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Prepared for:

NOVA SCOTIA

Department of Transportation and Public Works

Condition Assessment and Recapitalization Plan

Job No. F01-25-01-23
Joseph Howe Building
Hollis Street, Halifax, NS

Final Report

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1 Executive Summary

This 13-storey office building is now occupied by a single tenant, The Government of Nova Scotia, with the exception of a 820 ft^2 ± Coffee Shop on the Granville Street Level.

For the purposes of this report, it is assumed that the building was completed in 1974 and that the building was designed to the building codes in force in at that time.

At thirty three years of age, many of the building elements or components have reached or exceeded their generally expected life span, and this fact is evident throughout this building.

This report contains a general Building Condition Assessment and a recapitalization plan for the building. The recapitalization plan provides an analysis of the renovations required, along with the associated costs, for the building to continue in service for another 25 years.

A building code review to today's building codes have identified areas of non-conformance, such as washrooms and service rooms opening directly off exits and not meeting the "Additional Requirements for High Buildings".

Provisions for barrier-free accessibility have been adopted in this building, such as access to the building itself and the various floor levels, however, although it does not meet the latest code requirements, a good measure of accessibility is provided.

Building security at present is minimal with the general public having easy access to each floor level via the elevators. Access to each individual office is restricted by pushbutton security locksets; however, they only provide a low level of security.

The building envelope, while still serviceable, is creating serious comfort, energy and serviceability concerns. The building roof appears to have performed satisfactorily, but due to its age, requires replacement. The building curtain wall system and lowest level glazing systems have either deficiencies that require immediate attention to prevent further problems, or due to their nature, do not perform adequately in today's environment. Replacement of the curtain wall system is recommended to reduce energy consumption and eliminate occupant discomfort.

The building interiors are generally satisfactory. The majority of interior spaces conform to a typical office environment with individual office around the perimeter of the building and open office spaces on the interior. The building access, exits and services spaces are centrally located.

The level of interior finish observed in this building reflects typical office finishes, acoustic tile ceilings, painted or vinyl covered gypsum board walls, and carpet floors. Public washrooms are finished with ceramic tile. Exits and service spaces are finished with painted concrete/gypsum board or concrete block.

Most areas appear to have received regular maintenance and upgrades; however, in several areas of the building, the finishes are starting to age.

The existing elevators are serviceable, with dated finishes and operating machinery. The present equipment does not meet today's code requirements and due to the age of the equipment requires considerable upgrades.

A visual condition assessment of the existing structural framing was carried out by CBCL.

Based on our review of the condition of the existing framing, it is our opinion the building will continue to perform adequately under present occupancies. Any changes in floor and roof loading conditions must be subject to a detailed structural review.

Structural repairs are required and are identified in the report.

The building plumbing systems appear to be original, however, they do function. Deficiencies were noted and are included in the mechanical sections of this report.

All of the existing heating, ventilation and cooling equipment and controls are beyond their expected life span. The building uses oil and electrical energy and by today's standards, energy consumption costs are extremely high. The high energy consumption is due to poor thermal properties of the building envelope and inefficiencies associated with the existing HVAC equipment. The building occupants have commented that they perceive poor indoor air quality and poor comfort throughout the building. While the present systems are operating, a total replacement of the mechanical systems would be required under the recapitalization plan.

The building is equipped with a sprinkler system that appears to be in reasonable condition and in general conformance with present day codes. However under the recapitalization plan a total replacement of the sprinkler system and provision of a fire pump would be required.

The existing electrical systems has been partially upgraded and modified to suit new building requirements; however, the majority is original, including lighting, fire alarm system, exit lighting and emergency power and emergency lighting.

The present lighting is not energy efficient and is dated technology. Newer technology lighting can significantly decrease energy consumption.

Lighting controls are inadequate for the present office layouts. The controls also do not allow for use of available natural light from the large curtain wall windows. This further contributes to the high energy consumption and cost.

The fire alarm system is outdated and although operational as originally installed, it falls short in many areas for today's building code requirements. This system would be replaced as part of the recapitalization plan.

The existing power distribution system is inadequate for today's office environment, where computers are now used extensively. Under the recapitalization plan a total replacement of the electrical system would be required.

The new mechanical and electrical systems will require additional space on each or alternate floor levels and the exact area will be determined during the design phase. This will result in less usable floor space on each of the affected floors. It is also anticipated that Level 12 will be significantly reduced in useable floor space owing to the upgraded mechanical and electrical equipment.

The building repair and renovation costing tables are formatted to provide two levels of costing.

"Immediate Repairs" column: This column costs associate repairs that require immediate repair/replacement that is within the next two years. These items typically relate to health and safety.

"Building Renovations" column: This column includes all the construction costs associated with recapitalization plan.

These estimates are "order of magnitude" and will have to be re-evaluated once the exact nature of any renovation or upgrades is determined through the design process.

A summary of the construction costs is as follows. A more detailed listing of the costs is contained within the text of the report.

DESCRIPTION	COST ESTIMATES	
	Immediate Repairs	Building Renovation
Architectural / Structural	$ 66,700	$ 7,759,000
Mechanical	$ 73,000	$ 6,390,000
Electrical	$ 228,000	$ 3,805,000
SUBTOTALS	**$ 367,700**	**$ 17,954,000**
Contingency 25%	Included	$ 4,488,500
Construction Manager Overheads & Fee	Included	$ 1,954,000
TOTALS	**$ 367,700**	**$ 24,396,500**
* Estimated Consulting Fees 10%		$ 2,439,650
* Additional Emergency Generator for EMO		$ 70,000

All above building renovation costs assume that building is unoccupied during renovations. For renovation costs if building is occupied, during renovation apply a 23% multiplier as per the following.

Renovation Costs	$ 24,396.500
Renovation Costs Occupied	$ 30,007,695

Demolition costs on detail cost summary 3.2 includes Architectural, Mechanical, & Electrical demolition costs.
No allowance has been included in the budget for demolition of hazardous materials
Costs do not include HST

As an integral part of this project, the CBCL project team was requested to provide a recommendation on the means to undertake the renovation of the Joe Howe Building (JHB) from an occupancy position. In other words, there are two primary options under consideration regarding the occupancy of the building during the construction process;

Construct/vacate option: to have the building vacated in support of the renovation work, or
Construct/occupy option: to maintain a level of occupancy throughout construction.

With these two options in mind the following synopsis is offered.

The planned renovation for the JHB is a total recapitalization of the entire facility leaving the basic support building structure in tact but essentially demolishing each of the eleven floors, replacing the mechanical and electrical services in their entirety and replacing the external façade or curtain wall.

To recapitalize a facility in downtown Halifax is a challenge in itself with the considerations of the removal of demolition debris and the access of equipment and the delivery of building material. The construction plan for a vacated facility would be entirely different than one with occupants residing in the building during the construction.

A vacated facility would enable the contractor to essentially set-up shop within the building and complete the renovation from a systems perspective. Internal structures, mechanical and electrical systems and even the curtain wall could be demolished and reconstructed coincident in terms of the repair process itself. For instance the curtain wall would be replaced with the best replacement process in mind not a floor-by-floor method.

Obviously an occupied building would have opposing constraints from the systems approach as the overlying factor in the renovation would be geared equally to minimizing the disruption of the remaining occupants. But, the construct/occupy option could be done and is contingent on the amount of disruption the management and occupants are willing withstand.

The plan to renovate while occupied would present a method whereby three floors starting at the level above the existing Hollis Street lobby/ground floor would be the beginning point. The plan would be to renovate two floors while having a swing floor above the two being renovated to buffer the next floor as much as possible from the construction process. The top floor housing the building's mechanical/electrical systems and some office spaces would be placed in a construction mode until the building was completed.

The plan would be to vacate the floors under construction placing the occupants in a temporary location while those particular floors were renovated. One elevator would be dedicated to construction. Replacement of the curtain wall would be carried out on a floor by floor basis coincident with the floors under construction as well as the mechanical and electrical services. This bottom-up concept of repair would continue until all the floors were renovated and the occupants would return to the renovated space while others on the next three floors would relocate into the temporary accommodations. This has a number of advantages and disadvantages as follows.

The construction/occupant plan negates the requirement of finding suitable office space to facilitate total temporary or permanent relocation of the occupants to other facilities. Yet in the event of a total relocation one might argue that the occupants have undertaken only one move and not ones geared to satisfy the construction schedule.

The cost of the renovation would be approximately 23% more expensive for the construction/occupant option as the construction plan is not focused on the systems replacement but geared toward minimizing the disruption to the remaining building occupants. Higher costs will be imminent with contractors parlaying subtle differences into significant costs. This additional charge has been derived from a survey of prior construction projects utilizing the construct/occupy option. Again, one could argue that there are savings associated with the total non-relocation of the occupants.

Risk to the contractors will be higher for the construction/occupy plan as there is a higher element of unknown. This will result in additional costs to the owner.

While minimizing the disruption to the remaining occupants, the renovation will bring with it considerable hardship with regards to noise, dust, smells and vibration during office hours. Notwithstanding the fact that this disruption would include the newly renovated floors as well since the construction would progress above the renovated. Leaving the occupants in the building will undoubtedly be more of a burden to the Department of Health (DOH)/Department of Transportation & Public Works (DPW) management team.

Design costs will be approximately 23% higher for the construction/occupant plan as the design will have to include a phased construction plan. In the vacated scenario, the design would focus on the demolition and replacement of the systems only.

The schedule for the construction/occupant plan would be approximately 25% longer owing to the fact that additional time will be encumbered working around the occupants. Furthermore, extra construction shifts maybe necessary for changeover of building systems which would not be required for the vacated scenario and after hours work performed by the contractor to minimize occupant disruption during the day would result in additional costs.

In view of the above, the construction/occupy scenario offers the ability to occupy the JHB and with it comes advantages from minimized leasing alternatives and understandably, relocating the occupants would be done on a temporary basis.

The construct/vacate scenario offers the contractor carte blanche access to the JHB and this will be reflected in a lower construction cost due to reductions in the schedule, lower risks, delays resulting from impacts from the occupants and a more congruent construction plan based on the systems approach.

The construction/occupy impacts on the owners management team with negative employee feedback & stress, increased sickness as well as time lost from other irritants. Furthermore, the owner's DOH/DPW management team will have a greater role to play on providing continual feedback to employees of potential office interruptions resulting from construction processes, temporary relocation and associated start-up for computers and equipment, and ultimately a greater role to play with the construction.

Although the construct/occupy option has been done on building renovations and is a feasible solution, it is recommended that the construction/vacate option is the preferred option.

2 Introduction and Assignment

2.1 Introduction

CBCL Limited was engaged by the Nova Scotia Department of Transportation and Public Works to carry out a building condition assessment and produce a recapitalization plan for the Joseph Howe office building on Hollis Street in Halifax.

2.2 Site Review

Site review of the existing building conditions was conducted at various times during the months of July and August 2007. These site reviews were undertaken by all members of the evaluation team, namely, structural, architectural, mechanical and electrical disciplines. During, and subsequent to these visits, staff members interviewed Mr. David Baker of Universal Properties, reviewed existing building design drawings and energy consumption amounts and costs.

All assessments and comments are based on visual inspection of observable building elements. No cutting or testing was conducted. Many of the building's structural, architectural, mechanical and electrical elements were covered with various finishes, thus preventing a thorough visual inspection. Therefore, the project team's assessment is limited to those elements exposed to view within the portions of the building reviewed.

2.3 Assignment

.1 The purpose of this review was to visibly examine all components of this building, including building structure, building envelope, interior finishes, mechanical and electrical systems, conduct a building codes review.

.2 Prepare a report that comments on the findings of the site review and include a cost analysis inline with the requirements of the Province of Nova Scotia standard DC350 to recapitalized the facility for another 25 years. In addition, the costing exercise would identify repairs that are required immediately to bring the building to current standards.

3 Building Description

3.1 Building Description

The Joseph Howe building is bounded by Hollis, Prince and Granville streets. It is a thirteen storey high office building with an approximate typical floor plate area of ten thousand square feet (10,000 ft^2). The building was constructed in the early 1970's and for the purposes of this report it is assumed that completion was 1974.

The floor numbering system is unique, with floors numbered, Hollis level, Granville level, Second level and so on up to level 12. There is also a basement that contains service rooms. Each floor up to level 11 is served by a bank of three elevators, with Level 12 accessible by a circular stairway from Level 11. There is also a small "wheelchair" type lift from Level 11 to Level 12.

The building roof is an "IRMA", 4 ply built up asphalt and gravel type. On three sides, the exterior wall is clad in a unique aluminium framed curtain wall system with large single glazed windows and enamelled steel panels. The south side of the building is completely clad in enamelled steel panels matching those on the other three sides.

There are two entrances to the building, one from Hollis Street and the other from Granville Street.

3.2 Building Envelope

3.2.1 Roof

3.2.1.1 Description

The existing roof is an I.R.M.A. (Inverted roof membrane assembly) consisting of ¾" crushed gravel, 1" to 1½" rigid insulation installed in asphalt flood coat with a 4 ply BUR (built up roof) membrane on concrete and steel deck substrata (refer to Figure A-1, Appendix A).

3.2.1.2 Observations

The roof deck is poured concrete with a small area of steel decking. The steel deck is limited to what appears to be a "removable" section of roof structure for mechanical equipment replacement.

Due to the roofing type, examination of the roof membrane was not possible. This roof appears to be the original 1974 roof and at thirty-three (33) years old, is at the end of its life cycle. However, no roof leaking has been reported nor indication observed.

Numerous fall arrest roof anchorages are installed but the perimeter areas around the anchorages are now un-insulated. The roof insulation has an R-Value which is 5 to 7½ maximum.

The roof edge parapets are extremely low, less than 6" high. This is low for the building's height as evident where wind scouring in the corners has displaced the crushed stone ballast possibly even off the roof (refer to Figure A-2, Appendix A). A higher parapet would be required.

There are numerous pieces of roof mounted equipment that require attention (refer to Figure A-3, Appendix A). There is also a large recessed area that contains a cooling tower. The roof in this recess is a similar type to the main roof system, and is located at Level 12. Access to this roof is through an exterior doorway and by a vertical access ladder to the main roof areas.

There are numerous small repairs required to roof mounted elements and these are identified in the Building Costs Sheets.

3.2.1.3 Conclusions

The present roof system is still serviceable and with the required repairs completed could provide a number of years of further service. However, due to the low insulation values on the present roof and the age of the roof, replacement of this roof would be carried out under the recapitalization plan.

3.2.2 Windows, Curtain Wall and Entrances, and Wall Cladding

3.2.2.1 Description

The exterior wall cladding on the Hollis, Prince and Granville Street facades from the second floor level to the roof is a unique curtain wall system consisting of dark brown anodized aluminium framing with large vertical I-beam profile mullions, enamelled steel panels at floor levels and at the roof level and large single glazed windows (refer to Figure A-4, Appendix A). A tinted vinyl film has been applied to the interior face of each window pane.

On the south wall the windows return one bay on the east and west sides with the remainder of the wall clad with the enamelled steel panels matching those on each floor level (refer to Figure A-5, Appendix A).

The glazing on the street level on Hollis, Prince and Granville Street is a combination of several systems. Along Hollis Street and the east end of Prince Street, it is a double glazed, flush glazed system, and the west end of Prince Street is typical floor type single glazed curtain wall. On Granville Street, it is a typical 2” x 4” aluminum storefront type framing with single glazing. None of the window framing systems appear to be thermally broken.

The entrance at the Hollis Street level has power operated sliding aluminium doors (refer to Figure A-6, Appendix A), and at the Granville Street level, typical hinged aluminium entrance doors. All of the doors are finished in dark brown anodizing.

Hollis, Prince and Granville Street levels also have unpolished stone facing at the base of the wall and accent panels. The exterior round columns on the Hollis, Granville and Prince Street level and the main entrance steps, entrance aprons, planters and retaining walls are also sheathed in tiles of the same stone (Figure A-11, Appendix A).

At the Hollis and Granville Street levels, there are soffits around the perimeter of the building. On the Hollis and Granville Street sides, the majority of the soffit is enamelled or painted sheet, with integral pot lights. Directly above the main entrance at the Hollis and Prince Street corner, the soffit is a horizontal aluminum framing system with bronze coloured spandrel glass, also with integral pot lighting. On the Granville Street side, the flat panel, with integral pot lights, is continued until the Granville Street entrance. There the soffit changes to a liner metal panel system (Figures A-11, A-13 and A-14, Appendix A).

The aluminum and glass curtain wall system spans from floor to floor, with a continuous integral heating/air conditioning cabinet as a base at the interior of each floor level, this is typical on all floors with the exception of the Hollis Street side and Level 12.

At the street levels, the south façade abuts an existing building on the Hollis street side and is open to an alley-way from Granville Street. The unpolished granite facing is continued on the south wall approximately one third of the width of the building from Granville Street.

The west stairway exits at the Granville Street level on a concrete ramp that leads to the sidewalk on Granville Street. This ramp also serves as a service access to the Coffee Shop on the Granville Street level.

There is a large open grille/grating on this ramp that serves as a fresh air intake to the existing electrical vault located on the Hollis Street level of the building, and as the ramp rises, a large air handling unit is located beneath the ramp that also serves the Joseph Howe Building. This equipment is enclosed in a wire mesh type fence. The supply air intake for this equipment is mounted on the south wall and ducted to the unit (Figure A-22, Appendix A).

The alley-way descends to a level below the Granville Street level and is used as a garbage collection area. It is very poorly maintained and produces unpleasant odours and conditions. However, this area is not part of the property belonging to the Province as it appears that the ramp designates the property boundary line.

3.2.2.2 Observations

The aluminium curtain wall framing on the majority of the building appears to be in fair condition with some erosion of the anodizing on the framing the members, particularly on the Hollis Street façade (refer to Figure A-7, Appendix A) and some minor damage to flashing, at the bottom of the vertical mullions. The single glazing is causing problems: such as heat loss and gain, increased energy consumption required for heating and cooling, reducing comfort levels within the office spaces, condensation on interior of glass and aluminum framing. In an effort to reduce the effects of solar gain through the single glazing, a tinted vinyl film has been applied to the interior face of the glass panels. Discussion with building staff indicated that this has reduced the effects of solar gain/heat loss, but is still not wholly satisfactory (refer to Figure A-8, Appendix A).

During high winds the panes can flex and deflect. This movement can stress any glazing tape sealant and extrude it from the glazing joint; this was observed in many locations. This window pane movement can also be disconcerting to the building occupants.

All glazing replacement is carried out from the building interior and, therefore, the weather seal relies on any new glazing tape installed in the framing – usually without a cap bead of sealant applied to the exterior of the joint. However, on the Hollis Street façade heavy bead or beads of sealants has been applied to the glazing perimeter and a bronze coloured sealant along the vertical joints of the I-beam shaped mullions and enamelled steel panels (refer to Figure A-9, Appendix A).

The exterior enamelled steel panels form an integral part of the floor level heating/cooling cabinets. The exterior panel appears to be a single skinned steel panel framed into the window framing with a site applied sprayed on fibrous insulation – approximately 1" thick. It appears that the insulation is interrupted at each floor slab. This insulation is readily visible through the ventilation grilles. The horizontal mullion at the glazing sill has what appears to be a condensation trough where condensation from the glass collects and is evaporated into the office spaces. Residue from the evaporation was observed in many locations (refer to Figure A-10, Appendix A).

In the space above the ceiling level, similar exposed insulation was observed, to the underside of the concrete slab and it is assumed that the same level of insulation was applied to the steel panels on the south face of the building. No vapour barrier of any sort was observed.

At the Hollis level, along Hollis Street, there are six (6) very large (60" x 126") flushed glazed, thermo pane glass panels. These panels are retained by the head and sill framing. The vertical joints are flush glazed with a weatherproofing sealant in the joints between the panels and the panels attached to the vertical mullions with a structural grade sealant (refer to Figure A-11, Appendix A).

Failure of the structural grade sealant at these vertical joints has allowed the panel to disconnect from the vertical mullions and bow outwards approximately 1/2" at the panel centreline.

This situation has caused the weatherproofing sealant to fail significantly and clear open joints between the exterior and building interior were observed.

Gentle hand pressure will cause these panels to flex significantly. These panels are retained in place only by the sill and head framing. From observations of the interior framing and sealant, it appears that an inappropriate structural sealant was used when these panels were installed (refer to Figure A-12, Appendix A).

Along the Prince Street façade at this level, the glazing system is similar to that on Hollis Street, with the glass panels reducing in size as Prince Street rises. The condition of the panels is the same as on Hollis Street.

At the entrance to the building, at the Hollis Street level, at the base of the aluminium door frame assembly, salt erosion of the framing members was observed. The aluminium entrance doors on the Granville entrance appear to be newly replaced units.

On the glazed soffit at the Hollis entrance, the coloured film on the glass panels is failing (refer to Figures A-13 and A-14, Appendix A).

While the unpolished granite wall panels appear to be in good condition, many if not most of the joints require re-pointing (refer to Figure A-15, Appendix A). This joint failure was also observed on the round columns and on the granite steps, retaining walls and planters. The bedding mortar and mortar joints on the cap stones on the retaining wall on Hollis and Prince Streets have failed completely so that at the time of inspection they were "loose laid" in place and could be easily moved (refer to Figure A-16 and A-17, Appendix A).

Prince Street rises significantly towards Granville Street and the Hollis Street façade on Prince Street reduces as Prince Street slopes. There is an alcove that terminates at a wall approximately 5’-6” high and centred on this wall is the oil tank fill and vent pipes. There is also a stone faced retaining wall on the street side of this alcove (Figure A-18, Appendix A).

The cap on the oil fill pipe appears to be damaged and oil odours are evident in this location (Figure A-19, Appendix A).

Along Granville Street, on the Granville Street level, corrosion was observed at the building entrance, where the adjacent metal panel finished at the sidewalk level (Figure A-20, Appendix A).

