UNIVERSITY OF ALBERTA

ASSET MANAGEMENT AND OPERATIONS
4th Floor, General Services Building
Edmonton, Alberta, Canada, T6G 2H1

Facilities Maintenance Plan

as of September 20, 2023

This applies to the maintenance of our physical (supported building) assets. This plan does not apply to Campus Services (Residences and Parkades), utilities infrastructure, remote research facilities, Enterprise Square or communications and other groups computing systems/hardware and Research / Special equipment.

This plan has been drafted within the framework of the Integrated Asset Management Strategy (IAMS) which establishes our collective mission, vision, principles, goals, and actions for future-proofing the University of Alberta's infrastructure. IAMS guides the decisions the University will take to support the infrastructure needs of its learners, faculty, staff, and community, while balancing the risks, opportunities, and fiscal environment in which the institution operates. This Maintenance Plan, like IAMS, is a living document that will be reviewed as part of the annual planning process.

In order to provide safe, operational and functional facilities for our university community, we strategically prioritize our maintenance and operating requirements using a risk-based approach, while proactively preparing for the future requirements of the institution. The triage of maintenance priorities is aligned with the University's Capital Renewal Rolling Plan, Space Optimization Strategy and annual Capital Plan.

Facilities and Operations Mission

Facilities and Operations supports the University of Alberta's mission through safe, well-maintained, sustainable and inviting spaces, and by providing crucial services for the university community.

Maintenance Mission

Proactively and cost-effectively maintaining and caring for our infrastructure to ensure that our assets provide their maximum service potential in a sustainable manner - ***ultimately creating an enriching and inviting environment that supports exceptional learning and research***.

The F&O team also subscribes to the following aspects of service as being fundamental to our success:

- Safety
- Integrity and quality of service
- Sustainability
- Continuous improvement
- Teamwork

- Balancing responsiveness to client requests with long term asset stewardship

Objectives

The university's objectives in maintaining and operating buildings, plant and equipment are to:

- Ensure the safe, efficient and continued operation of the University's assets
- Ensure compliance with legislated requirements
- Create enriching, effective and inviting spaces
- Optimize the life cycle costs of assets

Maintenance Operations

The University's physical assets are maintained in accordance with this Maintenance Plan for vertical and horizontal infrastructure and landscaping. Numerous strategic plans related to capital expenditures, space optimization, asset rationalization, utility services, long range development, risk management, and sustainability provide a backdrop of considerations for this Facilities Maintenance Plan. ***Together, they support the University's academic and research missions.*** Historical data, in-house expertise, and design consultants inform maintenance expenditure forecasts used for maintenance planning, capital renewal (CR) planning, and property asset planning purposes. An overarching goal for Asset Management and Operations is to optimize our operations to strategically re-invest funding to maintenance programs and/or capital renewal efforts to better manage our growing deferred maintenance liability and deliver the highest possible service level with allocated funding / resources.

Maintenance is defined as all actions necessary for retaining an item or asset in, or restoring it to, a condition in which it achieves its originally specified service potential. It typically does not include cleaning or refurbishment. However, maintenance for certain types of assets can include cleaning (i.e. certain types of electrical assets can have a functional failure if allowed to become excessively dirty due to flashover or tracking). Cleaning is a common task performed for these specific types of assets to ensure they continue to operate as originally specified.

Maintenance of our broad spectrum of assets is carried out with available funding to provide their maximum service potential to meet our Institution's needs. This is achieved by providing the optimum level of maintenance and care in a sustainable manner. **Budget constraints are weighed against priorities that are established based on our APPA Level 5 (CRISIS MANAGEMENT) maintenance funding. Good stewardship planning and practices continually compete with client satisfaction metrics.**

The physical assets of the University will be maintained in order to deliver their maximum service potential in the following order of priority:

1. Maintenance required by legislation in accordance with regulations and as further set out in codes of practice and preventive maintenance schedules;

2. High priority emergency and reactive maintenance to protect health, life and safety as well as short term customer satisfaction, while not compromising the integrity of our assets;
3. Critical service areas by the use of predictive or preventive maintenance techniques; and
4. Any deferred maintenance which accrues in priority as determined to eliminate or mitigate risk.

Preventive, emergency and unplanned maintenance is provided through in house and outsourced vendor contracts. The University of Alberta currently maintains a number of contracts for services that include elevator maintenance, pest control, and air filters, **emergency generator load testing, and fire safety.** These vendors are selected through a competitive tendering process based upon qualifications, experience, and the ability to provide services, appropriate staffing levels, and overall value to the University. F&O staff oversee the performance of the outsourced vendors and are responsible to ensure the quality of services and **regulatory compliance are met** with the vendor contracts.

Facilities and Operations has adopted an evidence-driven approach and seeks opportunities to harness innovation in how it maintains, monitors, and operates infrastructure. This includes predicting trends that will improve capital-planning decisions based on expected performance of existing infrastructure.

Over the next three to five years, Facilities and Operations will use predictive analytics to better understand performance, utilization, ecological impacts, and operating costs of assets including the impact of external events such as changing weather patterns and advances in innovation. As increasing amounts of building data is gathered by sensors and sources across all networks, assets that are 'over-maintained' and too cost intensive will be identified leading to a consideration of where alternatives may be more appropriate. Considerable progress has been made on this front with the installation, calibration and use of air filter sensors.

Accountabilities and Responsibilities

The University of Alberta's building portfolio is a wide variety of mixed use spaces which support teaching, administration, recreation, operations, and research. The accountabilities and responsibilities identified to distinguish between Faculty and Asset Management and Operations involvement is built around the definition of 'base building systems.' Systems that are directly related to the services described by mechanical, gas, utilities, sanitary, heating, air conditioning, ventilation, elevators, plumbing, sprinklers, cabling, security including FMNet, wiring, and life-safety belong to the realm of base building systems which are within the purview of Asset Management and Operations. Program equipment that is owned by Faculty and is directly related to their activities is within the purview of Faculty in all aspects of purchasing, installation, licensing, validation, maintenance, replacement, and operation.

Asset Management and Operations is often involved with assessment and guidance related to the installation of Faculty equipment at their request where it has significant impact to the base building structure and its base building systems. Asset Management and Operations also participates in maintenance agreements with Faculties where it is mutually beneficial to do so. In such cases, Faculties remain accountable and responsible for their equipment.

Examples of Faculty equipment that is not supported by Asset Management and Operations are as follows:

- A clean room complete with a packaged air-conditioning unit, special filtration, and uninterrupted power source in place to support a specific type of research.
- Freezers, walk-in coolers or refrigerators for storing laboratory research and/or materials.
- Air compressors or vacuum pumps, even when installed in an O&M mechanical room, that serve a specific lab or research area.
- Specialized water systems (e.g. temperature, filtration, or purifying).
- Air conditioning units for server rooms, environmental chambers, or laboratory equipment such as microscopes, incubators, ovens, chromatographs, scales, sterilizers, glass washers, and cage washers.
- Fume hoods, biosafety cabinets, and laminar flow hoods.
- Recreational equipment.
- Pressure vessels used for research.
- Office furniture and equipment owned by Faculties.
- UPS and power backup systems for Faculty equipment that are not central emergency generators.
- Appliances owned by Faculties (e.g. coffee machines, dishwashers, refrigerators, microwaves).

