

A WHOLE-SCHOOL APPROACH TO FACILITIES MAINTENANCE

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November, 2009



DECLARATION

I hereby declare that:

A WHOLE-SCHOOL APPROACH TO FACILITIES MAINTENANCE

is my own work, that all the resources used or quoted have been indicated and acknowledged by means of complete references¹, and that this thesis has not been previously submitted by me for a degree at any other university.

Velaphi Aaron Nhlapo

20.11.2009

¹ Some sources, like internet web pages, do not have page numbers.

DEDICATION

I humbly dedicate this thesis to my beloved wife Tshidi “Mmabotle” Jeanette Nhlapo. “You are my best friend and the shoulder I lean on. You are my pillar of strength. It is not only the utterances you choose, but the actions you take that are a constant inspiration.”

Not forgetting the greatest father of all times, my late father, Mlawuli Nhlapo. ‘Tini, you were, and still are God’s best gift to us.’

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Mnr. Christo Hoffman; "Ek waardeer u ondersteuning."

Ms Marga Jordan for editing this thesis so excellently.

Sabelo samaNhlapo, please, be good.

ABSTRACT

The area of school facilities maintenance as an integral component of schools' educational programmes is only beginning to receive attention in South Africa, through the publishing of Notice 1438 of 2008 of the National Education Policy, which is a call for comments on the National Policy for an Equitable Provision of an Enabling School Physical Teaching and Learning Environment. This implies that, while it is a critical aspect of teaching and learning, school facilities maintenance has not been accorded a priority status. Numerous studies have indicated a strong correlation between the quality of school facilities and learner achievement and educator morale and job satisfaction.

This study aimed at determining how a whole-school approach to facilities maintenance can be developed at schools by investigating the nature of school facilities maintenance and what the current school facilities maintenance practices are. An exploratory qualitative empirical research involving the use of ethnographic observation, photography and interviews was conducted. The study found that the current facilities maintenance practices at schools mainly comprised routine, corrective and emergency maintenance, which implies that facilities maintenance is not an integral component of the educational programmes. It also implies that schools need to implement a comprehensive and systematic process of facilities maintenance, which has a strong strategic dimension.

A Whole-School Facilities Maintenance Model is thus proposed as a solution to this need. The model addresses schools' immediate facilities maintenance needs and long-term needs as it is accommodative of changes, both minor and major, as can be the case with the enactment of policy regarding school infrastructure management. This study contributes to the practice of school organisational development and management by customising strategic planning into school development planning and improvement.

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LIST OF ABBREVIATIONS/ACRONYMS

DoE	Department of Education
HVAC	Heating, ventilation and air conditioning
PFMA	Public Finance Management Act
SASA	South African Schools Act
SGB	School Governing Body
UNICEF	United Nations Children's Education Fund
WSFMM	Whole-school facilities maintenance model

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CHAPTER 1

ORIENTATION

1.1 INTRODUCTION AND PROBLEM STATEMENT

Section 21(1)(a) of the South African Schools Act No. 84 of 1996 (Republic of South Africa, 1996a:16) locates the maintenance of school facilities among other functions of School Governing Bodies (SGBs). As such, schools' financial allocations from the Department include an allocation meant for the maintenance of school facilities. To the extent that there is a special financial allocation for this purpose, school facilities maintenance must indeed be an important and integral part of the conditions of learning (Picus, 2007).

However, Reynolds, Bollen, Creemers, Hopkins, Stoll & Lagerweij (1996:1) make the point that the disciplines of school effectiveness and school facilities maintenance have been apart for too long. This implies that, while schools may go all out to improve effectiveness and while they may put all efforts for improvement, the maintenance of school facilities is very often not accorded a priority status equal to other aspects of school improvement. In this regard, Young, Green, Roehrich-Patrick, Joseph and Gibson (2003:12) postulate that most education research points to social factors as having a bigger influence on learning than physical factors, with the result that physical factors are ignored in educational planning. These researchers argue that, while the "bottom line" to all reforms in education is improved academic achievement, usually measured by mathematics and reading scores of standardised tests, it is becoming more and more apparent that the learning environment itself has a positive or negative effect on education outcomes.

The fact that, out of the Departmental financial allocation for schools, only a small percentage is allocated to facilities maintenance is a noteworthy source of concern. In fact, in my experience as principal of a primary school, very often the bulk of the financial allocation for facilities maintenance goes to expenditure for services like water and electricity supply. For instance in schools 33% is

allocated to municipal services, 55% to learning and teaching support materials while only 12% is allocated to maintenance of school facilities.

According to Picus (2007), school facilities consist of the physical structure and the variety of building systems like plumbing, mechanical, electrical and power, telecommunications, security and fire suppression systems on the one hand, and on the other hand, school facilities consist of furnishings, materials and supplies, equipment and information technology as well as various aspects of the building grounds, namely athletics fields, playgrounds, areas for indoor learning and people and vehicular access and parking. In light of these features, school facilities should be responsive to the changing programmes of educational delivery and, at a minimum, should provide a physical environment that is comfortable, safe, secure, accessible, well-illuminated, well ventilated and aesthetically pleasing (Picus, 2007).

Despite the little financial attention paid to school facilities maintenance, there is evidence that suggests the importance of school facilities maintenance. Among other important aspects, school facilities maintenance ensures that the school presents safe and secure learning environments (Nhlapo, 2006:24). Carter and Carter (2001) assert that creating and ensuring school building safety revolve around the physical maintenance of buildings. This implies the repair, replacement and general upkeep of buildings, allows for the continued use of space for its intended purpose, and serves as an additional manifestation of ownership and caring. Thus, Szuba and Young (2003:2) contend that facilities maintenance is much more than just resource management in terms of procurement, use and upkeep. It is about providing a clean and safe environment for learners and is also about creating a physical setting that is appropriate and adequate for learning.

Uline and Tschannen-Moran (2008:55) state that there is a growing body of literature that provides evidence of a link between school building adequacy and learner achievement. They point out that one unexamined link between school facilities and learner achievement may be the school climate. School climate in this case may be a mediating variable, explaining, at least in part, the

deleterious impact that poor school facilities have on learning and that it may be that dilapidated, crowded or uncomfortable school buildings lead to low morale, reduced effort on the part of educators and learners alike, reduced community engagement with a school and even to less positive forms of school leadership.

Young *et al.* (2003:12) postulate that a supportive, safe, orderly, civil and healthy learning environment is one of the widely accepted characteristics of effective schools and assert that:

The effective school establishes a well disciplined, secure and wholesome learning environment, and maintains clean and orderly school buildings.

Young *et al.* (2003:14) report on a study of working conditions in urban schools which concluded that physical conditions do have direct positive and negative effects on educator morale, the sense of personal safety, feelings of effectiveness in the classroom and on the general learning environment. The study also found that building renovations in one district led educators to experience a renewed sense of hope and commitment, and a belief that district officials cared about what went on in that building and that an improved physical environment affected the social climate of the school and subsequently had a positive effect on learning.

Uline and Tschannen-Moran (2008:57) report the following research studies on the effects of school facilities:

- Cash found that comfort factors appeared to have more of an effect on learner achievement than did structural factors, and that high achievement was associated with schools that were air-conditioned, enjoyed less noisy external environments, had less graffiti, and where classroom furniture was in good repair state.
- Earthman, Earthman and Lemasters, Higgins, Hall, Wall, Woolner and McCaughey and Schneider in more recent reviews consistently found relationships between building quality and academic outcomes and

also found that design criteria and building conditions related to human comfort, indoor air quality, lighting, acoustic control, and secondary science laboratories have a demonstrable impact on learner achievement.

- Buckley, Schneider and Shang determined that educator attitudes and behaviours have also been found to be related to the quality of school facilities and that educator retention/attrition decisions were significantly related to the quality of school facilities. Even when controlling for a host of factors, factors that directly affected the quality of educator work life the most also included indoor air quality, thermal controls, noise level and acoustics, adequate classroom lighting and the amount of natural daylight. In addition, educators who perceived a detrimental effect on their health due to building conditions, or who were stressed by high noise levels, poor acoustics, and lack of thermal controls were more likely to seek employment elsewhere.

The foregoing exposition indicates clearly that a relationship exists between school effectiveness and well-maintained school facilities in terms of learner achievement and educator well-being and satisfaction. This then, is the basis on which this research is grounded: *that school facilities maintenance as an integral component of the school's learning programmes must receive priority attention and should be treated as part of the whole school's programmes.*

School facilities maintenance basically relates to the repair, replacement and general upkeep of physical features as found in the school's buildings, grounds and safety systems (Nhlapo, 2006:42). Szuba and Young (2003:43) make the point that maintenance is concerned with ensuring safe conditions for facility users, be they learners, educators, staff, parents or guests. Accordingly, The Organization of American States General Secretariat (1998:1) describes school maintenance as an organisational activity carried out by the school community in order to prolong the life expectancy of school buildings, its furniture and equipment.

Facilities maintenance comprises *emergency* maintenance, *routine* maintenance, *preventive* maintenance and *predictive* maintenance (Sizuba & Young, 2003:74). According to UCSC Physical Plant (2004), emergency maintenance is concerned with the repair or replacement of facility components or equipment requiring immediate attention because the functioning of a critical system is impaired or because health, safety or security of life is endangered.

Routine maintenance refers to the repair, replacement and general upkeep of the grounds and buildings (Carter & Carter, 2001:3). Furthermore, these authors emphasise the fact that routine maintenance allows for the continued use of a space for its intended purpose and serves as an additional manifestation of ownership and caring. Nhlapo (2006:44) makes the point that preventive maintenance is crucial in so far as it ensures that equipment is always in good working order and provides safety for learners. An example could be the maintenance of electric systems in order to avoid and pre-empt unintended injuries that may result from electrocution.

Szuba and Young (2003:74) posit that preventive maintenance is the scheduled maintenance of equipment, such as the replacement of air conditioner filters every ten weeks or the semi-annual inspection of water fountains. Preventive maintenance is crucial in ensuring that equipment is always in good working order and provides safety for learners and educators (Nhlapo, 2006:44).

Szuba and Young (2003:74) describe predictive maintenance as maintenance that forecasts the failure of equipment based on age, user demand and performance measures. This kind of maintenance is rooted in the proper execution of a facilities audit (Gaither, 2003), which aims to assist schools in avoiding emergencies and dramatically reducing damage.

Despite the integral role of school facilities maintenance in the school learning programme and effectiveness, as alluded to earlier in the text, it somehow astounds that not much research has focused on this aspect in South Africa. Some literature deals with facilities maintenance in relation to other aspects of schools, like school culture (Kruger, 2003:7) and in terms of educational

planning and utilisation of physical facilities (Barnard, 2002:489), as well as in matters pertaining to school safety (Xaba, 2006:565).

On the basis of its importance and significance, this research focuses on school facilities maintenance as a significant and important aspect of the learning environment. Szuba and Young (2003:2) opine that school facilities maintenance affects the physical, educational and financial foundation of the school organisation and should be a focus of its day-to-day operations and long-range management priorities. School facilities maintenance should therefore be regarded as an integral and prominent aspect of all school operations and should receive particular attention in all educational planning and development aspects of the school operations.

The Guyana Ministry of Education (2008) aptly describes the phenomenon of a whole-school approach and states that a whole-school approach to school facilities maintenance and improvement and thus, requires that planning becomes coherent and integrated, be part of the life of the school and be related to the school's aim of raising learner achievement. This begins with the school as a whole and emphasises the whole process of change, from defining the need for and the value of policy, through its formulation to its implementation and evaluation. To this end, this study seeks to explore a whole-school approach to school facilities maintenance, which purports to explore facilities maintenance by looking at all aspects of school functioning. For purposes of this study, this raises the following question:

How can a whole-school approach to facilities maintenance be developed at schools?

To answer this question, this study addresses the following questions:

- What is the nature of school facilities maintenance?
- What are the current school facilities maintenance practices at schools?

- How can schools develop a whole-school approach to facilities maintenance?

These questions translate into the research aim as concretised in the following section.

1.2 RESEARCH AIM

The aim of this research was to investigate how facilities maintenance at schools is currently carried out. This aim is conceptualised through the following objectives:

- to determine the nature of school facilities maintenance;
- to investigate the current school facilities maintenance practices at schools; and
- to provide guidelines on how a whole-school approach to facilities maintenance can be developed.

The literature review and the empirical study helped to identify gaps and strengths in practice and thus concretised the above-mentioned objectives and assisted in the development of a whole-school approach to facilities maintenance at schools. For this purpose, a particular research design was employed.

1.3 ASSUMPTIONS

A comprehensive review of South African literature did not yield much information on school facilities maintenance. It was found that only in 1998, did the National Department of Education initiate a process that seeks to develop a policy for the equitable provision of an enabling school physical teaching and learning environment. Thus, in November 1998, the Department gazetted a call for comments on the policy (Republic of South Africa, 2008). Based on these developments, this study is initiated on the basis of the following assumptions:

- School facilities maintenance is recognised as key to facilitating efficient and effective achievement of schools' educational programmes.
- The Department is already spending huge sums of money in trying to renovate and equip schools with facilities (Gower, 1998). Without proper maintenance of such school facilities, the capital expenditure will be a waste of much needed financial resources that could be used to improve the quality of education in general.
- School communities desire well-maintained and functional facilities.
- Well-maintained and functional school facilities have a positive effect on learners' academic achievement.
- Well-maintained school facilities can be a catalyst to ensuring safe and secure school environments.
- A whole-school approach to school facilities maintenance is a necessity for schools to deliver quality education that caters for the holistic performance of a school.

1.4 SIGNIFICANCE OF THE STUDY

Ardé (2008) makes a compelling argument regarding facilities maintenance:

Buildings and the equipment in them were never meant to last forever and the only way to reduce costs is to maintain frequently and introduce more energy-efficient technology and materials when possible to save on operating costs.

In light of this argument, this study assists schools and their communities in establishing and sustaining good practices in so far as facilities maintenance is concerned. The study recognises that a strategic approach is necessary for facilities maintenance in South African schools, and thus presents guidelines to assist schools in developing a whole-school approach that positions facilities maintenance within a strategic planning process. The study also introduces

research into school facilities maintenance into the discipline of Educational Management in South Africa and contributes to practice by drawing from business and industry, as well as from foreign countries' education practices.

1.5 OVERVIEW OF RESEARCH DESIGN AND METHODOLOGY

This study assumes an exploratory stance because a comprehensive search of South African literature yielded very little on facilities maintenance. Most literature sources reviewed are foreign, with a particular proliferation of American literature, where school facilities maintenance is at an advanced level. Consequently, there is no reference to research on facilities maintenance in South Africa. Struwig and Stead (2007:7) describe exploratory research as research into an area that has not been studied, in which the researcher wants to develop initial ideas and a more focussed research question, and in which the researcher investigates a problem about which little is known. A qualitative design is thus engaged.

Qualitative research uses many approaches that are quite different from one another. In this study, ethnographic observations and interviews of a small sample are used for data collection (Struwig & Stead, 2007:7). The former are used to observe features relating to facilities maintenance in terms of buildings (cleanliness, equipment storage and maintenance), grounds (the schools' perimeter fencing, the general layout and landscaping, vegetation and shrubbery), the visibility or obscurity and maintenance of amenities (such as toilets, playgrounds, parking areas as well as the status of equipment and systems). Observations also related to electrical, plumbing, sanitation, waste disposal, heating, ventilation, air conditioning (HVAC), signal and communications, safety and security, landscaping and vehicular systems.

Interviews were used to elicit data on how facilities maintenance at schools was undertaken. An interview schedule with open-ended questions was developed and it focused on the quality of school facilities, school facilities maintenance policies, facilities maintenance planning, monitoring of the conditions of school facilities, personnel responsible for facilities maintenance and school facilities

maintenance programmes/approaches. Participants comprised a purposely and conveniently selected number of schools (for observations) and principals and/or designated facilities maintenance officers (for interviews).

The research design and methodology is detailed in Chapter 3.

1.6 DELIMITATION OF THE STUDY

This study was delimited to the following:

- Only the Gauteng Education Departments' Districts 7 and 8 schools were targeted.
- Focus on the condition of buildings, grounds and systems were in terms of cleanliness and functionality. The technical aspects related to these components of facilities were not investigated as these would require engineering expertise, which are not necessarily expected of school principals and, consequently, the researcher.

1.7 LIMITATIONS OF THE STUDY

This study was limited by the following factors:

- Data collected for analysis was only for the year 2009 and observations were limited to facility conditions at the time of data collection. It is possible that some emergency and corrective maintenance was in progress or would be carried out as a matter of normal school operation during or after the investigations.
- As is typical of qualitative research, conclusions and inferences drawn on the basis of data collected are by no means representative of schools in the district, province or republic. However, useful insights are gained into the state of facilities maintenance at schools.
- The responses from participants could have included attempts as presenting the "good" side of the schools' maintenance operations. However, observations, to a greater extent, do create a balance in this regard.

- Very few literature sources of a South African orientation were available. Consequently, the literature review is heavily biased towards foreign content, especially the United States of America, the United Kingdom and Australia.
- The guidelines for developing a whole school approach to facilities maintenance proposed as a model by the study has not been tested. It however presents a scope future research, especially of a longitudinal nature.

1.8 ORGANISATION OF THE STUDY

The organisation of this research study is presented in the form of a research report, in line with guidelines proffered by Struwig and Stead (2007:208):

Chapter 1 presents the orientation to the study, which basically serves as an introduction detailing the problems statement, research aim, assumptions, delimitation and limitations of the study, significance of the study and an overview of the research design and methodology. Chapter 2 presents the literature review on the nature of school facilities maintenance and Chapter 3 presents the research design and methodology. Chapter 4 focuses on data analysis and interpretation, while Chapter 5 presents the summary, findings and recommendations of the study.

1.9 SUMMARY

This chapter presented the general orientation to the study. The problem statement as outlined details the research problem and questions. The aim and objectives of the study are then presented. The chapter then presents a discussion of assumptions, the study's significance, overview of the research design and methodology, delimitation and limitations.

From the exposition of the problem statement, it is clear that school facilities maintenance is an important component of schools' educational programmes in terms of its effect on learner achievement and educator well-being. This implies

a need for a good understanding and insight into the nature of facilities maintenance. The next chapter presents an exposition of the nature of school facilities, which addresses the second objective of this study.

CHAPTER 2

THE NATURE OF SCHOOL FACILITIES MAINTENANCE

2.1 INTRODUCTION

The previous chapter presented an overview of this study by outlining the research problem statement and the research methodology, which detailed how this study would unfold. This chapter presents the first stage, namely the literature review on the essence of school facilities maintenance. Firstly, facilities maintenance in South African schools is contextualised.

