

Bachelor Thesis

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In cooperation with T. Hendriks

Analysing the Maintenance policy

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Preface

This report has been written in cooperation with Thomas Hendriks. Both of us are studying Industrial Engineering and Management at the University of Twente. Our study includes a minor part in the regular curriculum of the third year. The minor we both independently selected was “International Management”, where the main goal was to get cultural understanding of a non-European country. The third year of the curriculum also consisted of writing a bachelor thesis. We choose to combine the minor with the bachelor thesis, what consist of an internship for a period of four months. By getting in contact with a former CEO of a Dutch Housing Association (Parteon), we heard of Yeast City Housing, because Parteon is supporting Yeast City Housing in its management. From this point on, our assignment was getting shape and in February 2007 we went on an internship to Pretoria, South Africa.

Acknowledgements

During the whole process of preparing this research report, we have been fortunate to receive contributions of various people. First, we would like to acknowledge our supporting supervisors who made this research report a valuable contribution to our study. Thereby we deeply accede to the support of Wooncompagnie, Digh and others who informed us about maintenance issues, social housing and South Africa in general. Special attention do we give to the very enjoying and helpful cooperation at Yeast, where we had a very friendly relationship with each of the staff members and with the people of PCM as well. This lifetime experience could not be as good without the effort they made.

Finally, we would express much of gratitude to our family, because of them we live in the fortunate circumstances of being able to set off for this journey and to do this study project.

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Management summary

Yeast City Housing, a social housing association in South Africa, has recently become more aware of the relevance of its maintenance process. In this process building condition is their focus issue. As of now, their maintenance execution is delimited by their human and financial capabilities. Therefore, the main question to maximize the resource utilization is how to organize the maintenance process in an effective and efficient way. To answer this main problem, a method is used where the discrepancies between the formulation and the implementation of the maintenance policy are analyzed based on theoretical success factors. The contradictions found, between the documented and the implemented maintenance process, and missing success factors in the policy are grouped by organizational level.

Based on a problem solving method an overview of the core problems was formulated. By prioritizing the core maintenance problems, the missing policies showed to be the main problem group. Of these, the consequences can be noticed on each organization level. Organizing the maintenance process effectively and efficiently starts for Yeast with the formulation of objectives at a strategic level, what comes down to policy formulation. This problem group includes four aspects: (1) missing long term maintenance planning, (2) no planning of repair, (3) no accurate control on time span, and (4) no optimal management of outsourced jobs. Next to these four problems, three additional problems are recognized: (5) stock management has to be set up, (6) lack of a supporting financial program, and (7) labour capacity shortage. Altogether, by eliminating the lack of policies a significant number of Yeast's problems will be solved, underlining the importance of this problem group.

For each of the problems discussed, either a solution or a partial solution has been found. Firstly, for the housing stock to be in a good condition, five steps should realize a long term planning: (1) condition assessment, (2) budgeting, (3) prioritizing, (4) execution, and (5) monitoring. Secondly, the project to a better implementation of the reactive maintenance system should continue. Correlated with this, a better control on time span limits consequential loss. In order to correct the clarity issues in the outsourcing process, a contract should be drafted defining procedures and important issues.

To improve setup times Yeast is advised to set up a safety stock with the most frequently used materials and parts against a low inventory cost. Therewith, a good division of responsibilities and authorities will warrant a certain amount of materials and parts. To further support the maintenance function, Yeast needs a financial maintenance program that eases the execution of performance control and improves decision-making. In order to choose the right system, the help of literature and the experience of other social housing institutes are welcome. Finally, an assessment remains to determine the required amount of staff members to execute the planned activities. In this determination both internal and external factors should be considered, for example the ratio between in-house and outsourced maintenance.

In this report the most relevant problems within Yeast City Housing and the accompanied solutions are discussed, which are the starting point for the effectiveness and the efficiency improvements of Yeast's maintenance process.

1 Introduction

In this introduction the structure and the intention of our assignment will be elucidated. Foregoing a detailed description of the research design, background information will serve as an introduction to the subject. This first section is also used to place social housing in the South African context, which is essential for understanding the research.

1.1 Background

Social Housing is a relative new concept in South Africa and it is still developing since it has arisen with the end of the Apartheid policy in 1994. According Wicht (1999) there has been a major strategic shift in the housing policy and provision, from the segregationist apartheid urban approach to an integrated urban development framework. The article also stated that *“under the new political dispensation, urban and housing policies have radically shifted from apartheid mindset to recognizing that the dysfunctional and unsustainable urban areas need to be addressed with urgency”* (Wicht, Social Housing in South Africa; A feasible option for low-income households?, 1999, pp. 17-4). The new constitution recognizes that housing is a human right for all, but acknowledges the current backlog (South African Government Information, 1994). Several months after the introduction of democratic government in South Africa, the National Housing Ministry stated its White Paper on Housing. The governmental paper highlights the importance of *“a significant community participation in housing processes and an active role for low-income groups as partners with government and private sector in developing housing”* (Department of Housing, 1994, p. 8). This was a main starting point for South African role-players in the private, government and non-profit sectors to review the impact of the housing policy and its implementation. The new constitution of 1996 is one of the few progressive contributions, which recognizes housing as a fundamental human right (Miraftab, 2003). The following aspects had to be permanently accessible to all South African’s people: secure tenure, privacy and adequate protection against the elements, potable water, sanitary facilities including waste disposal, and electricity supply (Khan & Thurman, 2001).

As a response on the situation described above the social housing organization ‘Yeast City Housing’, shortly Yeast, was founded in 1997 by the Pretoria Community Ministries (PCM). The aim of Yeast City Housing is to provide decent, affordable accommodation to low income and at-risk people in the inner city of Pretoria, as well as to people with special needs. During the apartheid most of the poor people were black and were forced to live outside the inner city of Pretoria. By ending this apartheid policy and setting up a new housing policy, more low-income housing became necessary within the inner city of Pretoria (Yeast, 1999). Yeast first property exists of two older buildings in the city centre, where it expanded to eight buildings within eight years. All of the buildings are located in the centre of Pretoria and most of the buildings are dated. The current amount of accommodation units in the eight buildings comes up to a total of 300, which are managed for tenants earning up to €250,- and €350,- a month. Yeast is not only accommodating tenants, about 20 percent of the units is used by PCM. These buildings and units are used as Aids-hospice, Christian nursery and shelter. Table 1 gives an overview of Yeast’s main assets. A distinction between institutional and transinstitutional units is found in the housing projects. Institutional units are independent residences, while transinstitutional units share sanitary and cooking facilities. Other than housing projects are managed in cooperation with PCM. All in all, five out of the eight buildings are owned by Yeast.

Housing project	Year of construction	Nr of units	Kind of project	Owner	Condition rating*
Burgers Park	2002	16 + 25	16 institutional units, 25 transinst. units for woman at risk, offices YCH & TLF	YCH	Good
Hofmeyr	1940?	54 +2	Transinst. Units	YMCA (lease)	Poor
Litakoemie	1949?	31	Transinst. Units	YCH	Poor
Sediba	1980? and 2003 refurbishment	45	Institutional units	Rental	Fair
Kopanong	2003	62	Institutional units	YCH	Fair
Living Stones	2003	24	Transinst. Units	YCH & Wesley Church	Good
Salvokop	1970?	13	Nursery school for 50 children and house for TLF-volunteers	YCH	Fair
Rivongingo	2004 refurbishment	8 rooms 20 beds	(Aids) Hospice	YCH	Fair

? = An estimation of the year of construction

* = An indication based on experience and condition assessment (Yeast City Housing, 2007).

Table 1: Basic information assets

During the last years, Yeast focus was to expand their number of housing units to enable shelter for a larger extent of tenants. The main problem with many social housing companies in South Africa comes down to property maintenance. The current condition of the property, see the last column in table 1, is not optimal because of overdue maintenance. According to Yeast, they indicated that the maintenance costs are rising and simultaneously the buildings are deteriorating. Beside daily maintenance, Yeast is facing some huge expenditure because of some substantial renovations in prospect. Problems are accumulating when the current condition of some of the buildings is declining, because of consequential loss. The problem with this situation is the limited available resources within Yeast. In this condition, it is hard to set-up goals and maintain the buildings without a complete condition rating per building. Currently Yeast is still focusing on expanding their building capacity, what indicates the importance of an effective maintenance management. The article of Wicht (1999) supports the focus of Yeast and mentions that in order to be sustainable, the capacity of the housing projects and the development of skills to manage the future housing association are going to play a critical role. Taken together, for Yeast the current situation of their property maintenance keeps them from organizational growth.

This background information is useful in the following section where the problem definition for this research is formulated.

1.2 Defining the main problem

As mentioned in the section above, maintenance is becoming to play an essential role within social housing of South Africa. These circumstances are also noticeable to the business of Yeast, where Yeast is becoming more and more aware of the problems within their maintenance process. The environment of social housing in South Africa, and therefore to Yeast, has rapidly developed in the last few years. Considering this frequently changing environment Yeast has to anticipate rapidly. Having said that, a first observation of Yeast maintenance process can be performed. This shows that Yeast is suffering from problems like long outstanding maintenance, missing planning and strategy, buildings in poor state, and a restricted capacity. Therefore, Yeast assigned us to analyze the maintenance policy to anticipate on the maintenance condition. Taken together, the research of this assignment is based on one main problem, which is formulated as:

“How can YCH’s maintenance policy be organized to operate in an effective and efficient way?”

1.3 Division into sub problems

This main problem is containing all different aspects of maintenance, and in order to give a structured answer to this main problem a subdivision into five problems is formulated. The subdivision is based on regular policy determination where a comparison is made between the documented maintenance policy and the implementation of this maintenance policy. In addition, the implemented state is compared with the desirable state which is formed by the official policies, procedures and the important findings from literature.

The five sub problems will be dealt subsequently in the chapters three to seven and are defined as follows:

1. *What are important theoretical aspects of a maintenance policy?* (Chapter 3)
2. *What is the current maintenance policy?* (Chapter 4)
3. *How is the current maintenance policy implemented?* (Chapter 5)
4. *What are the main current bottlenecks in the maintenance policy and its implementation?* (Chapter 6)
5. *Which solution(s) exist to the main current bottlenecks?* (Chapter 7)

These five sub problems should lead us to an answer to the main problem statement in a systematic way. To answer the first sub problem a literature review is performed in chapter three, which generates a framework for the sequential sub questions. Accordingly, in chapter four will be started with the relevant elements of the maintenance function, like the documented policies and procedures. The same elements are treated in chapter five, however here the implementation of the elements is addressed. Subsequently, chapter six includes the main discrepancies between the desirable and the practical situation. In chapter seven, the problems are prioritized and provided with solutions and recommendations. In chapter eight the conclusions are presented and chapter nine is a discussion to this research. Before elaborating on the sub questions, the methodology is discussed in the following chapter.

2 Methodology

In this chapter the applied methods to answers the research questions will be amplified. So, here will be presented how the answers to the research questions arise and here will insight be given in the structure of the report.

The months preceding the internship in February consisted of cultural and research preparation. The cultural preparation consisted of two courses, part of the minor International Management. In order to prepare the research assignment in The Netherlands, problems within Yeast were communicated in advance. The exploration part of the research started with the literature study, a visit to the South African coordinator of the Dutch Institute for Guarantee and Housing (DIGH, 2006) and a course day with the technical staff of Wooncompagnie. DIGH is a Dutch organization which connects Dutch and South African housing association to realize lower loan interests rates. This conversation introduced the main characteristics and situations of the African Social Housing. Wooncompagnie is a Dutch housing association and showed their way of inspecting and handling maintenance procedures.

The literature review is based on the Systematic Literature Review (SLR). A systematic literature review can comprehensively identify, track down, and appraise all the literature on a topic (Petticrew, 2003). To perform the SLR different search engines and multiple search terms are used.

In order to find relevant literature for answering the research questions, first a brainstorm session is done to find keywords, which are relevant for finding the right literature. Secondly, there are some inclusion and exclusion criteria formulated to get the review structured, see table 2. These criteria help to include

Inclusion	Exclusion
Maintenance process Maintenance policy formulation Managing state of buildings Related to the maintenance function of a (social) housing company	Maintenance other than on buildings Not related to housing associations Outside western culture Before 1970's

Table 2: SLR inclusion & exclusion

theory about the maintenance management in a housing company and to exclude theory which not fit in the housing context or is not relevant because of age or professionalism. The professionalism plays a role because organizations with a western culture, also active in South Africa, are ahead in the housing sector.

The literature search is performed in the EBSCO database "Business Source Elite" and in the Quicksearch engine of the Twente University Library. Table 3 shows the keywords used to perform the final search. The Quicksearch engine searches three databases: Picarta, Scopus and Web of Science. Searching in those databases, the 25 best-rated journals in Operations Management are covered (Olsen, 2005). After this search, the

Search terms	
Policy state social housing Housing corporation Housing association Life cycle property Manag* Asset management	maint* housing stock Condition based maintenance Upkeeping building Repair Condition assessment Maintenance function

Table 3: SLR search terms

found articles are selected on usefulness by reading title and abstract. Before making use of an article,

the full article is read and checked on validity. Finally, the reference list of the article is used to perform a forward- and backward search to check if there are more relevant articles on the subject.

During the three months of internship, the maintenance process is analyzed on the important maintenance aspects from the literature. The main purpose was to get an understanding of the current maintenance policy, its implementation, and the desired state of the property. For this reason, it is necessary to be part of all different aspects of the maintenance related activities, like working with the technical staff, the Building Manager, consultants, and quantity surveyors. Likewise, part of the research is getting familiar with the written policies and existing tacit knowledge. Executing a condition inspection and making a property overview showed the ins and outs of the buildings. In spite of the cooperation and support, the coordination of the project assignment was performed autonomously to a great extend.

Back in Holland, the discrepancies between the implemented and desired operations are worked out. To overcome some irregularities in the data extra theories are used. To create an overview of the main current problems, in chapter seven a problem cluster is made. By creating this cluster the Managerial Problem-Solving Method (TSM business school, 1994) is used as guide. Actually, all problems are listed and form the starting point of the problem cluster. Based on experience of the internship, read literature, principles of the study IEM, and logical reasoning the causal relations between the problems are set up. To conserve the integrity of the problem cluster some rules have been taken into account. Firstly, define clearly the problems in discussion to prevent misjudgments. Also, only add problems and relations you know and are compliant. In the determination of relations only set the most relevant links, because in the end everything is somehow relatable. The resulting cluster forms a central part in section 7.1 and is added in annex 3.

The main function of the overview is to establish the causal relationships of the maintenance related problems. Going back in the causal chain will end with finding the core problems. With the removal of these core problems, the related consequences are positively affected. Subsequently a priority list of the core problems can be formulated, because now a better understanding exist of the most fundamental bottlenecks and their consequences. Hereby, only the most relevant causes of the remaining candidates have been taken to prevent a flood of causes.

The preparation, research, and analysis stage together lead to this final research report that contains conclusions and recommendations to the main problem. These stages and the literature findings make up the structure of this report. Like that, the chapters one to three form the preparation stage. In the following three chapters research is done to the formal maintenance policy, the implementation of the policy and the discrepancies between both. Then in chapter seven feasible solutions to overcome these discrepancies are presented and chapter eight consists of the conclusions and recommendations. The report will be ended with a discussion in chapter nine.

3 Literature review

When experts are asked to give an accurate description of maintenance many different and diverge aspects will be mentioned. In this chapter a distinct description of maintenance will be given after a systematic literature review (SLR) was applied. In the first section a definition of maintenance is formulated, and in the remaining sections the important aspects of the maintenance process are attended. The chapter will be ended with an overview of each theoretical variable and the section it will return in the report.

3.1 Clarifying maintenance

Every branch of industry has their own thoughts about maintenance. However when the housing branch is observed maintenance can be simply defined as, *keeping a building in a condition appropriate to its use*. The objectives that go with this definition are to ensure a safe condition, make sure the building is fit for use, maintaining the quality and value of the building stock, and meeting all the statutory requirements. (El-Haram & Horner, 2002)

Having a glance at the motives of executing the maintenance the following aspects are mentioned: legal requirements, technical and functional motives, and environmental motives. In general, the legal requirements are to conserve the building and to stick to the minimum requirements. These requirements are mainly about safety, health, and liveability. Material damage and functional defects have to be repaired to preserve the technical lifespan and the value of the property. Taking prompt action will also prevent collateral and consequential damage. In other words, when maintenance is performed in time, the final effect of the damage will be limited. A functional defect is most likely to results in dissatisfaction or even impediment for tenants. Environmental motives is reflected by the durability of the solution, which plays an important role at all maintenance activities. The 'Foundation for construction research' set up a list with five theme's of durability: material, energy, water, internal, and environmental. Internal theme's are for example air quality and noise pollution. (Straub, 2001)

Execution of maintenance can be divided into cleaning, repair and replacement. A further division in maintenance activities is possible by type, kind of elementary component (e.g. electricity, floor, doors), material usage (e.g. concrete, wood, steel), and size (e.g. working hours). From all possible divisions the following is already in use by Yeast and utilized in common: (Kaan, 1993)

- | | |
|-------------------------|---|
| Reactive maintenance: | This type of 'unplanned' maintenance is a reaction to occurred failures, whereby it is not primary performed to ensure the intended lifespan. |
| Planned maintenance: | This is a predictive type of maintenance and is based on the actual condition of the property. Whereby the needed maintenance tasks are based on quantified building conditions. |
| Preventive maintenance: | This type of maintenance is performed on a time-based schedule that detect, preclude, or mitigate degradation of a building with the aim to preserve or extend the lifespan. This process is performed by controlling the degradation due to an acceptable level. |

So preventive maintenance is time-based and planned maintenance is mostly based on the current condition of the building. The main target of planned maintenance is, although it is facing higher control and inspection cost, to lower the overall maintenance expenditures and to optimize the building conditions in the long run. By way of illustration, the Dutch association *Aedes* declared that 35% of the activities is day-to-day maintenance and the remaining 65% is planned maintenance and minor improvements (Aedes, 2003).