Please refer to the joint memorandum and FAQs signed by the Vice Presidents of Facilities and Operations and Research on 18 October 2018 outlining the responsibilities associated with research equipment and research support systems.

Note, departments may be responsible for premature replacement of building equipment as a result of abuse, vandalism or misuse that they could reasonably have predicted or controlled.

Life Cycle Costs

Operating and maintaining assets can account for up to 90 per cent of the total cost of building ownership (TCO) and is comprised of: support and maintenance such as administration costs (insurance, security, etc.); routine maintenance and minor repairs; custodial services; fire protection services; pest control; snow removal; grounds care; environmental operations; and utility charges (electric, gas, water). All members of the University of Alberta community can individually and collectively help meet and potentially extend the life cycle of infrastructure through understanding and adapting behaviors in how assets are used and cared for.

It is planned to regularly review the University's maintenance activities in order to optimize expenditure. As a result of these reviews, preventive maintenance frequencies will be periodically examined to see if there needs to be a change in frequency or scope.

Over-servicing can be as damaging as under-servicing. Some "mean times between services" can be expanded as a result. In other cases, life cycle costs may warrant capital expenditure to reduce long-term operating costs, not only for maintenance, but also in cleaning and utilities consumption.

Maintenance Management Responsibilities

The University of Alberta Maintenance Policy is established by F&O and set by the AVP of Asset Management and Operations, who shall monitor the implementation and effectiveness of maintenance on each campus through the Facilities Condition Assessment process and other performance measures outlined in this Maintenance Plan. In accordance with the University maintenance policy, repairs, replacement, or planned maintenance on University base building systems must be approved by the Associate Vice-President (Operations and Maintenance), and are addressed on a priority basis.

Additionally, Faculties are **not** to hire contractors to perform maintenance or renewal of their space nor can they perform those repairs or renewals themselves.

Facilities maintenance is funded by an ongoing Lights on Funding as well as funds from VP F&O and Central Administration for the upkeep and preservation of buildings, base equipment, roads, and grounds, required to maintain University of Alberta property in a condition that supports the University's mission.

Maintenance in this normal program includes the maintenance activities required to provide a safe, healthy and secure environment. Given traditional maintenance and capital renewal funding levels, the University must defer a considerable amount of maintenance work and life cycle renewal. Consequently, F&O must prioritize critical maintenance and lifecycle items with available resources and as a result, lower priority maintenance items will most likely not be addressed until they escalate to higher priorities. **As a result of limited routine maintenance and sporadic and uncertain life cycle replacement funding - our deferred maintenance (DM) liability will continue to escalate with only the most critical of our deferred maintenance issues addressed with available funding.**

Our seven maintenance goals are as follows:

Maintenance Goal 1: *Perform and document 100% of regulatory preventive maintenance obligations.*

***Metric**: 100% of regulatory PM work orders are executed and automated in the IWMS (AIM) and completion percentages as shown for select PM work orders with special considerations.*

Regulatory Preventative Maintenance Work Orders	Organization Responsible	Frequency
Chemical fume hood inspection and testing [ASHRAE, ANSI, CSA]	Operations	Annual
Cross contamination device inspection and testing [City Bylaw, National Plumbing Code, Alberta Safety Codes Act, CSA]	Trades	Annual
Elevator inspection and testing	Trades	As prescribed by AEDARSA (Biennial)
Emergency eyewash station inspection and testing [ANSI]	Operations	Annual
Emergency generator inspection, testing and maintenance [CSA]	Trades	Monthly, Semi-Annual, Annual
Emergency lighting systems - self contained battery packs, battery test [Alberta Fire Code]	Trades	Monthly
Emergency shower testing [ANSI]	Operations	Annual
Fire alarm inspection and testing [Alberta Fire Code, CAN/ULC]	Trades	Annual
Fire pump testing [NFPA]	Trades	Monthly run / annual flow test
Gas detection inspection and calibration	Trades	Semi-Annual
Handheld fire extinguisher inspections [Alberta Fire Code, NFPA]	Trades	Annual Inspection 6 yr Maintenance 12 yr Hydrostat
Personal protective equipment and protective tools [CSA]	Trades	Annual and semi-annually as required for equipment type

Regulatory Preventative Maintenance Work Orders	Organization Responsible	Frequency
Pressure relief devices on pressure vessel inspection, replacement or testing [Alberta Safety Codes Act, ABSA]	Trades	1-6 years based on ABSA AB-506
Pressure relief devices protecting the steam service line to each building - replacement, rotation, or testing [Alberta Safety Codes Act, ABSA]	Trades	Every 5 years
Pressure vessel inspection [Alberta Safety Codes Act, ABSA]	Trades	1-10 years based on ABSA AB-506
Sprinkler system testing [NFPA]	Trades	Per NFPA 25
Fire Dampers/Fire Doors/Closures [NFC]	Trades	Annual
Chimneys/Flues/Flue Pipes [NFC]	Operations	Annual
Smoke Control Measures in Pressurized Vestibules/Stairwells [NFC]	Trades	3 months to 2 years based on 1 of 14 testing measures in section 7 of the NFC 2019

Regulatory Preventative Maintenance Work Orders With Special Considerations	Organization Responsible	Frequency
Roof Anchoring and Fall Arrest Systems	Trades	When required to be used, valid for limited period of time
Emergency lighting - self contained battery packs, testing with power outage	Trades	Aspirational goal of a 5 year building rotation, subject to funding availability and research constraints limiting power outages
Emergency exit signs, testing with power outage	Trades	Aspirational goal of a 5 year building rotation, subject to funding availability and research constraints limiting power outages
Emergency lighting systems, testing with power outage	Trades	Aspirational goal of a 5 year building rotation, subject to funding availability and research constraints limiting power outages
Fire Dampers/Fire Doors/Closures [NFC]	Trades	Dampers serving critical spaces on a 5 year building rotation schedule, aspirational goal 100% of all fire dampers subject to funding availability

Note, regulatory PM's are subject to change as regulatory bodies are regularly reviewing, adding and enhancing its requirements. Supervisors must be diligent in reviewing the standards as they are published.

Maintenance Goal 2: *Response times and completion standards are achieved based on the AMO Maintenance Service Level.*

Metrics: An AiM dashboard showing all maintenance work orders and their respective compliance rates under the Service Level based on their work order priority. This will be posted publicly on a quarterly basis. (**Note that with APPA 5 (Crisis Management) funding level, this remains an aspirational goal and there will continue to be a maintenance backlog of Priorities 3,4,and 5 work orders that will ultimately add to our growing Deferred Maintenance (DM) liability) until they meet triage oriteria.**

Table 1. Maintenance Response standards (Response times are measured from when a client reports the maintenance fault to the Maintenance Desk until the time a maintenance worker attends site to inspect, make initial repairs, isolate services and minimize hazard to personnel and property as required.)

