2021. https://www.ourcommons.ca/About/HistoryArtsArchitecture/heritage_spaces/honour/honour-e.htm.



Figure 36 Two workers wearing protective equipment remove painted fabric from a ceiling and wind it onto a large spool

Image retrieved from "Centre Block Stories and Videos - The Centre Block Project ..." Photo gallery - Canada's Parliamentary Precinct. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/edificeducentre-centreblock/histoires-stories-eng.html>.

- marble
- stained glass
- lighting
- fine art
- decorative finishes
- historical paint
- copper roofs
- wallpaper
- doors and windows
- carillon
- tower block
- monuments
- statuary

The CM has their own heritage team who act like consultants that work for the CM directly. They try to help streamline the heritage recordings and removal process while fulfilling all the contractual obligations. It is redefining the role of the CM by having their own consultant team, and subject matter experts as part of their own management. This puts another layer of subject matter experts outside of the consultants contracted to the client.

Most heritage items that are required to be repaired were tendered to Canadian companies however some work had to be done internationally by specialists. There is a high degree of craftsmanship throughout the building but specifically in the woodwork in the Senate Chambers and for the wood paneling (which can be seen behind Winston Churchill's famous photo taken in Centre Block). Some of the complex joinery of the wood craftsmanship, like behind Winston Churchill has been lost in the trade over time and a detailed review of these elements must take place to understand how it was built.

In this sense and for much of the detail and highly skilled craftsmanship found throughout Centre Block, the building becomes a museum to a past we cannot recreate. In 1941 "Churchill visited first Washington and then Ottawa. The Prime Minister, Mackenzie King, invited [the photographer] to be present. After the electrifying speech, [they] waited in the Speaker's Chamber where, the evening before, [he] had set up [his] lights and camera. The Prime Minister, arm-in-arm with Churchill and followed by his entourage, started to lead him into the room".¹⁴

¹⁴ Quote from Trickey, Erick. "In the Darkest Days of World War II, Winston Churchill's Visit to the White House Brought Hope to Washington." Smithsonian.com. Smithsonian Institution, February 13, 2017. <https://www.smithsonianmag.com/history/darkest-days-world-war-ii-winston-churchills-visit-white-house-brought-hope-washington-180961798/>.



Figure 37 Sir Winston Leonard Spencer Churchill by Yousuf Karsh, 1941

Image retrieved from Paez, Beatrice. "How Can One Person Be so Lucky to Work Here?: MPs Say They'll Miss Centre Block." The Hill Times. The Hill Times, December 26, 2018. <https://www.hilltimes.com/2018/12/17/can-one-person-lucky-work-mps-look-back-centre-block-years/180952>.

The Senate Chambers are some of the finest areas of Centre Block in terms of its decorative work. Along with the elaborate wood walls, it has gold leaf plated ceilings and decorative ironwork in the senate foyer created by artist Paul Beau. The building itself is a piece of art, and all the fine craftsmanship of stone, wood, iron, glass, and linen are also in their own right public art. They not only comprise the building but are a display within it.

During the rebuild of Centre Block after the fire, the architect called for a blacksmith shop to be made right on the parliamentary grounds, to allow the materials to be made on site. This is unheard of in modern construction where the industry is moving towards modular offsite components that are assembled as quick as possible once delivered.

The fine stonework in Centre Block is one of the building's most elaborate features. This area includes the Confederation Hall and the Hall of Honors which are fine examples of masonry and marble with central arches. The common theme throughout Centre Block is the atmosphere and presents that is created through its architectural style. The high Gothic Revival brings out detailed elements of wood and stone that can be found throughout the building. From the linen ceiling in the House of Commons to faces carved on sculptures, the detailed craftsmanship is a signature of the building's atmospheric quality. Stone carvers were the highest-paid trade on-site during its construction. The building contains 34 stained glass windows. Each glass tells a story of Canada's history as a nation. Some stones were left blank on purpose. The building has a master carver who designs the new sculptures for the remaining empty stones to tell the ever evolving story of Canada.

Some of the spaces in Centre Block are so grand and beautiful they deserve to be a museum, to be preserved, and viewed for ages. Frescoes are a heritage asset which line the halls of Centre Block. Room 4075 holds a Frescoes by Atillio Pusterla which are rare in Canadian history. The frescoes are part of the wall, and specialists have been brought in to remove them (with a terracotta backing). They are one of the most sensitive assets on-site, along with the linen ceilings. The linen ceilings in the House of Commons chambers symbolizes images from the nation and the provincial/territorial coat of arms. They were removed and have been rolled up. It tells the story of Canada, and the people, much like many of the building and design elements that make-up Centre Block.

The carillon, which is a series of bells located within the top of the Peace Tower is one of only 23 grand carillons worldwide and the 7th heaviest in North America. It holds 53 bells, and the largest bell weighs 10,090 kg. As part of the restoration, 29 bells will be shipped to Belgium to be repaired, with the larger bells being repaired on site. To undertake all these heritage restoration elements, specific heritage protection plans are required of the contract and written into the specification. They are submitted and reviewed prior to any scope of work happening in that area and developed by the heritage consultants under the CM. There are also the aspects of heritage finds that are discovered during demolition and asbestos removals. Items such a pipe or newspaper

which will be preserved. A full bottle of beer from the 1960s has been discovered in the walls along with a smoke pipe from the original trade workers of Centre Block.

The Centre Block building was filled with various types of asbestos-containing materials all of which are currently being abated. The interior is being taken back to its bones, exposing the original brick, terracotta and structural steel substructure. All of these elements make up the heritage fabric of Centre Block. Abatement and asbestos removals have commenced for Centre Block even though the design is not finalized. This is work the CM can start. It allows the schedule to move forward without future design. This is part of the advantage of having a construction management contract. The CM, consultants and owner can work together at the beginning phases of a project's schematic design phase to see where construction can begin without waiting for the full design to be developed. Without this benefit the project would take much longer and cost more due to the increase in time required. The CM looks at the design/construction process and where overlaps can occur to expedite the schedule.

THE LIBRARY OF PARLIAMENT

The Library of Parliament was previously renovated, and even though some work is still outstanding, it will not be part of the Centre Block Rehabilitation Project. Since it falls within the boundaries of the construction site it was not practical to keep it operational. It will remain closed for the duration of the project. The building's original function was to be the Parliament Library. This is no longer the case as the collection is now located mostly in the Library's facility at 45 Sacre-Coeur Boulevard in Gatineau, Quebec. The building, with its strikingly beautiful Gothic Revival architecture from the original Centre Block design is the last remaining part of Centre Block that wasn't destroyed in the fire of 1916. The library sits as a reminder of the past opulence, not as an actual functioning government facility. The main operating arm of the Library of Parliament is located just south of Wellington Street and is the interim location while the building is closed.

The former project of the Library of Parliament was considered a success in 2002. This rehabilitation project replaced the three copper roofs, including the drainage system to take water away from the Library. The project also included repairing all decorative ironwork and weathervanes from the exterior, removing and repairing 147 leaded glass windows to more modern energy-efficient windows and repoint/repairing all stone masonry.



Figure 38 Interior of the Library of Parliament

Image retrieved from Limited, Alamy. "Stock Photo - Parliamentary Library at Parliament Hill in Ottawa Ontario Canada Parliamentary Tourists Looking at Statues." Alamy. Accessed February 13, 2021. <https://www.alamy.com/stock-photo-parliamentary-library-at-parliament-hill-in-ottawa-ontario-canada-20761254.html>.

THE DESIGN PROPOSAL

Some of the requirements needed in Centre Block that have been released to the public are public access routes, new elevators from the underground Visitors Welcome Center Phase II into a grand interior courtyard, and a secondary screening area.

The Visitors Welcome Center Phase II can be seen in the front section of figure 39, and the public access tunnel will go under the peace tower and to the existing inner courtyard of Centre Block. It hits a vertical shaft which will be public elevators, and bring individuals into the newly enclosed inner courtyard of the building.

- Public Universally Accessible route to Chambers, Committee Rooms and Gallery
- New elevators to serve L1-L6
- Secondary Screening
- Meeting and Crush Space

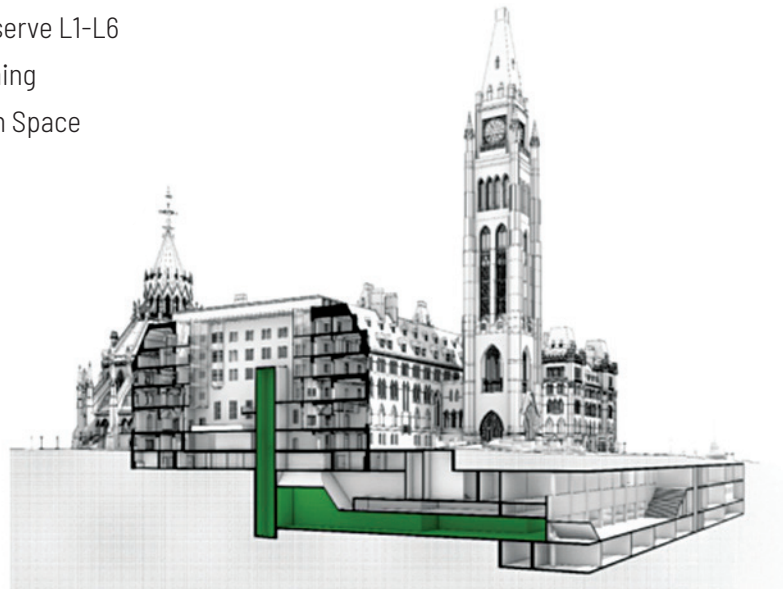


Figure 39 Courtyard Circulation and Connections

Image retrieved from Lim, Jolson. "Determining Commons Chamber Size a Crucial next Step in Centre Block Rehab, Officials Say." iPolitics, February 19, 2020. <https://ipolitics.ca/2020/02/18/determining-commons-chamber-size-a-crucial-next-step-in-centre-block-rehab-officials-say/>.

HOUSE OF COMMONS CHAMBER - DESIGN DECISIONS

One of the key design decisions of the Centre Block project is the House of Commons. The chamber is located on the far west wing of Centre Block. It is twenty-one meters long, sixteen meters wide and has seats for 320 members of parliament. The upper gallery can hold an additional 580 people on the second level meant for viewing. The House of Commons is the public functioning space of the government, it holds a seat for each member of parliament and allows every political party to sit and debate the issues of the day. The current House of Commons has a central axial floor plan with seats on either side and a central table. The spacing between sides is 3.96m from the opposing member's benches across the main floor. This measurement is said to be equal to three swords' length. It is derived from when the English parliament members carried swords, and the dimension was carried forward from the English parliament to Canada's parliamentary. The designed spacing was to help avoid actual sword fights.

Centre Block was closed in 2018 to start construction, at which time the House of Commons was moved to its interim location into the courtyard of West Block. The courtyard of West Block was completely transformed into an interim House of Commons. The temporary space was a massive undertaking inclusive of bedrock excavation, new structural steel columns, and a glass roof. The West Block House of Commons design holds the original desks from Centre Block which were moved into the space. The public second-level galleries in West Block's new space are smaller than Centre Block's original area, with seating for 346 persons as opposed to 581.

The architectural design of the House of Commons is driven by seating requirements which is tied to the population of the country. At present, the House of Commons is comprised of 338 members, each of whom represents a single electoral district (also called a riding). The constitution specifies a basic minimum of 295 electoral districts, but additional seats are allocated according to various clauses. Electoral district boundaries are adjusted to reflect the population changes after each decennial census.