From this section, the definition of and motives for doing maintenance will be used as background information. The division in three types of maintenance will form a basic principle of chapter four and five.

3.2 Maintenance in a housing organization

The embedding of the maintenance function in a housing association forms the second aspect to be considered in this literature review. A distinction can be made between the maintenance process and the framework at the strategic, tactical and operational organizational level. It is argued that structure and systems within the organization together with the series of process steps, determine the success of the maintenance. Here Marques & Gupta (2006) define the structure and systems as 'framework' and the series of steps as 'process'. Although the article orientates to production systems, the distinction between process and framework is useful in building maintenance.

The division in framework and process confirm the insight that systems applied in housing associations should support the processes at the different organizational levels. At the strategic level business priorities should be transformed into a generic maintenance plan. To fulfill this plan the right resources should be assigned at the tactical level. Finally, at the operational level the tasks should be carried out in time at the right way. The most important task of a system is to give a supportive structure and to store data of the accomplished work. Accordingly, the supportive structure consists of three pillars: IT, maintenance engineering techniques, and organizational techniques. The first mainly refers to tracking performances, providing, processing and integrating of maintenance information. Engineering techniques are the systems used for planning and managing resources. The latter one refers to the communication, coordination, and motivation of people in the organization. (Marquez & Gupta, 2006)

Both the maintenance process and the framework are described in chapter four and five. The division into organizational levels is used in chapter six.

3.3 Maintenance cost

The financial accounting aspect is very important in building maintenance management. "*Housing organizations ensure the continuing provision of the required standards and service provided by the buildings, at the minimum cost*" (Wordsworth, 2000). Maintenance costs include all spending in order to keep the building up to an acceptable standard. The organizational capital is spent on new assets, maintenance, and running costs. According to Dutch housing associations 19% of the overall cost is maintenance expenditures (Straub, 2001). The indirect overhead costs (fixed) consist of staff salaries, plants, cost of general services, etc. The direct overhead costs (variable) depend on the actual work done on a property.

Different types of cost are distinguished: (Wordsworth, 2000)

1. *Committed costs*: Represent the after-effect of irreversible decisions taken in the past.

2. *Variable or engineered cost*: Directly related to the volume of maintenance
3. *Managed or discretionary costs*: Require specific decision making in a budget period.

Within social housing there are numerous factors that influence the maintenance costs. According to a survey from El-Haram & Horner (2002) these can be divided in the following five groups: building characteristics, tenant factors, maintenance factors, political factors, and other factors. Controlling this maintenance cost is done by some strategies, like reducing the amount of maintenance jobs by making a selection according applicability and cost-effectiveness. The duration of the execution can be reduced by increasing the job accessibility, training staff, and planning the maintenance resources in advance. The third strategy is to consider the design of new housing concerning reliability, maintainability, and life costing. The factors driving maintenance cost have to be controlled or even reduced. (El-Haram & Horner, 2002)

To realize the funding for all the maintenance, to upkeep a building in its life span, is a great responsibility of housing associations. When speaking about maintenance cost, unavoidable major investments should get special attention. In order to finance these investments, sinking funds are more often used. A conventional sinking fund is characterized by a series of constant annual payments that result in a lump sum of money for future expenditure. Bowles et al (1997) state that housing associations should fluctuate the payments to create a better match with their revenues. Creating any form of sinking fund requires a judgment on the maintenance need, which is affected by both the durability of building components as the maintenance vision and perception within the organization. Bowles et al (1997) argue that a willfully decision approach is necessary to proper forecast maintenance, because the lifespan is affected by lots of different variables and historical data have been proven to be an unreliable guide to future costs. Hereby they show the impact of changing component life spans over time on the sinking fund strategy to highlight the importance of regular condition checks.

The theories of this subsection mainly stress the importance of financial planning and give some guideline for the recommendations at the end of the report.

3.4 Outsourcing and partnerships

Housing associations have to consider to perform maintenance in-house or to outsource it. This decision can depend on various facets like service to tenants, intervention time, the organization's image, project flexibility, job costs, and maintenance quality.

When taking a closer look to the housing branch, it seems that maintenance is mostly outsourced. The ratio of maintenance performed in-house versus outsourced maintenance cost will clarify the overall picture. Table 4 gives a more detailed ratio overview of the Dutch housing associations, classified per maintenance type. It is clearly perceptible that a large extent of the maintenance is outsourced and major differences exist between the different maintenance types. By way of illustration, within Dutch associations one-third of the unplanned maintenance is performed internally and almost all planned maintenance is outsourced.







<i>Average ratio of in-house vs. Outsourced maintenance cost of Dutch housing associations</i>				
	<i>In-house</i>		<i>Outsourced</i>	
Reactive maintenance		33%		67%
Planned maintenance		2%		98%
Total		9%		91%

Table 4: Ratios of maintenance execution based on maintenance type (source: Aedes, 2003)

Not only the consideration to outsource maintenance, based on the facets described before, is precarious. The following step is to choose a suitable contractor with the proper conditions for the job. The collaboration between housing corporations and their contractors can be described as follow (Vijverberg, 2004):

1. Traditional tender of maintenance activities on project base.
2. Price- and performance agreements on maintenance activities.
3. Long term collaboration concerning maintenance.

The former one is well-known and needs therefore no more attention. A performance agreement is made with an individual contractor and is linked to specific functions and components of a building, for which minimum performance criteria exist. With the third collaboration the contractor is acting like a consultant who is managing the main outline of the maintenance process. Besides basic organizational characteristics, the appropriate form is mainly dependent on the goals of the housing association towards the partnership. (Straub, 2006)

This outsourcing and partnership theory support to identify which part of maintenance should be outsourced and can determine the type of collaboration in the following chapters.

3.5 Intensity of maintenance

When executing maintenance two questions possibly arise, which should be answered before a job can be finished. To which degree should the maintenance restore an object, and to what degree is the system actual improved by the executed maintenance? First, Pham & Wang (1996) classify five degrees of maintenance, according to the degree to which the object is restored. These degrees diverge from perfect maintenance, the object is as good as new, to worst maintenance where the object is broken down. Second, an evaluation is formed to determine whether the objectives are met. To handle the two questions, several methods are classified which mainly differ in time intervals and condition orientation. Although the theory is originally orientated on machinery, the concept that maintenance actions often do not make things as good as new (called “imperfect maintenance”) seems to be very interesting. Imperfect maintenance can be used as background information and is very useful in a long-term housing maintenance planning.

3.6 Contextual effects on maintenance

Wall (1993) clearly states contextual issues do affect the maintenance of buildings. The climate is a good example of an issue that determines differences in maintenance development. Climate is setting a best set of materials, design, and maintenance strategy. In addition, some forms of capital do play their part with national maintenance differences. The human capital in construction, maintenance, and management functions has a huge influence on maintenance. Organizational systems or institutional capital forms another contextual issue, which is closely related with the human capital. Differences in cultural capital do have its impact on the expectation of maintenance. Finally, the areas of natural, physical, and financial capital determine the available materials, assets, and funds. (Wall, 1993). In conclusion, contextual effects influence maintenance and therefore a maintenance policy should consider these effects.

3.7 Planning of maintenance

In the first section a clear difference between planned- and unplanned maintenance is made. Here the importance of having a planned and systematic approach in maintenance management will be underlined.

First, the objectives for a longer-term maintenance planning can be summarized from literature to the list below:

- Meet standards set by South African SHI and rental housing act for the living areas (SPSH, 2004)
- Satisfy tenants (SPSH, 2004)
- Retain the units initial value (SPSH, 2004)
- Maximize economic (or useable) life and minimize maintenance cost (Eilenberg, 1990)
- Generate certainty, standard procedures, and a high level of effectiveness (annex 3)
- Be able to estimate repair costs (Kodo et al, 1990)

Therewith there are several tasks belonging to planned maintenance: (1) list available information, (2) inspection, (3) setting up a long-term maintenance plan, (4) setting up an annual plan and budget, and (5) execution. Adjacent to this, there are some assisting tasks like: document the cost of the maintenance activities, document the lifespan and maintenance cycle, formulate job descriptions, and set up maintenance contracts. All these tasks are important for the reliability and inerrability of the maintenance process planning, and influence the progression. (Straub, 2001)

The strategic policy enactment strives to set up a financial long-term budget, the desired maintenance achievement, and special project budgeting. The tactical planning implies a long-term maintenance plan and budget. An operational planning contains an annual planning and budget of the maintenance activities.

Setting up a long-term maintenance plan bases on two aspects. The first one is listing the inspection data (internal information), which is part of a condition assessment. The second aspect is the theoretical lifespan and maintenance cycle (external information). Setting up a long-term maintenance plan

requires several steps. These steps can be divided into four phases: (1) stock-taking, (2) inspection, (3) planning and budgeting, and (4) programming. (Straub, 2001)

After the several aspects of building maintenance, 'systematically planned maintenance' gets some more attention. In the literature [see also (Shen et al, 1998)] often the lack of maintenance is stated, also mentioned is the perception that *private housing is a national asset but public housing is a national liability* (Allen & Hinks, 1996, p. 531). Therefore, especially to public houses, maintenance should be coordinated more effectively with IT in order to improve the housing stock, satisfying tenant's needs, and the sustainable use of resources. (Allen & Hinks, 1996) Therefore, a longer-term policy is required with input about building condition, cost implication of that condition, and available options. This is a complex and continuous process, where a quantitative model can support. The most important step to make is to prioritize the different maintenance jobs. In most models, clear data and secure component categories are needed and it can handle important subjective factors (like contextual effects) and different levels of building component detail. In short, planning is about prioritizing based on cost, time, and condition data. (Alani et al, 2004) Another model is based on the Analytic Hierarchy Process (AHP) approach and sets up priorities on six variables varying from the importance of the building, defect and function to the effect on users, consequence loss and service provision. (Shen, Lo, & Wang, 1998)

In this chapter the literature is reviewed to get familiar with the main issues regards to maintenance. As an answer to the first research question the main aspects of a maintenance policy are described. The issues form the essential knowledge of any single maintenance policy, what is applicable to the entire report. The next table structures the theoretical concepts to answer the first sub question. To continue with the second sub question the following chapter includes the current maintenance policy, as it is documented within Yeast.

Theoretical concept	Variables	Used in the report
3.1 Clarifying maintenance	Definition & motivation for maintenance Reactive, planned & preventive maintenance	1.1 'Background information' 4.3.2 & 5.3.2 'The reactive maintenance procedure' 4.3.3 & 5.3.3 'Planned & preventive maintenance procedures'
3.2 Maintenance in a housing organization	The maintenance process The framework (organizational structure and systems)	4.3.1 & 5.3.1 'General processes and systems' 4.1 & 5.1 'The organization structure & the housing stock' 4.2 & 5.2 Vision according to the maintenance 4.3.4 & 5.3.4 'Supporting software systems' 4.4 & 5.4 'Maintenance related tasks'
3.3 Maintenance cost	Types of maintenance costs Controlling costs Sinking funds	6.1.3 'Property condition' 6.2.2 'Financial' 7.2.5 'Financial maintenance program still to develop'
3.4 Outsourcing & Partnerships	Motives for and types of collaborations	4.4.2 & 5.4.2 'External relations' 7.2.4 'Not optimal managing and monitoring outsourced jobs'
3.5 Intensity of Maintenance	Imperfect maintenance	7.2.1 'Planned long/term maintenance' 1.1 'Background information'
3.6 Contextual effects on maintenance	Contextual issues affect maintenance	1.1 'Background information' 7.2 'Existing solutions to the main current bottlenecks' 9 'Discussion'
3.7 Planning of maintenance	Long-term maintenance plan: Annual maintenance plan Condition assessment Budgeting Prioritizing Executing Monitoring	6.2.4 'Planning' 7.2.1 'Planned long-term maintenance' 7.2.2 'No planning of repair' 7.2.3 'No control on time-span' 7.2.4 'Not optimal managing and monitoring outsourced jobs' 7.2.5 'Financial maintenance program still to develop' 8 'Feasible solutions and recommendations'

Table 5 - Overview theoretical concepts

4 The current maintenance policy

To provide recommendations for Yeast and to answer the main problem, the current situation has to be clarified by describing different facets of the organization. In brief, in this chapter will be focused on the current maintenance policy.

In the first section Yeast's organization structure and property is described. On the vision on maintenance is concentrated in section two. Subsequently, the processes and systems that are supporting the observance of the policies are presented. Finally, the last section includes the official tasks descriptions.

4.1 The Organization structure & the housing stock

As mentioned in the introduction, Yeast is a small organization consisting of a board and ten employees. At the same time the organization structure, as found in annex 1, is best described as relatively tall. This implies a relatively large number of hierarchical levels, whereby the location of decision authority is centralized. Building issues, finance as well as external consultants are structured by function under supervision of the General Manager. Out of this organization chart, the Board of Directors will formulate the maintenance policy at the strategic level, and the maintenance issues at the tactical and operational level are the responsibility of the Building Manager in cooperation with the service engineer.

The background information within the first chapter already gives an overview of Yeast's property. Remarkable is the great variety in Yeast's housing stock, caused by the differences in age, function, location, and usage of the property. The buildings accommodate a modest amount of units. Detailed documentation about the housing stock is often lacking and data are not completely documented.

4.2 Vision on maintenance

A vision will allow Yeast to set a direction and is the first step in developing an achievable business plan. Having a clear vision and a shared goal is of great importance in the operation. Moreover it's of importance that staff, tenants and other related partners share this vision to accomplish the desirable direction it is heading for.

Yeast's vision is written down in the Business plan (Yeast City Housing, 2001), which is provided by the Board of Directors. The following visions on maintenance are mentioned:

- *Property management*
Ensure that the responsive maintenance is undertaken quickly and efficiently to reduce inconvenience to tenants and protect the buildings from long-term decay. Establish a cyclical maintenance program for all property under the management of Yeast. Make provision within the financial models for long-term repair program.
- *Repairs and maintenance policy*
Yeast recognizes that the property portfolio owned and managed by YCH is the asset on which future borrowing will be based. The condition of this asset will also reflect upon the community living in our properties.

Beside this, the Housing management Service charter (Yeast City Housing, 1999) gives another vision on maintenance, namely:

- Aim to provide the highest possible standard of service to Yeast's tenants and other customers.
- Request and problems would be dealt with efficiency and in a manner that is caring, courteous, fair, and honest.
- Yeast will keep tenants' home in good repair by carrying out repairs and external decorations as necessary and by the implementation of a planned maintenance program.

The vision expressed in these documents forms the basic principles of Yeast's activities. In the next chapter the personal visions of the staff are enquired. In chapter six, the organizational and personal vision(s) will be compared.

4.3 Policy supporting processes and systems

Some processes and systems assist the organization in implementing the policies. In this section an outline of these systems and processes is formulated. In the first subsection is started with general processes. In subsections two and three the processes and systems of the planned and unplanned maintenance are discussed. This section is ended by bringing some extra attention to the IT-systems.

4.3.1 General processes and systems

Yeast has set itself some general rules for response times to complaints, requests, and enquiries. Next, it has made a telephone, visitors and contact policy. The specific procedures and approaches related to the maintenance policy can be found in annex 6. For the executing of repairs, some time limits are set for several levels of urgency. In case of a complaint, the tenant (or staff-member) will first fill in a request form. In case of outsourcing, when the staff member doesn't have the required skills or the work is too ambitious, the tenant will be informed and should sign the satisfaction form afterwards. To know of maintenance problems Yeast will also carry out a Stock Condition Survey annually.

Tenants are expected to abide by the terms of their agreement, if not Yeast will take action. They have to take care of their premises and facilities, and should immediately notify the landlord about defects. The internal decoration and defects by normal use are the responsibility of the landlord. Tenants are (financial) responsible for wilful damages or removals. At the time of a handover a condition check has to be done together by the landlord and the tenant. During the handover the premises should be in good order and condition so the room can be properly checked before refunding the deposit money. Failure of inspections by the landlord means the tenants gets their deposit and eventually interest. Tenants are not allowed to make structural alterations or additions to any part of the building without permission of the Landlord. Finally, the tenant is not entitled to a remission or withdrawal of rent by reason of a landlord's failure to complete any maintenance, except in case of extreme long periods.