2.2 FACILITIES MAINTENANCE: CONTEXTUALISATION

Facilities maintenance is part of the broader discipline of facilities management. Springer (2004:1.3) sees facilities management as people, process and place, and defines facilities management as playing a role of integrating employees, work processes and workplaces into a coherent, productive and holistic system. In this sense, this implies the coordination of the interface between *what* people do and *where* they do it. Within this exposition, this study views school facilities from the perspective of the school as an organisation.

According to Theron (2007:81), the school organisation is a cooperative social system involving coordinated efforts of two or more people pursuing a shared goal and consists of people standing in relation to one another and acting together to achieve certain common objectives. To this end, the school comprises three components, namely people, facilities and educational programmes. With regards to people, the school comprises staff, learners and parents as immediate stakeholders, facilities comprise buildings, grounds and service systems that make them operational, and educational programmes comprise all curricular activities, including the hidden school curriculum (Janson & Xaba, 2007:134). Therefore facilities management in the school entails the coordination of the interface between activities that people do and the school programmes. Facilities maintenance as part of facilities management entails

ensuring that school facilities support the activities performed at school to attain educational goals.

Sebake, Mphutlane and Gibberd (2006) make the point that in endeavouring to attain educational goals of the school as an organisation, people as users of school facilities, should be comfortable, healthy and productive and have their basic needs met and rights respected. To this end, facilities should inherently be able to perform well by being among others, weather-tight and structurally sound, having low operating costs and being resource-efficient, and the educational programmes should be supported by facilities in a way that, for example, ensures that the curriculum and preferred modes of teaching and learning can be accommodated. Therefore school facilities should be in a condition that promotes educational programmes at schools. The Schedule for the National Policy for an Equitable Provision of an Enabling School Physical Teaching and Learning Environment, Section 4.107 (Republic of South Africa, 2008:25) states as much regarding school facilities:

If well maintained and managed, they (school facilities) provide conducive environments that translate into quality education. If well maintained and utilised, they can realise substantial efficiency gains... Also deepen national and sector values of school-community relationships and community ownership of schools.

Facilities maintenance as a component of facility management is defined in various ways. Among other definitions, Webster's New College Dictionary defines facilities maintenance as "*the upkeep of property or equipment*", which, according to Grasmick, Hall, Collins, Maloney and Puddester (2008:1) implies that maintenance should include actions to prevent a device or component from failing, or to correct the normal degradation of equipment and building systems in order to keep them in proper working condition. In this sense, Hinum (1999:1) points out that the quality and life span of a building are affected by how it is looked after, the ways in which servicing and repairs are carried out, and the rate at which needs and requirements change.

Tsang (1998:88) opines that the definition of maintenance as being concerned with the upkeep of property and equipment is purely tactical and myopic. He asserts that facilities maintenance also has a strategic dimension that covers issues such as the design of facilities and their maintenance programmes, upgrading the knowledge and skills of the workforce, and deployment of tools and “manpower” to perform maintenance work. In support of this assertion, Then (1999:463) points out that, more recently, the shift in facilities maintenance has been towards resource integration with the emphasis on the provision of an enabling working environment where the issues of people, processes and property are elements of the same problem seeking a common solution. To this end, Leung, Lu and Ip (2004:226) espouse facilities maintenance as aiming to provide end-users with a comfortable, effective and quality environment with minimum resources to enhance organisational effectiveness and successfully implement multi-disciplinary activities.

The foregoing views are extended by Sapp and Scientific (2009:1) who state that facilities maintenance includes all services required to assure that the built environment will perform the functions for which a facility was designed and constructed. Thus, maintenance typically includes the day-to-day activities necessary for the building, its systems and equipment to perform their intended functions. Bastidas (1998) relates directly to the school and defines facilities maintenance as a school maintenance programme and states:

A school maintenance programme is an organisational activity carried out by the school community in order to prolong the life expectancy of school buildings, its furniture and equipment ... Maintenance is a continuous operation to keep the school building, furniture, and equipment in the best form for normal use, ... should be systematic and pro-active.

Considering the various definitions described above, it is clear that school facilities maintenance is an important component of the school's pursuit of attaining educational goals. This essentially implies all activities undertaken by the school community in ensuring that school facilities are in a condition that

delivers and supports educational programmes in a continuous and optimum manner. This is even more important when considering facilities maintenance as a legislative and policy requirement.

2.3 LEGISLATIVE AND POLICY REQUIREMENTS FOR SCHOOL FACILITIES MAINTENANCE

According to the White Paper on Education and Training (Republic of South Africa, 1995), the post-apartheid education dispensation in South Africa had to articulate the fundamental principles of transformation in terms of open access, to quality education, redress of educational inequalities, utilisation of state resources to achieve equity, community participation, democratic governance accountability and financial stability. In this regard, the White Paper states:

The present pattern of organization, governance and funding of schools is a patchwork from the past. It contravenes the rights to equality and non-discrimination which the Constitution guarantees.

This policy framework prescribed by the White Paper led to the enactment of various Acts bearing relevance to school facilities maintenance. The most relevant legislative provisions are the South African Schools Act No 84² of 1996, which directly relates to school governance, and the Public Finance Management Act No 1 of 1999.

The Schools Act (Republic of South Africa, 1996) ushered in a new direction in school governance in South Africa. With regard to school governance, the Schools Act prescribes the formation of stakeholder-inclusive and democratically elected school governing bodies (SGBs). The school governing bodies are tasked with numerous key functions, with the main function being that of school governance. To facilitate the performance of this task, Section 34 of Schools Act prescribes that the state must fund public schools from public revenue on an equitable basis in order to ensure the proper exercise of the

² Hereafter referred to as the Schools Act.

rights of learners to education provision and the redress of past inequalities in education.

The Schools Act further prescribes SGB functions that locate the school governance function within two categories of functions translating into schools being classified as Section 20 and Section 21 schools. Regarding school facilities maintenance, Sections 20(1)(g) and 21(1)(a) of the Schools Act respectively state that the SGB must:

administer and control the school's property, and buildings and grounds; and may apply to the Head of Department in writing to be allocated the following function of maintaining and improving the school's property, and buildings and grounds occupied by the school, including school hostels, if applicable.

Clearly, these provisions allude to the facilities maintenance function of SGBs.

The Public Finance Management Act No. 1 of 1999 (PFMA) (Republic of South Africa, 1999) relates to the responsibilities of the principal as the accounting officer at school. According to Section 38(1)(d) of this Act, the accounting officer of any state department or entity is responsible for the management, including the safeguarding and maintenance of the assets as well as of the liabilities of the department or entity and must ensure that processes and procedures ensure the effective, efficient, economical and transparent use of assets. In this sense, the principal is basically charged with the responsibility of ensuring that school facilities are used effectively and efficiently and are well-maintained. This is also in line with Chapter 2, Section 24(a) of the Constitution of the Republic of South Africa (Republic of South Africa, 1996), which states that everyone has the right to an environment that is not harmful to their health or well-being, and, as shall be explained later, facilities maintenance seeks to ensure, among other intentions, that the school environment is safe and not harmful to people's health and well-being.

Although the Schools Act specifically relates to the maintenance of school facilities and the PFMA and the Constitution imply the need for school facilities maintenance, these Acts do not specifically provide policy directives as to school facilities maintenance. In fact, there have not been policy guidelines regarding this phenomenon at schools. Suffice to say that facilities maintenance at schools has been carried out in *ad hoc* ways, and perhaps on the basis of examples of good practice gleaned from other instances, be they in industry or other school situations in and outside the country. It was only in 2008, that the Department of Education published a call for comments on the proposed National Policy for an Equitable Provision of an Enabling School Physical Teaching and Learning Environment (Republic of South Africa, 2008). The proposed framework takes cognisance of the importance of a systematic approach to facilities maintenance at schools. Among other aspects, it makes the following points:

- There is a link between the physical environment learners are taught in, and teaching and learning effectiveness as well as learning outcomes.
- Norms and standards for school safety, functionality, effectiveness and enrichment will be explicitly defined at a national level by the Department of Education.
- By the end of 2010, the Department of Education will have developed a national policy on the management of immovable assets. These will include, efficient, timely and adequate usage and maintenance.
- Within the same time span, the Department of Education will also develop a comprehensive maintenance policy for school infrastructure, basic services, furniture and equipment, (and) will entail norms and standards for preventive and corrective maintenance as well as replacements.

From the proposal set forth in the framework above, it is apparent that school facilities maintenance is only beginning to receive attention in South Africa.

However, it is equally important that, for schools to attain their educational goals, facilities maintenance be regarded as a crucial aspect that cannot be left to the end of 2010. It is therefore essential to explore this phenomenon so as to understand its essence.

As alluded to earlier, facilities maintenance entails much more than just fixing broken equipment. This is expressed in the different categories of facilities maintenance.

2.4 CATEGORIES OF SCHOOL FACILITIES MAINTENANCE

While maintenance is mainly concerned with the repair and fixing of broken equipment, it is important to note that there are various categories of maintenance, which include emergency maintenance, routine maintenance, preventive maintenance, predictive maintenance, corrective maintenance and deferred maintenance (Szuba & Young, 2003:74; Grasmick *et al.* 2008:5; Office of Public School Construction, 2008; Horner, El-Haram & Munns, 1997). These terms are used to describe maintenance needs and many of them have their origins in colloquial derivations, while some reflect the type of condition under which maintenance needs to occur. An exposition of each of these categories is presented in subsequent paragraphs.

2.4.1 Emergency maintenance

According to UCSC Physical Plant (2004), emergency maintenance is concerned with the repair or replacement of facility components or equipment requiring immediate attention because the functioning of a critical system is impaired or because health, safety or security of life is endangered. Independent Schools Queensland (2007:3) refers to this kind of maintenance as response maintenance which is concerned with, for example, electrical faults, storm damage or accidental damage. Alberta Learning Facilities Branch (2004:5) states that emergency maintenance responds to unexpected equipment breakdowns, building component failures and accidental or deliberate vandalism damage.

Asiabaka (2008:18) postulates that emergency maintenance is very common in the management of school facilities in societies where the maintenance culture is not well established and it takes place when a facility breaks down and urgent measures or steps have to be taken to remedy the situation. Asiabaka also points out that emergency maintenance is expensive because, due to lack of regular maintenance, the extent of damage may demand total replacement of the facility or result in high cost of repair and, in some cases, the breakdown may cause injury or even death to staff and or learners of the school, while the resultant effect may be the prevention of the use of the facility for teaching and learning until repairs have been effected.

Grasmick *et al.* (2008:2) term emergency maintenance as reactive maintenance and postulate that it involves no actions or efforts taken to maintain the equipment or building systems. Consequently, Grasmick *et al* argue that in reacting to breakdowns or damage, or if equipment fails during the hours of school operation, the continuity of the educational programme is jeopardised as learners and staff must be relocated, alternative measures be put in place to keep the building in operational condition, or, in the worst instance, the programme is temporarily halted while repairs are in progress. Of note is the fact that the health and safety of building occupants may be jeopardised if the equipment failure affects the electrical, lighting, egress and mobility, or ventilation systems, resulting in, among others, liabilities and potential dissatisfaction of the community at the closure of an educational programme on even a temporary basis.

It is clear that emergency maintenance, while unavoidable due to unforeseen circumstances and conditions that require it, should be minimised through ongoing maintenance of facilities. There should be constant vigilance of school facilities and these facilities should be inspected regularly for any signs of defects that could result in malfunctions that may require emergency maintenance. For example, after a learner was scalded in 1997 by over-heated water in the Maryland State Department of Education, all public school systems were required to sign assurances that the actions for preventing emergencies,

and consequently, emergency maintenance, were taken (Grasmick *et al.*, 2008:14).

Emergency maintenance can be minimised through effective preventive maintenance.

2.4.2 Preventive maintenance

Preventive maintenance is perhaps the most important category of facilities maintenance. To this end, Szuba and Young (2003:74) assert that a good maintenance programme is built on a foundation of preventive maintenance. Preventive maintenance is described as the component of a facilities maintenance system which has as its goal the maximising of the useful life of all building systems before failures occur (Meinig, Crittenden, Morgan & Guess, 1999:5; Carter & Carter 2001:3; Stevenson, 1993:769; Adendorff & De Wit, 1999:306). Meinig *et al.* (1999:5) point out that, at its heart, preventive maintenance asks, "What can I do to make this item, be it an automobile, building or piece of equipment, remain as good as new for as long as possible?" According to Howard (2006:1), the purpose of an effective preventive maintenance plan is to:

- preserve taxpayers' investments in public buildings since preventive maintenance can extend the life of building components, thus sustaining buildings' value and the significant tax funds they represent;
- help buildings function as they were intended and operate at peak efficiency, including minimising energy consumption and because preventive maintenance keeps equipment functioning as designed, it reduces inefficiencies in operations and energy usage;
- prevent failures of building systems that would interrupt occupants' activities and the delivery of public services, because buildings that operate trouble-free allow public employees to do their jobs and serve the public;

- sustain a safe and healthful environment by keeping buildings and their components in good repair and structurally sound; and
- provide maintenance in ways that are cost-effective because preventive maintenance can prevent minor problems from escalating into major system and equipment failures that result in costly repairs.

Mearig *et al.* (1999:5), in recognising that preventive maintenance is usually relegated to a small role which sees it being concerned with periodically scheduled work on selected equipment, usually dynamic, to provide for required inspection, lubrication and adjustment, offer an alternative definition which is all-encompassing:

All activities that can be regularly scheduled to prevent premature failure or to maximise the useful life of a facility, and applies to all building systems and components.

In line with the definition above, the Florida Department of Education (2004:78) asserts that preventive maintenance comprises proactive procedures that are taken to reduce the risk or potential for maintenance-related problems. Kowalski (cited by Paradise, 2006:20) also postulates that preventive maintenance optimises the useful life of equipment in the school's infrastructure. Thus an effective preventive maintenance programme reduces operational cost by reducing expensive emergency repairs to equipment, reducing the accumulation of deferred maintenance and reducing disruption to the operation of the school's infrastructure.

In consideration of the importance of preventive maintenance, it follows that such a maintenance programme should be systematic and well planned. In fact, preventive maintenance can be seen as proactive maintenance aimed at preventing unexpected equipment or building component failure and is performed on regular intervals throughout the school year. Therefore preventive maintenance is planned and not reactive, and is supplemented by routine maintenance.

2.4.3 Routine maintenance

According to Alberta Learning Facilities Branch (2004:5), routine maintenance refers to generally repairing or replacing building components, equipment or operating systems. This includes the general upkeep of the grounds and buildings (Dilworth, 1996:639; Clamp, 1996; Carter & Carter, 2001:3). Furthermore, Carter and Carter (2001:3) posit that routine maintenance allows for the continued use of a space for its intended purpose and serves as an additional manifestation of ownership and caring. This occurs through the regular maintenance of such items as burned-out light bulbs or fluorescent tubes, dripping faucets, worn floor and ceiling tiles and sticking doors and windows, which result from normal building use. In this sense, routine maintenance will normally be performed as expeditiously as possible during normal working hours. Routine maintenance also assists in identifying areas for predictive maintenance.

2.4.4 Predictive maintenance

According to Grasmick *et al.* (2008:4), predictive maintenance is a process of investigation and measurement to detect the onset of equipment or system degradation, thereby allowing stressors to be eliminated or controlled before they cause significant deterioration in the physical state of the components. The results of these investigations will indicate the current and future capability of the equipment or system. Predictive maintenance therefore bases maintenance needs on the actual condition of the equipment or building system and is time-based, with activities (such as changing lubricant) determined by calendar time or equipment run time (Grasmick *et al.* (2008:4).

Predictive maintenance is regarded as the cutting edge of facility management and uses sophisticated computer software to forecast the failure of equipment based on age, user demand and performance measures (Szuba & Young, 2003:74; Akram, Anderson, Arent, Stephan, Ayers & Brittain, 2004:135; Asiabaka, 2008:18). Carter and Carter (2001:3) point out that predictive maintenance enhances opportunities for casual surveillance and access control

of the school facilities. Grasmick *et al.* (2008:4) also indicate that this category of facilities maintenance has numerous advantages for the school. Among others, predictive maintenance:

- increases component operational life and sustainability;
- allows for pre-emptive corrective actions;
- decreases equipment or process downtime;
- ensures better product quality;
- improves worker and environmental safety;
- results in energy savings; and
- generates an estimated 8%-12% cost savings over preventive maintenance programmes.

Therefore predictive maintenance seems to be the key to effective and sustainable school facilities maintenance. Predictive maintenance enhances the conduct of corrective maintenance.

2.4.5 Corrective maintenance

Corrective maintenance is directly related to preventive maintenance and predictive maintenance. Corrective maintenance addresses the deficiencies that inevitably result from unforeseen events, however diligently a preventive maintenance programme is conducted, for example, vandalism, lightning strikes, hail, flooding etc. (Grasmick, *et al.*, 2008:5). Corrective maintenance, however, excludes activities that expand the capacity of an asset or otherwise upgrade the asset to serve needs greater than or different from those originally intended (Grasmick, *et al.*, 2008:5). On the contrary, Hammond Street Developments, 2005:26) argues that corrective maintenance covers the basics of a school maintenance programme. It addresses all the repair needs requested by the school. However, this approach does not call for any checking of services before system failure. Although inexpensive, it therefore poses concerns about short-sightedness of investment in facility management.

2.4.6 Deferred maintenance

Contrary to corrective maintenance, deferred maintenance includes scheduled activities that are delayed or postponed for reasons such as lack of funds or personnel, changes in priorities and change of use (Baltimore County Public Schools, 2007:92). BOMA International (undated) adds that deferred maintenance occurs when preventive maintenance costs are selectively deferred to a future period of time. This approach has merit when a school facility is non-performing or under-performing (that is, when it no longer serves its expected purpose) and when cash preservation is critical. Visser (undated) points out that a common application of deferred maintenance is when a building is being placed in a “mothballed” condition, which is when a building is shut down for a period of time. The building shut-down is typically temporary, with plans to reopen it later. BOMA International (undated) further advises that when the deferred maintenance option is selected, it is important to determine the period during which this approach will be used in advance and at the end of the deferred maintenance period, a one-time cost needs to be calculated to restore the system or equipment to normal operating efficiencies.

There are, however, risks to the deferred maintenance approach. BOMA International (undated) opines that the risk of a deferred maintenance programme lies in the cost of restoring the system/equipment. Nevertheless, with proper planning, the restoration cost of deferred maintenance could be less than the deferred maintenance savings. Another risk is deferring the maintenance beyond the system’s recovery point, and if this happens, the system would need to be replaced or repaired.

