



Maintenance planning in outdoor environments

Planejamento de manutenção em ambientes externos

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ABSTRACT

Maintenance activities carried out in external environments such as streets and avenues in urban areas have numerous variables that are difficult to control. However, they are essential for safety and quality of life in cities, which deserves the proper attention of public entities. This work is an experiential account of the planning process for maintenance activities performed in external environments in an infrastructure services company in the city of Lages. Similar to other maintenance processes, the planning begins with mapping the facilities that need to receive this service, followed by organizing routines through appropriate documentation, utilizing reports for monitoring, and using ERP software for support and analysis of the work performed. Supervision of maintenance teams and training are essential elements for ensuring quality control, as they provide assurance that operations are being carried out in accordance with the guidelines outlined in the documented manuals.

Keywords: Public bodies, External maintenance, Infrastructure.

1 INTRODUCTION

Companies and public agencies and their contractors perform maintenance activities in environments that are influenced by climate, traffic, pedestrian traffic and other conditions that are difficult to control (BORGES et al, 2016). Examples of this are activities carried out on highways, streets, avenues, outdoor areas in general, such as



pruning vegetation, painting cobblestones, resurfacing asphalt, maintenance on water, gas, electricity or sewage networks. Despite these difficult-to-control conditions, planning remains necessary, especially for services involving the interest of society or public funds, as they should be directed to reduce resource consumption and increase productivity (CARLINO, 2012).

Although they are under different conditions from the industry, the assets of these bodies also need maintenance in order to conserve, reduce unnecessary expenses with unforeseen situations, prevent accidents caused by failures and wear and tear of use and provide a performance that satisfies the citizen and has a long useful life (CARLINO, 2012).

Thus, the objective of this work is to demonstrate a maintenance planning carried out in an infrastructure services company in the municipality of Lages-SC for services performed in outdoor environments.

2 MATERIALS AND METHODS

This work is an experience report of maintenance planning for outdoor operations performed by an infrastructure services company located in the municipality of Lages - SC.

The aim of this research is to describe the process of establishing a maintenance plan. Initially, to start from maintenance planning, a mapping of all facilities and their characteristics is carried out. Network valves, stations, shelters, safety signs and others are separated according to type and location. This data is entered into an ERP (Enterprise Management System) system for asset control. This information is essential for designating the frequency of maintenance, the types of operations and the team that will be involved with the maintenance.

According to the type of installation, maintenance procedures are defined and documented as manuals. To monitor activities and standardize maintenance, reports are created in accordance with the requirements set out in the manuals. Once the operating procedure and reporting templates have been created, the technical teams are trained to carry out these activities and periodically inspected to maintain quality.

For maintenance analysis, the data from the reports are entered into the ERP (Enterprise Management System) system which records working hours, calculates the average time of activities, operations performed, materials used and people involved.



Thus, it is possible to calculate the standard time of the activities, predict resources required and maintenance costs. In the calculation of the standard time (ST), the normal time (NT) is adopted as the average of the times presented in the reports over a month. It is considered that this average time already includes travel time and weather conditions that may increase maintenance time. The fatigue factors used are those observed in physically heavy and mentally medium services (7.8% and 1.8% respectively) (SILVA E COIMBRA, 1980). Through this calculation, it is defined how many activities the teams can perform in a day:

$$TP = TN \times (1 + \text{physical effort} + \text{mental effort}).$$

3 RESULTS

3.1 ASSET SURVEY

The first stage of the planning consists of recognizing what assets exist and should receive maintenance (Table 1). The assets were registered in ERP (Enterprise Management System) software, receiving a registration number and details such as serial number, location, manufacturer, among others.

Table 1 - Asset inventory

Active	Quantity
Street valves	78
Stations	13
Shelters	13
Plates	46
Marcos	367

3.2 MAINTENANCE PROCEDURES

The operations required for each type of asset with the maintenance frequencies were surveyed. Below is an example of the maintenance of the "shelter" asset (table 2).

Table 2 - Frequency by type of maintenance

Active	Maintenance	Frequency
Shelter	Washing	1 time in two weeks
	Painting	2 times a year
	Repairs	Corrective Maintenance



With the maintenance defined, procedures are created ensuring the standardization of operations. Once this step is completed, the report forms are made where the maintenance teams describe their activities, fill in the situation as to whether or not the assets are in compliance, geographical region of the asset, time and weather conditions at the time of maintenance.

3.3 TRAINING AND ENFORCEMENT

With the definition of the frequencies and types of maintenance, it is possible to survey what is needed to create a workforce ready for the activities to be carried out. Training is carried out both through external courses, through vocational schools, and internally, taking advantage of the specialist technical staff.

Inspection is an essential activity in public agencies and companies, because it is through it that compliance with contractual, technical and administrative provisions is guaranteed (BRASIL, 1997). If inconsistencies or deviations from the established standards are verified through inspections, they are charged to the contractors or internal superiors so that the appropriate measures are taken, such as training and correction of the operation.

3.4 REPORTS AND ERP SYSTEM FOR MAINTENANCE SUPPORT AND CONTROL

Once the ERP system has all the assets registered and the maintenance and frequency of each type are defined, a schedule can be created.

The software used is a great support, as it automates the scheduling of preventive maintenance, creates work orders and allows the closure to be carried out with the attachment of reports.

The reports also serve as a source of information on whether the maintenance requirements in the manuals and operating procedures have been carried out and under what conditions. The information from the reports serves as a basis for adjustments in planning and prioritization of activities.

3.5 STANDARD TIME ON EXTERNAL MAINTENANCE ACTIVITIES

Through the reports it is possible to establish the standard time provided in table 3:



Table 3 - Standard time and normal time per asset

Active	Normal time (h)	Standard time (h)
Street valves	0,42	0,46
Stations	2	2,18
Shelters	2	2,18
Plates	0,33	0,36
Marcos	0,2	0,22

4 CONCLUSIONS

This experience report presented the maintenance planning process for operations performed outdoors, with exposure to traffic and weather conditions.

It was explained that the first step to carry out this type of planning is the survey and registration of assets, followed by the definition of maintenance frequency, training and supervision of operations.

With maintenance being carried out and reported through forms, it is possible to establish a schedule with support and automation through an ERP system (Enterprise Management System). The reports serve to support inspection activities, as they detail information on the procedures performed and compliance with requirements. These documents assist in adjusting the schedule and prioritizing maintenance activities.

Maintenance planning, when thought of in cities, is a source of quality of life and safety for citizens, so it should be seen as essential in public entities.



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