A POINT OF NO RETURN

The Urgent Need for Infrastructure Renewal at Canadian Universities

Canadian Association of University Business Officers
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A Study prepared for the Canadian Association of University Business Officers (CAUBO)
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Executive Summary

The study confirms, on a Canada-wide basis, that there is an urgent need for major reinvestment in the physical plant and infrastructure of our universities. The findings inform governments, public policy-makers and campus decision-makers at the national, provincial and institutional levels, of the estimated cost to reverse and eliminate the growing problem of accumulated deferred maintenance (ADM).

The study was commissioned by the Canadian Association of University Business Officers (CAUBO). Its findings are based on data from 51 universities, which together account for approximately 87.5% of Canada’s total enrolment.

Extent of the Problem

- The Canada-wide estimate to eliminate ADM at universities is $3.6 billion. Experience indicates that this figure is likely an underestimate.
- About $1.0-$1.2 billion of the ADM is considered urgent, meaning conditions that should be attended to in the very near future to avoid further deterioration and increased costs.
- The cost to eliminate ADM represents approximately $5,561 per FTE student or $214 per square metre of building space.
- The average facilities condition index (FCI) at Canadian universities is 11.3%, which compares unfavorably with the U.S. level of 7%. FCI is the ratio of accumulated deferred maintenance over current replacement value. As a general guideline, the FCI should be around 2% and not exceed 5%.

Causes of the Problem

Government has provided the large majority of capital funding for the $30.7 billion worth of existing physical plant at universities. The now urgent problem of ADM is the result of a number of factors.

- Aging Physical Plant - The average university building in Canada is 32 years old, while the average life cycle of its components and systems is about 23 years.
- Decreasing Funding Levels - Government cut backs in the 1990’s and high inflation and energy costs in the 1980’s squeezed resources available for capital upgrading and renewal. The inadequacy of physical plant operating and maintenance budgets contributes to the problem of ADM.
Lack of Profile - Facility maintenance and renewal tends to attract little interest in comparison to new building projects.

Demands for New Space - Growth in university programs, research and enrolment has continued relatively unabated for 50 years. Universities have had to place priority on expanding their physical plant.

Facility Renewal and Adaption – The need to comply with new codes and regulations, together with the pace of change in learning and workplace technology, has further depleted the available capital resources.

Life Cycle Funding – While budgeting processes are at best based on three-year plans, life cycle renewal of physical plant components requires longer term planning and fund allocation.

Impact of the Problem

It is being recognized at a national level that increased investment in post-secondary education is necessary for Canadians to be competitive in the knowledge-based global economy. The anticipated growth in enrolment over the next decade will place further demand on existing physical plants. Aging and deteriorating facilities can have a negative impact on the ability of universities to fulfill their missions in teaching and research.

Failure to address the physical plant deterioration can lead to serious circumstances. Educational activities can be disrupted and research experiments ruined. Service breakdowns have a serious impact on emergency and life safety systems, putting building occupants at risk.

Good Practices

The growing issue of ADM at universities is not new. Suggested practices to deal with the problem include the following.

Commitment to Eliminating ADM – Previous studies concluded that the most influential factor was leadership and commitment at the highest levels of universities and governments. Further, institutional planning and budgeting processes must reinforce this commitment and enlist the support of all stakeholders.

Ensure Adequate Level of Ongoing Funding – Funding levels for maintenance need to be set at a level that avoids further increases in ADM. A generally accepted benchmark is 2%-4% of the current replacement value on an annual basis.

Alternative Investment Strategies and Sources Of Funding - The increasing gap between available financial resources and the funding needed for capital renewal means that most universities
will need to find external sources of funds to have any hope of catching up on their deferred maintenance backlog.

- **Planned Preventive Maintenance** – An important starting point for avoiding future increases in ADM is an effective preventive maintenance program, supported at all levels of the institution.

- **Identification of the Problem** - Universities must have the necessary data, such as facility audits, to describe the state of facilities and provide the basis for internal and external decision-making on funding allocations. Developing accurate data on current replacement values and ADM costs are key strategies.

- **Long Range Facilities Planning** – Universities should develop and regularly update a long range capital priorities plan to communicate their needs both internally and externally.

- **Sustainability** – Future ADM must be prevented. For new building projects, concepts such as life cycle cost design and an endowment fund or reserve set aside for future renewal, should be seriously considered as part of the initial capital funding.

**Government Funding to Address ADM**

To date, funding for deferred maintenance at Canadian universities has been from two primary sources – general operating budgets and directed capital funding. It is clear that both will need to be increased to address such a large backlog of ADM. In summary, two forms of additional funding are necessary:

- An infusion of short term catch-up funds to bring the situation into equilibrium – the current estimate is $3.6 billion.

- A long term increase in base operational funding for physical plant to avoid the ongoing proliferation of ADM.
1. INTRODUCTION

Purpose

The primary purpose of the study is to analyze the problem of accumulated deferred maintenance at Canadian universities. It is hoped that the study will help inform governments, public policy-makers and campus decision-makers at the national, provincial and institutional levels who ultimately have the responsibility for safeguarding what has grown to be a major capital investment in bricks and mortar. An improved understanding of the overall scope and cost of addressing deferred maintenance will assist in making resource allocation decisions.

This study presents a Canada-wide picture of the current situation. The central message of the study is that there is a very significant amount of accumulated deferred maintenance and therefore an urgent need for major reinvestment in the physical plant and infrastructure of our universities.

Background

Concern about the campus physical environment and the financial implications of its renewal led the Canadian Association of University Business Officers (CAUBO) to fund and oversee this study. The consulting firm of RMC Resources Management Consultants Ltd. assisted CAUBO in undertaking the survey, interpreting its findings, and preparing the report.

The study findings are based on a survey of all Canadian universities that are members of CAUBO. The results of the survey are considered very representative, as they incorporate data from 51 institutions, which together account for about 87.5% of the total enrolment in Canadian universities.

There should be strong interest among all stakeholders in addressing the deteriorating condition of university facilities – students, faculty, staff; governing boards; the supporting public, foundations and corporations; as well as all levels of government.

The issue of facilities renewal is timely and important. Government cutbacks in post-secondary education have been a recurring phenomenon during the past two decades. At this time, however, there are strong indications of a renewed commitment on the part of the Federal and Provincial governments, to the critical role universities play in the development of knowledge, learning and research. There is growing recognition that if Canada is to compete successfully in the global economy and a knowledge-based society, reinvestment in post secondary-education is necessary.
At the same time, demographic trends indicate a large growth in student demand for post-secondary education over the coming decade. These and other related factors are placing increasing pressure on universities to renew and adapt their physical facilities. At risk is their ability to sustain relevance and quality in their educational programs and research.

**Previous Expansion of University Facilities**

During the 1950's, 1960's and 1970's post-secondary educational institutions in North America expanded at a tremendous rate to accommodate the needs of an increasingly sophisticated society and an expanding population and economy derived in large measure from the “baby boom”. For example, in Canada the number of institutions grew by 64% between 1950 and 1980, when thirty-four new Universities were established. Enrolment grew by over 500% in this same period and campus building space increased five-fold, from less than 2.5 million square metres in 1950 to approximately 12.8 million square metres in 1980.

By the mid-1970’s, universities (primarily through government funding) had made a large investment in what were then, new facilities. However, a number of the buildings constructed during this rapid growth period were not of optimal quality in terms of durability and efficiency. Also, many have had to undergo at least one, if not more changes in function and use.

Between 1980 and 1997/98, enrolment grew by an additional 42% to the 1997/98 level of approximately 644,000 FTE students. During this same period, another 3.8 million square metres of building space was added.

**Aging Physical Plant**

More than 50% of today’s total campus space was built over 30 years ago. A significant portion of the physical plant created during the 1950’s, 1960’s, and even 1970’s is reaching the end of its designed life cycle. The need for its upgrading or replacement is a reality. The replacement value of all existing university facilities represents an enormous financial investment. While new facilities are being constructed, the reality is that most of what is here now will continue to be used for decades to come.

The increasing complexity of technology and its rate of change, coupled with the demands placed on facilities to accommodate new methods of learning, has quickened the pace of obsolescence of buildings and equipment. Also, regulatory compliance in areas such as access for the disabled, fire and life safety, air quality, and the removal of hazardous materials has increased the need for facility adaption and renewal.
There is both a need and an obligation to provide learning and working environments that are safe, functional, adaptable, technologically current and with systems and services that are reliable and uninterrupted. Buildings must be prepared to meet the demand of new learning methods, electronic delivery systems and information technology. While innovations in information and communications technology are enhancing off-campus learning (the ‘virtual university’), the need for physical campuses, buildings and infrastructure, i.e. the ‘bricks and mortar’, is expected to change but not diminish. The deteriorating physical infrastructure still needs to be renewed.

Aging and deteriorating facilities have a negative impact on the ability of universities to fulfill their missions in teaching and research. The condition and quality of the physical plant affects a university’s ability to attract leading faculty, staff and students as well as donations and investments. For example, a Carnegie Foundation study in the U.S. found that, for 60 percent of college bound students, the visual environment was the most important factor in selecting an institution.

Ignoring the problem of deteriorating buildings can lead to disastrous circumstances. Unexpected interruptions in utilities or building services can ruin long term research experiments and disrupt instructional activities. Research areas such as animal care facilities, greenhouses and growth chambers, cold rooms and specialized chemical storage areas have critical needs. Equally important, disruptions in services can impact on emergency and life safety systems resulting in risks to building occupants. There are numerous examples of outdated ventilation systems causing poor air quality, which have led to occupational and health issues. Of similar concern is the damage to building interiors, equipment, furnishings and collections caused by the infiltration of water through aging roofs, walls, floors and foundations. The impact of the 1998 Ice Storm clearly demonstrated the reliance on campus utilities infrastructure and building systems at universities in eastern Ontario and Quebec. Studies have also shown that when deferred maintenance problems are left unattended too long, at times the only cost-effective solution becomes demolition and replacement of the building.

**Decreasing Funding Levels**

For at least the past eight years, governments across Canada have cut back funding for post-secondary education. As a result, institutional budgets for capital improvements and maintenance have generally been frozen or decreased. Prior to this, the high inflation and energy costs during the late 1970’s and early 1980’s squeezed university operating and maintenance budgets. Little if any provision has been made for replacement of the capital infrastructure.
The result has been a growing backlog of deferred maintenance, which exists today at virtually every institution. In some cases, it has led to closures of buildings or portions of buildings for reasons related to safety and unsatisfactory working conditions.

Being fundamentally a public system, Canadian universities continue to be heavily dependent upon government funding. Over the years, government has been the primary source of capital financing for university campuses and buildings. It is this same physical infrastructure that has aged and deteriorated, to the point now that there is an urgent need and continuing obligation on the part of government to fund its renewal.

At the institutional level, competing demands on scarce resources have prevailed, making it difficult for those responsible for facility management to convince the decision-makers of the need for additional investment in the physical plant.

**Enrolment Growth**

Full-time enrolments have remained steady since 1992; part-time enrolments have actually declined. Whether this reflected a reduction in demand is not apparent. However, it is known that students are paying increasingly higher fees – in most provinces tuition fees have more than doubled since 1990.

Nevertheless, there are strong indications that the “echo baby boom” has already started to generate increasing demand for post-secondary education. Its impact, forecast to represent at least a 20% increase in total enrolment at Canadian universities, will be felt between now and 2010. Such an enrolment growth scenario is also evident in recent initiatives announced by the federal government, such as the Canada Foundation for Innovation, the Millennium Scholarship Fund, and the 21st Century Chairs for Research Excellence. Furthermore, the emerging large volume of new building projects presently under design or construction at many campuses acknowledges the anticipated growth.

With the anticipated growth in enrolment over the next decade, the problems associated with deferred maintenance of the existing physical infrastructure are expected to become more profound. With enrolment growth and changing methods of learning, the intensity of building use will likely increase, both in terms of number of persons as well as extended hours of utilization over the day, week and year. There will be more demand placed on the physical infrastructure of universities to provide a functional, reliable and safe environment for working and learning.
Previous Studies

Previous studies in North America have voiced growing concern about the deteriorating condition of the physical infrastructure at post-secondary institutions. In 1989, *The Decaying American Campus – A Ticking Time Bomb* produced by APPA: The Association of Higher Education Facilities Officers (APPA), documented the nature and extent of the problem in the U.S. More recently APPA's 1996 study, *A Foundation to Uphold* provided further evidence of the extent of the problem at U.S. Colleges and Universities.

In Canada to date there has been no study of the problem of accumulated deferred maintenance at a national level. A number of universities across the country are known to be active in identifying the extent of deferred maintenance in their buildings and in trying to establish appropriate levels of ongoing funding. Also, there appears to be growing interest at the provincial government level to try to identify the estimated capital investment in infrastructure renewal required over the next 3 to 5 years. For example, Alberta Learning (formerly Advanced Education & Career Development) completed a cursory evaluation of its public post-secondary education facilities in 1997, as a partial basis for establishing funding levels for its Infrastructure Renewal Envelope.

Study Objectives

This CAUBO study attempts to increase awareness at the national and provincial level of the magnitude of the problem of accumulated deferred maintenance at Canadian universities, while at the same time, provide information that will be useful to individual institutions in their efforts to address the problem. The study objectives are to:

- Quantify and verify, at a regional and national level, the extent of accumulated deferred maintenance at all institutional members of CAUBO.

- Review provincial funding mechanisms intended to address capital improvements and facilities renewal.

- Identify best practices and other recommendations for dealing with the problem of accumulated deferred maintenance.

The study does not try to forecast future levels of accumulated deferred maintenance. The emphasis of the study is to utilize readily available information as a basis for validating and extrapolating the findings to reflect all institutions and to present a current Canada-wide picture. The information was gathered through a survey distributed to all 94 regular members of CAUBO.
Report Contents

The remainder of the report is divided into five sections.

- Chapter 2 describes the study and survey methods and defines the terminology.
- Chapter 3 outlines and examines the survey results.
- Chapter 4 presents the findings and observations concerning the extent of accumulated deferred maintenance at Canadian universities.
- Chapter 5 provides an overview of current methods of capital funding and identifies good practices as suggested by institutions and from previous studies.
- Chapter 6 summarizes the report’s findings and conclusions.