4.3.2 The reactive maintenance procedure

The reactive maintenance procedure is based on received complaints from tenants or staff members. During the process of receiving the complaint until the resident's signature, a 'maintenance form' is used. This form can be found in annex 4 and includes a part to be filled in by the resident/staff member (white area) and one to be filled in by the repairer (grey area). Besides the reference number, the names

of involved persons, agreed dates, and the description of the defect and the work, the form includes some main functions:

- Registration of the total time-span of repair
- Supporting in making the appointment and the visit of repair by contact details
- A proof of Yeast's, the tenant's, and eventually the workman's satisfy by the signatures
- In case of outsourcing the repair it provides the contact and work information of the workman

In addition to this paper form, a digital Excel spreadsheet exists within Yeast, containing exactly the same information as the paper form. All the information has to be manually put in the spreadsheet, which results in a joined database with better search and analyze possibilities.

4.3.3 Planned & preventive maintenance procedures

Currently the planned maintenance procedures are extremely limited available. For that reason, this subsection is based on some general responsibilities found in Yeast's documentation.

When staff members of YCH identify problems, they are able to use the reactive procedure by making an enquiry. In case of major repairs Yeast is allowed to vacate tenants for a period not exceeding two weeks, or in case of a longer period they have to supply other, but similar, accommodation. Yeast, being the landlord, is responsible for a good order of repair by maintaining the common property, the outside of the building, electrical, plumbing, sanitary, heating, ventilation, garbage, and elevator systems as well as any damage caused by fair wear and tear. Of course, the landlord is responsible to the agreements out of the tenant's contract and therefore has to repair defects, identified by inspection or receipt, within fourteen days or a reasonable other period agreed between the landlord and tenant.

Two other aspects related to the longer term maintenance are superficially set in the YCH Business plan 2001-2011 (2001):

- Because of the paragraph in section 4.2 "Yeast recognizes that (...) in our properties" each development appraisal provides for an annual maintenance allowance for each unit.
- New projects will be provided with a planned maintenance program to remain the value of the project.

4.3.4 Supporting software programs

At each of the workplaces at Yeast the Microsoft Office package is installed to satisfy all the basic software needs. In addition to this, the programs *Novtel Property Management & Pastel* are installed. To Novtel Property Management additional modules like Activate Access Control and Activate Recurring Maintenance exist which especially orientate to the maintenance processes. These software modules include functions for general property management with all the important basic information about buildings, e.g. location and a building description or also more specific information like charges for electricity, plumbing, or damages. In addition, the (contact) information of suppliers, tenants, and occupiers can be systematically organized, as well as the waiting list for units.

Besides, the package contains a property maintenance facility, which consists of a recording and a maintenance repairing part (Novtel, 2005). The first part consists of basic information of the record, like

item, place, date, contact, and priority level. Work orders, supplier information, maintenance reports, statistics, and the possibility to update the financial system are the fundamental functions of the second part. The Novtel package for handling leases/rentals is strongly linked with a third accounting system, which is 'Pastel' in case of YCH. Pastel is currently available to handle the financial administration of all processes.

In fact, Novtel forms the clustering of the currently separate Word and Excel documents at Yeast. The purpose was to implement and use Novtel since April 2007, where to start with the financial part before the maintenance module. Long term maintenance planning and specific needs are not directly satisfied by the package and the possibilities should be well considered.

4.4 Maintenance related tasks

The documents about maintenance policies contain an elaboration of the tasks that has to be fulfilled. The official job descriptions and the contractors' agreements are used as the main resource for this section. The two subsections are used to deal with the intern and extern stakeholders separately.

4.4.1 Staff

The task of each staff member is formulated by a job description or, if a description is lacking, the job description guidelines of the 'Social Housing Foundation' (SHF, 2007). The job description of all the employees and their functions are stated below. This provides insight in the daily activities within Yeast and the allocation of tasks.

The **Board of Directors** consist of: *Prof Tp Masihleho, Mrs P Vilakazi, Dr S de Beer, Mrs ZN Mhlongo, Mr S Slade, Bishop G Taylor, Mr R Jardine, Dr P Zawada, Mr JP de Swardt, and Miss L van Heerden.*

The Board of Directors has the ultimate responsibility for the government of Yeast City Housing. The board oversees and guides the Yeast's management and its business. The board approves e.g. the business strategy and annual budgets, but also supplies a business plan for a period of ten years. The policies and plans in this business plan will contribute to the set objectives. Another function of the board is to advise the managing director and the executive management on key financial and business objectives, and to delegate authority to management. Important to all these issues is to monitor and evaluate the implementation of policies, strategies and business plans.

The **General Manager (GM)**, *Stéphan de Beer (previous: Stuart Talbot)*, is appointed by the Board of Directors and has to justify to them. The main task is to perform leadership to the organization and give direction in planning, development, and monitoring of the company's assets. The General Manager should allocate resources, manage and evaluate risk, and draw the board's attention when required. In association with the board a strategic direction on maintenance is developed by the GM. Finally, ensuring an adequate and good relationship with thirds parties belongs also to the function of a GM.

The **Building Manager's**, *Ezekiel Ntakirutimana*, function is to oversee the management of all Yeast's buildings. The building manager is responsible for maintaining the property, and should thereby identify and repair any defect. Developing, budgeting, and implementing (preventive) maintenance procedures have to be done by the Building Manager. Where the building manager is responsible for all the

maintenance aspects mentioned in the first chapter, and for monitoring all the maintenance performance. In operating, the Building Manager will make recommendations if required and report any irregularities to the General Manager.

The **Admin Officer**, *Zanele Mofokeng*, task is to ensure effective functioning of daily office tasks and activities. Her task is to keep information and documentation easy accessible and up-to-date, wherefor a database is made. An Admin Officer manages complaints registers and monitors the response time. Thereby a monthly report off all maintenance has to be set up.

The **Financial Manager**, *Boitumelo Bosoga (previous: Lindi Mncwango)*, has to deal with all different aspects of bookkeeping. She has to arrange the accounts payable and debtors within the financial administration. A part of the Financial Manager's activities is to monitor and control the petty cash for maintenance expenditures and budgets. Beside this, a good filing system has to be established and maintain required records, reports, and files on an organized manner.

The **Maintenance Engineer**, *William Lebipi*, has no official contract so far. A verbal contract exists for already several years. The main task of the maintenance engineer is to carry out all the reactive maintenance for YCH. Maintenance will be performed according to the South African Bureau of Standards (SABS). A Maintenance Engineer will purchase the required parts and will manage the available stock. The maintenance is performed according a fixed schedule of two buildings a day. The Maintenance Engineer can decide to outsource certain maintenance tasks.

The execution of **Gardening & Cleaning** have a more indirect effect on maintenance. Up keeping the buildings and surroundings is of importance, but will not be described in this assignment.

4.4.2 External relations

Yeast receives assistance from several organizations and often makes an appeal on external institutions. The purpose of the external support is described, so the intentions of employment will become clear.

Trafalgar assists in Property Management and is "*focused on enhancing the return on Yeast City Housing' property assets and adding value to their lifestyles with effective property management*" (Travalgar, 2007). Trafalgar will support Yeast with providing procedures and processes to deal with maintenance.

Jacus Pienaar is a Quantity Surveyor and, beside this, a professor of the Department of Construction Economics at the University of Pretoria. Mr. Pienaar and his colleague HOFFIE Cruywagen are providing a recommendation for the longer-term maintenance. By creating a condition assessment and a maintenance assessment there is a more grounded and theoretical base for making the longer-term decisions.

Parteon is one of the companies that stand surety for the loan of Dutch International Guarantees for Housing (DIGH) and is also more directly involved in the operations at Yeast. On May 2006 Parteon and Yeast signed a Memorandum of Understanding (MoU) under surveillance by the DIGH (Parteon, 2006).

This MoU refers to the MoU between the government of the Republic of South Africa and the Dutch Ministry of Housing, Spatial Planning and the Environment.

The Dutch International Guarantees for Housing (DIGH) supports Yeast by arranging loans on a cheaper rate on the basis of guarantees Dutch organizations provide. The current interest rates applied to Yeast are on average about 12%. In comparison, the interest rate DIGH arranged at the '*Bank Nederlandse Gemeenten*' is about 5%. *Wooncompagnie* and *Woonwaard* recently joined the alignment with Parteon and Yeast. Everything is still in an early stage, but at the moment a consultation takes place to determine the possibilities of supporting Yeast.

Johannesburg Housing Company is a partner organization, which supports in practical issues as housing rules, security contracts, and share experiences. A partner in Cape Town provides knowledge about pricing of maintenance, rent, property valuation and outsourcing.

The Social Housing Foundation (SHF) provides several strategic services and the Social Housing Focus Trust (SHIFT) is supporting the planning and delivery of social housing.

In this chapter the answer to the second research question is provided. With this chapter the maintenance policy is described consistently with the available documentation. The implementation of this maintenance policy is the subject of the next chapter.

5 The current maintenance policy execution

The same aspects from the previous chapter will be described for the implementation of the maintenance policy. So, in this chapter will be dealt with the third sub question.

The chapter structure is similar to previous one. In the first section an outline about the operating procedure and the building state is given, where in the second section the vision of Yeast's staff about the maintenance is provided. Subsequently, the processes and systems that are supporting the current maintenance execution are stated. The tasks execution of staff and the actual support of external relations are described in the fourth section.

5.1 The Organization structure & the housing stock

Considering the daily functioning of the organization and the internal relations, the in 4.1 discussed organization chart is easily recognized. Usually the four top officers, the board excluded, are present in the office while the other staff members are working in and around the buildings. The relations between the staff members are best classified as informal, although the relation with the Board of Directors is far more formal and pragmatic. The informality is caused by the small size of Yeast and by cultural influences. The differences in power and responsibilities are well accepted in both the higher and lower level of the organization. This causes an informal atmosphere with quite strict differences between employees. In relation to the board, the respect to authority from the lower hierarchic levels turns towards submission.

The general impression after a first visit of the buildings can't be easily classified because of the differences in their function, age, and condition. At the first glance, the newer buildings give far better impressions than the older ones and the same is true for institutional compared to transinstitutional housing. Later on, after deeper inspection of the buildings and the maintenance file, it becomes clear that the older and transinstitutional buildings suffer because of the lack of planned and larger scale maintenance. The newer institutional buildings do have a lot of smaller defaults because of e.g. construction savings. Next to this distinction the building's function has its influence, for example the nursery school and the aids hospice have a better state of maintenance. Sediba, Hofmeyr, and Kopanong are examples where the housing function is carried out efficiently for a large number of similar units. Whether Yeast is the owner or not, Yeast executes the maintenance in each of the mentioned buildings.

5.2 Vision according to maintenance

Finding out the vision of the employees individually will give a perception of the prevailing common vision. This section finds out if there is a shared goal within the organization and if it strokes with the official vision described in the previous chapter. A goal-setting model of Locke and Latham (1990) predicts an increase in performance and motivation of the staff when there are clear goals. Also the collectivity of the vision enables a company to perform in a more effective and efficient way. (Hays & Hill, 2000)

The vision of each staff member within Yeast is obtained by a staff questionnaire (annex 9) which is set up during the internship. The results give an idea of the current individual visions.

The **Building Manager**, *Ezekiel*, thinks a company should have a healthy financial situation, for which rent collection has to be guaranteed. To collect rent a reliable and clear understanding with the tenants have to be established. Therefore his goal is to keep tenants and colleagues satisfied. This can be done by putting his goodwill in the job and delivering good service on aspects as maintenance and cleaning. According to Ezekiel, all of this will lead to a good reputation of Yeast.

The **Maintenance Engineer**, *William*, tries to perform maintenance in a good and properly way. This is satisfying himself and will lead on the other hand to a satisfied tenants. By performing maintenance he wishes to practice his skills and knowledge. Ultimately the main vision is to guarantee the safety in the buildings.

The **Admin Officer**, *Zanele*, is satisfying people by properly helping them and be present at the service desk. Satisfying people and being part of the Support Program for Social Housing develops Zanele personally. Beside informing staff en tenants on maintenance issues she is also creating an orderly course of processes.

The **Financial Manager**, *Boitumelo*, has a more solo and restricted vision concerning her execution. She indicates to work just in the way people told her to do and not aim for own or business purposes.

The overall vision that ensues from the individual visions is the willingness to be as helpful to the tenants as possible. Serving the tenants in a proper and honest way is one of the common visions shared within the organization according to the interviews.

5.3 Policy supporting approaches and systems

Processes and systems should assist the organization in implementing the policies and are analyzed in this section. Again, in the first sub subsection is started with the general processes and systems, before in the second and third section is continued with the planned and unplanned types of maintenance. Finally the IT is highlighted in the fourth section.

5.3.1 General processes and systems

In practice the response times to complaints as also the general rules to phone calls, visitors and other contacts match with the existing policies. Politely and adequately are noticed as important values and are well applied within Yeast. The classification of time limits for repairs are not easy recognizable in practice, in fact most repairs do have equal time-spans. Figure 1 presents the remedial action time for the different urgencies. The urgency is spilt up in emergency repairs, urgent repairs, and non-urgent repairs. The deadline of the repairs shown in figure 1 will be 24 hours (Priority 1), seven working days (Priority 2), and thirty days (Priority 3). When consulting Yeast's 'Maintenance report', there is a great discrepancy between the actual duration to perform maintenance and the priority deadlines above. People with emergency repairs were waiting for over 20 days instead of the 24 hours that is admissible. Considering the outstanding maintenance, the average remedial action time is 89 days.

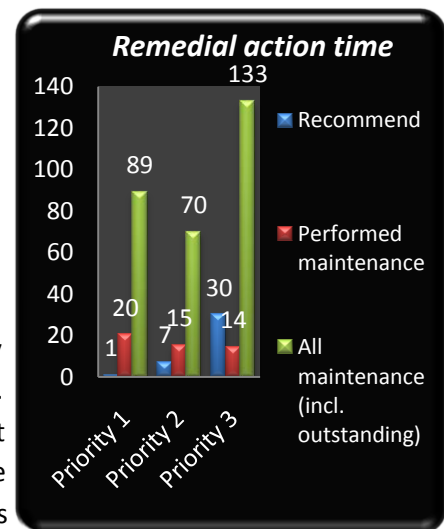


Figure 1: Time span

To fill in the request form most tenants phone or visit the office. As far as known no proper condition survey was ever performed. With the property condition report of J. Pienaar and H. Cruywagen, in which we assisted, a first step is made. (Yeast City Housing, 2007)

Outsourcing is merely used by Yeast in case of a capacity or a workmanship problem. As will be discussed later, some problems of control exist with outsourcing whereby tenant's satisfaction is not especially included. In general, tenants are taking good care of their unit, don't make structural alterations, and report complaints quite soon. Together with this, some examples can be mentioned of units in bad condition after a tenant moved out. In the first situation almost no problems arise, while in case of damages deposit money or seizure is used to handle the situation. An empty unit is normally quickly inspected and smaller defects are solved to let a new tenant move in. Finally, a tenant not paying

rent because of imperfect maintenance is exceptional, often this happens in case of wrong accounts or lack of funding.

Meetings about maintenance within Yeast are organized twice a month, where the planning of outstanding complaints and new developments are discussed. Meetings with the board, once in a couple of months, include more complex maintenance problems and developments.

5.3.2 The reactive maintenance procedure

When a tenant or staff-member reports a defect to the office, the maintenance form (out of annex 4) is filled in. All the forms are placed in one file, which has to be sorted out every morning by the Maintenance Engineer to find the maintenance he will possibly carry out that day. After performing the maintenance it has to be signed as accomplished. The file is placed on reference number and therefore contains accomplished and vacant maintenance confusedly. Also it's not sorted out per building and in the mean time the Admin Officer is manually transferring the data into the corresponding Excel file. The old Excel file faced some fundamental problems with prioritizing jobs and saving historical data. The most important objective of the digital file is to see easily which maintenance is not carried out and for how long it's in the system. The use of both systems can be explained because of the paper form is preferred by the Maintenance Engineer, while the digital form is preferred by the administration officer.

The already mentioned emergency maintenance is just executed as fast as reasonably possible. Besides that, no system or regular process is supporting this type of maintenance.

5.3.3 Planned & preventive maintenance procedures

The preventive and predictive maintenance procedures are in execution the same as reactive maintenance procedures, as there is currently no procedure strictly for preventive and predictive maintenance. The decisions and actions in these processes are mainly made on intuition and experience. Preventive and predictive maintenance are mostly dealing with negligence within the organization's determinations. When Yeast is replacing parts, a quality and durable replacement is utilized. This way of 'preventive maintenance' results in some durability.

To change this more ad-hoc based policy some processes within Yeast can be recognized. Yeast is working with several consultants, surveyors, institutions, and colleague associations to improve their maintenance planning. As described in external relations (4.4.2 and 5.4.2) Yeast is working with Trafalgar to get general information based on maintenance policies. The Social Housing Foundation (SHF) is working on information and documentation that will support the social housing institutes on even broader facets and aspects. By attending the management courses of SHF, Yeast improves their knowledge, skills and their ability to adjust. Property maintenance courses provided by the 'Support Program for Social Housing' (SPSH) give a theoretical background to plan and manage stock maintenance.

Quantity surveyors are implementing a building assessment on Yeast's property. Herewith a longer-term planning will be established, see the condition assessment of Jacus Pienaar (Yeast City Housing, 2007).