The concrete ramp on the south face is in very poor condition with large areas of spalled concrete, exposed rebar and previous repairs failing again (refer to section 3.4 Structural).

The handrail is in poor condition and does not meet present code requirements.

The hollow metal doors, frames and hardware that serve the Coffee Shop and act as an exit door to the west stairway are all in very poor condition.

The alley-way is filthy and smelly with loose garbage lying around (Figure A-21, Appendix A).

The fresh air intake for the air handling system serving the Hollis Street level picks up odours from this area and introduces it to the building interiors (Figure A-22, Appendix A).

The steel panels on the remainder of the wall appear to be in fair condition with some evidence of rusting.

3.2.2.3 Conclusions

The flush glazing system along Hollis and Granville Streets require immediate attention to repair the structural stability of the window system and replacement of the sealant to provide weather protection.

The entire curtain wall and insulated panel wall system would be replaced in the new capitalization program, with a modern curtain wall system with a higher thermal performance. The single glazed window system on the Granville Street level would also be replaced as would all the exterior man doors.

These repairs and replacement will provide additional occupant comfort and lower energy costs.

The unpolished granite stone facing, column tiles, steps, planters and retaining walls would be repaired and re-pointed.

The ramp on the south face that provides access to the exterior man doors would also be replaced as part of the recapitalization plan.

3.2.3 Building Interiors

3.2.3.1 Description

This building, with the exception of the small coffee shop on the Granville level is occupied primarily by the Nova Scotia Department of Health, however, there are several other Government of Nova Scotia departments occupying this building.

In general, the interior finishes observed on all floors of this building are typical for similar type office buildings (Figure A-23, Appendix A). Some individual offices have a higher level of finish in keeping with the occupant's status (Figure A-24, Appendix A).

Most built-in cabinets are of an inexpensive nature, again with some other of a slightly higher quality observed (Figure A-25 and A-26, Appendix A).

Most doors and frames are typical with either doors with solid transoms or larger doors and many with glazed side lights (Figure A-27, Appendix A).

The majority of ceiling finishes are 2'-0" x 2'-0" acoustic ceiling tile and suspension grid, with various patterns of ceiling tile observed (Figure A-27, Appendix A). Some small areas of painted gypsum board ceiling were also observed. On the Hollis and Granville Street levels, metal linear type ceilings are used in the public spaces, extending into adjacent office spaces

(Figure A-28, Appendix A). In most service and equipment rooms, the exposed concrete floor structure above is the only ceiling finish.

All interior partitions are gypsum board, either painted (the majority) or with a vinyl fabric covering.

The exterior walls of the building perimeter on the Hollis, Prince and Granville Street sides are glazed aluminum curtain wall from the ceiling level to a heating/cooling cabinet approximately 1'-0" above the floor

Areas of gypsum board with sprayed on acoustic plastic were observed on Levels 11 and 12. (Figure A-29, Appendix A).

All the public washrooms have ceramic tile wall finish (Figure A-30), with the small en suite washrooms in individual offices having general office type wall finishes.

On the Hollis and Grenville Street levels, the Department of Vital Statistics has very dark wooden wall panelling and an interior stairway with dark wood, brass and glass finishes (Figure A-31, Appendix A).

Carpet is by far the prevailing floor finish in all offices (Figure A-32, Appendix A) and circulation space (Figure A-33, Appendix A), generally the same quality and design of carpet used in all areas. Certain individual offices have a high grade carpet. All office service rooms such as lunch, printing and storage rooms have a vinyl composite tile floor finish (Figure A-34, Appendix A).

The elevator foyer and adjacent offices at the Hollis Street level have a polished marble floor finish (Figure A-28, Appendix A). On the Granville Street level, the entrance lobby and vestibule have a stone floor finish that matches the exterior stone wall finish.

At the Hollis Street level, the entrance area is a polished marble tile floor that also extends into the Vital Statistic's area. The Granville level entrance finishes are a granite tile similar to the exterior wall panels.

All washrooms have a ceramic tile floor finish.

All areas such as exit stairways and mechanical and electrical service spaces are painted concrete floors. The treads in the stairway have adhesive applied non slip pads of a contrasting colour.

The baseboard throughout generally matches the adjacent floor covering. For example, carpet floor, matching carpet bases, vinyl tile, vinyl base, and so on.

Doors in this building are generally painted, hollow metal doors for washrooms and stairways and other building service rooms. Entrance doors to the individual suites and offices are stained natural finished wood, in various shades, with matching solid wood transom panels. The door frames are usually solid wood that match the doors or dark brown anodized aluminium frames.

In various locations throughout the building there are borrowed lites adjacent to the doors that are framed in the same material as the door frames.

3.2.3.2 Observations

Building Service Rooms, Exit Stairways and Corridors
The finishes in these areas are finishes of a basic level such as painted concrete, concrete block and gypsum board and appear to be well maintained.

All handrails in the stairways are painted steel. Most appear original and all are in good condition. The railings however do not meet current barrier-free accessibility requirements as they do not have the required top and bottom horizontal extensions.

<u>Public Areas, Corridors and Washrooms</u>
The finishes in these areas appear to be in good condition with some obvious usage damage particularly to the vinyl wall covering and to entrance doors and frames to individual office suites.

The washroom finishes appear to be in good condition. The walls and floors are ceramic tile, the vanities are plastic laminate finish and the toilet partitions are a painted steel type. On floor levels 3, 4, 6 and 10, the configuration of the washroom layout has been changed to provide a barrier free type stall in each.

<u>Office Areas – All Floors</u>
The office areas on each floor all have similar types of finishes as described. In some areas the carpets and interior decoration appear to be recent replacements, in others the finishes are worn and dated, with the carpet flooring stained, worn, torn and ready for replacement. Minor usage wear and tear damage was observed in many locations.

It appears that the majority of carpet in the building is a fairly recent replacement.

In many service and lunchroom areas, the vinyl composite floor tile is scuffed and scratched with the uneven surface of the substrata telegraphing through the tile.

The quality of built in cabinetry varies with its location. The cabinets in all the lunchroom kitchenette areas, in particular, are inexpensive melamine construction and most are approaching the end of their life cycle.
The vanities in the small individual ensuite washrooms are in good condition.

The level of finish is typical of an office building with basic, plain finishes, with certain areas receiving a higher level of finish.

3.2.3.3 Conclusions

The level of finishes reflect a typical office environment and are consistent with a building that has been in use for many years, during which office layout modifications and renovations have taken place. In general throughout the building, the condition of the interior finishes is still good; it appears that most areas have received finish upgrades such as new carpets, repainting and new ceiling tiles. In a smaller proportion of spaces, the existing interior finishes are at the end of their life cycle and will require replacement. Based on their present condition, no interior finishes appear to require immediate renovation or upgrading (Figure A-35, A-36, Appendix A).

However, during the recapitalization program and due to the extensive nature of the curtain wall replacement, modifications to conform to the requirements of the latest building codes and, the extensive nature of the mechanical and electrical renovations and replacements, the interiors on all floors in the building will have to be completely demolished and new office facilities constructed once all the curtain wall modifications and systems replacements are complete.

The only portions of the floor area that will not require complete replacement are the exit stairwells and elevator shafts. However, some modifications are required to meet present day codes.

Space planning and use was not reviewed in this assessment.

3.3 Elevators

3.3.1 Description

This 13-storey building is served by three 3000 lb (1360 kg) elevators (Figure A-37, Appendix A) and one wheelchair type lift (Figure A-38, Appendix A). The elevators serve the Hollis Street level to Level 11, with no elevator service to the basement or Level 12. The wheelchair type lift serves Level 12 from Level 11. This lift was installed at some time after the building was originally occupied.

The elevator cabs are finished with carpet floors, plastic laminate panels on three sides and stainless steel panels on one side. The ceiling is a metal type “egg crate” suspended ceiling with fluorescent back lighting. The eastern most cab has a higher ceiling than the other two. The “in cab” floor pushbuttons are located on both sides of each cab and each cab has an emergency phone device (Figures A-39 and A-40, Appendix A).

No elevator is designated as a firefighters’ elevator and none are equipped with the required firefighter communication and system interlocks.

With the exception of the Hollis Street level, which has floor level indicators, the typical floors have only up or down indicators above each elevator. The pushbutton control panel in each elevator foyer is simple and non-obtrusive. The elevator machine room is located above the elevator shaft above Level 12.

The elevator controllers and motors all appear to be original. The controllers are electro/mechanical type. The elevator traction system is a gearless system (Figure A-41 and A-42, Appendix A).

3.3.2 Observations

The elevator cab finishes appear dated, but are still serviceable, and the elevators appear to operate reasonably satisfactorily. Discussions with Mr. David Baker indicated that problems with the elevator operation were occurring more frequently than in the past. No detailed time or traffic loads were carried out for this report.

The pushbuttons in the elevator cab have Braille indicators; however, there is no audible signal to indicate on which floor the elevator has stopped. The present cab sizes meet the CSA standard B651-04 (accessible design for the built environment) with the exception of the cab interior width which is just 8 mm less than the required width. There is an emergency communications device in each cab located in a cabinet low to the floor. It has Braille indicators. The floor finish meets the requirement of the CSA standard.

Within the elevator cabs, there are no handrails provided on the non-access walls. This does not meet the CSA B651-04 standard.

The elevator controllers in the elevator machine room are antiquated technology and maintenance and spare parts acquisition will become more difficult as time goes by.

All elevator equipment within the elevator machine room appears to be original.

The wheelchair lift is in good condition, however, it appears be used very infrequently.

3.3.3 Conclusions

The elevator equipment appears to be original and, at 33 years old, it is nearing the end of its expected useful life span and there is no elevator service to level 12. The present system does not meet current code requirements including use by fire fighters. The present elevator system should be upgraded to modern standards and code requirements and the elevator hoistway and machine room modified to provide elevator access to level 12 by one elevator.

In the future recapitalization renovation it is anticipated that a larger proportion of level 12 floor space will be used for mechanical and electrical service spaces and with new the elevator access the present wheelchair lift will become redundant and should be removed.

Under the present Building Codes it appears that there is not a requirement for a dedicated fire fighters elevator in this building, and no requirement for a separate hoistway, however, one elevator would have to be modified to meet the latest National Building Code requirement for use by fire fighters. At the same time the cab and entrance layout could be modified for stretcher use. This elevator could be the one chosen to be extended to serve level 12.

The remaining two elevators would also have to receive lesser upgrades to meet the latest code requirements.

3.4 Structural

3.4.1 Description

The structural condition assessment is based solely on the visible condition of the building as of July 4, 2007. Much of the building’s structural elements were covered with various finishes, thus preventing a thorough visual inspection. Therefore, our comments are limited to those areas exposed to view within the portions of the building that were reviewed, and should not be inferred to be applicable to all areas of the building.

Floor framing typically consists of concrete flat slabs with thickened drop panels at the columns. Floor slabs are supported on circular concrete columns that are laid out on a regularly spaced grid measuring approximately 20 ft x 20 ft. The columns at the perimeter of the floor plate are offset a half bay spacing from the interior columns.

Existing structural drawings, issued for Building Permit, were obtained from Halifax Regional Municipality's (HRM) archives. Unfortunately, these plans did not reflect the as-built condition of the building. Specifically, the archived structural Building Permit plans did not indicate the existing thickened floor slab drop panels at each column, the existing cooling tower opening at the roof level, the existing elevator machine room floor framing, the existing 12^{th} floor, or the existing concrete vaults at the Granville and Hollis Street floors. It is not uncommon for design changes to be made after permit drawings have been issued. Presumably the structural design evolved and revised structural plans were issued to reflect the above noted changes. Unfortunately, Halifax Regional Municipality's archival records did not include any revised structural plans for this building.

The design live loads for the building were not indicated on the archived structural plans. However, based on the building code of the day, the typical office floors should have been designed for a minimum live load of 50 psf. That live load would be adequate for most normal office occupancies, including localized filing cabinet loads and reading room book shelves. A 50 psf live load allowance would likely be inadequate for areas of heavy filing or storage loading. The two ground floor levels at Hollis Street and Granville Street respectively should have been designed for a minimum live load of 100 psf in accordance with the building code of the day. The vault areas on those two floors should have been designed for considerably more live load.

The exterior of the building is finished with a glazed aluminum curtain wall system. The curtain wall structure consists of vertical, I-beam shaped mullions spaced 5 feet apart horizontally. The vertical mullions span from floor-to-floor. Where mullions connect to the floor slab, pockets at the top of the slab were evident. However, existing sprayed on insulation on the inside faces of the curtain wall and existing mechanical piping behind perimeter radiators prevented a visual review of the mullion-to-floor connections.

3.4.2 Structural Condition

The condition assessment consisted of a visual survey of the use and occupancy of all floors to identify areas with unusually high loading, like high density “Space Saver” filing systems or heavy equipment storage rooms. No such areas of heavy loading were observed in the office areas. Of course, the mechanical rooms on the upper floor are heavily loaded with boilers and other equipment, and presumably the original design accounted for these equipment loads.

All floors in the building were fully occupied at the time of the review. At numerous locations throughout the building, ceiling tiles were removed in small areas to permit a visual review of the soffit of the slab. In those areas, no structural deficiencies were observed.

Existing floor finishes and partitions prevented an unobstructed review of the floor plates. As such, possible areas of excessive slab deflection could not be documented.

The roof slab is of similar construction to the typical floor plate. A large rectangular opening in the roof slab over the mechanical room was provided presumably to allow the removal and installation of mechanical equipment. This opening is enclosed with a metal roof deck. At one end of the metal roof deck, a fan opening, approximately 2 feet square, had been cut out of the steel deck. See Figure S1, Appendix B. Structural steel trimmers are required around this fan opening to ensure the roof deck is adequately supported.

At the cooling tower opening in the roof, the edge of the roof slab is exposed and has spalled in areas. These areas should be chipped out and repaired to prevent further corrosion of the reinforcing steel and increased deterioration of the roof slab.

Fall arrest roof anchors have been installed on the roof. A roof anchor plan dated October, 2005 is located beside the door to the cooling tower. The plan indicates the roof anchor system consists of 18 proprietary fall arrest anchors bolted to the roof slab with a chemical adhesive. Adhesive anchors should be tested annually to ensure they remain structurally adequate.

The roof top cooling tower is supported by 4 spring isolators bearing on steel posts on top of concrete curbs at the 12th floor. The spring isolators have not been bolted to the structural steel framing; refer to Figure S2, Appendix B. We recommend the spring isolators be bolted in place.

At the south side of the Granville Street level, the existing concrete ramp slab at the transformer vault ventilation opening and the existing cantilevered slab behind Rudy's restaurant require resurfacing. Areas of spalled concrete and corroded reinforcing steel at the top of the slab and at the edge of slab by the guard rail should be removed and repaired to prevent further deterioration of this slab, refer to Figures S3, S4 and S5, Appendix B.

At the exterior entrance steps to the Hollis Street level, located at the north-east corner of the building, the soffit of the suspended stair slab is cracked and exhibits evidence of concrete spalling and leaking water, refer to Figure S6, Appendix B. This was observed at one corner of the stair soffit located in the sprinkler pump area in the basement. The extent of the spalling could not be confirmed because access to the Building Maintenance room and the Department of Health storage room under the entrance stairs could not be provided. To prevent further deterioration of the entrance stair slab, this area must be repaired.

3.4.3 Floor Slab Fire Separation Performance

Where ceiling tiles were removed to review the make-up of the floor structure, no unsealed pipe, conduit, or duct penetrations through the floor slabs were noted, except for two sprinkler pipes penetrating the Hollis Street floor slab at the east side of the elevator shaft. The voids around these two pipe penetrations must be sealed to ensure the required fire separation between floors has not been compromised.

The 2005 Edition of the National Building Code of Canada requires that this building have a 2 hour fire separation between floors. To achieve this separation, a minimum slab thickness of 5 inches, with a minimum 1 inch clear cover to the reinforcing steel would be required. Based on the archived Building Permit structural drawings, the typical office floor slab is 7.5 inches thick. A clear cover to the reinforcing steel of 0.75 inches is specified on those drawings, providing a fire separation of only 1.5 hours. As noted previously, the archived structural plans do not accurately represent the as-built building. It is possible the clear cover was revised to 1 inch on subsequent structural plans. However, unless the revised structural plans are discovered or cover meter testing of the floor slabs is carried out, we would have to assume the existing clear cover to the reinforcing steel is only 0.75 inches. Therefore, based on the information at hand, the fire separation provided by the existing floor slabs does not satisfy the 2 hour requirement. However, discussions conducted as part of this project with the authorities having jurisdiction view this as meeting the code of the day. (Refer to Chapter 4, Section 4.13, Conclusions).

3.4.4 Roof Loading

Under the requirements of the new 2005 National Building Code of Canada (NBC), the design snow load for roof structures in Halifax has increased by 13% over the 1995 NBC. Assuming the roof slab is 7.5 inches thick and the superimposed dead loads are 20 psf (for roofing, ceiling finishes, ductwork and lights), this 13% increase in live load would result in only a 3% increase in total roof load, which is almost insignificant.

Unless changes to the roof structure are carried out, the NBC does not require existing buildings to be reinforced to accommodate the new, heavier snow loads. If a new penthouse or new roof top equipment was installed which was large enough to generate a snow drift, the capacity of the existing roof in the vicinity of the new construction would have to be reviewed by a structural engineer. Localized roof reinforcing may be required to support the new construction and drift loads.

The existing roof slab has performed adequately over the last 35 years. Unless new roof top units or a penthouse structure are added to the roof, the existing roof does not require reinforcing to comply with the new NBC.

3.4.5 Conclusions

Based on our review of the conditions of the existing framing, it is our opinion the existing building will continue to perform adequately under present loading conditions. If areas of high density filing are to be installed, we recommend a structural engineer be retained to review the capacity of the floor and design any necessary reinforcing.
If new roof top units are installed, we recommend a structural engineer be retained to review the adequacy of the roof framing subject to the new snow drift loads and design any necessary reinforcing.

The following structural repairs are recommended:

- Steel trimmers are required around the opening in the existing roof deck over the mechanical room;
- The cooling tower's spring isolators should be bolted to the supporting steel framing;
- Spalled concrete at the roof slab around the perimeter of the cooling tower opening, at the Granville Street level exterior ramp slab, and at the Hollis Street main entrance stair slab should be repaired to prevent further deterioration of the concrete structure.

The existing fall arrest anchors on the roof should be tested annually to ensure the chemical adhesive is structurally adequate.

All unsealed penetrations through floor slabs should be suitably patched to maintain the fire separation requirement between floors. Two unsealed openings were observed at the Hollis Street level, but more may exist elsewhere throughout the building.

The building modifications during the future recapitalization renovations to the elevator shaft to provide elevator service to level 12, additional mechanical and electrical equipment located throughout the building and any new floor penetrations will require that the present roof and floor structures concerned be reinforced.

3.5 Mechanical System

The following commentary on the mechanical systems for this building is based on visual observations by CBCL Mechanical Engineering staff; comments received from the building maintenance staff and occupants as well as a review of the original building mechanical systems drawings. While the existing mechanical systems are presently functioning, a plan to recapitalize the building to DC350 standards would require a replacement of the mechanical systems. These systems are discussed in the following text.

3.5.1 Plumbing

3.5.1.1 Domestic Water System

<u>Description</u>

A 6”Ø water line serves the building and is fed by the water main located in Hollis Street. A 2½”Ø domestic water line is tapped off the main and penetrates the exterior basement wall of the building. The water entrance is equipped with a water meter and booster pump, however, a backflow preventer is not present at the entrance (see Figure M-01, Appendix C).

The building is equipped with stacked washroom groups that are located on the centre of the building, between the south exterior wall and the exit stairs. The domestic water riser is located in a chase located between these washrooms and extends from level 1 to the top of the building.

We noted 3 locations in the building are equipped with water cooled air conditioning units. These units do not appear to be equipped with water regulating valves.

Observations

- The domestic water distribution system is original to the building.
- There is no protection from backflow at the chilled water and condenser water system make up water connections to the domestic water system. (Heating system make up is complete with a check valve only).
- Sections of the domestic water piping insulation are damaged.
- No provision for backflow protection between the city main and the building domestic water supply.

Conclusions

- Provide new domestic water piping from the entrance to the 12th floor. The new domestic water distribution system shall include:
  - Backflow prevention device at the building water entrance as per the Halifax Regional Water Commission (HRWC) regulations.
  - Backflow prevention for the make up water assembly serving the chilled water, condenser water and hydronic heating system to protect domestic water supply from contamination.
  - New water meter.
  - New packaged water booster system complete with variable frequency drives.

3.5.1.2 Drainage Systems

Description

An 8”Ø cast iron storm and 4”Ø cast iron sanitary sewer system exits the building above the basement floor slab on the Hollis St (east) side of the building. The elevator pits, basement floor drains and exterior foundation drainage are piped to a sump pit located in the basement level. Sump pit pump discharges this water into the storm sewer at the basement level.

Rudy’s restaurant located on the Granville St level has a grease interceptor located below their triple pot sink.

Observations

- The existing storm and sanitary piping systems are original to the building.
- No leaks were observed in the building drainage systems.
- There did not appear to be high level alarm for the sump pit at the basement level.
- The main sprinkler drain is directly connected to the building sanitary sewer at the basement level. A check valve is located at the sprinkler drain connection to the sanitary sewer (see Figure M-02, Appendix C).

Conclusions

- The roof drains shall be removed and replaced as part of the roofing upgrades.
- The storm drainage riser shall be renovated and replaced with new.
- Provide a new sump pump and controls to serve the basement underground drainage systems.
- Remove direct connection of sprinkler main drain to sanitary sewer. Modify drainage to provide an air gap.