The various maintenance categories discussed in the foregoing section are all aimed at ensuring that school facilities are kept in conditions that support and advance the school’s educational programmes. This, in essence, can include the curricular and co-curricular programmes, which really implies maintaining correct school facilities standards.

2.5 SCHOOL FACILITY STANDARDS

Florida Department of Education (2004:17) postulates that, to realise the support and advancement of educational programmes and acceptable standards for the performance of educational facilities, schools should establish standards to institute baseline criteria and benchmarks for maintaining educational facilities, which reflect the expectations of school stakeholders. Furthermore, these standards, which can be considered as criteria for facilities maintenance, form the basis by which maintenance activities can be planned, customised and effectively measured. Florida Department of Education (2004:18) identifies, inter alia, the following standards for facilities maintenance:

- *Safety*, which relates to school facilities being maintained to create a safe learning environment that is free from environmental hazards and occupational risks for learners, staff and the general public. Kilpatrick (2003:12) identifies safety hazards as including the school site location, building design, material selection or poor operational practices. Szuba and Young (2003:53) include operations aimed at dealing with power shortages, handling of hazardous materials, pest management and storage facilities, both above and underground.
- *Sanitation*, which means that school buildings have to be cleaned on a daily basis to promote health and ensure sanitary conditions, especially in classrooms, laboratories, kitchens and other areas that are prone to germs and bacteria. UNICEF (1999:1) points out that after the family, schools are the most important places of learning for children and have a central place in the community. Schools are a stimulating learning environment for children and stimulate or initiate change. Therefore if sanitary facilities in schools are available, schools can act as a model and educators can function as role models. Schools can also influence communities through outreach activities since schools are in touch with a large proportion of the households in a community through their learners. Buchanan (2003) and Szuba and Young (2003:44) refer to sanitation in terms of the “the four horsemen of facilities maintenance”, namely indoor

air quality, asbestos, water management and waste management. These authors advocate the notion of creating environmentally safe schools and posit that one of their chief responsibilities now is to supervise the implementation of numerous environmental regulations governing school facilities and grounds, and to verify compliance with a host of regulations and laws. It is thus incumbent on schools to uphold environmental regulations that ensure that schools comply with laws governing operations related to “the four horsemen of facilities maintenance”.

- **Security**, which means that facilities are maintained in such a manner as to protect occupants, property and equipment from vandalism, theft, intrusion and natural disasters. According to Szuba and Young (2003:62), security includes maintaining locking systems, protecting equipment and ensuring that there are visibility, fire protection, communications systems and systems for crisis management.
- *Functional performance*, which means that all maintenance activities should ensure that buildings, grounds and equipment facilitate the educational process and function in an economic and efficient manner. According to Earthman (2004:26) functional performance implies ensuring human comfort, for example, temperatures within the human comfort range as regulated by appropriate HVAC systems, indoor air quality, including appropriate ventilation and filtering systems, also as regulated by appropriate HVAC systems, lighting, acoustic control, and improving science laboratories and learner capacity in terms of overcrowding for both the primary and secondary schools.
- *Physical condition*, which relates to maintenance operations to ensure that buildings, components and equipment are sound, in good serviceable conditions and otherwise in good working order.
- *Appearance*, which implies that facilities must be maintained to achieve the desired level of appearance expected by a school community.

Based on the standards for facilities maintenance discussed above, it is clear that a concerted facilities maintenance effort is needed and that this should encompass the effective use of all of the emergency, routine, preventive and predictive maintenance categories. This is basically because each maintenance category plays a role in ensuring that school facilities are in a condition that supports the school's educational programmes.

Facilities maintenance clearly has to be a systematic and planned effort that seeks to ensure that all areas of maintenance are covered at school.

2.6 AREAS OF FACILITIES MAINTENANCE

The focus of maintenance at schools includes all facilities. All these components of the school are integral to and facilitate the school environment for delivering the school's educational programmes effectively. Therefore basic knowledge and understanding of these components and their maintenance are essential.

The facilities maintenance areas consist of the school buildings, service systems and grounds.

2.6.1 The school building

The school building includes all constructions at school. For purpose of facilities maintenance, the school building comprises the structure of all buildings. To this end, reference is made to the building envelope, which technically refers to the area that separates the conditioned space of a building from the unconditioned space or outdoors or the outer most layer of windows, walls, floors, roofs and doors (Bastidas, 1998). Gould (2005) likens the building envelope to the skin of the structure, in that just as the skin protects the body from outside elements, a maintained building envelope protects a structure's interior from water, wind and pollution, and maintains a comfortable heating system. It is therefore crucial that the building envelope be well and regularly maintained. In this regard, Bastidas (1998) points out that over time, the school building settles and moves, creating minute stresses at joints in materials that can cause small cracks to appear

which, in most cases, are a normal part of the structure settling in its foundation. For effective maintenance of the school building, regular inspections are thus essential. While experts are needed for such inspections, Bastidas (1998) indicates that inspections should start with simple observations of the inside and outside of the school, simply walking around the interior and the exterior, looking at it carefully.

Vasfaret (2002:6) provides a sample preventive maintenance schedule which includes, inter alia:

- HVAC controls and energy management systems, that relate to all building and system functions being monitored daily to ensure proper operation;
- the fire protection system having daily inspections and corrected immediately in the case of operational faults;
- inspection for burned wired or overheated connections;
- all fixtures being inspected for visible signs of leaking or overheating ballasts, burnt-out bulbs and all motion sensor operations checked daily;
- visual inspection daily by users of the facilities for insect and rodent faeces;
- interior inspection of walls and floors, and review of exterior finishes for graffiti or wall cracking which could include rodent and/or insect access and envelope water-tightness.

In terms of maintenance, walls, floors, roofs, windows and doors require specific maintenance attention.

2.6.1.1 **Walls**

Walls require routine, preventive, corrective and predictive maintenance. According to Bastidas (1998), the biggest threats to the exterior of the school

building are water, wind, sun and saltpeter (in areas near the coast). He advises that a visual inspection of the exterior of the school building should be done to look for changing conditions of the exterior walls and covering, especially inspecting for peeling paint, missing mortar or caulking between masonry joints and cracks that have appeared since the last observations, mildew or mould that grows on walls, bushes and shrubs that touch the school building's exterior, which are all clues that some maintenance action is needed.

The maintenance of walls should be carried out in terms of the interior and exterior of the building. Elghaffar (2007:63) makes the following points about interior walls:

- Maintenance of interior masonry walls is usually minimal unless cracks appear. A vertical crack is caused by differential stress along the base of the wall and may result from simple settlement. Therefore if there is a hairline crack where the walls join other elements, just resealing and repainting will be sufficient.
- Windows should open and close easily and glass windows should be whole, with the sheet of glass fitted into the window frame.
- Sometimes a door starts to stick at a corner due to settlement of the building. If it is not serious, the door can be removed and the sticking edge planed down to relieve the problem. However, if the door is sticking, it could be out of rack, which indicates a more complex problem involving the school building's structural system and should receive corrective or emergency maintenance.

In terms of the exterior of the building, Elghaffar (2007:64) indicates that the basic concerns would be cracking and water intrusion, and that water can erode the mortar and damage the wood siding products. For this reason, wood must be kept coated with a protective film of paint or stain and all joints and openings must be caulked to prevent water intrusion. A periodic check for peeling paint or stains that have worn so thin that the wood grain is exposed and raised is

therefore necessary. This check must look for open joints where water can penetrate and then action must be taken before wood rot sets in. Bastidas (1998), in this regard maintains that the exterior walls of the school building have to be kept clean and free of debris. Leaves and plant materials should be raked away from the walls so that any water that falls there will drain away, and not be retained where it might penetrate the walls and foundation.

2.6.1.2 *Floors*

Similar to the maintenance of walls, the maintenance of floors requires routine, preventive, corrective and predictive maintenance. This essentially implies keeping floors in a condition that ensures their longevity, which includes repairing damaged areas timely, ensuring that the floors are not damaged due to careless use or abuse and checking them for signs of damage. Alberta Learning Facilities Branch (2004:6) terms this the caretaking activities and indicates that these entail cleaning services, including hallways/stairways (daily floor maintenance, inspections, cleaning, vacuuming, removing graffiti, spot-checking lockers) and mechanical area servicing (floor maintenance and low/high dusting).

Hale (2002:1) points out that every day learners, educators and other staff members walk through school doors and throughout the school campus. Dirt, sand, grit and other substances can thus easily be tracked into a building, causing floors to become dirty, unattractive and even hazardous. Thus, Hale is of the opinion that to get the maximum life out of floors, they need to be kept clean and in good shape and, most importantly, that clean floors will help those walking on them to avoid injury.

According to Dolan (2009:1) and Kennedy (2006:1), flooring should be durable enough to withstand heavy use without requiring frequent repairs and regular corrective maintenance. According to Kennedy (2004:1) it does not matter whether the school's floors are covered with carpet or a hard surface such as tiles, maintenance workers have to be vigilant to combat the effects of heavy traffic and keep surfaces clean. In this regard, Wakeham (2003:30) points out

that floors sometimes collapse and this is usually because of inadequate back-filling below the floor, which, he emphasises, is not really a maintenance problem and requires remediation. Wakeham then indicates that the most common maintenance problems relate to tiles becoming loose or cracked or floor screeds cracking. To this end, and if cracks are noticed in the floor, they should be observed over a period of time to see whether they get wider. If they do get wider or the floor starts sinking, remedial action must be taken, which could require re-fixing any loose tiles and hacking up any cracked tiles to replace them to match the existing tiles using tile adhesive. If the screed floor finish is cracked, the cracked area should be broken up and replaced appropriately.

In terms of routine maintenance, Szuba and Young (2003:78) advises that floor mats in the entryways should be shaken out, carpets must be vacuumed daily, a spot remover should be applied as needed, they should be deep cleaned before the start of the school year and during holiday breaks and scrubbed or cleaned twice a year. For hard surfaces, Kennedy (2006:1) and Dolan (2009:1) espouse that maintenance workers should dry-mop and wet-mop at least three times a week and a spot remover should also be applied as needed.

2.6.1.3 **Roofing**

In the case of roof maintenance, unlike with other components of the building envelope, good periodic maintenance of the roof should be followed. This is necessary because the function of the roof is to protect the school building from rain, sun and wind, and roofs are a key part of the school building's waterproofing system (Bastidas, 1998; Milshtein, 2004; Liscum, 2007). Therefore the roof should be kept in good condition.

The roofing of school buildings is usually pitched or flat. According to Bastidas (1998), high winds might tear off roof sheets off a pitched or slanting roof. The occurrence of this is directly related to how well-secured the roofs are and whether they are corroded or not. In the case of flat roofs, rainwater can be impounded on them, gradually working its way through to the school building

below and as such, flat roofs lose their protective covering over time as they are exposed to sun, rain and wind. If there is standing water on a flat roof the day after it rained, it is a strong indication that the roof is experiencing a major drainage problem. Bastidas (1998), Chiodo (2009) and Parkins (2009) recommend that the ridge caps of roofs should be solidly fixed to the roof sheet so that it cannot be peeled off by the wind. Bastidas (1998) also suggests a technique of flashing, which helps to seal out water and is installed where two sections of roof come together. It is also used where something penetrates through the roof line, such a vent pipe or roof ventilation.

Another way of ensuring or extending the life span of the school roof is by painting it. Painting roofs not only makes the building look attractive, but also saves money that would be used to replace or repair damaged roofs (Opel, 2008; Phinney, 2008). In addition to painting the roofs, Hoffmann Architects (1997) indicates that gutters are a part of the roof and they need to be kept clean in order to function properly. In this regard, leaves, debris and plant or tree droppings should be cleaned out regularly because clogged gutters or down-spouts will not work, and water problems are invited into the school building if gutters are left that way. Gutters should also be examined for pinhole leaks or rusted sections that leak water. Gutter brackets should not be broken or rusted, while down-spout pipes should be intact, with no rust, holes or broken sections. Furthermore, Bastidas (1998) maintains that rainwater should flow freely through the gutters and into the down-spouts and, as such, the gutters must be aligned correctly and should slope towards the down spout. Improper alignment should be corrected promptly, as it will defeat the purpose of the gutter system. In the case of double-storey buildings, Bastidas (1998) advises that water from down-spouts must never be allowed to pour directly onto the roof below, but that upper-storey down-spouts should rather be connected to lower-level gutters.

Clearly the measures discussed above are preventive maintenance measures aimed at ensuring that the roof remains in a useful condition and serves its purpose well. Hoffman Architects (1997:2-3) suggests using a checklist for all

items of the roof that need to be inspected and maintained. This is intended to ensure that there is regular observation of the roof condition, which is helpful for school staff who may not be technical experts in this regard.

2.6.1.4 ***Windows and doors***

The primary functions of windows is to allow light into the building and to provide for ventilation, but the most critical issues relating to maintenance concern security and weather protection (Hoffman Architects, 1997:5-1; Milshtein (2004). Consequently, Hoffman Architects (1997:5-6) recommends the following:

- When inspecting the frame, it must be ensured that there are no indications that window frames are not firmly anchored in place. This can be seen by damaged paint or badly broken sealants at the joints between the frame and building wall.
- When large areas of paint have failed and window material is exposed, the coating must be replaced.
- Rust spots on steel frames are an indication of deteriorating metal. In this case preventive and or corrective maintenance must be undertaken.
- Missing screws or bolts must be replaced to prevent damage to the windows.

Milshtein (2004) points out that another challenge for the maintenance of windows concerns breakages, both intentional and unintentional. In this regard, she argues that taking care of this kind of damage quickly is important as it *“keeps things positive for the students”*. To this end, Wakeham (2003:31) advocates that windows and frames should be checked for insect and other damage and be repaired, re-fixed or replaced as necessary. Fixings to hinges, bolts and stays should be checked and re-fixed or tightened as necessary, while any broken panes of glass should be replaced.

According to Hoffman Architects (1997:6-1), the function of doors varies with the occupancy of the building. During periods when the building is open, doors allow entry and keep the weather out, but when the building is unoccupied, doors become an important part of the security system of the building. Furthermore, Hoffman Architects (1997:6-1) indicates that the most important function of doors is that they serve as a means of egress to allow occupants to escape in times of emergency and, for this reason, they must be maintained and kept in working order at all times. Wakeham (2003:31) points out that the most common problems with doors are those affecting the locks and handles where the screws fixing the handles, the lock and the striking plate tend to become loose. These fixtures should be tightened before any damage is done to the door and the screws should be tightened as soon as they become loose. It can thus be deduced that the maintenance of doors relates to making sure that they work perfectly by inspecting and fixing them when they are loose, unsteady, cracked or do not open easily.

The maintenance of school buildings goes hand in hand with the maintenance of school grounds.

2.6.2 Maintenance of grounds

Victoria State Government Department of Education and Training (2006:35) asserts that a well maintained, functional and aesthetic school site has a positive influence on learners' values, behaviour and performance and that school grounds should provide a safe, manageable, pleasant and ecologically responsible outdoor environment. Weidener (2008) and Wood and Littlewood (1996:18) also indicate that school grounds maintenance aims at providing a continuously safe and visually attractive outdoor setting for educational facilities, and accommodating primary or secondary outdoor activities associated with the education process.

According to Szuba and Young (2003:83), the entire school grounds must be properly maintained on a routine and preventive basis. Poorly maintained school grounds can be a death trap for learners who run around within the

school premises, especially in the primary schools. School grounds comprise the full extent of the school property and include sidewalks, driveways, parking lots, the landscape and perimeter fencing (Bastidas, 1998). In fact, school grounds typically consist of the hard and the soft landscape (Wood & Littlewood, 1996:18).

The hard landscape includes surfaces such as sidewalks, driveways and parking lots, footpaths, drain and manhole covers, playground surfaces, steps and grass edges. According to Bastidas (1998), good maintenance means keeping a watchful eye for conditions that may cause tripping hazards or water drainage toward the school building. Bastidas (1998) maintains that any tripping hazards should be eliminated through repair, ramping or clearing and that repairs must also be done if the condition of the material deteriorates and creates an eyesore. Bastidas (1998) indicates that driveways and parking lots are typically built of either paving bricks, concrete or gravel and most important, that all these features require some degree of maintenance. To this end, as posited by Bastidas, gravel driveways often develop ruts and, if severe enough, re-grading may be needed in addition to some gravel. Although concrete is said to be a durable material, it may start to crack as the ground under the driveway shifts slightly.

Soft landscapes include features such as irrigation systems, trees and/or shrubs, flower bed plantings, turf or lawn and climbing plants (Wood & Littlewood, 1996:18; George, 1996:8). According to Wood and Littlewood (1996:19), these features require regular and active maintenance. This is mainly because most soft landscape surfaces are affected by the climate and soil conditions, which are manifested in the rate of plant growth, drainage systems and the surface water control. For this reason, Funnell, Alford, Denegri, Johns, Young, Lucas, Tittman and Wood (1997:42) opine that the school must select, arrange and install plant materials and maintain planting beds, and that each plant species must be given proper attention in order to serve its purpose. Bastidas (1998) is of the same opinion, and emphasises the fact that gardens should be watered and fertilised frequently to cultivate a lovely landscape.

Flower and plant beds should therefore be cleaned and remade, plants pruned, hedges trimmed and grass cut on a regular basis.

Maintenance of soft surfaces also includes turf maintenance, which requires more of the routine maintenance than the other types of maintenance. According to Akram *et al.* (2004:314), beautiful and healthy turf is a function of successful maintenance practices such as mowing, grass-cycling, aeration, monitoring and irrigation. This includes focusing on pest control and fertilising properly.

Equally important is the perimeter fencing of the school. Schools have an obligation to secure their perimeters so that visitor access is limited to approved entranceways (Bastidas, 1998). Accordingly, the fences on these school perimeters also need to be resistant to vandalism and also need to have attractive aesthetic appearances so as to present well-coming environments.

Due to financial constraints, it seems a challenge for schools to erect durable and vandal-resistant fencing. Despite these constraints, a fence is a necessity at a school for various reasons as mentioned before. Purvis (2008: 344) postulates that once a fence is constructed on or around a school property, it has to be maintained or the purpose of the fence will be defeated. Corrective maintenance, preventive maintenance and routine maintenance are therefore, key in maintaining school perimeter fencing. Furthermore, Purvis (2008: 344) postulates that to avoid possible liability issues pertaining to:

“school officials knowing about improper maintenance and someone being injured due to the breach in security, school principals should make provisions for the fence to be checked daily by designated school employees. ... This must be documented, and any defects in the fence should be immediately reported to the appropriate school official or principal, and repairs be made.”