Action	Response Parameters	Target
Priority 1 – Burst water pipes, major energy outages (e.g. reset the circuit breaker, loss of power), issues with essential air-conditioning (e.g. animal houses, main computer room), and essential ventilation, failure of low-temperature freezers/fridges, gas leaks, passengers trapped in lifts, fires, broken glass (constituting a safety issue), blocked sewerage, building heating systems (winter), toilets (where there is accessibility constraints or limited number of facilities in a building), soil lines, electrical faults (identified as potentially dangerous), cold room failures, life safety systems that are in trouble mode, accessibility points/entrances/exits. FMNet failure, scheduled event access failure, critical door left in unsecure state due to system failure.	Priority 1 – within 2 hours of notification	85%
Priority 2 – Blocked stormwater drains, broken doors (external), major roof leaks, broken glass (internal/external), broken locks (external), broken door handle, the door jammed, air-conditioning failures (in buildings with inoperable windows), air-conditioning failures (lecture theatres), fume hood failures, water leaks, reverse osmosis equipment/de-ionisers, flooring issues that cause tripping hazards, malfunctioning whiteboards/blackboards, running taps (hot water), no water, non operating fixtures in areas which present a safety concern (e.g.: stairwells, emergency lighting, exit lighting). Elevator intercom failure, card access issues, intrusion system issues, emergency notification issues, video surveillance issues.	Priority 2 – within one (1) working day of notification.	75%

Action	Response Parameters	Target
Priority 3 – Flickering fluorescent lamps (open areas), minor roof leaks, external lighting (external), faulty toilet cisterns, toilets running constantly, signage requests through the repair shop, non-essential air conditioning, toilet seat broken. Card access and intrusion user processing.	Priority 3 – within three (3) working days of notification.	65%
Priority 4 – Dripping taps, failed lamps, flooring issues that do not present a safety concern, pipework insulation, broken door closer, electrical faults (non-dangerous), redundant lighting outages (e.g.: areas where one fixture outage does not impact workable lighting), rusted box gutters, leaking (external downpipes), building security system estimates.	Priority 4 – within two (2) weeks of notification.	65%
Priority 5 – Resurfacing benchtops, repairs to caulking, internal painting, external painting, non safety related road resurfacing, non safety related curb and channeling repairs, painting repairs. BSS battery replacements, internal painting (essential), external painting (essential), domestic hot water systems, building heating systems (summer).	Priority 5 – work to be programmed.	N/A

Completion Standards

Action	Response Parameters	Target
Completion of Reactive/Emergency Maintenance Work Orders - Priorities 1 and 2	Priorities 1 and 2 – Upon responding to initial call, completion within five (5) working days given availability of parts, otherwise within five (5) working days of availability of parts.	75%
Completion of Reactive/Emergency Maintenance Work Orders - Priorities 3 and 4	Priorities 3 and 4 – Upon responding to initial call, completion within ten (10) working days given availability of parts, otherwise within ten (10) working days of availability of parts.	50%
Completion of Reactive/Emergency Maintenance Work Orders - Priority 5	Priority 5 – Completion in accordance with the program set for this work after appraisal and planning.	N/A

Maintenance Goal 3: *A Corrective Maintenance plan will be produced and updated annually that establishes prioritized corrective maintenance projects that are supported through GoA Capital Maintenance Renewal funding.*

Metric 3: A Corrective Maintenance Plan for non-standing open and standing open will be developed at the beginning of every fiscal year and reviewed periodically throughout the fiscal year prioritizing Corrective Maintenance projects that require completion.

Corrective Maintenance:

Corrective Maintenance projects are prioritized according to risk-based decision-making processes with the intention of reducing the potential issues that pose the highest risk to the University. The risk ratings shown in the table below are established upon base building equipment, component, and system condition assessments as well as risks to occupational health and safety issues, unforeseen failures which may cause significant disruptions or safety related issues or collateral damage to other elements.

System & Component Criticality

Priority and focus must be given to systems and components that pose the most immediate threat to building occupancy in order to minimize disruption to the academic mission of the Institution. Systems and components should be prioritized according to risk-based decision-making processes with the intention of reducing the potential issues that pose the highest risk to the University. The risk ratings shown in the table below are established upon base building equipment, component, and system condition assessments as well as risks to occupational health and safety issues, unforeseen failures which may cause significant disruptions or safety related issues or collateral damage to other elements.

Probability \ Impact	5	4	3	2	1
5	Low	Low	Low	Low	Low
4	Low	Low	Low	Medium	Medium
3	Low	Low	Medium	Medium	High
2	Low	Medium	Medium	High	High
1	Low	Medium	High	High	High

Figure 1: Priority Matrix based on the Impact and Probability statements below.

The Priority Matrix is based on a risk assessment of impact and probability of failure. Utilizing the Probability and Impact statements below to classify deficiencies, their respective scores in each category place their location on the Priority Matrix.

- Red squares denote critical priority projects that must be actioned as soon as possible.
- Yellow squares denote important but not yet critical priority that may be planned for action in the short term.
- Green squares denote recommended priorities that need to be planned in the medium term.

Probability: General characterization of the likelihood of failure

1. Asset has failed before and is now on temporary repair, or is at risk of failure within the next year. Replacement parts will take longer than 12 weeks, or are unavailable.

2. Asset has failed before and has now been repaired with a fairly permanent solution. Asset is showing signs of failing in the next 1-2 years. Replacement parts are available within 12 weeks.
3. Asset is at or beyond life cycle but has not yet failed. Asset is showing signs of failing in the next 3-5 years. Replacement parts are available within 1 week.
4. Asset is within 1-3 years of expected life cycle, but no signs of failing. Replacement parts are shelf-available at local suppliers.
5. Asset is beyond 3 years of life cycle. Replacement parts are readily on hand.

Impact: General characterization of the consequences of failure

1. Asset failure will impact the entirety of building occupants. Impacts also include a risk to life and safety of occupants, or can preclude the accessibility to the building. Asset failure impacts core systems critical to the occupancy and use of the building (i.e. electricity, heating) as well as severe impact to the academic mission (whether it be teaching, studying, or research). Cost of remediation extends beyond primary failure, causing secondary cascading failures throughout the facility (i.e. electrical failure causing heating failure that results in bursting pipes causing flooding damage throughout the building).
2. Asset failure will impact the entirety of building occupants. Asset failure impacts systems that are of high importance to the operation of the building (i.e. lab services in a research space, hot water in a pool facility) as well as significant impact to the academic mission. Cost of remediation may extend beyond primary failure, which may cause secondary cascading failures throughout the facility.
3. Asset failure will impact a large group of the occupants. Asset failure impacts systems that are of moderate importance to the operation of the building, as well as moderate impact to the academic mission. Cost of remediation does not extend beyond primary failure.
4. Asset failure will impact a small group of the occupants. Asset failure impacts systems that are of low to moderate importance. Impact to the academic mission is low to moderate. Cost of remediation does not extend beyond primary failure.
5. Asset failure will impact little to no occupants. Asset failure impacts systems that are of low importance. Impact to the academic mission is low. Cost of remediation does not extend beyond primary failure.