"The number of seats given to a province is determined by the representation formula found in the Constitution. The main criterion for electoral boundaries is population equality. The Electoral Boundaries Readjustment Act requires that the population of an electoral district in a given province be as close as is reasonably possible to the average population size of a district for that province (that is, the province's population divided by the number of electoral districts). However, in addition to population equality, commissions must consider other social and geographic factors. They may choose to create electoral districts whose populations vary



Figure 40 West Block, Interim House of Commons

Image retrieved from Lindell, Rebecca. "West Block's Transformation into the New Home of the House of Commons." *Global News*. Global News, June 16, 2018. <https://globalnews.ca/news/4275087/fixer-upper-how-the-west-block-has-been-transformed-into-the-new-home-of-the-house-of-commons/>.

from the average, if they consider it necessary or desirable to do so”¹⁵

As Centre Block only has enough floor space for 320 members of parliament, it is already too small to hold all 338 members on the main floor. This presents a complicated architectural spatial problem in designing a larger House of Commons in a confined heritage space.

There is a debate on how this building will be designed for government requirements in the future for the House of Commons Chamber. As the country grows so must the seats in the House of Commons; therefore the designed capacity of the room will only be sufficient for a period of time. How much time is still being decided as three different capacities and seating arrangements are being vetted. It is in these details and decisions that the merging of the old and the new must be decided. The government is the body making these decisions, and the House of Commons themselves. Weight is given to the heritage asset value and the requirements of a functioning body of government. Due to the structure of the contract, and the weight of such a large design decision, very little input will be provided from the CM outside of feasibility studies, constructability, and schedule impacts. The schematic design is being driven by the Federal Government and their modern desires. Architects are playing a role by presenting various options; however, the final decision and driver is still the government.

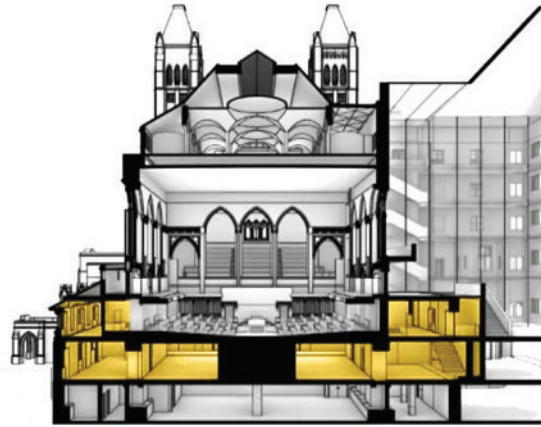
Very quickly one can see that the two left designs will not increase the seating to a significant amount and the third option which does increase seating has a dramatic effect on the original architecture and heritage. These are very early design ideas that the government is working through with input from a variety of stakeholders, including parliamentarians.

“In question are what exactly to do with the House of Commons chamber, which may need space to hold 460 MPs by the year 2060 based on House of Commons estimates on the growth of members in line with the country’s population growth, as well as a planned subterranean Visitor Welcome Centre at the foot of Centre Block that will connect all three buildings on Parliament Hill.”¹⁶ The specific space requirements that designers need are being asked for the Parliamentarians to input so the final scope and size can be determined. This is the biggest design decision for the entire project. “We are now at the point that the input of parliamentarians is critical to support key decisions in order to finalize the schematic design and determine a substantive cost, scope and schedule”.¹⁷ The three different design proposals for the House of Commons suggest that certain design elements are conflicting with one another, and no true perfect resolution will be able to be reached. The reality of the requirements asked of the historical Centre Block building “emphasize

¹⁵ Quote from “House of Commons of Canada.” Wikipedia. Wikimedia Foundation, May 12, 2021. https://en.wikipedia.org/wiki/House_of_Commons_of_Canada.

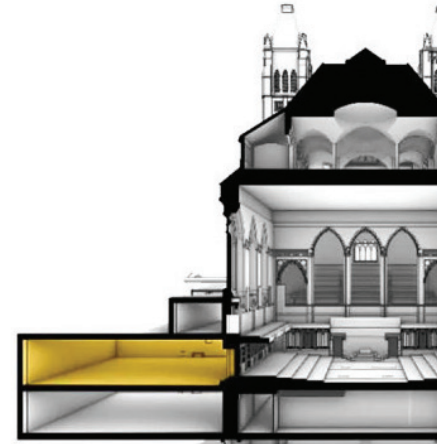
¹⁶ Quote from Lim, Jolson. “Determining Commons Chamber Size a Crucial next Step in Centre Block Rehab, Officials Say.” iPolitics, February 19, 2020. <https://ipolitics.ca/2020/02/18/determining-commons-chamber-size-a-crucial-next-step-in-centre-block-rehab-officials-say/>.

¹⁷ Quote from Lim, Jolson. “Determining Commons Chamber Size a Crucial next Step in Centre Block Rehab, Officials Say.” iPolitics, February 19, 2020. <https://ipolitics.ca/2020/02/18/determining-commons-chamber-size-a-crucial-next-step-in-centre-block-rehab-officials-say/>.



Option 1:
Preserve the building's existing footprint

Accommodate Forecast growth	Flip seats/desks
Lobby Capacities	2 levels
Lobby Proximity	
Gallery Capacities	305
Heritage Impact	



Option 2:
Expanded footprint for larger government lobby as an addition

Accommodate Forecast growth	Expanded footprint
Lobby Capacities	1 level
Lobby Proximity	
Gallery Capacities	305
Heritage Impact	Very low

Figure 41 House of Commons Chamber Design Options

Image retrieved from Lim, Jolson. "Determining Commons Chamber Size a Crucial next Step in Centre Block Rehab, Officials Say." *iPolitics*, February 19, 2020. <https://ipolitics.ca/2020/02/18/determining-commons-chamber-size-a-crucial-next-step-in-centre-block-rehab-officials-say/>.



MP lobbies, build
tion

Option 3:

Expanded footprint for larger Commons chamber and MP lobbies, entire western wall of the Centre Block to be rebuilt

Flip seats/desks
1 level
305
West Courtyard and West façade

Accomodate Forecast growth	Pairs of desks or flip seats/desks
Lobby Capacities	1 level
Lobby Proximity	
Gallery Capacities	500
Heritage Impact	Reconstruction Required

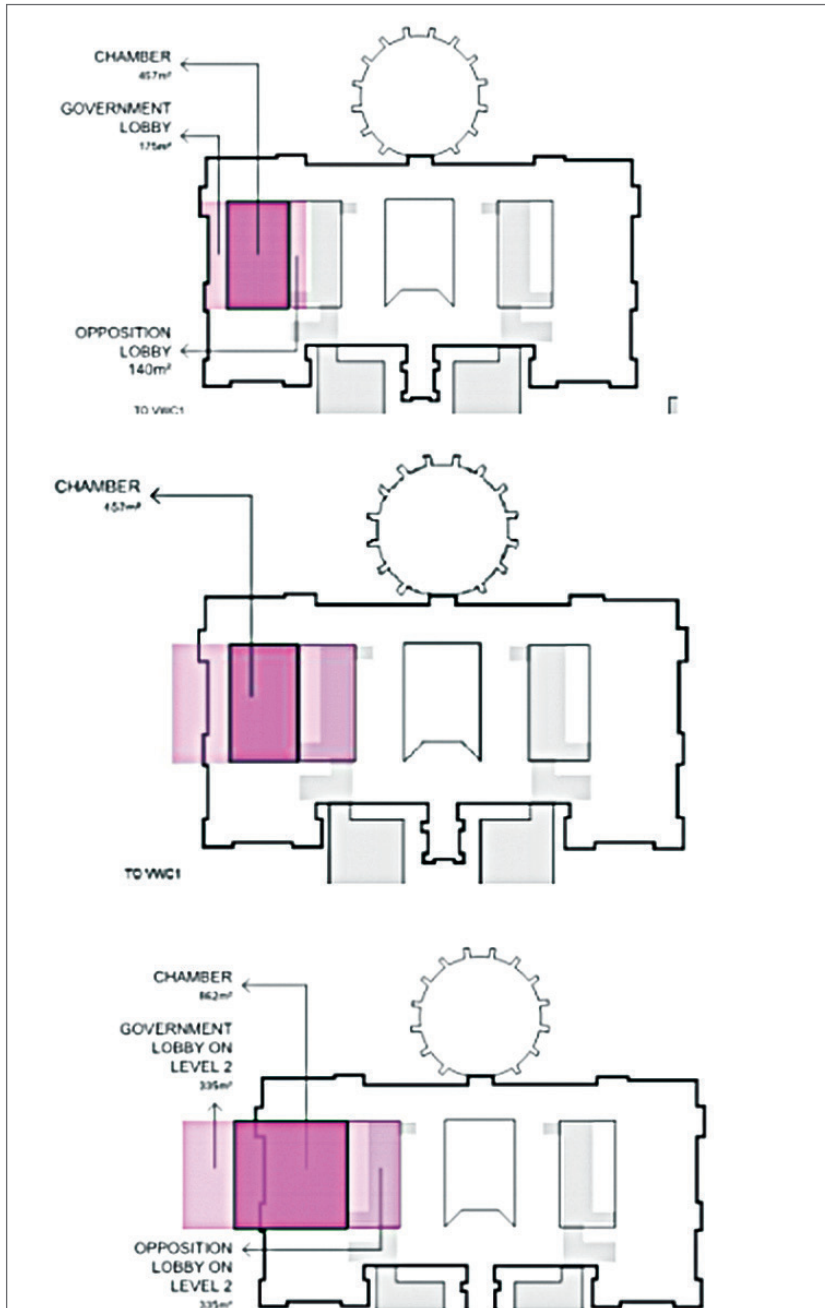


Figure 40 –Potential concepts for the House of Commons chamber in Centre Block. Courtesy of Public Services and Procurement Canada

Image retrieved from Lim, Jolson. "Determining Commons Chamber Size a Crucial next Step in Centre Block Rehab, Officials Say." *iPolitics*, February 19, 2020. <https://ipolitics.ca/2020/02/18/determining-commons-chamber-size-a-crucial-next-step-in-centre-block-rehab-officials-say/>.

the tension between space, functionality, accessibility, and heritage.” Each option favors either heritage or future space, but none satisfies both requirements.

The least invasive option retains the existing footprint of the chamber that would not change or alter the building’s façade. It would add a new lobby space on the second floor and could accommodate up to 420 MPs. If accessible seating were factored into the design, it would reduce the gallery seating to 305 spots. The second option increases the lobby footprint to accommodate more space on a single floor, but it extends the Chamber outside the current Centre Block building. Based on the section, this size increase would still retain its interior heritage. The third option is also the most extreme. It increased the lobby and chamber size beyond its current space and would have major implications to the heritage and symmetrical character of Centre Block. The space would be completely removing the west wall of the original chamber and have both the lobby’s reach beyond the current space and beyond the exterior building west wall. This option would be the most expensive and allow for seating for up to 544 MPs which should satisfy the popular requirement for the next hundred years.

The final design for the House of Commons chambers has not been publicly released, but the final schematic design for the project was set for fall 2020. Jennifer Garrett, Director General of the Centre Block program based with PSPC said what to do with the House of Commons chamber within Centre Block’s physical and heritage constraints will be the most challenging choice in the rehabilitation project. “These types of heritage buildings always prove technically challenging to modernize, and the House of Commons chamber will be the most challenging decision that the project faces”¹⁸.

¹⁸ Quote from Jennifer Garrett, Lim, Jolson. “Determining Commons Chamber Size a Crucial next Step in Centre Block Rehab, Officials Say.” iPolitics, February 19, 2020. <https://ipolitics.ca/2020/02/18/determining-commons-chamber-size-a-crucial-next-step-in-centre-block-rehab-officials-say/>.