The working plan between Yeast and Parteon stated a capacity building support, where among other things a stock acquisition and development policy is formed. Both organizations agreed as well to cooperate in setting up a long term maintenance policy. At present, the two other Dutch housing associations, Wooncompagnie & Woonwaard as described in 4.4.2, are negotiating to join the collaboration.

5.3.4 Supporting software programs

At the moment of arrival the Microsoft Office programs Excel and Word are the most frequently used in the maintenance administration. Maintenance reports as far as existing, letters intern, to tenants and to third parties are all done with these standard programs. The new bought Novtel package is started to be implemented during our stay. People got some training and the software is installed. Although the discussed functions of the package in 3.3.4 are very interesting and could really improve Yeast's current situation, Novtel is currently not completely implemented. The software is installed but no one is using it for the data are not imported in the system and nobody has a full understanding or takes responsibility for it. In conclusion, Novtel is bought and installed but the complete implementation and use of it keep on waiting. Pastel is the financial program which is already in use for some years and linked with Novtel. Currently the main use of Pastel is to generate all the invoices and to control the accounts. Out of the report's perspective the maintenance invoices are the most relevant, although these are not systematically nor in detail administrated. Contrary to Novtel, Pastel is implemented and used by Yeast's employees to control the financial situation.

5.4 Maintenance related tasks execution

In this section the performance of all staff members and external relations are outlined. So, the daily operating of members within and outside the organization are stated below.

5.4.1 Staff

The **Board of Directors** is not directly involved with the activities of Yeast City Housing. The involvement with daily operations is slight and communication is performed in a formal way. The board has supported Yeast in 2001 by providing a 10 year business plan, but soon after the release the feasibility of the plan became doubtful and unrealistic (Yeast City Housing, 2001). The guidelines of the progressive business plan are impracticable, so the plan is currently not in use.

At present the **General Manager** function is fulfilled differently, a former general manger is temporary fulfilling the position on a part-time basis. Currently Yeast is dealing with the issues like new housing projects, the maintenance catch up, implementing new support programs, and internal staff replacements. These issues are requiring leadership and perseverance to achieve the set goals. Beside, providing leadership and assistance to the staff are completely taken by the Building Manager. Monitoring the maintenance performance had a limited priority during the last years.

The **Building Manager** is strongly involved in the maintenance process and its execution, which is part of his responsibilities. Herewith the daily tasks are e.g. ordering parts, starting maintenance budgeting, contracting out bigger projects, and managing the maintenance and cleaning. Less strictly related with maintenance are the communication with lawyers and third parties, staff supervision, and the rental

collection. The high workload results in unfinished tasks and not catching deadlines. Setting up maintenance procedures and policies appear to be one of the critical parts of the Building Manager, because at the moment these are incomplete or missing.

The **Admin Officer** mainly works, as first focal point, on the assisting activities like administrative tasks for other staff members, consulting electricity, sending rent payment letters and contacting people. Related to the maintenance process are the receipt and management of maintenance complaints, the preparation, and elaboration of meetings. A meeting about day-to-day maintenance is organized twice a month with the entire management of Yeast.

The **Financial Manager** administers the total financial spending on maintenance materials, labor and contracts. The documentation of this relevant information occur on an inaccurate manner. The information is not detailed and there exists no control function. The other main task is the reconciliation of the bank statements.

The **Maintenance Engineer** executes the smaller and mainly reactive maintenance and decides in cooperation with the Building Manager the urgency and priority of the jobs. Of the reported complaints he selects a list per building. Each day two buildings are visited. Other tasks he normally is doing are handling other complaints or requests (not reported), execute small adjustments to buildings, involve in turnovers, and maintenance meetings. The Maintenance Engineer is authorized to execute the maintenance, while the overall maintenance responsibility is still the Building Manager's.

5.4.2 External relations

Trafalgar has provided Yeast with general information. After Trafalgar left, the documents did not serve the purpose and needed adjustments for Yeast's operating. This information is not utilized through lack of implementation. Trafalgar didn't support Yeast with the process of developing policies and procedures. The information was too general and not tapered to the needs of Yeast.

Jacus Pienaar has set-up a detailed sheet to perform condition assessment on the property. Theoretically this sheet was properly drawn up with a high level of detail. But during the execution of the condition assessment filling-in this document wasn't practicable. Finally, time presses and the condition assessment is roughly performed by a colleague of Jacus. The report on longer-term maintenance is not finished completely, in spite of several expired deadlines, so the practicability of the content is not known.

The Dutch International Guarantees for Housing (DIGH) is providing Yeast with a lower loan rates, so Yeast is able to pay off their loans with a higher rate. The collaboration between DIGH and Yeast can be more indicated as collegiate and cooperative.

Parteon, Wooncompagnie and Woonwaard are the prospective partners of Yeast. Currently the situation is uncertain and the organisations are engaged in negotiations. Probably the organisations will provide practical information and plans to develop and improve the organisational processes. Right now it is not clear if there will be financial support.

Johannesburg Housing Company and the Social Housing Foundation are passing on information according experiences and habits of social housing in South Africa. Herewith Yeast is able to see how other housing associations are handling this housing business. Sharing experiences and difficulties with colleague associations is an effective way of gathering information, especially in South Africa where social housing is still in a development phase.

After this chapter it's clear how the maintenance process is executed. In this chapter an answer is given to the third research question by a description of current implemented maintenance policy. It has been shown that on first sight the actual implementation differs from the documented policy described in the previous chapter. In the next chapter the main discrepancies between the documented and implemented maintenance policy will be analysed, where also the main bottlenecks are brought to light.

6 The main current bottlenecks in the maintenance policy and its implementation

The maintenance process is implemented in a different way than the documented policy. By defining the main current bottlenecks the fourth sub question will be answered in this chapter. The contradictions that result from the fourth and fifth chapter are classified in three main organizational levels: strategic (section 1), tactical (section 2), and operational (section 3). The purpose of this classification is to find out where the problems occur and what kind of solution they require. The bottlenecks are mainly not free-standing and are noticeable on the effectiveness and efficiency of the entire organization.

6.1 Current bottlenecks at the strategic level

Strategic management comes down to formulating, implementing, and evaluating cross-functional decisions that will support Yeast in achieving their objectives. This implies a process of specifying the objectives, developing supporting policies and plans, and allocating the organization's resources. Decisions on this level are mainly formulated by the Board of Directors, performed by the General Manager, and executed by a team or staff-member. The main bottlenecks are split to the strategy (subsection 1), the vision within the organisation (subsection two) and the property condition (subsection 3).

6.1.1 Strategy

The bottlenecks at the strategic level are mainly based on the cooperation between the different organizational levels. The top management's objectives are stated in the 10 year Business plan of 2001, where a substantially progress is envisioned (Yeast City Housing, 2001). The business plan supposes to give an understanding and feasibility of the formulated plans and objectives. Nonetheless, soon the feasibility of the plan was doubtful and unrealistic, because it had a too positive perception. The growth strategy determined Yeast to double its capacity for several times in a ten year period. Consequently, a gap can be noticed between the vision of the board and the perceptions of the staff. In fact, the decisions and strategy of the board have to be implemented and monitored. Subsequently, the effect has to be evaluated so a clear feed-back can be formulated which will help to refine the strategy.

As concluded above the Business Plan was not feasible and applicable, through which the formulated plan is not even applied in practice. The absence of implementation and lack of feedback are both causal related with each other. This vicious circle makes it even harder to set up appropriate procedures, plans, and policies. Additionally, a full-time General Manager is missing to implement and guide the policies, taken into account that in South Africa the more passive attitude of staff and tenants require considerable supervision.

In formulating a strategic policy, the social issues affecting Yeast should be considered. Even other aspects as low turnover, lax behaviour of tenants, and low priority of housing by tenants has to be taken into account.

6.1.2 Vision

When a vision is not shared among the organization it will affect its operating. Yeast's staff indicates a common vision to satisfy the tenants, but aiming at maintenance and it's execution a shared vision is missing. New staff appointed by the Board even didn't share a clear vision and objective that would be considered as obligatorily. This will have a negative effect on the efficiency, better is to create a vision through interaction with the individuals in the organization, a so called Learning Organization. This signifies a shared vision everybody agree on. (Easterby-Smith et al, 1994) The current vision isn't based on such an interaction. Last but not least, maintenance within Yeast is envisaged as an additive side issue, instead of considering maintenance as an investment.

6.1.3 Property condition

As a continuation of the short-term thinking, the former General Manager stated that the time orientation in planning and strategizing should be extended to 7-10 years. With this, the effectiveness will rise and future building conditions will improve. Speaking about the absence of a planned maintenance program combined with a financial model, a longer-term strategic shortcoming is apparent. Although, Yeast indicates in its business report to recognize the importance of the property portfolio as an asset that forms a base on future borrowing. For this reason the business plan state as well to undertake maintenance quickly and efficiently (Yeast City Housing, 2001).

The vision of increasing the housing stock, as mentioned in section 6.1.1, is only possible when the current situation is sustainable and prepared to grow. New projects will give Yeast more supporting power and decisiveness, providing that first the condition of the property is satisfying. Currently, old buildings are falling into decay, and big renovations are required. Therefore a proper balance on budgeting new projects and current assets should be established. A relevant remark is to consider problems with former new housing projects, like Kopanong. As a consequence of general savings, this reasonable new building is requiring a high amount of maintenance. Temporarily it seems to be a reasonable saving, but now-a-days it has significant disadvantages. The lack of funding in the design phase of a building could be avoided by a proper maintenance plan.

6.2 Current maintenance bottlenecks at the tactical level

At the tactical level should be thought of the procedures which support the strategy and guide the operational activities. These procedures are set by departments or within organization's functions, like

the maintenance function. In the maintenance policy discussed so far, some general procedures are missing or these are incomplete for operation, resulting in faulty execution or no activities at all. Next to this problem (subsection one), challenges exist towards procedures concerning finance, capacity, planning and external relations (subsection two to five).

6.2.1 General maintenance

When considering the procedures for the daily and fundamental maintenance procedures several points of attentions are discovered, which will be classified in two groups. First, standardized procedures to handle similar situations equally are incomplete. For example, the Admin Officer mentioned to miss a number of fixed suppliers. Each time parts or materials are needed a separate order will be placed in just a nearby shop. Because of the variety in suppliers and the small order size, minor mutual understanding exists. Another aspect is the missing authority of the Maintenance Engineer to receive and spend money when parts are needed. As a consequence, a slow consultation takes place each time parts are required. Also not standardized, for example per building and category, is the maintenance administration. Data about former maintenance on assets are hardly retraceable or not available. Another aspect causing inefficiency is the double recording of the maintenance complaints, on hard copy and digitally. The last activity which is not coordinated equally concerns the outsourcing agreements. For each outsourced job a different selecting method is practiced, agreements change randomly and monitoring is often missing.

Secondly, the group of missing procedures at the tactical level bring some problems around. The current storage of just some parts is resulting in so much loss of time that an inventory management procedure is proven to be necessary. A good storage of frequently used spare parts and materials can simplify the execution of repairs and prevent temporarily solutions. A second procedure which should be improved is the transport to the buildings in order to execute the maintenance. Distances are too great and equipment is too heavy to walk to all the buildings. As a result, time is lost and regularly the required tools or materials are not brought along. This transport problem and the authority for the Maintenance Engineer to spend money have been internally discussed several times, but still need to be solved properly by a suitable procedure. Also important is the absence of a maintenance and financial program. Both are stated in the policies because of their relevance to continuity of the organization, but both of them are still in the orientation phase. Finally, two missing procedures at the tactical level are a time-span control to monitor response time to complaints and the control on outsourced jobs by a tenant satisfaction form.

6.2.2 Financial

When the financial function is observed a number of aspects appear, e.g. most procedures are not formulated. Regrettably, a financial program isn't implemented for maintenance and therefore no budgets are available. Also a maximum allowance to the annual maintenance spending per unit should normally be part of such a program. Additionally, the financial maintenance administration in total or preferable per building is not registered. In combination with a new and not that experienced financial employee, the financial situation is far from supporting the maintenance execution. Striking to the new Financial Manager are the only small reparations she came across in the accounts, which were even not

properly administrated. The current way accounts are handled includes not enough detail and actuality. Moreover she has no control over (maintenance) spending, because budgets don't exist for maintenance. This situation and the problem of the Maintenance Engineer to spend money on maintenance parts, see 6.2.1, is clearly slowing down the process of improving the maintenance function.

6.2.3 Capacity

The capacity restriction is in some way describable as a vicious circle. Because the limited resources restrict the possibilities to extend the organization by increasing the housing stock, while at the same time Yeast's small scale is not forcing to improve the use of resources. An important maintenance capacity problem, also stated by the formal General Manager, is just to have one technical officer for different kind of defects in the eight buildings. The Admin Officer stated the need to have more Maintenance Engineers as well, preferable split by specialty, e.g. plumbing, electricity, painting. Beside, capacity problems are identifiable with the Building Manager and the Admin Officer. Especially without a full-time General Manager it's hard for them to accomplish their own plus substitute tasks. In case of the Building Manager this results in long workdays and a relapse into partly chaotic working on only the daily tasks.

6.2.4 Planning

Although there is a strong relation with the other sections, planning problems are discussed separately because of their relevance towards the maintenance process. For example, the shortage of time as discussed in '6.2.3 Capacity', is one of the Building Manager's reasons to be unable to implement a longer term maintenance planning and to develop new housing projects. Consequently, the process to longer term maintenance planning, together with a good finance program, has just started. This is also argued by the Maintenance Engineer and he stated the importance to first solve fundamental defects before continuing longer term planning. All in all, the building states should improve when these will be maintained more properly. Besides these planned maintenance procedures some planning should also be added to the reactive maintenance process. The administration officer is receiving quite a lot complaints because of defects which were not repaired on time. Currently two causal problems for the delay of repair occur: times-span control is not used optimal and the tenant is not involved in planning the repair. As stated in chapter five a distinction between normal repair and urgency is practiced, where actually the four scale time classification should be used. Not planning a repair with tenants actually results in a high number of visits before meeting someone at home. It can be concluded that the problems with building conditions are related to planning problems in the planned and reactive maintenance procedures.

6.2.5 External relations

Some remarks can be made towards the way Yeast is doing business with its main external relations as mentioned in the former two chapters. To all of them, Yeast formulates and communicates not precisely what they expect from the other party. The problem with this is that the external relation is not utilized to an optimum. Let's consider the Trafalgar consultancy service, the net result is just some publicly available paperwork without any customization. The quantity surveyor Jacus is also appointed without engagement, who consequently started with a detailed inspection without clear objectives. Out of

practical reasons it finally ended, far after several deadlines, with a report that is not detailed or convincing. Thirdly, clear expectations should be communicated to tenants in order to involve them in the maintenance process. As the Maintenance Engineer correctly argued, training and newsletters should improve tenants involvement and moreover prevent smaller complaints by a better cooperation. The current relation with externals is costing Yeast lots of efforts to problems which can be far easier solved in good cooperation. A last important example is the cooperation with Dutch associations which are willing to support new developments, like new housing projects. Here again, explanations about the current situation and expectations towards the support are not properly communicated. Some statements to outsiders are sometimes even misleading, when e.g. is stated a new bookkeeper is attracted to improve the management without any word about the accompanied problems in practice, as argued in '6.2.2 Finance'. In conclusion, current external relations should better support Yeast's interests.

6.3 Current maintenance bottlenecks at the operational level

At the operational level the problems related to the daily tasks and the individual employees are considered. The experienced problems are often the direct or indirect result of a tactical or strategic bottleneck. Nevertheless, to contribute to a complete understanding of Yeast's current situation, all of the main bottlenecks at the operational level are discussed below.

The problem of short term strategizing and planning is also experienced at the lowest level of the organization. In practice day-to-day activities are mostly relevant, so service delivering and Yeast's future state seem to make their exit, as these are stated by the "Housing management Service charter" (Yeast City Housing, 1999) and the business plan (Yeast City Housing, 2001). This has also to do with uncertainty of employees about their responsibilities, because of the minimally customized job descriptions in the contracts of employment (or the contract is even not available in case of the Maintenance Engineer). In fact, employee's activities are not sufficiently linked with the set policy of growth and improvement, but somehow single standing or not specifically described.

The same situation holds for the activities of external relations, which are not clearly linked with a set policy or objective. As a consequence efforts are not fine-tuned to the organizational interests. A causal related problem of afore is the absence of a fulltime General Manager, who is in the position to lead employees and other involved people along a set strategy. In the end the personal vision of employees is covered up by all the daily tasks, wherefore it's hard to aim for their personal goals.

With the missing links between activities and objectives the overview of everyone's duties also fades away. As a result an extra call for communication arises, while this competence is already one of the bottlenecks. The Building Manager and the Maintenance Engineer both stated some difficulties with the current communication. Firstly, the maintenance manager has to rectify jobs when tasks and expectations are not properly communicated to intern staff or tenants. Next to this, the Maintenance Engineer pointed to better communication, because outsourced jobs are regularly not communicated to him or reported, have a high price and are rarely of the desired quality. In this way money is wasted and misunderstandings arise, especially when jobs and plans of the management are not conferred at the

operational level. Finally, the Admin Officer gets frustrated when she cannot properly explain daily duties or give any guarantees to tenants.

