Technical Information Document

MAINTENANCE MANAGEMENT SYSTEMS

RPS for INAC
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Foreword

This document is intended to provide general information and guidance on establishing a system of maintenance management for use in First Nations communities.

Policy and Standards

Policy and standards related to capital facilities and community services in First Nations communities are addressed in the DIAND Corporate Manuals System (CMS) in the Capital Facilities and Maintenance Manuals. The Level of Service Standards for community services maintenance are included in the CMS.

Scope

This document describes a system framework from the initial step of inventory gathering to preparing a community maintenance budget for asset maintenance planning and monitoring. It is designed to assist First Nations technical and managerial staff, Funding Services Officers and DIAND program staff with the implementation of the various elements of a Maintenance Management System including:

- Preparing a Maintenance Plan
- Work Scheduling
- Completing Work Orders
- Managing a Maintenance Budget.

Responsibilities

Delivery of a maintenance management system may, in the case of a large asset, be the responsibility of the individual accountable for the asset or, in the case of a number of small assets, be the overall responsibility of one individual selected by community leaders.

1.0 Introduction

Maintenance Management is an orderly and systematic approach to planning, organizing, monitoring and evaluating maintenance activities and their costs. A good maintenance management system coupled with knowledgeable and capable maintenance staff can prevent health and safety problems and environmental damage; yield longer asset life with fewer breakdowns; and result in lower operating costs and a higher quality of life.

This document provides general information and guidance on establishing Maintenance Management Systems for use in First Nations communities. It describes a system framework from the initial step of inventory gathering to preparing a community maintenance budget for asset maintenance planning and monitoring.

Depending on the application and design, Maintenance Management Systems may have various formats and procedures, (e.g., various formats of work orders, reports and computer screens, etc.), but the basic principles of all these systems are similar to the one presented in this document.

2.0 Types of Maintenance

The word "Operation" is usually linked with "Maintenance". To put these terms in context, Operation is the performance of work or services and the provision of materials and energy to ensure the day-to-day proper functioning of an asset, e.g., the work activities, associated chemicals and electricity to run a water treatment plant. As such, it has a direct but simple impact on the cost of operating an asset. Maintenance is the work performed on an asset such as a road, building, utility or piece of equipment to preserve it in as near to its original condition as is practical and to realize its normal life expectancy. This Technical Information Document, as its name implies, concentrates on maintenance management systems only.

In general, maintenance can be classified into the following categories:

(a) routine - ongoing maintenance activities such as cleaning washrooms, grading roads and mowing lawns, which are required because of continuing use of the facilities;

(b) preventive - periodic adjustment, lubrication and inspection of mechanical or other equipment to ensure continuing working condition;

(c) major projects such as floor replacement, re-roofing, or complete re-painting which are performed once every few years; and

(d) emergency - unexpected breakdowns of assets or equipment. These are unpredictable or reactive type of maintenance and are more difficult to schedule than the above three categories.

Repair is restoring an asset by replacing a part which is broken or damaged, or reconditioning that part to its original or acceptable working condition. The need for repairs can result from normal wear, vandalism, misuse or improper maintenance.

3.0 Preparing a Maintenance Plan

Depending on the application and design of a maintenance system, the format and steps of preparing a maintenance plan can vary. The key steps in preparing a typical maintenance plan are:

(1) **Prepare an asset inventory** - identifying the physical features (e.g., area, material, etc.) of all assets (e.g., schools, roads, etc.) which require maintenance;

(2) **Identify maintenance activity and tasks** - defining the type of maintenance task (activity) to be performed on each asset and what work should be done under each activity, e.g.

Activity: cleaning.

Work to be performed: clean chalk boards, vacuum carpets, etc.;

or,

Activity: Preventive Maintenance (Shingle roof).

Work to be performed: Inspect attic space for signs of dampness caused by leaks in roof. Inspect roof for loose, torn, folded or missing shingles. Repair or replace shingles as required. Inspect flashings eaves troughs and down spouts, and caulk or replace as required. Visually check soffit and facia for loose or damaged materials;

(3) **Identify the frequency of the task** - determining how often the activities should be performed (frequency of service); this is important particularly in preventive type of maintenance. Emergency or reactive type of repairs are unpredictable, but with good preventive maintenance, the frequency of emergency situations occurring may be reduced;

(4) **Estimate the time required to complete the task** - indicating how long each task should take to complete;

(5) **Develop an annual work schedule** - planning what time the maintenance work for the entire year should take place;

(6) **Prepare and issue a work order** - identifying what, when, where and by whom maintenance work is to be done; and

(7) **Determine a Budget -** determining the costs for all maintenance activities by calculating labour hours, material, equipment, and contracting costs.