Acknowledgements

This study would not have been possible without the cooperation and assistance of the majority of Canadian universities that responded to the survey. We would especially like to thank those individuals at the universities who assembled the data and willingly shared their knowledge and experiences in dealing with the problems of accumulated deferred maintenance.

The study was directed by a steering committee consisting of four representatives of CAUBO member institutions and the Executive Director of CAUBO. First, we wish to thank the following institutional representatives for their direction, advice, and their assistance in communicating with the universities: the Atlantic Region - Neil Henry, Vice-President, Finance & Facilities, University of Prince Edward Island; the Quebec Region – Charles Emond, Vice-Rector Services, Concordia University [and before her departure from McGill, Phyllis L. Heaphy, Vice-Principal (Administration and Finance), McGill University]; the Ontario Region - Duncan Watt, Vice-President (Finance and Administration), Carleton University; and the West Region - Keith Winter, Vice-President, Finance and Services, The University of Calgary.

In particular, we wish to acknowledge the leadership and direction provided by Maurice Cohen, Executive Director of CAUBO. The study depended upon his day-to-day advice and input and his diligent efforts in coordinating the survey.

We also wish to thank the following individuals who assisted the steering committee in the collection of data from the institutions: the Atlantic Region - Don MacIsaac, University College of Cape Breton, Chair Atlantic APPA; Quebec Region - Chuck Adler, McGill University,
Finally, it is important to acknowledge that the funding for this study was provided by CAUBO, reflecting the association’s concern about the need for facility renewal at universities across Canada.

**Sources of Information**

The data on facilities such as building and site areas, replacement values, and estimates of deferred maintenance was obtained from the individual institutions through the survey instrument. All enrolment data used in the report is from Statistics Canada. Other statistical information was obtained from the CAUBO/Statistics Canada survey “Financial Statistics of Universities and Colleges 1997-1998”, e.g., operating expenditures. A list of previous studies and documents reviewed during the study and/or referenced in the report is provided in the appendix.

**Abbreviations**

The following abbreviations and acronyms are used in the report. Terminology is defined at the end of Chapter 2.

- ADM - Accumulated Deferred Maintenance
- APPA - APPA: The Association of Higher Education Facilities Officers (formerly the Association of Physical Plant Administrators)
- AUCC - Association of Universities and Colleges of Canada
- CAUBO - Canadian Association of University Business Officers
- CEGEP - Collège d’enseignement général et professionnel
- CONSUP - Council of Nova Scotia University Presidents
- COU - Council of Ontario Universities
- CREPUQ - Conference of Rectors and Principals of Universities of Quebec
- CRV - Current Replacement Value
- CSAO - Council of Senior Administrative Officers (Ontario)
- FCI - Facility Condition Index
- FTE - Full Time Equivalent
- HVAC - Heating, Ventilation and Air Conditioning
- MEQ - Ministère de l’Education du Québec
- MPHEC - Maritime Provinces Higher Education Commission
- OAPPA - Ontario Association of Physical Plant Administrators
- NACUBO - National Association of College and University Business Officers
- NSCHE - Nova Scotia Council on Higher Education
- PPM - Planned Preventive Maintenance
- SAM - Strategic Assessment Model
- SCUP - The Society for College and University Planning
2. STUDY METHODS

The Survey

The survey was designed to generate the necessary information, while at the same time, create as little additional work as possible for institutional staff. For this reason, the survey requested basic data and readily available information from previous studies and facility audits.

A key goal of the survey was to obtain data that is consistent from institution to institution and is credible and reliable. As much as possible, the information categories and definitions used are consistent with previous studies, such as those in Alberta, Ontario, and the 1996 and 1989 U.S. studies produced by APPA. The definitions are provided at the end of this chapter.

Response Rate

The survey was distributed to all members of CAUBO. Note: CAUBO has 94 regular members, of which 4 are combined university/community colleges and 22 are federated or affiliated colleges or universities. The remaining 68 university members represent over 96% of the total enrolment (full-time and part-time) at Canadian Universities.

Survey respondents numbered 53 universities in total, which together represent 91.5% of the total enrolment at Canadian Universities. With one exception, all universities in Canada with an annual enrolment of more than 2,000 FTE responded. It is assumed that the smaller institutions are less likely to have sufficient staff or the readily available data to have been able to respond.

Of the 53 responses, 51 are used in the data analysis. While the remaining 2 institutions provided information on building inventories and replacement values, they were unable to provide estimates of accumulated deferred maintenance. Given the excellent response rate, the survey results are considered very representative, as they incorporate data from 51 institutions, which together account for about 87.5% of the total enrolment in Canadian universities.

Survey Parameters

The survey encompassed all owned facilities at the universities regardless of their function or use. Therefore, in addition to educational and general space, it included ancillary facilities such as residences and parking as well as site infrastructure and utilities.
The survey form was kept to two key pages of summary information, but the option of appending additional pertinent data was encouraged. The form was divided into four sections as follows.

**Section I – Basic Information**, requested Building Areas (for Educational and General space, Residences, Parking Structures), Site Areas (Serviced, Unserviced), Current Replacement Values (for all of the above areas), and a Building Inventory (on separate appended pages). This information is normally quite readily available at institutions, even the ones that have no facility audit data. All 53 institutions that responded completed Section I, although a portion did not provide replacement values for components such as Site and Utilities.

**Section II – Accumulated Deferred Maintenance**, asked for estimated costs of accumulated deferred maintenance for the four major components (Educational and General space, Residences, Parking Structures, and Site and Utilities). This was the key section of the survey as this information was used to produce the total picture of deferred maintenance at Canadian universities. In total, 51 of the 53 responses completed Section II, while less than one-third of them did not provide any breakdown by the four major components.

The survey also asked institutions how they calculated their estimates of accumulated deferred maintenance – whether by Level III analysis (i.e. detailed building audits), by Level II survey (i.e. ‘cursory’ building condition surveys, typically by major building component or system), or by Level I estimate (i.e. ‘ballpark’ estimates with little or no analysis or survey of actual building conditions). Of the 51 responses:

- 7 institutions said their estimates were based on Level III analysis.
- Another 8 institutions identified that they used a combination of Level III/II estimates.
- 23 institutions said their estimates were based on Level II surveys.
- The remaining 13 institutions identified their figures as being Level I estimates.

**Section III – Facility Audits**, requested institutions that had completed facility audits on some or all of their buildings to provide those audits, to assist in the extrapolation and verification processes of less accurate and less detailed data from other institutions.

**Section IV – Good Practices**, asked the institutions to share ‘good practices’ that had produced successful results. This included, for example, methods of determining estimates, facility audit tools,
methods of establishing funding policies and priorities, and communication strategies.

Upon receipt, the data was documented, analyzed and the necessary values extrapolated. A number of follow-up telephone calls were made for clarification purposes.

**Survey Benchmarks**

The survey uses three benchmarks to assess the levels of accumulated deferred maintenance.

- The Facility Condition Index (FCI) is a well-known unit of measure of the state of repair (or disrepair) of buildings, sites, and even institutions as a whole. The FCI is the ratio of accumulated deferred maintenance (ADM) over current replacement value (CRV). Previous U.S. studies have tended to use the FCI as their main benchmark.

- The ADM per FTE student provides a second benchmark, which enables comparisons with other financial data.

- The ADM per square metre of building space is a third benchmark that may be most useful as a tool for capital planning, budgeting and comparisons among buildings.

**Survey Assumptions and Limitations**

The unit of measure upon which the survey data is extrapolated is Full-Time Equivalent (FTE) student. It is calculated using 1997 Full Time student counts and adding the Part Time Factor, which consists of the part time student head count divided by 3.5. Enrolment numbers are those reported by Statistics Canada.

The study does not include institutions such as colleges whose mandate may include university level programs. Similarly, even though Quebec provides the equivalent of year one of university at its CEGEP's, no attempt is made to include these institutions in the study.

The study attempts to present the magnitude of the deferred maintenance problem as it is known today (1999). Most of the institutional responses identified that their estimates were 1998 or 1999 figures, with a few going back to 1997. Given the relative stability of construction prices over this period, the range of years is not considered a problem. Also, the study makes no attempt to differentiate regional variations in construction costs or building values as the 53 responses cover all ten provinces, including geographic sub-regions within the larger provinces. The assumption is that institutions have already taken such variations into consideration in their estimates.
The survey produces a dollar value of accumulated deferred maintenance at Canadian universities. The survey responses were completed by knowledgeable physical plant managers who were asked to produce them in a relatively short period of time. They were not requested, nor in most cases were they able, in the time available, to undertake detailed audits by technical experts. The study scope and time frame did not permit the consultants to visit institutions to assess and verify the reported data on a first-hand basis. However, the Level III and in some cases Level II audit/survey information that was submitted provides a benchmark measure for validation, and confirmed that the study method is credible.

Despite some possible limitations, the information can be used as a planning tool and for budgeting and budget defence purposes. However, it should not be used to allocate funds for individual renovation or restoration projects. In those cases, detailed audits should be carried out prior to final budget decisions. It is important to point out that, in most cases where a cursory audit was followed by a detailed audit, the detailed audit produced a higher estimated cost of work to be done.

While the survey reports on FCI’s, the reader is cautioned about their preciseness. The FCI is the ratio of two estimated numbers, the accumulated deferred maintenance and the current replacement value. In light of this, it is suggested that for some institutions, more useful facility condition indicators may be the accumulated deferred maintenance per FTE student or accumulated deferred maintenance per square metre of building area, since both the FTE count and building areas are known to be accurate numbers.

The survey form requested that Accumulated Deferred Maintenance costs be broken down into three subcategories (Renewal and Replacement, Adaption, and Deferred Routine Maintenance). Since a number of institutions were unable to provide that breakdown, only the total Accumulated Deferred Maintenance figures are used in this report for extrapolation purposes.

The total dollar value of Accumulated Deferred Maintenance for all Canadian universities has been calculated, through extrapolation, for the four categories: Educational and General Space, Residences, Parking Structures and Site and Utilities. The extrapolated total for Educational and General Space is considered the most valid and representative.

The reported values for Residences, Parking Structures, and Site and Utilities are likely an understatement of the extent of the problem of ADM within these categories. The survey yielded a wide range of replacement values, especially for parking structures and site and utilities. For example, it is apparent that a number of Quebec institutions have not established any replacement values for their site and utilities. Previous studies have shown that the CRV for
infrastructure such as site and utilities can represent 25% of the CRV of buildings. Also, not all universities across Canada were able to provide data on their Residences. Variations in the reported CRV’s suggest that governments and institutions need to give more attention to ensuring consistency in estimating current replacement values.

It is apparent that the survey responses are not totally consistent in the degree to which they included facility adaption within their ADM estimates. Often major building upgrading is triggered in a renovation project to comply with new code and regulatory standards. Until the project proceeds into detailed design and construction, it is difficult to predict the extent and costs of this type of upgrading.

Where appropriate, the survey data is compiled and presented according to CAUBO’s four regions – the Atlantic Region which includes Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick; the Quebec Region; the Ontario Region; and the Western Region which includes Manitoba, Saskatchewan, Alberta and British Columbia.

**Terminology**

Definitions were provided with the survey to enable respondents to categorize information in a consistent manner. The information categories and definitions used in this study try to be consistent with previous studies, knowing however, that there is inconsistency among universities in the use of nomenclature.

**Accumulated Deferred Maintenance (ADM)** is a backlog of unfunded major maintenance and renewal projects that have been deferred to future budgets. It results either from an accumulation of neglected routine maintenance items which evolve into more serious major concerns or from failure to carry out major repair or restoration projects on facilities which have reached the end of their life cycle or have become obsolete. Typically, this is considered ‘catch-up’ maintenance. Accumulated deferred maintenance is subdivided into the following three categories.

- **Renewal and Replacement** refers to capital expenditures required for the preservation of capital assets in order to keep the physical plant in a reliable operating condition for its present use. It deals with the repair and replacement of systems and components (with a life cycle of more than one year) which extend the life and maintain the functional and usable condition of facilities and systems. Examples typically include: building structure, building envelope, building systems, finishes, spalling, leakage, building control systems, electrical and HVAC systems, telecommunication systems, site and utility improvements. Note that renewal and replacement does not include new construction.
Adaption refers to capital expenditures required to meet current regulatory standards and the evolving functional needs of an institution. Such expenditures are in addition to routine maintenance and are not usually contained within the operating budget. It often addresses health and safety risks to people and animals as well as externally imposed regulatory influences. Examples typically include: barrier free access projects, asbestos removal and other health hazards such as fumes, insurance requirements, fire and smoke protection systems, exiting, emergency lighting, elevator safety, tripping hazards, directed code compliance, local regulations, by-laws, and environmental requirements; as well as changes in instructional and research facilities to accommodate current technology or programmatic needs.

Routine Maintenance refers to day-to-day maintenance to control deterioration of facilities and site and to provide services to the users. It is typically funded out of the annual operating budget. While this category consists of a large number of relatively small items, a substantial backlog can accumulate if too many requests are deferred. Examples typically include: preventive maintenance, site maintenance and groundskeeping, housekeeping, minor repairs.

Current Replacement Value (CRV) is the estimated cost, in current dollars, to replace buildings, utility systems, physical plant and site improvements. Insurance replacement values or adjusted book values may be, but are not necessarily the same, as they serve different purposes. For buildings, the CRV is usually the product of the gross area and the current local unit cost of that type of space (cost to be all-inclusive, i.e. planning, design, construction, commissioning, project management). For site and utilities, various methods can be used. Some institutions carry out periodic audits for funding or other purposes. If those are not available then a unit cost per hectare can be applied. For example, the recent (1998) Ontario survey for the Strategic Assessment Model suggests $250,000 per hectare for paved areas and half that amount for unpaved areas. In Alberta, a recent study (1997) suggested an average amount of $130,000 per hectare for the entire developed campus site (i.e. excluding agricultural and other unserviced lands).