Figure 43 Empty House of Commons

Image retrieved from Paquet, Laura Byrne. "Temporary House of Commons and Senate Are Now Open for Tours." Ottawa Road Trips, October 26, 2020. <https://ottawaroadtrips.com/2019/02/19/temporary-house-of-commons-senate-ottawa-parliament-open-2019/>.



Figure 44 Excavation for The Visitors Welcome Centre (Main Building)

Image retrieved from "Centre Block Stories and Videos - The Centre Block Project ..." Photo gallery - Canada's Parliamentary Precinct. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/edificeducentre-centreblock/histoires-stories-eng.html>.

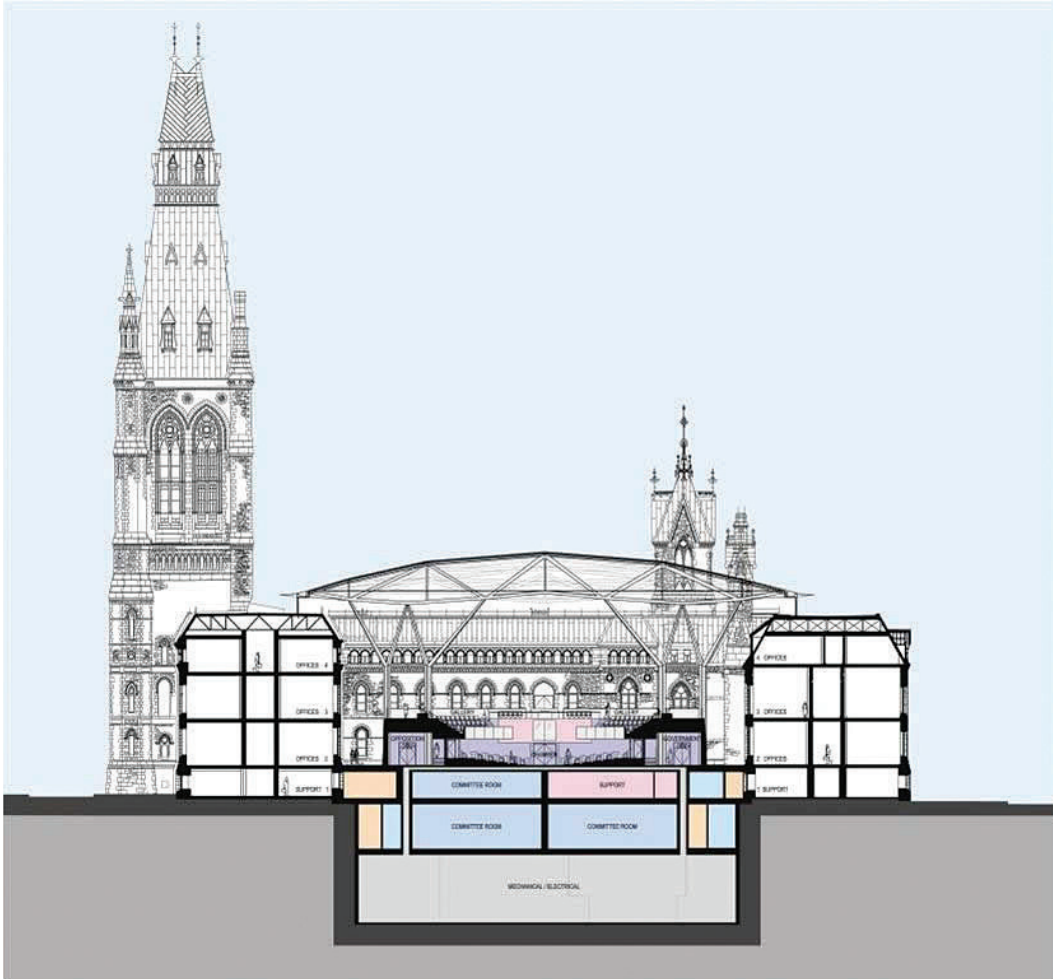


Figure 45 An artist's rendering of a cross-sectional view of the redesigned West Block building, including the House of Commons Chamber

Image retrieved from "Restoring and Modernizing the West Block - Canada's ..." Restoring and modernizing the West Block - Canada's Parliamentary Precinct - PSPC . Public Service and Procurement Canada. Accessed February 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/ouest-west-eng.html>.

HOUSE OF COMMONS CHAMBER - RELATIONSHIP

The House of Commons is an interesting room, not only for its relationship to the country but to the public and government. It becomes the stage in which the country is run from. In the simplest form, it is a room for the committee of the members of parliament to discuss appropriate bills, and other legislation among themselves and in front of a public audience. It is here that laws are made, bills are passed, the current government's work is reviewed, and important issues are debated.

The Centre Block House of Commons is the most spacious room in the building. Upper galleries were designed to accommodate 580, people and the original main level can hold 320 members. There are three new spaces surrounding the main house, which didn't exist when it was first designed. These are the antechamber, the government lobby, and the opposition lobby, located on the east and west sides. When the room was first unveiled in 1920 and "A local newspaper declared that the architectural beauty of the splendid room, enhanced by the presence of the social elite in a formal evening affair, made for quite an impressive scene. The high level of interest in this event came largely from the public's desire to see inside the new Parliament Building, even though it was incomplete".¹⁹

Canada being one of the British colonies, modeled its government building and House of Commons from the Westminster model (Parliament of the United Kingdom). "The seats are evenly divided between both sides of the Chamber, three sword-lengths apart (about three metres).[21] The speaker's chair (which can be adjusted for height) is at the north end of the Chamber. In front of it is the Table of the House, on which rests the ceremonial mace. Various "table officers"—clerks and other officials—sit at the table, ready to advise the speaker on procedure when necessary. Members of the Government sit on the benches on the speaker's right, while members of the Opposition occupy the benches on the speaker's left. Government ministers sit around the prime minister, who is traditionally assigned the 11th seat in the front row on the speaker's right-hand side. The leader of the Official Opposition sits directly across from the prime minister and is surrounded by a Shadow Cabinet or critics for the government portfolios. The remaining party leaders sit in the front rows. Other members of Parliament who do not hold any kind of special responsibilities are known as "backbenchers".²⁰

In the upper gallery facing the speaker's chair is the ladies' gallery, where the first row of seats is reserved for diplomatic corps or other distinguished guests. The remaining rows can

¹⁹ House of Commons Chamber - History, Arts and Architecture - House of Commons (ourcommons.ca)

²⁰ House of Commons of Canada - Wikipedia

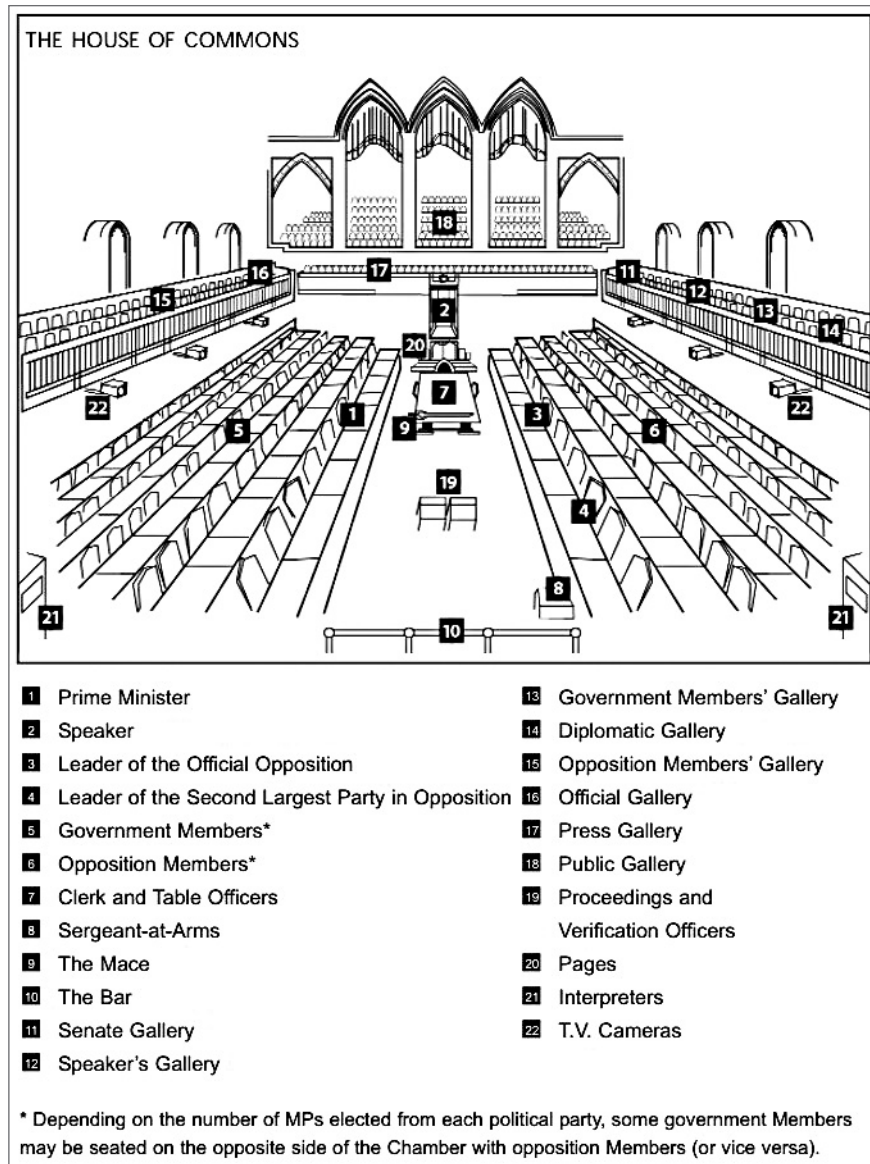


Figure 46 House Of Commons Seating

Image retrieved from "House of Commons." *The Canadian Encyclopedia*. Accessed February 13, 2021. <https://www.thecanadianencyclopedia.ca/en/article/house-of-commons>.

be used by the public. On the opposite side, immediately above the speaker's chair is the press gallery. Facing the government benches are three galleries for government members, senators, and guests. On the other side facing the opposition bench is a gallery for department officials.

The entire room design lays out the relationship of authority for the country and the relationship of the government to the public and press. It is the legacy of our democracy that runs from the British empire into the colonies. The room is how the colony and country actualize their governments' identity and decision-making. Its identity and time period are reflected through the architecture of the room. A new design for the House of Commons opens up new opportunities to reimage this identity for the country and redefine it. It also opens up the opportunity to refine the relationship of the government party to the opposition party. These notable design decisions currently being made for the Centre Block project are tied to the project schedules and project management process. In some ways, the project management process has allowed more time for this design process to unfold, but on the other hand it provides a clear deadline for the decisions.

CONSTRUCTION MANAGEMENT: THEIR ROLE IN DESIGN DEVELOPMENT

CONTRACT TYPES AND DELIVERY METHODS

Modernizing heritage buildings is an attempt to take the basic building form and mold advanced systems, designs, access, and usually new space into it without compromising its historic qualities. It requires expertise from not only a creative designer but a creative contractor. Their relationship with a project is driven by the project's set delivery method. Construction management is one type of delivery method, and that's how the Centre Block project is contractually set-up. Much like the original movement from master builder to architect and engineers, the contractor's scope had also increased on building projects from when the buildings were first constructed. The modern large construction projects divide the requirements up to include construction expertise to help in the successful delivery of complex projects. The scopes of work that once may have only covered three or four specification sections of masonry, mortar, glazing and roofing in recent history, now embody fifty different divisions in the master format. Design has become a huge conglomerate of requirements. Major building projects will only typically use thirty-three of those fifty divisions in their specifications. The massive increase in design requirements and divisions has led to buildings that are extremely complex in nature. They are not just a mass building of stone to create enclosed spaces but embody massive mechanical, electrical, and security systems, each with unique space requirements and specialty construction elements. Hence the birth of the CM and the increase in construction contract types and delivery methods. A large part of making sure everything works together in design coordination required among all specifications is done by the contractor.