A third and last bottleneck group is about capacity or efficiently in the maintenance execution. Argued by the former General Manager as well, simply more defects should be solved at the same time. In other words, processes should be optimized to maximize the utilization of time. For each of them who are most directly linked with the maintenance operations, some reasons of inefficiencies exists. The Admin Officer is experiencing difficulties to accomplish her (maintenance) tasks, because of her extra tasks after the leave of the former General Manager. With outsourcing maintenance she has efficiency problems because of long respond times by the external companies. Except of these no remarkable other reasons came to light, yet with the Service Engineer more efficiency improvements can be considered. First of all, the visit of two buildings a day results in a high setup and transport time. As mentioned at the tactical level, the absent of a storage and restricted rules for procurement of parts are generating inefficiencies. Also planning of repair with tenants could bring time savings, as is stated as well at the tactical level in 6.2. The Building Manager is trying to improve the effectiveness and efficiency of Yeast's process, but unaccomplished daily jobs, a high workload, time restrictions, and stress hinder this process. In combination with a lot and therefore hard to plan reactive maintenance, while the middle and longer term planning doesn't exist, the Building Manager fairs dissatisfaction in the longer term. Another point of attention is the use of the emergency priority (section 5.3.2), which should not be too much orientated towards the tenant's perspective but should follow Yeast's own guidelines and approaches as well. Financially, budget planning and execution are not in line because budgets are easily exceeded while problems are solved only half.

At this place also some non-business, maybe cultural, attitudes can be mentioned. For example, postponing or suppressing problems too long and a passive attitude for which people need a motivator (vision, leader or reward) are strongly influencing the efficiency at Yeast.

Let's end this section with a summarizing statement:

"At the operational level Yeast is missing concrete plans which tune activities, guide internal communication and bring efficiency to the maintenance execution."

In this chapter the discrepancies with regards to Yeast's documented and implemented maintenance policy have been brought to light. With that an answer to the fourth research question is given by an analysis of the main bottlenecks at each organizational level. In the next chapter these bottlenecks will be further analyzed and possible solutions will be presented.

7 Existing solution(s) to the main current bottlenecks

In this chapter the recommendations and solutions to the improvement of the efficiency and the effectiveness of Yeast's maintenance policy will be presented. First, the bottlenecks from chapter six are formulated into a problem cluster after which the core problems are prioritized. According to the priority list, available solutions to these main current bottlenecks are formulated in section two. These solutions are compliant to a number of restrictions that are given in the last section.

7.1 Priority list of the main current bottlenecks

At this place is dealt with the prioritization of the found problems in the latter chapter. Hereby the Managerial Problem-Solving Method is used, as it is mentioned in the methodology chapter.

When considering the cluster in annex 3 some extra points of attention consist. Firstly, the problem cluster includes aspects out of the entire organization, although it's made out of a maintenance perspective. The reason for this choice is related with the size of Yeast and its coherence between the organizational functions. All-over, just minor decisions within the organization can have significant impact on its total.

Within the framework of this report, only problems directly related to the maintenance process have been further analyzed. After this, the most relevant candidates are selected to be a core problem. Subsequently the problems are prioritized.

The first of the core problems which is selected due to its causal link to the maintenance process is 'financial maintenance program still to develop'. With this lack an essential support to the maintenance process is missing and the maintenance effectiveness is affected. According to the scheme it causes the unavailable maintenance administration by missing set targets which form a point of departure. It influences as well the financial situation and the therewith future expansion possibilities. Ultimately the two consequences do form enough ground to include the missing financial maintenance program as core problem.

Secondly, added to the core problems is the 'limited stock management' because it is a fundamental, and easy to compliant cause of the inefficient working in Yeast's maintenance function. In addition to this, it causes the existence of various suppliers and small purchasing quantities which are time consuming. In this way, no benefits from standard processes, mutual understanding, or quantity discounts exist.

Thirdly, defined to be a core problem is the more including 'Missing procedures'. This problem actually consists of four core problems, namely:

1. Not optimal managing and monitoring outsourced jobs
2. No preventive/long-term maintenance
3. No control on time span
4. No planning of repair

Many different consequences of these missing procedures on the maintenance functioning have been stumbled across in each of the organization levels, as described in chapter six. To avoid repetition of the former chapter only the main consequences out the problem cluster will be mentioned such as the still to be developed maintenance procedure, a lot of outstanding maintenance work, missing of a common vision, and a high workload for the Building Manager. With a long term plan and a controlled plan of repair the outstanding maintenance decreases, and so the building conditions shall improve. When becoming in such improved circumstances the Building Manager's workload decreases and time results to be used for arranged the smaller maintenance procedures. In this way the improvement starts with increasing the maintenance effectiveness by setting the strategy and ends with improving efficiency by standard procedures. Two last results that originates with solving 'the missing policies'-problem are certainty about business process and a more easily shared vision. In turn, this will improve Yeast's operating by simplifying the communication and promises.

Lastly, the seventh core problem is defined as 'Labour capacity.' With this problem and the insufficient funding a typical situation exist. In the problem cluster a circle is represented between 'insufficient funding'-'few new projects'-'insufficient housing stock', as well as a circle exist between these three extended with the 'labour capacity problem'. Because of few new projects (in combination with high demand and low turnover) an insufficient housing stock exist which leads to a low level of income. The insufficient funding causes restrictions to the possibility of investment in new projects as well as to labor capacity (the second circle) which is also a cause of few new projects. These are not vicious circles but just reflect a situation with related problems which already can be improved by solving one of the circle's elements. An important realization is that the labor problem depends on matters like efficiency, external relations, funding, and is in this way strictly related with the other six core problems. Supposing it remains a problem independent of the other solutions, it will more or less affect the effectiveness of the maintenance function.

The last core problem to consider is the 'Missing of permanent full-time General Manger' and its consequences 'Lack of Leadership' and 'No close relationship with the Board of Management' are seen as major restrictions in solving the key problem. To a practical development and a good implementation, cooperation between the Board and the General Manager as well as a good leadership of the General Manager to the staff members are, obviously, extremely important. Restrictions like these will be discussed in more detail in 7.3.

Now the core problems have been analyzed, the priorities have to be attached to each of them. In order to prioritize, the two aspects out of the main problem are applied: effectiveness and efficiency. Because effectiveness is of most importance in the long run a weight of 1.5 is allocated to this criteria, where to efficiency a not negligible weight of 1 is allocated. Effects are analyzed separately with the assumption none of the circumstances are changed by e.g. a solution to one of the other core problems. Finally, effects to both effectiveness and efficiency are in perspective of the main maintenance objective: improving the condition of the buildings.

Core Problem	A: Effect on effectiveness	B: Effect on Efficiency	Total (1.5A + 1B)	Priority
'Financial maintenance program still to develop'	+	-	3	5
'Limited stock management'	-	+	2	6
'Not optimal managing and monitoring outsourced jobs'	+	+/-	4	4
'No preventive/long-term maintenance'	++	+	6.5	1
'No control on time span'	+	+/- to +	4.5	3
'No planning of repair'	+	+	5	2
'Labour capacity'	+/-	-	1.5	7
++: many (3 points)		+: moderate (2 points)	+/-: little (1 point)	-: not any (0 points)

Table 1: Graphical overview of determining priorities

As an ultimate result, table 5 shows for each of the core problems a priority which is indicating the effect on the maintenance process' effectiveness and efficiency. An important remark is this representations forms a subjective representation of the discussion above. In this way, a step further is made toward the final answer of the main problem, which will be given later on in this chapter. Again a short remark can be given to the dependence between the core problems. For example, with solving the key problem 'Missing policies', indirect the 'Labour capacity', and 'Insufficient funding' will be positively influenced. Also, good policies will improve the efficiency of staff and so lowering the labour capacity problem and the need for supervision. Finally, it will improve the financial situation by more effectiveness with a housing stock policy. Summarized the result of this section is represented by the problem priority list in figure 2.

PRIORITY LIST

1. No preventive/long-term maintenance
2. No planning of repair
3. No control on time span
4. Not optimal managing and monitoring outsourced jobs
5. Financial maintenance program still to develop
6. Limited level stock management
7. Labour capacity problem

Figure 2: Priority list

7.2 Existing solutions to the main current bottlenecks

The priority list from the previous section will be elaborated into applicable solutions. The intention and effect of the solutions per problem are stated in each subsection and argued with some additional literature.

7.2.1 Planned/long-term maintenance

This part of the missing policies is mainly relevant to the effectiveness of the maintenance policy, as is clarified in section 7.1. Because of its absence the policy is incomplete and with this the maintenance effectiveness is not optimal. As a result, several large maintenance projects are outstanding as well as some procedures still have to be developed. Another consequence is the lack of certainty, communication and common vision with Yeast's employees.

There is also a financial disadvantage because of the late detection of defects without preventive condition checks. The earlier measures can be taken, the more feasibilities exist which lead in the long run to cost savings: "It is essential that the long term maintenance of the building be planned and built

in to the structure to (..) minimize the cost of maintenance throughout the life of the building". (Eilenberg, 1990)

Preventive maintenance is a general accepted part besides the regular, periodic and emergency management. Written by the own business plan and several others [e.g. (Psunder & Zaja, 1990), and (Jones, 1990)] the organization's buildings are its most valuable assets which need long term attendance.

According to the SPSH there are a few steps to take in order to find and implement planned maintenance (SPSH, 2005):

Step One: Condition assessment

A condition assessment will support in deciding which maintenance is essential. To observe the physical condition of the housing stock it requires correct, unbiased and objective information. Step two and three will rely on the quality and reliability of this information. The condition assessment must be clear and easy to handle on site, so only the necessary information is collected properly.

Step Two: Budgeting

Now the required maintenance is determined it's time to set up an outline of all costs. Budgeting provides an accounting for past expenditures and revenues, controls current spending and revenues, and forecasts those of the future. (Wildavsky, 1976)

Starting with budgeting the longer-term expenditures is done by a Zero-based budgeting where all the costs have to be defined based, among other things, on quotations. Hereafter an incremental budget can be established based on previous budgets.

Step Three: Prioritizing

The next step is to prioritize maintenance tasks on previous steps. It's useful to class the required maintenance and make an overview. This classification can be done according to the following three scales (Wieggers, 1999):

Essential: This condition is not acceptable unless the requirements are satisfied.

Conditional: It will enhance the condition, but the situation isn't critical.

Optional: It would be worthwhile considering.

Within the classes the required maintenance is further prioritized.

Step Four: Execution

From now on the execution of the maintenance has to be done according to the priority list founded in the previous step. Execution of the long-term maintenance is mainly outsourced as will be mentioned in section 7.2.7.

Step Five: Monitoring

Step five is of great importance for coming years. Monitoring and reviewing the performed maintenance is necessary to improve the implementation of planned maintenance.

7.2.2 No planning of repair

Currently no appointments for repair can be made with tenants, because complaints are arbitrarily picked out in the morning and possibly executed that day. At the moment, tenants are regularly not at

home, so time and energy to be at the unit with the right parts is wasted. Besides this inefficiency, simply no overview or planning of outstanding work is available per building. Finally, the selection of complaints to execute is influenced by personal preferences, with relatively more outstanding jobs in specific categories of maintenance as a result.

The aim of planning the unplanned/reactive maintenance is to create a well structured, clear, and efficient way of handling complaints. In giving clarity, repairing in time, and working efficiently tenants will be satisfied, what will ultimately support to the client orientation.

The solution can be found in extending the already existing reactive maintenance system. As part of our internship the maintenance file (annex 5) is analysed and thereby improved, to better cope with planning the maintenance execution. Now it is possible to print job lists, get statistics and track outstanding maintenance. An important condition is to use this system simply and solely for the registration of complaints. With the improvement of the longer term planning, reactive maintenance will lose some of its relevance that makes it even easier manageable. With the current average number of one new complaint a day, a good management should be possible. With assistance of the maintenance schedule, an appointment for repair can be directly communicated with the tenant. When keeping the administration up to date at all times it is possible to report and monitor the ongoing work.

7.2.3 No control on time-span

The required time between reporting and repairing a maintenance job is called the time-span. Monitoring the time-span will provide intelligibility in planning futures execution. To ensure the feasibility of the urgency deadlines it is important to control the time span, based on the type of maintenance job. Observing the urgency time limits will reduce the additional cost of consequence damage, which is a result of postponement.

It has been shown that Yeast has to apply priority categories to their maintenance and have to guarantee defects are maintained within the time limits. Applying categories to the maintenance will minimize the additional cost that will occur when emergency repairs are deferred and consequence damage arises. Live up to these standard will also give tenants more certainty about the point of time problems will be repaired, what contributes to the tenant's satisfaction level.

7.2.4 Not optimal managing and monitoring outsourced jobs

Without well considered management of outsourced jobs problems arise like a lack of quality, unsatisfied tenants, too much time efforts in contracting service providers, doubt about in-house or outsourcing jobs, and missing administration like used materials, contractor data and responsibilities. The diversity of activities in housing regularity requires outsourcing.

The main function of a procedure to outsource is, obviously, to generate clarity about all expectations and agreements from the start until the accomplishment of the job. It is important to develop mutual understanding or even long term commitment. Above mentioned problems will be solved when outsourcing is well organized and external professionals can be assigned effectively. Although the problems seem to be quite different, they are related with each other and can be solved by an outsourcing procedure.

The key to good management and control on outsourcing is the use of contracts and forms as discussed in lots of theory of which the files of the Support Program for Social Housing (SPSH, a; SPSH, c) are the most useful to Yeast. The files include in detail which procedures are important to have before using contracts and include the relevant aspects for the contract itself. Examples of issues and procedures are (1) to plan and budget repairs, (2) kinds of repairs in-house and outsourced, (3) quality assurance and performance management with tenant's involvement, (4) a database with specialist service provider per area of operating with their professionalism or qualifications, and (5) an in house maintenance team. For selecting a (list of) good service provider(s) a three-piece plan can be used:

- Evaluating a service provider with your criteria (skills, reliability, location,..), weights (total 100%), score (1-5) and result (sum of scores per provider)
- Development of service providers (make them familiar with your organization)
- Negotiations about quality, delivery, cost, payment terms (cost-based, market-based, competitive bidding, or a combination price model)

Important issues of the contract are set in another article of Robinson (1990) as well, although they will differ per organization and kind of job. First, the basic information should be recorded in a model contract. Subsequently, documentation about time, cost, the authorizing person, etc. should be part of the contract. Also important is the procedure for monitoring performance, combined with defined objectives and a payment agreement. In each contract the following basic aspects should be present: the articles of agreement, a definition of scope of work obligation, employer's powers and a module indemnities.

7.2.5 Financial maintenance program still to develop

During the internship at Yeast an unsatisfying and unserviceable financial maintenance administration has been experienced. The total spend money, spending per building, and kind of spending are all unavailable or unpractical. The same unavailability holds for maintenance budgets. The main problem is the missing insight in spending, which makes budgeting, planning and decision making harder.

A well-managed financial maintenance program will support the asset management strategy by a budget and plan of the maintenance strategy. Important numbers and ratios could be the ratio in-house/outsourced jobs, type of maintenance, spending per unit, variances at budgets, maintenance deferred, cost per supplier, orders in pipeline, and residents' liability. Finally, this all is important to a system of life cycle costing which is used as management tool for monitoring cost performance.

A plan accompanied with a budget will bring great improvement. The plan is based on the overall company strategy and the condition reports. A budget can be based on historic data, quotations for jobs or a schedule of adjusted rates. Important to use are the categories of maintenance in recording and planning. In addition, distinction can be made in the kind of spending when looking at the freedom of obligations: committed, variable, or managed. The budget itself can be conceptual or detailed. Where, a conceptual budget is more orientated to the total amount and a quick indication, while a detailed budget is based on information that is more accurate. The theoretical expiring date will be a basic instrument for decision-making and determines the spending. In the annex 8 a Strategic Maintenance Budgeting Scheme (Then, 1990) is added. Kennerley and Oxley (1990) stated to view maintenance with

investment theory, where the returns should arise the costs. Of course, returns are not that easy to predict, but this theory and the theoretical expiring date will facilitate maintenance planning and the prioritizing process. To assist the budget and planning process a financial software program should be used as well as the Company Lifecycle maintenance model for SA SHI's can be very useful. This model of the Johannesburg Housing Company can generate per maintenance category, year and building the (total) adjusted cost.

7.2.6 Limited level stock management

Nowadays Yeast is performing their maintenance with a limited amount of spare parts in their stock. So, attempts of repair often put to a stop because of the need for parts. Moreover, working with the Maintenance Engineer showed the problem of saving used parts through a lack of spare parts. The time consuming process to re-use these particular parts did not countervail against the profit of not replacing this inexpensive and commonly used part.

Every time a part has to be replaced the permission and financing of the Building Manager is required. Already a simple stock of spare parts will dramatically reduce the process time to replace parts. Stock management will attain a limitation of the set-up time and will ensure continuity in carrying out maintenance.