Educational and General Space refers to all University-owned facilities used for instruction and learning, research, administration, athletics/recreation, library, study, entertainment, lounge, health services, food services, day care, retail, physical plant support and infrastructure, circulation and structure.

Residences refer to all University-owned facilities used for housing accommodation.
**Parking Structures** refer to buildings/structures used for vehicle parking, but not surface parking.

**Site and Utilities** (also referred to as grounds or infrastructure) refers primarily to the spaces between buildings of a campus and to the non-architectural elements of campus design. These elements include, but are not necessarily limited to: circulation systems (roadways, walkways), utilities systems (sewers, drains, steam tunnels, electrical cabling, fibre optic lines), surface parking, campus places (natural areas, recreational and athletic areas, plazas, malls), paving and hard surfaces, landscape, campus furniture, way-finding and signage, exterior lighting, refuse and waste removal, exterior art and artifacts, and access points for people with disabilities.

**Gross Building Area** is the sum of all areas on all floors of a building included within the outside faces of its exterior walls.
3. SURVEY FINDINGS

Magnitude of the University System

The approximately 90 institutions that make up the Canadian university system range in size from a few hundred FTE students, to over forty thousand. There is considerable variation in the role and level of programming associated with different types of institutions, including also variations from province to province. Hence, the precise number depends upon whether one includes just universities, or university-colleges, federated colleges and/or affiliated colleges. This study utilizes the CAUBO membership of 94 institutions as its base, which corresponds closely to the 90 members of AUCC.

The following points illustrate the approximate scale of the university system Canada-wide.

- Total enrolment of 573,099 full-time and 249,673 part-time students (1997) which corresponds to 644,434 FTE’s.
- Total annual expenditures of approximately $11.67 billion (1997/98).
- Total building area of approximately 16.8 million gross square metres (180 million gross square feet).
- Total estimated current replacement value of about $30.7 billion.
- Total serviced site area of approximately 4,700 hectares (11,600 acres).
- Of the approximately 90 institutions, there are 26 universities with an annual enrolment of over 10,000 FTE (1997).

Total enrolments, together with estimated total building areas and corresponding replacement values, are summarized in Table 3-1 for the four CAUBO regions. The building area and replacement value estimates are extrapolations based on the survey responses.

<table>
<thead>
<tr>
<th>Region</th>
<th>Atlantic</th>
<th>Quebec</th>
<th>Ontario</th>
<th>Western</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrolment (1997 FTE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Building Area (m²)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Replacement Value ($ ‘000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68,248</td>
<td>159,937</td>
<td>248,940</td>
<td>167,309</td>
<td>644,434</td>
<td></td>
</tr>
<tr>
<td>2,061,000</td>
<td>3,199,000</td>
<td>6,040,000</td>
<td>5,407,000</td>
<td>16,707,000</td>
<td></td>
</tr>
<tr>
<td>$3,726,929</td>
<td>$5,404,589</td>
<td>$12,348,967</td>
<td>$9,177,665</td>
<td>$30,654,550</td>
<td></td>
</tr>
</tbody>
</table>
Because CEGEP’s are not included in the study, the total building area and replacement values for Quebec may appear low compared to the Province’s population base.

**History of Growth**

Canadian universities date back to Université Laval, founded in 1663 as the Séminaire de Québec. By 1867, there were 17 colleges in Canada, with only 4 not under denominational control. At the time of Confederation total enrolment was about 1,500 full-time students.

Government involvement in post-secondary education expanded significantly in the early years of this century when, for example, the four western provinces set up provincially charted universities.

In the 1960’s and 1970’s, a combination of demographic, social, economic and political factors contributed to unprecedented growth in university enrolment. Between 1955 and 1962, full-time university enrolment doubled; it doubled again between 1962 and 1969. This was not only due to large increases in the 18-24 age group (the “baby boom”), but also to a rise in the participation rate - from 10% in 1960 to 20% in 1975. During the 1950’s, 1960’s and 1970’s, 34 new universities were established across Canada (see Table 3-2).

|-----------------------------|--------|--------|--------|--------|--------|--------|

**Aging Facilities**

The condition and quality of university facilities are vital to the core functions of learning and research. Not only must buildings be safe and functional, they must be able to adapt to the changing needs of curriculum delivery, advances in equipment and technology, and new building code and environmental regulations. Deterioration and lack of renewal of the physical infrastructure can diminish an institution’s ability to attract students, faculty, and program and research funds.

The aging and deterioration of buildings is inevitable, like that of an automobile. Lack of funding for regular and preventive maintenance leads to more rapid deterioration. For example, finishes that are not properly maintained will tend to wear more quickly, and lack of attention to caulking will typically result in premature deterioration of exterior walls, doors and windows. Furthermore, there are inherent and predictable life cycles for every component of buildings and infrastructure that generate the need for periodic renewal or replacement, e.g. roofs, mechanical systems.
As long as regular maintenance is adequately funded and performed, facilities should continue to perform effectively for the purpose they were intended. The aging of facilities and changes in function and technology can be counteracted through renovations that address capital renewal, adoption and deferred maintenance assuming that adequate funding is available.

It is not necessarily the case that the older the building, the higher the amount of deferred maintenance. In fact, information contained in the survey responses indicates that many of the oldest buildings on campuses across Canada have undergone major renovation/renewal at least once, and in some cases two or three times. Furthermore, the survey findings demonstrate that the oldest campuses are not necessarily in the worst condition.

Other factors such as the building design, the quality of materials and systems, type of construction, building location, and history of maintenance will have a greater impact on a building’s current condition than just its age. For example, previous reports such as *The Decaying American Campus, A Ticking Time Bomb* noted that:

“many of the buildings constructed during the 1960’s were not of optimal quality in terms of longevity. In the rush to meet surging student demand and to stretch available capital, institutions cut back on building material quality. The facilities were functional in the near term, but not likely to hold up over time.”

The enormous growth in enrolment in Canada between 1950 and 1980 resulted in a major expansion of building space. Table 3-3 provides a summary of the age of buildings on Canadian campuses. It is based on the building ages (i.e. year opened) at 38 of the 53 universities that responded to the survey. Together, these 38 institutions account for close to 70% of the total campus building space in Canada. Also, the 38 institutions do provide a representative sample of when universities were founded.

**Table 3-3: Percentage of Total Campus Space Constructed by Decade**

<table>
<thead>
<tr>
<th>Region</th>
<th>&lt;1950</th>
<th>1950’s</th>
<th>1960’s</th>
<th>1970’s</th>
<th>1980’s</th>
<th>1990’s</th>
<th>Total m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic Region</td>
<td>9%</td>
<td>9%</td>
<td>40%</td>
<td>22%</td>
<td>13%</td>
<td>7%</td>
<td>970,000</td>
</tr>
<tr>
<td>(8 of 15 instit.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quebec Region</td>
<td>12%</td>
<td>10%</td>
<td>32%</td>
<td>16%</td>
<td>5%</td>
<td>24%</td>
<td>1,810,000</td>
</tr>
<tr>
<td>(5 of 9 instit.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ontario Region</td>
<td>13%</td>
<td>6%</td>
<td>38%</td>
<td>25%</td>
<td>9%</td>
<td>9%</td>
<td>4,506,000</td>
</tr>
<tr>
<td>(13 of 16 instit.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western Region</td>
<td>10%</td>
<td>7%</td>
<td>32%</td>
<td>24%</td>
<td>13%</td>
<td>14%</td>
<td>4,290,000</td>
</tr>
<tr>
<td>(12 of 13 instit.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sample Average</strong></td>
<td><strong>12%</strong></td>
<td><strong>7%</strong></td>
<td><strong>35%</strong></td>
<td><strong>23%</strong></td>
<td><strong>10%</strong></td>
<td><strong>13%</strong></td>
<td><strong>11,576,000</strong></td>
</tr>
</tbody>
</table>
Based on the sample, the median age of all university buildings in Canada is approximately 32 years. It demonstrates that 1960’s were a booming decade of new building construction **when over one-third of all campus space was built**, i.e. approximately 5.85 million square metres of space. An additional 3.8 million square metres was added during the 1970’s. The data also indicates that approximately 2 million square metres of university space across Canada is 50 or more years old.

**Size of Facilities**

Based on the survey data, the 10 largest institutions (by building area) together represent almost 45% of the total university building space in Canada.

For all surveyed institutions the average amount of educational and general space is about 20.5 gross square metres per FTE student while the total building space equates to slightly more than 26 gross square metres per FTE. On average, 78.5% of the building area is educational and general space.

The amount of educational and general space and total space per student is noticeably lower in Quebec and Ontario, while higher in the Atlantic and Western regions. The range is relatively large (see Table 3-4a).

<table>
<thead>
<tr>
<th></th>
<th>Educational &amp; General Space</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>m²/FTE</td>
</tr>
<tr>
<td>Atlantic Region</td>
<td>22.6m²</td>
</tr>
<tr>
<td>Quebec Region</td>
<td>17.1m²</td>
</tr>
<tr>
<td>Ontario Region</td>
<td>18.5m²</td>
</tr>
<tr>
<td>Western Region</td>
<td>25.5m²</td>
</tr>
</tbody>
</table>

| Sample Average | 20.5m² | 78.5% | 4.4m² | 17.0% | 1.2m² | 4.5% | 26.1m² |

Institutions that have a higher building area per FTE are also likely to have a higher level of accumulated deferred maintenance per FTE. The difference in total building space per FTE from institution to institution is broad, ranging from a low of 15-17 gross square metres per FTE to a high of 38-40 gross square metres per FTE. The survey data shows that, in general, the smaller universities (by level of
enrolment) tend to have more building area per FTE than the larger universities. However, there are exceptions. Some of Canada’s largest universities, in fact, have among the highest number of gross square metres per FTE. This can likely be attributed to their age or the additional amount of space dedicated to their research activities.

The distribution of total space per FTE by size of institution is summarized in Table 3-4b. Of importance to note is that a significantly higher percentage of institutions in the Atlantic and Western regions falls in the category of less than 5,000 FTE. Based on the 53 survey respondents, 54% of the institutions in the Atlantic and Western regions have less than 5,000 FTE, while in Ontario and Quebec it is only 22%.

Table 3-4b: Summary of Total Building Area/FTE by Size of Institution
(includes the 53 survey respondents)

<table>
<thead>
<tr>
<th>Grouping of Institutions</th>
<th>Total m²/FTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranking by Enrolment:</td>
<td></td>
</tr>
<tr>
<td>- 10 Highest (&gt;19,000 FTE)</td>
<td>26.7m²</td>
</tr>
<tr>
<td>- 20 Mid Range (5,000 - 19,000 FTE)</td>
<td>24.3m²</td>
</tr>
<tr>
<td>- 23 Lowest (&lt;5,000 FTE)</td>
<td>30.6m²</td>
</tr>
<tr>
<td>Average</td>
<td>26.1m²</td>
</tr>
</tbody>
</table>

Of the 53 institutions that responded, 51 include residence space as part of their building inventory.

Average serviced site area of the 53 responding institutions is approximately 81 hectares (200 acres). This does not represent the average size of campuses across the country as a number of the institutions have multiple campuses.

The 1996 APPA study, *A Foundation to Uphold* noted that buildings constructed after 1990 were on average 50% larger than pre-1950 buildings. While the CAUBO survey did not analyze individual building size, information from the survey responses indicates that a similar situation exists in Canada. Many of the largest buildings on today’s campuses were constructed in the 1960’s and 1970’s.
Current Replacement Values

Current replacement value (CRV) is the estimated cost of replacing all buildings and site and utilities infrastructure to meet similar functional requirements and in compliance with current codes and regulations (see definition in chapter 2). Determining a reasonably accurate CRV is important to understanding deferred maintenance needs, as it forms half of the equation for calculating the facility condition index (FCI), the ratio of the estimate of accumulated deferred maintenance to the current replacement value.

For the 53 universities that responded to the survey the total CRV is $28.3 billion, including educational and general space, residences, parking structures, and site and utilities. Based on extrapolation, the total CRV for all Canadian universities is estimated to be $30.7 billion (see Table 3-5). The Canada-wide average CRV per FTE is approximately $48,000, of which about $37,700 constitutes educational and general space.

For the 53 institutions surveyed, the total CRV for educational and general space is about $22.2 billion. This corresponds to an average per square metre cost of approximately $1,841 (see Table 3-6). The average for each region does not vary significantly from the Canada-wide average. Some range in CRV per square metre is due to the different roles and program mixes of universities, their different facility needs (i.e. some have a much greater proportion of laboratory and research space), and regional differences in construction costs.

As Table 3-6 indicates, the CRV per square metre for educational and general space closely reflects the total CRV for the campus as a whole. This is not surprising as close to 80% of the building area represents educational and general space.

An alternative measure of the replacement value of site and utilities is the cost per hectare of serviced land. Table 3-7 summarizes this information.
Table 3-5: Current Replacement Values - Extrapolated Totals & $/FTE

<table>
<thead>
<tr>
<th></th>
<th>Educational &amp; General Space Only</th>
<th>Total All Buildings &amp; Site Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total $</td>
<td>$/FTE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total $</td>
</tr>
<tr>
<td>Atlantic Region</td>
<td>$2,717,381,000</td>
<td>$3,725,929,000</td>
</tr>
<tr>
<td>Quebec Region</td>
<td>$4,670,754,000</td>
<td>$5,403,589,000</td>
</tr>
<tr>
<td>Ontario Region</td>
<td>$9,517,658,000</td>
<td>$12,347,967,000</td>
</tr>
<tr>
<td>Western Region</td>
<td>$7,228,689,000</td>
<td>$9,177,065,000</td>
</tr>
<tr>
<td>Canada-Wide Totals &amp; Averages</td>
<td>$24,134,482,000</td>
<td>$37,668</td>
</tr>
</tbody>
</table>

Table 3-6: Current Replacement Values – Average $/m²

<table>
<thead>
<tr>
<th></th>
<th>Educational &amp; Gen. Space CRV $/m²</th>
<th>Residential Space CRV $/m²</th>
<th>Parking Structures CRV $/m²</th>
<th>Site &amp; Utilities CRV $/m²</th>
<th>Total CRV $/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic Region</td>
<td>$1,762</td>
<td>$1,560</td>
<td>$121</td>
<td>$173</td>
<td>$1,808</td>
</tr>
<tr>
<td>Quebec Region</td>
<td>$1,706</td>
<td>$930</td>
<td>$310</td>
<td>$129</td>
<td>$1,689</td>
</tr>
<tr>
<td>Ontario Region</td>
<td>$2,066</td>
<td>$1,466</td>
<td>$712</td>
<td>$131</td>
<td>$2,044</td>
</tr>
<tr>
<td>Western Region</td>
<td>$1,696</td>
<td>$1,130</td>
<td>$356</td>
<td>$171</td>
<td>$1,697</td>
</tr>
<tr>
<td>Canada-Wide Averages</td>
<td>$1,841</td>
<td>$1,338</td>
<td>$374</td>
<td>$150</td>
<td>$1,841</td>
</tr>
</tbody>
</table>

Notes:

a. This column provides the CRV for site and utilities divided by the total square metres of all campus building space (including educational and general space, residential space and parking structures).

b. This column provides the total CRV for all campus building space together with site and utilities infrastructure divided by the total square metres of all campus building space.