Purvis (2008: 344) points out that such daily inspections help to ensure that the fence is clear of any obstruction, damage, gaps, or any other barriers.

Materials used for fencing vary and schools, based on their circumstances, often have to decide on which material to use. Due to financial constraints, schools have to choose a material that would be durable and maintainable. According to Bastidas, (1998), steel palisade with a rounded top has traditionally been a favourite product but in very recent times it has been overtaken by welded mesh or railing system as the preferred choice of most schools. In South African schools, concrete palisade fencing has become favourable. Regardless of the material used, perimeter fences need to be maintained regularly and typically, painting can go a long way towards ensuring that fencing is in a good condition for a long time (Bastidas, 2009).

The condition of school buildings and grounds should be complemented by the maintenance of service systems.

2.6.3 Maintenance of service systems

The maintenance of service systems and equipment involves formulation of policies that clarify the standards necessary to equip, maintain and operate the school, finance these systems and ensure that these policies are implemented (California Department of Education's School Safety and Violence Prevention Office, undated; Dilworth, 1996:642).

The service systems which might need attention in a school setting include, *inter alia*, mechanical, electrical, plumbing and lighting systems. These systems serve as the "functional arteries" of any modern educational facility, and when properly maintained will help to ensure a minimum of downtime and disruptions to educational activities (Florida Department of Education, 2004: 99; Wargo, 2004; Chase & Aquilano, 1989:757). In this study, electrical, plumbing, HVAC and waste management and disposal systems will be exposed.

2.6.3.1 Maintaining electrical systems

According to Bastidas (1998), the electrical system of the school is somewhat similar to the body's nervous system, with brain and nerves running throughout the school building. The electrical system, in this instance, refers to the main

- checking to make sure that cords and plugs are in good condition, placed away from the flow of traffic, and do not run under carpets or furniture, which can cause them to overheat;
- adding protection by installing a new electrical safety device like an arc fault circuit interrupter to detect and stop electrical arcs that can cause fires since arcs are not detected by most breakers and fuses.

From the exposition above, it cannot be overemphasised that the electrical system is perhaps the most powerful of systems at schools and requires meticulous vigilance and maintenance. The plumbing system is also an important component of school facilities maintenance.

2.6.3.2 *Maintaining plumbing systems*

The plumbing system includes the water supply, soil and waste pipes, sanitary appliances such as toilets and basins, and fittings such as taps, stop-cocks and stop valves (Wakeham, 2003:34). According to Schonberger and Knod (1994:581), most components of plumbing systems are embedded in the walls and floors of modern school facilities. Most school buildings rely on serviceable plumbing lines and fixtures to deliver fresh water for primary building functions such as toilets, sinks, showers, drinking fountains, grounds irrigation and fire suppression systems (Florida Department of Education, 2004:105). Wakeham (2003:34) makes the following assertions about plumbing systems at schools:

- If the school has a piped water supply from whatever source, the water supply pipes will be either galvanised steel or plastic and leaks in both sorts of pipes are common and usually require the services of a plumber to rectify them.
- The school should have a main stop-cock in order that the water supply can be cut off when the repairs are being made, so that the maintenance staff should check whether there is a stop-cock on the main supply pipe and if not, employ a plumber to fit one.

- Plastic pipes, especially if they are the least expensive type, are quite brittle and easily damaged and should be protected by either being buried if outside the building, or concealed in the walls if inside the building.
- The most common problems associated with water supply systems are leaking or broken taps over the water tanks, which are usually because the washers in the taps are worn. This should be fixed by replacing the washers or replacing the taps.

Furthermore, in the normal course of operations, pipes leak, burst and get clogged, fixtures break and other circumstances occur that could adversely impact the educational process (Schonberger & Knod, 1994:581). In that case, Coll and McCarthy Architects (1998:6-06) postulate that leaks should be repaired promptly, old water cisterns should be replaced and burst pipes should be replaced – preferably with plastic ones. Furthermore, blockages should be cleared. The same maintenance activities should be performed in the case of drainage pipe leaks and/or damage.

Another area of maintenance relates to the waste collection system. According to Bastidas (1998), the waste collection system consists of a series of large pipes that gather the used water from all fixtures and transport it out of the school to a treatment system. Since the pipes are large and because, unlike the water supply, the waste collection system operates by gravity flow, more often than not, leaks are not noticeable. Therefore preventive maintenance requires a periodic look under lavatories and sinks to see whether there is any water indicating leakage or damage. However, the most common problems experienced with waste lines are blockages. Bastidas (1998) makes the point that paper or other objects can become stuck in the wasteline, totally blocking the flow of water, and waste water will back up into the fixture served by the section of the piping, and may even overflow. To clean the obstruction, a special tool has to be used. In case of a school that has a septic tank, this tank should be inspected every year, cleaned and flushed out at least every four

years and it must be ensured that the access cover should fit properly, be in good condition, and removable for cleaning (Bastidas, 1998).

Wakeham (2003:38) also adds maintenance of the main water supply pipe and any outside standpipes or taps. These should be checked every month for leaks and if there are any leaks to pipes they should be repaired as described in plumbing above and, similarly, any taps that are leaking should have their washers changed or replaced.

The leaks in the plumbing system should be attended to in the same way that gas leaks would be treated.

2.6.3.3 *Maintenance of heating, ventilation and air-conditioning systems*

Preventive maintenance is essential for the proper functioning of HVAC systems' equipment. In this regard, Suttel (2006) asserts that if preventive maintenance is not performed regularly or if it is done haphazardly, the equipment will require extensive and costly repairs at a later date.

According to Suttel (2006), preventive maintenance programmes of air conditioning and heating equipment include regular inspections each year during which proper operation of the equipment is checked and verified. Since all mechanical equipment is designed to operate within certain limits, HVAC equipment is no exception, and if not properly maintained, the equipment will exceed its design limitations with the result being equipment failure. Therefore, the best insurance against HVAC failure and cost containment is preventive maintenance. The following components of the HVAC system need regular attention:

- *Filters*

When air filters are not replaced, they clog and become coated with dirt. This dirt reduces the amount of air through the unit below the design limit, leading to catastrophic failure (Ashworth, 2008).

- *Drive belts*

Suttel (2006) asserts that loose or broken drive belts cause the same problems that dirty filters cause. They cause the airflow through the equipment to be reduced below design limits. In addition, loose drive belts slip on the pulleys and this wears a groove in the pulley so that when the belt is replaced, the new belt is ruined in a shorter period of time by the worn pulleys. Once again, Suttel (2006) warns that during preventive maintenance, drive belts must be replaced or else more money will be spent on replacing pulleys.

- *Condenser coil*

According to Ashworth (2008), air conditioning equipment is designed to operate between certain outdoor temperature limits. Cooling and condensing of the refrigerant vapour is designed to occur with a particular volume of air flowing through the condenser at a maximum outdoor ambient temperature. Furthermore, Ashworth warns that if the finned surfaces of the outdoor coils are fouled with dirt, the ability of these coils to transfer heat is reduced and the airflow through the condenser coil is reduced (blocked by dirt and dust). In this regard, Alani, Tattersall and Okoroh (2002:178) point out that when the ability to transfer heat is reduced, the operating temperatures and pressures of the air conditioning unit increase, which brings about a strong reason for preventive maintenance.

- *Bearings and rotating components*

Bearings and other rotating parts are designed to have a useful life span of hundreds of thousands of hours, provided they are lubricated at appropriate intervals and are not overloaded due to vibration from defective drive belts or dirty blower wheels (Suttel, 2006). If bearings are not lubricated regularly, they overheat and eventually seize (Leung *et al.*, 2004; Ashworth, 2008). When this occurs, the bearings fall apart, and the blower wheel, shaft, and housing are destroyed, and this is a prime example of a situation where inexpensive preventive maintenance is neglected with catastrophic results.

2.6.3.4 **Waste management**

Akram *et al.* (2004:220) posit that statistics show that schools today each generate approximately 4.4 kg of garbage per day. In addition to solid waste, schools must dispose of hazardous waste. Furthermore, all forms of disposal negatively impact the environment and public health, degrading water, air and soil quality (by proper and improper waste disposal). UNICEF (1999:51) adds that indeed poor garbage disposal may also lead to fly breeding and to the attraction of vermin, and these situations can contribute to the transmission of diseases. For these reasons, waste reduction and maintenance processes are necessary pollution prevention strategies that promote the conservation of energy and their natural resources, while providing a healthier, more sustainable school environment. Therefore garbage needs to be dealt with in a safe way.

In addition to the environmental benefits, Akram *et al.* (2004:216) advises that a focus on waste reduction and material efficiency can lead to an important cost saving exercise. UNICEF (1999:51) posits that space for garbage disposal is sometimes a problem and in such cases, older learners are to take the garbage to the municipality if it is not collected. These older learners can also help with the selection of material for recycling. Furthermore, the best way of managing waste in an efficient way is to:

- empty the trash cans from the classrooms, offices, bathrooms, tuckshops and outdoor areas on a daily basis;
- let educators help with identifying recyclable and compostable materials so that these do not end up in trash cans;
- not overload trash cans and bags; and
- ensure that the trash bags and other waste materials are collected by the local municipality and/or the company hired by the school to collect the garbage on the days negotiated by the school management.

Another way of waste management is recycling. In this regard, staff should have a clear idea of the main types and amounts of waste that are generated

on the school site. For this reason, recycling programmes should target these areas (Akram *et al.*, 2004:219), which mostly relate to recycling programmes that generally include recycling of paper, plastics and organic materials.

School facilities maintenance is not without challenges. The next section highlights general challenges regarding facilities maintenance at schools.

2.7 Challenges regarding facilities maintenance at schools

There are numerous challenges regarding facilities maintenance at schools. Some of these challenges are as a result of backlogs created by deferred maintenance, for instance, efficient plumbing systems are essential for smooth facility operation, but too often they are overlooked until a problem arises (Westerkamp, 2000). Among other challenges, the following are prominent:

- **Maintenance activities are not documented**

Hopkinson (2008) opines that most of the challenges with facilities maintenance stem from poor documentation. Adding to this opinion, PharmOut (2007:6) asserts that documents such as policies, procedures and work instructions should exist for all maintenance activities. The documentation system must, however, be kept simple. It should indicate what the maintenance staff is going to do and must do exactly as prescribed (Adams, 2008).

- **Maintenance plans are not updated**

Howard (2006) is of the opinion that preventive maintenance requires strategic actions for prolonging the life of school facilities components and, as a baseline for planning, facilities managers should prepare and periodically update an inventory of facility components and their conditions. By so doing, the maintenance staff can then better identify maintenance needs, determine their costs and set priorities. Well-structured preventive maintenance, incorporated into ongoing maintenance programmes, therefore offers the best chance for achieving intended results.

- **Maintenance staff is not properly trained**

A study by Kommunikation (2003) found that schools in many countries are not safe for children due to neglect of the operation and maintenance of facilities. In addition there has been a lack of hygiene education for learners. The study also found that if the maintenance staff is not properly trained and other school personnel lack commitment, an unhealthy physical environment will be created. Lack of proper training becomes evident when compounds and classrooms are not clean, toilets do not work and are kept in poor condition, when there is an absence of convenient hand washing facilities and lack of safe drinking water.

These challenges are sometimes compounded by the lack of clean and convenient use of water and sanitation facilities by all learners and staff and the lack of roles for older learners to help and monitor the younger learners in using facilities and maintaining school cleanliness (Smith & Lewis, 2008). According to McCall (1997:4), untrained personnel, including the principal, will allow school facilities to degenerate to a crisis situation. The message sent to learners forced to attend school in shabby, overcrowded buildings is that nobody cares about, nor expect very much from them.

Schools therefore have a responsibility to make sure that their maintenance employees receive the necessary training beyond occupational licensure requirements, and for cost-effective decisions the school principal and the school governing body should include appropriate maintenance personnel in considering long-term maintenance needs in addition to initial project costs (Howard, 2006).

- **Inadequate funding for facilities maintenance**

The budget allocated for facilities maintenance in schools is usually inadequate. In most cases, the Departments of Education take responsibility for the expenditure of major repairs or replacements of existing school building components so that the education process may safely continue (Office of Public School Construction, 2008). Although this might sound responsible, it still poses

a challenge because the Department waits until more or excessive damage is done before giving attention to a problematic component of the building. Because of deferral, the repairs become costly (Goldstein, 2007). Preventive maintenance is undoubtedly the best in terms of saving funds for the school and the Department of Education.

- **Equipment documentation is not readily accessible**

According to PharmOut (2007:6), the ideal situation is for all the documentation for equipment to be in the hands of the maintenance staff before maintenance work is carried out. The documentation should include, the manufacturer's operation manual, installation manual, service manual, details of the validated state of the equipment, for example, the settings used, any maintenance records, any work instructions or procedures covering the use of the equipment, engineering drawings and process and instrument diagrams.

To be able to confront and address the challenges listed above, schools should have a way of approaching facilities maintenance.

2.8 APPROACHING FACILITIES MAINTENANCE

From the previous sections, it is clear that facilities maintenance is concerned with much more than just the repair and upkeep of school facilities. Because school facilities are an integral part of achieving the school's educational goals, facilities maintenance must be approached in a manner that positions it within the school's programmes. To achieve this, facilities maintenance should form part of the school's development programmes. Because a school is an organisation consisting of people working together towards the achievement of a common goal, the school should develop a strategy for facilities maintenance, which strategy will be a product of the involvement of all people involved in the school in their pursuit of common educational goals (cf. The Guyana Ministry of Education, 2009). To this end, there is a need for a facilities maintenance programme that is coherent and integrated, that is part of the school life and is related to the school's aim of achieving educational goals. Such an approach

begins with the school as a whole, and emphasises the whole process of change, from defining the need for and the value of the programme, through its formulation, to its implementation and evaluation (The Guyana Ministry of Education, 2009).

Approaching school facilities maintenance requires a focus on three components namely, organisation, inspection and maintenance planning.

2.8.1 Organisation

Organisation relates to creating an organisational structure for the school maintenance programme (Elghaffar, 2007:60). According to Bastidas (1998), the organisational structure of the school maintenance programme should clearly define duties and responsibilities, and should vary with the complexity of the school community. The success of a school maintenance programme also depends on the school community's ability to be organised and keep track of all activities included in the programme. Since school facilities management is the responsibility of the SGB in terms of its school governance responsibilities, it follows that the onus for the establishment of the School Facilities Maintenance Committee is vested in the SGB. Accordingly then, Wakeham (2003:4) maintains that the school maintenance programme should be managed and a committee should be set up to be responsible for maintenance. To this end, Bastidas (1998) postulates that avoiding large and complex structures is highly recommended and principals, representatives from parent-teacher associations, learners and any other school organisation should be responsible for establishing the school maintenance programme. Wakeham (2003:5) contends that the School Facilities Maintenance Committee should appoint a member of the community to be chairman of the maintenance committee and be the point of contact for the community and staff members and learners on maintenance matters, a secretary, a treasurer and members from the community and the school staff.

A variation in this committee setup is that the committee should be chaired by a parent-member of the SGB as required of any sub-committee of the SGB by the

Schools Act. The maintenance committee should then be responsible for ensuring that maintenance and repairs are carried out on a regular basis or when necessary, raising funds for maintenance, educating staff, the community and pupils on how to look after the buildings properly as well as accounting for the expenditure of funds on maintenance.

Clearly from the foregoing assertion, a maintenance programme should be comprehensive. Building Educational Schools Together (BEST) (2006:23) suggests a comprehensive maintenance plan which has as its aim to help maintain a positive learning environment, maintain the asset value of the property, eliminate or reduce the number of fires, accidents and other safety-related hazards in or on the property, provide buildings that function efficiently, enable the continuous use of the school building without disruption to educational programmes and services and conserve energy.

BEST (2006:24) adds that the comprehensive maintenance plan should generally include information pertaining to:

- staffing and staff members' respective activities and responsibilities;
- services provided by school district staff and those that are performed under contract;
- an inventory of the facilities and their condition;
- a schedule for preventive maintenance for various building systems and/or components as well as a schedule for potential replacement;
- the process and procedure for unscheduled maintenance and the handling of work orders;
- a description of scheduled and/or unscheduled maintenance work that has been deferred due to lack of funds or personnel and/or changes in priorities;
- budget information for the overall operation of the maintenance department and the implementation of the plan; and

- a description of the process, procedure and timeline for community participation in the development of the plan.

As with any committee or organisational structure, the School Facilities Maintenance Committee should have a leader or coordinator. Bastidas (1998) recommends that a school maintenance programme's basic organisational structure should include a general coordinator, a fund-raising coordinator, and a team responsible for every area of the school building. He further suggests that the general coordinator, who could be the principal or the parent-teacher association president, will be responsible for scheduling inspection activities to be carried out by the teams, collecting information, preparing a school building analysis report and preparing the annual school maintenance plan, while the fund-raising coordinator will plan activities to raise funds to be used for the day-to-day maintenance and minor repairs carried out by the school.

According to Sullivan, Pugh, Melendes and Hunt (2004:3.1), the outcome of creating an organisational structure for the facilities maintenance programme are:

- *Administration*, which relates to ensuring effective implementation and control of maintenance activities;
- *Work control system*, which implies controlling the performance of maintenance in an efficient and safe manner so that economical, safe and reliable plant operation is optimised;
- *Conduct of maintenance*, which relates to conducting maintenance in a safe and efficient manner;
- *Preventive maintenance*, which relates to contributing to optimum performance and reliability of plant systems and equipment;
- *Maintenance procedures and documentation*, which means providing directions, when appropriate, for the performance of work and to ensure that maintenance is performed safely and efficiently.

Once the organisational structure for the facilities maintenance programme is set up, the next focus area is the inspection. This is because the inspection of school facilities is necessary for any form of maintenance.

2.8.2 Inspection

Inspection relates to a preliminary school building examination conducted in order to prepare a school maintenance plan and, most importantly, gather information during the preliminary school building inspection to form the basis for the maintenance programme (Bastidas, 1998). In essence, the preliminary inspection is intended to assist in the evaluation of the overall condition of the school building and should be a continuous process in order to update the school maintenance programme. Mearig *et al.* (1999:7) add identifying facility systems and components that should be included in a school maintenance programme.