At the end of the internship, a (re)start is made to set up a safety stock (Visser & van Goor, 2004) to ensure the Maintenance Engineer more continuity and improve his efficiency. In addition, a recommendation is made to a budget for the Maintenance Engineer to purchase parts and to upkeep his stock. The Maintenance Engineer will therefore have the freedom and responsibility to take care of the stock level. Of course the finance and permission of the Building Manager is required to purchase the more radical and expensive expenditures. The existing theories on stock management are not applicable on this situation, because at Yeast is dealt with small amounts of inexpensive and commonly used parts. Therefore, it is redundant to take space, risk, and interest into consideration. The only field Yeast will reduce cost on is purchasing costs. A mutual understanding with suppliers has to be made to reduce ordering cost and insure continuity of supply.

7.2.7 Labour capacity problem

Facing a capacity problem is, obviously, not only dependent on the number of staff members performing the maintenance. In fact, with all the different kind of factor's involved it's difficult to make an evaluation. A company has to find the perfect mix of quantity in-house and outsourced employees. Also the available operating procedure will play a part according the job performance. Procedures can reduce the wasted working hours during operation, and reduce the number of staff that is required. There is even a good possibility that improving the efficiency of staff will benefit the labour capacity. Personal skills, appreciation, self-development, responsibility are all factors that can influence the efficiency of the employees. So a combination of aspects like personnel quantity, outsourcing maintenance, procedures, staff efficiency is accountable for the labour capacity on maintenance.

An indicator for the staff quantity is a ratio of the amount of staff compared with the amount of units. As stated above, this is not trustworthy without considering the other factors. One full-time employee

carries out Yeast's maintenance for the 300 units. When considering Aedes, a Dutch branch association for social housing, than this number is on average 625 Houses per Maintenance Engineer. The point this indicates, considering the huge differences between the working environments and circumstances, is that it is most likely possible to expand the housing stock without extending Yeast's number of maintenance employees. Therefore, Yeast's bottleneck according the lack of personnel is not only put right by employment. A working condition were proper procedures and a good work atmosphere are applied can increase the efficiency. However, to increase the housing stock and to reduce the workload a solution has to be found within these aspects.

7.3 Listing the main restrictions applied to the possible solutions

At this point specific characteristics of Yeast will be stated that exert influence on solutions out of paragraph 7.2. Although these aspects came across in the report, they are listed now because they have to be taken into consideration preceding the implementation of a policy or procedure modification.

A managing director is positioned between the strategic and tactical level, whereby the manager director at Yeast is also positioned between the operational and tactical level. This role is both a key figure for leadership as it is between the board and staff. Especially during the implementation of a policy modification, it is important somebody put these new ideas into practice. At the same time a manager director is the right person to bring experiences out of this daily practice back to the drawing table. In the current situation of Yeast this link between policy, staff, external relations, and the board can improve.

The limited financials within Yeast do not have to be the reason for the current reserved attitude toward investments. When concrete investment plans are established, possibilities arise and offer perspectives. In conclusion, the limited financial resources should just bring that extra drive to proper financial management. Within Yeast, people are used to give the investment cost more attention than the Net Present Value (NPV). Social Housing differentiates itself from general housing with a non-profit strategy and extensive social values. The utilization of these social values should be taken into account when dealing with new issues. Social values will always be subjective and differ along circumstances, so (re)consideration is necessary each time.

Finally, a category exists with characteristics that are not directly compliant. Herewith is thought at the turnover rates, Yeast's scale, government policies, market developments, income figures, and etcetera. Nevertheless, their impact on decision-making could be significant.

The chapter started with formulating a problem cluster, after which the main problems are prioritized. According to the priority list, possible solutions are formulated to answer the fifth research question. The solutions proposed in this chapter are further analyzed in the next chapter to make a practical advice for Yeast.

8 Feasible solutions and recommendations

The intention with this chapter is to give Yeast concise advice by answering the main research question. This will support Yeast with getting their maintenance policy organised to operate in an effective and efficient way. Preceding the recommendations, the sub problems will be reflected.

From theory, the success factors to an effective maintenance policy include planning, organization structure (framework), process design and a supporting financial system. With these factors, the current maintenance policy is analyzed to answer sub question two. It is already mentioned that the current documentation is limited about procedures, the property and functions. The vision of Yeast is orientated to tenants combined with a medium term of planning. For the third sub question, it shows that the current maintenance policy focuses on a diverse set of housing units in changing conditions by using the short-term maintenance procedures. Employees are motivated to work hard, but miss a common vision and leadership. The main bottlenecks in the policy, sub question four, are presented by organization level. At the strategic level the vision is unrealistic and incomplete which causes the (financial) procedures at tactical level to be short term and incomplete. The planning of maintenance is unsatisfactory which reveals itself in inefficiencies at the operational level. The solutions to the seven main bottlenecks, sub question five, are to set up a long term maintenance plan by five steps. These steps consist of administrate and manage repairs, apply categories to maintenance, use contracts for outsourcing, keep a stock of parts and materials, link budgets with plans. Where, after planning maintenance and implementing procedures, determine the human resources.

The answer to the main question, to organize the maintenance policy in an effective and efficient way, comes down to the importance of longer-term policies. The systematic approach given in chapter 6.2.1 could be a way to start taking action in setting up a long-term based vision on maintenance. For Yeast it's necessary to make a reliable condition assessment of the property. Keeping it simple and practical will ensure that the information is applicable so Yeast will be able to ensure the continuation. Current conditions of Yeast assets are not clear-cut and it is important to implement the overview from Jacus. Besides, there is a strong need to organize the financial situation as mentioned before. To get a more well founded situation, clear and simple budgets have to be allocated as a starting point. Again, for now it is important to have most of the processes as simple and clear as possible to make sure that they are practical. Start making budgets for projects and be aware that revising these budgets is necessary. Revising is only possible if expenditures are properly allocated and administrated.

Setting-up a priority list of outstanding maintenance will form a good base to a job completion. The maintenance jobs have to be prioritized according several issues like cost, budgets, and the organizational planning. The reliability of prioritizing can be deduced from the bottlenecks shown at the strategic-level.

The last major task is to make a reliable planning for all the maintenance jobs. This planning should be based on the above-mentioned results. In the long run the planning will be fine-tuned on the basis of acquired information from the previous years. Therefore, the financial information on budgeting has to be rectified continuously. When cost allocation is properly done, budgets are getting more precise and a

more strictly planning can be established. Information on maintenance performance requires a control on the time-span to clarify the average maintenance execution time.

It is imperative to deal with the remaining aspects on the priority list during this process of improving the effectiveness and efficiency. All the aspects of the recommended improvements are strongly related with each other, so a proper approach to all of the aspects is advisable to achieve an optimal result. Some of the bottlenecks will be automatically improved when a concrete planning is drawn up. For instance, managing the labour capacity will be easier when a planning is made, and simultaneously outsourcing maintenance can be better anticipated. Furthermore, this results in a situation where the stock level will be easier to predict and maintain.

9 Discussion

Our analysis identifies several aspects that bear some discussion. First, within Yeast there are some problems with the documentation of general building information. In the few years of the Yeast's existence, they are gathering necessary documentation, but it is impossible to complete it for older buildings when even the municipality is missing this property documentation. One of the main assumptions is on the condition assessment of the building. The long-term planning we used is based on the information of the condition assessment, and the integrity decreases by making assumptions to the missing information. To cope with this problem, a maintenance expert from the University of Pretoria conducted a rough condition assessment. Besides, the data of executed maintenance tasks are coming from a maintenance Excel file, which showed some irregularities. Based on some hard copy reports we supplemented this file to generate an overview of the maintenance history. Although we introduced a new documentation file what will overcome irregularities in the future, assumptions had to be made about building conditions and maintenance history.

As authors, we are students from Europe who are doing an internship in the 'developing' country South Africa. This unconsciously influences the way of analyzing situations and we applied western knowledge in the research. Recognized theories at Dutch university's like the problem cluster (TSM business school, 1994) and setting up a priority list in section 7.1 are typical methods coming from our studies in the Western world. To orientate as much as possible to the South African context, we studied background information and used documentation of the Social Housing Foundation of South Africa. Lastly, the implementation of presented solutions can be directed to the local context. In case of the stock management (section 7.2.6) for example, we decided to use a practical bias, because the western theory would imply too much professionalism. Still, it can be a point of discussion whether we always succeeded in the orientation to Yeast's context.

The last discussion point is about the research implementation. This research focuses on the maintenance policy, whereby efficiency and effectiveness play a key role. However, can the organizational structure and culture itself bear the changes in the policy formulation? For example, the maintenance related tasks are described with the most feasible function division. Further research will be helpful to find out if the current structure is supporting the business in the right way. Taken this all together, can Yeast handle the solutions offered by this research or should there be a change in the current organization structure?

Considering the competence of Yeast we are confident regarding the future. The possibilities within Yeast are sufficient to make improvements on their maintenance process. We feel very much honoured to contribute to this process. We wish Yeast all the best to keep up the good work!

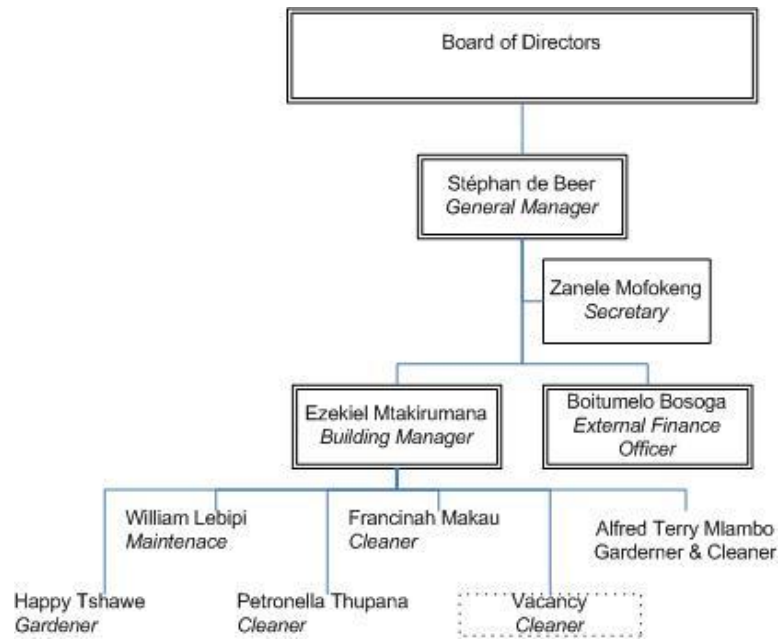
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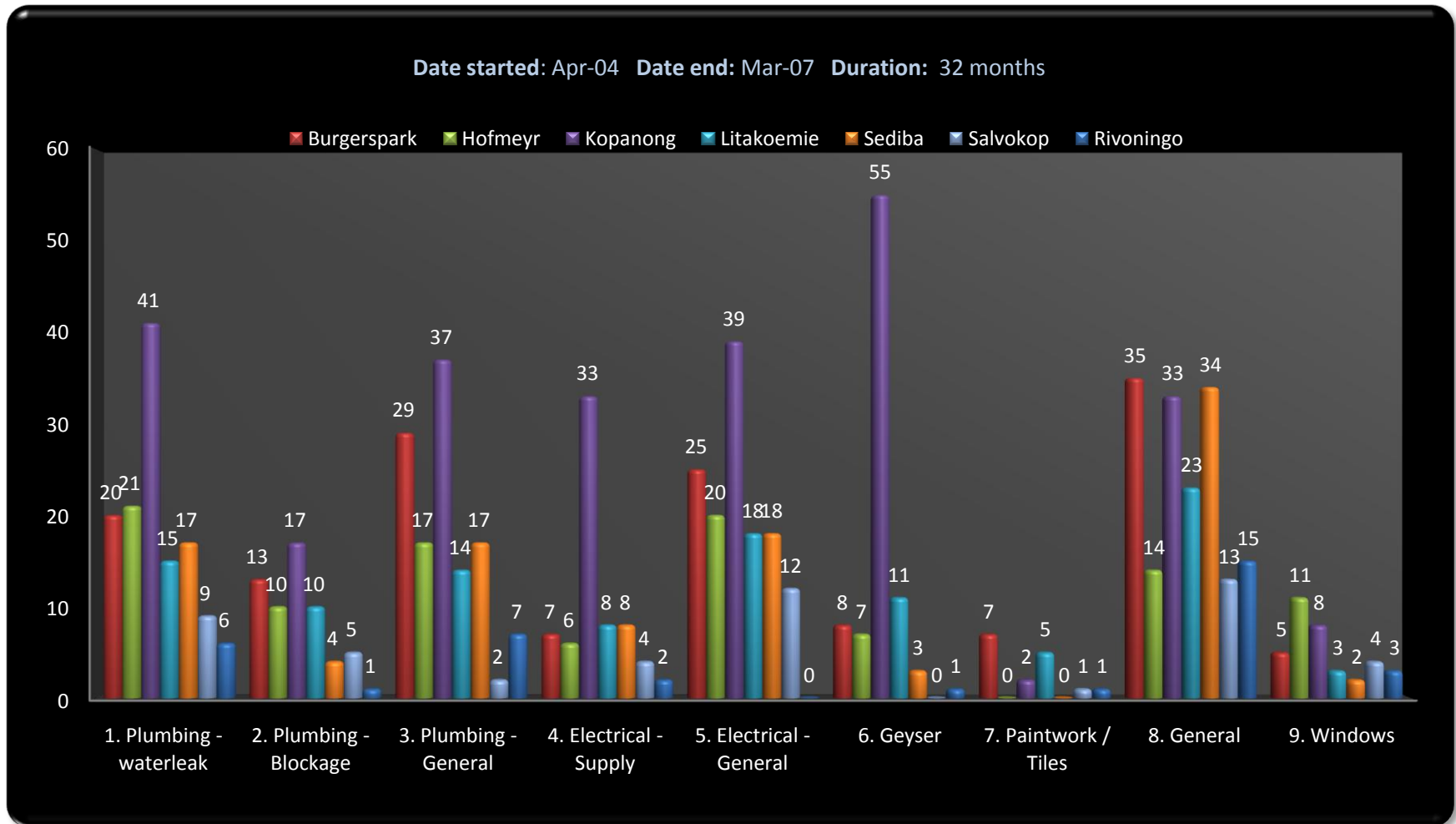
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Annex 1: Organization chart

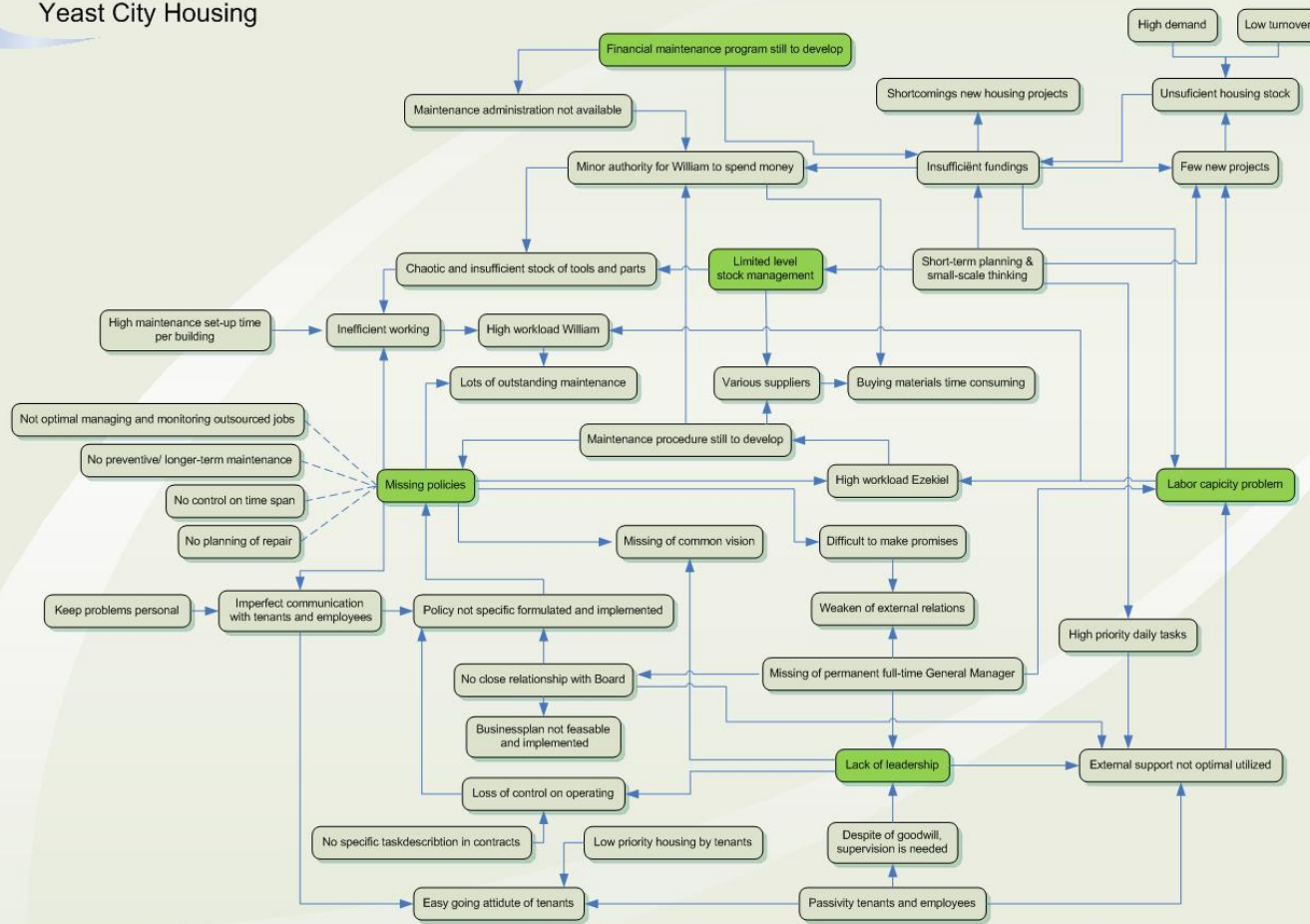


Annex 2: Monitor of maintenance interventions



Annex 3: Problem cluster

Problem Cluster Yeast City Housing



Annex 4: Maintenance form

REF No:						
Query received by:		Repair routed to	Company		Date	
Date			Caretaker		Date	
Time			other		Date	
Query made by:		Order-/ invoice form attached? <i>(please tick)</i>			Duty to be carried out by:	
Surname			yes		Date	
Name			no			
Unit number						
Superblock		Description of the defect:				
Contact details						
Availability at the unit:						
Dates						
Time						
		Description of works:			Duty completed on:	
Key available at:					Date	
Name					Time	
Unit number						
					After hours service?	
					yes	
Responsibility for repair: <i>(please tick)</i>					no	
retention / guarantee						
insurance						
tenant		Signature of the workman:			Signature of <i>Housing Institution</i> :	
Housing Institution						
Signature of the resident						
declare that the above-mentioned damage is repaired and that I am content with the workmanship						