A chart showing a Maintenance Management System Process is shown in Figure 1.

More detailed discussion of the steps are covered in subsequent sections.

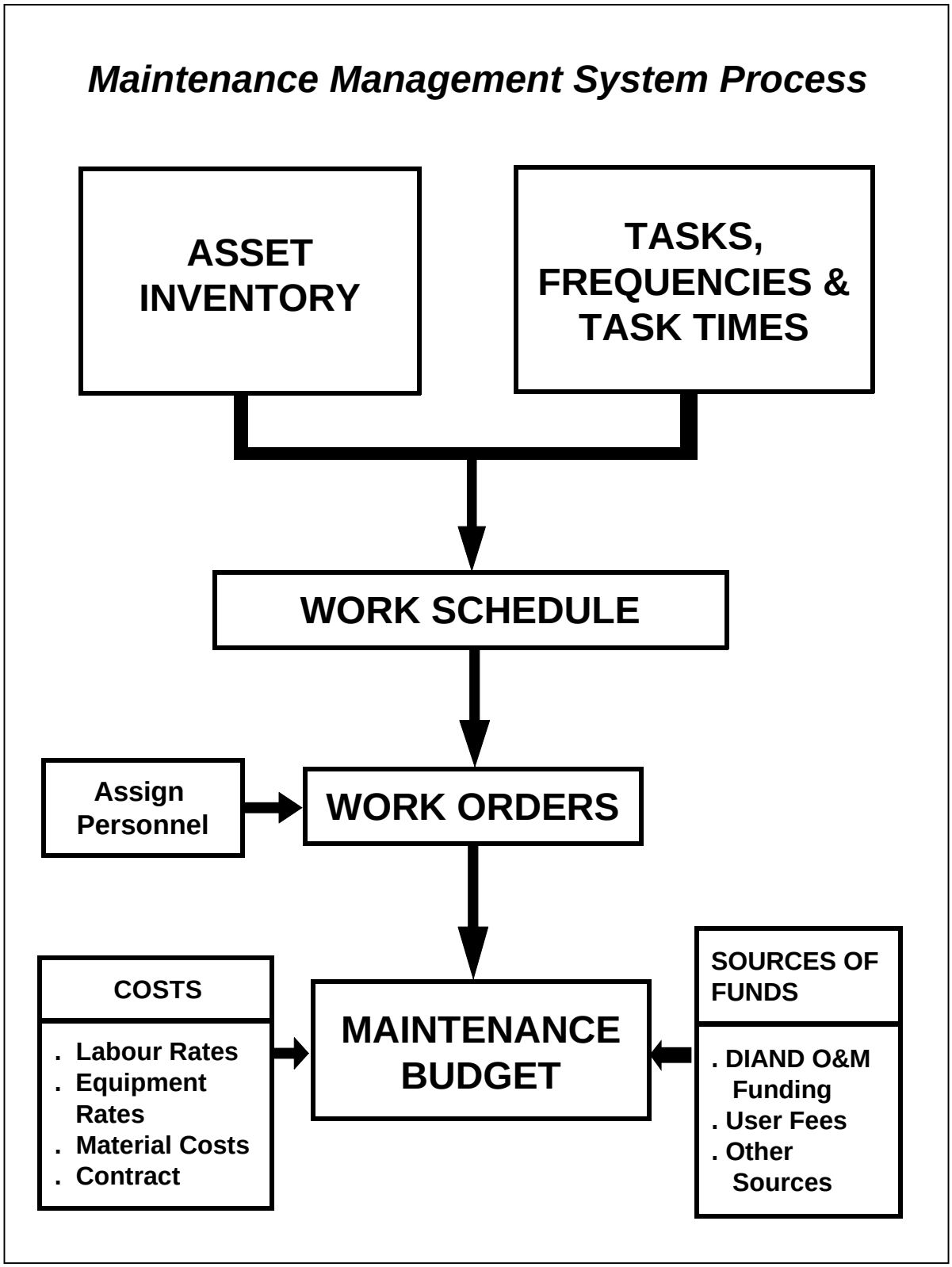

Figure 1: Maintenance management system process.