Building inspections need to be well planned. This is because, as pointed out by Howard (2006:3), the process of inspection can be time-consuming and costly, and thus the use of standardised methods is recommended as such methods enable data collected in one year to be reliably compared to data collected in subsequent years. Also, because principals and personnel at schools are generally not suitably qualified for most facilities maintenance activities, it is imperative that there is a way of assisting them in terms of basic knowledge for maintenance functions. The maintenance procedures and documentation mentioned above serve this purpose to a large extent. This can however, be supplemented with the use of generally accepted checklists for facilities inspections. Various forms of inspection checklists can be used for this purpose. Following are some of the checklists that can be useful to School Facilities Maintenance Committees as proposed by Bastidas (1998):

Checklist 1: Checklist for the school building structure

SCHOOL BUILDING STRUCTURE				
Name of school:			Date of inspection:	
Name of community:			Name of person who filled out the form:	
Component	Conditions		Remarks	Location
<i>Identify the specific item accordingly with a description. Leave blank if the item does not exist.</i>	<i>Choose one.</i>		<i>If unsatisfactory, describe the problem.</i>	<i>Where is the unsatisfactory component located in the school building?</i>
	<i>Satisfactory</i>	<i>Not Satisfactory</i>		
Columns				
Beams				
Structural walls				
Ground floor				
Upper floor				
Roof structure				
Stairs				

Checklist 2: Checklist for the roofing

SCHOOL BUILDING ROOFING				
Name of school:			Date of inspection:	
Name of community:			Name of person who filled out the form:	
<i>Identify the specific item accordingly with a description. Leave blank if the item does not exist.</i>	<i>Choose one.</i>		<i>If unsatisfactory, describe the problem.</i>	<i>Where is the unsatisfactory component located in the school building?</i>
	<i>Satisfactory</i>	<i>Not Satisfactory</i>		
Roof covering				
Flashing				
Gutters				
Down-spouts				
Flat roof protection				
Other				
General Remarks:				

Checklist 3: Checklist for the building exterior

SCHOOL BUILDING EXTERIOR				
Name of school:			Date of inspection:	
Name of community:			Name of person who filled out the form:	
<i>Identify the specific item accordingly with a description. Leave blank if the item does not exist.</i>	<i>Choose one.</i>		<i>If unsatisfactory, describe the problem.</i>	<i>Where is the unsatisfactory component located in the school building?</i>
	<i>Satisfactory</i>	<i>Not Satisfactory</i>		
Exterior walls				
Exterior windows				
Exterior doors				
Corridor railings and posts				
Other				
General Remarks:				

Checklist 4: Checklist for electrical systems

SCHOOL BUILDING ELECTRICAL SYSTEM				
Name of school:			Date of inspection:	
Name of community:			Name of person who filled out the form:	
<i>Identify the specific item accordingly with a description. Leave blank if the item does not exist.</i>	<i>Choose one.</i>		<i>If unsatisfactory, describe the problem.</i>	<i>Where is the unsatisfactory component located in the school building?</i>
	<i>Satisfactory</i>	<i>Not Satisfactory</i>		
Service entrance cable				
Main panel box				
Circuits and conductors				
Outlets and switches				
Interior lighting (lamps and bulbs)				
Exterior lighting				
Electrical equipments				
Other				
General Remarks:				

The checklists illustrated above are designed to focus on particular areas of the school facilities. However, this may result in many checklists being used and may require many people to handle them, which may be time-consuming. It may also be difficult in South Africa because schools do not have adequate facilities maintenance personnel sections or departments. Consequently, a

comprehensive, yet simple checklist could be desirable for ease of use in this case. Checklist 5 illustrates a typical comprehensive checklist for facilities maintenance as proposed by Coll and McCarthy Architects (1998:CK-01).

Checklist 5: Maintenance Checklists

Annual Maintenance Checklist (Page 1 of 2) Date:	Done		Comments
	Initials	Date	
<ul style="list-style-type: none"> • Check roof for slipped or broken or missing slates or tiles. • Check the roof for defective flashing. • Check the operation of ball valves in water tanks in the roof void. • Check all accessible timbers for signs of dry rot,- dampness, mould or fungus growth. • Check all external timbers for signs of decay – wet rot. • Check all accessible timbers for signs of woodworm. • Areas affected with condensation should be treated with a fungicidal wash. • Check surrounds to window and door frames for signs of dampness. • Check timber/concrete floors for signs of dampness and staining on walls. • Control climbing plants; keep away from window and door frames and down from eaves level. • Check the putty in doors and windows. • Clean carpets with high performance hot water extraction equipment. • Have septic tank desludged. 			

Maintenance Checklists (Cont.)

Annual Maintenance Checklist (Page 2 of 2) Date:	Done		Comments
	Initials	Date	
<ul style="list-style-type: none"> • Check all electrical appliances, e.g. radios, overhead projectors, photocopiers, hand-driers. If in doubt, have inspected by suitably qualified person. • Check cloakroom fixtures: rails, benches, hanging fixtures. Repair/renew damage or defects as appropriate. • Check any trees on school grounds for problems with overhanging branches or threat to power lines. • Repair/replace, as appropriate, damaged or lifting tiles or floor coverings. • Check goalposts, crossbars, basketball nets, backboards and roofs and all other major items of P.E. and sports equipment. • Check door closers and adjust if necessary. • Renew chalkboard surfaces. • Check all boundary walls, hedges, fences for damage or breaks and repair as necessary. • Update master maintenance "To Do" sheet as necessary. Add new items requiring action. "Sign Off" any actions completed 			

Checklist 6 Maintenance Checklists

Weekly Maintenance Checklist: Week Ending Friday:	Done		Comments
	Initials	Date	
<ul style="list-style-type: none"> • Vacuum carpets not vacuumed daily (i.e. in less heavily trafficked areas, such as classrooms and staffrooms) using a rotary brush vacuum cleaner. • Wash hand basins and sinks. • Clean toilets and urinals. • Check heating oil levels during the heating season • Cut grass during the growing season • Maintain shrubs and flowerbeds during the growing season. • Carry out general "walk around" inspection of school and grounds. Note any items requiring action. • Update Master maintenance "To Do" sheet as necessary. Add new items requiring action. "Sign Off" any actions completed today. 			

Checklist 7 Maintenance Checklists

Six- Monthly Maintenance Checklist: Date:	Done		Comments
	Initials	Date	
<ul style="list-style-type: none"> • Clean gutters. • Check rainwater outlets on flat roofs. • Clean rainwater downpipes. • Clean windows • Clean blinds. • Check all tables and chairs for damage to legs or tops, and repair, if necessary. • Check all school furniture for damage to castors, shelves, tops. • Scrub linoleum or vinyl flooring and reapply recommended protective covering. • Check external paving surfaces; replace or repair any damage immediately. • Clean all gullies, access junctions and manholes for blockages. • Check septic tank, where present. If necessary, have tank desludged, preferably not during school hours. Desludging should be carried out by a competent contractor and rigorous safety procedures followed. • Cut hedges at start and end of growing season. • Check all toilet roll holders, towel rails, soap dispensers. • Check for vermin and deal with appropriately. • Update Master maintenance "To Do" sheet as necessary. Add new items requiring actions. "Sign Off" any actions completed today. 			

Checklist 8 Maintenance Checklists

Every 5 -7 Years Maintenance Checklist Date:	Done		Comments
	Initials	Date	
<ul style="list-style-type: none"> • Paint internally and externally • Update master maintenance "To Do" sheet as necessary. Add new items requiring action. "Sign Off" any actions completed 			

Creating an organisational structure for facilities maintenance and conducting an inspection of school facilities facilitates the maintenance planning process.

2.8.3 Facilities maintenance planning

Out of the categories of facilities maintenance discussed earlier, preventive maintenance seems to be the key category for ensuring that school facilities are in a condition suitable for learning and teaching. Buchanan (2003:4) points out that the key to preventive maintenance is good planning, which Szuba and Young (2003:14) describe as "the formulation of a strategy for getting an organisation from the here and now, to the future". Facilities maintenance planning is thus a process with an underlying purpose of achieving better use of school facilities and of minimising the cost of resources tied up in grounds and buildings (Scottish Executive, 2003:7). According to Lavy and Bilbo (2008:8), effective maintenance planning requires the following:

- a well-conceived, formulated and written school facilities maintenance plan as an essential component for an effective school program;
- making facilities maintenance planning one component of a greater organisational management plan;
- ensuring that facilities maintenance planning includes long- and short-term plans, which demonstrate organisational commitment to facilities maintenance;

- ensuring that the maintenance plans are periodically updated; and
- including stakeholders, school managers, maintenance and custodial representatives, educators, parents and learners in the maintenance planning process.

Because facilities maintenance planning, as alluded to above, has to do with the formulation of a strategy, it stands to reason that the process of planning itself is a strategic one. According to Scottish Executive (2003:6), the plan should list activities and related procedures that are currently in place and operational, and those that are proposals, with actual achievements appropriately evidenced. Facilities maintenance planning should thus unfold systematically in well-defined stages. This implies that the strategic facilities maintenance plan must follow a clear and logical sequence of steps, setting out policy in relation to the management of education property and clearly differentiating between objectives. It should be a strategic document with explicit commitment to its use. It is therefore clear that the facilities maintenance planning process unfolds in sequential stages, in this case, definition of the school's objectives, assessment of current position, consideration of options, development of the plan, implementation and monitoring, review and evaluation.

2.8.3.1 Stage 1: Defining school objectives

Defining school objectives relates to a definition of local school objectives, reflecting the strategy and local circumstance strategically and taking account of the wider picture, the long term and sustainability of strategies and involving the identification of stakeholders, roles and responsibilities and the scope of the plan reflecting school policies and circumstances (Scottish Executive, 2003:7). Furthermore, the aims and objectives should be clearly set out and integrated into a policy framework that identifies assumptions, strategic issues and stakeholders.

Examples of objectives could be to optimise building operations to reduce operating costs, address complaints from occupants regarding air quality or

comfort, create a model facility, and improve facility maintenance, including reducing emergency trouble calls (Sullivan *et al.*, 2004:75). Objectives can also include ensuring that facilities maintenance is a component of the learning programme of the school.

Szuba and Young (2003:16) see this step as the first and most important step in the planning process and regard it as aiming at achieving agreement on the desired outcomes of the organisation's efforts, that is, what the school is hoping the plans will lead to in the future. This implies a vision statement, out of which objectives flow, and it helps to focus facilities maintenance policies, procedures and day-to-day operations on the needs of the larger organisation.

2.8.3.2 Stage 2: Assessment of current position

This stage relates to the assessment, evaluation or audit of the state of the school's current facilities and maintenance. According to Scottish Executive (2003:7), this entails an audit of the existing school property – taking into account the conditions, sufficiency, suitability, life cycle management and design – and the extent to which it currently meets the objectives. Szuba and Young (2003:26) regard a facility audit or inventory as a comprehensive review of a facility's assets, and therefore facility audits are a standard method for establishing baseline information about the components, policies and procedures of a new or existing facility and a way of determining the "status" of the facility at a given time – that is, it provides a snapshot of how the various systems and components are operating. These authors contend that the primary objective of a facility audit is to measure the value of an aging asset relative to the cost of replacing that asset. Thus, facilities audits are a tool for projecting future maintenance costs.

Hammond Street Developments (2005:2) postulates that the primary goal in maintenance auditing is to provide an organisation with the information it needs to create maintenance programmes that use available funds to meet organisational objectives most effectively. Roper, Kim and Lee (2009:11) assert

that it should also address the evaluation of the current facilities and the conceptualisation, planning and implementation of new facilities.

According to Szuba and Young (2003:27), facilities audits are accomplished by assessing buildings, grounds and equipment, documenting the findings and recommending service options to increase efficiency, reduce waste and save money, thus providing the landscape against which all facilities maintenance efforts and planning occur. In conducting facilities audits, using standardised methods, condition data collected in one year can be reliably compared to data collected in subsequent years. Written guidelines, an overview of sufficiency and suitability, information on school enrolments and other essential but core data, as well as an overview of priorities and statement of the most serious and urgent needs can be useful in facilities audits (Scottish Executive, 2003:7; Howard, 2006:3).

2.8.3.3 Stage 3: Consideration of options

Once a clear definition of the facilities situation at a school has been established, stage three begins with the consideration of balancing current facilities' needs with long-term needs and issues (Roper *et al.*, 2009:12). This stage must identify and assess the range of options available to meet the facilities maintenance objectives and each option needs to be appraised, by considering the costs and benefits of each option over the short and long term, taking resources into account, and identifying the option that offers the best solution (Scottish Executive, 2003:14).

According to Howard (2006:4), adequate planning involves setting priorities to target resources toward the highest needs and also requires analytical tools to determine components' full costs, including expected maintenance over their projected lifetimes. Howard (2006:5) further opines that, because maintenance needs can outpace available resources, good planning requires a process for ranking maintenance projects, including preventive maintenance, general maintenance and projects necessary to correct deficiencies. This is because a ranking process recognises that not all projects share equal importance, for

instance, some projects left undone would involve too great a risk to building occupants' safety or could result in premature and expensive equipment failure. To this end, Howard (2006:5) asserts that conditions that pose no immediate threat, but may endanger the future integrity of other building components could receive somewhat lower priority than those that threaten occupants' safety.

In considering various options for facilities maintenance planning, an important aspect to be contemplated relates to maintenance staff training. Grasmick *et al.* (2008:8) regard staff training learning opportunities designed specifically to help an employee do his/or her job better, and includes expanding the worker's knowledge and awareness of areas outside of their specific job duties, yet still related to the overall well-being of the school. According to Szuba and Young (2003:111), staff training can include, *inter alia*, training on equipment instructions, task-oriented lessons and expectations of what is to be done and work evaluation information, with the purpose of ensuring that staff stay safe. Training may also include teaching staff how to deal with changing facilities needs, providing a stimulating experience to people who perform repetitive tasks, thereby improving staff morale and retention rates, preparing staff for the future and promotions.

2.8.3.4 Stage 4: Development of the facilities maintenance plan

According to Roper *et al.* (2009:14) the plan needs to be detailed and long term, although the level of detail will inevitably be greater in the initial years of the plan. This involves thinking through the preferred options with sufficient detail in the earlier years to base them on. Furthermore, this process might include procurement and funding matters, including revenue implications, medium- and long-term expenditure plans, and resources of funding and other finance-related issues.

According to Baltimore County Public Schools (2007), the maintenance plan is designed to extend the life of facilities, building systems and equipment. It also ensures that the equipment and systems operate at optimum efficiency and that potential problems are identified at an early stage before they become

expensive emergencies and disrupt the learning environment. For instance, in creating a maintenance plan for a school's building envelope, the plan should cover all exterior elements of the structure namely, roof, windows, exterior walls, foundation and doors (Gould, 2005). Furthermore, Gould (2005) also suggests that the plan should recognise seemingly small but important factors, such as proper drainage, plant overgrowth and pest problems, as well as recommend funding and clearly state the frequency with which inspections should be and are being performed. It also helps to include the tasks that can be performed in-house and those that require outside inspection and maintenance. Similarly, Paige, Whitehurst and Plisko (2003:12) assert that, unless facilities maintenance planning is a component of the school's development planning, it is doomed to failure because the plan is the blueprint for daily decision-making within the school premises.

Paige *et al.*, (2003:12) opine that a good plan includes short- and long-term objectives, budgets and time frames, all of which demonstrate the school's commitment to facilities maintenance. Priestly (1997:12) views a well constructed maintenance plan as the one that will ensure that future maintenance needs and costs are known, so that management's attention can be focused on such costs and they can take action to minimise or eliminate them, while giving appropriate priority to important aspects of maintenance, and using scarce financial resources effectively.

Howard (2006) adds that a maintenance plan should list all expected maintenance projects with their timeframes and budgets, be they preventive maintenance, routine maintenance, major and minor repairs, custodial operations or alterations. Furthermore, the maintenance plan should also include projects needed to reduce backlogs of deferred maintenance. In addition and most importantly, an effective school facilities maintenance plan protects capital investment, ensures the health and safety of learners and supports educational performance (Elghaffar, 2007).

The school facilities maintenance plan clearly informs the school's facilities maintenance programme and translates into planning for the implementation of the plan.

2.8.3.5 Implementation

Scottish Executive (2003:15) points out that stages 4 and 5 should lead to prioritised lists of capital and maintenance projects, and recommends that the implementation of the school facilities maintenance plan should be phased in and will need to balance maintenance, refurbishment and replacement requirements. This should be developed in the context of a realistic assessment of the resources likely to be available to meet these requirements. Accordingly, the implementation of the plan should take into account the procurement routes, budgets and time frames, maintenance matters, sustainability, staffing implications and other relevant factors.

Roper *et al.* (2009:16) maintain that, regardless of the efforts taken in the development of the plan, the plan should be viewed as a living document that reports findings and makes considered recommendations for implementation within a realistic time frame, yet maintains flexibility to adapt as the school requires. Accordingly, it is prudent to view a plan as the "current plan" since any major change in school conditions, economic outlook or other forces could require varying degrees of change to the original document. To this end, these authors assert that documentation of especially successful or problematic portions of the plan, if noted, can provide valuable feedback for the next iteration of planning, and that the cyclical nature of planning and continuous improvement can provide opportunities to learn from each process.

2.8.3.6 Monitoring, review and evaluation

According to Scottish Executive (2003:15), progress against the objectives of the school facilities maintenance plan should be regularly monitored and evaluated. It should be reviewed, maintained and regularly updated so that it can continue to provide good quality maintenance information. In addition,

consideration should also be given to what data are collected and how it is maintained to measure the impact of investment, including costs and arrangements for evaluation and review.

Szuba and Young (2003:124) make the point that it is also fair for stakeholders to expect the maintenance programme to yield results, namely clean, orderly, safe, cost-effective and instructionally supportive school facilities that enhance the educational experience of all learners. This can be regarded as programme success, which can only be evaluated relative to programme objectives, and implies measuring “success”, which, in essence, means answering the question, “Are we reaching our goals and objectives?” Szuba and Young (2003:124) posit the following considerations for the evaluation of the school’s maintenance programme:

- *Physical inspections*, which relates to using records of physical inspections as good evaluative material;
- *Work order system*, which is an effective tool for identifying, monitoring and projecting future maintenance needs;
- *User feedback or customer satisfaction surveys*, which relate to ways of gathering information from the people who benefit from the maintenance activities, including collecting satisfaction surveys and convening advisory committees of stakeholders;
- *Audits*, which include performance audits, commissioning, comparisons with peer organisations or other schools, benchmarking and annual reviews of accomplishments to collect important data for ensuing proper and effective evaluation;
- *Alternative resources*, which include maintenance and operations manuals, vendor expertise, warranties and other resources, such as web sites and can be used as sources of benchmarking data or evaluation standards;

- *Regulatory activities*, which entail assigning appropriately trained staff or contractors to determine whether applicable public safety and environmental regulations are followed.