<u>Maintenance Goal 4: Building Condition Assessments</u>: *Improve the quality and integrity of building assessment data in VFA that enables enhanced decision making***.**

F&O has assumed control of facility condition assessments (FCAs) now that the GoA no longer provides 3rd party audits. The Asset Management Team in collaboration with AMO maintenance leadership, performs the evaluations as well as updates VFA to provide the latest infrastructure condition data to decision makers. Internal FCAs will be streamlined and balanced between detail and speed to meet a robust 60-80% detail level but will be complete within 4 weeks per building as compared to the 15-20% detail level currently provided by 3rd party auditors. The internal facility evaluations undertaken by the Asset Management Team will consist of a multi-dimensional approach to facility condition to ensure that the data collected and updated in VFA is robust, auditable, and collaborative with our subject matter experts. Condition assessments will be auditable by having all checklists filed, indexed, and searchable. An entire history of every assessment checklist will be available along with time-stamped photographs for each asset.

In addition, continued work of updating VFA based on construction and maintenance work completed will ensure that VFA stays current instead of waiting for evaluations to catch asset and condition changes.

Metric 4: Internal facility evaluations will be completed for major buildings on North and South Campus within 5 year cycles. Based on 4 weeks per building including prep and post-review VFA updates, and accounting for winter closure, and vacation time, works out to 12 buildings per year, meaning each 5 year cycle will see 60 buildings evaluated constituting our core and major facilities on North Campus with other facilities at South Campus, Augustana, and CSJ evaluated in between. Condition updates in VFA will be done annually instead of waiting for the next FCA to capture it.

Maintenance Goal 5: *Achieve a Preventive Maintenance (PM) ratio to Corrective Maintenance (CM) at APPA Maintenance Level 3 "Managed Care" (65% to 75%). This is a purposeful and disproportionate investment in PM to keep our newer buildings new and meet expected life cycles of systems.*

Metric 5: Report on the PM (both regulatory and non regulatory) to CM ratio vs APPA's standard for continual annual evaluation.

The following list illustrates additional non legislated PM activities that can be undertaken in University buildings across the portfolio based on a cost effectiveness and risk assessment.

Non-regulatory Preventative Maintenance Work Orders	Organization Responsible	Frequency
Air compressor inspections and routine maintenance	Trades - Millwrights	Annual
Air conditioning unit inspections	Operations - HVAC Trades - Mechanical	Monthly or Annually Depending on Type
Air handling unit filter media inspection and replacement	Operations - Managed Contractor	Combination of Predictive Measurement and monthly inspections
Chiller inspections and routine maintenance	Operations - Managed Contractor	3 times a year
Condenser inspections and routine maintenance	Operations - HVAC	Semi Annual - Depending on the type
Electrical disconnect inspection and adjustment	Trades - Electrical	Aspirational goal is annual, subject to funding availability
Electrical main breaker inspection and testing	Trades - Electrical	Aspirational goal is 1-3 years depending on the service and operating conditions, subject to funding availability
Electrical panel inspection, thermography, and adjustment	Trades - Electrical	Aspirational goal is 1-3 years depending on the service and operating conditions, subject to funding availability
Gas-fired equipment (boilers and rooftop units) inspections and routine maintenance	Operations - HVAC	Annual

Non-regulatory Preventative Maintenance Work Orders	Organization Responsible	Frequency
Motor control centre inspection, thermography, and adjustment	Trades - Electrical	Aspirational goal is annual, subject to funding availability
Mural maintenance	Trades - Architectural	Every Three Years
Radio Communications System	Trades - Repair Shop	Annual
Roof inspections	Trades - Architectural	Annual
Supply/Exhaust/Return fan inspections and routine maintenance	Trades - Millwrights	Semi-annually
Transformer inspection and testing	Trades - Electrical	Aspirational goal is annual, subject to funding availability
Uninterrupted power supply inspection and testing	Operations - BMS/BSS	3 year PM rotation
Vacuum pump inspection and routine maintenance	Trades - Millwrights	Monthly
Variable frequency drive inspection, testing, and adjustment	Trades - Electrical	Aspirational goal is annual, subject to funding availability
Vesda inspections and testing	Trades - Life Safety Systems	Annual
Water filter media inspection and replacement	Trades - Mechanical	Annual
Drinking water - Test drinking water to meet Canadian drinking water quality guidelines.	Trades - Mechanical	Annual
Electrical Motors	Trades - Millwrights	Monthly and Annually Depending on Type
Batteries in Critical Equipment	Operations - BMS	Annual
Expansion Tank Routine	Trades - Mechanical	Aspirational goal is annual,

Non-regulatory Preventative Maintenance Work Orders	Organization Responsible	Frequency
Inspections		subject to funding availability
Heat Exchanger Routine Inspections	Trades - Mechanical	Aspirational goal is annual, subject to funding availability
Pumps Routine Inspections	Trades - Millwrights	Semi Annually - Annually
Sanitary and Storm Drainage Piping Routine Inspections	Trades - Mechanical	Aspirational goal is annual rotational scheduled site wide, subject to funding availability
Steam Pressure Reducing Stations	Operations - HVAC	Annual
Central aIr handling units	Operations - HVAC Trades - Mechanical	3 year rotation
Failing / Failed building envelopes	Trades - envelope specialist	TBD in accordance with envelope audit recommendations.

Maintenance Goal 6: **Predictive Maintenance (PdM)**: *Implement a Predictive Maintenance program for high payoff building systems (ie. Air Filters, lights) to achieve cost efficiencies that can be reinvested in PM, PdM and/or CR.*

Metric 6: 1. Money saved from contracts, excessive preventive maintenance (PM) and invested in expanding preventive maintenance or predictive maintenance programs. 2. Reduced failure rate (emergency maintenance or replacement) / higher efficiency of high cost / high risk equipment.

Maintenance Goal 7: **Re-Verification**: *Perform central system re-verification to address deferred maintenance and system energy performance degradation.*

Metric 7A: Ideal operational benchmark standards will be established for all central systems.

Metric 7B: Minimum energy performance standards (i.e. the acceptable tolerance from the ideal operational benchmark standards) are measured for all central systems on a periodic basis.

This long term maintenance goal establishes evidence-based decision making criteria (energy performance degradation plus a discretionary FCI weighting) which informs the maintenance rolling plan that fits within budgetary allowances. The benchmarks and minimum energy performance standards are designed to consider the break-even cost analysis of energy efficiency loss vs equipment life cycle. These metrics also establish when a central system should be replaced instead of re-verified.

Integrated Workplace Management System (IWMS)

An **IWMS** is a software platform that helps optimize the use of workplace resources and the built environment. Industry defines IWMS as a toolset that enables management of the following areas: Real Estate and Property Management, Space Management, Operations and Maintenance Management, Energy Management and Capital Planning and Project Management. IWM Systems use technology to integrate the primary management disciplines into a cohesive platform with shared, common data amongst all disciplines. Additionally, effective IWM Systems have a robust financial foundation.