In modern times architects and engineers have become distinct professions, with their own legal requirements for buildings. They are part of a team which creates discipline-based construction drawings to facilitate the builder's contract, award scope and estimate the project's cost. This relationship between builders and designers molded into a contractual and legal relationship. In Daniel's book, *Construction Management*²¹, these two courses of contractual relationships are laid out. The first is between the client and designer, intended to outline the project's planning, design, and contract administration requirements. The second relationship is between the client and the builder. Thus, the designer and builder are brought together through the client but do not have a relationship or contract between them.

There are two popular relationship scenarios between builders and designers described

²¹ Nurcholis, Achmad. "Halpin D. W., *Construction Management*, 4th Ed, 2011.Pdf." Academia.edu. Accessed February 13, 2021. https://www.academia.edu/36218951/Halpin_D_W_Construction_Management_4th_ed_2011_pdf.

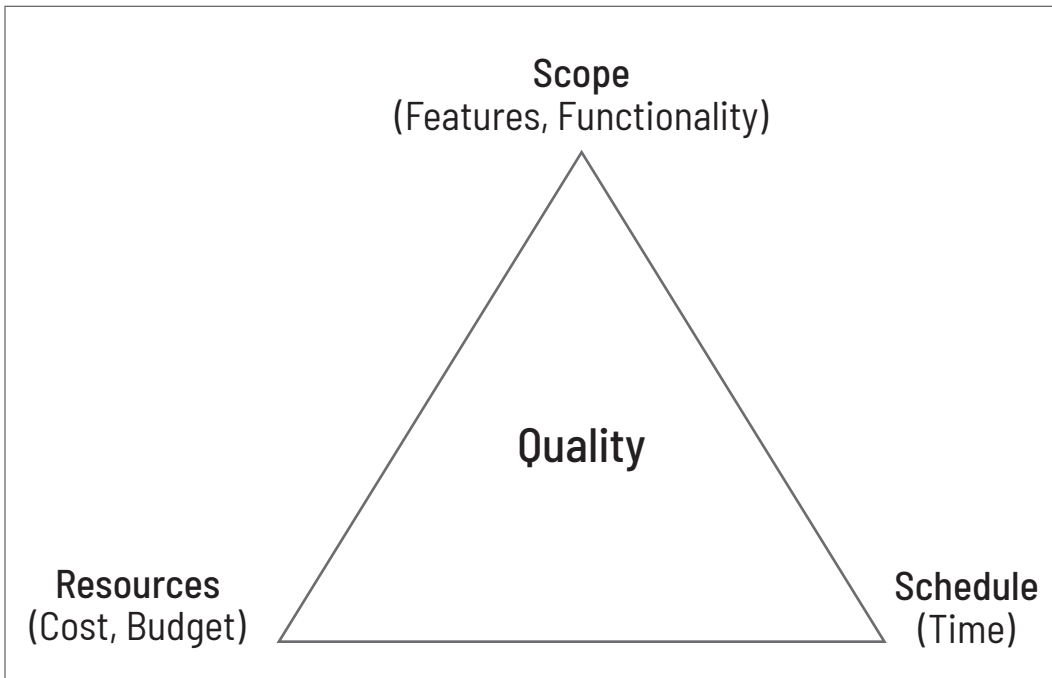


Figure 47 Project Constraints

Image retrieved from Wambler, Scott. The "Broken Iron Triangle" Software Development Anti-pattern. Accessed February 13, 2021. <http://www.ambysoft.com/essays/brokenTriangle.html>.

in Daniel's book. The first is a design/bid/build relationship described above. The second is a design-build contract. The design-build contract is typically formed for large complex projects. The architect and engineers work for the design-builder to take the building concept into a completed design state. During this time, they also proceed with construction even though the design is not complete. In my opinion, the third relationship is that of the construction management delivery method. The relationship of the Owner having separate contracts with the designers and builders is still maintained, but the builder has a design requirement that allows for project collaboration at the beginning and through all stages of the project. A construction management contract is a cost-effective and time-conscious alternative to the traditional design-bid-build process and contractor led design build methods.

Modern-era construction projects formed from legally binding contracts, of which there are many types and multiple project delivery methods. There are four typical types of contracts between the builders and clients: Lump Sum, Cost-Plus, Time-Material, and Unit Price. The Centre-Block Rehabilitation Project is a Cost-Plus contract with a CM at Risk (CMR) delivery method. Construction contracts will have a cost type and a delivery method. They lay out the relationships in the project, how it will be staffed, how changes are processed, how RFI's and submittals will be completed, and in general, outlines how the project will be delivered and by whom.

A 'Construction Management at Risk' contract (known as a CMR) puts the CM as a team member, allows for early design assistance, and can redirect the risks from the client to the contractor. It is a delivery method that provides a commitment by the CM to deliver the project, typically (but not always) within a guaranteed maximum price (GMP), based on the construction documents and specifications at the time the GMP was given. The 'risk' can be associated with other aspects of the project rather than a guaranteed maximum price and this is the case with the Centre Block Rehabilitation Project. The contractor has a construction management contract with required design assistance and other associated bought risk. For Centre Block, there was no guaranteed maximum price, provided as the current design state could not allow for such an estimate.

In a CM contract delivery method, the CM acts as an adviser to the Owner, providing consultation and other professional services. Services such as design recommendations, schedule, and budget reviews prior to developing the project further. If there is a GMP and costs go over the set value, then the CM is financially responsible. To understand the CM's role, which differs from just a general contractor, their influence in developing and designing the project has to be understood. In a large multistage project such as Centre Block, the CMR delivery method will help the design team establish which work packages can proceed first in relation to the whole schedule. The CM will assist with the practical side of the design in

Contract Types - Have Variations and Are Customized to Suit
 (differences in contract structure or form, including compensation arrangements and amount of risk)

Unit Price	Lump-Sum/Fixed Price	Time and Material	Cost-Plus
<p>This type of bid is written for projects where the scope isn't totally certain. This means that the quantity of materials, the labor, rate per unit work volume, and other factors can be estimated. Work can begin prior to finalizing specifics.</p>	<p>Most common construction contracts and used when pricing is decided upfront. Are used most often when there is an agreed-upon scope and defined schedule. This contract transfers risk to the builder and is utilized when an owner wants to avoid change orders for work that hasn't been specified.</p>	<p>The buyer pays for the time spent by the builder and his subcontractors and must pay for the actual costs of construction materials. There is uncertainty involved for the buyer here as well, since the buyer has to pay for extra costs or time overruns. Many time and materials contracts will contain maximum price clauses as well.</p>	<p>The Owner paying the actual costs of construction plus an additional set percentage or amount for the contractor or builder. The owner takes on the risk here, because if it turns out the project is much more expensive, the buyer will be the one to pay for the cost of construction plus the profit margin. Cost-plus contracts can be structured in different ways, including cost plus with the builder making a fixed percentage of costs; or cost plus with a fixed fee or set amount for the builder. It is also possible for a cost-plus contract to specify a guaranteed maximum price, so the buyer can mitigate risk.</p>

Figure 48 Contract Types

Image retrieved from Emanuelli, Paul. "Selecting the Appropriate Contract Structure." Procurement Office. Accessed February 13, 2021. <https://procurementoffice.com/selecting-the-appropriate-contract-structure/>.

Delivery Methods					
	Design-Bid-Build (Traditional)	Construction Management	Design-Build	Integrated Project Delivery	P3
CCDC Contract #	CCDC 2 - Stipulated Price Contract	CCDC+5A+17 - Owner at Risk	CCDC 14 - Design-Build Stipulated Price Contract	CCDC-30	design-build-finance-maintain with structured companies comprised of builders, trades, designers and financiers
	CCDC 3 - Cost Plus Contract	CCDC - 5B - CM at Risk	CCDC 15 - Design Services Contract Between Design-Building		
	CCDC 4 - Unit Price				
	CCDC 18 - Civil Work Contract				
Design Responsibility	Consultants	Consultants + Input from CM	Design-Builder Company	All parties	Design-Builder company

Figure 49 Delivery Methods

Image retrieved from Emanuelli, Paul. "Selecting the Appropriate Contract Structure." Procurement Office. Accessed February 13, 2021. <https://procurementoffice.com/selecting-the-appropriate-contract-structure/>.

Contract Type (examples)	CM with GMP	Cost Certain	Cost Plus	GMP	LS	Reimbursable	Reimbursable Fixed Fee	Target Price	Unit Price
						Construction Management - At Risk (Delivery Method)			

Figure 50 Contract Type

Image retrieved from Emanuelli, Paul. "Selecting the Appropriate Contract Structure." Procurement Office. Accessed February 13, 2021. <https://procurementoffice.com/selecting-the-appropriate-contract-structure/>.

intergrading existing elements, conditions and investigation work with the requirements and limitations of the building. They also look for value engineering opportunities. In addition to sequencing and building restrictions, the CM's role is to help coordinate, direct practical, and financial design decisions that help advanced the schedule, design, or cost-savings on the project.

A project delivery method is a system used to organize and finance the design, construction, operation, and maintenance services for a building through a legal agreement. All construction projects required a mixture of services, including planning, design, and construction. Construction project delivery methods consist of different ways to organize those services in order to execute a project.

There are different types of standard delivery method contracts (the main are listed below):

- Stipulated Price Contract/Traditional (CCDC 2 – 2008)
- Master Agreement Between Owner and Contractor (CCDC 2MA – 2016)
- Cost-Plus Contract (CCDC 3 – 2016)
- Unit Price Contract (CCDC 4 – 2011)
- Construction Management Contract for Services (CCDC 5A – 2010)
- Construction Management Contract for Services and Construction (CCDC 5B – 2010)
- Design-Build Stipulated Price Contract (CCDC 14 – 2013)
- Integrated Project Delivery (CCDC 30)
- Public-Private Partnership ("P3")

In addition to deciding on a delivery system (shown above), the Owner must decide on a contract type (payment method) which was described as four main types. A contract type is simply an agreement between two or more entities in which they agree to provide a specific task in exchange for something in return. The contract type is the format on how the owner pays for the services of the project. I will not go into detail on all of them however there are some popular ones that control the design responsibility for which I will explore a bit deeper. It is important to note that projects are usually described by their contract type (LS/TM/CP) and by their delivery method (CM/Design-Bid-Build/IPD method). Below is an example of the delivery method of a CM-at Risk contract with all the different types of contract types you can have with it.