The foregoing exposition on the stages of school facilities maintenance planning clearly indicates that this is a comprehensive process that must be undertaken carefully and meticulously. It is also clear that the maintenance planning process finally culminates into an approach for a school facilities strategic programme.

2.9 CHAPTER SUMMARY

This chapter responded to the question of what the nature of school facilities maintenance is. First, the phenomenon was contextualised within the school as an organisation. School facilities maintenance was explicated as an inclusive process that systematically ensures that school facilities serve the school's educational programmes. This was exposed through the discussion of various categories of facilities maintenance, the areas of school facilities maintenance and standards thereof. Having exposed the legislative framework, it became clear that school facilities maintenance, especially in consideration of the South African scenario, is not without challenges. Thus a discussion was proffered regarding approaching school facilities maintenance as a preamble, as it were, to the proposed whole-school approach to facilities maintenance. This chapter has laid the ground for addressing the second research objective of this study by providing constructs underpinning school facilities maintenance. The next chapter presents the empirical research design and methodology.

CHAPTER 3

EMPIRICAL RESEARCH METHODOLOGY

3.1 INTRODUCTION

The previous chapter set the tone for the empirical study of this study by presenting the literature review on the nature of school facilities maintenance. This provided main constructs pertaining to the study phenomenon, with the intention of providing a basis for the empirical study. This chapter begins the second phase of this study in line with its second objective namely, to investigate the current school facilities maintenance practices at schools. This chapter, therefore, details this study's research design and methodology in terms of its paradigmatic orientation, the research design and methodology, including the data collection and analysis strategies, issues relating to reliability, validity and ethical considerations.

3.2 PARADIGMATIC ORIENTATION

This research follows an interpretivist qualitative design in an attempt to gain insight into how individuals in everyday settings construct meaning and explain the events of their worlds (Niewenhuis, 2007a:59). Furthermore and according to Niewenhuis (2007a:59), an interpretivist researcher starts out with the assumption that access to reality is only through social construction such as language (including text and symbols), consciousness and shared meanings. Thus, interpretivist researchers attempt to understand phenomena through the meanings that people assign to them and as articulated by Niewenhuis (2007a:60), the ultimate aim of interpretivist research is to offer a perspective of a situation and to analyse the situation under study to provide insight into the way in which a particular group of people makes sense of their situation or the phenomenon they encounter.

In this regard, as researcher, I started from the premise that I could only understand how a whole-school approach to facilities maintenance can be developed at schools, through understanding how people living the school

experience practice facilities maintenance. It is only through interacting with them in their natural settings and through their language, that I could understand the study phenomenon. To this end, I interacted closely with the participants in their schools to gain a holistic understanding of school facilities maintenance through interviews and viewing physical evidence of facilities maintenance through ethnographic observations of physical facilities at schools.

3.3 RESEARCH DESIGN AND METHODOLOGY

Leedy and Ormrod (2005:85) contend that a research design provides the overall structure for the procedures the research follows, the data collection and analysis. It is always done with the central goal of solving the research problem in mind. According to Niewenhuis (2007a:70), a research design is a plan or strategy that moves from the underlying philosophical assumptions to specifying the selection of respondents, the data gathering techniques to be used and the data analysis to be done. In this regard, Denzin and Lincoln (2005:32) point out that, due to many factors that must be considered in planning the research, including time and costs, it is imperative that researchers consciously and purposely select and utilise those research methods that would permit better, convenient and successful attainment of specific research aims.

Qualitative research uses many approaches that are quite different from one another. In this regard, Leedy and Ormrod (2005:133) state that these approaches all have two things in common. Firstly, they focus on phenomena that occur in natural settings and, secondly, they involve studying these phenomena in all their complexity and thus qualitative researchers recognise that phenomena they study have many dimensions and layers. To this end, qualitative research relies on researchers' abilities to interpret and make sense of what they see, which are critical for understanding any social phenomenon. Charles (1995:123) posits that qualitative inquiry seeks to understand human and social behaviour from the insiders' perspective, that is, as it is lived by participants in a particular setting, like culture, school, community, group or institution. In this regard, MacMillan and Schumacher (2001:395) state that in a qualitative inquiry, researchers collect data in face-to-face situations by

interacting with selected persons in their setting. Therefore the qualitative approach combines social actions, beliefs, experiences, thoughts and perceptions of respondents (Hummevoll & Da Silva, 1998:465).

Different strategies of enquiry, including biography, phenomenology, grounded theory, ethnography and case studies are used in qualitative inquiries (Cohen, Manion & Morrison, 2000:165; Fouché, 2002:272; Bogdan & Biklen, 2003:23). For reasons expounded above, this research followed a qualitative inquiry with a phenomenological perspective to explore and describe facilities maintenance practices carried out at schools. Phenomenology seeks to understand and interpret the meaning that people give to their everyday lives (Fouché, 2002:272). To this end, Bogdan and Biklen (2003:23) state that in phenomenology, researchers attempt to understand the meaning of events and interactions for ordinary people in particular situations. In essence, this implies a study that describes the experiences that a phenomenon, topic or concept has for various individuals.

In this research I attempted to understand facilities maintenance practices at schools by interacting with principals or designated facilities maintenance officers and by allowing them to describe their practices. Furthermore, I interacted with their settings by observing physical facilities in terms of maintenance practices. In essence, the qualitative aspect in this research involved the description and empirical data-collection processes through interviews about and ethnographic observations of school environments, which highlighted the status of facilities maintenance.

The research method for this study involved thorough data collection, using two strategies

3.4 DATA COLLECTION STRATEGIES

Data collection entailed a comprehensive literature review and empirical study.

3.4.1 Literature review

A literature study was conducted to establish the nature of school facilities maintenance and to enable the study to embark on the empirical study with a strong orienting framework of what would be studied and how it would be studied (Fouché & Delpont, 2002:268). A data search process was conducted using the internet and databases like GOOGLE, ERIC, DIALOG, Ebscohost and Sabinet. The following key words were used to conduct the literature search for relevant data:

school facilities; facilities maintenance; facilities management; school facilities maintenance policies; school physical facilities; school building design; safe school facilities; asset management.

A comprehensive search of South African literature yielded very little on facilities maintenance and, as such, most literature sources reviewed were foreign, with a particular proliferation of American literature, where school facilities maintenance is at an advanced level. Consequently, there is no reference to research on facilities maintenance in South Africa. This then makes this an exploratory study, which Struwig and Stead (2007:7) describe as research into an area that has not been studied, in which the researcher wants to develop initial ideas and a more focused research question, and in which the researcher investigates a problem about which little is known.

3.4.2 Empirical study

The empirical study developed in terms of the following:

3.4.2.1 *Aim*

An empirical investigation was conducted to determine the current school facilities maintenance practices at schools. This was done through the use of two qualitative research modes namely, ethnographic observations and interviews.

3.4.2.2 *Ethnographic observations*

Leedy and Ormrod (2005:145) describe observations as unintentional, unstructured and free-flowing, where the researcher observes phenomena in their natural settings. The advantage of observations in qualitative research is that they allow the researcher a wide range of instruments, from watching phenomena, recordings, interviews, informal and informational discussions to photography and field-noting (also see De Vos, 2002:340).

Ethnography is the study of an intact cultural or social group based primarily on observations over a prolonged period of time spent by a researcher in the field (Fouché, 2002:274). Ethnography is thus characterised by observation and description of behaviour of a number of cases and data analysis and is mainly descriptive and interpretive and concerns an account of lived experiences or fieldwork experiences. In this research, ethnographic observations were undertaken to observe features relating to facilities maintenance at schools. Photos and field notes of observed phenomena were taken. Photos would be used as a "*good way of collecting observable data of phenomena which can be captured in a single or series of shots*" (Hancock, 2002). Field notes were made with regard to observed features (cf. Martella & Marchand-Martella, 1999:285). Consequent to that, the following features were observed:

- *Buildings*: Observations related to cleanliness and maintenance. The focus was on the status of the buildings and maintenance.
- *Grounds*: Observations focused on school grounds and playgrounds in terms of maintenance of, among other aspects, the schools' perimeter fencing, the general layout and landscaping, vegetation and shrubbery, the visibility or obscurity and maintenance of such amenities as toilets, playgrounds, parking areas as well as the status of equipment.
- *Service systems*: Observations related to electrical, plumbing, HVAC and waste management and disposal.

This phase provided a rich source of data which was transcribed and analysed after every session at a school to establish emerging patterns and possible themes, and it formed the basis for data analysis and triangulation with the data collected through interviews.

For purposes of ethnographic observations, a checklist (cf. Annexure D) was developed. The checklist ensured that there was consistency of features observed and facilitated the process of analysis through categorising areas pertaining to school facilities.

3.4.2.3 Interviews

To get an overall picture pertaining to facilities maintenance, data collection used interviews with school principals and designated school facilities maintenance officers (deputy principals in this case) to elicit data on how facilities maintenance at schools was currently undertaken. An interview schedule (cf. Annexure E) with open-ended questions was developed for the interviews. The focus of the interviews was on the *condition of school facilities, maintenance related activities and maintenance systems*. The normal thoroughness and rigour of conducting interviews was followed. Suffice to state here that data was recorded *per* permission of interviewees (cf. Greef, 2002:305). In addition, interviews were conducted after school hours and *per* arrangement. Due to being a principal and colleague to participants, it was easy to gain their confidence and have cordial interviews. I, however, was particularly careful not to let familiarity with participants to interfere with my objectivity. Consequently, interviews were conducted in an atmosphere of mutual respect and openness.

3.4.2.4 Participants and their selection

The participants for this research comprised school principals and deputy principals as designated school facilities maintenance officers in the Gauteng Province. The research was confined to the Sedibeng Municipalities, consisting of Districts 7 and 8 of the Gauteng Department of Education. The two districts

have a total number of 251 schools. The participants were decided upon in terms of the following:

- *Ethnographic observations*

Since this phase of the research adopts a qualitative approach and uses observations, including photography, the schools to be included in ethnographic observations was consciously selected to yield as much information-rich data as possible about the study phenomenon (*cf.* Merriam, 1998:61). A non-probable, purposive and convenient sample of at least 20 schools was selected. Care was taken to ensure that schools selected included schools from the suburban^{§§} and township^{***} areas from both districts 7 and 8. Table 1 illustrates the different categories of the purposive and convenient sample. Informational considerations informed the saturation point and thus determined the ultimate number of schools where observations were conducted.

Table 1 Schools selected for the ethnographic observation phase

District	No. of schools	Categories of schools		Location of schools	
		Primary	Secondary	Township	Suburban
7	8	4	4	5 Primary 5 Secondary	3 Primary 3 Secondary
8	8	4	4		
TOTAL	16	8	8	10	6

At 16 schools, I realised that I had reached a saturation point and no new and useful data would be forthcoming from the remaining four schools.

- *Interviews*

For purposes of interviews, purposeful participant selection was engaged. Wiersma (2000:285) describes this selection of participants as being selection decided upon to meet the purpose of the research, based on information-rich cases that are studied in depth. Strydom and Venter

^{§§} Ex-model C schools previously located in areas designated for Whites.

^{***} Settlements previously designated for Blacks.

(2002:207) assert that purposeful participant selection is based entirely on the judgement of the researcher, in that the selected participants display elements that contain the most characteristic or typical attributes of a larger population. In this research and based on data that were gathered through ethnographic observations, I decided on typical schools for data collection through interviews. It was decided that the number of participants would be 16 principals or school facilities maintenance officers and this number was also informed by saturation due to informational considerations.

3.4.2.5 *Data analysis*

Niewenhuis (2007b:98) contends that qualitative data analysis tries to establish how participants make meaning of a specific phenomenon by analysing their perceptions, attitudes, understanding, knowledge, values, feelings and experiences. In the same mould, Creswell in De Vos (2002:340) regards the process of data analysis as a spiral, where the researcher moves in analytic circles – entering with data made up of text or images and exiting with an account or narrative. In this regard, I indeed engaged a data analysis spiral starting with recordings, images (photos), field notes and memos of data and ending up with an account or narratives of participants' perceptions of and attitudes towards school facilities maintenance.

I had three sets of data. The first set from observations consisted of photos of the features of school environmental features, data from the checklist on school facilities and data from interview recordings. Data analysis unfolded in the following manner:

- Data from the checklist was categorised into sections dealing with observed phenomena and was then classified in terms of categories of areas of school facilities maintenance as mentioned earlier, namely, buildings, grounds and service systems. Observations related to electrical, plumbing, sanitation, HVAC and waste management and disposal systems.

- Guidelines by Struwig and Stead (2007:169), Niewenhuis (2007b:99) and De Vos (2002:339) were used in the data analysis. Consequently, data from the interviews were analysed using *a priori* coding. According to Niewenhuis (2007b:109), this form of data coding uses preset categories into which data is to be sorted and implies that data coding begins with a list of categories determined in advance. Niewenhuis (1997b:109) points out that this can relate to topics that emerged as important aspects from the literature review and they provide direction for what to look for in the data. In that case, one searches data for text that matches the themes. In this study, preset categories included observation stemming from *the condition of school facilities, perceptions on maintenance related activities and maintenance service systems*. The process was undertaken in the following manner:
 - Responses from interviews were first transcribed *verbatim*.
 - The transcripts were then read to gain an overall impression of the responses.
 - Data was matched to the preset categories.
 - Emergent themes not covered by the preset categories were identified and categorised.

After the initial data analysis involving data from observations, checklists and data from the interviews was completed, a comparison of the three sets of data was undertaken. This, according to De Vos (2002:341), is triangulation and means that the researcher uses different types of sources that can provide insights about the same events or relationships. In this research, this analysis involved triangulation of data collected through observations, photography and interviews. The intention was to correlate and confirm observations of school environments in terms of the status and maintenance of facilities with the accounts of the interviewees.

On the completion of the entire process, data were then synthesised and summarised for the compilation of the research report.

3.4.2.6 ***Trustworthiness of the research data***

According to Cohen *et al.* (2000:118), qualitative research, being premised on the uniqueness and idiosyncrasy of situations, cannot be replicated for purpose of trustworthiness. In this regard, Bogdan and Biklen (2003:36) suggest that in qualitative research, researchers are concerned with the accuracy and comprehensiveness of their data and tend to view reliability as a fit between what they record as data and what actually occurs in the setting under study, rather than the literal consistency across different observations or situations. In line with guidelines provided by Struwig and Stead (2007:134), De Vos (2002:351) and Niewenhuis (2007b:113), MacMillan and Schumacher (2001:404), the following steps were taken to ensure the trustworthiness of the research data:

- A checklist for observations of school environment in terms of the status and maintenance of school facilities was used to ensure that only those variables related to school facilities were observed.
- A digital data recorder was used for interviews and the data were transcribed *verbatim* to ensure validity.
- A similar semi-structured interview-schedule with open-ended questions was used for all interviews and the meanings and information provided by interviewees were compared.
- Data from observations, photos and interviews were triangulated to strengthen the data between the observations, photos and interviews and to minimise their inherent limitations and create the opportunity to analyse data from different angles. This reduced the chances of researcher bias and heightened the validity of the study.

- It was ensured that all documentation used was kept, such as notes, transcriptions and category labels and revisions. This would ensure that another person could see the trail taken in the data analysis.
- The study promoter also assisted in ensuring trustworthiness by discussing and examining categories and interpretation of data.
- An attempt was made throughout data analysis to avoid generalisations and to seek insight into participants' perspectives, perceptions, attitudes and behaviours.
- A test-run of the observations was conducted at the school where I am principal to ensure that I would focus on intended observation variables and take photos that would help me obtain information-rich data for triangulation purposes.
- The interview questions were piloted with two principals from a primary school and a secondary school respectively. This helped to ensure that the questions were clear and addressed the study phenomenon appropriately.
- Finally, it was ensured that ethical issues were strictly adhered to.

3.5 ETHICAL CONSIDERATIONS

Approval and permission to conduct research at schools were sought from the Gauteng Department of Education's Information Systems and Knowledge Management. For this purpose, the Department's prescribed research protocol was followed and the application form (obtainable from the Department's website at www.education.gpg.gov.za) was used. Approval was granted (cf. Annexure B). Approval of the research methods was also obtained from the North-West University Ethics Committee and a certificate of approval was granted (cf. Annexure A).

Maximum cooperation and goodwill of the participants were obtained as advised in Cohen *et al.* (2000:37), through articulating the topic and objectives of the research interviews to the participants beforehand, discussing the report before it was actually finalised and considering and respecting participants' wishes for anonymity and confidentiality. The research report, therefore, makes use of fictitious names. Participants were made to understand their rights to withdraw from the interviews at any stage if they so desired and also guaranteed that their responses were for research purposes only and would not be used for any other purpose. They were also informed that they were not obliged to answer questions they felt uncomfortable with.

Before interviews commenced, participants were requested to sign the informed consent form (cf. Annexure F), which ensured that participation was free and voluntary.

3.6 CHAPTER SUMMARY

This chapter presented the research design and methodology. An exposition of the interpretivist qualitative design was presented as the paradigmatic orientation of the study, which also meant that the study used the qualitative approach. In this regard, ethnographic observations and interviews as qualitative research strategies were exposed. The chapter also provided details of the research method in terms of data collection and analysis, which included aspects such as participants and their selection, the selection of research sites, issues of reliability and validity and ethical considerations.

This chapter has thus laid the ground for the empirical study which aims at investigation the current school facilities maintenance practices. The next chapter presents the data presentation, analysis and discussion.

CHAPTER 4

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 INTRODUCTION

This study sought to determine how a whole school approach to facilities maintenance can be developed at schools by focusing on what the current facilities maintenance practices are at schools. The focus of the data analysis was on three pre-set categories namely, *the condition of school facilities, maintenance-related activities and maintenance service systems*. As expounded in the earlier (Chapter 3) , data were collected by means of ethnographic observations and interviews. In the former case, visual observations by means of a checklist and photography were used, while in the latter case, data were collected through the interviews. The demographic profile of schools and participants foregrounds the rest of the data presentation, analysis and discussion.

4.2 DEMOGRAPHIC PROFILE OF PARTICIPANTS

The participants for this study were school principals or designated facilities maintenance officers. Sixteen participants were involved in the study. Of these, twelve were school principals and four were deputy principals in charge of school facilities. Participants were from both primary schools and secondary schools, with ten from township schools and six from suburban schools (cf. table 4.1).