The IWMS stores diverse data regarding an organization's resources, operations, costs, assets, transactions, time and spending. In comparison to Enterprise Resource Planning (ERP) or institutional finance systems, the data collected is far more detailed and granular and therefore inherently more valuable to manage the buildings, assets and work. The tracking and reporting of costs, effort, issues, and history is intended to assist maintenance staff to be more effective in maintaining the infrastructure of the University.

The IWMS of choice for the University of Alberta is AiM, provided by AssetWorks.

AiM has achieved a significant share of the post secondary IWMS market by serving 50% of the 30 largest (by enrollment) universities, including the largest 3, University of Central Florida, Texas A&M and Ohio State. AiM is specifically designed to be used in the post secondary, institutional and government sectors, for example, it has capabilities for tracking

research to a location (grants, etc.)

As a platform, the IWMS enables:

- Prioritization of repairs
- Informed business decisions
- Estimation of costs
- Crucial repair versus replacement decision making
- Compliance verification
- Personnel and work tracking
- Resource availability for planning and scheduling, and
- Automated preventive maintenance scheduling based on the maintenance plans strategy.

Planning - AiM enables and enhances strategic planning of facilities, whether looking at space programming, comparisons of operating costs by building, equipment failure analysis, and response/repair time. In addition, since the Team Scheduler module was implemented, Foremen and Supervisors are able to plan and schedule maintenance and project work for their tradesmen all while working within the AiM ecosystem that has access to work order, space, and other data.

Analytics - AiM integrates with the F&O Data Warehouse which houses all F&O data for use and reporting. In the wake of AiM IQ no longer being supported, data cubes have been migrated to Microsoft SSAS tools to allow users to easily pull necessary data into the analytical tool of their choice for analysis.

Using advanced analytics tools, such as Tableau or Power BI, F&O can enable strategic decision making such as making operating decisions to save energy, analyze most effective maintenance spending, compare long range plans against immediate infrastructure needs or allowing for shovel ready projects when expected (or unexpected) funding comes in. Additionally, comprehensive analytics makes a more compelling case for the **right** level of funding, not just *more* funding.

F&O is also better positioned to report on the performance of maintenance activities by leveraging data analysis of work management data. In particular, new performance measurement dashboards that report on maintenance response and completion times, as well as the growing backlog of work orders are now available on the F&O website.

Risk Mitigation - AiM serves the university by being able to prioritize components or actions critical to the University's mission, reducing the risk of loss of use or capability. As well, AiM identifies and tracks issues and needs, long into the future to aid in planning and to reduce expensive surprises. This is relatively widely known and expected, additionally AiM tracks the record keeping, documentation, photos, hazard identification, abatement and financial details for the university to remain compliant with regulatory bodies and government in the fields of safety, construction, financial audits, etc., thereby reducing liability and providing assurances legislative requirements, safety for our workers and good practice is occurring.

Workflow Improvements - with the deployment of the AssetWorks ReADY platform for workflows, several new capabilities are available for F&O staff to enhance our processes

and procedures.

- F&O has deployed Fixit, an online maintenance request platform for both North Campus and Augustana to greatly streamline the process of intaking maintenance requests, while also enhancing customer service by providing modern capabilities such as live status updates on work orders, connecting customers to staff for communication purposes, and making it convenient to report maintenance needs in whatever way they feel most comfortable.
- Further development in ReADY has also streamlined key requisition, key sign out, and work requisition processes by building in multi-level approval right into the process flow. Internally, 3 separate project initiation forms have been consolidated into one robust process that routes requests to the appropriate authorities for secure electronic approval.
- Finally, individual Field Level Hazard Assessments (FLHAs) have also been moved to ReADY to allow for quicker turnaround on reviews/approvals, but also as an improved means of ensuring compliance on record keeping.

A Look Ahead - The pace of change in technology capability and its acquisition cost will continue to provide opportunities for more efficient methodologies and increased evidence based knowledge. Trends that will impact are:

- Availability and the cost of sensors should positively impact the deployment of predictive maintenance regimes and energy consumption,
- Safety, regulatory and compliance requirements will steadily increase over time, requiring robust procedures, management and tracking,
- Higher expectations of detailed modeling activities and analysis will manifest in both government and internal requirements,
- Analytical techniques and machine learning advancements will increase the accuracy of forecasted outcomes, providing for more predictable behaviors.
- An improvement to the inventory management system within AiM will improve supply center operations whilst also allowing maintenance team members to get the materials they need in a timely manner.
- Continued expansion of the PM program in AiM enables regulatory compliance requirements.

Appendix A

Regulatory considerations that factor into the Facilities Maintenance Plan

Provincially and nationally, a number of Codes, Standards, and Regulations contribute to the planned maintenance strategy. A summarized list is shown below:

ABSA AB-506: Inspection and servicing requirements for in-service pressure equipment
Alberta Asbestos Abatement Manual
Alberta Building Code
Alberta Electrical Utility Code
Alberta Environmental Protection and Enhancement Act RSA2000
Alberta Fire Code
Alberta Occupational Health and Safety Act
Alberta Safety Codes Act
Alberta Transportation
ANSI Z9.5: Laboratory ventilation
ANSI Z358.1: American national standard for emergency eyewash and shower equipment
ASHRAE 110: Methods of testing performance of laboratory fume hoods
ASME A17.1/CSA B44: Safety Code for Elevators and Escalators
CAN/ULC-S536: Standard for inspection and testing of fire alarm systems
CAN/ULC-S537: Standard for verification of fire alarm systems
CSA B51: Boiler, pressure vessel, and pressure piping code
CSA B64.10: Selection and installation of backflow preventers
CSA B64.10.1: Maintenance and field testing of backflow preventers
CSA B149.1: Natural gas and propane installation code
CSA B311: Safety Code for Manlifts
CSA B355: Lifts for persons with physical disabilities
CSA Standard C22.1 Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations
CSA C282: Emergency electrical power supply for buildings
CSA Z185-M87: Safety Codes for Personal Hoists
CSA Z316.5: Fume hoods and associated exhaust systems
CSA Z462: Workplace electrical safety
CSA Z463: Maintenance of Electrical Systems
National Energy Code of Canada for Buildings
National Plumbing Code of Canada
NFPA 10: Standard for portable fire extinguishers
NFPA 25: Standard for the inspection, testing, and maintenance of water-based fire protection systems
NFPA 80: Standard for Fire Doors and Other Opening Protectives
Nuisance and General Sanitation Regulation Alta Regulation 243/2003
Pressure Equipment Safety Regulation Alta Reg 49/2006
Safety Codes Act RSA 2000

STANDATA - documents produced by Alberta Municipal Affairs which provide interpretations, information bulletins, related to construction codes for building, electrical, fire, gas, plumbing and private sewage, elevators, and amusement rides and passenger ropeways.

In addition, while not necessarily classed as statutory maintenance, insurance underwriters require effective maintenance in order to minimize risk of loss either through theft, damage by elements (wind, rain, etc.) or failure.