Annex 5: Maintenance File (Excel)

Maintenance_report_(NEW) [Compatibility Mode] - Microsoft Excel

Home Insert Page Layout Formulas Data Review View Acrobat

Clipboard Font Alignment Number Styles Cells Editing

1255 =IF(AND(G255<>"";N255<>"")=TRUE;"OUT";IF(AND(G255<>"";N255="")=TRUE;"IN";""))

Yeast City Housing										Date: 15-12-2007				
Incident Monitor														
Ref.	Building Name	Unit no.	Name tenant	Contact number	IN	DU	IN/OU	Error Code	Detail of the defect	Query received	Description of works	OUT D	carried out b	
159	96	10.06.2007	Litakoemie	toilet on the first flc	Emly	20-6-2007	-10,00	OUT	General (Doors,roof leaks,et	Toilet is not flushing	Zanele	Fixed the mechanism inside the cisten	10-6-2007	William
160	97	11.06.2007	Kopanong	A102	Nolundi	20-06-2007	178,47	IN	General (Doors,roof leaks,et	Cupboard is broken, window handle is broken, globe is not working in the bathroom, curtain track is loose, tap is loose, basin is broken	Zanele			
161	98	12.06.2007	Kopanong	B102	Magana	21-06-2007	-8,00	OUT	6. Geysler	Geysler is not working	Zanele	Replaced thermostat & element	13-6-2007	William
162	99	13.06.2007	Kopanong	B303	Cathrine	27-06-2007	44,00	OUT	General (Doors,roof leaks,et	Door does not lock, no keys for the bedroom	Zanele	The lock was not properly fitted so I fixed it	10-8-2007	William
163	100	14.06.2007	Litakoemie	LT12	Matshidiso	28-06-2007	170,47	IN	1. Plumbing - Waterleak	Outside pipe for the basin is broken	Zanele			
164	101	01.07.2007	Kopanong	B204	Yvone	02-07-2007	166,47	IN	1. Plumbing - Waterleak	Kitchen Sink is leaking	Zanele			
165	102	02.07.2007	Litakoemie	Toilet next to no. 6	Christina	03-07-2007	165,47	IN	General (Doors,roof leaks,et	Door handle is broken	Zanele			
166	103	03.07.2007	Kopanong	B304	Mimi	05-07-2007	0,00	OUT	6. Geysler	Geysler is not working	Zanele	Replaced thermostat & element	5-7-2007	William
167	104	04.07.2007	the Potters House	BP004	Nwabisa	06-07-2007	35,00	OUT	General (Doors,roof leaks,et	There is a hole underneath the tiles in the kitchen and in the b	Zanele	The hole was for the aluminium strips so I put them back	10-8-2007	William
168	105	05.07.2007	Litakoemie	LT6	Nina	07-07-2007	158,47	IN	General (Doors,roof leaks,et	Door is not closing properly	Zanele			
169	106	06.07.2007	Kopanong	A302		11-07-2007	157,47	IN	4. Electrical - Supply	Plugs are not working in the kitchen & bedroom, the sink is leaking and the tap is broken	Ezekiel			
170	107	07.07.2007	Kopanong	C006		11-07-2007	157,47	IN	4. Electrical - Supply	Light is not working in the passage	Ezekiel			
171	108	08.07.2007	the Potters House	Outside drain	Lizzy	11-07-2007	2,00	OUT	2. Plumbing - Blockage	Main drain is blocked	Zanele	Unblocked the drain	13-7-2007	Contractor 1
172	109	09.07.2007	Sediba House	510	Christopher	083 6798 203	85,00	OUT	General (Doors,roof leaks,et	Main door lever is loose, bathroom door handle is loose, middle	Zanele	The shelf was fitted back properly	4-10-2007	William
173	110	10.07.2007	the Potters House	Toilet & rooms	Lilian	12-07-2007	29,00	OUT	General (Doors,roof leaks,et	2 curtain track needs to be replaced, 2 toilets are leaking, oven is not working small sink is leaking, basin in the room are leaking, shower is blocked	Zanele	I used chemicals to unblock the shower	10-8-2007	William
174	111	11.07.2007	Kopanong	C304	Sipho	082 558 4446	152,47	IN	6. Geysler	Geysler is not working	Zanele			
175	112	12.07.2007	Sediba House	504	Anna	084 756 6917	80,00	OUT	1. Plumbing - Waterleak	pipe is leaking in the kitchen sink, the door is loose	Zanele	The frames plate was loose so I fixed it and the leaking pipe	4-10-2007	William
176	113	13.07.2007	Kopanong	A002	Anna	17-7-2007	151,47	IN	4. Electrical - Supply	There is power failure in the unit	Zanele			
177	114	14.07.2007	Kopanong	C106	Tumelo	18-7-2007	150,47	IN	1. Plumbing - Waterleak	Kitchen tap is leaking	Ezekiel			
178	115	15.07.2007	Hofmeyr	HM01	Virginia	082 901 5456	73,00	OUT	4. Electrical - Supply	Plug is burnt	Zanele	the plug was having loose connection wire so I fixed it and its working	4-10-2007	William
179	116	16.07.2007	Kopanong	B104	Shennay	072 615 4852	145,47	IN	6. Geysler	Geysler is not working	Zanele			
180	117	17.07.2007	PCM office	Folding door	Eric	24-7-2007	17,00	OUT	General (Doors,roof leaks,et	Folding door is broken, offices need painting, rail by the stairs needs painting, pipes are leaking in the pilar in the lounge.	Zanele	The leaking pipe was fixed by contractor	10-8-2007	William
181	118	18.07.2007	the Potters House	Toilet	Marry	30-7-2007	11,00	OUT	1. Plumbing - Waterleak	Pipe is broken in the toilet	Zanele	There was a leaking pipe in the wall and it was fixed by contractor	10-8-2007	Contractor
182	119	19.07.2007	Kopanong	Bathroom	Zoleka	083 3010223/	138,47	IN	1. Plumbing - Waterleak	Tap in the bathroom is not working	Zanele			
183	120	01.08.2007	Sediba House	606	Mike	083 986 0286	59,00	OUT	General (Doors,roof leaks,et	Tiles are falling off the wall in bathroom, the plug is loose in the bedroom	Zanele	The tiles were fixed and also the plug which was not properly fitted	4-10-2007	William
184	121	02.08.2007	the Potters House	Bedroom		8-8-2007	2,00	OUT	4. Electrical - Supply	The plug in the room is not working	Zanele	The plugs were off because the earth leakage was off	10-8-2007	William
185	122	03.08.2007	the Potters House	Outside	Vestine	15-8-2007	122,47	IN	1. Plumbing - Waterleak	Water is leaking by the right side of Potters House	Zanele			
186	123	04.08.2007	Kopanong	C102	Shale	072 7272 202	121,47	IN	6. Geysler	Geysler is not working, bathroom lights is not working.	Zanele			
187	124	05.08.2007	Litakoemie	Geysler next to 31	Esme	16-8-2007	121,47	IN	6. Geysler	Geysler is not working	Zanele			
188	125	06.08.2007	Sediba House	515	Sophie	082 4831 213	49,00	OUT	General (Doors,roof leaks,et	Basin in the bathroom is falling off the wall	Zanele	Roll bolts were used to hold the basin because contractor uses silicon.	4-10-2007	William
189	126	07.08.2007	Burgerspark	TPH G2	Vestine	17-8-2007	120,47	IN	1. Plumbing - Waterleak	Geysler Leaking and Shower blocked	William			
190	127	08.08.2007	Burgerspark	TPH G1	Vestine	17-8-2007	120,47	IN	ng - General (Other sanitary y	Geysler not working	Zanele			
191	128	09.08.2007	Kopanong	B001	Dothry	20-8-2007	117,47	IN	6. Geysler	Geysler is not working	Zanele			
192	129	10.08.2007	Sediba House	5th Floor passage	Violet	20-8-2007	45,00	OUT	4. Electrical - Supply	No lights in the paages	Zanele	The timer was out of time so the passes lights comes on late and I fixed it	4-10-2007	William
193	130	11.08.2007	Hofmeyr	HM36	tenant	20-8-2007	117,47	IN	6. Geysler	No hot water in the rooms 36,37,38,38	Zanele			
194	131	12.08.2007	Kopanong	A305	Pumeza	21-8-2007	116,47	IN	1. Plumbing - Waterleak	tap is leaking	Zanele			

Ready

Annex 6: Maintenance specific procedures and approaches

Housing management, Service charter

- Response times:
A response or acknowledge within 5 working days to written requests and enquiries.
An acknowledgement tells you how long to expect to wait for a reply (max 10 working days).
If an enquire is complex and needs more time a complete as possible reply is given in 10 working days, as well as when you get the complete reply
- Correct telephone policy
- Visitors can speak directly or make an appointment within 5 working days with the person they need to see.
- Yeast will listen to any problems tenants have and will help whenever we can. If we cannot help ourselves we will do our best to recommend where help can be located.
- Yeast expects tenants to abide by the terms of their tenancy agreements as well it will take action to enforce tenancy conditions.
- The Building Manager will maintain a regular presence in the buildings.
- Yeast will consult with tenants about any important matter that affects your tenancy such as changes to housing management policies or major repairs/improvements to your property.
- Yeast have set themselves of attending repairs:
 - If emergency – within 24 hours
 - If urgent – within 5 days
 - If routine – within 10 working days
 - If low priority – within 20 working days
- Tenants will fill in a request form, attend to the problem.
- When Yeast asks a contractor to carry out a repair, Yeast will notify the tenant and before signing off, the tenant inspects the repair and signs the satisfaction form.
- Yeast will carry out a Stock Condition Survey annually to make sure we know of any problem to help us plan for future repairs and maintenance.

Tenancy agreement/lease:

- 6. At any time when a building needs major repairs or refurbishment Yeast can vacate the tenants for a period not exceeding two weeks. For a period longer than two week similar accommodation should be found by the landlord. Provided the landlord shall make all reasonable efforts to minimize disruption caused by these works and shall not require the tenant to pay rent for the period the premises are vacated.
- 11.1 Throughout the period of the tenancy /lease the tenant shall keep the premises in good order. Any defect defects within the premises shall be notified to the landlord without delay. Any works required to the property will be undertaken in accordance with section 6 of this agreement.

- 11.2 The internal decoration on the premises is the responsibility of the landlord and will be undertaken periodically when required. However it is the responsibility of the tenant to ensure that no willful damage is caused to the premises.
- 11.4 At the time of handover the premises will be deemed to have been in good order and condition. The tenant shall have seven days to notify the landlord of any defects within the premises from the date of commencement. A default list will be attached with the lease agreement. All defects will then be programmed for completion. When a tenant moves out the room will be checked for any defaults before refunding the deposit money.
- 17.1 On the termination of this agreement/lease for whatever reasons the tenant shall:
 - not remove any fixtures any fittings from the premises
 - return the premises to the landlord in the condition it was handed over at the time of tenancy commencement. The landlord will allow for reasonable wear and tear the duration of the tenancy.
 - undertake any repairs to the premises. Amend and restore any damage caused during the period of tenancy.
- 13.1 The tenant shall not make structural alterations or additions to the premises without the landlord's prior written consent. Such consent shall not be unreasonably withheld.
- 15.2 The tenant will not be entitled to claim damages or remission of rent or withhold payment of rent by reason of:
 - The landlord's failure to complete repairs to the building or premises provided the repairs are completed within a reasonable period; or
 - The failure or interruption in any services provided to the premises. Such provision may be out of the landlord's control.

Rental housing act 1999:

chapter 3 page 10: 5e,f,g,h,j,k: Provisions pertaining to leases

- The tenant and the landlord must jointly, before the tenant moves into the dwelling. Inspect the dwelling to ascertain the existence or not of any defects or damage therein with a view to determining the landlord's responsibility for rectifying any defects or damage or with a view to registering such defects or damage, as provided for in subsection (7):
- At the expiration of the lease the landlord and tenant must arrange a joint inspection of the dwelling at a mutually convenient time to take place within a period of three days prior to such expiration with a view to ascertaining if there was any damage caused to the dwelling during the tenant's occupation thereof;
- On the expiration of the lease, the landlord may apply such deposit and interest towards the payment of all amounts for which the tenant is liable under the said lease, including the reasonable cost of repairing damage to the dwelling during the lease period and the cost of replacing lost keys and the balance of the deposit and interest, if any, must then be refunded to the tenant by the landlord not later than 14 days of restoration of the dwelling to the landlord;
- The relevant receipts which indicate the costs which the landlord incurred. As contemplated in paragraph (g), must be available to the tenant for inspection as proof of such costs incurred by the landlord;
- Failure by the landlord to inspect the dwelling in the presence of the tenant as contemplated in paragraphs (e) or (f) is deemed to be an acknowledgement by the landlord that the dwelling is in a good and proper state of repair, and the landlord will have no further claim against the tenant

who must then be refunded, in terms of this subsection, the full deposit plus interest by the landlord;

- Should the tenant fail to respond to the landlords request for an inspection as contemplated in paragraph (f), the landlord must, on expiration of the lease,
- inspect the dwelling within seven days from such expiration in order to assess
- any damages or loss which occurred during the tenancy;

chapter 7 page 4: 7.(1)b,d,f,g,h,i,j,l,m

A landlord must:

- take reasonable steps to ensure that the tenant enjoys undisturbed use of the dwelling and in a multi-tenanted building that no tenant or other person conducts an activity within a dwelling which is expressly prohibited under the Act or any other law; which shall include disturbance of the peace of the area.
- maintain the common property, if any, in good order and repair;
- maintain the outside of the dwelling, including the walls and roof in good order and repair;
- maintain electrical, plumbing, sanitary, heating, ventilation, air conditioning systems and elevator systems in good order and repair;
- repair any damage to the dwelling or common area caused by fair wear and tear;
- provide and maintain appropriate dwelling or common area caused by fair wear and tear;
- provide and maintain appropriate container and places for the removal of ashes, garbage, rubbish, and other waste incidental to the dwelling and arrange for its removal;
 - provide all services agreed to in the lease;
- effects repair which a landlord is responsible for under the lease and as indentified during inspections by the landlord or on receipt of a notice from a tenant to do such repairs, but a landlord is not liable for repairs if a tenant his or her household members or visitors brought about the state of disrepair; and
- effects repairs for which a landlord is responsible for, under the lease and as indentified during inspections by the landlord or on receipt of a written notice from the tenant to do such repairs, within fourteen (14) days or such further periods as may be agreed to between the landlord and tenant.

chapter 7 page 5: 7.(2) tenant responsibilities

A tenant must:

- use the dwelling in a proper manner and for the purpose for which it is left, and in a manner which does not contravene this Act or any other law
- maintain the dwelling in a clean, tide and safe state of repair
- use in a reasonable way, all electrical, plumbing, sanitary, heating, ventilation, air-conditioning, and other facilities and appliances including elevators on the premises
- refrain from intentionally or negligently damaging, defacing, impairing, or removing any part of the dwelling or common property or knowingly permitting any person to do so, who is on the premises with the tenant's permission or allowed access to the premises by the tenant and the tenant is liable for the repair of such damage, fair wear and tear excluded, at the tenant's own cost
- during the period of lease be liable to maintain, replace or repair electrical globes, fittings and switches and also be liable for the maintenance, repair or making good all water-borne taps, stoves, locks, handles, and windows where such damage has not been due to natural causes
- comply with the house-rules, which are enforceable pursuant to these regulations and must respect the peace of the area