Table 4.1 Profile of schools

School			Location	Designation of maintenance office	Gender	Years in facilities maintenance	Enrolment
No	Principal	Type					
1	A	P	Township	Principal	Female	16	1042
2	B	P	Township	Principal	Male	21	1240
3	C	P	Suburb	Principal	Male	30	1227
4	D	S	Suburb	Deputy Principal	Male	17	1747
5	E	P	Suburb	Principal	Male	2	1177
6	F	P	Suburb	Deputy Principal	Male	4	1031
7	G	S	Suburb	Principal	Male	11	959
8	H	S	Township	Principal	Male	15	1180
9	I	S	Township	Principal	Female	4	947
10	J	P	Township	Principal	Male	13	356
11	K	P	Township	Principal	Female	20	355
12	L	S	Township	Deputy Principal	Female	12	608
13	M	S	Suburb	Deputy Principal	Female	6	584
14	N	P	Township	Principal	Male	10	782
15	O	S	Township	Principal	Male	1	1489
16	P	S	Township	Principal	Male	2	1323

P = Primary; S = Secondary

As depicted in table 4.1, participants portrayed various demographic features. Participants from township schools exhibited an inclination towards a gender balance between male and female principals. There were six male participants, three each from primary and secondary schools, and four female participants, two each from the primary and secondary schools, while at suburban schools, which are all former model C schools, five participants were male and only one was female.

While not considered a factor regarding school facilities maintenance, it is interesting to note that there is a gender shift in township schools from predominantly male-headed schools towards a balance between male and female principals while suburban schools still display an overwhelming bias towards male dominance in the principalship.

A number of factors emerged from the profiling of research sites/schools. Firstly, most township schools were big with enrolments of between 700 and 1500, although two schools' enrolments were less 500. Secondly, most township schools had old buildings in need of large scale renovations. Thirdly, township schools were conspicuously poorly resourced. Fourthly, township schools, while big, had few general or custodial workers. Finally, township schools tended to be clustered in vicinities spanning a radius of less than 3km. It must be noted, however, that some township schools were relatively new and presented newer and modern school facilities.

Suburban schools were also old schools ranging from 30 to 50 years. The enrolments at these schools ranged from 500 to more than 1500. Despite lower enrolments, these schools had more custodial staff members compared to township schools. This was apparently due to their being employed on school governing body posts, which means they were paid by the schools.

The experience of participants in school facilities maintenance ranges from one year to thirty years. There were ten principals who had less than ten years experience, seven principals had less than twenty years, two principals had less

than thirty years and only one had thirty years experience. Observations and responses to interviews shed light on the role that experience can play in terms of the upkeep and appearance of school facilities. Experienced principals seemed to have their ways of maintaining their schools although there were no proper maintenance systems in place as evidenced by the lack of policies and plans. Their successes could have been based on trial-and-error over the years until they had perfected their own ways of maintaining their schools. For instance at school two, the principal, Mr B was very proactive. Having seen that passersby intentionally threw stones to break the windows of the administration block of the school, he applied preventive measures and put protective mesh over all the windows (exhibit 1). Since then, the school reportedly does not spend money on replacing broken windowpanes.

Exhibit 1 **An example of preventive maintenance**



Though not very significant in terms of the essence of school facilities maintenance, the gender of participants seemed to play a role in the appearance, repairs and upkeep of facilities. It was also noted that schools where persons in charge of facilities maintenance were male exhibited better buildings and grounds maintenance while where females were in charge, administrative offices and classrooms appeared cleaner and well kept.

The next section presents a discussion of findings as derived from observations in terms of three main categories namely, the condition of the school facilities, activities related to facilities maintenance and maintenance systems.

4.3 THE CONDITION OF SCHOOL FACILITIES

The analysis of data regarding the condition of school facilities was done with regard to the condition of school buildings, grounds and service systems. A checklist was used for this purpose.

4.3.1 School buildings

Observations of school buildings were made regarding the exterior appearance, interior appearance and exterior structural conditions (cf. 2.6.1). Because, as is typical in qualitative research, the aim was not to quantify research results, and there was no intention of a comparative analysis of schools, the analysis presented is largely descriptive and where quantification is done, this cannot be generalised, but provides more insight into the condition of school facilities.

4.3.1.1 Exterior appearance

The exterior appearance of the buildings refers to painted surfaces, graffiti on buildings, general cleanliness like bird droppings and litter, walls, windows and gutters.

- ***Painted surfaces: roofs and walls***

Of the sixteen schools observed, thirteen had their painted surfaces in good condition. Two schools illustrated examples of recently painted roofs, including gutters (exhibit 2).

Exhibit 2 **Painted school roofs**



Three schools had poorly maintained roofs. At one school (exhibit 3), for instance, the roof, gutters and the exterior walls had paint peeling off, which resulted in rusting. Even the walls had rain water marks. The reason for this may be inadequate funding or lack of maintenance planning.

Exhibit 3 **Example of a non-maintained roof**



It was also noted that exterior walls of most schools were made of face brick and thus did not necessitate painting.

- ***Gutters and down spouts***

Gutters are a part of the roof structure (cf. 2.6.1.3), and need to be kept clean in order to function properly. There was generally little evidence of systems for checking whether the gutters were functioning properly or not at schools. For instance, at one school (exhibit 4), a weed grew to a height of about one metre in the gutters.

Exhibit 4 **Poorly maintained gutters**



Only six schools out of sixteen had their gutters and spouts well-looked after, and rain leaders were clean and free flowing (cf. 2.6.1.1). The remaining ten schools had broken gutters and down spouts, while gutters and spouts were clogged and rain water was not free flowing (exhibit 5). This could be ascribed to lack of facilities maintenance planning, which guided schools in terms of time to clean all the gutters and spouts of the entire school.

Exhibit 5 **Damaged gutters and down spouts**



In all fairness, this down spout can be re-mounted before being destroyed or lost. This is a typical example of neglect and deferred maintenance. If the spout is lost, it will cost more money, but fixing it will not cost anything.

- ***Graffiti on buildings***

Fourteen schools had a problem with graffiti. It was observed that the trend was the same in all the schools and that while the walls were painted, they did not look good due to graffiti on them. An example is that of the school wall illustrated overleaf.

Exhibit 6 **Graffiti on wall**



In some suburban schools the graffiti was covered with paint, which prompted the learners to paint graffiti even more often. As a preventive measure, Mr E indicated his solution to the graffiti problem, especially in the toilets:

"...we tiled all the bathrooms, graffiti is easy to clean because on the tiles, it's easier to clean it off".

This is an example of preventive and corrective maintenance measures to ensure that the walls are kept free of graffiti.

In township schools, it was observed that graffiti was also rife. It was also found that it was seldom attended to. One school, for example, had a lot of graffiti on the walls, but there was no indication of attempts at removing it. This is evidence of the "broken window theory", which postulates that once something is left unattended, people tend to further vandalise it. This is evidence of neglect and or deferred maintenance (cf 2.4.6).

- **General cleanliness**

Generally, in most schools, there were no signs of bird droppings all over the school yards. This indicates that the surroundings are tidied up on a regular basis. There were clean paved areas providing access to administrative offices as illustrated in exhibit 7.

Exhibit 7 Clean paved roadway



There were, however, two schools with a problem of bird droppings. It was observed that in one school it was no longer perceived as a problem because, there were pigeons permanently housed there. The roof was badly affected by the bird droppings.

Littering seemed to be rife in township schools. The principals in the suburban schools had a system of dealing with littering. For instance, huge drums were placed in every block into which the learners threw litter. It was, however, observed that even well maintained township schools had a problem with littering. Learners seemed to have the culture of throwing papers all over.

- **Windows**

All sixteen schools had broken windows. The extent to which the windowpanes were broken in one school (exhibit 8) suggested that there was no definite plan for the replacement of broken windowpanes, since it was evident that the broken windowpanes had remained broken for a long time. It looked like the people responsible had given up on replacing windowpanes.

Exhibit 8 **Broken window panes**



However, there were a few schools that had a plan for replacing the broken windowpanes (cf. exhibit 1). It was evident that the problem was created by learners themselves. With regard to windows, most schools – whether township or suburban and whether primary or secondary – had many broken windowpanes. In one school, it was reported that at one stage people were hired to replace all broken window panes at the school. After they had finished one block, they moved to the next one. Within no time, one of these workers reported that the window panes that they had just replaced had been broken. This could possibly be linked to the lack of learner involvement in the long-term

planning for the schools' facilities maintenance. In this regard, most principals confirmed, especially the primary schools' principals, that they did not include their learners in the long-term planning for school facilities maintenance as is evident in, for instance, Mr N and Ms L's comments respectively: *"All stakeholders as have been mentioned, except learners, because we are a primary school"*; *"It includes all the above-mentioned except learners"*.

4.3.1.2 ***Interior appearance***

The interior appearance of the building relates to observations of the general cleanliness and the building envelope (cf. 2.6.1).

The general cleanliness of fourteen schools was satisfactory and there was evidence that the classrooms were cleaned regularly. In one school, the chairs and tables were arranged in a manner that made it easy for the cleaners to clean the classrooms without any hindrance (exhibit 9). However, in some schools it was very difficult to clean the classrooms because of the condition of the floors.

Exhibit 9 **Example of a well kept classroom**



- **Floors**

With regard to the floors, one school had very poor floor conditions. There were very conspicuous “potholes” on the floors as exhibited overleaf. These floors need a new screed altogether, which would be costly for this school since it is ranked as a quintile one school.

Exhibit 10 ***A bad floor condition***



The building was more than fifty years old. Apparently since being built, the school has not been given a massive facelift by either the school governing body or the Department of Education. It may be stated that this condition is because of deferred maintenance over the years. It can also be deduced that even the class educators do not help in school facilities maintenance, because if they did, the potholes could have been attended to before they reached the current level of deterioration. This means that educators do not manage their classrooms like their own work stations. The cracked and missing tiles should have been reported to the maintenance committee or maintenance staff so that they could be replaced.

- ***Interior walls***

Fifteen schools had cracks on the walls around the door frames. Some of the classrooms were closed down by school management as they no longer were safe for use. Closing them down was, however, only a temporary solution. The problem needed serious corrective maintenance attention. This could not be ascribed to structural problems only. It could also mean that the doors were banged extremely hard to such an extent that, over time, mortar was dislodged between the joints. The doors could then no longer open easily, but were sticking. Only one school was not affected by cracks on the walls.

Generally the structure of the walls looked very firm in all sixteen schools, but due to the pasting and removing of teaching aids on the walls, particularly those adhered with prestik, the plastering was damaged. It had small tiny holes which needed attention. In some instances, the teaching aids on the walls were just hanging, seemingly indicating that they were no longer serving their purpose and their colours had changed from white to brown. This was an indication that they were put there a very long time ago. Thus, the walls were not attractive.

- ***Ceilings***

Eight of the schools in this research had stained, missing and broken ceilings. Of the sixteen schools, seven did not need their ceilings to be painted while nine needed them to be. The classrooms with broken and missing ceilings were still used for learning and teaching at one school. At another school (exhibit 11), the ceiling was particularly badly damaged and seemed to have been in this condition for a long time.

Exhibit 11 **Damaged ceiling**



4.3.1.3 ***Exterior structural conditions***

The foundation settlements of fourteen schools looked very firm with no cracks in the walls. Only two schools had threatening foundations. The foundation of one school (exhibit 12) had become exposed. The building structure was prefabricated and that is why there were no cracks on the walls. Seemingly, the school was unable to replace eroded soil, which is a clear indication of lack of knowledge of preventive maintenance, corrective and predictive maintenance, to a degree.

Exhibit 12 Exposed building foundation



At some schools, it was observed that there were tripping hazards in the buildings (exhibit 13). The steps were not usable and the stoeps were too high for grade three learners. It looks like these steps were in that state for quite some time, which is indicative of poor corrective maintenance.

Exhibit 13 A tripping hazard



4.3.2 School grounds

Observations in this regard focused on the roadways and parking lots, site appearance and sidewalks.

4.3.2.1 Roadways and parking lots

Eleven schools' parking spaces were clearly marked (exhibit 14a). Four other schools had parking lots but these were not marked (exhibit 14b). This may be because at times there is nobody who can measure and mark the parking lot for the school, otherwise they would have to enlist the services of skilled people from outside.

Exhibit 14a **Marked parking lot**



Exhibit 14b **Unmarked parking lot**



The reason for the unmarked parking lot above could also be because the ground is not paved, but has grass. The identified difference between the suburban schools' parking lots and those of township schools is the material used to erect them. For instance, as seen in the pictures above, township schools mostly use netted carports while the suburban schools use the old corrugated iron structures (exhibit 14c). This may be because the township schools are only having these structures recently and it also could be that the netting material is not as costly as the corrugated iron structure. It was also not

possible to determine the extent and nature of the maintenance of carports in township schools since they were all relatively new.

Exhibit 14c A corrugated iron structure carport



4.3.2.2 Site appearance

A well maintained, functional and aesthetic school site has a positive influence on learners' values, behaviour and performance and school grounds should provide a safe, manageable, pleasant and ecologically responsible outdoor environment (cf. 2.6.2). Through observations it was found that thirteen schools had their lawns and plants manicured. Overgrown, dead or diseased branches were pruned. This was an indication that the ground staff had a vested interest in the lawns and shrubs, and that they could do them perfectly as evidenced below.

Exhibit 15 Well-maintained lawns and shrubbery



The most striking observation is that most schools focus their maintenance efforts on the area closest to the administration block. The remainder of the site is neglected. In the school exhibited below, for example, damaged desks and chairs were discarded in a heap in a corner. This is indicative of poor storage and disposal of obsolete furniture and equipment.

Exhibit 16 Obsolete furniture and equipment disposal



Many schools tried to keep their surroundings attractive. Others, as mentioned earlier, focused on the area in and around the administration block. The suburban schools had very attractive landscaping. There were also a few township schools that had attractive and well-maintained landscapes as

illustrated below. One township school even had boreholes powered by solar energy panels in order to water their gardens, which minimised the water consumption bills.

Exhibit 17 **A well-maintained township school landscape**



4.3.2.3 ***Perimeter fencing***

During observations, it was discovered that most schools had good perimeter fencing. The main observation was vandalism, particularly in the township schools. The fence, whether concrete or steel palisade, had been torn by vandals in order to gain free access into the school premises. The grounds staff in some schools tried to repair the damaged fence but their efforts were in vain. As a result, the fence was no longer maintained. This could probably mean that the schools do not have enough money to do maintenance anymore. Other schools replaced the security fence (exhibit 18a) with a supposed durable concrete palisade fencing (exhibit 18b), which subsequently was also damaged. Vandalism of the perimeter fencing was found to be rife in township schools than in the suburban schools.

The reason for this kind of vandalism could be ascribed to lack of recreational facilities in the townships. In some instances, it was found that children tear the fence or break the palisade to gain access to the recreational facilities in the

school yard. In the suburban schools, school facilities are out of bounds for learners after school hours, which arrangement is respected. In any case, children in those areas have enough recreational facilities at their homes and in the community. Exhibit 19 illustrates a typical suburban school perimeter fence

Exhibits 18a Damaged perimeter fence Exhibit 18b Concrete palisade



Suburban schools keep their fencing clear of grass or weeds and as a result, there is visibility all over. This cannot be said of the township schools. It was observed that grass was growing along the perimeter fencing. However, there were a few schools in the township that took good care of their perimeter fencing, which was also clear of grass and weeds.

Exhibit 19 **Suburban steel palisade fencing**



4.3.3 **Service systems**

As alluded to in chapter two, service systems serve as the “functional arteries” of any modern educational facility and, when properly maintained, help to ensure a minimum of downtime and disruptions to educational activities (cf. 2.6.3) Observations focused on electrical, plumbing, HVAC, waste management and disposal systems.

4.3.3.1 **Electrical systems**

Electrical systems were observed in terms of distribution and lighting.

- ***Lighting***

With regard to lighting, light switches were properly working and properly wired as well as grounded in fourteen schools. This was because these schools ensured that their electrical distribution functioned properly. Any minor problem seemed to receive attention before it became a deferred maintenance issue. This was confirmed by Mr D, for instance, when he said, with regard to the responsibility towards electrical fittings and systems, that

The groundsman report to me, and we normally have an electrical contractor who we get in, a qualified person.

This could also imply that this contractor does general inspections and recommends areas that need or that might need attention. This, in essence, would be a good preventive measure taken by the school. There were also no dysfunctional light bulbs at any of the sixteen schools.

- ***Distribution***

At thirteen schools the wiring was properly enclosed. As mentioned above, these schools could be having a way of dealing with electrical systems. Only in three schools was the wiring not properly covered. At one school, for instance, the distribution box was open (exhibit 20), possibly because the circuit breakers were removed by vandals. From the appearance of the box, it seemed that it might have been damaged a considerable time ago and there seemed no evidence of attempts at repairing it. This implies that some sections of the school do not have electricity distribution. This exposure can also be a hazard, especially to curious learners who might poke their finger into the gaps. It was, however, noted that there was no live electrical current in this section of the school.section of the school.

Exhibit 20 **An exposed electrical distribution box**



For major electrical faults, the schools, as mentioned earlier, sought the services of qualified electricians.

4.3.3.2 *Heating, ventilation and air-conditioning*

Not all the schools had functional HVAC systems. Most of them made use of household heaters and fans. A few suburban schools had HVAC systems (exhibit 21), but these were not working. Seemingly, the pipes burst a long time ago and one principal indicated that it would be uneconomical to repair the systems.

Exhibit 21 **Example of suburban school with chimneys for the HVAC systems**



4.3.3.3 **Plumbing**

With regard to plumbing systems, thirteen schools did not have a problem of leaking pipes. However, the low water pressure in one school could be ascribed to either corrosion or leaking underground water pipes, but this could not be confirmed. Only one school, had a leaking tap (exhibit 22). Three schools had leaking urinals and water was just flowing into the drain, day and maybe night. A few schools had problems with the flushometers but preventive maintenance was applied, all the cisterns were tightly closed with iron bars so that vandals could not have free access to the cistern mechanisms (exhibit 23). Sanitary wastelines were properly ventilated in ten schools, while six schools did not have properly ventilated wastelines and as such, the toilets had an overpowering and unpleasant smell.

Exhibit 22 **A dripping tap**



Exhibit 23 **Cistern protected against vandalism**



4.3.3.4 Waste management and disposal

It must be indicated that some schools had a good approach to waste management and disposal. For instance, when asked who was responsible for waste management and disposal, Mr P commented: ... *the Emfuleni (municipality) people come once a week to remove all the waste from the school. We put it at the gate on that particular day.* In most instances, waste is collected in plastic bags and put at the gate outside the school (exhibit 24) to be collected by the municipality workers on specific days to be disposed of.