As you can see from above the design/build delivery method takes all design services under the umbrella of the contractor, the general contractor is that single point of responsibility,

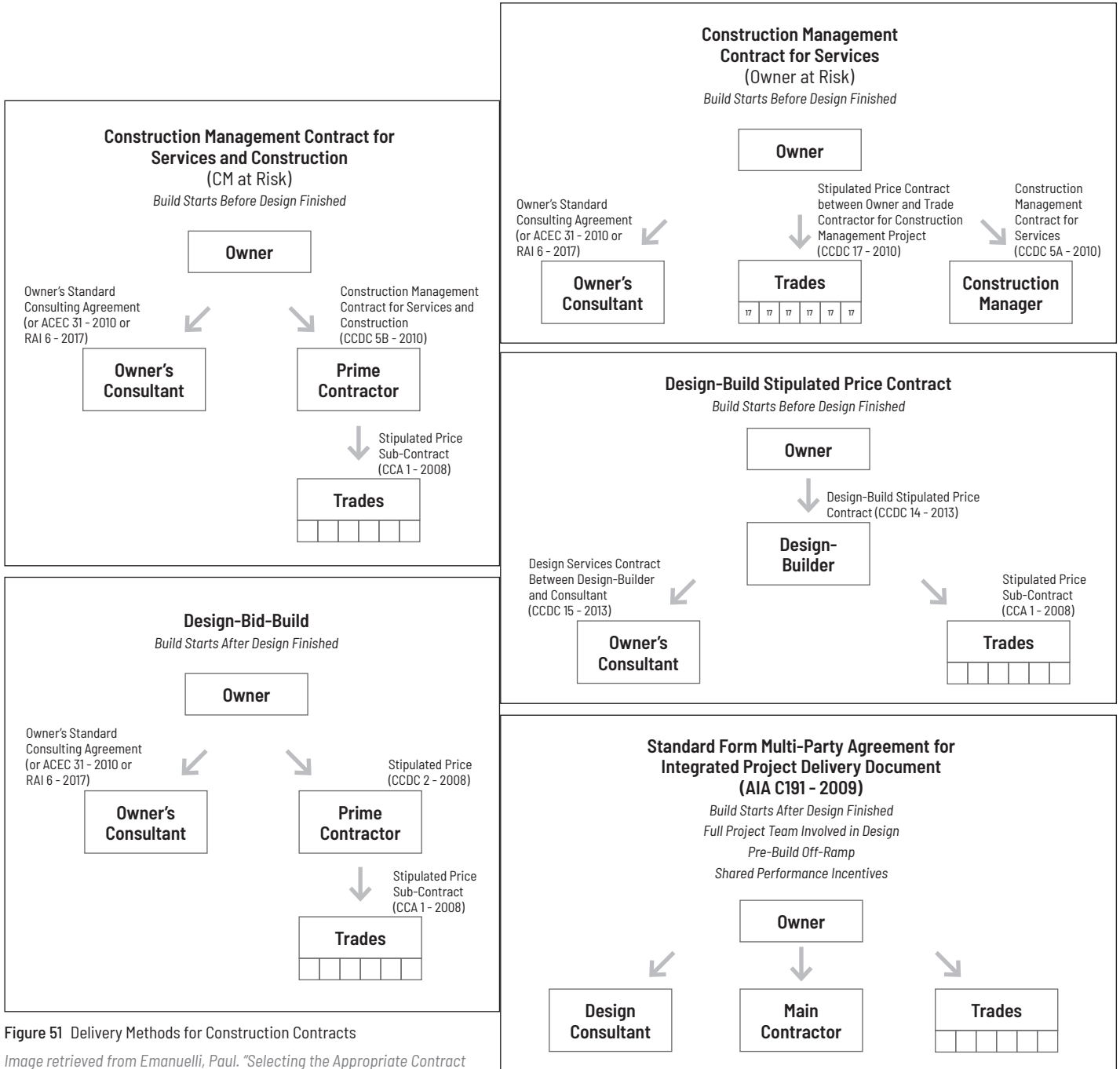


Figure 51 Delivery Methods for Construction Contracts

Image retrieved from Emanuelli, Paul. "Selecting the Appropriate Contract Structure." Procurement Office. Accessed February 13, 2021. <https://procurementoffice.com/selecting-the-appropriate-contract-structure/>.

subcontracting both the various construction trades as well as the entire scope of the design team services. From this position, the contractor or company assumes all responsibility for design outcomes, cost control, and schedule. Even though this approach is popular, most of my experience has been on construction management projects where the contractor still plays a large role in design however does not control the project or consultants, and I believe this team approach is more beneficial for the success of a project.

DESIGNING WITH THE CONTRACTOR

The delivery methods when contractors are brought to the project at the beginning of the design process to form part of the design team will result in the most successful projects. With this logic, the best approach for a complex project is a construction management contract delivery. A number of benefits can be seen by forming this relationship early, such as better cost feedback during the design process, more time for the contractor to thoroughly grasp the scope and details of the project, and more time for the owner, design team, and contractor to develop and design together with all expertise in a goal to meet the budget and schedule.

Design-assist delivery methods where the construction team is engaged by the owner to collaborate with the architect and engineers during the design phase will reduce the cost and time for construction, reduce changes, improve constructability and add value. The three delivery methods that push this design-assist relationship are Design-Build (DB), Construction Management(CMA), and IPD contract types. The general contractors' goals of schedule, budget, safety, and quality can be included early on in the design, leveraging the contractors' knowledge as a key to the success of the project. This integrated design process was created over the last twenty years to combine the owner, design team, and constructor's knowledge together to promote collaboration and project success. Projects now are highly complicated, and because of this, the project design team is removed from the traditional design process (where the architect designs it, then the contractor prices it). This model is old and puts complex projects at potential schedule and budget risk because they require high levels of technical understanding of complex systems and/or products.

In traditional construction management contracts, "The contractor's role is to provide input to the designer to increase the constructability of designs and to decrease schedule

durations through overlapping the design and construction phases”²². This input has grown into a much bigger role where construction management services are now provided to assist the design and the design team, various consultants, and owners. It is the modern integrated design process, which is a huge collaboration of multiple sectors engaged throughout the design and construction of a project. This process of integrated project delivery and collaboration has led to projects starting with a high level of common goal sharing and trustworthiness amongst the team members. This typically works better if they all are still contracted to the Owner rather than the design-build set-up where they all work for the builder or parent company. To make this successful, the owner is a key player who must understand their seat at the table as the lead director and decision-maker. For the Centre Block Project, this collaboration goes beyond just a complex building design. It includes a complex coordination requirement of heritage removal, protection, salvage, and reinstatement which is unique to heritage projects.

Defining what the role of design-assist or CM means can vary by contract and requirements. There is no underestimating that the construction industry is one that demands speed, quality and budget management. The triple constraints of cost vs. scope vs. time are a continuous dance. “The triple constraint theory in project management says every project operates within the boundaries of scope, time, and cost. A change in one factor will invariably affect the other two.”²³ This is important because every design change affects the time and cost of a schedule, by how much and to whom depends on the contract structure.

Contract types which allow for design-assist are a “collaborative team-oriented project delivery method which capitalizes on the benefits of early engagement by design-assist subcontractors. The process is able to utilize the specialty expertise to optimize project cost, value and constructability efficiency”²⁴. This integrated design process aims to maximize overall value for the client, the speed of construction, and the quality of the final product by avoiding changes down the road.

It is not uncommon for sub-trades to have their own design-assist below the CM, and offer the ability to perform designs for mechanical, electrical, plumbing, fire protection

²² Konchar, Mark, and Victor Sanvido. “Comparison of U.S. Project Delivery Systems.” *Journal of Construction Engineering and Management*. American Society of Civil Engineers, December 1, 1998. <https://ascelibrary.org/doi/abs/10.1061/%28ASCE%290733-9364%281998%29124%3A6%28435%29>.

²³ Laverne., Rakos, John; Dhanraj, Karen; Kennedy, Scott; Fleck. *The Practical Guide to Project Management Documentation*. Hoboken: Wiley, 2015.

²⁴ “Design Assit - Alliance for Construction Excellence”. Arizona Board of Regents, 2007. <http://studylib.net/doc/18350545/design-assit-alliance-for-construction-excellence>

or security systems. Large subcontracts will carry their own engineers for designing systems to the client or owner's building criteria. This delivery method intentionally transfers design liability from the architect or engineers in specialty areas. This is also common for structural building, concrete precast designs, and curtain wall systems. The design requirements are now spread among many parties, and the architect provides the framework that directs them. This involvement leads to the minimization of delays and costly rework during construction due to a decrease in requests for information (RFI), change orders, site logistical issues, and constructability issues.

The Centre Block Rehabilitation Project is a Cost Plus (CP) contract with a Construction Management – At Risk (CMR) delivery method. Construction management services are required from the time of contract award for a duration of approximately twelve years with the ability to extend the contract further if desired. The contractual obligations for design are laid out clearly for the CM in the contract terms. Without going into specifics of the CM design requirements for Centre Block I will outline the standard design expectations with a CMR contract which will be similar in nature to the expectation on the Centre Block Project excluding all the additional security and heritage coordination.

Design Phases assisted by the CM in a CMR contract such as Centre Block would be as follows:

- 1 Programming/Predesign required prior to beginning the Schematic Design phase.
- 2 Schematic Design (SD): The Consultant develops study drawings, documents, and other media that illustrate design concepts. This will be evaluated by the CM, and a construction cost estimate provided. Cost estimates will vary depending on the level of the design provided.
- 3 Design Development (DD): work begins with the approved SD documents and develops them in further detail. This phase begins to establish mechanical, electrical, plumbing, structural, and Architectural details. It is typically followed by a construction cost estimate have been updated based on the new information. Once the DD submittal and budget has been reviewed and approved the design can proceed to the Construction Documents phase.
- 4 Construction Documents (CD): incorporates all design decisions made in previous phases into detailed drawings and specifications to be used in the bidding and construction of the project with an updated final budget from the CM.

This system is typically done for different phases of the project and repeated as necessary for different work packages. Once one phase is completed, construction can begin on that work package while other areas of the project continue to develop through the above design stage. The major settings that the above design process will be done in are listed below are broad project design goals:

- 1 Early Works or Enabling Project Work Packages
- 2 Abatement and Demolition of the Main Project Work Packages
- 3 Exterior Works of the Main Project Work Packages
- 4 Interior Works of the Main Project Work Packages

For Centre Block enabling projects was a large list of requirements that had to happen prior to starting the main building. Due to the heritage content a portion of this work included building facilities to house and store the heritage assets once there were removed from the building.

The document design phases generally have two construction documents; reviews. The first review occurs at approximately 50% completion of the construction documents, the final review takes place around 100% design completion.

At each phase, the CM shall provide recommendations on construction feasibility, actions designed to minimize adverse effects of labor or material shortages, missed scope criteria, time requirements for procurement, installation, and construction completion. They will also address factors related to construction cost, including estimates of alternative designs or materials, preliminary budgets, and possible economies. The risk also increases for the contractor on CM delivery methods, and this has been a general trend in construction. In the case of Centre Block, the CM also helps direct the phases of the different types of work packages and when they are required in the schedule.