Table 3-7: Current Replacement Values of Site & Utilities – Average $/ha

<table>
<thead>
<tr>
<th></th>
<th>Site &amp; Utilities CRV $/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic Region</td>
<td>$431,678</td>
</tr>
<tr>
<td>Quebec Region</td>
<td>$672,860</td>
</tr>
<tr>
<td>Ontario Region</td>
<td>$500,515</td>
</tr>
<tr>
<td>Western Region</td>
<td>$596,288</td>
</tr>
<tr>
<td>Canada-Wide Average</td>
<td>$539,692</td>
</tr>
</tbody>
</table>
4. ACCUMULATED DEFERRED MAINTENANCE

Overview

Of the 53 universities that responded to the survey, 51 provided cost estimates of the accumulated deferred maintenance (ADM) on their campuses. The 51 institutions in total account for 87.5% of the total enrolment at all universities. Based on these results, the current Canada-wide estimate of ADM throughout the university system is $3.6 billion. This includes all buildings and infrastructure such as site and utilities. The survey results indicate that 75% of this amount, or about $2.7 billion is for educational and general facilities.

The average facility condition index (FCI) for the 51 survey respondents is 11.3% for all buildings and site infrastructure. FCI is the ratio of the estimate of ADM to the current replacement value (CRV). As a general guideline based on previous studies the FCI should be in the range of about 2% and not exceed 5%.

In looking at just educational and general space, the overall average FCI is the same 11.3%. For residences the FCI is somewhat lower, at about 9.9% while for site and utilities it is higher, at about 14.4%.

Other measures for appreciating the total Canada-wide value of ADM is that it represents approximately $5,561 per FTE student and about $214 per square metre of building space.

While the CAUBO survey did not ask institutions to differentiate what portion of ADM they considered to be of an ‘urgent’ nature, the 1996 APPA study, *A Foundation to Uphold*, identified that urgent items constituted approximately 22% of the total ADM. It defined ‘urgent’ as

“conditions which, if not attended to in the next year, will further deteriorate and become more costly to remedy in the future.”

The 1989 APPA study, *The Decaying American Campus – A Ticking Time Bomb* suggested that about 33% of the ADM was urgent. The 1997 *General Facility Evaluation* in Alberta estimated that urgent ADM represented as much as 50% of the total ADM at universities and colleges. Based on these previous studies, it can be assumed that in the range of 25-35% of the total estimated Canada-wide ADM is most likely urgent, i.e. $1.0-$1.2 billion.

As reported by the universities, urgent conditions are those that require immediate action to avoid health and safety concerns, to avoid escalating deterioration, and/or to provide protection against costly damage. They identify examples such as: leaking roofs and ground level flooding that result in water damage to finishes, equipment and valuable collections; breakdowns in utility distribution systems that result in building freeze-up in the winter; failures in building control
and ventilation systems that seriously impact on occupant use and comfort; power outages that affect critical fire safety and emergency systems and sensitive research experiments.

**Regional Summary**

A summary of the survey results of the reported and extrapolated ADM by CAUBO region is presented in Table 4-1.

**Table 4-1: Summary Survey Results & Extrapolations of ADM**

<table>
<thead>
<tr>
<th>Region</th>
<th>Category of Space</th>
<th>Total $ of ADM</th>
<th>$/FTE</th>
<th>$/m²</th>
<th>FCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic Region</td>
<td>Educational &amp; Gen.</td>
<td>$433,302,809</td>
<td>$6,578</td>
<td>$291</td>
<td>16.5%</td>
</tr>
<tr>
<td></td>
<td>Residences</td>
<td>$156,192,387</td>
<td>$2,371</td>
<td>$394</td>
<td>25.3%</td>
</tr>
<tr>
<td></td>
<td>Parking Structures</td>
<td>$1,455,000</td>
<td>$23</td>
<td>$14</td>
<td>11.5%</td>
</tr>
<tr>
<td></td>
<td>Site &amp; Utilities</td>
<td>$31,003,843</td>
<td>$471</td>
<td></td>
<td>9.0%</td>
</tr>
<tr>
<td>96.5% of FTE’s</td>
<td>Total Reported</td>
<td>$621,954,039</td>
<td>$9,442</td>
<td>$313</td>
<td>17.3%</td>
</tr>
<tr>
<td></td>
<td>Total Extrapolated</td>
<td>$644,368,328</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quebec Region</td>
<td>Educational &amp; Gen.</td>
<td>$452,727,000</td>
<td>$3,412</td>
<td>$199</td>
<td>11.7%</td>
</tr>
<tr>
<td></td>
<td>Residences</td>
<td>$39,390,000</td>
<td>$297</td>
<td>$166</td>
<td>17.9%</td>
</tr>
<tr>
<td></td>
<td>Parking Structures</td>
<td>$9,934,000</td>
<td>$75</td>
<td>$68</td>
<td>α</td>
</tr>
<tr>
<td></td>
<td>Site &amp; Utilities</td>
<td>$177,295,000</td>
<td>$1,336</td>
<td></td>
<td>α</td>
</tr>
<tr>
<td>83.0% of FTE’s</td>
<td>Total Reported</td>
<td>$679,346,000</td>
<td>$5,120</td>
<td>$256</td>
<td>12.0%</td>
</tr>
<tr>
<td></td>
<td>Total Extrapolated</td>
<td>$818,845,137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ontario Region</td>
<td>Educational &amp; Gen.</td>
<td>$714,011,382</td>
<td>$3,366</td>
<td>$182</td>
<td>9.1%</td>
</tr>
<tr>
<td></td>
<td>Residences</td>
<td>$78,760,727</td>
<td>$371</td>
<td>$74</td>
<td>5.2%</td>
</tr>
<tr>
<td></td>
<td>Parking Structures</td>
<td>$3,330,000</td>
<td>$16</td>
<td>$32</td>
<td>5.0%</td>
</tr>
<tr>
<td></td>
<td>Site &amp; Utilities</td>
<td>$104,014,214</td>
<td>$490</td>
<td></td>
<td>15.6%</td>
</tr>
<tr>
<td>85.2% of FTE’s</td>
<td>Total Reported</td>
<td>$900,116,323</td>
<td>$4,243</td>
<td>$177</td>
<td>9.0%</td>
</tr>
<tr>
<td></td>
<td>Total Extrapolated</td>
<td>$1,056,272,156</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western Region</td>
<td>Educational &amp; Gen.</td>
<td>$755,000,232</td>
<td>$4,936</td>
<td>$194</td>
<td>11.4%</td>
</tr>
<tr>
<td></td>
<td>Residences</td>
<td>$39,000,906</td>
<td>$255</td>
<td>$54</td>
<td>4.7%</td>
</tr>
<tr>
<td></td>
<td>Parking Structures</td>
<td>$6,605,000</td>
<td>$43</td>
<td>$21</td>
<td>5.8%</td>
</tr>
<tr>
<td></td>
<td>Site &amp; Utilities</td>
<td>$132,527,756</td>
<td>$867</td>
<td></td>
<td>15.7%</td>
</tr>
<tr>
<td>91.4% of FTE’s</td>
<td>Total Reported</td>
<td>$933,133,894</td>
<td>$6,101</td>
<td>$189</td>
<td>11.1%</td>
</tr>
<tr>
<td></td>
<td>Total Extrapolated</td>
<td>$1,020,783,551</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada-Wide Totals &amp; Averages</td>
<td>Educational &amp; Gen.</td>
<td>$2,355,041,423</td>
<td>$4,178</td>
<td>$203</td>
<td>11.3%</td>
</tr>
<tr>
<td></td>
<td>Residences</td>
<td>$313,344,020</td>
<td>$556</td>
<td>$129</td>
<td>9.9%</td>
</tr>
<tr>
<td></td>
<td>Parking Structures</td>
<td>$21,324,000</td>
<td>$38</td>
<td>$32</td>
<td>5.9%</td>
</tr>
<tr>
<td></td>
<td>Site &amp; Utilities</td>
<td>$444,840,813</td>
<td>$789</td>
<td></td>
<td>14.4%</td>
</tr>
<tr>
<td>87.5% of FTE’s</td>
<td>Total Reported</td>
<td>$3,134,550,256</td>
<td>$5,561</td>
<td>$214</td>
<td>11.3%</td>
</tr>
<tr>
<td></td>
<td>Total Extrapolated</td>
<td>$3,583,892,370</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:

a. No FCI has been calculated for the Parking and Site and Utilities for Quebec, as the majority of Quebec institutions are unable to provide replacement values for these components. For the same reason, the calculated Quebec Total FCI and the calculated Canada-Wide FCI’s for Parking, Site and Utilities and Total Reported exclude reported data on Parking and Site and Utilities from all Quebec institutions.
It is most likely that $3.6 billion represents an underestimate of the Canada-wide amount. Previous studies have consistently reported that their findings tend to be an understatement of the problem. Similarly, institutions have found that estimates from detailed audits as well as actual amounts spent on renovation projects tend to be higher numbers than the ADM estimates derived from cursory studies such as this. Survey data on educational and general facilities is considered the most reliable and comparable from region to region.

On a regional basis, the survey data indicates that the Quebec, Ontario and Western regions do not differ widely from the Canada-wide averages, ranging in FCI from 9.0% to 12%. However, the Atlantic region stands out as being significantly higher by all three measures: $9,442/FTE, $313/m² and an average FCI of 17.3%. While the Western region’s $6,101/FTE is also higher than the Canada-wide average, its $189/m² is lower, and therefore, its FCI is very close to the Canada-wide average. The higher level of dollars of ADM per FTE in the Atlantic and Western regions partially relates to the fact that they have a greater proportion of smaller universities.

Interestingly, of the four regions, Ontario shows the lowest average FCI. While this may reflect that Ontario universities generally have less accumulated deferred maintenance, it may equally be explained in the CRV figures (see Table 3-6). The Ontario Region has the highest average CRV, i.e. $2,044/m² versus the Canada-wide average of $1,841/m². A higher CRV has the effect of reducing the FCI.

Institutional Comparisons

Comparison of the survey data among specific groups or categories of universities does not reveal any major trends. For example, there are no discernable patterns of FCI related to the age of universities, to their location (i.e. large urban centre versus smaller urban centre), or to their role (i.e. heavily into research versus mainly undergraduate).

Noteworthy is the wide variation in total estimates of ADM from institution to institution (see Table 4-2a). The range is from 0% FCI to over 40% FCI. This certainly reflects overall differences among institutions in their age, in the condition of their buildings and physical infrastructure, and in their need for facilities renewal. Furthermore, in a survey of this nature, there will be variances in the extent to which facility adaption is included within the ADM estimates. A number of institutional responses identified that major and costly renovations could be triggered if they were to comply with new building codes and regulatory standards, such as structural reinforcement in earthquake prone areas, unrestricted access for the disabled, improvements in air quality, removal of hazardous materials.
Table 4-2a: Range of Institutional FCI’s

<table>
<thead>
<tr>
<th>Level of FCI (average is 11.3%)</th>
<th>&lt; 5%</th>
<th>5-10%</th>
<th>10-15%</th>
<th>15-20%</th>
<th>&gt; 20%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Universities Reporting (total=51)</td>
<td>6</td>
<td>19</td>
<td>9</td>
<td>7</td>
<td>10</td>
</tr>
</tbody>
</table>

As shown in Tables 4-2b and 4-2c, there is a similar range of estimates of ADM/FTE and ADM/m² of building space among the surveyed institutions.

Table 4-2b: Range of Institutional $ of ADM/FTE

<table>
<thead>
<tr>
<th>$ of ADM/FTE (average is $5,561/FTE)</th>
<th>&lt; $2,500</th>
<th>$2,500-$4,999</th>
<th>$5,000-$7,499</th>
<th>$7,500-$10,000</th>
<th>&gt; $10,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Universities Reporting (total=51)</td>
<td>8</td>
<td>19</td>
<td>11</td>
<td>5</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 4-2c: Range of Institutional $ of ADM/m²

<table>
<thead>
<tr>
<th>$ of ADM/FTE (average is $214/m²)</th>
<th>&lt; $100</th>
<th>$100-$199</th>
<th>$200-$299</th>
<th>$300-$400</th>
<th>&gt; $400</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Universities Reporting (total=51)</td>
<td>7</td>
<td>20</td>
<td>11</td>
<td>4</td>
<td>9</td>
</tr>
</tbody>
</table>

Level of Survey Audit

The survey data was analyzed according to the level of institutional audit. It is assumed that those institutions whose ADM estimates are based on Level III building evaluations and audits, provide the most accurate measure to validate the Canada-wide extrapolations. As shown in Table 4-3a, the seven universities that based their ADM estimates on Level III analysis have a combined average FCI of 12.0%, slightly higher than the Canada-wide average. As mentioned previously, ADM estimates typically increase when they are based on more detailed building condition audits.
Table 4-3a: Comparison of Survey Results by Level of Audit - Total $ of ADM

<table>
<thead>
<tr>
<th>Level of Audit</th>
<th>Total $ of ADM</th>
<th>$/FTE</th>
<th>$/m²</th>
<th>FCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level III Audit Data Only (7 institutions)</td>
<td>$849,437,572</td>
<td>$6,160</td>
<td>$204</td>
<td>12.0%</td>
</tr>
<tr>
<td>All Level II &amp; Level III Audit Data (38 instit.)</td>
<td>$2,607,961,941</td>
<td>$5,641</td>
<td>$211</td>
<td>10.9%</td>
</tr>
<tr>
<td>All 51 Responses</td>
<td>$3,134,550,256</td>
<td>$5,561</td>
<td>$214</td>
<td>11.3%</td>
</tr>
</tbody>
</table>

In reviewing the survey data by level of audit for just educational and general space, the findings are consistent with those for total amounts of ADM. The institutions whose ADM estimates are based on Level III building evaluations and audits, show a slightly higher FCI than the average of all universities (see Table 4-3b).