4.0 Inventory

The inventory is a list of physical features (area, material, etc.) of capital assets that require maintenance. The types of data to be kept vary with the maintenance activity and the task required. Table 1 gives examples of the types of inventory detail.

Maintenance Activity	Inventory Items
1100 - Building Custodial	. area of floor surface . number of light fixtures/bulbs . number of doors
1101 - Building Cleaning	. area of floor surface . number of windows . area of wall
1302 - Culvert Inspection	. number of culverts
1310 - Ditching	. length of ditches

Table 1: Examples of inventory detail.

5.0 Task Statement / Frequency / Task Times

A task statement is a detailed list of the generic maintenance tasks to be performed for a particular type of asset in conducting preventive or routine maintenance. Frequency refers to how often the maintenance tasks are performed, for example, daily, weekly or every five years. Task times indicate how long it will take to do such an amount of work.

Each task statement relates to a specific type of maintenance activity appropriate for an asset. A component of an asset, such as a boiler in a building, may require maintenance checks weekly, monthly, quarterly, and/or annually. Similarly, a road may have a single task statement, such as grading, to be repeated a number of times during the year.

To prepare a set of tasks applicable to a particular asset, one should review the physical features of an asset and/or the manufacturer's operation and maintenance manual to determine the maintenance tasks, task times and frequencies required. For emergency or reactive type work orders, the maintenance tasks and estimated task times will have to be assessed based upon the problem occurring.

6.0 Work Schedule

The work schedule lists all maintenance work to be done for the whole year for each asset. It can be used to identify work load peaks and valleys, i.e., where load balancing (see section 7.0), overtime and/or part-time help is needed. It also serves as a basis for preparing and issuing scheduled work orders and for preparing the maintenance budget.

When all work orders have been listed and the hours distributed, the sub-totals of each period for each worker are calculated. This process is repeated for work orders to be carried out by other workers, and extended to all capital assets to obtain the annual work load profile for each worker.

7.0 Balancing Work Load

Work load balancing may reduce the extreme demands of personnel and provide a more even work load, leading to better use of human resources, reduced administrative paper work and improved efficiency.

To balance the work load, one may:

(a) shift some of the work in the peak period(s) to other weeks, either sooner or later than originally planned. If the demand in certain weeks is still greater than the available hours from a regular shift, the deficit could be made up by overtime;

(b) assign part-time personnel for the peak periods; or,

(c) assign additional duties or emergency work to the worker in the period where the worker is not busy.

Decisions of this type are required to make the total work load for each worker as even as possible to facilitate staffing and to identify periods when additional help is required.

8.0 Work Orders

Work orders provide information on what, where, when, how long and by whom maintenance is to be carried out. Two sample work orders are shown in Figures 2 and 3.

Work orders are prepared from inventory data (physical features) and task statements. Each work order lists tasks for the same frequency of work and for the same asset. For example, one work order could contain tasks for weekly boiler maintenance for a school. Another work order could contain different tasks for monthly maintenance of the same asset.

The general guidelines for preparing a work order are as follows:

(a) Starting with any asset on reserve, say a First Nations Day Care Centre, examine the inventory data and typical task statements to determine the tasks appropriate for that specific asset;

(b) List the asset name, maintenance activity number and work order number, etc. on a blank work order. Using the task statement or manufacturer's operation and maintenance manual as a reference (modify, if necessary, to suit specific situations), fill in the appropriate tasks (i.e., Work To Be Performed) on the work order;

(c) Calculate or estimate the time needed to complete the individual tasks and enter the total time for all tasks in the "planned time" block. The sum of work order planned times for all assets in a reserve will determine the workforce requirement for planning and scheduling personnel resources.

Time standards for routine and preventative maintenance activities are based on time studies and are available from reference books. If time data for a specific task is unavailable, it can be estimated based on similar past experience. This is particularly true for emergency or reactive type work orders. When the task has been completed, the actual time taken should be compared to the estimated time to determine the accuracy of the estimate or measure the productivity of the maintenance team.