3.5.1.3 Plumbing Fixtures

Description

The existing plumbing fixtures appear to be original to the building:

- Water closets are floor mounted, flush tank type (see Figure M-03, Appendix C).
- Urinals are wall hung c/w flush valves, recessed in wall (see Figure M-04, Appendix C).
- Lavatories in the main washroom groups consist of porcelain, vanity type complete with manual faucets and exposed chrome plated waste piping (see Figure M-05, Appendix C).
- Lunch rooms located throughout the building are stainless steel kitchen sinks.

Observations

- It appears that the pluming fixtures do not comply with present day barrier free requirements.
- Existing water closets and urinals are not low consumption type.

Conclusions

- Plumbing fixtures, with the odd exception, are original to the building. In many instances, the fixtures do not meet the requirements outlined in the DC350 Document.
- Plumbing fixtures shall be removed and replaced with new.

3.5.2 Fire Protection

Description

The building is equipped with a wet sprinkler system and is fed by a 6”Ø water line from the city main located on the Hollis street side of the building. The fire department connection, water gong and main drain are located on the east exterior of the building, south of the Hollis street entrance (see Figure M-06, Appendix C).

The main entrance is complete with an alarm valve; the alarm valve serves sprinkler risers located on the east and west side of the building elevators.

There are separate risers for building fire hose connections located in the elevator lobby of each floor and a separate riser for the main sprinkler distribution systems serving each floor. The system is zoned per floor via a flow switch and test connection located in the ceiling space of every floor level where the sprinkler distribution for each floor connects to the sprinkler main (see Figures M-07.1 and M-07.2, Appendix C).

The records storage area of Vital Statistics, located on the Granville level of the building is equipped with an Energen, clean agent, fire suppression system. The system is divided into 2 zones with the Energen cylinders and manifold located in the fuel oil storage room in the basement (see Figure M-08, Appendix C).

The kitchen hood located in Rudy's restaurant on the Granville level is equipped with a wet chemical, fire suppression system.

Observations

- The sprinkler entrance is equipped with an alarm valve; however, the entrance does not include the use of a backflow preventer to the present day standards of the HRWC.
- The sprinkler distribution system, sprinkler devices and heads are original to the building.
- The sprinkler system is zoned per floor.
- No fire pump exists.

Conclusions

- Given the age of the sprinkler system and its components, we recommend replacement of the sprinkler distribution system.
- The replaced to include new backflow prevention device at the entrance, an allowance for an electrical fire pump, new sprinkler riser, including a new sprinkler fire hose connection in stairwells at each level.

3.5.3 Heating Systems

3.5.3.1 Boiler Plant

Description

Two, oil fired, hot water boilers located in the 12th floor mechanical penthouse serve the space and ventilation heating requirements of the building. Each boiler manufactured by Ray Burner Company of Canada has a rating of 80 Boiler horsepower and is original to the building. The original burners have been replaced with new Weisphaut model L5Z-E No. 2 oil burners (see Figure M-09, Appendix C). Each boiler is equipped with a dedicated chimney stack penetrating the mechanical room roof. Each boiler is equipped with a relief valve that is piped to a floor drain in the mechanical room.

Fuel storage consists of a 9,000 gallon oil tank located at the basement level. The oil tank is a single wall tank and is original to the building. The exterior of the oil tanks appears to be in good condition. The oil tank is surrounded by a concrete wall acting as a dyke in case of a leak.

A fuel pump set delivers oil to the 12th floor mechanical room. The Albany gear pumps appear to be in good condition. Drip pans are located below each fuel oil pump and at each burner and oil filter to catch any small oil leaks that may occur while serving these components (see Figure M-10, Appendix C).

Originally, the boilers also fed a shell & tube heat exchanger to serve the domestic water requirements of the building, but this system has been abandoned and replaced with 2-100 imp gallon electric domestic hot water heaters. (Giant Model 1122B-1-3 c/w 3000W input.) (see Figure M-11, Appendix C).

<u>Observations</u>

- Boilers are original to the building (circa. 1974). Thirty three years of service exceeds ASHRAE published service life for this type of equipment. We noted while on site, there is significant heat loss through the jacketing of the boilers, the insulation value of the jacket is low.
- Boiler controls are old, noted one boiler was generating 204F water temperature while the other was generating 221F water temperature.
- Return piping to boilers appears blackened and galvanizing on nearby ductwork has appears to have been scorched by high room space temperatures.
- Occupants on the Prince Street side of the Granville Street level reported oil fumes periodically in their space. It was noted the fuel oil system fill and vent connections are located on Prince Street below this location.

<u>Conclusions</u>

- The existing boilers age exceeds the ASHRAE published service life expectancy for this type of equipment; recommend this equipment be replaced with 2 new, hot water, gas fired boilers, each sized at 60% of the calculated heat loss.
- Provide new natural gas exhaust stacks, penetrating the roof of the mechanical room to the exterior of the building.
- Fuel oil storage tank is approx 33 years old. If no. 2 fuel was to continue as the fuel source, the existing oil tank should be removed

and replaced with new double wall fuel storage tank. Note the location within the building will not allow access to get the new tank to this location; therefore a new tank will be required at the exterior of the building. Therefore, given the availability of natural gas in downtown Halifax, we recommend the use of natural gas fired boilers which would eliminate the requirements for no.2 fuel oil storage for this building.

- Prior to the complete replacement of the existing boiler plant, we recommend the source of oil fumes detected on the Granville Street level along Prince Street be determined and corrected. At a minimum, seal all floor and wall openings at tank room.

3.5.3.2 Heating Distribution Systems and Terminal Units

Description

The hot water distribution system consists of 4 main heating circuits:

- One serves the 180/160 hot water circuit that delivers heating water to wall fin terminal units in various locations throughout the building (Hollis Street level, 12th floor and along the south exterior wall).
- One serves the requirements of the absorption chiller (see Figure M-12, Appendix C).
- One serves the induction piping circuit.
- One serves the perimeter air handling unit's heating coil.
- One had served the domestic water shell & tube heat exchanger. This circuit has been abandoned.

With the exception of Hollis Street level, level 12, and the south exterior wall (all floors), the perimeter of the building is heated (& cooled) through a 2-pipe, induction units located at floor level. Flow through each induction unit zone is modulated by a pneumatically controlled 2-way control valve, controlled by a space mounted pneumatic thermostat. Seven individual risers located at the building perimeter serve the induction units. A summer/winter changeover switches the entire induction system between heating and cooling mode.

Baseboard heaters are located in the office spaces on level 12 and the Hollis Street level. Baseboard heaters are also located along the south wall of the building, (2 rooms per floor). Electric baseboards are provided in the main washroom on each level. The electric baseboards are equipped with built in thermostats.

Observations

- Comments received from the building staff indicate the heating system is able to maintain acceptable space temperatures during the winter season. However several occupants on the Hollis street level commented that the space temperatures are cold at the perimeter of this level during the winter season. They observe considerable infiltration through the glazing at this level.

- Wall fin enclosure and fins are in need of repair/replacement on the Hollis street level (see Figure M-13, Appendix C).
- Pumps and trim appear original; it appears some pump motors have been replaced.
- Hot water system pipe insulation is damaged in several locations, both in the mechanical room and what is visible at the induction units along the exterior wall (see Figure M-14, Appendix C).
- Pneumatic control valves for the most part appear original.
- There is no relief valve on the make up water connection to the heating distribution system.
- The 2-pipe induction system can only be in heating mode or in cooling mode. This system does not have the flexibility required during times of the year when some exposures of the building require heating while other exposures require cooling. For example, during a sunny afternoon in the fall/spring the west side of the building may require cooling while the shaded east or south side may require heating because outside space temperatures are low. We would expect this has lead to comfort issues for the occupants and constant adjustments for the maintenance staff.

Conclusions

- The heating distribution system for the most part is original and remains fully functional; however these components exceed ASHRAE published service life expectancy and should be replaced with new.
- We would recommend a new primary secondary piping arrangement. The secondary circuits shall deliver hot water to the space heating terminal units and ventilation heating coils, while the primary circuit shall distribute hot water through the boilers and inject heat to the secondary circuits as required.
- The existing 2-pipe induction system shall be replaced with an alternative system for heating & cooling the building. The new heating terminal units will consist of radiant ceiling panels and where required wall fin radiation where a second stage of heat is required.
- New air handling units located throughout the building will be equipped with hot water heating coils as required to maintain acceptable supply air temperatures and space variable air volume (VAV) terminals will be equipped with hot water reheat coils.
- The existing electric domestic hot water heaters will be removed and replaced with new domestic hot water storage tanks, heated by the boiler water.

- A new hot water heating coil will be provided to serve the outside air heating requirements. Design will have to consider the use of propylene glycol/water for freeze protection.

3.5.4 Air Conditioning Systems

3.5.4.1 Cooling Equipment

Description

- A 250 TonR absorption chiller is located in the 12th floor mechanical room. The chiller is original to the building and serves the majority of the cooling requirements of the building. The heat source for the absorption process is the oil fired boilers located in the mechanical room. A dedicated hot water loop is fed to the absorption chiller (see Figure M-15, Appendix C).
- Chiller condenser water is connected to an outdoor rooftop cooling tower. The cooling tower is equipped with 2 fan motors to achieve 2 stages of capacity control. The cooling tower is original to the building (see Figure M-16, Appendix C).
- The 12th floor is equipped with a dedicated DX split system air conditioning system. The system consists of a indoor air handling unit located in the diesel generator room and an outdoor condensing unit located on the roof above with interconnecting suction gas and liquid refrigerant piping. The system has been in service for approximately 22 years (see Figure M-17 and M-18, Appendix C).
- The Vital Statistics tenant on the Hollis Street level is served by a split system DX air conditioning unit that is located on grade level on the south side of the building. The unit is located below a service stairway on the south side of the building. The unit and its fresh air intake are located very close to various sources of odors such as garbage storage bins, oil tank fill & vent, food odors from Rudy's and cigarette smoking areas (see Figure M-19, Appendix C).
- Water cooled air conditioning units (utilizing city water) are located in Rudy's, 5th floor server room and the 9th floor (see Figure M-20, Appendix C).

Observations

- Existing chiller age (33 years) has exceeded ASHRAE published life expectancy of this type of equipment.
- Cooling tower age (33 years) has exceeded ASHRAE published life expectancy of this type of equipment.
- The 5th floor water cooled air conditioning unit is a nominal 5-ton unit, therefore required approx 10gpm of city water to provide capacity required. If we assume the server room air conditioning requirement would have a 24 hour per day, seven days a week cooling requirement,

without regulation, the water usage would be 100,800 gallons per week.

- The 5th floor water cooled air conditioning unit supply air duct is not insulated. A film of condensation exists on the exterior of the ductwork.

Conclusions

- The main chilled water plant is original to the building. The 33 years of service exceeds the published life expectancy of the plant equipment. The existing absorption chiller requires the operation of the oil fired boilers. The low coefficient of performance (COP) of the existing chiller (COP=0.70 for a new absorption chiller) and the inefficiencies associated with the combustion of number 2 fuel oil has resulted in high consumption of energy by the existing chilled water plant. Given the age of the chiller plant equipment and high energy consumption, we recommend complete replacement of the chilled water plant.
- A new chilled water plant shall consist of the following:
  - We have calculated the cooling load for the building to be 300Ton, we recommend the installation of 2 new 150Ton, and water cooled liquid chillers. (The cooling capacity required for the renovated building will have to be confirmed once the occupancy, details of new building envelope is known.)
  - Each chiller will be equipped with a dedicated chilled water pump, providing a constant supply of chilled water through the plant primary loop. Secondary variable speed pumps shall deliver chilled water to the new air handling units cooling coils throughout the building.
  - New condenser water piping, including a new cooling tower. Cooling tower to be complete with a variable frequency drive to modulate capacity control and conserve Tower fan energy.
  - The new design should consider the installation of a new plate and frame heat exchanger to allow the building chilled water requirements to be served by the cooling tower (bypass the chiller) during times of the year when outside air conditions are suitable.
  - The new chilled water plant will serve the air conditioning requirements of the entire building with the exception of server rooms and the emergency measures “war room”. Server rooms will be provided with dedicated, critical environment computer room air conditioning systems and the war room should be provided with a dedicated split system air conditioning system.
- As indicated above, we recommend the removal of the domestic water cooled air conditioning systems;
- Split systems that serve the 12th floor and the Hollis street level are in poor condition and should be replaced. The air conditioning

requirements of the Hollis street level and the 12th floor should be served by the new chilled water plant.

3.5.4.2 Cooling Distribution

Description

Chilled water is distributed to cooling coils located in the perimeter and interior air handling systems by constant volume vertical inline pumps. Chilled water is also distributed to the 2-pipe, induction units located at floor level. The flow through induction unit is modulated by a pneumatically controlled 2-way valve, controlled by a space mounted pneumatic thermostat. Seven individual risers located at the building perimeter serve the induction units. A summer/winter changeover switches the entire induction system between heating and cooling mode.

In many locations the vapour barrier on the chilled water piping insulation has failed and the resulting condensation has damaged the insulation. This was especially noticeable at the main chilled water pump and pump trim located in the 12th floor mechanical room (see Figure M-21 and M-22, Appendix C).

Observations

- Comments received from the building staff indicate the cooling system is able to maintain acceptable space temperatures during the majority of the summer season, with the exception of the few extremely warm days of the year. During the month of July 2007 during the warmest weather, space temperatures were reported by maintenance to have reached a maximum of 77-78F.
- Chilled water and condenser water pumps and trim appear original.
- Chilled water system pipe insulation is damaged in several locations, both in the mechanical room and what is visible at the induction units along the exterior wall (see Figure M-23, Appendix C).
- Pneumatic control valves for the most part appear are original.
- There is no backflow preventer on the make up water connection to the chilled water and condenser water distribution systems.
- The 2-pipe induction system can only be in heating mode or in cooling mode. This system does not have the flexibility required during times of the year when some exposures of the building require heating while other exposures require cooling. For example, during a sunny afternoon in the fall/spring the west side of the building may require cooling while the shaded east or south side may require heating because outside space temperatures are low. We would expect this has lead to comfort issues for the occupants and constant adjustments for the maintenance staff.

Conclusions

- The cooling distribution system for the most part is original; the age of the system components exceed ASHRAE published service life expectancy. We recommend the cooling distribution system be removed in its entirety and replaced with new.
- The new cooling distribution system shall consist of the following:
  - Constant volume primary chilled water circuit with dedicated pumps serving new chillers.
  - Variable speed secondary piping circuit serving the cooling coils of new air handling units throughout the building.
  - New chilled water piping system, complete with new insulation and vapour barrier;
- Add backflow preventers to the domestic water connections to the chilled water and condenser water piping systems.

3.5.5 Air Handling Systems

3.5.5.1 Air Handling Equipment

Description

The main air handling equipment for the building is located in the mechanical penthouse adjacent the 12th floor. Supply (Primary) air is delivered to the perimeter induction units by a built up air handling system and distributed through a high pressure duct distribution system. Vertical risers located around the perimeter supply the individual induction units. The perimeter air handling system is equipped with constant volume supply and return fans, heating coil, cooling coil and filters. Fresh air is brought into the system via outside air louvers located on the south side of the mechanical penthouse.

Ventilation and air conditioning requirements of the interior core of the building is supplied by a built up air handling system and distributed by a low pressure duct distribution system. Two vertical supply air risers are served by this system, and are located on the east and west side of the main stairwell. The duct risers are branched off at the ceiling level and feed a duct distribution system in the ceiling space. The interior air handling system is equipped with a constant volume supply and return fan, cooling coil and filters. Fresh air is brought into the system via outside air louvers located on the south side of the mechanical penthouse.

The 12th floor of the building is served by a split system DX system. The air handling init is located above the diesel generator on the 12th floor and consists of a mixing box, filter section, DX cooling coil, hot water heating coil and constant volume supply air fan. A duct mounted steam dispersion tube is located in the supply air duct of this unit. The unit was installed in approximately 1985.

The outdoor air handling unit serving the Hollis Street level of the building is located on grade level on the south side of the building. The unit consists of a mixing box, filters, supply air fan electric heating coil and a DX cooling coil.

Observations

- The outdoor air handling unit serving the Hollis Street level of the building is located on grade level on the south side of the building. The location makes servicing of the unit difficult. The fresh air intake for this unit is located in close proximity to various sources of odours such as: garbage storage bins, oil tank fill & vent, food odours from Rudy's and cigarette smoking areas. Occupants in the Vital Statistics space have reported these odours in their space. It was also noted that light garbage appears in the duct distribution system, we noted paper material hanging out of one ceiling mounted diffuser on this level while we were on site (see Figure M-24, Appendix C).
- Sections of the penthouse mechanical room form part of the return air plenum. In order to service the any of the systems, the air handling units need to be shut down.
- The air handling systems serving the building exceed the ASHRAE published service life expectancy.
- The kitchen hood located in Rudy's Restaurant is ventilated by a roof top utility blower. This exhaust fan termination does not appear to comply with NFPA-96 and fan construction does not appear to meet the requirements of ULC762.

Conclusions

- The age of all the air handling systems serving the building exceeds the ASHRAE published service life expectancy should be replaced.
- The location of the air handling unit serving the Hollis Street level should be abandoned. The location does not allow proper maintenance of equipment and the fresh air intake is located too close to outside sources of odours.
- The new air handling systems shall consist of the following:
  - The outside air and exhaust air requirements of the building shall be served by a new air handling unit. The unit shall incorporate some form of heat/energy recovery that will transfer energy between the exhaust and outside air streams reducing energy consumption.
  - New design should consider incorporating some form of demand ventilation control and variable speed supply and exhaust fan operation to minimize energy consumption;

- The quantity of outside air will be determined during the detailed design. The outside air quantity shall, at a minimum, meet the requirements of ASHRAE 62-2004.
- The new unit shall be designed and operated to meet the filtration requirements of the DC-350.
- Outside air shall be delivered to each new air handling rooms located throughout the building. The building pressurization will be controlled by a combination of sanitary and general exhaust from each floor.

- Room adjacent Boiler Room is used as a return air plenum and is under negative pressure when fans are operating. Potential exists to draw contaminated air from Boiler Room into ventilation system if the wall and all penetrations are not sealed. Prior to the complete system replacement, we recommend the separation between the boiler room and the fan room be investigated and all penetrations sealed.
- The existing ventilation supply duct system shall be cleaned prior to the system replacement;
- Grease exhaust fan serving Rudy's shall be removed and replaced with an exhaust fan constructed to meet ULC762 and installed to meet the requirements of NFPA-96.

3.5.5.2 Air Distribution Systems

<u>Description</u>

The perimeter of the building is served by induction units located along the exterior wall, at floor level. High pressure duct distribution system deliver air to the induction units through several vertical risers located around the perimeter of the building. The high primary air is ducted through induction nozzles that create a negative pressure and "induce" air from the space to flow through the induction units coil.

The interior of the building is served by a low pressure duct distribution system that deliver air conditioning and ventilation air to ceiling mounted diffusers. Zone control is attempted through the use of bypass boxes. Space mounted thermostats divert cooling air to the ceiling cavity once supply air temperature is achieved.

<u>Observations</u>

- Excessive air noise at the perimeter induction units.
- Occupants have reported allergy type symptoms throughout the building.
- Interior of induction units is dirty. The design of this type of system results in air from within the space and around the induction unit to be re-circulated to the space. If this area is not kept clean, dirt, dust, etc

will be carried along with it and distributed to the occupant breathing zone (see Figure M-25, Appendix C).

- Induction units are complete with drain pans located below each coil. Drain pans are not piped to drain.
- In one location an unidentified white material was identified at the base of the induction unit cooling coil, see photos (Appendix C).
- Occupants store materials on top of induction units that impede the delivery of ventilation and air conditioned air (see Figure M-26, Appendix C).
- It appears in many locations that interior partition renovations have not included the appropriate ventilation system renovations. Results are that heating & cooling zoning has not been modified to suit new layout; airflow quantities to diffusers have not been modified and measured to ensure proper ventilation effectiveness. (On the 7th floor, one office does not have a supply air diffuser).
- Duct distribution systems should be inspected and cleaned if required.

Conclusions

- Recommend the induction style units be removed from service and replaced with an alternative system for heating and cooling the perimeter.
- The new ventilation & air conditioning, air distribution system would consist of the following:
  - New air handling units located throughout the building. Given the low floor to floor heights in this building, several air handling equipment rooms may be required to reduce the ceiling space requirements for the new duct distribution system. We have based our cost estimate on one air handling unit per floor;
  - The new air handling units will be equipped with variable speed supply and return fans, filtration to meet the requirements of the DC-350, hot water heating coil, chilled water cooling coil.
  - Supply air shall be distributed via a new ceiling duct distribution system. Zoning will be accomplished through the use of variable air volume (VAV) terminals dedicated to each office or thermally distinct zone. Space mounted temperature sensors will modulate the air flow delivered to each zone based on a comparison of space temperature and the space temperature set point.
  - The VAV box zoning will match the heating system zoning, preventing simultaneous heating and cooling within the zone, improving comfort, and reducing energy consumption.
  - We have based our cost estimate on the use of the ceiling plenum for return air path back to the air handling unit.
- The existing duct distribution system shall be cleaned prior to the major air handling system replacement.

3.5.6 Humidification Systems

3.5.6.1 Equipment

Description

An electric to steam humidifier is located in the 12th floor mechanical room. The unit is a Nortec Model MP-800, nominal 800lbs/hr low pressure steam, 61.2kW electrical input. The unit consists of two steam generating cylinders individually piped to air handling system (see Figure M-27, Appendix C).

The 12th floor air handling unit is complete with an electric to steam humidifier. The unit is piped to a steam dispersion tube(s) located in the supply air duct of this system;

Observations

- Low pressure steam piping in the mechanical room does not slope consistently back to humidifier. This results in inefficiencies associated with collection of condensate in steam piping.
- Could not confirm if an air gap/ back flow preventer is located on the domestic water supply to the humidifiers.
- No vapour barrier present in exterior wall construction. Mechanical humidification without a vapour barrier could migrate into the building envelope and condense on cold surfaces inside the envelope walls.