**MULTI-DISCIPLINED:
THE MODERN DESIGN APPROACH
OF CENTRE BLOCK**

Due to the large size, scope, and delicate undertaking of the Centre Block project there are many teams of people, each tasked with a variety of designs, constructions, and monitoring aspects to ensure the heritage of the building is protected. "In the case of the Centre Block project, it represents a massive endeavor. There are numerous aspects to consider, including the heritage nature of the building, the state it is in, the many upgrades it requires, and the various players involved. Public Services and Procurement Canada (PSPC) is working closely with parliamentary partners, namely the Senate, the House of Commons and the Library of Parliament, as well as with other external partners, like the National Capital Commission, the City of Ottawa and Ottawa Tourism. These engagements are essential in order to deliver a building that meets the needs of a modern Parliament and that will still be relevant in 100 years."²⁵

One of the most criteria areas' is the structural capacity of the existing building. Due to its age and construction, the loading of every floor and every room has been calculated. Construction requires equipment, manpower, and movement of materials all of which must fit into the loading capacity of the area of work. In addition to loading concerns, vibration concerns due to construction and its potential effects on heritage assets and the building are watched by numerous vibration monitors installed throughout the building. Vibration holds a serious risk to the state of the building. Monitors prior to construction were installed throughout the building to ensure they remained within calculated tolerances. As engineers reviewed the current Centre Block design, one of the key items on the functional requirements is bringing the building up to the current earthquake standard of the Ottawa Region. Building design for various earthquake loads is addressed in the National Building Code, and engineers are reviewing how the current Centre Block building and its associated structures can be modified to withstand these potential loads. In their own words, the engineers are "performing advanced, analytical, non-linear modelling of this historic building to determine its response to seismic shaking. Various seismic upgrade strategies are being explored, including the use of seismic isolation technology as a means of minimizing the structural intervention and its impact on the building's heritage finishes"²⁶ The idea is to install base isolators between the top of the foundation wall and the building wall. This will allow the foundation to move independently from the building if an earthquake occurs. A floor loading capacity plan, vibration monitors, and base isolators are all items that help the health of the building during construction and the long term. In each area of monitoring and design exploration, the CM assists the designers in developing long-term, feasible

²⁵ Reference from Government of Canada, Public Services and Procurement Canada. "Government of Canada." The Centre Block Project - Follow the rehabilitation of the parliamentary buildings - Canada's Parliamentary Precinct - Canada.ca. / Gouvernement du Canada, May 4, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/edificeducentre-centreblock/index-eng.html>.

²⁶ Reference from "Canada's Largest and Most Complex Heritage Rehabilitation Project." WSPglobal. Accessed February 13, 2021. <https://www.wsp.com/en-CA/projects/centre-block-rehabilitation>.



Figure 52 Workers install plywood to protect the First World War altar in the Memorial Chamber

Image retrieved from "Centre Block Stories and Videos - The Centre Block Project ..." Photo gallery - Canada's Parliamentary Precinct. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/edificeducentre-centreblock/histoires-stories-eng.html>.



Figure 53 Plywood protects an ornate staircase in the House of Commons foyer

Image retrieved from "Centre Block Stories and Videos - The Centre Block Project ..." Photo gallery - Canada's Parliamentary Precinct. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/edificeducentre-centreblock/histoires-stories-eng.html>.

solutions.

Not only is the project concerned with the health of Centre Block but also the health of the existing structure that supports the bedrock. Geotechnical reviews of the existing limestone outcrop that the building rests on, conditions of embedded structural steel within the exterior walls, and thorough documentation of as-built designs are and have been investigated. This takes a team, comprised of trades, designers, contractors, historians, and consultants. WSP is one of the engineering firms that were the successful proponents of the design contracts for Centre Block. In their own words, "Our successful bid for this fascinating project was the result of a combined interdisciplinary effort and collaborative approach that successfully leveraged the strength of our local and global teams. The keywords on this project being innovation, technology and sustainability. We are proud to work with our partners to maximize our support on these aspects. As the design of the building's rehabilitation and modernization progresses, we will be advising on opportunities to reduce the environmental footprint; optimize energy use; enhance occupant health and well-being; and produce designs which are ready for the future."²⁷ Together the CM, engineers, and architects work towards a common project goal, and that is the modern design approach.

As a historical treasure, Centre Blocks rehabilitation starts with an assessment of current materials and what needs to be removed. This is typical for most older buildings with heritage value undergoing a large renovation. One of the first elements that can be started is the abatement of any designated substances. This is because any existing harmful materials must be removed prior to the start of construction and interior fit-ups. This process is called demolition and abatement.

As construction progresses, the interior of the building continues to be stripped down to its structural core. In areas that this is not possible, protective fire-resistant plywood has been installed turning the interior into an unrecognizable space that begins to resemble a construction site.

The modern design process has been a development of the industry to respond to complex buildings. One of the main areas of consistent process is constructions use of technology. The industry is consistently developing its integration, workflows, and use of technology to aid in coordination, schedule, design and transparency between all parties. Technology is a big factor in why and how this progress happened. With the popular use of cell phones, personal computers, and digital software the architectural profession along with the

²⁷ Reference from "Canada's Largest and Most Complex Heritage Rehabilitation Project." WSPglobal. Accessed February 13, 2021. <https://www.wsp.com/en-CA/projects/centre-block-rehabilitation>.

construction management role was completely redefined into a digital world. This goes just beyond digital drawings but into unique construction software which has been developed to assist the contract administration of projects and workflows between consultants, contractors, and clients. In the last ten years of my experience, I have witnessed the start and growth of technology use in assisting construction projects both in the office and on-site.

For Centre Block this digital technology is taken to the extreme since the budget was available and desired to track and organize the historical aspects of the project. This is done both through a digital mapping process that has been undertaken of the entire building as a 3D model and through a digital barcode scanning of heritage assets removed from the site. A digital model of Centre Block was created which will record and digitized it into a building information model (BIM). This will assist all project teams with understanding and tracking required work and completed work. This will be a detailed model of every stone, able to have a massive database of reports, photographs, and building elements that can trace the history of every stone and list every repair it has had or requires. A large portion of the construction is tracking and coordinating. What has been done, how it was done, when it is scheduled to be done, and quantities of all scope play a huge role in historical renovations. Technology has allowed an unprecedented way for information to be tracked and shared in construction which I believe has helped drive the modern design process are integration among other project teams.



Figure 54 Centre Block's Bim Model

Image retrieved from "Centre Block Stories and Videos - The Centre Block Project ..." Photo gallery - Canada's Parliamentary Precinct. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/edificeducentre-centreblock/histoires-stories-eng.html>.

**FUNCTIONAL ICON:
TRANSFORMING A BUILDINGS PURPOSE**

UNDERSTANDING GENERAL CONTRACTORS

If you were to break a building down to its elements, it becomes a series of specification sections, each with its own expertise, innovation, and costs. General Contractors learn to look at buildings as a series of specification sections; it's a globally accepted way to evaluate the buildings complexity. Any design from architects and engineers' whether that be on a schematic level or with construction documents, can be quickly assessed through its specification sections. By breaking a project down this way, a schedule can quickly be generated, and budgets supplied for each scope of work. In large complex projects, the work is done in a union construction environment. For each specification section, a union has its own right to that scope of work for each district and its own list of qualified companies that perform the work. There are over 500,000 construction workers that make up over 14 international unions that cover 60 different trades. Most general contractors are committed to at least one or two union trades regardless of the project. Using union labour for large complex projects provides a large body of highly skilled workers for that scope.

Many large complex projects, including Centre Block, are a union environment with skilled union trades. This is important because you have a set number of skilled labor available for a scope of work. The Centre Block project along with the other parliamentary building upgrades, is a massive masonry (04 00 00) specification scope. The volume of masonry stones that are required to be cleaned, repairs and/or replaced requires a significant amount of skilled masonry labor. Having a shortage of skilled labour is nothing new to delivering infrastructure projects. This will be one of the unique challenges for the Centre Block Rehabilitation Project. The project has options to help eliminate this risk since the work has just begun and will take years to complete. Ottawa has always been an epicenter for masonry work due to its large inventory of historic masonry buildings. These buildings are consistently being upgraded and renovated for new purposes and functions. Many of the downtown stone buildings were renovated as part of the LTVP plan which required the temporary relocation of parliament. This is an example of known project risk. If they believe there will be a shortage of skilled masonry workers, than they can look at increasing the current output of stone apprenticeships, increasing college enrollments, and sourcing trade workers from nearby cities, including Kingston & Toronto. This example of risk review and migration is done by the entire project team, including the client, general contractor, consultants, and designers.

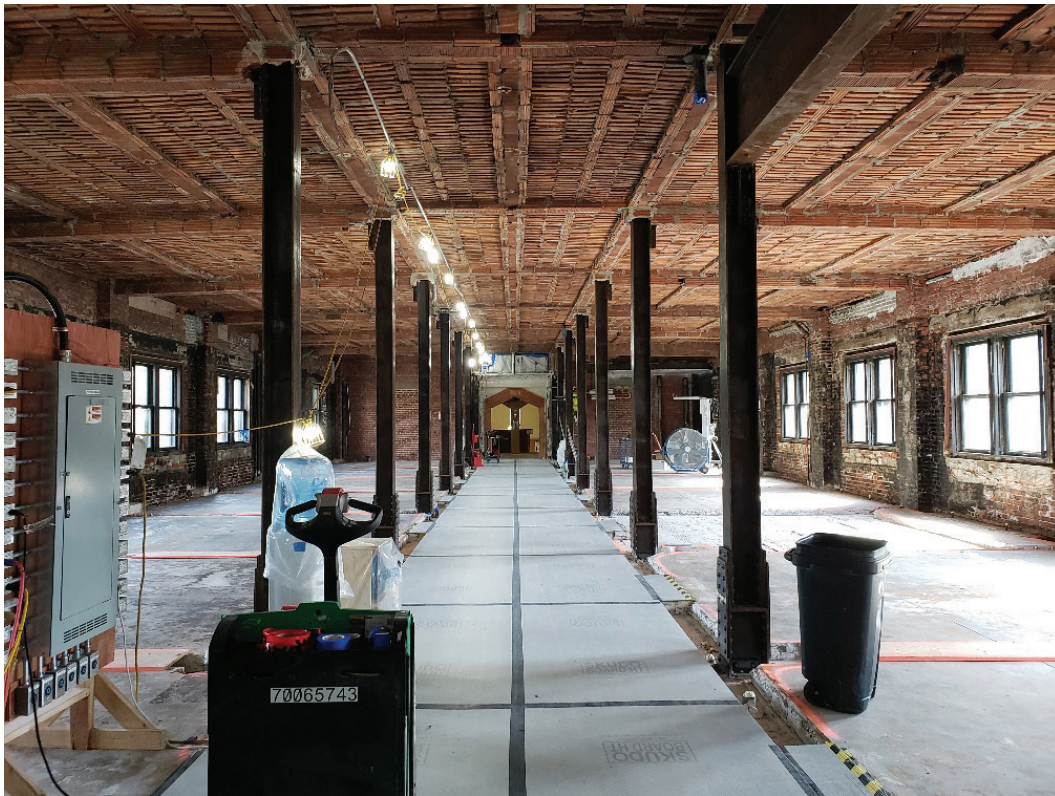


Figure 55 “The sixth floor taken is down to its bones. The ceilings, flooring, walls and plaster have all been removed. Other areas of the building with more heritage elements in them will be kept more intact”

Image retrieved from “Centre Block Stories and Videos - The Centre Block Project ...” Photo gallery - Canada’s Parliamentary Precinct. Public Service and Procurement Canada. Accessed January 13, 2021. <https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/rehabilitation/edificeducentre-centreblock/histoires-stories-eng.html>.

MANAGING HISTORICAL RECORDS & RESOURCES

General contractors take on large management and logistic roles in a project. The specifications and drawings lay out what the contract is; however, the general contractor is the one who executes that work. This is why the CM role has grown in the industry and is the controlling point of contact on a project. They become the middleman between the designers and the builders that organize, manage, and execute the work. They are the manager of the project's execution. For the Centre Block Project, the specification requirements for documenting, disassembling, crating, and storing for a vast portion of the work is a huge management of resources. In this sense, it is as much of a tracking, organizing, and disassembling project as it is a construction project.