Appendix B - Glossary

Most of the terms used within this Facilities Maintenance Plan are defined by APPA and have been adopted by the University of Alberta's Facilities & Operations to standardize terminology commonly used by our audience of peer institutions.

ABSA - Alberta Boiler Safety Association is the pressure equipment safety authority which administers Alberta's pressure equipment safety programs under Alberta's Safety Codes Act. The association's key activities include: reviewing, accepting, and registering pressure equipment designs and construction procedures; inspecting newly installed and in-service pressure equipment; examining, certifying, and registering skilled trades people who have specific roles within the pressure equipment industry; investigating accidents or unsafe conditions involving pressure equipment; authorizing and monitoring quality management systems; and conducting safety education and training. ABSA is a regulatory authority, but is not a direct part of the Government of Alberta.

AEDARSA - Alberta Elevating Devices & Amusement Ride Safety Association.

Base Building - A common term used to describe a building's primary structure, the building envelope, common spaces, elevators, stairwells, primary mechanical systems (like heating, ventilation, and air conditioning), telecommunications infrastructure, electrical supply, and water supply.

Capital Asset Management - The identification and prioritization of facility and infrastructure physical, functional, and budgetary needs, spanning a multiyear timeframe. Includes the process of reinvesting funds into physical assets in support of the organizational mission, above and beyond normal routine operations and maintenance.

Capital Construction - New or alterations work, paid from the capital funds budget, that is performed to create new capital assets.

Capital Investment Plan (CIP) - A plan which describes investment strategies for new construction or refurbishment of building assets, equipment, components, and systems which are commensurate with the organization's business objectives.

Capital (Major) Maintenance/Repairs - Previous or future repairs or replacement, paid from the capital funds budget and not funded by normal maintenance resources received in the annual operating budget cycle.

> *Repairs* - work to restore damaged or worn-out assets/systems/components (e.g. large-scale roof replacement after a windstorm) to normal operating condition.
>
> *Replacement* - an exchange of one fixed asset for another (e.g. replacing a transformer that blows up and shuts down numerous buildings) that has the same capacity to perform the same function.

Capital Project/Construction - A new facility, rehabilitation/renovation, or major maintenance that increases the value of the location, site, or campus (e.g. a new building) or extends the useful life of a facility. Includes construction and purchase of fixed equipment. (e.g. a replacement chiller).

Capital Renewal (CR)/Replacement - The systematic management process of planning and budgeting for known future cyclical repair and replacement requirements that extend the life and retain the usable condition of facilities and systems, not normally contained in the annual operating budget. Includes major activities that have a maintenance cycle in excess of one year (e.g. replace roofs, paint buildings, resurface roads). The cyclical replacement may be for all or a significant portion (e.g. the replacement of 50% or more of a building system component such as lighting system or roof system) as it reaches the end of its useful life, or of major components or infrastructure systems at or near the end of their useful life. These activities may extend the useful life and retain the usable condition of an associated capital asset (e.g. replacement of an HVAC system, extending the usable life of a facility).

Construction - Any combination of engineering, procurement, erection, installation, assembly, or fabrication activities involved to create a new facility/structure or to alter, add to, or rehabilitate an existing facility/structure and its support areas, such as parking, grounds, roadways, service buildings for power generation, and waste disposal. The construction costs of interior spaces include the costs of ceilings, lighting, life safety such as sprinklers, heating, ventilation, air conditioning, floor systems, carpeting, walls, doors, hardware, and special finishes.

Compliance - The act of adhering to, and demonstrating adherence to, a standard or regulation.

Corrective Maintenance (CM)-Planned maintenance, usually moderate to major in nature, to repair or replace building components or systems that have failed or been damaged. Corrective maintenance is often undertaken after a problem is identified by repeated calls for reactive maintenance.

CMMS - Computerized maintenance management system (synonymous with IWMS)

Current Replacement Value (CRV) - The total expenditure in current dollars required to replace any facility at the institution, inclusive of construction costs, design costs, project management costs, and project administrative costs. Construction costs are calculated as replacement in function vs. in-kind. The value of design (6%), project management (10-12%), and administrative costs (4%) can be estimated at 20% of the construction cost. The value of property/land, however, is excluded, and insurance replacement values or book values should not be used to define the current replacement value. Costs for replacement value are typically generated using a cost model based upon the use of reference cost databases using the building construction type, user and use categories, quality level, building systems and/or subsystems/components/units, and local experience. The property owner/manager may decide, for internal purposes, to base the CRV on “replacement in kind” (e.g. duplicate construction techniques), vs. “replacement in function” (e.g. six-story office space). The CRVs for associated infrastructure, such as utility systems, and generating plants, roadways, and nonbuilding

structures (e.g. dams, bridges) are developed in a similar manner. Insurance replacement values or book values should not be used to define current replacement value.

Deferred Maintenance (DM), Deferred Maintenance Backlog, Accumulated Deferred Maintenance Backlog, Deferred Capital Renewal - The total dollar amount of existing maintenance repairs and required replacements (capital renewal) that were not accomplished when they should have been, not funded in the current fiscal year, or otherwise deferred. Typically identified by a comprehensive facilities condition assessment or audit of buildings, grounds, fixed equipment, and infrastructure. These needs have not been scheduled to be accomplished in the current budget cycle and thereby are postponed until future funding budget cycles. The projects have received a lower priority status than those to be completed in the current budget cycle. For calculation of facility condition index values, deferred maintenance does not include grandfathered items.

Deficiency/Requirement (Facility/Structure/Asset) - The quantitative difference, typically in terms of dollar amount and associated physical requirements, between an asset's current physical or functional condition and an established minimum level of condition/performance. Any problem or defect with materials or equipment.

80/20 Rule - A rule of thumb that says that 80% of the maintenance needs will regularly come from 20% of the components of the systems, and 20% of the maintenance time will be spent on the remaining 80% of the components.

Emergency Maintenance (EM) - Unscheduled corrective activities that require immediate attention to restore a critical piece of equipment whose failure could threaten the safety of personnel or cause damage to other equipment or building systems.

Emergency Repairs - Unscheduled and unanticipated requests for system or equipment repairs. Service calls generally are received when a system or component has failed or is perceived to be working improperly. If the problem has created a hazard or involves essential service, an emergency response may be necessary. Conversely, if the problem is not critical, a routine response is adequate.

Facility Condition Assessment (FCA) or Audit - The structured development of a profile of existing facilities conditions, typically in an electronic database format, and populated with detailed facility condition inspection information. A detailed FCA typically involves an assessment team and depends upon robust, scalable methodologies to ensure accurate and consistent information. The FCA identifies deficient conditions (requirements) in logical grouping and priorities, along with associated recommended corrections and corrective costs. Costs are generally based on industry standard cost databases.

Facility Condition Assessment Program (Facility Capital Planning and Management Program) - A continuous systematic approach to identifying, assessing, prioritizing, and maintaining the specific maintenance, repair, renewal, and replacement requirements for all facility assets to provide valid documentation, reporting mechanisms, and budgetary information in a detailed

database of facility issues.