Conclusions

- Age of humidifiers exceeds the ASHRAE published service life expectancy for this type of equipment; we recommend these systems be replaced with new.
- New humidification system to be fully modulating with steam distribution located within the new air handling unit. In our cost estimating we have allowed for humidification system to be provided for the outside air handling unit only. The application of mechanical dehumidification assumes the building envelope renovation has included the addition of a proper vapour barrier.

3.5.7 HVAC Controls

Description

The building is equipped with a mixture of pneumatic controls and direct digital control system. The pneumatic system consists of two air compressors located at the top of the exit stairway adjacent the elevator machine room on the top floor of the building. The compressors are approximately 12 years old and appear to be in good working condition. Refrigerant driers, air receiver are all located in the 12th floor mechanical room (see Figure M-28, Appendix C). Most of the valve and damper actuators are equipped with pneumatic actuators. The space zone temperature control is through pneumatic thermostats controlling pneumatic control valves.

The direct digital control (DDC) system is a Siemens Buildings Technology Apogee controls system. The system consists of an operator's workstation that allows a graphical interface for maintenance staff with the HVAC system controllers. The operator's workstation also allows user access to the HVAC equipment programming, scheduling, monitoring and alarm notifications. The operators work station is connected to HVAC equipment controllers via a proprietary Siemens communication network.

The digital control system mainly controls the major pieces of mechanical equipment; the space zone control is still under the control of the pneumatic control system. The DDC system monitors the space temperature on each floor (at one location);

Observations

- The control system appears fully functional;
- Majority of the pneumatic actuators appear original;
- Graphical display for operator's workstation;
- Off site access to DDC is possible, however presently it is not accessed remotely;
- DDC system does not control space temperature;
- No demand control for ventilation system;
- Limited room for point expansion;
- System is proprietary protocol, additional expansion to the system cannot be competitively tendered;

Conclusions

- Although the existing controls system is fully functional, the existing pneumatic controls are outdated and the existing proprietary controls system has limited expansion capabilities.
- We recommend the existing controls system be replaced with a new non-proprietary, open protocol (BACnet) DDC system;
- The new controls system to include the provision for a new operators workstation with secure web based user interface.

3.6 Heating, Cooling and Ventilation Load Calculations

We calculated the heating, cooling and ventilation load requirements of the existing building for the purposes of comparing the installed HVAC system capacities with the calculated capacities. We utilized the Carrier Hourly Analysis Program (HAP) to calculate the building heating, cooling and ventilation system capacities. We combined site observations and a review of the original architectural construction drawings to determine the envelope characteristics of the building, namely exterior window and wall areas, building envelope construction, floor to floor heights, etc. We divided the building into 78 zones. Each floor was divided into north, north east, east, south east, south, south west, west and north west exterior exposures. The interior zones consisted of interior office space, stairs and elevators.

Ventilation Load Calculation:
ASHRAE Standard 62-2004 - Ventilation for Acceptable Indoor Air Quality, was used to determine the occupant density and the outdoor air requirement for the building. As stated in the RFP, we did not base our analysis on the present occupancy but the occupancy indicated in the current ASHRAE standards. Occupant density is dependant on the type of occupancy; these calculations are based on the published occupant density of 5 people per 1000sqft for an office space. For this building, this equates to an occupant count of 600 people. The standard indicates an outdoor air requirement for office spaces to equal the sum of 5.0cfm (cubic feet per minute) per person and 0.06cfm per sqft. Given the ventilation is delivered (warm) at floor level and returned to the ceiling space, a ventilation zone effectiveness factor of 0.70 was used. This resulted in an outdoor airflow requirement for the building of 14,894cfm.

Heating & Cooling Load Calculations
The Carrier HAP program analysis has indicated the following heating and cooling requirements for the building. See Appendix A for detailed summary of heating and cooling load calculations.

	Installed Capacity	Calculated Requirements
Cooling Load (Tons)[*1]	275 Tons [*3]	301.3 Tons
Heating Load (MBH)[*2]	4,283.4 MBH[*4]	3,890.6MBH
Outside Air Requirements (cfm)	15,800cfm[*5]	14,894cfm

[*1] Calculated cooling load is the building block peak load. Calculation indicates building peaks in July @ 1600h

[*2] MBH = 1,000 BTU/hr

[*3] Installed capacity based on 250Ton Chiller + 2 split systems totaling 25 Tons

[*4] Installed capacity based on 2, 80HP boilers at 80% efficiency

[*5] Installed capacity based on information received from Siemens that outside air damper set at 20% min position of total airflow (0.20 x 79,000cfm);

The results of the heating & cooling requirements appear to match the observations received from building staff. The installed cooling capacity is less than the required capacity; the staff has reported difficulty maintaining space temperatures during hot, humid, summer weather. The comparison of the installed heating plant capacity with the calculated heating load indicates the building heating system has adequate capacity to meet the building's heating requirement. There were some local complaints of a lack of heat, but they were a result of poor control and excessive infiltration at the exterior glazing.

The comparison of the building ventilation requirements versus installed capacity appears to indicate the building is receiving the required minimum outside airflow required by ASHRAE 62-2004. However, as indicated in the table, the existing outside air delivered to the building is based on a 20% outside air damper setting. We recommend the outside air quality delivered to the spaces be measured and confirmed by an air balance contractor.

3.7 Building Energy Costs

We collected electrical consumption and oil consumption data for the years 2005 & 2006. The following table summarizes this data

Year	Power Consumption (kWhr)	Oil Consumption (litres)	Total Energy Consumption (kWhr) *1
2005	2,064,827.0	309,043.7	6,247,074.3
2006	1,987,380.0	270,302.7	5,645,350.5
		Ave Annual Energy Consumption	5,946,212.4
		Ave Annual KWhr per sq ft	46.9

*1 Total energy consumption is the sum of kWhr power consumption and oil Consumption converted to kWhr. Applied 140,000 BTU/US gal no.2 fuel, 80% oil burner efficiency and 3412BTU/hr/kW

The annual energy consumption for this building at 46.9kWhr per sqft is high. A modern building designed to best practice standards would expect energy consumption in the range of 20-25kWhr per sqft. This building consumes approximately twice that amount. In 2006 the building energy costs were $216,621; energy costs for a best practice building should have cost $110,000 per year, roughly a $100,000 per year savings. We attribute the high energy consumption costs to the following factors:

- Poor thermal performance of building envelope. Extensive use of single pane glass, 1½" insulation (R-5.6) in walls, roof R-7;
- Poor efficiency of air conditioning equipment. Absorption chiller has a coefficient of performance (COP) of 0.70. Burning oil to generate hot water serving this chiller is 80% efficient reducing the overall COP to 0.56. In other words, for every unit of energy input, 0.44 units of energy go to losses. For comparison a new centrifugal chiller has power requirements in the range of 0.60 kW per Ton, which equates to a COP of 6.0, Roughly 8.5 times more efficient than the existing chiller. In 2006 between the months of June to September the building consumed 70,032 liters of oil or 758,187kWhr of energy. The new chiller would have consumed 89,200 kWhr of energy over the same time frame (savings of 668,988 kWhr of energy);
- Ventilation systems do not employ energy recovery methods. Several types of heat recovery are possible, most types can recover 50 -60% of the heating energy required to heat outside air;
- Pumps and fans are all constant volume, use of variable speed pumping and fans could further reduce energy use;

3.8 Electrical Systems

3.8.1 Service Entrance and Distribution

3.8.1.1 Description

The electrical service enters the building via a 25kV underground cable from Granville Street. This cable terminates in an NSPI owned utility vault located in the basement of the building. The vault contains two step-down transformer banks that each provides a different secondary voltage: 600/347V, 3-phase, 4-wire and 208/120V, 3-phase, 4-wire. At present, there are three (3) electrical services that enter the building's main electrical room from these transformers in the NSPI vault. These services are as follows:

.1 Three (3) bank, 75kVA, 23kY- 208/120Y connected step down transformers located in the NSPI vault to a 120/208V, 800A switchboard (refer to Figure E-1, Appendix D for the switchboard).

.2 Three (3) bank, 250kVA, 23kY- 600/347Y connected step down transformers located in the NSPI vault to a 600/347V, 800A switchboard (refer to Figure E-2, Appendix D for the switchboard).

.3 The same three (3) bank, 250kVA, 23kY- 600/347Y connected step down transformers also feeds a 600/347V disconnect switch and 600/347V distribution panel that feeds Vital Statistics (refer to Figure E-3, Appendix D panel and main switch).

Revenue metering is performed on the high voltage primary side of the vault. The meter (NSPI Meter # 339194) is located in the main electrical room (refer to Figure E-4, Appendix D).

The 120/208V switchboard feeds all the buildings office area and Rudy's coffee shop but excluding Vital Statistics. From this switchboard there is a 120/208V, 400A feeder that provides power to floors two (2) through to twelve (12). This Level 2 to Level 12 floor riser feeds a 400A panel on each floor adjacent to the elevator lobby. The riser enters into the panels at the bottom via "feed through" type lugs, this allows the feeder connection to continue to the next floor. This is typical up to Level 7, where a splitter has been installed rather than the feed through lugs. This power riser feeds the majority of the power to the building offices (refer to Figure E-5, Appendix D).

The 600/347V switchboard feeds the majority of the building lighting and the mechanical building loads such as air handling equipment, pumps and fans. The lighting is fed from a 347/600V power riser that is similar to the 120/208V, 3-phase system with the feed through lugs. The mechanical equipment is fed from a separate circuit from the 347/600V switchboard to a splitter in the penthouse boiler room.

Both power and lighting risers enter and exit through an electrical closet located in the public corridor on the floors of the building. The electrical panel located in these electrical closets provide the branch circuits to each individual floor.

Vital Statistics is fed separately from the electrical service mentioned in the description above. The 600/347V 3-phase supply is further stepped down to 120/208V, 3-phase from a dry type transformer located in the main electrical room.

3.8.1.2 Observations

The original electrical distribution equipment has been replaced in the main electrical room. There is evidence on site and on the as built drawings that a bus duct system originally fed both the 120/208V and 600/347V power risers. These risers are now fed with single conductor armoured cables.

All distribution equipment located in the main electrical room appears to be in fair physical condition. There were no visible signs of excessive wear or corrosion. Cabling runs also appeared to be in good condition with no apparent deficiencies.

The incoming service capacity in the utility vault appears to be adequate based on the peak demand history over the past 2 years (480 kW). We have recorded some measurements on the 600/347V switchboard and the 120/208V switchboard and have found that an excessive portion of the building demand is fed from one circuit breaker in the 120/208V switchboard, specifically, the 400 amp power riser. This feeder has exceeded its maximum allowable demand.

The electrical equipment in the electrical closets appeared to be in fair condition. There is a shortage of available circuit breakers in the electrical closet panels to feed the required circuits to the office areas. This is requiring the sharing of circuits amongst several workstations. As well, it was observed that in several of the tenant lunchrooms, that circuits were being shared for multiple appliances, such as refrigerators, water coolers and microwaves. This leads to overloading of circuits resulting in nuisance tripping of circuit breakers.

3.8.1.3 Conclusions

Overall condition of the electrical distribution system and service entrance equipment appears to be fair condition. There are however, excessive loading issues on the 120/208V power riser, as well as inadequate branch circuits for the required office equipment.

We recommend reducing the load on the 120/208V riser and installing additional branch circuits as required. If a renovation is in the future, we recommend the entire replacement of the distribution system, such that it meets today's code requirements, as well as designed better to today's occupancy requirements.

3.8.2 Emergency Power System

3.8.2.1 Description

The emergency power system in the facility consists of an 88kW diesel power generator (refer to Figure E-6, Appendix D), a 100 Amp, automatic transfer switch (ATS) (refer to Figure E-7A, Appendix D) and a splitter feeding the emergency loads (refer to Figure E-8, Appendix D). The emergency power system feeds critical life safety equipment such as the reserved fire fighter elevator, fire alarm system, and emergency lighting.

The fuel for the genset is from a 25 gallon tank located on the exterior wall of generator room (Refer to Figure E-7B, Appendix D).This tank is kept full from the main diesel tank on the lower level which supplies fuel mainly for the building's boiler plant. The fuel is delivered from the main tank through a fuel pump.

3.8.2.2 Observations

Overall, the emergency power system appears to have been maintained and in satisfactory condition: however, the engine of the genset is beyond its anticipated life expectancy. As indicated in the emergency power assessment report, the emergency power system has been used to feed additional non life safety systems. This is an acceptable practice if adequate capacity is available to operate the life safety equipment. However, this is not the case and the emergency power system capacity has been exceeded.

3.8.2.3 Conclusion

The genset is past its life expectancy and has loading added beyond the designed capacity range. We recommend replacing with a new system. Refer to Appendix G for a report of an assessment of the emergency power system. Please note that the costs in that report are superseded by this report due to the allowance of a future fire pump requirement if the building is renovated.

3.8.3 Lighting

3.8.3.1 Description

The majority of the building floor areas are lit with 4 –lamp, T12 linear fluorescent light fixtures. The elevator lobbies and entrance areas are lit primarily with incandescent recessed potlight with integral ballasted fluorescent lamps and some recessed linear fluorescent T8 light. There is no apparent exterior building lighting outside of the entrance canopies. The lighting is generally fed from the 600/347V power riser. Some lighting in office areas has been replaced with 120V lighting and therefore is fed from the 120/208V power riser (refer to Figures E-9 and E10, Appendix D for typical office lighting).

Floor area lighting is controlled by one group of 4 switches located at the entrance doors to the lease spaces. There is no individual lighting control in offices, with some exceptions throughout (refer to Figure E-11, Appendix D). The as-built drawings do not indicate whether these switches are line-voltage switching or low voltage with relay panels.

3.8.3.2 Observations

The T12 light fixtures installed are inefficient and an old technology. Several fixtures had burned out lamps, some with missing lens and missing lamps. After some random discussions with tenants, some of the lamps were removed due to no individual office lighting controls to reduce excessive lighting levels. Our site visit confirmed that the existing light control system is low voltage with relay panels.

There is an abundance of natural light entering the building from the nearly full floor to ceiling high windows throughout the floor area. The existing lighting control does not take advantage of this resulting in wasteful and expensive energy usage.

Public corridors and exit stairwells were observed to have adequate lighting levels as required by the latest edition of the NBCC and IESNA. Approximately measured at 60 lux, this is about 15% above the code requirements.

3.8.3.3 Conclusion

We recommend that the entire lighting system in the facility be replaced or retrofitted with newer technology lamps and ballasts.

The existing light controls are inadequate and we recommend incorporating new controls that would take advantage of the natural daylight and one that would turn lights out in unoccupied areas not required.

3.8.4 Emergency Lighting/Exit Lighting

3.8.4.1 Description

The building is equipped with lighted exit luminaries located throughout. They are lit with incandescent lamps. They are fed from a dedicated circuit provided by the emergency power system. The emergency lighting consists of linear fluorescent and incandescent potlights fed from the emergency power system. Emergency lighting has been installed in the West and East exit stairwells and in the public washrooms.

3.8.4.2 Observations

The exit signage locations in the floor areas are inadequate and are not C860 compliant. There was several areas on most floors that were noted as having no exit luminaire in visible range.

The exit luminaires appear to be original and most were in working condition with a few burned out lamps. However, they are showing signs of their age with the plastic enclosures fading. Refer to Figure E-12, Appendix D.

There is inadequate emergency lighting provided. The elevator lobbies and the office areas are part of the required egress path and have no emergency lighting with exception to some emergency lighting observed on the 6th level office area.

3.8.4.3 Conclusion

There is not enough emergency lighting or exit signage in this facility. We are recommending the installation of additional emergency lighting in the dedicated egress paths out of the office areas and in the public corridors. This could be the addition of battery units or additional lighting fed from the emergency power system.

3.8.5 Receptacles

3.8.5.1 Description

U-grounded, duplex receptacles are installed throughout the building. Receptacles are recessed with the exception of the receptacles installed in the boiler room and other mechanical spaces, which are surface mounted. Receptacles all appear to be grounded.

3.8.5.2 Observations

Receptacles appear to have been replaced recently and are in good condition. They are grounded and all but one receptacle tested ok. This was a random check on sample floors.

It was noted that there was insufficient quantities of receptacles and circuits to feed the necessary office equipment. As a result there are several areas that require extension cords and multi-outlet arrangements to provide the required connections. This may result in overloaded circuits and nuisance circuit breaker tripping (refer to Figure E-13, Appendix D).

3.8.5.3 Conclusion

Overall condition of the receptacles is good. There are however, insufficient quantities of receptacles. We recommend the addition of more receptacles and circuits to avoid the use of extension cords.

3.8.6 Branch Wiring

3.8.6.1 Description

Wiring system appears to be a combination of AC-90, TW cabling installed in EMT conduit, and jacketed, armoured cabling. Conduit is generally used for wiring in unfinished service rooms.

3.8.6.2 Observations

Wiring appears to have been replaced recently and appears to be in good condition. We did notice that most AC-90 cables were not properly supported in ceiling spaces and were lying on the ceiling tiles. Also, there was some evidence of redundant cabling and junction boxes not supported and with missing covers (refer to Figure E-14, Appendix D).

Branch circuits feeding the genset fuel pump in the basement and the dedicated fire fighter's elevator are required to have a fire separation from the building. This was not the case observed. Also, a circuit breaker lock is required on the circuit feeding the fire alarm panel.

Branch circuit wiring associated with the mechanical equipment in the boiler room is accomplished through a splitter and a series of fused disconnect switches feeding each individual piece of equipment. This equipment appears to be original but in relatively good condition. Refer to Figure E-15, E-16, and E17, Appendix D. The arrangement of this equipment is difficult to follow due to little labelling of switches. Also one splitter feeds one splitter and that splitter feeds another. This is not necessarily a code violation, but rather resulting in a disorganized, confusing configuration for maintenance. It was observed that there was wiring from different power systems mixed in the same raceway systems. This is a violation of the Canadian Electrical Code.

3.8.6.3 Conclusion

Branch circuiting office equipment is inadequate. This has resulted in the use of temporary extension cords throughout (refer to Figure E-13, Appendix D).

The branch circuit wiring overall was in good condition, but we recommend providing supports to the ceiling to remove cabling from the ceiling tiles and junction boxes should be supported and covers replaced. Branch circuits feeding the fire fighter's elevator and genset fuel pump are required to be fire separated from the rest of the building.

The branch circuit wiring from different power systems should be installed in a separate raceway system. If a building renovation is in the future, we recommend removing all branch circuit wiring and replacing with new.

3.8.7 Fire Alarm System

3.8.7.1 Description

The Fire Alarm panel is an Edwards 6500 Series System. It is a fully supervised, single stage, multiple zone, non-addressable system monitoring all initiating devices. The panel is located inside the main electrical room and an annunciator panel is located on the Granville St. Entrance to the building (refer to Figure E-3, Appendix D for the main fire alarm panel and E-18, Appendix D for the annunciator). There is a limited voice communication system that uses bells for the general area alarm and voice communication in the corridors and elevators for voice instructions.

3.8.7.2 Observations

The fire alarm system is original therefore, approximately 30 years old. Wiring where observed was installed in EMT raceway which is an acceptable method.

The latest edition of the NBCC requires a high rise building to have a 2 – way voice communication system with speakers throughout the entire floor areas. This fire alarm system has limited voice communication and would not meet this NBCC requirement.

There are several areas throughout the floor areas that may have inadequate fire alarm bells. The NBCC requires a minimum of 10dBA above the ambient noise level throughout the floor area. We recommend having the existing system tested to confirm this requirement is met.

No visual signal alarms were apparent throughout the building. We recommend the installation of visual alarms for aiding any hearing impaired occupants.

No smoke detectors were installed in the exit stairwells. For a high rise building, a smoke detector is required on every third level in all exit stairwells.

The NBCC requires a minimum of 24hours of supervisory power in addition to the emergency power system. The previous fire alarm test report does not indicate any testing of integral batteries. We had contacted the maintenance company and they could not confirm if there was sufficient battery back up. Therefore, we recommend having this confirmed.

Also, it was observed on a test report dated September 9, 2006, performed by Edwards (refer to Appendix G for the emergency power report). This report noted that certain fans are required to be shut down on detection of smoke in the ductwork. This feature has been disabled.

3.8.7.3 Conclusion

The fire alarm system in this facility is original and has not been manufactured in years. It does not appear to have any functional issues based on the original installation. However, it is deficient in several of the requirements of the present code requirements. As well, there may soon be issues with obsolete part replacements due its age. Therefore, we recommend that it be replaced.

3.8.8 CATV & Telecommunication Systems

3.8.8.1 Description

The building telecommunication system enters the building in the main telecom closet located in the basement adjacent to the main electrical room. This is provided by Aliant and consists of a fiber optic cable.
The backbone cabling appears to be original and consists of a multi-pair voice cabling that terminates in telecom closets on each floor. All tenants appear to have their own independent data/voice system. There is also CATV cabling used for IT and cable television.

3.8.8.2 Observations

Each government department has their active switching equipment contained within the telecom closets located in the corridor. The horizontal cabling runs from the telecom closets to the work stations. The telecom closets are very congested with the added data components. Also, there is no ventilation in the closets creating a less than ideal environment for this equipment. Refer to Figure E-19, Appendix D.

The Department of Health is the exception with a dedicated air conditioned IT room within the floor area (Figure E-21, Appendix D). It has also, a dedicated branch circuit panel fed from an uninterruptible power supply (UPS) (Figure E-20, Appendix D). The horizontal cabling was plenum rated Cat5 run free air through the ceiling space. We did observe that several cables were not properly supported and were laying on the ceiling tiles.