SITE: 99999 WORK ORDER No.: 123456
ASSET NAME: Day Care Centre ASSET No.: 0050
ACTIVITY: Daily cleaning and equipment check

CATEGORY: BUILDINGS CREW: John Axe

Inventory

Vinyl floor - 50.6 square metre
Vacuum cleaner 1 - Soap dispenser
Carpets - 96.9 square metre
15 - Doors
9 - Wastebaskets
3 - Sinks
2 - Mirrors
4 - Fire extinguishers
2 - Toilets
1 - Towel dispenser
1 - Chalkboard
1 - Urinal
4 - Exits, porches and exit signs
3 - Lumacell Emergency Light Packs

WORK TO BE PERFORMED	**HOURS**
1. DAILY CLEANING	
- Wash dishes, sinks, fountains, washrooms (lavatories/washbasins, mirrors and toilets).	
- Wipe doors and frames.	
- Sweep and dust mop floors.	
- Wash and sanitize floors.	
- Empty and replace wastebaskets and garbage containers.	
- Wash and rinse all dishes, cups, etc. and return to their proper locations.	
- Wash and sanitize all furniture (counters, cupboards, cabinets, tables, chairs, shelves, baseboards, etc.).	
- Wash and sanitize toys.	
- Wipe off blackboards, scuff marks, and window trim.	
- Vacuum carpet daily.	
- Replenish supplies (toilet paper, soap dispensers).	3.0
2 EXITS & EXIT LIGHTING	
- Ensure exits and exterior lights are in proper working order.	
- Exits doors and door hardware are to be checked to ensure proper operation.	0.1
3. EMERGENCY LIGHT PACKS	
- Visually inspect to check for damage to lamps, and battery units.	0.1
4. FIRE EXTINGUISHERS	
- Inspect all fire extinguishers for general condition.	
- Make sure wire seal is unbroken.	0.1

Total planned time: 3.3

Figure 2: Work Order Sample A.

SITE: 99999 WORK ORDER No.: 123477
ASSET NAME: Day Care Centre ASSET No.: 0050
ACTIVITY: Preventive Maintenance (Shingle roof)

CATEGORY: BUILDINGS CREW: J. Gull

Inventory

Shingle Roof 255.6 square metre

WORK TO BE PERFORMED	HOURS
- Inspect attic space for signs of dampness caused by leaks in roof.	
- Inspect roof for loose, torn, folded or missing shingles.	
- Repair or replace shingles as required.	
- Inspect flashings eaves troughs and down spouts, and caulk or replace as required.	
- Visually check soffit and facia for loose or damaged materials.	4.0

Total planned time: 4.0

Figure 3: Work Order Sample B.

9.0 Maintenance Budget

A maintenance budget is a cost projection based on the costs of labour, equipment, material and other items (such as contracts) required to do all work identified in the Work Schedule. A sample of an Annual Maintenance Budget - Worksheet is shown in Figure 4.

After the costs are calculated for one work order, the process is repeated for the remaining work orders to get the total cost required to maintain the asset.

The maintenance supervisor is responsible for monitoring the actual expenditures against the budget for the year. He or she is also responsible for its yearly update using forecast labour rates, and material and service contract costs. The updated budget would be used for determining the operation and maintenance costs of the First Nation's physical assets.

The Annual Maintenance Budget - Summary, Figure 5, recaps total labour hours, labour cost, equipment cost and material cost for the asset. At this point, all overhead costs, utility costs, and maintenance management supervision costs are also entered. To determine the total maintenance budget for a First Nation, simply prepare a similar summary for each asset in the community and add up the totals of each asset in the community.

The Department of Indian Affairs and Northern Development provides operations and maintenance (O&M) funding for many community assets such as schools, arenas, water supply systems and roads, etc., which appear on a First Nation's Capital Asset Inventory System (CAIS). The level of Departmental support for each asset may vary from 100% of the O&M costs in the case of schools to 20% in the case of arenas. The difference is to be made up through user fees or other sources of revenue. Maintenance managers should discuss with their First Nations administrators or managers the level of funding being provided in support of each asset to ensure sufficient funds exists to provide an appropriate level of maintenance to every First Nation asset.