Facility Cost Index (FCI) - A comparative industry indicator/benchmark used to indicate the relative physical condition of a facility, group of buildings, or entire portfolio “independent” of building type, construction type, location, or cost. The FCI is expressed as a ratio of the cost of remedying deficiencies/requirements and capital renewal requirements to the current replacement value. The FCI provides a corresponding rule of thumb for the annual reinvestment rate (funding percentage) to prevent further accumulation of deferred maintenance deficiencies. The FCI value is a snapshot in time calculated on an annual basis. FCI = DM + CR/CRV. Forecasted FCI values for a building in the future would include the current DM items, plus the projected values of CR requirements. The FCI is represented on a scale of zero to one, or 0% to 100%, with higher FCI values representing poorer facility conditions.

Facilities Performance Indicators (FPI) - Annual data collection and report produced by APPA.

Full-Time Equivalent Employee (FTE) - Used in facilities and human resource accounting to provide a standard measure of numbers of employees.

HVAC - Heating, ventilation, and air conditioning

Improvement - A change or addition to an asset that improves its performance or appearance and/or extends its useful life.

Infrastructure Maintenance Program (IMP) - A program funded by the Government of Alberta whose primary objective is to improve the physical condition of Alberta Infrastructure’s facility assets and to reduce the total deferred maintenance burden. The program outlines specific planned repair, replacement, and maintenance of base building equipment, components, and systems.

Key Performance Indicators (KPI) - A performance measurement which is used to evaluate the success of a particular objective or operational goal. These indicators highlight performance criteria that are important to the organization’s mission, goals, and values. Analysis of KPIs allows the organization to respond in a calculated fashion with necessary operational adjustments to remain on target with established goals and objectives.

Life-Cycle Costing - An estimating procedure used to determine the cost of facility system or component renewal based on the average useful life of an individual component. Typically based on visual observations, via a facilities condition assessments/audits, to determine the remaining useful life of a system and the development of cost models for the facility. This process enables multiyear modeling of future replacement costs and timing.

Life-Cycle Renewal - Activities related to the modernization or adjustments required to correct functional obsolescence of space. It is commonly regarded as requirements into the future of the facility, as anything current and in the past is considered capital renewal.

Maintenance - Work required to preserve or restore buildings and equipment to their original

conditions or to such a condition that they can be effectively used for their intended purpose, ensuring ongoing operation of the campus.

Maintenance Measurement -The measurement of aspects of maintenance in order to provide the feedback necessary to adjust the overall maintenance plan.

Examples of maintenance measurements are Facility Condition Indexes (FCI), ratios of planned to unplanned maintenance, and maintenance reinvestment rates that assess funding levels and probable long-term financial impact.

Maintenance Quality/Service Levels - The levels are Showpiece Facility, Comprehensive Stewardship, Managed Care, Reactive Management, and Crisis Response.

Major Maintenance - Unplanned repairs and replacement, paid from the capital funds budget, that must be accomplished but that is not funded by normal maintenance resources received in the annual operating budget cycle.

New Capital Construction - A project performed to create or add to a building. Includes construction and purchase of fixed equipment.

Normal/Routine Maintenance and Minor Repairs - Cyclical, planned work activities funded through the annual budget cycle, done to continue or achieve either the originally anticipated life of a fixed asset (i.e. buildings and fixed equipment) or an established level of performance. Normal/routine maintenance is performed on capital assets such as buildings and fixed equipment to help them reach their originally anticipated life. Deficiency items are low in cost to correct and are normally accomplished as part of the annual operations and maintenance (O&M) funds. Normal/routine maintenance excludes activities that expand the capacity of an asset, or otherwise upgrade the asset to serve the asset needs greater than or different from those originally intended.

O&M - Operations and maintenance.

Operations All activities associated with the routine, day to day use, support and maintenance of a building or physical asset; inclusive of administration, management fees, normal/routine maintenance, custodial services and cleaning, fire protection services, pest control, snow removal, grounds care, landscaping, environmental operations and record keeping, trash-recycle removal, security services, service contracts, utility charges (electric, gas/oil, water), insurance (fire, liability, operating equipment) and taxes. It does not include capital improvements. This category may include expenditures for service contracts and other third-party costs. Operational activities may involve some routine maintenance and minor repair work that are incidental to operations but they do not include any significant amount of maintenance or repair work that would be included as a separate budget item.

Peak Shaving - Keeping enough inhouse staff to handle around 80 percent of peak demand and purchasing external resources or staff to make up the difference during peak times. Peak

shaving may involve staffing a certain trade or department at a level that is less than required in the most demanding months of the year.

Planned or Programmed Maintenance - Maintenance tasks whose cycle exceeds one year, such as painting, flood coating of roofs, overlays and seal coating of roads and parking lots, and digging of constricted utility lines.

Predictive Maintenance/Testing/Inspection - Routine maintenance, testing, or inspection performed to anticipate failure using specific methods and equipment, such as vibration analysis, thermographs, X-ray, or acoustic systems, to aid in determining future maintenance needs. Examples include tests to locate thinning piping, fractures, or excessive vibrations that are indicative of maintenance requirements.

Preventive Maintenance (PM) - A planned and controlled program of periodic inspection, adjustment, lubrication, and replacement of components, as well as performance testing and analysis. It seeks to extend the useful life of building systems and keep them operating near design intent. This means that PM program objectives include the following:

- Reducing the occurrence of breakdowns, particularly of critical systems. Documenting the performance of legally required work, such as fire alarm system testing. It is helpful to identify legally required work orders with a unique work indicator. This improves their visibility during execution and tracking.
- Reducing energy consumption.
- Reducing overall maintenance costs.

Programmed Major Maintenance - see Planned or Programmed Maintenance.

Programming - The process of planning and organizing the quantitative physical requirements of resources needed to accomplish established goals. A program is an organized set of activities directed toward a common purpose or goal undertaken or proposed in support of an assigned area. It is characterized by a strategy for accomplishing a definite objective(s), which identifies the means of accomplishment, particularly in quantitative terms, with respect to staffing, materials, and facilities requirements. It normally includes an element of ongoing activity, and typically comprises technology-based activities and projects and supports an established level of reliability.

Reactive Maintenance (RM) - Unplanned maintenance, usually minor in nature, for repair or adjustment of building sub components or subsystems that have failed or been damaged.

Recapitalization/Reinvestment Rate - The level of annual funding for a facility renewal and deferred maintenance expressed as a percentage of facility replacement values. A facility, system, or components with existing deficiencies will deteriorate faster than a component that is in good condition. Altering the recapitalization/reinvestment rate has direct impact on the facility condition index and associated deferred maintenance levels over time.

Re-verification - Sometimes more commonly referred to as recommissioning, re-verification is applying the building commissioning process to an existing building, or building subsystem, that has already gone through original commissioning, after substantial time has passed and owners' uses or needs have changed since construction. Re-verification should not require capital improvements.