Not only must the CM look out how to manage the scope of the project and materials involved in the salvage, removal, or disposal of different portions of the work, but they must manage the people required to do the job. Resource management extends to the vast network of staff and trade workers required to fulfill the project's obligations. Each different scope of construction is a specialized field of qualified individuals. Per union agreements, each is able to perform certain scopes in different areas. For this reason, on union projects which are typical for high profile heritage buildings, there may be a limited number of trade workers locally available for that particular scope of work. As a CM you need to be aware of your required manpower of each scope and what is readily available for the area. Understanding this project risk early allows all parties involved to find additional resources to meet the upcoming schedule. This understanding of schedule and resource management is a key aspect of the CM role and the modern design process.

JUXTAPOSING INTERIORS

At the moment, the Centre Block building is being stripped away of the majority of its heritage assets, finishes, and abatement requirements to leave a structural shell of a building on the interior. The exterior stone that forms part of the building envelope will be repaired and replaced but kept, for the most part, the same in its appearance but in a better condition. The exterior cladding of Centre Block done in Gothic Revival architectural style will remain mostly unchanged in its appearance after the work. This is not the case with the areas of the interior of the building. The interior will be in a different condition since it must do the majority of the accommodating for the requested building upgrades.

The building interior can be broken down into two categories: high heritage and low heritage. High heritage areas are identified as those areas which are most valuable and, for the most part, will not be removed. These are mostly on levels two and three of the building where the entrance, hall of honors, rotunda, House of Commons, and Senate areas are located. The low heritage areas of the building are mostly in the basement, levels one, and the upper levels of four, five and six. The high heritage areas of levels two and three will remain as is and not accommodate much new design. The lower heritage areas and exterior space of the current courtyards are the areas in which new design opportunities exist.

Design requirements include but are not limited to:

- restoring the building's stonework, wood, plaster, frescos, stained glass and metalwork
- replacing mechanical, electrical and fire safety systems
- installing new information technology, multimedia, and security systems
- upgrading committee rooms
- making the building more environmentally sustainable
- making the building more accessible for employees, parliamentarians and visitors
- building phase II of the Parliament Welcome Centre complex
- restoring the Peace Tower

Certain lower heritage areas of the interior of Centre Block will receive huge overalls or be demolished all together to facilitate the items above and provide an updated interior environment for occupants. Its unavoidable with the changes above and new public entrance through the courtyards that the modern designed interior will be present against the



Figure 56 Louvre Pyramid

Image retrieved from "Louvre Pyramid." Wikipedia. Wikimedia Foundation, January 12, 2021. https://en.wikipedia.org/wiki/Louvre_Pyramid.

historical Gothic Revival interior. The ornate stone finishes, sculptural elements, ironwork and detailed woodwork will contrast against the new modern interior areas of the building. After construction has finished on the rebuilding of the interior, the Centre Block building from that point forward will be a conglomerate of architectural style. It will include the high heritage areas from the original high Gothic Revival period and juxtapose this ambiance with the modern design requirements from the 2020 rehabilitation design. The success of these two merging architectural styles on the interior or the full extent of the design requirements on the historical assets of the building cannot yet be determined as the design is still on-going on many aspects of the project.

There are key projects that can act as testimonies in this evolution of historical buildings to modern functioning facilities. It can be debated that the most successful of these projects in a high heritage building was the addition of the Louvre Pyramid to the courtyard of the Louvre Museum. Its success is due to the fact they reserved the original historical building and designed a new modern icon as part of the program. The large pyramid serves as the main entrance to the Louvre Museum, and although it contradicts the architectural style of the adjacent Palace, it did not destroy it. The pyramid was completed in 1989, was a showcase of the architectural capabilities of the time, and has become a landmark of the city of Paris. It sits in the Louvre Palace courtyard which was originally built as the Louvre castle in the late 12th to 13th century under Philip II. The beautiful aspect of the master vision is the program's respect for the historical palace. The architects' vision allowed a new additional modern design to co-exist while providing the functional requirements of the program to be fulfilled.

ADAPTABLE SPACE

In the end, historical renovations are about how space can be adapted. How and what can change to allow the new design in. For Centre Block, there are key areas that were identified early in the project as high heritage areas which must be protected in place and are to remain as is. Although the goal is always to enhance the heritage and bring the building back to its formal glory, it's not a practical picture. This is because it doesn't take into consideration all the new requirements needed to modernize the building. There is a constant battle of give and take between new and existing elements that must happen in the design and be implemented by the contractor.

These areas of re-design will typically fall to low heritage areas or floors where complete demolition of the interior space is warranted. Due to the heritage buildings' value, outdated spaces are often left for years with no upgrades. Over the years, they have become in dire need of a complete overhaul or complete demolition. This allows these areas to be reimaged for modern purposes. For the Centre Block project, a lot of these redesign spaces exist on the lower and upper levels of the building and the current open courtyards. Levels two and three are more of the high heritage areas that remain intact and hold the heritage value of the building.

The heritage value of Centre Block is an important factor in its rehabilitation. One can look at the 'Theory of Permanence's'²⁸ by Aldo Rossi. He was an Italian architect, designer, and theorist leading the postmodern movement. To understand the true heritage value a building can have, one can look at Rossi's work in architectural theory. Rossi argued that buildings could have a pathological condition, this condition; holds an important collective memory. The pathological condition is an idea that the building is a memorial object. That architect is the bridge between the individual memory and collective memory from a period of time, for a city, or an important event. Centre Block is that idea of architectural permanence for Canada as a country. It holds the collective memory for the country of its government. As such, its high heritage areas should remain as physical artifacts, a living architectural memory of the collective past.

²⁸ Rossi, Aldo. *The Architecture of the City*, Cambridge, Mass: MIT Press, 2007.

**CONCLUSION:
CONSTRUCTION MANAGEMENT AND ITS
LIMITATIONS**

Complex building projects are typically completed in CM, Design-Build, or IPD contracts, in all of which, the CM today has a considerable amount of input and a high degree of influence in the building process, even if not charged by the client with complete control. This choice of broad based managerial and technical expertise tends to lend itself to successful practical buildings by fulfilling the set program requirements within budget and schedule for the client. In the CM world, buildings are not just about the design. They are also about the process of consultation, the process of actual construction, and the process of how the design manifests itself over time in the world. On large complex renovation projects like Centre Block, with complex client structures, the design problems are rarely given the room in the overall CM process for growth to develop the various possible solutions outside of the client's narrower functionally driven vision. Before this movement of contract development into more integrated delivery methods the main vision of a typical architectural project was more directed by an architect or master visionary. They had the charm, intellect, and social wit to bring the various stakeholders together under one direction. This type of grand vision of the project manifested the design into reality on the ground often overriding the bureaucratic power structures and their red tape. These major projects from history were influenced by the time of their construction and the modern relationships for which they were being built. In history, there have been known architects that have imaged such a project vision on high profile projects such as Centre Block. The two key individuals that fulfilled these requirements are Chicago's Daniel Burnham and Paris's Georges-Eugene Haussmann. They were the drivers of their respective Master Plans and were able to execute their visions to their full potential.

Haussmann, not an official architect, or even an architect but well known as an active bureaucratic problem solver, was appointed to a powerful position controlling the city of Paris, the Prefect of the Seine, by the French Emperor Napoleon III in 1853. With that, he was given the instructions to reimagine Paris with open air and public spaces, as well as a revamping of the Paris urban infrastructure itself. He was also given extended powers of expropriation to facilitate the centralized body of works. The intent was to connect the different parts of the city, Paris's urban villages of over a million inhabitants, into one beautiful overarching vision. He took the dark medieval streets of Paris and framed them with wide geometrical boulevards. He demolished and relocated everything in his path to establish the new vision, made an income to fund his renovations with the resale of improved properties on the avenues, and as a result, much of the centre of Paris we know today is from Haussmann's massive design overall that took place from 1853 to 1870.

One could argue Haussmann was more of a powerful opponent to an established order than a bureaucratic manager for the project. He directed strongly against fierce opposition to his work at the time. Daniel Burnham had four notable city designs from Chicago (co-designed

by Edward Bennett, who also designed the 1913 Holt Report Plan for Ottawa's Parliamentary District and the city overall (mentioned earlier) to downtown Washington, San Francisco, and the World's Columbian Exposition. He was the first to propose and implement comprehensive plans for the controlled growth of American cities, a movement which became the City Beautiful. This is was first initiated and captured in his 1906 Plan of Chicago with Bennett.

Burnham was the political and financial driver of the Bennett design, helping to politically position it for success, however, Bennett was the actual mastermind behind the design for Chicago, in effect splitting the roles of designer and mastermind of the managerial process. Not long after graduating Bennett went to work to assist Burnham in Chicago, and prepared plans for West Point. He assisted on the San Francisco plan before moving to the Chicago plan. Bennett became well known for his and finished his career as a planning consultant to many cities and developed comparable plans for numerous American cities. He was the pioneer in the creation of zoning ordinances and regional planning for the beautiful city movement for which roots can be found in Todd's work on the plan for Ottawa and its place as Canada's capital city.

The overarching element shared by both Burnham and Haussmann is their position of power, influence, and desire for a beautifully planned city and it's expanding growth requirements. In modern design projects like the ones under CM there is no one position of such overarching power anymore. The process and contractual set-up now has to allow for a shared element of design development in complex problems. Burnham and Haussmann, however, weren't just looking at one visionary design element or one project, they established an entire city vision and found practical negotiated ways to make it happen. In modern design development under CM, by contrast, there are limitations preventing the various directions the design could go these controlled by the layered decision makers that comprise the client structure. The vision for any city today, much like Haussmann or Burnham's approach in the past, needs to be elaborate, negotiated and complex, and clear to allow the smaller building projects within to form part of the overall vision. Ottawa, however, has never had a Haussmann or a Burnham with the controlling power to execute these ideas in full. This is highlighted in how just pieces of these plans were fulfilled over a century to today. Scattered elements of all of these sequential plans were built leaving it Ottawa not fully realized, unlike Haussmann plan of Paris where the entire city was redefined.

Even the grand city beautiful plans of Chicago after Burnham's death never came to their full fruition because they were so dependent on the will of the original visionary. This grand goal of a vision, despite it's unifying usefulness, needs to be modernized and interwoven in smaller ways into the current modern design development CM process and specifically its construction management contracts. The Parliamentary Precinct is an ever-evolving work in



Figure 57 A rear view of 391 Parliament Hill from Hull, Quebec side of the Ottawa River

Image retrieved from "Ottawa." Wikipedia. Wikimedia Foundation. Accessed February 13, 2021. <https://en.wikipedia.org/wiki/Ottawa>.

progress; any modern Master Plan must evolve with the passage of time and social and political ambitions and visions to make the city a beautiful and functioning place of government, one that includes the new needs of government, even those still unanticipated and not foreseen.

The iconic symbolism of Centre Block and the entire precinct is important to consider for the future relationship of the government, public, and country. This is the opportunity to redefine this relationship to reflect the country that Canada has become, is becoming and will become, showing its growth from conception and its constant transformation. The entire program and project must ensure the historical revitalization fulfills the set project requirements while preserving the historical assets and valued history of the building, but it also must explore a new vision or the possible best vision for not only the functional requirements, but also the evolving symbolic iconography of the capital.

Presenting various design visions for the complex needs of the future, especially on projects which involve iconic buildings, is a fundamental requirement in the modern design process, one not easily assimilated into a CM process. If such a focus on design will help guide the new project requirements to merge within the current historical fabric of the building. Never again in our lifetime in Canadian history, will a historic landmark like Centre Block undergo such an intensive and invasive restoration. and revisioning The modern CM driven design process is a key in facilitating the vast detailed requirements of this project, including the massive undertaking of recording, removing, crating, storing, and reinstating the interior stone cladding, heritage assets, and sculptures.