Table 4-3b: Comparison of Survey Results by Level of Audit - $ of ADM for Educational & General Space

<table>
<thead>
<tr>
<th>Level of Audit</th>
<th>$ of ADM for Educ &amp; General Space</th>
<th>$/FTE</th>
<th>$/m²</th>
<th>FCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level III Audit Data Only (7 institutions)</td>
<td>$684,059,322</td>
<td>$4,960</td>
<td>$219</td>
<td>12.3%</td>
</tr>
<tr>
<td>All Level II &amp; Level III Audit Data (38 instit.)</td>
<td>$1,969,539,263</td>
<td>$4,260</td>
<td>$202</td>
<td>11.1%</td>
</tr>
<tr>
<td>All 51 Responses</td>
<td>$2,355,041,423</td>
<td>$4,178</td>
<td>$203</td>
<td>11.3%</td>
</tr>
</tbody>
</table>

Size of Institution

The survey data was analyzed according to size of university, measured both by enrolment and by building area. Together, the ten largest universities (by enrolment) have more than 40% of the total ADM for Canada. This is not surprising as these same 10 institutions contain over 40% of the total building space.

The overall size of the university does appear to have some bearing on its relative FCI. Table 4-4a summarizes the total ADM data from the 51 universities according to enrolment numbers and according to overall building size. The findings indicate that the largest institutions as a group have an FCI slightly above the Canada-wide average, the mid-size institutions are slightly below the average, and the smallest
as a group are well above the average. A possible explanation for the smaller group is that it includes a large proportion of the universities in the Atlantic Region, which as a region had a significantly higher FCI.

It is interesting to note that the range in dollars of ADM per FTE, clearly reflects the distribution of square metres of building space per FTE (as was summarized in Table 3-4b). The findings confirm that, as a general rule, institutions that have more building space per FTE also tend to have more $ of ADM per FTE, which is to be expected.

<table>
<thead>
<tr>
<th>Grouping of Institutions</th>
<th>Total $ of ADM</th>
<th>$/FTE</th>
<th>$/m²</th>
<th>FCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranking by Enrolment:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 10 Highest (&gt;19,000 FTE)</td>
<td>$1,465,649,730</td>
<td>$5,482</td>
<td>$206</td>
<td>11.5%</td>
</tr>
<tr>
<td>- 20 Mid Range (5,000 - 19,000 FTE)</td>
<td>$1,240,276,765</td>
<td>$5,070</td>
<td>$212</td>
<td>9.8%</td>
</tr>
<tr>
<td>- 21 Lowest (&lt;5,000 FTE)</td>
<td>$428,623,761</td>
<td>$8,296</td>
<td>$254</td>
<td>17.7%</td>
</tr>
<tr>
<td>Ranking by Enrolment:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 25 Highest (&gt;10,000 FTE)</td>
<td>$2,557,888,495</td>
<td>$5,340</td>
<td>$207</td>
<td>10.7%</td>
</tr>
<tr>
<td>- 26 Lowest (&lt;10,000 FTE)</td>
<td>$576,661,761</td>
<td>$6,817</td>
<td>$247</td>
<td>14.5%</td>
</tr>
<tr>
<td>Ranking by Building Area:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 10 Largest (&gt;500,000 m²)</td>
<td>$1,465,607,730</td>
<td>$5,816</td>
<td>$197</td>
<td>11.8%</td>
</tr>
<tr>
<td>- 20 Mid Size (139,000 – 500,000 m²)</td>
<td>$1,299,513,652</td>
<td>$5,149</td>
<td>$226</td>
<td>10.0%</td>
</tr>
<tr>
<td>- 21 Smallest (&lt;139,000 m²)</td>
<td>$369,428,874</td>
<td>$6,236</td>
<td>$248</td>
<td>14.3%</td>
</tr>
</tbody>
</table>
The survey data for just educational and general space was analyzed according to size of university. Again, the findings are consistent with those for total amounts of ADM. The largest institutions show a slightly higher level of FCI, the mid-size are slightly lower and the smallest institutions are well above the average (see Table 4-4b).

### Table 4-4b: Comparison of Survey Results by Size of Institution – $ of ADM for Educational & General Space

<table>
<thead>
<tr>
<th>Grouping of Institutions</th>
<th>$ of ADM for Educ &amp; General Space</th>
<th>$/FTE</th>
<th>$/m²</th>
<th>FCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranking by Enrolment:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 10 Highest (&gt;19,000 FTE)</td>
<td>$1,106,581,477</td>
<td>$4,139</td>
<td>$196</td>
<td>12.1%</td>
</tr>
<tr>
<td>- 20 Mid Range (5,000 - 19,000 FTE)</td>
<td>$937,257,700</td>
<td>$3,831</td>
<td>$200</td>
<td>9.5%</td>
</tr>
<tr>
<td>- 21 Lowest (&lt;5,000 FTE)</td>
<td>$311,202,246</td>
<td>$6,023</td>
<td>$253</td>
<td>16.6%</td>
</tr>
<tr>
<td>Ranking by Enrolment:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 25 Highest (&gt;10,000 FTE)</td>
<td>$1,954,074,177</td>
<td>$4,079</td>
<td>$198</td>
<td>10.9%</td>
</tr>
<tr>
<td>- 26 Lowest (&lt;10,000 FTE)</td>
<td>$400,967,246</td>
<td>$4,740</td>
<td>$234</td>
<td>13.2%</td>
</tr>
<tr>
<td>Ranking by Building Area:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 10 Largest (&gt;500,000 m²)</td>
<td>$1,228,544,477</td>
<td>$4,875</td>
<td>$210</td>
<td>12.6%</td>
</tr>
<tr>
<td>- 20 Mid Size (139,000 – 500,000 m²)</td>
<td>$858,100,182</td>
<td>$3,400</td>
<td>$186</td>
<td>9.3%</td>
</tr>
<tr>
<td>- 21 Smallest (&lt;139,000 m²)</td>
<td>$268,396,764</td>
<td>$4,530</td>
<td>$242</td>
<td>13.9%</td>
</tr>
</tbody>
</table>

### ADM Benchmarks

Financial benchmarks of the level of ADM are extremely useful for a number of reasons. They provide a measure to determine where an institution (or group of institutions) stands in relation to its peers. They establish a baseline to assess annual changes in the condition of facilities. Most importantly, they provide a benchmark for capital budgeting and planning within an individual institution as well as at the provincial and federal government levels.

### Facilities Condition Index (FCI)

FCI, the ratio of accumulated deferred maintenance to the current replacement value, is one of the most commonly accepted indicators of ADM. As a comparative measure the FCI is very useful, although some caution must be exercised in comparing FCI from institution to institution. A detailed facilities audit is the best method to accurately confirm the level of FCI at an institution.
Based on the survey, the average FCI among Canadian universities is estimated to be 11.3%. This represents the average percentage or proportion of the total current replacement value of their physical plant that universities need to spend to eliminate ADM. In other words, it could be viewed as the depleted value of their current physical plant. For survey respondents in the 1996 APPA study *A Foundation To Uphold*, the average FCI was approximately 7% among American universities and colleges.

The fact that Canadian universities appear to have a significantly higher level of accumulated deferred maintenance than American universities may partially be explained by a comparison of funding trends. In Canada, over the past 20 years the portion of total federal program dollars dedicated to post-secondary education transfers has fallen from 3.3% in 1979/80 to 1.6% in 1998/99. Over this same period, Canadian universities have experienced a 30% reduction in the level of government support per student, although some relief has been provided by rising tuition fees in a number of provinces. In contrast, U.S. universities now receive almost 20% more government support per student than they did 20 years ago. (See *Federal Spending On Post-Secondary Education Transfers To Provinces: Trends and Consequences*, B. C. Ministry of Advanced Education, Training and Technology).

Previous studies have determined that an institution’s FCI should not exceed 5% and that an ideal target is in the range of 2%. The suggested measures of FCI are as follows:

- 0% - 5%  Excellent to Good
- 5% - 10%  Fair to Poor
- > 10%  Unacceptable

There clearly is a large volume of catch-up maintenance work required at Canadian universities to reduce the gap from the current unacceptable level of 11.3% down to a 0% - 5% level.

88% of Canadian universities have an FCI higher than 5%. On a Canada-wide basis, the required capital investment in university facilities and infrastructure to reach a 5% FCI level is $2 billion. To reach the recommended target of 2% FCI at all institutions, the required investment is $3 billion. As indicated in the CAUBO survey, approximately 75% of this investment, or $1.5 - $2.25 billion must be targeted specifically to educational and general facilities.

These estimates essentially represent one-time capital costs calculated in today’s dollars. It is clear that an investment of this scale will require an infusion of new capital funds into the university system.
Other Benchmarks

Other methods of measuring the ADM at universities may also provide a meaningful and comparative benchmark for capital budgeting and planning purposes, and for presenting findings to those responsible for funding decisions.

Dollars per FTE is one suggested measure as it enables comparisons with other institutional financial data such as annual operating budgets, annual expenditures on plant operations and maintenance, and even annual tuition fees. The Canada-wide estimate of the current level of ADM is **$5,561 per FTE**, with the regional averages ranging from $4,243 per FTE in Ontario to $9,442 per FTE in the Atlantic. As a comparison, the estimated cost of ADM per student at U.S. universities in 1996, as determined from the 1996 APPA study *A Foundation To Uphold*, was in the range of $1,800 US to $2,300 US.

As discussed previously, part of the explanation why the Atlantic and Western regions show a higher estimate of ADM per FTE is that they have a greater proportion of smaller institutions and more building area per FTE.

Another suggested measure of the ADM is dollars per square metre, which will tend to be useful for those responsible for capital planning and campus development. On a Canada-wide basis, the average cost to eliminate ADM is **$214 per square metre of building space**. This encompasses all ADM costs including items external to the buildings such as site and utilities infrastructure. Another way of looking at this figure is to compare it with the CRV per square metre. While universities will spend on average $1,841/m² to build new space, **in addition they need to spend $214/m² to renew their existing facilities**. Again, to compare with the U.S. situation, based on the 1996 APPA study *A Foundation To Uphold*, the cost of ADM per square metre of building space in 1996 ranged from $70 US to $87 US / m².

A further measure of the magnitude of the ADM problem is a comparison with annual operating expenditures. For Canada as a whole, the total estimate of ADM represents **approximately 48% or almost half of the total annual general operating expenditures of all universities** (as reported in the 1997-1998 Financial Statistics of Universities and Colleges prepared by Statistics Canada for CAUBO).

This same report indicates that Physical Plant budgets totaled about $821 million for 1997/98, which represented close to 11% of the total general operating expenditures. However, it also indicates that well over 80% of the Physical Plant budgets are allocated to day-to-day operational costs such as staff salaries and benefits, utilities, operational supplies and expenses, property taxes and insurance. Indeed, a very small proportion of Physical Plant budgets is actually
spent on what is termed renovations and alterations, i.e. 4.9% or about $40.6 million Canada-wide. Furthermore, even of this amount, it is understood that very little is available to spend on ADM.

It is clear that the level of operating expenditures, and in particular the amounts accorded to Physical Plant, have been inadequate to prevent an ongoing increase in the backlog of deferred maintenance. To put it in perspective, the current level of funding for renovations and alterations represents only 1% of the estimated cost of eliminating ADM. At these levels, there is no capacity in the physical plant budgets to deal with the additional cost of ADM. As mentioned previously, to address the problem of ADM will require an infusion of new capital funds into the university system.
5. GOOD PRACTICES & FUNDING METHODS

Provincial governments have provided the capital funds for most of the $30.7 billion worth of physical plant at Canadian universities. The universities own, operate and maintain the physical facilities and infrastructure. They, together with government, have an obligation to ensure their physical plant is maintained in a safe, healthy and functional condition. Furthermore, the facilities must provide an effective environment for learning and research to support the academic mission of each institution.

It is the responsibility of universities to maintain, and if possible, enhance the value of their capital assets. The average university building in Canada is 32 years old, while the average life cycle of its components and systems is about 23 years. While the issue of increasing levels of ADM in the post-secondary education sector has been trumpeted for at least the past 15 years, it is apparent that to date the problem is not being adequately addressed. Some of the key reasons for this are:

- Cutbacks in government funding have been a recurring phenomenon over the past two decades, which has had a devastating effect on the resources available per student. As a result, physical plant maintenance budgets especially have suffered.

- Facility renewal and maintenance has attracted little interest from potential funding sources; it is often easier to obtain capital funds for new building projects than for renovations.

- With some exception, growth in university programs, research and enrolment has been relatively continuous over the last 50 years. As a consequence, universities have had to place emphasis on expanding their physical plant.

- Typically, physical plant operating and maintenance budgets are a static fixed amount, often without incremental annual increases. Adjustments are not normally provided to accommodate aging physical plant needs nor catch-up maintenance and renewal. Often, these have to be funded through major capital projects or special funding requests.