YCH Business plan 2001-2011

Chapter 9.7 page 3; repairs and maintenance policy

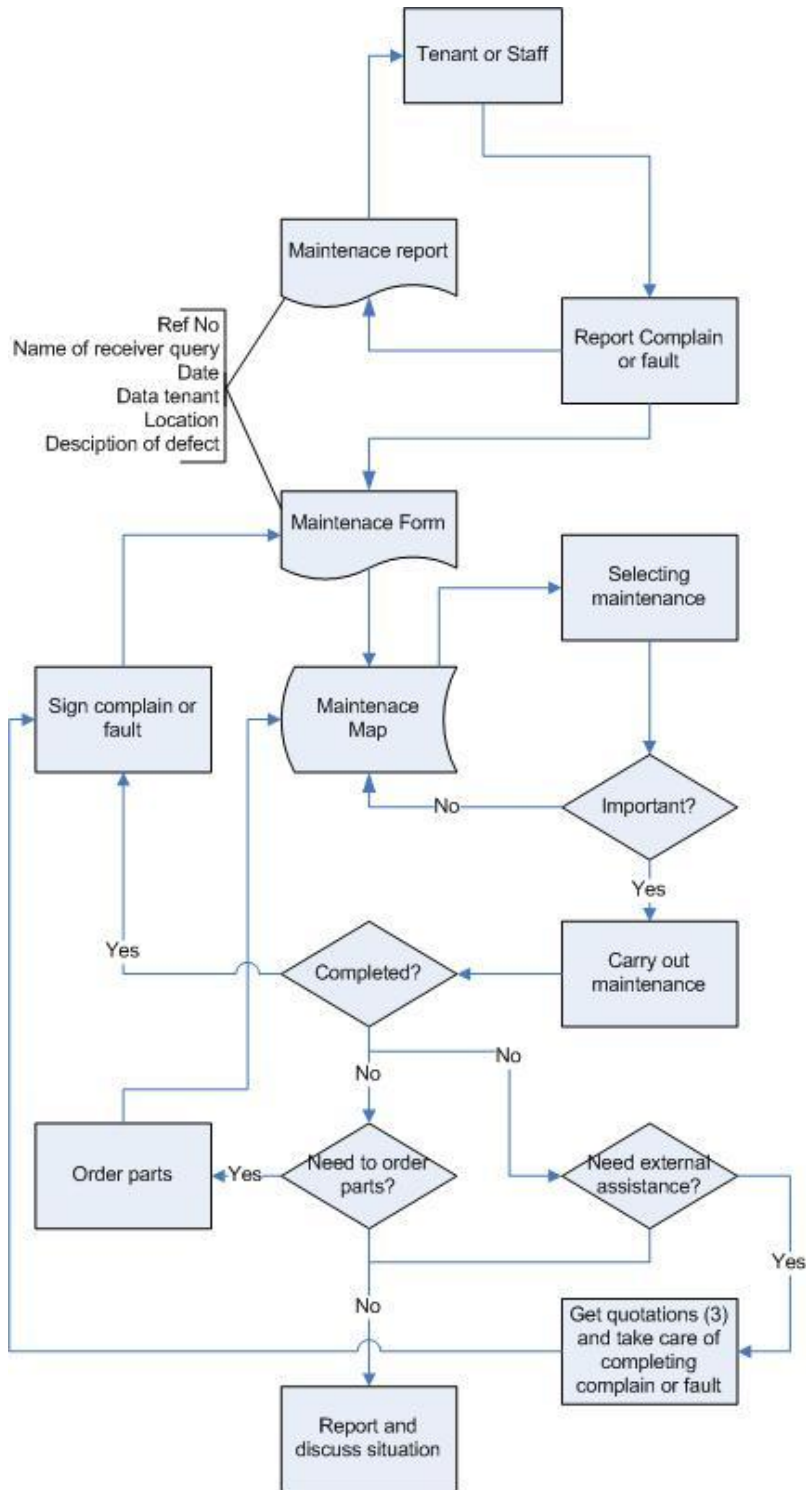
Because of the paragraph “we recognize that (...) in our properties” in 1.3 each development appraisal provides for an annual maintenance allowance for each unit.

The responsive repairs are to be undertaken by our own staff where possible and outsourced if the work is too involved or our staff lack the skills needed.

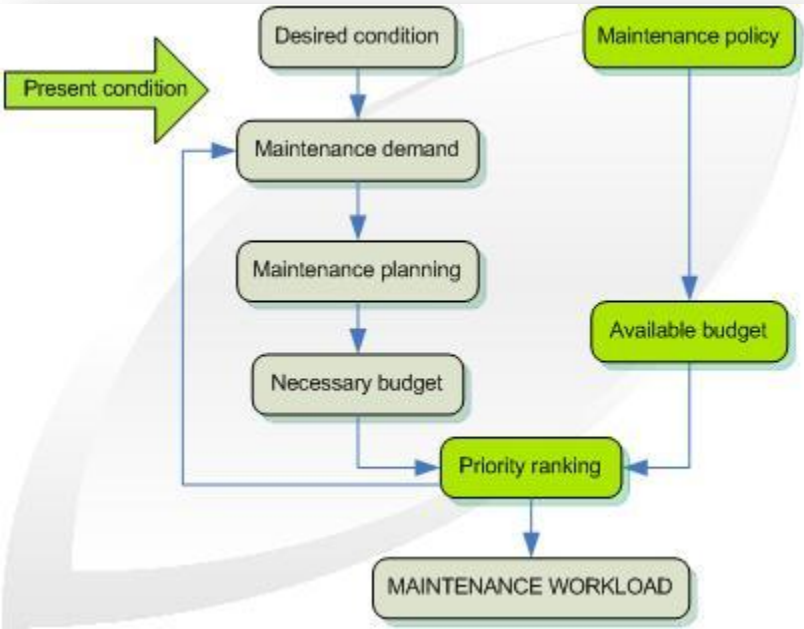
Upon acquisition or completion of new projects the consultant will be requested to provide a planned maintenance program to ensure the property remains an asset to YCH and our tenants.

Priority	Remedial action time	Example of defect
1	Emergency 24 hrs	Power failure, burst pipe, leaking roof, blocked toilets, etc
2	Within 7 days	Minor roof leaks, re-glazing ,missing floor tiles, minor electric faults, etc
3	Within 14- 30 days	Blocked gutters, broken downpipe, redecoration of selected areas such as entrance foyers, broken light fittings, etc.
4	5-year cycle	Major redecorations, structural repairs such as plasterworks, replacing of flat roof covering.

Annex 7: Maintenance report diagram



Annex 8: Strategic Maintenance Budgeting



Annex 9: YCH staff questionnaire

1. Task description

- What are your formal tasks to carry out (for example out of your contract)? Please give special attention to the maintenance related tasks.
- Is your task description ever changed during your employment? Please clarify.
- Are you satisfied with your task description?

2. Task performing

- What are your daily tasks and activities? Please be detailed and give special attention to the maintenance related tasks.
- Do you think your daily tasks are strongly related with task description?
- Do you feel flexible in carrying out your tasks or do you have a fixed and repetitive schedule?
- Which (personal) purposes are you aiming for with your activities?

3. Improvements

- Are you able to accomplish your tasks in a way which is satisfying yourself?
- When you think about your task description, your daily tasks, and the purposes you aim at, what are your suggestions for improvement?
- When you think about the current maintenance policy, what are in your opinion the main bottlenecks?
- What are your suggestions for improvement to the maintenance policy?

Dutch management summary

Sinds enige tijd bestaat er binnen Yeast City Housing in Pretoria (Zuid-Afrika) een toenemend bewustzijn voor het onderhoudsproces. Daarbij staat het optimaliseren van de conditie van het huizenbestand centraal. Momenteel wordt men zich steeds bewuster van beperkingen op het gebied van financiën en tijd. De hoofdvraag van dit onderzoek is dan ook: *“Hoe kan het onderhoudsproces van Yeast effectief en efficiënt worden georganiseerd?”*. Voor het beantwoorden van dit vraagstuk wordt aan de hand van theoretische succesfactoren het gedocumenteerde en werkelijke verloop van het onderhoudsproces geanalyseerd. De verschillen tussen beide en ontbrekende succesfactoren zijn vervolgens per organisatieniveau gegroepeerd.

Met behulp van een probleemcluster is een overzicht gemaakt van de kernproblemen. Vervolgens is aan elk kernprobleem prioriteit toegekend op basis van de invloed dat het heeft op de effectiviteit en efficiëntie van het onderhoudsproces. De probleemgroep “ontbrekend beleid” scoort hierbij het hoogst en bestaat uit vier kernproblemen: (1) een ontbrekende lange termijn onderhoudsplanning, (2) het niet opstellen van een reparatieschema, (3) geen controle op de tijdsduur van de reparatieafhandeling en (4) het beperkt organiseren van uitbestedingen. Naast deze vier zijn er nog drie andere kernproblemen herkend: (5) er bestaat geen voorraadmanagement, (6) een ondersteunend financieel systeem ontbreekt en (7) er is een tekort aan arbeidskrachten.

Voor elk van de beschreven problemen wordt een oplossing of een oplossingsrichting aangedragen. Zo kan een langetermijnplanning een goede staat van de gebouwen realiseren. Om tot dergelijke planning te komen bestaan er vijf stappen: (1) conditie analyse, (2) budget opstelling, (3) prioriteiten stellen, (4) uitvoering en (5) terugkoppeling. In aansluiting op de langetermijnplanning kan het klein onderhoudssysteem (In Engels: ‘reactive maintenance system’) verbeterd worden door verder te gaan met de implementatie van het huidige systeem. Ook zullen daarbij, door strikte controle, de tijdslimieten in acht moeten worden genomen om daarmee zekerheid voor bewoners te creëren en eventuele gevolgschade te beperken. Om het tekort aan duidelijkheid bij uitbestedingen op te vangen, bieden contracten uitkomst die richtlijnen en procedures vastleggen.

Om de set-up tijd te verbeteren moet een voorraad worden aangelegd die bestaat uit de meest relevante en doorgaans matig kostbare onderdelen. Het beheer en de bevoegdheden moeten daarbij weloverwogen worden verdeeld, zodat materiaal veelal eenvoudig voor handen is. Ook ter ondersteuning van de onderhoudsfunctie is het financiële programma van belang, dat de prestatiecontrole en het maken van beslissingen moet verbeteren. Hiervoor moet het juiste systeem worden gekozen op basis van beschikbare theorieën en op basis van systeemervaringen bij collega-woningbouwverenigingen. Tot slot rest een noodzakelijke afweging van het benodigde aantal personeelsleden om de geplande taken uit te kunnen voeren. Hierbij kunnen interne en externe factoren worden meegenomen en speelt de ratio tussen intern uitgevoerde en uitbestede opdrachten een rol.

Met het beschrijven van de belangrijkste problemen binnen Yeast City Housing en het aangeven van oplossingen, wordt steun geboden en bovendien aangezet tot effectiviteit- en efficiëntieverbetering van het onderhoudsproces.

Reflection on the professional performance

This annex includes the individual reflection on my professional performance. The efforts we put in this process to come to the final report is not that visible, but to grade the project as a bachelor thesis it is of much importance too. Therefore I will give my personal judgement by reflecting on the achievement of objectives, the criterion for a bachelor thesis and on my personal performance.

Objectives

From my study so far, the combination of a bachelor and minor internship is the greatest project I am associated with. At this moment I will reflect on the objectives from the preparatory report to this internship. For the company Yeast I am convinced to have made a good contribution by the daily activities as volunteer and moreover by this report about their maintenance. Their letter of recommendation underlines this statement in more detail. With that the main objective for the company is achieved. By the contribution to the organisation, planning the stay in Pretoria and analysing the cultural differences, the minor objectives are achieved. This achievement is underlined by a mark '9' for the preparation report and a mark '8' for the minor project. For both the company and the minor the project is successful because of a good preparation and involvement with the project.

In the perspective of this reflection the bachelor and personal objectives (presented below) are of most importance to describe the project progress. On these I will shortly reflect one by one. From day one there is always been a structured approach to fulfil the project, mainly because I am used to it after several study courses and projects which focus hereon. Process thinking and managing the situation are typical the main issues showed in the report for Yeast maintenance process. A good example of systematic working can be found in the report. The structure is the outcome of the process: preparation (gathering information) - determining the optimal situation - analyzing the current situation - getting the overview - and make up conclusions to manage the problem situation.

The data have been selected by scientific rules in case of the literature review and by conversations, surveys and intern research to map the processes. In the end a complete overview of the maintenance process is generated and is it possible to give appropriate advice. The academic level is guaranteed by contact with our supervisors, compliance to the regulations of a bachelor thesis and a professional working attitude. The whole project in itself is coordinated and executed by Thomas and me, because within Yeast and the university, everybody is willing to help when you show progression and need specific support. Therefore an independent working approach has been a matter of course. Objective five is something we strive for in our communication, although the presentation still has to be made.

Bachelor Objectives - from the School of Management and Governance

- | | |
|---|--|
| 1 | Show sufficient knowledge and insights in your own field of study and actual developments in it |
| 2 | Be able to collect, interpret and judge relevant data, also based on the weighing of the relevant social, scientific and ethical aspects |
| 3 | Fulfill a task of a certain 'academic' level of difficulty, related to your curriculum |
| 4 | Show a certain level of independence in the preparation and execution of the project |
| 5 | Making a clear, structured and to people of different education level understandable presentation |

Personal Objectives - from preparatory report

- | | |
|---|--|
| 1 | Learning to stay independently in a environment totally strange to you therefore become more flexible to changes and differences |
| 2 | Learning about the social housing industry in South Africa |
| 3 | Experience the contrasts inside the national borders |
| 4 | Apply knowledge of study and general knowledge in the project |
| 5 | Learning about my level of skills, knowledge and personal development |

To reflect on my personal objectives I will start with the fact this internship has been one of my biggest experiences of life. To live four months in a totally new environment in another way has made me more open-minded to new and other situations. It helps to make you enthusiastic for new adventures instead of trying to live your secured life. My decision to apply for a fulltime board function one year after this internship is a good example of being enthusiastic about new opportunities. The importance of social housing to a good society has become clear after visiting Yeast and some other housing associations. Knowing the difference in climate, landscape, people, income, and well-being let me understand the Dutch safety and down-to-earth way of living. From day one in Pretoria I have seen our approach and way of thinking could really help Yeast with their maintenance process, of which I had as third year student some doubts before the arrival. I can conclude this internship has set the base for my interest in possible working fields, international contact and personal development, which subjects I extended by being a year fulltime involved in AIESEC.

Criteria

To meet the criteria for a bachelor thesis, the subject of the research and the research questions are set in cooperation with the company and the supervisors. It is clear the report included our well-considered approach, a literature research, findings, analyses, conclusions and a discussion. For Yeast the subject is their main focus area at the moment and we have helped them to make the first right steps to an effective and efficient maintenance process. I think we succeed in combining theory, daily practise, company information and (own) experiences to a useful content. To find the right information, the report is structured by chapters, sections, introductions, summaries and a straightforward writing style. We put extra efforts in the report by writing everything in English, using illustrations and an attractive layout.

Personal performance

As it is a great project some performances went better than others. Speaking about independence Thomas and I performed well. The assignment we got ourselves and the preparations and the research execution are executed independently. I think we can really say it is our project we can be proud of. Of course the independency does not mean we did it alone. We worked closely together with the employees of Yeast, we involved the supervisors with a research proposal and draft reports and we involved other organisations (DIGH, Wooncompagnie, SPSH). Next to that we asked colleague student to read parts of our report to check the understanding and English writing skills. Finally, of course we used the IT applications provided by the university library. The cooperation with others in our research environment went very well. Thomas and I supplement each other in the research approach which caused much communication but ended up in a successful cooperation.

In case of project management not everything went how it should have. In advance the research is prepared and during the internship we have been able to execute the research and to gather all the necessary information. In the Netherlands we made subsequently a draft report. From that time several aspects had to be changed to meet the criteria for an academic structure. These changes took far too long. The planning of this project is an example which teaches me the importance of deadlines and setting priorities. Let me mention what delayed the report finalisation:

- After we had the draft version, we had little time because of other study projects
- The parts we had to rewrite seems to be more work than expected
- There seems to be no urgency to finish, because there was no formal deadline and the content wouldn't not change compared to the version Yeast already received

The last criterion to the personal performance is reflectivity, which is mainly relevant to the feedback on draft reports and the cooperation within Thomas and I. In receiving feedback I think I tend to be too adoptable. Feedback on a draft version of the report for example, is good but not definitely the truth as it can be also be a solution direction, opinion or mistake. The defence of my position has improved, because I still will be open to feedback but search for the right conclusion. Giving feedback is no problem when doing it on an apparent experience, in a positive was at a right moment and place. About the cooperation I can say my strengths are in abstract and structured thinking and doing work with great precision. I have been strengthened in working concrete, efficient and communicating clear or more focussed.

Speaking about objectives I can conclude this project has been very successful and is a starting point for my future objectives. At the same time the structure and content of the report meets the bachelor thesis criteria from the school of management and governance. In general I should mark my personal performance as adequate, although I have had my learning points with planning and reflectivity. Overall, I definitely feel satisfied about this memorable project.

Yeast City Housing

(assoc. incorp. under Sect. 21)

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