The CM process has allowed the broad general contractor to provide design assistance, begin construction before finalization of the full design, and provide practical constructability assistance. As noted through out this thesis, the CM contract delivery method allows for the utilizing of a consultative team approach by retaining architects, historical consultants, engineers, and a CM at the onset and throughout the project resulting in an effective, more thorough, design process. In reviewing the Centre Block project, one of the main areas where the process has failed for Centre Block is in the very shape of the new vision of the architecture to redefine specifically for the need of a new expanded House of Commons inside or even outside of Centre Block.

Winston Churchill is famously quoted as saying: "We shape our buildings, and afterwards our buildings shape us."²⁹ In the case of the Centre Block rehabilitation – and the larger restoration of the parliamentary precinct – Churchill's words implore us to consider: who is shaping our

²⁹ Churchill, Sir Winston. "Churchill." UK Parliament. UK Parliament 2021. Accessed February 13, 2021. <https://www.parliament.uk/about/living-heritage/building/palace/architecture/palacestructure/churchill/>.

buildings for the future? In this case, the primary issue with the CM process is the client structure, as it leaves too many branches of the government in the seat to make diffuse fragmented decisions rather than a concise plan driven by a clear picture of the goals or even a broader vision. It forces design decision options against high heritage spaces such as the House of Commons, a place that really should remain unchanged to preserve Canadian history. PSPC, the Treasury Board Secretariat, Cabinet, the National Capital Commission, the Library of Parliament, the Parliamentary Protective Service and, of course, the House of Commons and the Senate are all in the role of the client trying to drive the design decisions of our historical icon and these are many actors working at cross purposes often.

The project and entire Parliamentary Precinct design have been watched by the Auditor General, who noted direction problems with the rehabilitation plan in 1998 and again in 2010. The Auditor General stated that PSPC is divided between potentially incompatible official clients. Those incompatible official clients are the parliamentary partners. The government and the PSPC department have to deliver on all projects within the set parameters. As well, the government also has to fulfill the requests from the parliamentary partners that are not subject to government control. Despite being a construction management contract with an integrated project office, PSPC is in charge of the maintenance of the building and the branch that makes the final decisions. There has been very little public input into the entire precinct development despite the fact that a public outreach strategy was supposed to be developed by PSPC. While PSPC was focused on providing future government requirements within the walls of this heritage fabric, it can be argued that they should have focused as well on its rehabilitation as a historical artifact, preserving it, and exploring more creative new design options for the House of Commons space issues. Such a broader approach with CENTRUS, for example, would allow the design to develop outside of the limited purely functional constraints of the PSPC client.

This is where the Centre Block project needs to capitalize on opportunities available and have the forethought of a publicly shaped and determined national ideal. Instead, the program is being directed by government officials; bureaucrat politicians are driving a massive design program but within a very narrow framework. By definition, bureaucrats are “an official in a government department, in particular one perceived as being concerned with procedural correctness at the expense of people’s needs.” It’s not to say that they mean any harm, but it’s to understand that you can’t have a narrow- vision political leader directing a large public works program like the Centre Block project for the broader public interest.

The building is a historical artifact comprised of smaller historical artifacts which together contribute to a majestic web of Canadian history, hopefully a shared national vision despite the obvious limitations of such an unrealistic goal. The current Centre Block building embodies the country’s rich history and is irreplaceable precisely because it is at the stage on

which to build a working picture of a national consensus. How it is altered for new government functions must be developed, as is expected already. Although renovations, repairs, and abatement of dangerous materials were necessary in order for the building to remain structurally sound, waterproof, and safe for future generations, one might argue that the present Master Plan design of a new functional underground complex and redirected public access, though functional and secure, is still not a worthy design to the precinct's broader architectural goals and even vision. There needs to be a change to the CM integrated design process that should help guide such important design decisions and broaden the critical base from a purely functional one.

As an extension of the above critique, the design conflict that still exists between the historical interior spaces and the expanded future functionality for the government requirements for the House of Commons is concerning for both the preservation of the building and, in many ways, opens issues regarding our future political discourse. The functional requirements of the government for this building include security upgrades, accessibility, mechanical, electrical, and fire safety systems, new information technology, multimedia areas, and committee rooms, all areas of comfort for a CM manager. Most importantly, however, is what to do with the House of Commons itself as a physical fabric with high historical heritage value and provide enough seating for our country to function for the next 100 years. There is a historical generosity and even opulence of in the existing design of the House that represents our government and country's history, one which adds an additional concern for how to solve this design problem.

As we have seen, the Centre Block Rehabilitation Project, under a CM delivery model, is massive and complex in its scope and schedule. There are many and various stakeholders involved, the client structure is not one individual but layered committees. As an added layer the Project Manager acting on behalf of those clients (PSPC) is a complex government structure within itself. The companies hired for the design, the CENTRUS consortium, and construction of the project, the CM, must also be in themselves a large organizational assembly to facilitate the size of the project. All these intricately layered elements become magnified by the fact that Centre Block is a historical renovation project and much more complex than just a new build. The project process to date is showing the areas of the limitations of the CM management contracts and the design development itself in large heritage restoration projects. These limitations become more heightened by the complexity and fragmented purpose of the client structure, as indicated through the limited design options present to resolve complex issues like the House of Commons space problem.

Two key critiques of the role and shape of design emerge in the two limited projects that have been indicated in this thesis: the three options presented for the expansion of the House

of Commons, and the three entrance options suggested for the Visitors Welcome Centre. Each problem was given three very slightly varied resolutions. All the resolutions for two separate design decisions show the same limitations of real choices, and are within the very same (and limited) perspective. Based on the complex client structure, one can wonder why only those three options were reviewed in each case, and the design process get to that point of really no choice of real options. At that point one can start to question the design and decision-making process themselves within the decision making structure and how two distinct sub-projects of the larger Centre Block project can demonstrate the same design process limitations. More than likely, the 'who' and 'how' of the design development rests its with PSPC and its structure within the Federal Government. With such a powerful client, who also has its own external consultants monitoring the project, the design architects in a very diplomatic position. They have less visionary guidance from the client and instead, appear there more there to provide a limited service. If architects were given the opportunity, however, to explore a wider variety of options with fewer preconditioned restrictions, and as these problems were being discovered, it would help the design development. Multiple options, outside of the restricted ones presented as the only viable solutions, would allow for potentially more creative and useful multiple project directions at different points in the schedule, this happening as design developments and information from the general contractor's work drifts into the overall CM process.

If one evaluates the development of the relationship of contracts and the design development process, there has been a large shift in the role of the contractor but not nearly as much change in the design development from the side of the architect. I believe the limitations exposed in these case studies show a gap in the current system, one which is an opportunity for the architect to reconsider a limited role as the provider of a basic design service to a CM and instead take a role to develop a wide range of diverse design options within the project development process as it evolves with new consultation and information. The opportunity to present a variety of architectural options to the Centre Block client on project issues might have produced new options that PSPC had never thought of or allowed to be reviewed. The CM contract could be modified to allow the designers ample time to review and propose various options to these key design complexities, solutions that would offer more effective ways to resolve design issues unlike the 'brute force' approach of limited well circumscribed design problems. It Such a broadening would benefit the entire project and all stakeholders involved including the public. If we examine this process in the case of the House of Commons seating capacity dilemma, as an example, one could argue there were more design solutions left on the table than just the three presented. These would include but are not limited to:

- Option 1: Reevaluating the strict positioning of the different parties and members

within the House of Commons. By opening the very strict historical formal relationship between individual MPs and political parties in the House of Commons one could start to develop different seating arrangements within the space. Maybe the parties no longer need the traditional three sword lengths between the opposing political parties.

- Option 2: Rather than increasing the space confined by the exterior walls sideways, one might excavate down, and the Centre Block basement now becomes the main level of the House of Commons and offering more raked seating without affecting any interior walls of the high heritage space itself. This would also open up more support space sideways in the expanded basement.

- Option 3: The current temporary House of Commons, now placed in a very permanent architecture within the former courtyard of the West Block building, is much more spacious than the historical House of Commons within the present Centre Block. Maybe the temporary solution it has more potential to be kept as the House of Commons moving forward since it has the space to eventually have more seating added. It will be over a decade that Parliament will be held there and new habits will be born. The Prime Minister's Office, MP and staff offices would be maintained in Centre Block and connections to Centre Block would be through the new underground building of an again revised Visitor's Centre. To balance the Commons, as in Centre Block, the Senate might move to the East Block courtyard.

- Option 4: A brand new HOC could also be built outside of the walls of Centre Block in the Parliamentary Precinct adjacent to the Ottawa River. This is definitely the 'blue sky' option but still unexplored in the present limited design framework.

The importance of the very quick exercise above demonstrates that there could be a much broader variety of options to create solutions for the design issues of the House of Commons that go far beyond which has currently been presented. The design architect needs a platform to develop each one significantly so it can be presented to the complex client structure and supported by the CM process. Right now, in the present balkanized client and design structure, there is little opportunity for this to happen and there lies the current limitations of the CM contract and project structure for the Centre Block Rehabilitation Project. Such CM project structures in general, however, are the future of the design and building industry, and historic buildings are not going anywhere and will increasingly move to become projects in a climate of social change and environmental refitting. This means that issues of limitations of and on design should be evaluated and resolved for the CM process on a per building basis and also in a climate of shaping best practices. There is an opportunity for a change in the current CM process that takes the consolidated managerial, access to specialized expertise, and logistics benefits of a CM contract and modifies it them to assist in more sophisticated and unexpectedly creative complex design development decisions

for multifaceted clients. By reevaluating the CM delivery method, one could create the best possible design outcomes for both function and heritage in complex historical renovation projects like Centre Block.

To give up on inspired design and default into the purely process driven CM management of the specific functional design interests of government bureaucratic actors is not going to get anyone any kind of inspiring design solutions for Centre Block, in part or in whole. We return here to the central dilemma of this thesis discussion of CM in the shaping of the restoration, rebuilding, and incorporation of modern functional solutions for Canada's central government building, the Centre Block of Ottawa's Parliamentary Precinct. The thesis has walked us through the complexity of the CM's rigorous analysis, dismantling, consultation, logistics and building works of the Centre Block project, but then highlights the problems and possible unconsidered limitations with the CM approach in two important places, the new underground Visitor's Centre and the House of Commons functional space options. To date, architectural design seems to have a limited very circumscribed role in the solutions to those and other design issues that, however central to the institution, are still left hanging by the limitations of the CM process. We do not have to accept a new average, as much as the CM approach of bottom up consultation is the preferred route for design of buildings today and has proved itself over and over to effectively get complex buildings built on time and on budget. This thesis does not reject that centrality of the CM approach. Giving a more overarching architectural design a stronger voice, however, in creating a 'big picture' solution one guiding the broad range of particular micro-design decisions is the main concluding suggestion of this thesis, just simply to get a better more inspiring architectural solution.

In a final conclusion, it is worth briefly to look at the institutional buildings surrounding the Canadian Parliament along the Ottawa River. In the CM world, the era of the heroic architect is clearly over and will not be missed. But, looking at inspired authorship, just ask Douglas Cardinal how he feels about who is the designer of the Canadian Museum of History directly across the river from Parliament Hill, since he has always certainly seen himself as its author. The same goes for Moshe Safdie in the National Gallery, and also Raymond Moriyama in the Canadian War Museum. Safdie, Cardinal and Moriyama are masters at negotiating the discussion in the consensus building attitude of our time that is the aspiration of the CM approach as well, but all remain powerful artistic voices as well. Their works bear that out and speak with inspiration about the diversity of Canadian voices that, despite the difficult path of their history, need to be embodied in the new, restored, refurbished, modernized and expanded Canadian Parliament.

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