3.8.8.3 Conclusion

Overall, we did not identify any major deficiencies in the telecommunication system installation or performance. However, it is somewhat disorganized in structure with several of the active switching equipment jammed into inadequately ventilated closets. Consideration should be given for a completely new structured cabling system using the Star topology, as well as dedicated space for proper equipment layout and adequate ventilation provided.

3.8.9 Security Systems

3.8.9.1 Description

There is an access control system that controls access to the Granville St side of the building during after hours. Refer to Section 6 for a full description.

3.8.9.2 Observations

The power to the security system was fed from the normal power system. Therefore, during a power outage, there is a potential that the access control system could disable door locks. There were discussions between Universal Properties and Department of Health to rectify this. This work may still be ongoing.

3.8.9.3 Conclusions

The only electrical deficiency noted is the potential security breach that may exist during a loss of normal utility power to the building after hours, resulting in disabled door locks. We recommend installing a battery back up system to cover short duration outages and connecting the system to the emergency generator for longer duration outages.

4 Building Codes Review

National Building Code of Canada 2005 Edition
Nova Scotia Building Code 2006 Edition

A building code review was carried out by visual inspection of the building elements and review of available existing design drawings. The drawings were reviewed only for construction details pertaining to makeup of interior walls and fire separations and travel distances, etc.

Fire resistance ratings were obtained from notes on the drawings and verified where possible from manufacturer’s data and NBC Appendix A, Table A-9.10.3.1.A Fire and Sound Resistance of Walls.

No cutting or testing of any interior walls or separations were carried out.

4.1 Occupancy Classification

This building falls under Division B, Part 3 of the NBC.

Major occupancy: Table 3.1.2.1.
Group D, Business and Personal Services occupancy; Section 3.2.2.49, Group D. any height, any area.

Building area: typical floor plate area = 10,000 ft^2 (929.00 m^2 ±)

Hollis and Granville Street floor plate areas are less.

Building height in storeys: from Hollis Street 13 storeys. Building height in feet from Hollis Street to 12^{th} floor level = 138’-11”± (42.3 m ±), from Granville Street level to 12^{th} floor level – 127’-3” ± (38.8 m ±).

NBC Section 3.2.6, Additional Requirements for High Buildings requires all buildings for this group that are more than 36 m (118’-13/8”) from grade to top floor level to meet the requirements of this section. This building does not meet the requirements of this section.

Under NBC Section 3.2.2.49, building must meet the following requirements:

1. Building must be of non-combustible construction.
2. Building must have a sprinkler system throughout the building.
3. Floor assemblies must have a fire resistance rating of 2 hours.
4. Mezzanines must have a fire resistance rating of 1 hour.
5. All load bearing columns, walls and arches shall have fire resistance not less than that required for the supported assembly.

This building appears to meet the requirements of this NBC Section with the exception of the fire rating of concrete floor slab. Refer to Structural Section 3.4.

4.2 Fire Separations

1. Public Corridor Separations
   Under the NBC, a *public corridor* is defined as "a corridor that provides access to exit from more than one *suite*.

   Suite is defined as "a single room or series of rooms of complementary use operated under a single tenancy….etc. and in Appendix A-A.1.1.3.2, Suite states "….the term suite is not normally applied to buildings such as schools and hospitals since the entire building is under single tenure.

   This building is under single tenure and therefore, there are not "suites" or "public corridors".

   If the elevator lobby and corridor on each level is considered an access to exit only, then the present walls around it meet the requirements of the NBC.

   If the elevator lobby and corridor on each level is considered a "public corridor", then the partitions between it and the office spaces do not meet the requirements of Section 3.3.1.4(3). the present partitions extend only from the floor to the underside of the ceiling and not to the underside of the structure and therefore, do not meet the requirements of an "unrated" fire separation.

2. Fire Separation of Exits
   NBC Section 3.4.4.1, requires the fire separations around exit to be the same as the floor assembly above the storey….
   In this case 2 hours.
   The present exit enclosure appears to meet his fire rating.

3. Exits Through Lobbies – NBC 3.3.4.2
   One exit stairway exits through the lobby on The Hollis Street level and appears to meet the requirement of this section.

4. Integrity of Exists, NBC 3.4.4.4
   The building does not conform to this section of the NBC for the following reasons:
   1. Washrooms on most floor open into exits.
   2. Service rooms on Level 11 and 12 open into exits.

3. Mechanical equipment, fans and air compressors are located in the exit on Level 12.
4. Ducting passing through exit on Level 12 is not equipped with fire dampers.

4.3 Types of Exit Facilities, NBC 3.4.6

The existing exit facilities (i.e., stairway) appear to meet the requirement of the NBC with the exception of 3.4.6.7 treads and risers. Existing treads and risers do not meet the requirement of the NBC Section.

4.4 Fire Separation of Elevator and Service Shafts

Table 3.5.3.1 – Building does not meet the requirements of this table. Based on drawing review, elevator shaft appears not to meet the 2-hour fire rating required.

4.5 Continuity of Fire Separations, NBC 3.1.8.3

The fire separation in this building appears to meet the requirements of this section. However, penetrations of concrete floor slabs between basement level and Hollis Street level were observed that appeared not to have been fire stopped.

4.6 Vertical Service Space Separations, NBC 3.6.3.1

Unable to determine.

4.7 Mezzanines and Interconnected Floor Spaces

The only areas that are classed as mezzanines in this building are the Elevator Machine Room and Service Rooms above Level 12. These rooms appear to meet the requirements of the NBC Section 3.2.8.1.

There are two areas in this building that are considered “interconnected floor spaces”. The first, Hollis and Granville Street levels, are penetrated by a stairway located within the Vital Statistics Department. This stairway penetration appears to meet the requirements of NBC Section 3.2.8.2(6). The second, Level 11 and Level 12, are penetrated by curved stairway that serves as the main access to Level 12 (the elevators do not extend to Level 12). This stairway terminates at an enclosure on Level 12. This enclosure has wood framed glazing and a wooden door in a wooden frame with no label indicating a fire rating and therefore, this space does not meet the requirements of NBC Section 3.2.8.2(6).

4.8 Fire Separations Around Service Room, NBC 3.6.2

The Service Rooms in the building appear to meet the requirements of NBC Section 3.6.2.1.

The building contains an electrical vault that is only accessible by Nova Scotia Power staff. No review was carried out.

The building contains an emergency generator on Level 12 and its enclosure and room do not meet the requirements of NBC Section 3.6.2.8 and 6.

4.9 Elevator Machine Room Separation, NBC 3.5.3.3

The Elevator Machine Room appears to meet the requirements of this section.

4.10 Closures in Fire Separations, NBC 3.1.7

All closures (doors and frames) in a fire separation require a label indicating what fire rating the closure is rated for. All closures in this building have received many coats of paint and no labels were visible. However, all closures in fire separations are hollow metal doors in steel frames and by default this should provide the required fire rating. Visible duct penetrations in fire separation appear not to be equipped with fire dampers (refer to Mechanical Section).

On Level 12, in the corridor that serves as access to exit in front of the elevator core, there are openings through the Level 12 floor slab and directly above it through the Elevator Machine Room floor slab. The closure for these openings are steel plate and appear not to meet the required 2-hour fire separation.

4.11 Number of Exits, NBC 3.4.2

The building appears to meet the requirements of this NBC section.

4.12 Interior Finishes in Building, NBC 3.1.5.10 Combustible Interior Finish

The finishes in this building appears to meet the requirements of this NBC section.

4.13 Conclusion

No review of the Building Code of the day (NBC 1970 Edition) was carried out to determine if the building was constructed in accordance with that edition of the National Building Code.

Based on the review for compliance to the latest edition of the National Building Code, the following non-compliant areas were observed:

4.13.1 Building does not meet the requirements of NBC Section 3.2.6 "Additional Requirements for High Building".

4.13.2 Review of existing Structural Drawings indicates that the concrete cover on the rebar in the concrete floor slabs is not sufficient to provide the required 2-hour fire separation.

4.13.3 The building does not meet the requirements of NBC Section 3.4.4.4 "Integrity of Exits".

4.13.4 The exit stairway rise and run dimensions do not meet the requirements of NBC Section 3.4.6.7.

4.13.5 The elevator shaft does not appear to meet the required 2-hour fire separation.

4.13.6 The enclosure around 11/12 levels circular access stairway does not meet the required fire separation.

4.13.7 The room containing the emergency generator does not meet the requirements of NBC Section 3.6.2.6 and 3.6.2.8.

During the recapitalization plan, all renovations and modifications would have to meet the latest Building Code requirements. With regard to the issue of exit stairway rise and run, the Halifax Regional Municipality Development Department prefer to maintain the existing situation unless there are major changes to the building use and occupancy.

With regard to the concrete cover of steel reinforcing in the floor slabs, the authorities having jurisdiction view this as meeting the code of the day and, therefore, do not require changes.

5 Barrier Free Accessibility

Section 3.8 Barrier Free Design of the Nova Scotia Building Code and CSA Standard B651-04 Accessible Design for the Built Environment were used as guidelines for review of the barrier free accessibility of this building.

5.1 Description

This building is sited between two streets, Hollis and Granville, and bounded on one side by Prince Street. The adjacent sidewalk on Prince Street slope steeply up from Hollis Street to Granville Street. Access to the building is through one entrance on Hollis Street via six steps and one entrance from Granville Street via four steps. Wheelchair access to this building is achieved from Prince Street, whereas Prince Street rises from Hollis Street to Granville Street, the rise in the sidewalk allows level access from Prince Street to the landing at the Hollis Street entrance. The doors at this level are power operated and allow barrier free access to the building. Each occupied floor level of this building is barrier free accessible by use of the elevators. However, access to Level 12 from Level 11 is through a restricted use (keyed entry) wheelchair lift. There are public washrooms on each level of the building, some of which have been modified to provide a barrier cubicle.

5.2 Observations

All levels of this building, except the basement area, are required to be barrier free accessible and in general, they conform to this requirement.

At each entrance, the existing handrails and guards do not meet requirement for barrier free design. There are no warning surfaces at the edge of the tops stair on the exterior landings at both entrances.

After hours access to the building is via the Granville Street entrance and this entrance does not permit wheelchair access.

No wheelchair signage was visible at the wheelchair accessible entrance.

All interior spaces appear to meet the minimum width requirements for barrier free accessibility with the exception of most public washrooms. Most public washrooms are not barrier free. However, modifications to the women's washrooms on Levels 3, 4, 6 and 10 and the men's washroom on Levels 4, 6 and 10 have created a barrier free toilet stall. The vanities in these washrooms have not been modified to meet barrier free requirements.

The elevator control buttons have Braille indicators.

5.3 Conclusions

Generally, access to and from space within the building can be considered barrier free, with the exception of some of the washrooms, handrails and signage.

When the building is completely renovated during the recapitalization plan, requirements for barrier-free accessibility will have to be incorporated into all the renovations.

6 Building Security

6.1 Description

During regular daytime office hours, this building is open to the general public and as such, the public have access to all office levels, Hollis Street through Level 12. However, entrance to the individual office spaces on each level is restricted and security is provided by a keypad operated door lockset, or a digital keypad. Some departments control access through a receptionist and security doorway. The Department of Health also relies on a “Sign-in/Sign-out” system for visitors.

On the Granville Street level, there is a commissionaire who provides more of a directory service. After hours, access is restricted to access through the Granville Street level. These doors are opened with a proxy card and reader. All other security is provided by keyed locksets.

The interior of the building is also monitored on selected floors by a CCTV system. During our site inspection of this building, it was obvious that building staff and office staff are very security conscious.

6.2 Observations

Discussion with the building custodial staff indicated the present door lock key pad system functions with very few problems. The CCTV monitoring system provides observation points at strategic locations throughout the building.

6.3 Conclusions

Keypad operated security door locks provide a very low level of security as code numbers can be passed to unauthorized people. A receptionist at secure door provides a slightly better level of security and CCTV systems and commissionaires provide about the same level of security.

Security in this building is minimal at best.

It is strongly recommended that a security plan for the entire building be developed and a more secure system be used to restrict access to the building.

7 Cost Estimates and Building Description Checklists

BUILDING COSTS
SUMMARY SHEETS

DESCRIPTION	COST ESTIMATES	
	Immediate Repairs	Building Renovation
ARCHITECTURAL/STRUCTURAL	$ 66,700	$ 7,758,800
MECHANICAL	$ 73,000	$ 6,390,000
ELECTRICAL	$ 228,000	$ 3,805,000
TOTALS	**$ 367,700**	**$ 17,953,800**

ITEM NO.	DESCRIPTION	COST ESTIMATES	
3.2	ROOF	Immediate Repairs	Building Renovation
	Chimney Stacks: ▪ 4 Guy wires rusted off. ▪ 5 Guy wires partially rusted, check. ▪ Check caulking and base flashing	 $ 4,000 $ 5,000 $ 200	
	Exhaust Fan (by chimney): ▪ Minor rusting ▪ Wood curbs rotted	$ 1,000	
	Elevator Upstand Flashing: ▪ Elevator upstand flashing requires repairs ▪ Minor insulation exposure ▪ Exposed membrane ▪ Fascia hanging loose	$ 2,000	
	Air Handling Unit: ▪ Piping support to the unit requires repositioning	$ 500	
	Wood Curb Upstand: ▪ Wood curb upstand is totally rotted off ▪ Metal counter flashing falling off ▪ Insulation slightly exposed and possible UV exposure to the roof membrane	$ 2,000	
	Diesel Generator Exhaust Pipe: ▪ Two (2) brackets, one (1) bolt missing from each	$ 500	
	Exhaust/Intake Louvre: ▪ Repair masonry and insulation infill around the frame	$ 500	
	Northeast Corner: ▪ Major wind scouring of gravel ballast. Install concrete pavers	$ 3,000	
	Southeast Corner: ▪ Minor wind scouring of gravel ballast	$ 500	
	Roof Drains: ▪ Three (3) roof drains. Two (2) have UV broken down plastic strainers. Replace two (2) broken one and one (1) missing one (Photo 527) ▪ Also reinstall weir of control flow as it is loose	$ 2,000	
	Parapet Cap Flashing: ▪ Minor rusting of the parapet cap flashing. Scrape, prime and re-paint	$ 1,000	
	Vent Stacks: ▪ One un-insulated ▪ One lead capped ▪ No indication of leaking	$ 1,000	
	Access Ladder: ▪ Minor holes in cap flashing	$ 1,000	
	Corner Junction: ▪ Minor exposed insulation	$ 500	
	Exterior light above the door: ▪ Masonry infill required	$ 500	

ITEM NO.	DESCRIPTION	COST ESTIMATES	
3.2	ROOF	Immediate Repairs	Building Renovation
	Door Thresholds: ▪ All door thresholds and weather stripping should be replaced, as well as the door top caps	$ 500	
	Roof replacement with 2 ply modified bitumous membrane increase R-values		$ 170,000
	ROOF SUBTOTALS	$ 25,700	$ 170,000
3.3	BUILDING ENVELOPE	Immediate Repair	Building Renovation
	Metal siding (new Penthouse)		$ 50,000
	Aluminum curtain wall, entrances glazing		$ 4,220,000
	Replacement of flush glazing system	$ 25,000	
	BUILDING ENVELOPE SUBTOTALS	$ 25,000	$ 4,270,000
3.4	BUILDING INTERIORS	Immediate Repairs	Building Renovation
	Interior demolition		$ 331,800
	Structural modifications, Penthouse and elevator machine extension		$ 314,000
	Masonry and repointing		$ 60,000
	Interior finishes, doors, millwork and specialties		$ 1,824,000
	Main lobby finishes allowance		$ 60,000
	Elevator refit and extension		$ 729,000
	BUILDING INTERIOR SUBTOTALS		$ 3,318,800
3.5	STRUCTURAL	Immediate Repairs	Building Renovation
	Install new trimmers at roof deck opening	$ 5,000	
	Repair spalled concrete on Granville Street ramp	$ 10,000	
	STRUCTURAL SUBTOTALS	$ 15,000	
	ARCHITECTURAL/STRUCTURAL TOTALS	$ 66,700	$ 7,758,800

ITEM NO.	DESCRIPTION	COST ESTIMATES	
		Immediate Repairs	Building Renovation
3.5.1	Plumbing system renovation:		
	▪ New plumbing fixtures		
	▪ New domestic hot and cold water piping		
	▪ New above ground sanitary and storm piping and insulation		
	▪ New water booster system		
	New Plumbing Renovations		$ 1,100,000
	▪ Remove direct connection of sprinkler main to sanitary sewer	$ 5,000	
	▪ New backflow prevention devices on chilled water, condenser water, heating system piping	$ 3,000	
3.5.2	New fire protection renovation:		
	▪ New risers, distribution and heads		
	▪ New fire hose connections in stairs		
	▪ New electrical fire pump		
	New Fire Protection Renovations		$ 320,000
	▪ Clean agent fire suppression systems for 3 server floors		$ 75,000
3.5.3	New Heating system renovation:		
	▪ New natural gas boilers (2 @ 60% gas)		
	▪ New natural gas from street to 12th floor		
	▪ New exhaust stacks		
	▪ New heating distribution		
	▪ New heating terminal units		
	▪ New glycol heat exchanger and piping		
	New Heating Renovations		$ 1,600,000
	▪ Investigate fuel oil smells at Granville level, seal wall and floor openings	$ 5,000	
3.5.4	New air conditioning system:		
	▪ New chillers (2 @ 150 ton)		
	▪ New cooling tower, complete with VFD		
	▪ New condenser water piping		
	▪ New chilled water piping and pumps		
	▪ New chilled water waterside economizer heat exchanger		
	New Air-Conditioning Renovations		$ 655,000
	▪ New split system for "War Room" (5 ton split AC system, complete with outdoor condensing unit)		$ 20,000
	▪ New critical environment air conditioning system for server rooms (1 larger server room, 8 ton, 2 smaller server rooms 3 ton each)		$ 70,000

ITEM NO.	DESCRIPTION	COST ESTIMATES	
		Immediate Repairs	Building Renovation
3.5.5	Air handling system: ▪ Complete demolition of existing air handling systems, including distribution (cost included in item) ▪ Air handling system renovations: - New outside air heat recovery and air handling unit - New outside air and exhaust air duct distribution - New chilled water air handling units per floor - New duct distribution, complete with VAV box distribution (25 VAV boxes per floor)		
	Air Handling System Renovations		$ 1,750,000
	- Replace Rudy's exhaust fan	$ 10,000	
	- Clean existing supply air duct distribution	$ 50,000	
3.5.6	New Humidification System		$ 50,000
3.5.7	New HVAC Controls		$ 750,000
	MECHANICAL SUBTOTALS	$ 73,000	$ 6,390,000

ITEM NO.	DESCRIPTION	ESTIMATE BY PRIORITY	
		Immediate Repairs	Building Renovation
3.8.1	Service Entrance and Distribution: ▪ Reduce load on 120/208V riser ▪ Replace all electrical distribution	 $ 40,000(1)	 $ 1,000,000
3.8.2	Emergency Power System ▪ Remove non-life safety loads ▪ Replace system with new	 $ 2,000(5)	 $ 250,000
3.8.3	Lighting ▪ Replace lighting system		 $ 1,450,000(2)
3.8.4	Emergency Lighting/Exit Lights ▪ Add emergency lighting ▪ Add exit lights ▪ Replace entire system	 $ 75,000 $ 40,000	 $ 110,000(3)
3.8.5	Receptacles ▪ Additional receptacles	 $ 50,000	
3.8.6	Branch Circuit Wiring ▪ Fire rated feeder to genset fuel pump ▪ Fire rated feeder to elevator ▪ Modify circuitry to separate conduit systems in Boiler Room ▪ Additional branch circuit wiring for office equipment	 $ 6,000(4) $ 5,000(4) $ 10,000 (Included in 3.8.5 additional receptacles)	
3.8.7	Fire alarm System ▪ Replacement		$ 150,000
3.8.8	Telecommunication System ▪ Replace entire system		 $ 520,000
3.8.9	CCTV/Security/CATV System ▪ Replace entire system		 $ 270,000
	War Room ▪ Lighting ▪ Telecom ▪ Stand-by Power System(6)		 $ 10,000 $ 5,000 $ 40,000
	ELECTRICAL SUBTOTALS	$ 228,000	$ 3,805,000

(1) Cost involves "cutting" the existing riser into two runs and feeding half the riser from another location.

(2) Cost includes branch circuit wiring and emergency lighting fed from generator.

(3) Cost includes branch circuit wiring.

(4) Consult with AHJ for grandfathering. May be acceptable until renovation.

(5) Existing emergency power system does not meet CSA standard C282 – Emergency Electrical Power Supply for Buildings. This standard was not produced at date of original construction, therefore consult with AHJ for grandfathering. However, we recommend removing all non-life safety loads for the emergency power system that have been connected since construction.

(6) Stand-by power system cost includes all branch circuit wiring and devices.