Annual Maintenance Budget - Worksheet

First Nation: _____ Site No.: _____ Date: _____

Asset Name: Day Care Centre Asset No.: 0050 Page: _____

Work Order No.	Description	Crew Hrs	Crew Size	Total Person Hrs	LABOUR COST Quantity hrs	Rate $/hr	Cost $	TOTAL COST Labour $	Equip-ment $	Material $	Others/ Contracts $	Total $
B2D	Daily Janitorial Activities	858.00	1.00	858.00	858.00	9.00	7722.00	7722.00	250.00	300.00		8272.00
B2W	Weekly Janitorial Activities	104.00	1.00	104.00	104.00	9.00	936.00	936.00	52.00	104.00		1092.00
B4M	Monthly Janitorial Activities	36.00	1.00	36.00	36.00	9.00	324.00	324.00	24.00	100.00		448.00
B3M6	Semi-Annual Janitorial Activities	7.00	1.00	7.00	7.00	9.00	63.00	63.00	10.00	5.00		78.00
B5A	Annual Janitorial Activities	4.00	1.00	4.00	4.00	9.00	36.00	36.00	0.00	0.00	50.00	86.00
B10AR	Bldg. & Equip. Repair Activities	24.00	1.00	24.00	24.00	9.85	236.40	236.40	30.00	500.00		766.40
B30M	Monthly Maintenance Activities	45.60	1.00	45.60	45.60	9.85	449.16	449.16	25.00	240.00		714.16
B32M3	Quarterly Maintenance Activities	4.00	1.00	4.00	4.00	9.85	39.40	39.40	2.00	10.00		51.40
B11M6	Semi-Ann. Maintenance Activities	12.00	1.00	12.00	12.00	9.85	118.20	118.20	10.00	50.00		178.20
B31A	Annual Maintenance Activities	10.10	1.00	10.10	10.10	9.85	99.49	99.49	10.00	50.00		159.49
										Fire Extinguisher		100.00	100.00
										Septic Tank Pumpout		75.00	75.00
B14Y4	Painting Activities	26.00	2.00	52.00	26.00	9.85	256.10					
					26.00	8.43	219.18	475.28	20.00	100.00		595.28
	TOTALS ---------->			1156.70				10498.93	433.00	1459.00	225.00	12615.93

Figure 4: Annual Maintenance Budget - Worksheet.

Annual Maintenance Budget - Summary

First Nation: _____ Site No.: _____ Date: _____

Asset Name: Day Care Centre Asset No.: 0050 Page: _____

Work Order Number	Description	Total Person Hours	T T A L C O S T Labour $	Equipment $	Material $	Others/ Contracts $	Total $
	Janitorial Activities	1009.00	9081.00	336.00	509.00	50.00	9976.00
	Preventive Maintenance Activities	147.70	1417.94	97.00	950.00	175.00	2639.94
	Sub-total:	1156.70	10498.94	433.00	1459.00	225.00	12615.94
	Benefit Costs - Vacation Pay		419.96				419.96
	Employment Insurance		146.99				146.99
	Worker Compensation		96.59				96.59
	Utility Charges - Water					170.00	170.00
	Hydro					3000.00	3000.00
	Garbage Collection					150.00	150.00
	Insurance Costs					700.00	700.00
	Grounds Keeping Costs					950.00	950.00
	Total:	1156.70	11162.48	433.00	1459.00	5195.00	18249.48
	Supervision of Maint. Activities & System					912.47	912.47
	GRAND TOTAL:						19161.95

Figure 5: Annual Maintenance Budget - Summary.

10.0 Management of Maintenance

There is a lot of work required to set up a successful maintenance management system. However, once it is in place, most of the data and calculations remain the same from year to year. Changes are required only when there is an addition or deletion to the inventory or when cost increases and estimates need to be corrected. In these cases, the appropriate work orders and schedule must be revised and the labour, equipment, material and contract costs updated for the new year. There are numerous computerized maintenance management systems available in the commercial market to assist in effectively managing the maintenance of on-reserve assets.

The maintenance supervisor or manager must also monitor the work progress daily, weekly or monthly depending on the nature of the situation and the potential impact of a service breakdown to the community. He or she must not wait until the year end to review the budget, as it would be too late to take any corrective action if it were necessary. Any significant variance in labour hours, work order costs or total maintenance cost for a particular asset should be identified through exception reporting. The supervisor should determine the cause of the variance and, where possible, develop alternative solutions or actions to reduce time and costs. Taking these steps will help improve the efficiency and effectiveness of the maintenance program.