Regulations - "Controlling human or societal behavior by rules or restrictions." Regulations can take many forms: legal restrictions promulgated by a government authority, self-regulation by an industry such as through a trade association. One can consider regulation as actions of conduct imposing sanctions (such as a fine).

Renewal - The periodic replacement of major components or infrastructure systems at or near the end of their useful life. Renewal work, such as tuck-pointing brickwork, ensures that facilities will function at levels commensurate with the institution's academic priorities and missions.

Renovation year - The date of the building's most recent major renovation, if applicable. A major renovation is defined as addressed at least 50% of a building's components while reinvesting at least half of the building;s current replacement value into the renovation.

Repair(s) - Work that is performed to return equipment to service after a failure or to make its operation more efficient. The work restores a facility or component thereof to such condition that it may be effectively utilized for its designated purposes by overhauling, reprocessing, or replacing constituent parts or materials that have deteriorated by action of elements or usage and have not been corrected through maintenance.

Replacement - An exchange of one fixed asset (i.e. a major building component or subsystem) for another that has the same capacity to perform the same function - for example, replacing a chiller with a like-sized unit.

Replacement Cycle - A regular cycle or schedule when maintenance occurs - for example, repainting every seven years.

Replacement of Obsolete Items - Work undertaken to bring a component or system into compliance with new codes or safety regulations or to replace an item that is unacceptable, inefficient, or for which spare parts can no longer be obtained.

Retrocommissioning - Applying the building commissioning process to an existing building, or subsystem of the building, that has not previously been commissioned. Retrocommissioning will often require capital improvements. Retrocommissioning can also be applied to an existing building or subsystem that has previously been commissioned if the construction project entails extensive and substantive alterations or wholesale replacement of previously commissioned items.

Routine Repairs - Actions taken to restore a system or piece of equipment to its original capacity, efficiency, or capability. Routine repairs are not intended to increase significantly the

capacity of the item involved. For example, replacing a failed boiler with a new unit of similar capacity would be a routine repair project. However, if the capacity of the new unit were double the capacity of the original unit, the cost of the extra capacity would have to be capitalized and would not be considered routine repair work.

Service - All the support provided to the campus customers as needed upon request.

Space Planning - The process of analyzing current and future requirements relative to physical assets (i.e. type, condition, size, capacity, with respect to their ability to support and advance programs and activities at a level deemed appropriate by appropriate parties in concert with associated regulations, codes, mandates, and acceptable levels of performance). Typically involves identifying each distinct type of activity covered by the program and defining the appropriate values relative to size, capacity, utilization, and so on.

Stewardship - The role of guardian of the campus' physical facilities assets and built environment.

Succession Planning - The process of identifying critical or key positions in the organization and developing a plan to provide coverage for those positions in the event the employee is unable to work for an extended period or leaves the organization altogether.

Support Maintenance - Discretionary work not required for the presentation or functioning of a building. May be operational (standby at a function such as graduation), minor trades work (hanging pictures), special event setups, or even minor alteration or construction. Support maintenance is often done to enhance an academic program, recruiting effort, or public relations event. It is also the "service" that the facilities department delivers for light customer service activities that every office-style building demands.

Sustainability - Policies and strategies that meet society's present needs without compromising the ability of future generations to meet their own needs.

Total Cost of Ownership (TCO) / Life-Cycle Cost Management - A dollar per square foot value associated with a facility. It is a calculation of all facility-specific costs (not including furnishings or non-facility-specific equipment) divided by estimated life span of the building (30 or 50 years) and the total gross area. Facility-specific costs include all construction, preservation, maintenance, and operations costs. A strategic asset management practice considers all costs of operations and maintenance in addition to acquisition costs. TCO, therefore, includes the sum total of the present value of all direct, indirect, recurring, and nonrecurring costs incurred or estimated to be incurred in the design, development, production, operation, maintenance, and renewal of a facility, structure, or asset over its anticipated life span. (This total is inclusive of site/utilities, new construction, deferred maintenance, preventive/routine maintenance, renovation, compliance, capital renewal, and occupancy costs. Land values are specifically excluded.)

Trade-specific Position Description (Job fact Sheet) - A detailed list of the tasks required of an

employee at a prescribed skill level within a specific trade. This version of a Position Description is sometimes referred to as a Classification Spec and is often used as a complement to the more detailed Non-Trade-Specific Position Descriptions and includes specific skills and abilities that a tradesperson would develop through education or job assignment within their specific field.

Unscheduled/Unplanned Maintenance - Requests for system or equipment repairs that, unlike preventive maintenance work, are unscheduled and unanticipated. Service calls generally are received when a system or component has failed or perceived to be working improperly. If the problem has created a hazard or involves essential service, an emergency response may be necessary. If the problem is not critical, a routine response is adequate. Reactive or emergency corrective work activities occur in the current budget cycle or annual program. Activities may range from unplanned maintenance of a nuisance nature requiring low levels of skill for correction, to nonemergency tasks involving a moderate to major repair or correction requiring skilled labor, to emergency unscheduled work that requires immediate action to restore services, remove problems that could interrupt activities, or protect life and property.

Utilization Rate - An indicator used to determine how efficiently available space is being used. Usually time-based in terms of month, quarter, or year.

$$\text{Utilization Rate} = \frac{\text{Occupied Space}}{\text{Facility Usable Area}}$$

Zone Maintenance - A team of multi-skilled maintenance craftspeople assigned to a campus zone. The team is responsible for all maintenance in its zone.

Appendix C

APPA MAINTENANCE STANDARDS

Under the Association of Physical Plant Administrators (APPA) there are five levels of maintenance. Please reference below for standards for each level.

Level 1: Showpiece Facility - Maintenance activities appear highly focused. Typically, equipment and building components are fully functional and in excellent condition. Service and maintenance calls are responded to immediately. Buildings and equipment are regularly upgraded, keeping them current with modern standards and usage.

Level 2: Comprehensive Stewardship - Maintenance activities appear to be somewhat organized, but they remain people dependent. Equipment and building components are usually functional and in operating condition. Service and maintenance calls are responded to in a timely manner. Buildings and equipment are regularly updated, keeping them current with modern standards and usage.

Level 3: Managed Care - Maintenance activities appear to be somewhat organized, but they remain people-dependent. Equipment and building components are mostly functional, but they suffer occasional breakdowns. Service and maintenance call response time are variable and sporadic without apparent cause. Buildings and equipment are periodically upgraded to current standards and usage, but not enough to control the effects of normal usage and deterioration.

Level 4: Reactive Management - Maintenance activities appear to be somewhat chaotic and are people-dependent. Equipment and building components are frequently broken and inoperative. Service and maintenance calls are typically not responded to in a timely manner. Normal usage and deterioration continues unabated, making buildings and equipment inadequate to meet present usage needs.

Level 5: Crisis Response - Maintenance activities appear chaotic and without direction. Equipment and building components are routinely broken and inoperative. Services and maintenance calls are never responded to in a timely manner. Normal usage and deterioration continues unabated, making buildings and equipment inadequate to meet present usage needs.