For example, physical plant managers know that good maintenance practices will fix the roof before it leaks, not after. However, when adequate funds are not available for preventive maintenance, the required work remains a lower priority until it reaches a crisis situation and the roof starts to leak. Unfortunately, by then the repair costs will tend to be much higher.
Life cycle renewal of physical plant components requires long term budgeting. Unfortunately, governments and institutions tend to plan and budget on the basis of 3 year, or maximum 5 year periods. Historically, it has also been difficult for institutions or their funding authorities to set aside and maintain the size of reserve funds required for life cycle renewal and replacement.

There has been a need to apply available capital resources to deal with code and regulatory compliance priorities.

The increasing rate of change and advancement in learning and workplace technology necessitates more frequent adaption of the physical plant just to keep pace.

**Good Practices**

Some institutions and funding authorities have taken steps to begin to address the problem of financing deferred maintenance, facility renewal and adaption. The following discusses a number of suggested practices and approaches gleaned from previous studies and specific institutional responses to our survey. One particular source recommended to the reader is *Successful Funding Strategies For Facility Renewal*, published by APPA in 1997.

**Level of Funding Required**

Institutional funding levels for physical plant operations and maintenance need to be set at a level that, at a minimum, avoids further increases in ADM.

The 1989 report *Financial Planning Guidelines For Facility Renewal and Adaption* produced by APPA, SCUP, NACUBO, and Coopers and Lybrand recommended 2%-4% of the CRV as a benchmark for annual capital budgeting purposes. The report states:

“*In order to preserve the value of its physical plant to the changing mission of the institution, each college or university should allocate:*
- sufficient “plant renewal” funds on an ongoing basis to keep the plant in good condition for its present use, based on facility subsystem life-cycles (1.5%-2.5% of plant replacement cost for most institutions);
- AND sufficient “plant adaption” funds on an ongoing basis to alter the physical plant for changes in use and codes and standards, based on recent experience and judgment (0.5%-1.5% of plant replacement cost at most institutions);
- AND sufficient “catchup maintenance” funds over a short-term period to bring the plant into reliable operating condition, based on a facilities audit.”
Another funding benchmark source is the American Public Works Association, which has published maintenance and repair funding guidelines that recommend a minimum of 2% to 4% of the aggregate current replacement value of the facilities.

Because of the increasing gap between available financial resources and the amount of funding needed to address ADM, universities with higher levels of ADM will need a major infusion of capital renewal funds to have any hope of catching up on their deferred maintenance backlog. One previous study suggested that institutions with an FCI greater than 5% typically must rely on additional sources of funding for capital reinvestment. Based on the CAUBO survey, **88% of Canadian universities have an FCI higher than 5%**.

**Planned Preventive Maintenance**

If there is no planned preventive maintenance program (PPM) in place, building components tend to deteriorate sooner and deferred maintenance accumulates until problems become visible and eventually untenable. A frequent characteristic of ADM is the chain reaction caused by the deterioration of one component or system on others. For example, leaking that occurs through a neglected roof will affect other components such as insulation and internal finishes.

One major Canadian university attributes its low FCI (well below 5%) to a focus on a planned preventive maintenance program and the commitment by senior university officials to providing sufficient operating funds to implement the program. As part of their best practices they suggest:

"We do not subscribe to the notion that mechanical and electrical systems should be automatically replaced after a theoretical life. We focus most of our efforts on PPM, and don’t have to spend as much time and money addressing breakdowns as a result...Parts that are subject to wear or failure are inspected, renewed or replaced on a regular schedule...The end result is lower total cost, more “up” time and less inconvenience to building occupants resulting from breakdowns or major system replacements.

Another “Good Practice” that we embrace is maintaining the integrity of the building envelope first. We have a comprehensive roof, brick and flashing inspection program, and when we select programs for the Facilities Renewal Program, we always make those repairs our first priority. We find that keeping water out of our buildings is one of the keys to minimizing total maintenance costs."

As most physical plant managers are aware, a starting point for avoiding future increases in ADM is to have an effective and adequately funded planned preventive maintenance program.
Having a Comprehensive Physical Plant Asset Protection Strategy

Another of Canada’s major universities identifies the importance of developing a comprehensive strategy ... that sets out a clear vision and long-term strategy for addressing physical asset protection...which... includes the identification of optimum annual funding levels in order to minimize long term costs and to reduce the deferred maintenance backlog to a manageable level. They go on to identify their five steps to success (based on the APPA study):

“1. Assess the needs;
2. Identify funding options;
3. Present strategies to decision-makers;
4. Build support within the University community; and
5. Manage the strategy’s implementation.”

Their implementation program includes the following action items, which are well worth restating:

- Maintain or increase maintenance budgets as set out in the strategy;
- Establish technical, finance and communications committees;
- Undertake a communications program to raise awareness of issues and provide more education about the physical assets;
- Develop and present financing strategy (annually) to Board of Governors;
- Establish quality assurance, benchmarking, and measurement systems; and
- Conduct a condition audit of all physical assets on an ongoing basis.”

With respect to implementation of a facilities renewal strategy, some of the examples of best practices in addressing ADM in American universities highlight the importance of physical plant managers having decision-making authority on operating and maintenance budgets as well as capital renewal budgets.

Identification of the Problem

It is essential to have the necessary data to describe the state of facilities and provide the basis for funding requests. Adjectives such as inadequate and critical are meaningless without hard backup information. Universities and governments are responsible for spending taxpayers’ money prudently and must ensure that the expenditures are justified. Therefore, providing decision makers with a complete picture, which includes reliable data based on generally accepted criteria, must be part of any budget-related proposal.

There are good examples of province-wide initiatives that are attempting to focus on identifying and quantifying the extent of the
ADM problem. For example, The Ontario Universities Facility Audit Program, supported by the COU, CSAO and OAPPA is developing a Facilities Condition Index to assist institutions and Ministry officials in monitoring the condition of facilities in Ontario universities and the progress achieved by investments in infrastructure renewal. As stated in the Ontario program, the four key steps of effective management of facility assets are:

- “Establish accurate baseline data about facility and infrastructure condition through a detailed, structured inspection, assessment and analytical process. (Each university will audit and report on 20% of its physical infrastructure on an annual basis).
- Estimate short and long-range component renewal needs using the data obtained from life cycle analysis verified through inspection.
- Create decision-support models to calculate alternate investment strategies and the effect on short and long-term facility conditions.
- Report on the facility condition and impact on mission to governing boards, senior management, and line management responsible for maintaining the capital assets.”

In 1997, the Alberta government completed a cursory condition survey of its public post-secondary education facilities to establish a baseline understanding of the funding levels required to address the ADM problem. An outcome of the study was the introduction of the Infrastructure Renewal Envelope fund specifically targeted at facilities renewal.

In Nova Scotia, a joint NSCHE-CONSUP Working Group is spearheading a similar study of deferred maintenance needs at the Province’s universities. Common elements of these types of initiatives include:

- the use of consistent measurement criteria and indices such as building replacement costs, building component life cycles, data definitions;
- a focus on ongoing monitoring of the problem;
- a training component;
- a focus on correcting the problem by addressing the need for funding;
- fostering inter-university cooperation.

**Commitment to Addressing the Problem of ADM**

The 1996 APPA study, *A Foundation To Uphold*, identified that the most influential factor in addressing the problem of ADM was:

“...where determined leadership placed deferred maintenance as a priority on their agenda, action followed.”
Because there are so many competing demands on university and government resources, a commitment to addressing ADM must be made at the highest levels of governments and universities, and communicated to all stakeholders throughout the system. Planning and budgeting for facility renewal and upgrading must become part of an institution’s strategic planning process, priority setting process, short term and long range campus development planning, the annual financial planning and budgeting cycle, and even part of the planning and budgeting of new building projects. Commitment also implies allocating human resources to address the problem of ADM to carry out tasks such as facility audits.

At the same time, planning and allocating resources for facility renewal must also become part of governments’ annual budget cycle, both in terms of short term catch-up funds, as well as long term increases in physical plant maintenance budgets. However, it is critical that universities maintain their autonomous decision-making authority with respect to the allocation of capital renewal funds from government and other external sources.

Another key element of commitment is the need to communicate the condition of the physical plant and its impact on institutional mission and program delivery. To be effective, the communication should be solution oriented, adequately supported by data and analysis (even including visual illustrations of ADM conditions), and addressed to stakeholders at all levels of the institution. Universities that are trying to address the problem indicated that they focus on how decreasing their level of ADM will improve safety, support learning and research, attract students, staff and faculty, and improve the reputation and image of the institution.

One major university noted how they have successfully presented their case for funding ADM in terms of funding scenarios and their implications on physical plant, safety, operations and program delivery. The three scenarios include:

- If current funding levels are maintained;
- If funding levels are increased to only a “keep-up” level; and
- If funding levels are increased to a “catch-up” level.

**Facility Audits**

While building condition information should be as current as possible, it is not practical and too costly to carry out annual detailed facility evaluations on all buildings. A good general (cursory) audit, with periodic detailed audits on selected buildings is usually a reasonable compromise.

The following are examples of successful practices adopted by some Canadian universities:
Training in-house staff to carry out detailed audits and maintain an accurate data base. One institution noted that a benefit in using in-house staff to undertake the audits was that it increased the staff's detailed knowledge about the buildings.

Maintaining a current costing information data base.

Establishing a reasonable proportion of detailed versus cursory audit information and incorporating it into the institutional building evaluation system, e.g. 20% of buildings receive detailed audits annually. This is the approach being undertaken by the COU, CSAO and OAPPA in their proposed Ontario Universities Facility Audit Program.

Ensuring adequate funding for the building audit process. Experience has shown that direct observation of building conditions must form part of an audit. Building/component age alone is not necessarily an accurate indicator of current condition.

Maintaining deferred maintenance information on each building and updating it regularly, e.g. annually.

Developing accurate data on replacement values and updating it periodically. This information is used to develop the FCI, which appears to be one important factor in funding formulae. The FCI is also a valuable tool for helping to set capital renewal priorities within an institution.

Using life cycle data to estimate short and long range component renewal and replacement needs.

Maintaining a long term capital priorities plan and updating it regularly. This can be done using cursory (Level II) estimates. A detailed evaluation can be carried out on a project-by-project basis shortly before the project proceeds. Such a plan can also be used internally while dealing with faculties and service departments. It is important that the critical renewal priorities remain high profile until they are addressed.

Occasionally bringing in outside expertise to provide unbiased assistance, and in particular, to train in-house staff.

**Sustainability & Endowment**

While the focus of this study is the need to deal with the current backlog of deferred maintenance, it is equally critical that any further accumulation of deferred maintenance be stopped. With the increased demand in enrolment being caused by the “echo boom”, many universities appear to be entering another phase of building expansion. At least one of the larger universities in Canada has
implemented the concept of providing an ‘endowment’ for future renewal and upgrading as part of the initial capital funding (their reported FCI is less than 5%). This appears to be a very good concept particularly when an increasing amount of new building space is being funded through private sector and other non-traditional sources, and in those cases where government does not provide “lights-on” funding for new buildings.

Another of the larger universities noted that greater attention should be paid to life cycle costing, both in addressing its facility renewal needs as well as in new building construction. Part of the reason it hasn’t been is that capital development is often approached on a project by project basis. It noted, for example, how the impact of life cycle planning in areas such as building cooling, campus heating plants and electrical co-generation can have a positive impact on ongoing operation and maintenance costs.

**Provincial Comparisons**

Information for this section came from contacts with staff in provincial government departments, including those responsible for construction and maintenance of post-secondary education facilities.

**Summary**

With some exceptions, the operations and capital investments of universities in Canada are largely publicly funded. However, with the cuts in government financial support in the 1980’s and 1990’s, the proportion of total university funding coming from the public sector has decreased substantially. As a result, tuition fee revenues have risen and there is greater reliance on alternative sources of funding such as foundations, endowments, other public sector entities and the private sector.

The following points summarize current capital funding for universities throughout the provinces.

- Except for Quebec, all provinces have reduced their funding of capital expenditures in universities over the past decade.

- Only Quebec and British Columbia use long term financing to meet the capital needs of the post-secondary education sector.

- While it is generally accepted that the required annual funding allowance for facility maintenance, renewal and adaptation is between 2% and 4% of replacement value, no Canadian university receives that level of funding from its provincial government. Consequently, most institutions continue to accumulate deferred maintenance backlogs.
Only Quebec and British Columbia use long term government debt to finance capital projects.

Typically, provinces provide funding for maintenance and minor renovations within the operating budgets. Major capital works are funded on a project by project basis.

At this time, only Alberta and Ontario have funding envelopes specifically targeted to deferred maintenance and infrastructure renewal.

Provincial governments expect increasing demand to invest substantial sums for the maintenance and renewal of existing buildings and infrastructure, as well as for the construction of new buildings.

The following is a brief look at the funding of capital needs at universities in each province.

**British Columbia**

There is annual block funding for the university system for cyclical maintenance and renovations, which is distributed according to a formula. The formula is based on facility inventory and takes into account building ages. The level of funding usually falls between 1% and 1.5% of replacement value.

Major capital projects are requested as line items and are subject to the normal budget approval process. The Ministry of Education, Training and Technology reviews projects according to a predetermined grid and as part of a five year plan. Since 1997/98, the Ministry of Finance and Corporate Relations is a major participant in university capital projects as part of the governments controls on capital spending and the public debt. Currently, the universities are in the second year of a “new space freeze”.

The Ministry of Education, Training and Technology’s *Strategy – Charting a New Course*, identifies the...*protection and rejuvenation of current capital assets, including cyclical maintenance programs*...as a key element of their Capital Funding Envelope. The allocation process for capital funding is to focus on *Cyclical Maintenance Plans* ...*developed through a comprehensive assessment of all campus facilities, and will typically involve a 15-20 year time horizon*; *Facilities Audits...prepared by the institutions...will be reviewed by the Ministry and institutional staff in order to establish options and priorities*. The emphasis of the Strategy is on capital projects that target facility renewal and upgrading. The long term view of 15-20 years on cyclical maintenance is a good strategy for potentially eliminating ADM.
Alberta

In the 1980’s and early 1990’s, the Alberta post-secondary system was funded on the basis of a Capital Funding Formula, which was based on existing space inventories and took into account ages of buildings as well as site and utilities infrastructure. The level of funding represented approximately 2% of the replacement value of institutions (including the replacement value of their site and utilities). As cutbacks became necessary, the level of funding decreased every year, and several years ago, the funds that remained under the formula were rolled into the annual operating budgets. Institutions became responsible for deciding what portion to dedicate to facility and equipment-related capital needs.