8 Schematic Floor Plans

Appendix A
Architectural Photographs

Figure A-1

Figure A-2

Figure A-3

Figure A-4

Figure A-5

Figure A-6

Figure A-7

Figure A-8

Figure A-9

Figure A-10

Figure A-11

Figure A-12

Figure A-13

Figure A-14

Figure A-15

Figure A-16

Figure A-17

Figure A-18

Figure A-19

Figure A-20

Figure A-21

Figure A-22

Figure A-23

Figure A-24

Figure A-25

Figure A-26

Figure A-27

Figure A-28

Figure A-29

Figure A-30

Figure A-31

Figure A-32

Figure A-33

Figure A-34

Figure A-35

Figure A-36

Figure A-37

Figure A-38

Figure A-39

Figure A-40

Figure A-41

Figure A-42

Appendix B
Structural Photographs

Figure S1: Existing un-reinforced opening in steel roof deck

Figure S2: **Existing cooling tower support framing. Note unbolted spring isolators.**

Figure S3: **Spalled concrete at transformer grating in Granville Street ramp slab.**

Figure S4: **Spalled concrete at the Granville Street cantilevered slab.**

Figure S5: **Spalled concrete and corroded reinforcing steel at the Granville Street cantilevered slab.**

Figure S6: **Cracked, spalled concrete at the soffit of the main entrance stair slab, Hollis Street level.**

Appendix C
Mechanical Photographs

Figure M-01

Figure M-02

Figure M-03

Figure M-04

Figure M-05

Figure M-06

Figure M-07.1

Figure M-07.2

Figure M-08

Figure M-09

Figure M-10

Figure M-11

Figure M-12

Figure M-13

Figure M-14

Figure M-15

Figure M-16

Figure M-17

Figure M-18

Figure M-19

Figure M-20

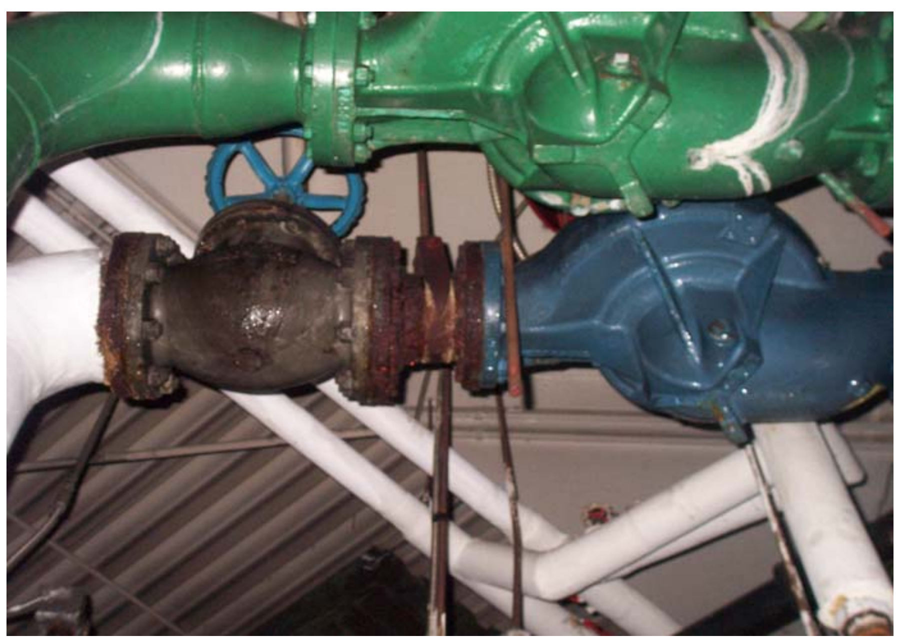

Figure M-21

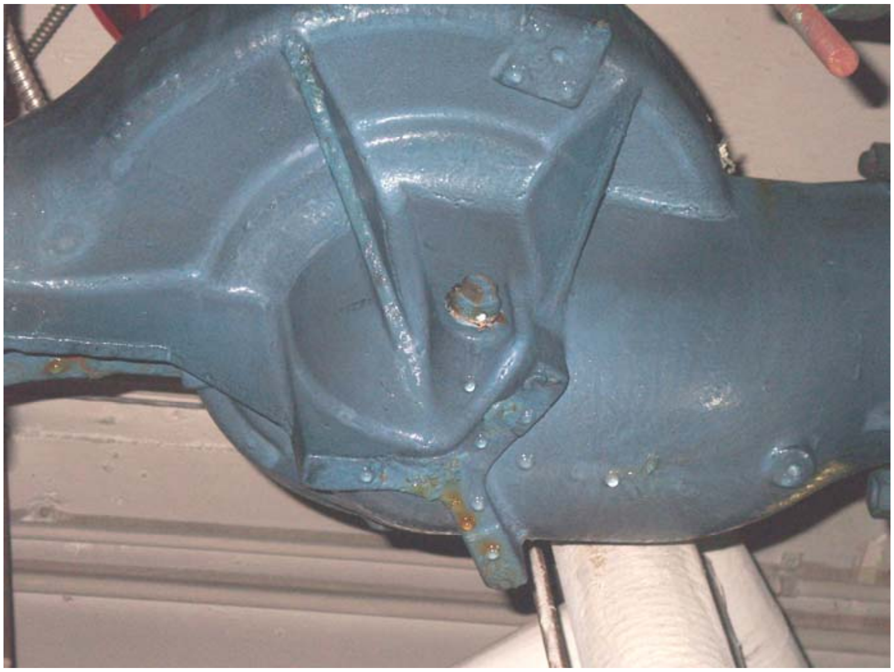

Figure M-22

Figure M-23

Figure M-24

Figure M-25

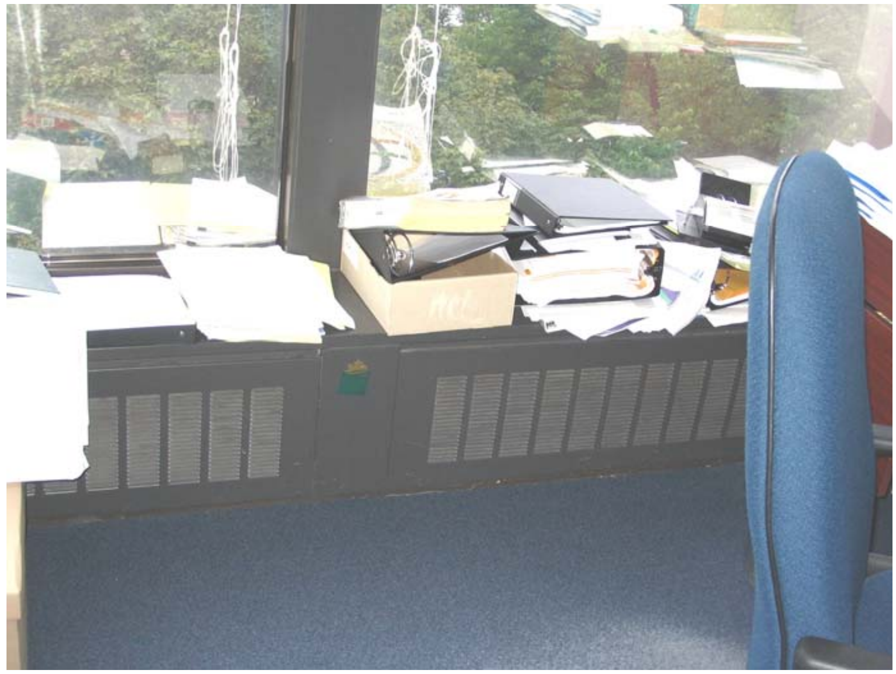

Figure M-26

Figure M-27

Figure M-28

Appendix D
Electrical Photographs

Figure E-1

Figure E-2

Figure E-3

Figure E-4

Figure E-5

Figure E-6

Figure E-7A

Figure E-7B

Figure E-8

Figure E-9

Figure E-10

Figure E-11

Figure E-12

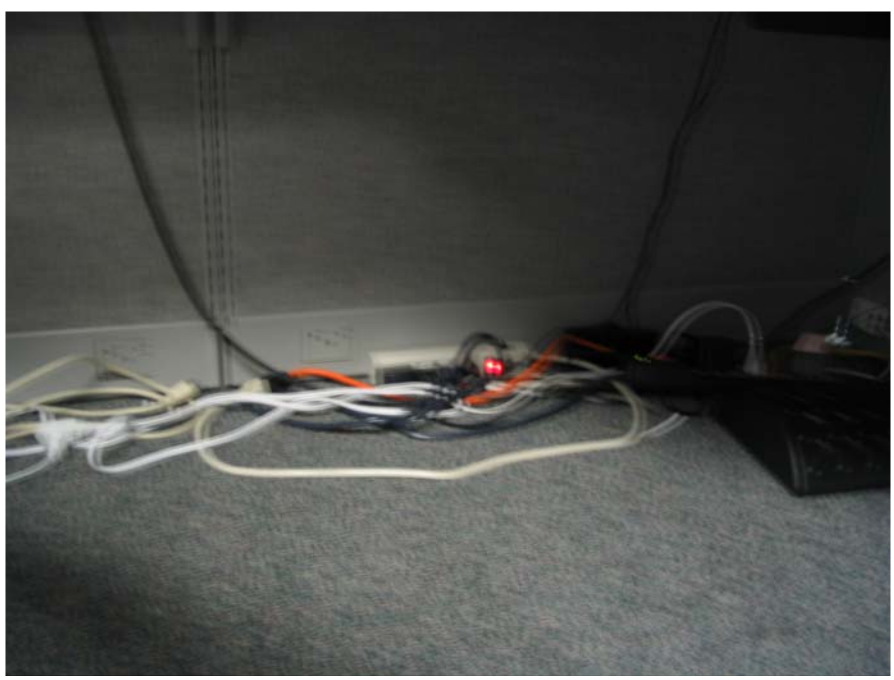

Figure E-13

Figure E-14

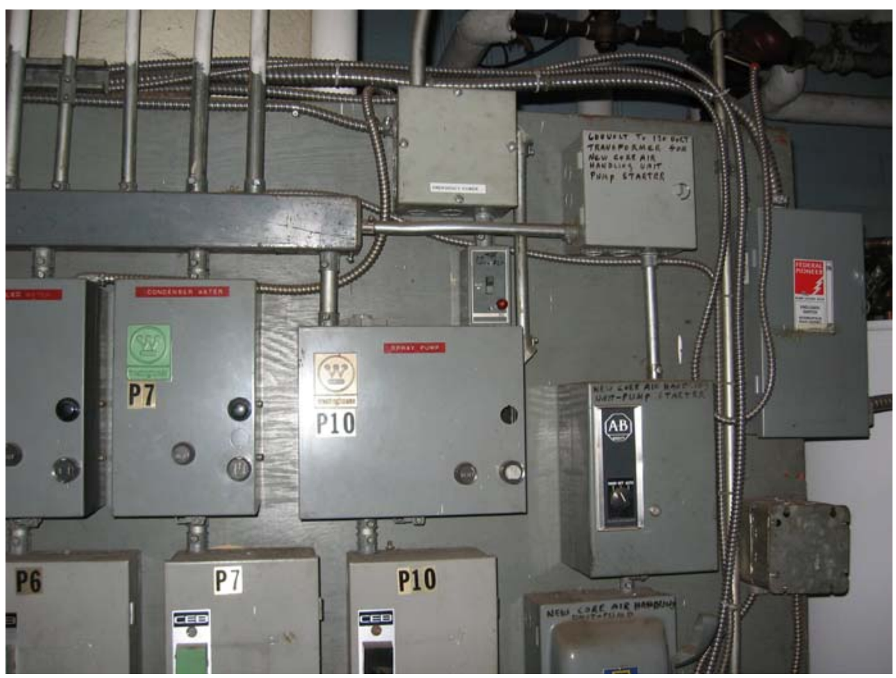

Figure E-15

Figure E-16

Figure E-17

Figure E-18

Figure E-19

Figure E-20

Figure E-21

Figure E-1

Figure E-2

Figure E-3

Figure E-4

Figure E-5

Figure E-6

Figure E-7A

Figure E-7B

Figure E-8

Figure E-9

Figure E-10

Figure E-11

Figure E-12

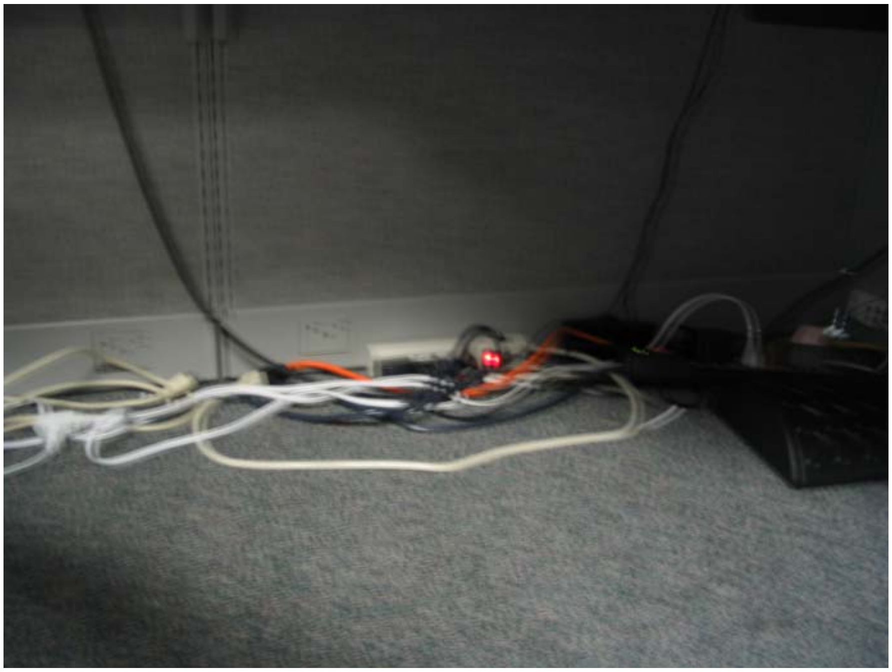

Figure E-13

Figure E-14

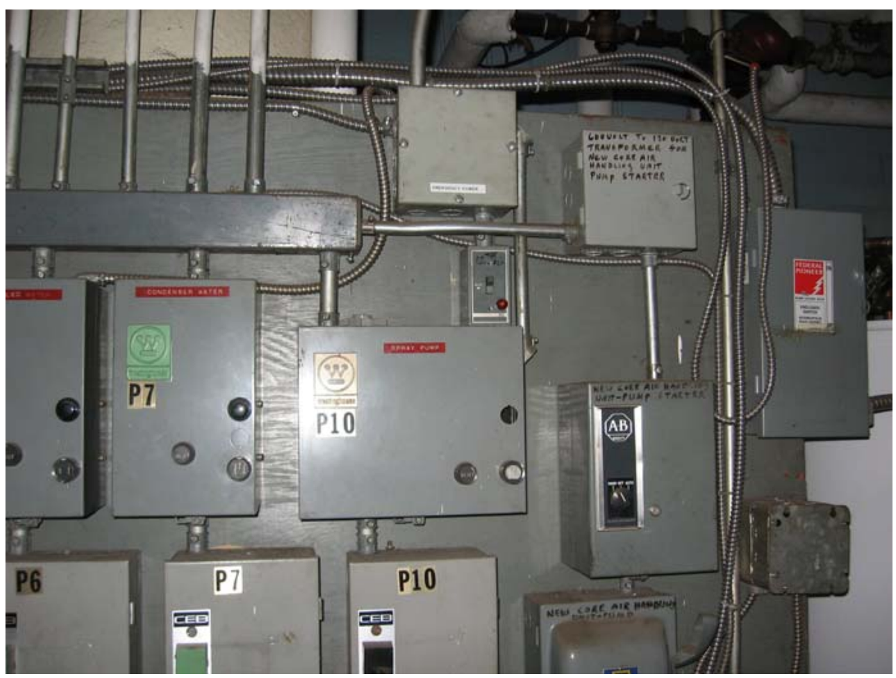

Figure E-15

Figure E-16

Figure E-17

Figure E-18

Figure E-19

Figure E-20

Figure E-21

Appendix E
HEATING, COOLING AND VENTILATION DETAILED CALCULATIONS

Air System Sizing Summary for Block building load

Project Name: 071833 - HAP - Joseph Howe Renovations 08/08/2007
Prepared by: CBCL Limited 12:38PM

Air System Information

Air System Name	**Block building load**		Number of zones	**78**	
Equipment Class	**CW AHU**		Floor Area	**126910.8**	ft²
Air System Type	**VAV**		Location	**Halifax, Nova Scotia**	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	**Peak zone sensible load**	Calculation Months	**Jan to Dec**
Space CFM	**Individual peak space loads**	Sizing Data	**Calculated**

Central Cooling Coil Sizing Data

Total coil load	**301.3**	Tons	Load occurs at	**Jul 1600**	
Total coil load	**3615.4**	MBH	OA DB / WB	**79.5 / 67.8**	°F
Sensible coil load	**3261.1**	MBH	Entering DB / WB	**73.4 / 61.6**	°F
Coil CFM at Jul 1600	**166592**	CFM	Leaving DB / WB	**55.0 / 53.9**	°F
Max block CFM at Jul 1700	**178439**	CFM	Coil ADP	**53.0**	°F
Sum of peak zone CFM	**189699**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.902**		Resulting RH	**51**	%
ft²/Ton	**421.2**		Design supply temp.	**55.0**	°F
BTU/(hr-ft²)	**28.5**		Zone T-stat Check	**78 of 78**	OK
Water flow @ 10.0 °F rise	**723.47**	gpm	Max zone temperature deviation	**0.0**	°F

Preheat Coil Sizing Data

Max coil load	**388.7**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**37933**	CFM	Ent. DB / Lvg DB	**40.3 / 50.0**	°F
Max coil CFM	**178439**	CFM			
Water flow @ 20.0 °F drop	**38.89**	gpm			

Supply Fan Sizing Data

Actual max CFM at Jul 1700	**178439**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**175391**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**1.41**	CFM/ft²	Fan static	**0.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**14894**	CFM	CFM/person	**24.81**	CFM/person
CFM/ft²	**0.12**	CFM/ft²			

1. Summary
Ventilation Sizing Method .... **Sum of Space OA Airflows**
Design Ventilation Airflow Rate .... **14894** CFM

2. Space Ventilation Analysis Table

Zone Name / Space Name	Mult.	Floor Area (ft²)	Maximum Occupants	Maximum Supply Air (CFM)	Required Outdoor Air (CFM/person)	Required Outdoor Air (CFM/ft²)	Required Outdoor Air (CFM)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (CFM)
Zone 1									
0101: Hollis - N	1	981.0	4.9	1540.6	7.14	0.09	0.0	0.0	119.4
Zone 2									
0102: Hollis - NE	1	707.5	3.5	884.3	7.14	0.09	0.0	0.0	86.1
Zone 3									
0103: Hollis - E	1	303.7	1.5	869.7	7.14	0.09	0.0	0.0	37.0
Zone 4									
0104: Hollis - SE	1	350.6	1.8	1346.3	7.14	0.09	0.0	0.0	42.7
Zone 5									
0105: Hollis - S	1	1279.1	6.4	962.3	7.14	0.09	0.0	0.0	155.7
Zone 6									
0106: Hollis - S (W/R)	1	359.6	0.0	246.1	50.00	0.00	0.0	0.0	0.0
Zone 7									
0107: Hollis - SW	1	494.8	2.5	372.2	7.14	0.09	0.0	0.0	60.2
Zone 8									
0108: Hollis - W	1	766.7	3.8	576.8	7.14	0.09	0.0	0.0	93.3
Zone 9									
0109: Hollis - NW	1	408.9	2.0	307.6	7.14	0.09	0.0	0.0	49.8
Zone 10									
0110: Hollis - Interior	1	2540.2	12.7	1911.0	7.14	0.09	0.0	0.0	309.1
Zone 11									
0111: Hollis - Stairs	1	274.2	0.0	187.7	0.00	0.00	0.0	0.0	0.0
Zone 12									
0201: Granv. - N	1	1700.0	8.5	2561.8	7.14	0.09	0.0	0.0	206.9
Zone 13									
0202: Granv. - NE	1	451.6	2.3	1522.9	7.14	0.09	0.0	0.0	55.0
Zone 14									
0203: Granv. - E	1	849.8	4.2	2444.5	7.14	0.09	0.0	0.0	103.4
Zone 15									
0204: Granv. - SE	1	479.2	2.4	1552.9	7.14	0.09	0.0	0.0	58.3
Zone 16									
0205: Granv. - S	1	876.3	4.4	698.6	7.14	0.09	0.0	0.0	106.6
Zone 17									
0206: Granv. - S (W/R)	1	525.7	0.0	434.0	50.00	0.00	0.0	0.0	0.0
Zone 18									
0207: Granv. - SW	1	427.6	2.1	402.2	7.14	0.09	0.0	0.0	52.0
Zone 19									

0208: Granv. - W	1	1205.9	6.0	2858.1	7.14	0.09	0.0	0.0	146.8
Zone 20									
0209: Granv. - NW	1	339.9	1.7	1270.6	7.14	0.09	0.0	0.0	41.4
Zone 21									
0210: Granv. - Interior	1	2218.1	11.1	1668.7	7.14	0.09	0.0	0.0	269.9
Zone 22									
0211: Granv. - Stairs	1	286.1	0.0	195.8	0.00	0.00	0.0	0.0	0.0
Zone 23									
0301: Level 2 - N	1	1700.0	8.5	2171.8	7.14	0.09	0.0	0.0	206.9
Zone 24									
0302: Level 2 - NE	1	451.6	2.3	1093.6	7.14	0.09	0.0	0.0	55.0
Zone 25									
0303: Level 2 - E	1	850.2	4.3	1805.2	7.14	0.09	0.0	0.0	103.5
Zone 26									
0304: Level 2 - SE	1	479.2	2.4	1127.0	7.14	0.09	0.0	0.0	58.3
Zone 27									
0305: Level 2 - S	1	1366.6	6.8	1105.4	7.14	0.09	0.0	0.0	166.3
Zone 28									
0306: Level 2 - S (W/R)	1	317.1	0.0	251.8	50.00	0.00	0.0	0.0	0.0
Zone 29									
0307: Level 2 - SW	1	479.2	2.4	1350.9	7.14	0.09	0.0	0.0	58.3
Zone 30									
0308: Level 2 - W	1	849.6	4.2	2133.5	7.14	0.09	0.0	0.0	103.4
Zone 31									
0309: Level 2 - NW	1	451.6	2.3	1392.6	7.14	0.09	0.0	0.0	55.0
Zone 32									
0310: Level 2 - Interior	1	2937.8	14.7	2210.1	7.14	0.09	0.0	0.0	357.5
Zone 33									
0311: Level 2 - Stairs	1	185.6	0.0	127.0	0.00	0.00	0.0	0.0	0.0
Zone 34									
0401: Level 3 - N	2	1700.0	8.5	2171.8	7.14	0.09	0.0	0.0	206.9
Zone 35									
0402: Level 3 - NE	2	451.6	2.3	1093.6	7.14	0.09	0.0	0.0	55.0
Zone 36									
0403: Level 3 - E	2	850.2	4.3	1805.2	7.14	0.09	0.0	0.0	103.5
Zone 37									
0404: Level 3 - SE	2	479.2	2.4	1127.0	7.14	0.09	0.0	0.0	58.3
Zone 38									
0405: Level 3 - S	2	1366.6	6.8	1105.6	7.14	0.09	0.0	0.0	166.3
Zone 39									
0406: Level 3 - S (W/R)	2	317.1	0.0	251.8	50.00	0.00	0.0	0.0	0.0
Zone 40									
0407: Level 3 - SW	2	479.2	2.4	1348.2	7.14	0.09	0.0	0.0	58.3
Zone 41									

0408: Level 3 - W	2	849.6	4.2	2122.2	7.14	0.09	0.0	0.0	103.4
Zone 42									
0409: Level 3 - NW	2	451.6	2.3	1389.5	7.14	0.09	0.0	0.0	55.0
Zone 43									
0410: Level 3 - Interior	2	2937.8	14.7	2210.1	7.14	0.09	0.0	0.0	357.5
Zone 44									
0411: Level 3 - Stairs	2	185.6	0.0	127.0	0.00	0.00	0.0	0.0	0.0
Zone 45									
0501: Level 5 - N	6	1700.0	8.5	2171.8	7.14	0.09	0.0	0.0	206.9
Zone 46									
0502: Level 5 - NE	6	451.6	2.3	1093.6	7.14	0.09	0.0	0.0	55.0
Zone 47									
0503: Level 5 - E	6	850.2	4.3	1805.2	7.14	0.09	0.0	0.0	103.5
Zone 48									
0504: Level 5 - SE	6	479.2	2.4	1133.6	7.14	0.09	0.0	0.0	58.3
Zone 49									
0505: Level 5 - S	6	1366.6	6.8	1148.3	7.14	0.09	0.0	0.0	166.3
Zone 50									
0506: Level 5 - S (W/R)	6	317.1	0.0	251.8	50.00	0.00	0.0	0.0	0.0
Zone 51									
0507: Level 5 - SW	6	479.2	2.4	1348.2	7.14	0.09	0.0	0.0	58.3
Zone 52									
0508: Level 5 - W	6	849.6	4.2	2122.2	7.14	0.09	0.0	0.0	103.4
Zone 53									
0509: Level 5 - NW	6	451.6	2.3	1389.5	7.14	0.09	0.0	0.0	55.0
Zone 54									
0510: Level 5 - Interior	6	2937.8	14.7	2210.1	7.14	0.09	0.0	0.0	357.5
Zone 55									
0601: Level 11 - N	1	1700.0	8.5	2245.0	7.14	0.09	0.0	0.0	206.9
Zone 56									
0602: Level 11 - NE	1	451.1	2.3	1154.2	7.14	0.09	0.0	0.0	54.9
Zone 57									
0603: Level 11 - E	1	850.0	4.3	1900.5	7.14	0.09	0.0	0.0	103.4
Zone 58									
0604: Level 11 - SE	1	478.9	2.4	1197.2	7.14	0.09	0.0	0.0	58.3
Zone 59									
0605: Level 11 - S	1	1150.5	5.8	1059.6	7.14	0.09	0.0	0.0	140.0
Zone 60									
0606: Level 11 - S (W/R)	1	313.5	0.0	254.3	50.00	0.00	0.0	0.0	0.0
Zone 61									
0607: Level 11 - SW	1	479.3	2.4	1462.6	7.14	0.09	0.0	0.0	58.3
Zone 62									
0608: Level 11 - W	1	850.4	4.3	2246.9	7.14	0.09	0.0	0.0	103.5
Zone 63									

0609: Level 11 - NW	1	451.6	2.3	1476.7	7.14	0.09	0.0	0.0	55.0
Zone 64									
0610: Level 11 -Interior	1	2262.6	11.3	1702.2	7.14	0.09	0.0	0.0	275.4
Zone 65									
0611: Level 11 -Stairs	1	662.4	0.0	453.4	0.00	0.00	0.0	0.0	0.0
Zone 66									
0701: Level 12 - N	1	1700.0	8.5	2594.1	7.14	0.09	0.0	0.0	206.9
Zone 67									
0702: Level 12 - NE	1	451.6	2.3	1220.6	7.14	0.09	0.0	0.0	55.0
Zone 68									
0703: Level 12 - E	1	850.0	4.3	2006.8	7.14	0.09	0.0	0.0	103.4
Zone 69									
0704: Level 12 - SE	1	479.7	2.4	1283.6	7.14	0.09	0.0	0.0	58.4
Zone 70									
0705: Level 12 - S	1	1359.7	6.8	1509.3	7.14	0.09	0.0	0.0	165.5
Zone 71									
0706: Level 12 - W/R	1	280.0	0.0	246.9	50.00	0.00	0.0	0.0	0.0
Zone 72									
0707: Level 12 - SW	1	479.2	2.4	1594.2	7.14	0.09	0.0	0.0	58.3
Zone 73									
0708: Level 12 - W	1	849.8	4.2	2462.6	7.14	0.09	0.0	0.0	103.4
Zone 74									
0709: Level 12 - NW	1	451.6	2.3	1600.5	7.14	0.09	0.0	0.0	55.0
Zone 75									
0710: Level 12 -Interior	1	2279.3	11.4	2199.4	7.14	0.09	0.0	0.0	277.4
Zone 76									
0711: Level 12 -Stairs	1	465.6	0.0	410.5	0.00	0.00	0.0	0.0	0.0
Zone 77									
0712: Level 12 - Elev1	1	243.4	0.0	243.4	0.00	1.00	0.0	0.0	243.4
Zone 78									
0713: Level 12 - Elev2	1	41.2	0.0	41.2	0.00	1.00	0.0	0.0	41.2
Totals (incl. Space Multipliers)				**189699.3**					**14894.5**

Air System Design Load Summary for Block building load

Project Name: 071833 - HAP - Joseph Howe Renovations 08/08/2007
Prepared by: CBCL Limited 12:38PM

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1600 COOLING OA DB / WB 79.5 °F / 67.8 °F			HEATING DATA AT DES HTG HEATING OA DB / WB -2.0 °F / -3.4 °F		
ZONE LOADS	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**
Window & Skylight Solar Loads	29323 ft²	1184256	-	29323 ft²	-	-
Wall Transmission	29977 ft²	91737	-	29977 ft²	303569	-
Roof Transmission	10314 ft²	31689	-	10314 ft²	108601	-
Window Transmission	29323 ft²	183488	-	29323 ft²	2448351	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	198 ft²	7571	-	198 ft²	6494	-
Floor Transmission	1991 ft²	1074	-	1991 ft²	13936	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	205596 W	701491	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	253822 W	866039	-	0	0	-
People	600	147059	123050	0	0	0
Infiltration	-	1770	3404	-	16993	-1
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	-	**3216174**	**126454**	-	**2897945**	**-1**
Zone Conditioning	-	3155927	126454	-	2788164	-1
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	166592 CFM	0	-	37933 CFM	0	-
Ventilation Load	14894 CFM	105198	227686	14894 CFM	1102460	0
Supply Fan Load	166592 CFM	0	-	37933 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	-	**3261125**	**354140**	-	**3890624**	**-1**
Central Cooling Coil	-	3261122	354302	-	0	0
Preheat Coil	-	0	-	-	388661	-
Terminal Reheat Coils	-	0	-	-	3501964	-
>> Total Conditioning	-	**3261122**	**354302**	-	**3890625**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

Appendix F
FIRE ALARM SYSTEM ANNUAL TEST AND INSPECTION TECHNICIAN’S PRE CHECKLIST

Security

FIRE ALARM SYSTEM ANNUAL TEST and INSPECTION
TECHNICIAN'S PRE CHECK-LIST

BUILDING NAME AND ADDRESS	JOSEPH HOWE BUILDING 1690 HOLLIS STREET, HALIFAX, NS		
DATE:	SEPTEMBER 8, 2006	SINGLE STAGE [X]	TWO STAGE [ ]
SYSTEM MANUFACTURER:	EDWARDS	MODEL NUMBER: 1523	
BUILDING NUM.		PROP NUM. 987-4120	

1 THIS IS TO CERTIFY THAT THE FIRE ALARM SYSTEM HAS BEEN TESTED IN ACCORDANCE WITH CAN/ULC-S536 SECTION 8, PERIODIC INSPECTIONS AND TEST-YEARLY, AND THESE RECORDS DOCUMENT THE RESULTS OF THE TESTING PERFORMED.

2 THE FIRE ALARM SYSTEM FUNCTIONED CORRECTLY UNDER GENERAL ALARM CONDITION.

yes [X] no [ ]

3 THE FIRE ALARM SYSTEM IS NOW FULLY FUNCTIONAL.

yes [ ] no [ ]

or

4 THE FIRE ALARM HAS DEFICIENCIES NOTED ON THE PAGES ATTACHED.

yes [X] no [ ]

5 A COPY OF THIS REPORT HAS BEEN GIVEN TO ______________________ WHO IS THE OWNER, OR OWNER'S REPRESENTATIVE FOR THIS BUILDING.

yes [ ] no [ ]

MICHAEL CHASE	GE SECURITY	468-2280
Printed name and signature of primary or supervising technician conducting test.	Company	Telephone
Printed name and signature of primary conducting test	Company	Telephone

ORIGINAL Prop. # 11-273-405 - (Built in 1973)

1A

Issued February 20,2002 - Form 536-97 - Rev 1.0

07/12/07 THU 14:30 [TX/RX NO 5891]

Security

Fire Alarm Annual Test and I... pection Report

PROJECT NAME JOSEPH HOWE BUILDING

PROP. NO. 987-4120

Location	Device		Address	Circuit Number	Sprinkler Flow Delay	Smoke Detector Sensitivity	Correctly Installed	Missing	Requires Service or Repairs	Alarm Operation Confirmed	Annunciation Indication Confirmed	Supv/Gnd. Circuit Confirmed	Decibel Level	NOTES
ZONE 1 - BASEMENT														
REAR STAIRWELL	M	(STATION)		1			✓			✓	✓			
REAR STAIRWELL	EOL			1			✓							
BASEMENT	PS	(PRESS. SWITCH)		1			✓							
MAIN SPRINKLER	PS	"	"	1			✓							SEE NOTE #8
														SEE NOTE #8
ZONE 2 - GROUND FLOOR HOLLIS STREET LEVEL														
BACK STAIRWELL VITAL STATISTICS	M			2			✓			✓				
MAIN LOBBY	M			2			✓			✓				
REAR MAINTENANCE OFFICE	M			2			✓			✓				
MAIN LOBBY	EOL			2			✓							
TELEPHONE ROOM		281C	Heat Det	2			✓			✓				
ELECTRICAL ROOM		283-01 "	"	2			✓			✓				
ELECTRICAL VAULT (INACCESSIBLE)	RHT	"	"	2			✓							
MAIN LOBBY	PS			2			✓							INACCESSIBLE
ELEVATOR LOBBY		6703 Speaker		2			✓							SEE NOTE #8
				2			✓			✓	✓			
ZONE 3 - 2ND FLOOR														
REAR WEST STAIRWELL	M	270 SPO		3			✓			✓	✓			
REAR EAST STAIRWELL	M	270 SPO		3			✓			✓	✓			
REAR WEST STAIRWELL	EOL			3			✓							
...BY		6700		3			✓							
...BY		PS		3			✓							
ZONE 4 - 1ST FLOOR GRANVILLE STREET LEVEL														
...EXIT	M	270 SPO		4			✓			✓	✓			
...Y BY WASHROOM	M	270 SPO		4			✓			✓	✓			
...RWELL	M	270 SPO		4			✓			✓	✓			
...WELL	EOL			4			✓							
...Y	PS			4			✓							SEE NOTE #8

...spection ____%

Technician *MICHAEL CHASE*

DATE (M/D/Y) *09 / 06 / 06*

Copy ______

Form Issued February 20,2002 Ver.1.0

Fire Alarm Annual Test and Inspection Report

Security

PROJECT NAME JOSEPH HOWE BUILDING

PROP. NO. 987-4120

Location	Device		Address	Circuit Number	Sprinkler Flow Delay	Smoke Detector Sensitivity	Correctly Installed	Missing	Requires Service or Repairs	Alarm Operation Confirmed	Annunciation Indication Confirmed	Supv/Grd. Circuit Confirmed	Decibel Level	NOTES
ZONE 5 - 3RD FLOOR														
NEAR WEST STAIR	M	270 SPO		5			✓			✓	✓			
NEAR EAST STAIR	M	270 SPO		5			✓			✓	✓			
NEAR EAST STAIR	EOL			5			✓							
LOBBY		6703		5			✓							
LOBBY	PS			5			✓							SEE NOTE #8
ZONE 6 - 4TH FLOOR														
NEAR WEST STAIR	M	270 SPO		6			✓			✓	✓			
NEAR EAST STAIR	M	270 SPO		6			✓			✓	✓			
NEAR WEST STAIR	EOL			6			✓							
LOBBY		6703		6			✓							
LOBBY	PS			6			✓							SEE NOTE #8
ZONE 7 - 5TH FLOOR														
NEAR WEST STAIR	M	270 SPO		7			✓			✓	✓			
NEAR EAST STAIR	M	270 SPO		7			✓			✓	✓			
NEAR WEST STAIR	EOL			7			✓							
LOBBY		6703		7			✓							
LOBBY	PS			7			✓							SEE NOTE #8
ZONE 8 - 6TH FLOOR														
NEAR WEST STAIR	M	270 SPO		8			✓			✓	✓			
NEAR EAST STAIR	M	270 SPO		8			✓			✓	✓			
NEAR EAST STAIR	EOL			8			✓							
LOBBY		6703		8			✓							
LOBBY	PS			8			✓							SEE NOTE #8
ZONE 9 - 7TH FLOOR														
NEAR WEST STAIR	M	270 SPO		9			✓			✓	✓			
NEAR EAST STAIR	M	270 SPO		9			✓			✓	✓			

Inspection ____%   Technician *MICHAEL CHASE*   DATE (M/D/Y) *09 / 06 / 06*   Copy ______

Form issued February 20,2002 Ver.1.0

Edwards Security

Fire Alarm Annual Test and Inspection Report

PROJECT NAME JOSEPH HOWE BUILDING

PROP. NO. 987-4120

Location	Device		Address	Circuit Number	Sprinkler Flow Delay	Smoke Detector Sensitivity	Correctly Installed	Missing	Requires Service or Repairs	Alarm Operation Confirmed	Annunciation Indication Confirmed	Supv/Grd. Circuit Confirmed	Decibel Level	NOTES
ZONE 9 - 7TH FLOOR - CONT'D														
NEAR EAST STAIR	EOL			9			✓							
LOBBY		6703		9			✓							
LOBBY	PS			9			✓							SEE NOTE #6
ZONE 10 - 8TH FLOOR														
NEAR WEST STAIR	M	270 SPO		10			✓			✓	✓			
NEAR EAST STAIR	M	270 SPO		10			✓			✓	✓			
NEAR WEST STAIR	EOL			10			✓							
LOBBY		6703		10			✓							
LOBBY	PS			10			✓							SEE NOTE #6
ZONE 11 - 10TH FLOOR														
NEAR WEST STAIR	M	270 SPO		11			✓			✓	✓			
NEAR EAST STAIR	M	270 SPO		11			✓			✓	✓			
NEAR WEST STAIR	EOL			11			✓							
LOBBY		6703		11			✓							
LOBBY	PS			11			✓							SEE NOTE #6
ZONE 12 - 9TH FLOOR														
NEAR WEST STAIR	M	270 SPO		12			✓			✓	✓			
NEAR EAST STAIR	M	270 SPO		12			✓			✓	✓			
NEAR EAST STAIR	EOL			12			✓							
LOBBY		6703		12			✓							
LOBBY	PS			12			✓							SEE NOTE #6
ZONE 13 - 11TH FLOOR														
NEAR WEST STAIR	M	270 SPO		13			✓			✓	✓			
NEAR EAST STAIR	M	270 SPO		13			✓			✓	✓			
NEAR WEST STAIR	EOL			13			✓							
LOBBY		6703		13			✓			✓	✓			

Inspection ____% Technician *MICHAEL CHASE* DATE (M/D/Y) *09 / 06 / 06* Copy ______

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Security

Fire Alarm Annual Test and Inspection Report

PROJECT NAME JOSEPH HOWE BUILDING

PROP. NO. 987-4120

Location	Device		Address	Circuit Number	Sprinkler Flow Delay	Smoke Detector Sensitivity	Correctly Installed	Missing	Requires Service or Repairs	Alarm Operation Confirmed	Annunciation Indication Confirmed	Supv/Grd. Circuit Confirmed	Decibel Level	NOTES
ONE 13 - 11TH FLOOR - CONTD														
MAIN LOBBY	PS			13			✓							
														SEE NOTE #6
ONE 14 - 12TH FLOOR GRANVILLE & 2ND FLOOR VAULT														
2ND FLOOR VAULT	S	6249 Smoke		14			✓							
2ND FLOOR VAULT	HT	245		14			✓							
12TH FLOOR	DS	6264 Duct Smoke		14			✓			✓				
12TH FLOOR IN STAIR	DS	6284		14			✓			✓				
ONE 15 - ELEVATOR ROOM														
ELEVATOR ROOM	HT	Heat		15			✓							
ELEVATOR ROOM	EOL			15			✓							
ONE 16 - 12TH FLOOR NEAR WEST STAIR														
EAR WEST STAIR	MI			16			✓			✓	✓			
ORRIDOR TO FAN ROOM WEST STAIR	MI			16			✓			✓	✓			
ORRIDOR TO FAN ROOM	EOL			16				✓						
AIN CORRIDOR		6702		16			✓							
ECHANICAL ROOM	PS			16			✓							
														SEE NOTE #6
NE 17 - MECHANICAL ROOM														
CHANICAL ROOM	HT			17			✓							
CHANICAL ROOM	HT			17			✓							
CHANICAL ROOM	EOL			17			✓							
E 18 - SPARE														
E 19 - FAN ROOM 1 & 2														
ROOM #1	DS	Duct Smoke		19				✓						
ROOM #2	DS			19				✓						SEE NOTE #3
ROOM #2	EOL			19				✓						SEE NOTE #8

Inspection ____%   Technician MICHAEL CHASE   DATE (M/D/Y) 09 / 06 / 06   Copy ________

Edwards Security

Fire Alarm Annual Test and Inspection Report

PROJECT NAME JOSEPH HOWE BUILDING

PROP. NO. 987-4120

Location	Device		Address	Circuit Number	Sprinkler Flow Delay	Smoke Detector Sensitivity	Correctly Installed	Missing	Requires Service or Repairs	Alarm Operation Confirmed	Annunciation Indication Confirmed	Super/Grd. Circuit Confirmed	Decibel Level	NOTES
SIGNAL CIRCUIT #1														
12TH FLOOR WEST	B	439D-6"		1			✓			✓				
11TH FLOOR WEST	B	439D-6"		1			✓			✓				
10TH FLOOR WEST	B	439D-6"		1			✓			✓				
9TH FLOOR WEST	B	439D-6"		1			✓			✓				
8TH FLOOR WEST	B	439D-6"		1			✓			✓				
7TH FLOOR WEST	B	439D-6"		1			✓			✓				
6TH FLOOR WEST	B	439D-6"		1			✓			✓				
5TH FLOOR WEST	B	439D-6"		1			✓			✓				
4TH FLOOR WEST	B	439D-6"		1			✓			✓				
3RD FLOOR WEST	B	439D-6"		1			✓			✓				
2ND FLOOR WEST	B	439D-6"		1			✓			✓				
GRANVILLE LEVEL WEST	B	439D-6"	Butts	1			✓			✓				
GRANVILLE LEVEL EAST	B	439D-6"		1			✓			✓				
1TH FLOOR WEST OFFICE AREA	B	439D-6"		1			✓			✓				
0TH FLOOR WEST OFFICE AREA	B	439D-6"		1			✓			✓				
TH FLOOR WEST OFFICE AREA	B	439D-6"		1			✓			✓				
TH FLOOR WEST NTERGOVERNMENTAL AFFAIRS	B			1			✓			✓				
H FLOOR WEST NS HUMAN RIGHTS OMMISSION	B			1			✓			✓				
H FLOOR WEST DEPT HEALTH UMAN RESOURCES	B	439D-6"		1			✓			✓				
H FLOOR WEST OFFIC EAREA	B	439D-6"		1			✓			✓				
D FLOOR CORRECTIONAL SERVICES	B			1			✓			✓				
D FLOOR WEST DEPT OF HEALTH CEPTION	B	439D-6"		1			✓			✓				
FLOOR LEGISLATIVE TELEVISION	B			1			✓			✓				
FLOOR WEST	B			1			✓			✓				
FLOOR WEST OFFICE AREA	B			1			✓			✓				
NAL CCT. #2														
FLOOR EAST	B	439D-6"		2			✓			✓				
FLOOR EAST	B	439D-6"		2			✓			✓				
FLOOR EAST	B	439D-6"		2			✓			✓				

Inspection ____%

Technician *MICHAEL CHASE*

DATE (M/D/Y) *09 / 06 / 06*

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Fire Alarm Annual Test and I. .pection Report