Currently, the government is providing additional funding through the new Infrastructure Renewal Program. It consists of $35 million per year (for the whole post-secondary system) which is distributed partly on the basis of existing space inventory and partly according to Deferred Maintenance needs based on each institution’s Facility Condition Index. A general evaluation of all post-secondary education facilities was completed in 1997 by external consultants. One-time dedicated capital grants are also provided from time to time.

Major capital projects are requested as line items and are subject to the normal budget approval process. External fundraising for capital projects is encouraged and matching grants are often provided.

Saskatchewan

In general, government provides capital funding to the two major universities on the basis of what it can afford. Typically, it has never been enough to prevent deferred maintenance backlogs. Currently, there are two funding categories:

1. Envelope (Block) Funding for minor and maintenance items.
2. Major Capital Funding for major projects which are requested as line items and go through the normal approval process.

The Department of Finance provided additional funds to post-secondary education institutions to upgrade existing buildings in its 1997/98 and 1998/99 budgets.

The Ministry of Post-Secondary Education and Skills Training is developing alternative methods of capital funding. There is a possibility that the recommendations of a recent consultant’s report, calling for the implementation of annual Envelope Funding, will be acted upon. Approximately 1% of replacement value would be provided. This figure is low but realistic under current fiscal conditions. Distribution would be according to theoretical space needs, calculated on the basis of programs and student enrolment.
**Manitoba**

The Ministry of Education and Training has no special capital funding or formula grant distribution to address ADM or facility renewal. Basic maintenance is covered by operating grants. Major capital project requests for the four universities are submitted first to the Council on Post-Secondary Education for approval, and subsequently to government for approval and financing. Projects that proceed are financed under the Capital Envelope which may include major renovations and equipment.

**Ontario**

In addition to the base operating budgets which include allocations for physical plant operations and maintenance, the universities receive a formula grant for facility renewal and ongoing maintenance - called the Facilities Renewal Program. The formula is based on theoretical space needs which take into account program requirements and enrolments. The amount distributed remained relatively constant up to 1999/2000, at which point it was increased almost threefold. Even at its increased level, it represents less than 1% of the replacement value of the institutions.

Major capital projects are requested as line items and are subject to the normal subject approval process which takes into account enrolment growth, private contributions (matching grants are available), student demand and satisfaction, and community and regional input.

Ontario universities have also received capital renewal funds through the Canada/Ontario Infrastructure Works program which was designed to renew Ontario’s infrastructure leading to economic development and job creation. Funds were distributed on a project by project basis.

The Ontario government announced its proposed SuperBuild Growth Fund in its 1999 Budget; the intention being to inject $20 billion into Ontario’s infrastructure over the next five years, half of which will come from partners in the public and private sectors. Post-secondary education is the first sector to receive SuperBuild funding - $742 million was announced for the current year to build and modernize in anticipation of an expanded student population. The focus of this fund appears to be new construction since, of the total amount, $660 million is apparently for new capital projects. Ontario is anticipating a major enrolment surge in 2003 due to the removal of one year of high school.

The COU together with CSAO and OAPPA has taken a strong position on the need for substantial investment in infrastructure renewal at Ontario universities. As discussed previously in the report, a CSAO/OAPPA working group is working with the Ministry of Training,
Colleges and Universities spearheading the development and implementation of an Ontario Universities Facility Audit Program. The objective is to assist institutions and Ministry officials to monitor the condition of facilities and to promote increased investment in infrastructure renewal.

**Quebec**

Quebec universities receive operating grants which include allowances for equipment and building maintenance. Major capital projects are requested through the Ministère de l'Éducation within the framework of a five year plan. Once approved, the project is typically funded through the Fonds de financement or through the issue of bonds. The debt service is paid by the government.

Over the past decade, the Ministère de l'Éducation has funded a shared government/university (70/30 split) program restricted to infrastructure renewal projects. This targeted fund has been distributed to date in three cycles, early 1990's, mid 1990's and late 1990's. In the most recent period, 1997-1999, the government contribution totaled approximately $50 million. The allocation among the universities is based on factors such as total building area, building age and current replacement value.

The Ministère de l'Éducation hopes to continue funding infrastructure renewal over the next decade and has estimated an annual need for $25 million. Infrastructure renewal is their second capital funding priority, after investment in new technology and communications.

**New Brunswick**

The Ministry of Education distributes operating grants through a funding formula, 75% of which is based on historical grant data and 25% on weighted enrolment averaged over three years. Of this grant, approximately 5% is the Restricted Fund for alterations and renovations, equipment, and libraries. There is no funding envelope or formula grant to specifically address ADM or facility renewal.

Major capital projects are requested as separate line items and are subject to the normal budget approval process. Capital budget submissions are channeled through the Maritime Provinces Higher Education Commission, whose objective is to help the Maritime Provinces and the institutions to use and allocate post-secondary education resources more effectively throughout the region. The Commission plays an important role in the evaluation and approval of major capital projects at the universities. Institutions are expected to participate in the funding of capital projects.

A recent task force in New Brunswick recommended increased capital funding and a three-to-five year moratorium on new construction.
Nova Scotia

The universities are currently in the second year of a three year plan through which funding is provided for capital needs. The grants are distributed according to a formula based on weighted enrolment calculations. The current spending level is about $7.6 million distributed among all the universities. It is made up of two restricted operating grants - Alterations & Renovations and Non-Space Capital (about a 50/50 split). Non-Space Capital, by definition, cannot be used for Deferred Maintenance and the Alterations & Renovations is usually used up changing space usage - not dealing with ADM. Consequently, very little is being done to address the facility renewal problem.

The Department of Education and Culture has delegated a portion of its responsibilities to the NSCHE. A joint NSCHE-CONSUP working group is completing a study on deferred maintenance needs at the universities. The working group activities include defining the ADM problem and making recommendations on required funding levels, distribution of funds, cost sharing and timing. It is anticipated that the government contribution to facility renewal and maintenance will need to increase from the current $7.6 million per year to approximately $29 million per year.

Major capital projects are requested as separate line items and are subject to the normal budget approval process. Institutions are expected to participate in the capital funding.

Prince Edward Island

The Ministry of Education provides the university with an operating budget, as well as Restricted Allowances for alterations and renovations, and for furnishings and equipment. This is a block amount and is not based on any space or inventory formula.

Major capital projects are requested as special capital grants and are evaluated on a case by case basis. The university is expected to participate in the capital financing. Capital budget submissions are channeled through the Maritime Provinces Higher Education Commission which makes recommendations to government.

Newfoundland

The university has the option of funding capital/maintenance projects from its operating budget. In addition, it receives an annual block grant for furniture and equipment which is not based on any formula. The Ministry of Education has no funding envelope or formula grant to specifically address ADM or facility renewal. Major capital projects are requested as separate budget line items as a capital grant of 1 to 5 years maximum, and are evaluated on a case by case basis.
6. SUMMARY & CONCLUSIONS

This study and its accompanying survey were commissioned by the Canadian Association of University Business Officers (CAUBO) to assess the problem of accumulated deferred maintenance (ADM) at Canadian universities. Response to the survey was excellent, totaling fifty-three institutions across the country. The findings incorporate data from fifty-one universities, which together account for approximately 87.5% of the total Canada-wide enrolment.

Extent of the Problem

Based on the results of the survey, ADM has become a major problem and concern at Canadian universities. There is an urgent need for reinvestment in the physical plant of our universities.

- The Canada-wide cost estimate to eliminate ADM at universities is $3.6 billion, which includes all owned buildings and site and utilities infrastructure. Approximately 75% of this amount, or about $2.7 billion, specifically relates to educational and general facilities. Experience from previous studies indicates that the $3.6 billion is likely an underestimate.

- Of the total $3.6 billion, it is estimated that $1.0-$1.2 billion of the Canada-wide ADM may be considered urgent.

- The cost to eliminate ADM represents approximately $5,561 per FTE student.

- The cost to eliminate ADM also represents about $214 per square metre of building space. For example, while today universities will spend on average $1,841/m² to build new space, in addition they need to spend $214/m² to renew their existing facilities.

- Canadian universities have an average FCI of 11.3%, which compares unfavorably with the U.S. average of 7%. As a general guideline, the FCI should range around 2% and not exceed 5%. To reach the recommended target level of 2% FCI at all institutions, a capital investment of $3 billion is required.

- It is apparent from the survey that for a number of institutions, data on residences and site and utilities is incomplete. Consequently, the $3.6 billion of ADM is likely a low estimate. Furthermore, universities that have completed detailed audits and/or renovation projects found that their actual ADM costs tended to be higher than originally estimated.

- The Quebec, Ontario and Western regions do not differ widely
from the Canada-wide averages, ranging in FCI from 9.0% to 12%. However, the Atlantic region stands out as being significantly higher, with an average FCI of 17.3%.

Measures of $ of ADM per FTE and $ of ADM per m\(^2\) indicate again that the Quebec, Ontario and Western regions are relatively close to the Canada-wide averages, ranging from $4,243/FTE to $6,101/FTE and from $177/m\(^2\) to $256/m\(^2\). Again, the Atlantic region is higher at $9,442/FTE and $313/m\(^2\).

There is a variation in total estimates of ADM from institution to institution, which not only reflects overall differences in the condition of their physical plant, but also pertains to the method and comparability of their estimates of ADM and CRV.

The survey data indicates no discernable patterns in the relative amount of ADM due to the location or the role of a university. In so far as age is concerned, while being a contributing factor to ADM, it alone does not determine its relative level.

Causes of the Problem

Provincial governments have provided the large majority of the capital funding for the $30.7 billion worth of existing physical plant at Canadian universities. The universities own, operate and maintain the physical facilities and infrastructure. Together, they have an obligation to ensure the physical plant is maintained in a safe, healthy and functional condition. The current problem of ADM is due to a number of factors.

Aging Physical Plant - The average university building in Canada is 32 years old; the average life cycle of its components and systems is about 23 years. Approximately 58% of today's physical plant was constructed in the 1960's and 1970's.

Inadequate Funding for Facility Renewal - Physical plant operating and maintenance budgets have been relatively static or even reduced at most institutions over the past decade. This has left little if any funds to invest in catch-up maintenance and renewal. In fact, the inadequacy of physical plant budgets is contributing to the problem of ADM.

Decreasing Funding Levels - The combination of government cutbacks in the 1990's and high inflation and energy costs during the 1980's has squeezed resources available for capital upgrading and renewal.

Lack of Profile - Facility renewal and maintenance has tended to attract little interest, especially at the senior decision-making level of governments and universities. With government cutbacks, universities have found it increasingly necessary to pursue
alternative sources of funding, such as the private sector. However, it is often easier to obtain capital funds for new building projects than for renovations.

- **Continual Demands for New Space** - With some exceptions, growth in university programs, research and enrolment has continued unabated over the last 50 years. Universities have had to place priority on expanding their physical plant.

- **Expanding Need for Facility Renewal and Adaption** – The need to comply with new code and regulatory requirements, together with the increasing pace of change in learning and workplace technology, has tended to deplete the available capital resources.

- **Resistance to Life Cycle Funding** – Institutional and government budgets are typically based on three year plans. Life cycle renewal of physical plant components requires longer term budgeting and/or setting aside funding reserves.

**Impact of the Problem**

It is being recognized at a national level that increased investment in post-secondary education is necessary for Canadians to be competitive in the knowledge-based global economy. The competition to attract top quality educational resources and research funds is fierce among institutions. Students are paying much higher tuition fees and becoming more selective and demanding. The anticipated growth in enrolment over the next decade will place further demand on existing physical plants. Aging and deteriorating facilities will have a negative impact on the ability of universities to fulfill their missions in teaching and research.

Failing to address the problems of ADM can lead to disastrous circumstances. Educational activities can be disrupted and research experiments ruined because of interruptions in physical plant utilities and services. Research facilities such as computer equipment, animal care areas, greenhouses and growth chambers, cold rooms and specialized chemical storage areas are particularly dependent upon an uninterrupted service supply.

Service disruptions can have a serious impact on emergency and life safety systems resulting in risks to building occupants. For example, outdated ventilation systems lead to poor air quality, which generate occupational and health issues. The infiltration of water through aging roofs, walls, floors and foundations can result in serious damage to building interiors, equipment, furnishings and collections.

Studies have also shown that when deferred maintenance problems are left unattended too long, at times the only cost-effective solution is the demolition and replacement of a building.
Suggestions of Good Practices

There have been a number of studies addressing the growing issue of ADM in post-secondary institutions. Many of the suggestions and recommendations contained in these reports continue to be valid.

3 **Commitment to Eliminating ADM** – Previous studies have concluded that the most influential factor in addressing the problem of ADM was leadership and commitment at the highest levels of the institution. In addition, institutional planning and budgeting processes must reinforce this commitment and enlist the support of all stakeholders.

3 **Ensure Adequate Level of Ongoing Funding** – Previous studies recommend 2%-4% of the CRV as a benchmark for annual capital budgeting purposes. At a minimum, funding levels for physical plant operations and maintenance need to be set at a level that avoids further increases in ADM.

3 **Explore Alternative Investment Strategies and Sources Of Funding** - With the increasing gap between available financial resources and the amount of funding needed for capital renewal, universities with levels of ADM higher than about 5% will need to find external sources of funds to have any hope of catching up on their deferred maintenance backlog.

3 **Planned Preventive Maintenance** – An important starting point for avoiding future increases in ADM is to have an effective preventive maintenance program in place that is supported at all levels of the institution.

3 **Identification of the Problem** - It is critical for universities to have the necessary data to describe the state of facilities and provide the basis for internal and external decision-making and funding requests. Communication of the problem should be solution oriented and adequately supported by data and analysis such as that developed through facility audits.