Security

PROJECT NAME JOSEPH HOWE BUILDING

PROP. NO. 987-4120

Location		Device	Address	Circuit Number	Sprinkler Flow Delay	Smoke Detector Sensitivity	Correctly Installed	Missing	Requires Service or Repairs	Alarm Operation Confirmed	Annunciation Indication Confirmed	SuperGrd. Circuit Confirmed	Decibel Level	NOTES
SIGNAL CIRCUIT #1														
12TH FLOOR WEST	B	439D-6"		1			✓			✓				
11TH FLOOR WEST	B	439D-6"		1			✓			✓				
10TH FLOOR WEST	B	439D-6"		1			✓			✓				
9TH FLOOR WEST	B	439D-6"		1			✓			✓				
8TH FLOOR WEST	B	439D-6"		1			✓			✓				
7TH FLOOR WEST	B	439D-6"		1			✓			✓				
6TH FLOOR WEST	B	439D-6"		1			✓			✓				
5TH FLOOR WEST	B	439D-6"		1			✓			✓				
4TH FLOOR WEST	B	439D-6"		1			✓			✓				
3RD FLOOR WEST	B	439D-6"		1			✓			✓				
2ND FLOOR WEST	B	439D-6"		1			✓			✓				
GRANVILLE LEVEL WEST	B	439D-6"		1			✓			✓				
GRANVILLE LEVEL EAST	B	439D-6"		1			✓			✓				
TH FLOOR WEST OFFICE AREA	B	439D-6"		1			✓			✓				
TH FLOOR WEST OFFICE AREA	B	439D-6"		1			✓			✓				
H FLOOR WEST OFFICE AREA	B	439D-6"		1			✓			✓				
H FLOOR WEST TERGOVERNMENTAL AFFAIRS	B			1			✓			✓				
H FLOOR WEST NS HUMAN RIGHTS OMMISSION	B			1			✓			✓				
I FLOOR WEST DEPT HEALTH MAN RESOURCES	B	439D-6"		1			✓			✓				
FLOOR WEST OFFIC EAREA	B	439D-6"		1			✓			✓				
FLOOR CORRECTIONAL SERVICES	B			1			✓			✓				
FLOOR WEST DEPT OF HEALTH CEPTION	B	439D-6"		1			✓			✓				
FLOOR LEGISLATIVE TELEVISION	B			1			✓			✓				
FLOOR WEST	B			1			✓			✓				
FLOOR WEST OFFICE AREA	B			1			✓			✓				
AL CCT. #2														
FLOOR EAST	B	439D-6"		2			✓			✓				
FLOOR EAST	B	439D-6"		2			✓			✓				
LOOR EAST	B	439D-6"		2			✓			✓				

Inspection ____%

Technician *MICHAEL CHASE*

DATE (M/D/Y) 09 / 06 / 06

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Form Issued February 20,2002 Ver.1.0

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Security

Fire Alarm Annual Test and Inspection Report

PROJECT NAME JOSEPH HOWE BUILDING

PROP. NO. 987-4120

Location	Device		Address	Circuit Number	Sprinkler Flow Delay	Smoke Detector Sensitivity	Correctly Installed	Missing	Requires Service or Repairs	Alarm Operation Confirmed	Annunciation Indication Confirmed	Supv/Grd. Circuit Confirmed	Decibel Level	NOTES
SIGNAL CCT. #2 - CONT'D										✓				
8TH FLOOR EAST	B	439D-6"		2			✓			✓				
7TH FLOOR EAST	B	439D-6"		2			✓			✓				
6TH FLOOR EAST	B	439D-6"		2			✓			✓				
5TH FLOOR EAST OFFICE AREA	B	439D-6"		2			✓			✓				
4TH FLOOR EAST	B	439D-6"		2			✓			✓				
3RD FLOOR EAST	B	439D-6"		2			✓			✓				
2ND FLOOR EAST	B	439D-6"		2			✓			✓				
HOLLIS LEVEL VITAL STATISTICS	B	439D-6"		2			✓			✓				
GROUND LEVEL PRINCE STREET	B	KMB-6-24		2			✓			✓				
BASEMENT	B	439D-6"		2			✓			✓				
7TH FLOOR EAST OFFICE AREA	B	439D-6"		2			✓			✓				
6TH FLOOR EAST OFFICE AREA	B	439D-6"		2			✓			✓				
TH FLOOR HEALTH LEGAL	B	439D-6"		2			✓			✓				
H FLOOR EAST NS HUMAN RIGHTS COMMISSION	B	439D-6"		2			✓			✓				
H FLOOR EAST DEPT HEALTH HUMAN RESOURCES	B	439D-6"		2			✓			✓				
H FLOOREAST OFFICE AREA	B	439D-6"		2			✓			✓				
D FLOOR EAST CORRECTIONAL SERVICES	B	439D-6"		2			✓			✓				
D FOOR EAST SECURITIES COMMISSION	B	439D-6"		2			✓			✓				
FLOOR EAST VOLUNTARY PLANNING	B	439D-6"		2			✓			✓				
GISLATIVE COUNCIL OFFICE LEVEL 9	B	439D-6"		2			✓			✓				
H FLOOR CORRIDOR TO FAN ROOM	B			2			✓			✓				
FLOOR	B			2			✓			✓				
FLOOR	B			2			✓			✓				
FLOOR	B			2			✓			✓				
FLOOR	B			2			✓			✓				
IS LEVEL VITAL STATISTICS	B			2			✓			✓				
IS LEVEL VITAL STATISTICS	B			2			✓			✓				
LIS LOBBY	B			2			✓			✓				

Inspection ____%   Technician *MICHAEL CHASE*   DATE (M/D/Y) *09 / 06 / 06*   Copy ______

Form Issued February 20,2002 Ver.1.0

PROJECT: JOSEPH HOWE BUILDING

PROP. NO. 987-4120

1. RECOMMEND A BELL BE ADDED TO THE PUBLIC SERVICES COMMISSION TRAINING CENTRE 3RD FLOOR.
2. AC FEED REQUIRES BREAKER LOCK
3. RECOMMEND AIR HANDLING UNITS THAT HAVE HAD DUCT DETECTORS REMOVED HAVE NEW ONES INSTALLED.
4. PANEL DID NOT DETECT GROUND FAULTS (NO GROUND WIRE ATTACHED TO GROUND TERMINAL IN PANEL)
5. BELLS AUTOMATICALLY SILENCE AT 2.5 MINUTES.
6. SPRINKLER DEVICES TESTED BY TURNER & STACY
7. Smoke Detectors in Stairwells

MICHAEL CHASE 09 06 06

Appendix G
EMERGENCY POWER SYSTEM ASSESSMENT REPORT

Report No. 060628

Prepared for:

NOVA SCOTIA

Transportation and
Public Works
Public Works
Building Design

Joseph Howe Building Emergency Power System Upgrade

DTPW # F01-25-01-18

April 20, 2007

Final Report

CBCL LIMITED
Consulting Engineers

ISO 9001
Registered Company

Appendices

* PART OF THE ORIGINAL FINAL REPORT ONLY
NOT INCLUDED IN THIS SUBMISSION

Executive Summary

CBCL was retained by Nova Scotia Department of Transportation and Public Works to perform an assessment of the existing emergency power system at the Joseph Howe Building.

Emergency Power Assessment

The existing emergency power system consists of a diesel fuelled genset and an automatic transfer switch located in a generator room on the 12th floor. The generator portion of the genset was replaced approximately one year ago while the diesel engine is approximately 25 years old. A full load test was performed on the genset on October 11, 2006. The genset failed to meet the performance requirements of the CSA standard C282 for Emergency Power Systems for Buildings. The report is included in Appendix E, as well refer to Chapter 1 for a discussion on the results.

After visiting the site and documenting the loads fed from the emergency power system we have determined that the genset capacity has been exceeded. Several options were explored including the replacement of the entire system with one genset of adequate capacity to keeping the existing genset to feed life safety equipment only; powering non-life safety equipment from a new genset.

Of the options we have explored, we recommend the complete replacement of the existing emergency system. This recommendation is based on the following:

1. Genset did not meet the minimum performance requirements of the CSA standard C282- Emergency Electric Power Supply for Buildings.
2. The engine is past its life expectancy.

The selection of a location for the new genset involves numerous considerations. The two location options we explored are on the roof, positioned to avoid any view plane issues or back in the existing generator room.

Each option has its advantages and disadvantages and these range from occupant disruptions, to financial and to downtimes of the emergency power system. The priority and weighting attributed to each of these considerations is left to the owner. Therefore, we have presented below information related to the implementation of each location for your evaluation.

Location: On the roof:

Advantages:
1. The existing emergency power system will remain operational throughout the duration of construction with a brief disruption of approximately 4 hours for the change over to the new genset.

Disadvantages:
1. Structural reinforcing of the roof. Beams will likely be required throughout the office area causing disruptions to occupants from construction. Length of the construction will depend on how substantial the structural reinforcing requirements.
2. Cost* is: $ 90,500. 00. But will be considerably higher when structural component is added.

Location: Existing Generator Room:

Advantages:
1. Construction area will mostly be contained within the generator room and a small portion of the 12th floor offices.

Disadvantages:
1. There is an estimated emergency power system shutdown of 3 weeks.
2. Cost* is: $110, 000.00.

Additional 3rd Floor Power

CBCL was also retained to evaluate and provide a recommendation to provide additional power to the 3rd floor. Due to the existing loading on the 120/208V riser and the likelihood of other floors requiring similar increases in employee density, we are recommending Option No. 1 which is to provide an additional riser to reduce loading on the existing riser. This provides a more long term solution. The approximate cost to perform this work is $40,000.00 *.

* This includes HST, 15% contingency and 15% for engineering. Cost information for all options is included in Appendix A. Please note that the cost of the structural reinforcement is not included in the estimate.

Chapter 1 Introduction

1.1 Introduction

CBCL Limited was retained by Nova Scotia Department of Transportation and Public Works to perform an assessment on the existing emergency power system and requirements to bring additional normal power to the third floor at the Joseph Howe Building located on Hollis Street, Halifax, NS.

1.2 Objectives

The objectives of the asessment were:

a) To review the existing conditions of the emergency power system;

b) To produce a power system riser diagram for “Normal” and “Emergency” loads;

c) To produce floor plans indicating loads fed from the emergency power system;

d) To determine if the existing emergency power system is adequate for the existing loads and assess capacity for additional future loads.

e) To provide budgetary estimates of probable costs for work required to implement tasks recommended in this report.

f) Provide recommendations on bringing additional power to the third floor for future employee density and provide a cost estimate to perform this work.

1.3 Requirements for the Emergency Power System

The National Building Code of Canada (NBCC) establishes requirements for having an emergency power supply for equipment responsible for life safety. For example, the NBCC defines that an elevator must be dedicated as a fire fighter’s elevator and that this elevator must be provided with an emergency power supply such that in the event that the normal utility power is lost to the building, the elevator will continue to run for a minimum 2 hours. The NBCC also indicates a requirement for emergency lighting for safe egress from the building. This lighting is also required to be backed up by an emergency power supply. This supply could be battery powered or in the Joseph Howe Building, backed up by the diesel fuelled emergency power system. This is an acceptable practice.

Current codes require that an emergency power system must be installed in accordance with the CSA standard C282. This standard was not in effect during the construction of this building but we presume that the emergency system was installed in accordance with the codes in effect at that time.

1.4 Emergency Power System Description and Condition

Photo 1.1; Genset

Photo 1.2; Automatic transfer switch on far right.

The existing emergency power system consists of a Detroit Diesel 88kW, 600/347V three-phase genset (Refer to *Photo 1.1*) and a Kohler 100A automatic transfer switch (Refer to *Photo 1.2*) installed in the generator room located on the 12th floor. The fuel for the genset is from a 25 gallon tank located on the exterior wall of generator room (Refer to *Photo 1.3*). This tank is kept full from the main diesel tank on the lower level which supplies fuel mainly for the building's boiler plant. The fuel is delivered from the main tank through a fuel pump.
The diesel engine that drives the generator is approximately 25 years old and appears to be in reasonably good condition but is beyond its life expectancy. The generator portion of the genset has been replaced approximately one year ago. A full load test is required to confirm the performance of the engine and generator.

The automatic transfer switch functions as follows; under normal operating conditions, the automatic transfer switch supplies the emergency loads through the utility power source. When there is a loss of normal utility power, the automatic transfer switch sends a signal to the genset to start. When the transfer switch measures the correct electrical parameters produced from the genset, it automatically transfers over to supply the emergency loads from the genset. When the normal utility power is restored, the transfer switch will switch back to the normal supply after the correct parameters have been met. The transfer switch then signals the genset to shut off.

The generator room location is on the 12th floor with one wall exposed to the exterior of the building. Outside this exterior wall, sits a large cooling tower. Refer to *photo 1.4* for details. This has basically "trapped" the genset within the building with no simple means to remove it for maintenance or replacement.

Overall, the emergency power system appears to have been well maintained and in satisfactory condition: however, the engine of the genset is beyond its anticipated life expectancy. It was also observed that the there is no emergency lighting installed in the elevator lobbies on all floors. This does not allow safe egress to the stairwells during a loss of normal utility power.

1.5 Load Conditions

Information taken from the building construction drawings indicates that the original loads fed from the emergency power system were the dedicated fire fighter’s elevator, fire alarm system, and the emergency lighting. There have been several loads added to the emergency system over time; however, existing records are not comprehensive and the present load on the emergency system is not known.

We have visited the site and have determined the following loads are now fed from the emergency power system: the building heating system, which consists of circulator pumps, fuel pumps, and building management system; Department of Health loads on the 4^{th} and 5^{th} floor; medical storage coolers on the 8^{th} floor. Refer to Appendix D for the Emergency loads layout drawings and power riser diagram.

We have determined that the loading on the emergency power system exceeds the system capacity. Therefore the reliability of the emergency power system is compromised thereby impairing the functionality of the life safety equipment it feeds.

Photo 1.3; 25gal day-tank

Photo 1.4; Shows the generator room location and cooling tower

2.1 Recommendations

Due to the over loading of the emergency power system and the concerns with the reliability of maintaining the life safety equipment, we are recommending that the system be updated. We have explored several options including keeping the existing genset and removing all non life safety equipment from it and transferring this load to a new genset. Due to the age of the existing genset and it did not meet the C282 performance test we do not recommend this option. Therefore, we are recommending the complete replacement of the genset.

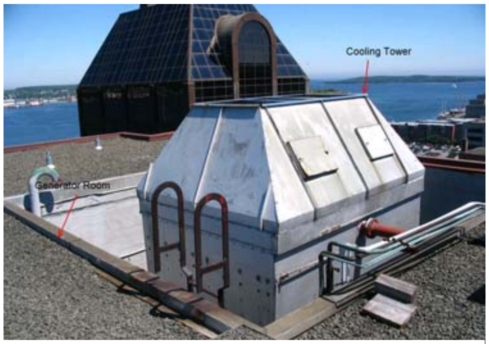

Photo 2.1; Mechanical equipment located outside of generator room

This involves replacing the generator, automatic transfer switch and possibly the "Normal" feeder from the main electrical room. All loads, now fed from the emergency power system would remain and additional loads that the Department of Health required standby power could be added to the existing distribution. The generator capacity was based on the assumptions stated in Appendix C.

Two different locations have been explored for the installation of a new genset.

<u>Location A</u>

We have reviewed the feasibility of using the existing generator room to house a new generator and we have determined this to be complicated for the following reasons:

1. Getting a genset into this room would require temporary removal of the mechanical cooling equipment to allow a crane to lift the old generator out and to install a new generator in its place (Refer to *Photo 2.1*). This would require shut down of the building air conditioning.
2. The exterior wall of the generator room would require removal to allow the genset to be removed.
3. The existing emergency power system will require complete removal to install the new system, therefore leaving the building with no emergency power for a significant amount of time (estimated shut down of emergency system is 3 weeks) .
4. The existing room will require an extension to allow for the new generator and ductwork.

Photo 2.2; View to Citadel Hill from Joe Howe Building

Location B

The second option for a location is the roof. This location involves structural reinforcement of the roof and view plane considerations from Citadel Hill. Refer to *photo 2.2*. This would need to be explored further and is outside the scope of this report.

Chapter 3 3rd Floor Additional Power

3.1 Background

CBCL has been retained to review the requirements to provide additional power to the 3rd floor of the Joe Howe Building. The additional power is required for the anticipated higher employee density for the Department of Health.

The following is our agreed scope of work:

1. Review the requirements to provide additional power to the 3rd Floor.
2. Communicate with NSPI for utility vault information and capacity.
3. Work with DTPW electrician to establish electrical measurements of relevant cabling.
4. Provide a letter stating our recommendations including a cost estimate to implement the work.
5. As agreed to by Zane O'Brien (DOH), we have excluded any energy savings review from this scope.

3.2 Electrical Distribution Description

At present, there are three (3) electrical services that enter the main electrical room from the adjacent NSPI owned vault. These services are as follows:

1. Three (3) bank, 75kVA, 23kY- 208/120Y connected step down transformer located in the NSPI vault to a 120/208V, 800A switchboard.
2. Three (3) bank, 250kVA, 23kY- 600/347Y connected step down transformer located in the NSPI vault to a 600/347V, 800A switchboard.
3. The same three (3) bank, 250kVA, 23kY- 600/347Y connected step down transformer also feeds a 600/347V disconnect switch and 600/347V distribution panel.

There is a 120/208V, 400A feeder that provides power to floors two (2) through to twelve (12). This feeder includes the 3rd floor. This 2-12th floor riser feeds a 400A panel on each floor adjacent to the elevator lobby. The riser enters into the panels at the bottom and via "feed through" type lugs, this allows the feeder connection to continue to the next floor. This is typical up to the 7th floor, where a splitter has been installed rather than the feed through lugs.

We have gathered data from the building and also performed a series of instantaneous measurements over several days on both the 600/347V and 208/120V switchboards and obtained peak demand information from

NSPI. The following is a summary of our findings and our recommendations.

Measurements taken on several different days indicated that the 2nd to the 12th floor riser is operating near maximum capacity with the phase “A” conductor actually overloaded. Therefore, there is no capacity for any additional loading on this feeder.

We have explored several options and we have listed two options below for your consideration. The first option involves a long term solution by modifying the 2nd - 12th floor riser to allow some future flexibility as well as providing the additional power requirements to the 3rd floor. The second option involves a short term solution to provide only additional power to the 3rd floor.

Please note that in either of these options, labelling of the new panels is important to identify where they are fed from, to avoid confusion that de-energizing the main 120/208V switchboard in the main electrical room does not de-energize all 120/208V loads.

3.3 Recommendations

Option No.1:

<u>Reduce the present loading on the 2-12th floor electrical feeder.</u>
Due to the loading of the existing 2-12th floor 120/208V riser, we recommend that a portion of this load be transferred to another circuit breaker to allow some room for additional loads.

The 120/208V switchboard does appear to have adequate electrical capacity however there is no physical space in the switchboard to install any additional circuit breakers. The 600V switchboard does have adequate electrical capacity and physical space to share some of the 2-12th floor 120/208V demand. Therefore, we recommend installing a circuit breaker in the 600V switchboard, to feed a new 600-120/208V three phase transformer that will be installed in the main electrical room. From the transformer, a new run of teck cable would be installed to the 7th floor. On the 7th floor, the existing splitter would be disconnected from the 2nd to the 6th floor portion of the existing riser and re-fed from the new riser. The existing 2-12th floor riser would only now feed the 2nd to the 6th floor. Now that the demand on the riser is shared between two separate feeders, there is now capacity in the 3rd floor panel to install a pony panel. This can be accomplished by installing a circuit breaker in the 3rd floor 120/208V panel

SP-3 to feed a new sub panel. This panel could be located in the same electrical closet. Some configuring of existing circuit breakers may be required to free up the space for the new 3P circuit breaker. Refer to the sketches in Appendix F of this report.

Advantages:
i) Provides additional power to the 3rd floor and allows some capacity in the riser to increase employee density on additional floors.
ii) Removes excessive loading on the 2-12th floor 120/208V riser

Approximate Cost: $35,000.00

Option No. 2:

<u>Provide power to the 3rd floor from the existing 347/600V lighting panel riser.</u>
We have reviewed the present loading on the 347/600V lighting riser and have observed it to be lightly loaded. Therefore, this option involves installing a new 120/208V panel on the 3rd floor and feeding it from the existing 347/600V lighting panel riser, through a step down transformer. This would be accomplished by installing a new disconnect switch and connecting it to the 3rd floor 600V splitter. This disconnect would feed a new 30KVA, 600-120/208V three phase transformer. This transformer would then feed a new 120/208V branch circuit panel. The transformer will not fit in the electrical closet therefore a location within the office space would be required.

Please note that if this option is implemented rather than option No. 1, we recommend having an electrician balance the loading on the 2nd to 12th floor riser to reduce the overloading of the Phase A conductor.

Advantages:
i) Less expensive then option No. 1

Disadvantages:
i) Allows only increased employee density on the 3rd floor. Other floors would require individual review.

Approximate Cost: $10,000.00

Appendix A:
Cost Estimates

PART OF THE ORIGINAL FINAL REPORT ONLY
NOT INCLUDED IN THIS SUBMISSION

Appendix B:
Equipment Details

PART OF THE ORIGINAL FINAL REPORT ONLY
NOT INCLUDED IN THIS SUBMISSION

Appendix C:
Generator Calculations

PART OF THE ORIGINAL FINAL REPORT ONLY
NOT INCLUDED IN THIS SUBMISSION

Appendix D:
Drawings

PART OF THE ORIGINAL FINAL REPORT ONLY
NOT INCLUDED IN THIS SUBMISSION

Appendix E:
Generator Test Report

PART OF THE ORIGINAL FINAL REPORT ONLY
NOT INCLUDED IN THIS SUBMISSION

Appendix F:
3rd Floor Sketches

PART OF THE ORIGINAL FINAL REPORT ONLY
NOT INCLUDED IN THIS SUBMISSION

Appendix G:
Compact Disc

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NOT INCLUDED IN THIS SUBMISSION