3 **Facility Audits** - Developing accurate data on current replacement values and estimates of ADM is an important strategy. Life cycle data should be used to estimate short and long range component renewal and replacement needs.

3 **Long Range Capital & Facilities Planning** – Many institutions have found it valuable to develop and regularly update a long range capital priorities plan. It also assists in communicating internally with faculties and service departments. Prior to carrying out specific major renewal projects, detailed evaluation should be carried out.
Sustainability – Future accumulations of deferred maintenance must be prevented. With a number of universities embarking upon a new phase of building expansion, concepts such as life cycle cost design and the provision of an endowment fund for future renewal and upgrading as part of the initial capital funding, should be seriously considered.

Government Funding to Address ADM

To date, funding for deferred maintenance at Canadian universities has been from two primary sources – operating budgets (i.e. tuition fees, government grants) and directed government funding (i.e. the Facilities Renewal Program in Ontario, the Infrastructure Renewal Envelope in Alberta). While physical plant managers are being challenged to find innovative and alternative methods for funding facilities renewal and upgrading, within the Canadian context, it is clear that additional directed government funding will be necessary to address such a large backlog of deferred maintenance.

Two forms of additional funding will be necessary to deal with the problem of ADM. An infusion of short term catch-up funds is required to bring the situation into equilibrium, together with a long term increase in base operational funding for physical plant, in order to avoid the ongoing proliferation of ADM.

To the extent that provincial governments are able to commit to longer range capital budgeting, i.e. 3 or even 5 years, universities will be in a much better position to plan larger scale capital renewal projects.
APPENDICES

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Canadian Education Statistics Council, Education Indicators in Canada, Pan-Canadian Education Indicators Program, published by the Canadian Education Statistics Council, 1996.


Universities that Responded to the Survey

1. Atlantic Region
   - Memorial University of Newfoundland
   - University of Prince Edward Island
   - Acadia University
   - University College of Cape Breton
   - Dalhousie University
   - University of King’s College
   - Mount Saint Vincent University
   - Nova Scotia Agricultural College
   - Nova Scotia College of Art & Design
   - Université Sainte-Anne
   - St. Francis Xavier University
   - Saint Mary’s University
   - Université de Moncton
   - Mount Allison University
   - University of New Brunswick
   - St. Thomas University

2. Quebec Region
   - Bishop's University
   - Concordia University
   - École Polytechnique de Montréal
   - Inst. national de la recherche sc.
   - Université Laval
   - McGill University
   - Université du Québec à Montréal
   - Université de Montréal
   - Université de Sherbrooke

3. Ontario Region
   - Brock University
   - Carleton University
   - University of Guelph
   - Lakehead University
   - Laurentian University of Sudbury
   - McMaster University
   - University of Ottawa
   - Queen’s University
   - Ryerson Polytechnic University
   - University of Toronto
   - Trent University
   - University of Waterloo
   - The University of Western Ontario
   - Wilfrid Laurier University
   - University of Windsor
   - York University
4. **Western Region**

- Brandon University
- The University of Manitoba
- The University of Regina
- University of Saskatchewan
- U. of Sask. - St. Thomas More College
- University of Alberta
- The University of Calgary
- The University of Lethbridge
- The University of British Columbia
- The University of Northern B.C.
- Simon Fraser University
- Trinity Western University
- University of Victoria
Background

CAUBO is undertaking a study to establish an objective and reliable assessment of the state of deferred maintenance at Canadian Universities. Our primary intention is to raise the profile of the problem of deferred maintenance at the national, provincial and institutional level to influence both public policy makers and campus decision makers.

The emphasis in this study is to utilize available information and data from as many institutions as possible, which we will validate to the extent possible and extrapolate to present a Canada-wide picture.

A Steering Committee comprising the following CAUBO members will direct the study and communicate with the institutions.

East Region: Neil Henry, Vice-President, Finance & Facilities
University of Prince Edward Island
Quebec Region: Phyllis L. Heaphy, Vice-Principal (Administration and Finance)
McGill University
Ontario Region: Duncan Watt, Vice-President (Finance and Administration)
Carleton University
West Region: Keith Winter, Vice-President, Finance and Services
The University of Calgary
CAUBO: Maurice Cohen, Executive Director, CAUBO

The following individuals will assist the Steering Committee in the collection of data from the institutions.

East Region: Don MacIsaac (University College of Cape Breton), Chair Atlantic APPA
Quebec Region: Chuck Adler (McGill University), Member, Comité MEQ-CREPUQ, Gestion des ressources matérielles
Ontario Region: Dave Riddell (The University of Western Ontario), Chair OAPPA Benchmarking Committee
West Region: Steve Baldick (The University of Calgary), Business and Financial Manager, Facilities Management

The firm of RMC Resources Management Consultants Ltd. will coordinate and produce the study on behalf of CAUBO.

Survey Parameters

As much as possible, the information categories and definitions used in this study will be consistent with previous studies, such as those in Alberta, Ontario, and the 1996 study A Foundation To Uphold, produced by APPA: The Association of Higher Education Facilities Officers. Our intent is to generate as little additional work for the institutions as possible.
Our survey will attempt to present the magnitude of the deferred maintenance problem as of 1999, knowing however that much of the information readily available will be from previous years. It is not our intention to try and project future levels of deferred maintenance.

The survey will encompass all owned facilities at the Universities regardless of their function or use. It therefore proposes to include ancillary facilities such as residences and parking as well as site infrastructure and utilities.

The key data we are requesting is the Accumulated Deferred Maintenance at each institution. Consistent with the APPA study, A Foundation To Uphold, the accumulated deferred maintenance is subdivided into three categories: Renewal and Replacement expenditures, Adaption expenditures, and deferred Routine Maintenance expenditures (see definitions below).

Our survey includes equipment that is built-in or fixed and/or forms part of the building infrastructure, e.g., telecom systems. It does not include movable furnishings and equipment.

**Terminology & Definitions**

**Accumulated Deferred Maintenance** is a backlog of unfunded major maintenance projects that have been deferred to future budgets. It results either from an accumulation of neglected routine maintenance items which evolve into more serious major concerns or from failure to carry out major repair or restoration projects on facilities which have reached the end of their life cycle or have become obsolete. Typically, this is considered ‘catch-up’ maintenance. Accumulated deferred maintenance is subdivided into the following three categories:

**Renewal and Replacement** refers to capital expenditures required for the preservation of capital assets in order to keep the physical plant in a reliable operating condition for its present use. It deals with the repair and replacement of systems and components (with a life cycle of more than one year) which extend the life and maintain the functional and usable condition of facilities and systems. Examples typically include: building structure, envelope, building systems, finishes, spalling, leakage, building control systems, electrical and HVAC systems, telecommunication systems, site and utility improvements. Note that renewal and replacement does not include new construction.

**Adaption** refers to capital expenditures required to meet current regulatory standards and the evolving physical needs on an institution. Such expenditures are in addition to routine maintenance and are not usually contained with the operating budget. It often addresses health and safety risks to people and animals as well as externally imposed regulatory influences. Examples typically include: barrier free access projects, asbestos removal and other health hazards such as fumes, insurance requirements, fire and smoke protection systems, exiting, emergency lighting, elevator safety, tripping hazards, directed code compliance, local regulations, by-laws, and environmental requirements; as well as changes in
Instructional and research facilities to accommodate current technology or programmatic needs.

**Routine Maintenance** refers to day-to-day maintenance to control deterioration of facilities and site and provide services to the users. It is typically funded out of the annual operating budget. While this category consists of a large number of relatively small items, a substantial backlog can accumulate if too many requests are deferred. Examples typically include: preventive maintenance, site maintenance and groundskeeping, housekeeping, minor repairs.

**Current Replacement Value** is the estimated cost, in current dollars, to replace buildings, utility systems, physical plant and site improvements. Insurance replacement values or adjusted book values may be used only if they are deemed to be reasonably accurate. For buildings, it is usually the product of the gross area and the current local unit cost of that type of space (cost to be all-inclusive, i.e., planning, design, construction, project management, etc.). For site and utilities, various methods can be used. Some institutions carry out periodic audits for funding or other purposes. If those are not available then a unit cost per hectare can be applied. For example, Dave Riddell, in his recent (1998) Ontario survey for the Strategic Assessment Model suggests $250,000 per hectare for paved areas and half that amount for unpaved areas. In Alberta, a recent study (1997) used $130,000 per hectare for the entire developed campus site (i.e., excluded agricultural and other unserviced lands).

**Educational and General Space** refers to all University-owned facilities used for instruction and learning, research, administration, athletics/recreation, library, study, entertainment, lounge, health services, food services, day care, retail, physical plant support and infrastructure, circulation, and structure.

**Residences** refer to all University-owned facilities used for housing accommodation.

**Parking Structures** refer to buildings/structures used for vehicle parking.

**Site and Utilities** (also referred to as grounds or infrastructure) refers primarily to the spaces between buildings of a campus and to the non-architectural elements of campus design. These elements include, but are not necessarily limited to: circulation systems (roadways, walkways), utilities systems (sewers, drains, steam tunnels, electrical cabling, fibre optic lines), surface parking, campus places (natural areas, recreational and athletic areas, plazas, malls), paving and hard surfaces, landscape, campus furniture, wayfinding and signage, lighting, refuse and waste removal, art and artifacts, and access points for people with disabilities.

**Gross Building Area** is the sum of all areas on all floors of a building included within the outside faces of its exterior walls.
Survey Form

Our survey form is divided into four sections. **As a minimum, we request that all institutions complete Section I and to the extent possible, Section II.**

Please note that if you already have the type of information we are requesting available from an earlier submission or survey, you may wish to simply forward a copy to us even if the categories are slightly different.

*Section I - Basic Information.* Includes the minimum information and data that we need to receive from all institutions.

*Section II – Accumulated Deferred Maintenance.* Includes the estimated cost of accumulated deferred maintenance according to the categories identified. We appreciate that some institutions may not be able to provide estimates of the costs of deferred maintenance. From such institutions we want to be sure we receive Section I completed in its entirety.

*Section III – Facility Audits.* We are aware that a number of institutions have completed campus-wide evaluations and/or audits of some or all of their buildings. As a basis for extrapolating information to all institutions across Canada, we would like to obtain more detailed information on the outcome of your facility audits, even if only available for individual buildings. Therefore, Section III of our survey form requests this information from those institutions who have undertaken facility audits, whether of a cursory or detailed nature. Institutions that have not done facility audits are not required to complete Section III.

*Section IV – Good Practices.* We would like to obtain feedback from the Universities on examples of ‘good practices’ in dealing with the issues of accumulated deferred maintenance. This may include, for example, methods of determining estimates, facility audit tools, methods of establishing funding policies and priorities, communication strategies.
# Section I – Basic Information

1. **Name of Institution:**

2. **Contact Person:**  
   (w/title, phone, fax & e-mail address)

3. **Building Areas:** (total gross square metres of owned space divided among the following 3 categories)
   - 3.1 Educational & General Space
   - 3.2 Residences
   - 3.3 Parking Structures
   - **Total**

4. **Site Areas:** (hectares of owned land divided between the following 2 categories)
   - 4.1 Serviced land used for buildings, grounds, athletics, parking, etc.
   - 4.2 Unserviced land such as that used for agricultural research and reserves

5. **Current Replacement Values:** (total values of all facilities & infrastructure according to the following categories; please identify what year’s dollars are being used)
   - 5.1 Educational & General Space
   - 5.2 Residences
   - 5.3 Parking Structures
   - 5.4 Site and Utilities
   - **Total**

6. **Building Inventory:**  
   (Note: Institutions completing Part III of the survey are not required to complete this item)  
   Please attach, in whatever format you already have available, a list of buildings identifying for each its age, gross area, and major functional uses.

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**Note:** Definitions of terminology are provided previously on pages 2 and 3.
Section II – Accumulated Deferred Maintenance

Note: As a minimum, we need to receive the subtotals for each category, only if you are unable to break it down further.

<table>
<thead>
<tr>
<th>Name of Institution:</th>
</tr>
</thead>
</table>

7. Accumulated Deferred Maintenance Cost Estimates: (summary total values according to the following categories; please identify what year’s dollars are being used)

<table>
<thead>
<tr>
<th>Category</th>
<th>Renewal &amp; Replacement Costs</th>
<th>Adaption Costs</th>
<th>Deferred Routine Maintenance Costs</th>
<th>Subtotal</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1 All Educational &amp; General Space</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.2 All Residences</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.3 All Parking Structures</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.4 All Site &amp; Utilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total

8. Methods of Estimation (Please identify how the estimated costs of accumulated deferred maintenance were calculated at your institution)

<table>
<thead>
<tr>
<th>Level I (i.e., ‘ballpark’ estimates with little or no analysis or survey of actual building conditions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level II (i.e., ‘cursory’ building condition surveys, typically by major building component or system)</td>
</tr>
<tr>
<td>Level III (i.e., detailed building audits, typically with the assistance of external consultants)</td>
</tr>
<tr>
<td>Other (please describe)</td>
</tr>
</tbody>
</table>

Note: Definitions of terminology are provided previously on pages 2 and 3.
Section III – Facility Audits

9. Facility Audits:

For those institutions that have completed Level II or III facility condition surveys/audits, please provide a one page summary for each building containing information such as the following:

- Building Age
- Gross Area
- Major Functions/Uses
- Current Replacement Value
- Accumulated Deferred Maintenance Cost:
  - Renewal & Replacement Costs
  - Adaption Costs
  - Deferred Routine Maintenance Costs
- Major Areas/Causes of Deferred Maintenance

Note: You may wish to simply forward a copy of the summary page(s) from your facility audit documents. Also, we are interested in individual building audits, even if you have not done your complete campus.

Section IV – Good Practices

10. Examples of Effective Means to Address the Problem of Deferred Maintenance:

Please provide us with examples of ‘good practices’ in dealing with the issues of accumulated deferred maintenance at your institution. This may include for example: methods of determining estimates, facility audit tools, methods of establishing funding policies and priorities, communication strategies.

Note: Definitions of terminology are provided previously on pages 2 and 3.