Exhibit 24 Waste disposal



As indicated earlier, at some township schools, holes were dug along the schools' fences, wherein waste was dumped. It was noticed that this could create a hazard, in that waste was not necessarily sorted, but was burned. There could be chances of flammable objects, like aerosol cans being among the burning waste. These can explode and harm people near the holes.

Much of the data presented above provided this study with the opportunity to investigate the perceptions of school principals and or the designated facilities maintenance officers at schools about the school facilities maintenance approaches at schools. In this regard, the interviews provided data.

4.4 SCHOOL FACILITIES APPROACHES

Questions regarding facilities maintenance approaches sought to determine how facilities maintenance is carried out at schools. To this end, interviews sought to determine answers with regard to maintenance-related activities and the maintenance of service systems at schools.

4.4.1 ACTIVITIES RELATED TO FACILITIES MAINTENANCE

Activities related to facilities maintenance included a focus on maintenance organisation, inspections, maintenance policies, planning, maintenance categories and funding of facilities maintenance.

4.4.1.1 *Maintenance organisation*

Maintenance organisation relates to creating an organisational structure for the school maintenance programme and means that a committee should be set up to be responsible for facilities maintenance (cf. 2.8.1).

It was found that of the sixteen participants, only eight made reference to school facilities maintenance committees. For instance, Mr E indicated: *"...on the governing body is a sub-committee, building and grounds committee. We've got err, monthly checks. We take a stroll along the school to see where the areas are that needs upgrading and fix it"*. Mr C also indicated: *"... that is done by the committee. We've got this committee, the maintenance committee, the committee that looks after the premises, grounds and the surroundings and the like"* and on a number of occasions indicated the involvement of the maintenance committee in answer to questions relating to maintenance issues. In response to a question on who was responsible for facilities maintenance in terms of waste management and disposal, he stated: *"Yes err, the very campus committee is looking into that."*

It was, however, also noted that reference to school facilities maintenance committees was made hesitantly. This was seen as a clear indication that, while some schools had facilities maintenance committees, these were not very functional and did not really focus on facilities maintenance as a deliberate action to ensure the longevity and optimum functioning of facilities (cf. 2.2). Mr O, for instance, indicated: *"(We) are working now closely with the committee that is led by the clerk"*. Remarkably, the committee is led by the clerk.

Mr F alluded to the existence of a buildings committee and a maintenance committee, which raises the question of what purposes the two committees

serve and the possibility of duplication of functions or non-functionality. This was also highlighted by the fact that, in mentioning these committees, participants did not really refer to any specific maintenance functions carried out, except identifying problems. For example, Mr O remarked: *“So the committee itself, the maintenance committee, they stick around and look at the problems”*.

It was also found that, generally, schools had only custodial or cleaning staff and no staff expressly assigned to facilities maintenance. This is understandable since there is as yet no policy regarding school facilities maintenance (cf. 2.3) and consequently, maintenance staffing. For instance, in answering the question of whether custodial representatives and/or general workers were involved in long-term planning for facilities maintenance, it was clear that this group was represented by general workers only. In response to this question, Mr B remarked that the SMT member *“either he gets the information from the general worker who is working around that ...”*, which indicates that the general workers are also tasked with facilities maintenance processes. Alternatively, schools outsourced functions that would otherwise be carried out by facilities maintenance staff. To this end, Mr D indicated that the recently painted office was painted by *“... three guys who are doing piece jobs (odd jobs), we just employed them to do that, because they are specialist painters”*. Mr H also indicated as much when he stated that they *“involve almost all the stakeholders, stakeholders in the sense that the school management team is involved, the general workers are also involved”*. This was also indicated by Ms I who stated: *“(Long-term planning) includes the school management team, the general worker, and the parents”*.

The role that general workers play in facilities maintenance was also evident in response to the question of who carried out facilities assessment. Responses indicated, *inter alia*, the following:

The assessment forms part of our general worker or gardener general job descriptions – Ms A.

It is the groundsman, plus one SMT member – Mr E.

The principal and the general workers, randomly – Ms K.

I personally as a principal do sometimes, but mostly the groundsman – Ms M.

The maintenance of service systems also seemed to be executed by general workers, and in particular, gardeners. This is cause for concern since these functions require specialised expertise to execute, especially the electrical, plumbing and waste management and disposal. To indicate this, Ms A remarked that the gardener was responsible for maintaining electrical systems “because he’s skilled”, while Ms M, on the question of waste management and disposal answered: “We rely on our groundsman and the cleaner”, which was echoed by Ms K as well: “The principal, the groundsman, the SGB, and the safety committee”.

It was, however, clear that involving groundsmen and general workers in the maintenance of service systems was a risky undertaking. For that reason, a number of schools outsourced this function at a cost to the school. With regard to the maintenance of electrical systems and plumbing, Ms I, for instance, stated:

This one, our groundsman is not work-shopped in this, so we have to. It's either we ask someone to help us a lot, (or) we go to the Head Office, because let me make an example. We have a problem with the main switch, and the connection was not right, then the Head Office came, they rectified it. Because it cost so much.

This was also the case at Mr B's school. He indicated that although the groundsman did the maintenance of service systems, in the event of major maintenance works that required specialised knowledge and skills, they outsourced such jobs to experts.

From the participants' responses, it can be averred that school maintenance committees, where applicable, are not very functional in terms of the essence of school facilities maintenance (cf. Chapter 2). This was also noticeable with regard to facilities maintenance inspections.

4.4.1.2 *Inspections*

Inspections relate to a school building examination conducted in order to prepare a school maintenance plan. The most important function of inspection is to assist in the evaluation of the overall condition of the school building and it should be a continuous process in order to update the school maintenance programme (cf. 2.8.2). Questions in this regard sought to find out:

- whether there was system of assessing the condition of school facilities;
- who carried out facilities assessment and at what intervals;
- how the condition of facilities was assessed;
- whether there was a detailed asset or facilities register; and
- and who compiled it.

It was clear from most participants' responses that there was no system for facilities inspection or assessment. This is understandable in the context of schools not having facilities maintenance policies, because such policies would detail how inspections were to be conducted. Mostly, inspections were conducted in an *ad hoc* manner and as the need arose. Only when something broke, for example, would an inspection of facilities related to that object be conducted. This was evident in responses such as:

That we don't have. That we don't have. Emm. Normally, ja, we don't have a system in place but we do, we don't have anything written down, but we do as in like, we check if the school needs to be painted, the classrooms need to be painted and maybe the toilets need to be

refurbished. That is happening. The only thing that we don't have is something on paper – Ms A.

I, as deputy principal, work with the executive governing body and in the school governing body meeting, (I) must hand in a report, a monthly report where I then will report on the conditions of the classrooms the condition of the building, things, etc. – Mr D.

We don't have a system where we walk and tick it off. We don't have that in place. But what we normally do is, when we see something is wrong, we immediately react on it. Let's take the windows. The windowpanes must always be replaced. So (that is) what we normally do. At the end of the term, we go to the whole school and make a list – Mr F.

No, we do not have system of assessing school facilities in place, but it is the responsibility of every staff member to report to safety committee or to the principal if there is any damaged/broken windows – Ms K.

No, we do not have a system. We just assess by looking at the thing that needs attention, broken windows, burglaries, broken taps and so on. Then we give attention to such ... We just look at the things that need attention – Mr N.

Although some participants indicated having a system for facilities inspections, it was not very clear how this system functioned. It was, however, clear that these systems were not well planned and did not make use of standardised methods that enable data collection, such as procedures and documentation supplemented with the use of generally accepted checklists for facilities inspections (cf. 2.8.2). This was evident in responses such as:

Yes Meneer.. Like I say err, I devolve powers Meneer. I expect reports. For instance, every term every manager must come and report that in my area I have these things that need attention, and then

I need to verify. If I can, I enlist the services of the general worker or we look for somebody else – Mr B.

What we normally do we, we, ehh we do inspection, regular inspection and when we discover there is a problem, then what I do is, I call in an engineer. For instance, we have discovered cracks in the wall. So we called in an engineer to investigate the foundation as well and everything, and then he makes recommendations, and then we take it from there – Mr E.

Ja, we only do check-ups on our grounds. That is the task of the committee to look at the whole structure. To say, where do we need the next step and so on. But it is not written as such – Mr O.

It was also clear that there were no records of facilities inspections. It seemed that schools did visual and walk-about inspections, and even these happened irregularly as opposed to a well-planned and systematic process. Responses in this regard included:

We don't have a record. It's just a report to say emm, we agree to say we spend this much on this and this is done, but we don't have records or a checklist per se – Ms A.

It is done, it is recorded ... although we call it a plan. As we look at it on a quarterly basis, we indicate what we have achieved and what we have not achieved, and is also recorded. In short, it is recorded – Mr C.

I want to go there, to say to you, not done, because we don't have a checklist, we don't have a checklist ehh, what we normally do is that as I am saying we walk. And we see then... we write it down. From there we give it to the finance committee and they take it to the SGB – Mr F.

Facility condition is reported in writing only when there is a need to do so, e.g. in 2008 we had some classrooms where its ceiling was falling, so learners and educators of those classrooms were at risk as that ceilings could fall on them. This matter was recorded and reported to District Office – Ms K.

Other participants seemed to see the interview questions as “eye-openers” as they were apparently hearing about these aspects for the first time. This prompted them to indicate that these were matters they would attend to. For instance, Mr D remarked: *“That is something that I just need to check, emm, I think we have a file there, file for school policy, a yellow one, (pointing at the files) and that one doesn’t ring a bell, I need to look at it”.*

An asset register is a useful tool for recording information about the school’s assets, as well as keeping track of the status of facilities. Participants were asked whether their schools had a detailed asset register and also who compiled and updated them. All the participants indicated that their schools had asset registers as these were required by the Department. The participants also indicated that school asset registers were detailed as they contained records of movable and immovable assets, dates of receipt and delivery, the condition of assets and the quantity. It was, however, remarkable that the asset registers were kept by different people. For instance, Mr B. commented that their asset register was updated by the gardener, the groundsman and the maintenance committee. He actually said:

It depends. We, items like forks and whatever, that is done by the, the, the, and gardener, the groundsman, but he can’t type anything. He just writes on a paper and the clerk will do that for him and the rest is done by the maintenance committee.

Mr C indicated that their asset register was compiled and updated by the administrative staff, while Mr D indicated that he, personally, was in charge of the school stock by summarising what educators had compiled for their classrooms. In some schools, there were people specifically responsible for

compiling and updating the asset registers as part of their job descriptions. This was mostly in suburban schools where extra personnel could be employed and be paid by the SGB. However, especially in township schools, it seemed that administrative staff generally was responsible for asset registers.

The responses to the questions relating to the asset registers indicate a weakness in the school systems, which might be ascribed to the lack of policy governing school facilities. In this case, school facilities staffing is a challenge, since schools do not have dedicated facilities maintenance personnel.

Facilities maintenance policies are another important aspect of facilities maintenance planning.

4.4.1.3 ***Maintenance policies***

Just as in the case of school facilities maintenance committees, it was evident that schools did not have functional policies on facilities maintenance. In fact, participants mostly related to other policies as a way of compensating for having no specific facilities maintenance policies. Most of them were forthright and stated categorically that they did not have such policies. In this regard, Ms A stated: *"We don't have, facilities maintenance, no we don't have a policy on that"*. Mr F also commented: *"There is no policy around that, em, especially about, em, one that is functional"*. Mr J and Mr G were quite categorical as they respectively stated: *"No"*; *"There is no policy on school facilities maintenance at our school."*

Other participants tended to cite other policies. For instance, Mr G stated: *"... Though, yes, we record the smallest things, and the biggest things are reported to me and I see that done"*, implying that though there was no policy, there was a known procedure for carrying out maintenance activities, meaning, everyone knew that they had to report to him. Mr C pointed out that they recorded maintenance needs and in that way, *"... we have recordings or a plan, that*

becomes a policy on its own". He, however, admitted: "Maintenance policy? Not at this stage. Perhaps we've got to come up with a policy which we have to follow. Otherwise we're just following a plan, so err, in my understanding, that would be a policy, but if we have to have this policy separately, that will be developed". Ms L related to a general maintenance policy, stating: "No, however, we do have a policy on general maintenance."

Some participants indicated that the interview question was an eye-opener in this regard, as they did not know about the whole issue of facilities maintenance and the need to have apposite policies for it. To this end, Mr D commented:

... (thinking deeply) that is something that I just need to check. Emm, I think we have a file there, file for school policy, a yellow one, (pointing at the files. But that one doesn't ring a bell, I need to look at it, Look it is an easy thing to do, because as I said, emm, the policy on assessing, the policy of the school ground and something like that is a very possible one. ... If you have the normal cleaning of the staff, I mean they sweep the classrooms every afternoon; that could be written in the policy".

This response indicates clearly that Mr D did not have an idea of what a school facilities maintenance policy entails, let alone knew how to develop it. Similarly, Mr H proffered a delayed and hesitant response that indicated lack of knowledge regarding this aspect:

Yes, err, we do have a functional policy for the school facilities maintenance which as I have indicated earlier ... on since we are a school of 3 phases, it works from phase to phase and then, err, usually will affect me, the compliance, the principal, one admin staff, one HOD and the educator look at the use of a checklist to assess everything in the school.

Some participants indicated that they were working on such a policy. In this regard, Mr. E stated:

Emm, we are working on a policy, we don't have a fixed policy yet, specifically dealing with all those aspects. Err, it is included in the school policy, but I think we need to review our policies in terms of, you know, the one that deals specifically with maintenance and projects. It is also a part of our finance policy, because we refer to it, for instance, in our finance policy. When we need, err, have identified a capital project, need to bring in 3 quotes and the finance committee will approve it, will look at it and also the final approval will be done by the SGB. Err,... (it is) budgeted for, within that policy, part of it. Also, you know, (it) deals with maintenance, where money is involved in projects.

Mr. N. also indicated that a need for developing a facilities maintenance policy. He remarked:

Yes we do have a policy, but it says security and maintenance. Basically, when I look at our policy, it becomes the issues of security more than maintenance. Yes, because usually, we review our policies after 3 years. So obviously, this year we shall be reviewing our policy ...We have to look at that. As the SGB, the issue of maintenance, and being under the section 21 category, we need to account. No, we need to look into that, it must be reflected in our policy.

Only one participant indicated that they had a facilities maintenance policy. Mr B. stated that there was a policy, though it was not functional. He stated:

"A policy is there, though I must say, the people do not adhere to it. But it is there. The committees are not functional, but it is there".

The status quo in the schools confirms that facilities maintenance is not accorded a priority status, which could also imply that facilities maintenance does not form part of the whole-school development planning.

4.4.1.4 **Maintenance planning**

Maintenance planning is a process with the underlying purpose of achieving better use of school facilities and of minimising the cost of resources tied up in grounds and buildings (cf. 2.9). As alluded to earlier (cf. 2.9), effective maintenance planning requires a well-conceived, formulated and written school facilities maintenance plan as an essential component of an effective school programme. This implies making facilities maintenance planning one component of a greater organisational management plan, ensuring that facilities maintenance planning includes long- and short-term plans, and demonstrates organisational commitment to facilities maintenance.

Schools in South Africa are directed by Provincial Acts to engage in school development planning or school improvement planning (cf. Gauteng Provincial Province, 1997). Consequent to that, it was found that participants were more familiar with these processes and thus misconstrued school facilities planning for these processes. Examples of this are evident in responses such as:

Oh yes it does, I want to associate the facilities maintenance plan as the school improvement plan and the school development plan. That is what we've written – Mr C.

What we have is, we have a emm, ... we do investigation on the buildings and the grounds. The whole SGB is involved and then we take regular inspection and make a list, then we prioritise this list and then we budget for it. And we include it in our SIP (School Improvement Plan) and then according to those priorities we add (inaudible) budgeted for, within the budget ... - Mr E.

We got the SIP School Improvement Plan. We include everything in place, what we need – Mr F.

No. The school does not have that kind of a plan. We only have a school development plan that looks at the entire school. We

unfortunately do not have a specific plan for facilities improvement – Mr P.

No, we don't have that. Mhn, we are normally guided by the SIP. We look at the SIP and there's a portion on maintenance and we look at our strengths and weaknesses, and that then guides us on what to put in our SIP – Ms A.

Other participants were explicit in likening facilities maintenance planning to their school development or improvement plans. Ms L, in this regard stated: *"Our facility maintenance plan is embedded in our SDP/SIP"*. Similarly, Ms K stated: *"Our school does not have a written maintenance plan, but the maintenance plan is included in our school development plan"*. A similar response came from Mr N as he stated: *"Yes, it is part of that, as I am saying, as I have indicated the nine areas, it covers the whole area of development. So it becomes a component of the whole err, SIP that will be translated into the school development plan."*

Other participants indicated directly that their schools did not have school facilities maintenance plans, nor did they include maintenance planning in their school development plans as evident in Mr O's response: *"No. The school does not have that kind of plan"*. One participant, Ms M indicated that they, as a school *"do not have any written things"* and ascribed this to her being *"new in that school"*.

Mr B gave an answer that suggested that that there is no maintenance plan. He remarked: *"No. I don't think I have it, in a written form, ... but I know that every now and then, the ground staff, general workers are divided according to blocks of classrooms and this one checks this with the maintenance committee and reports"*. This response contrasts with his response to the question on the availability of a functional policy on maintenance planning, where he answered that there was a policy (cf. 4.4.2). The thrust of the matter is that there can be no planning without a functional policy, since policy dictates operations which have to be properly planned.

From the responses above, it is clear that schools really do not have facilities maintenance plans, and that although respondents claim to have school development or improvement plans instead of maintenance plans, it is also evident that school facilities maintenance planning does not form part of the school development planning. What seems to emerge from the responses is a situation where maintenance planning is coincidental and does not receive specific attention as such. As alluded to above, school facilities maintenance planning requires a well-conceived, well-formulated and well-written school facilities plan (cf. 2.9). It can also be said that school facilities maintenance planning is a strategic lever for the school's short and long-term facilities needs.

The short- and long-term planning for school facilities requires a whole-school approach in terms of its focus, as well as in terms of the involvement of stakeholders. Participants were asked whether the school management team, administrative staff, facilities maintenance staff, custodial staff, representatives of general workers, educators, parents and learners were involved in such short- and long-term planning for school facilities. Responses to this question seemed to indicate the ideal situation where all stakeholders would be involved, rather than what was actually happening at schools. This is understandable since, from the previous questions, it was clear that no facilities maintenance planning or policies were available. For instance, Mr B stated that all the listed people were involved. However, his explanation indicated that there was no planning really and seemed to relate to an arrangement in cases of breakages of windowpanes and deployment of SMT members for purposes of reporting the anomalies in facilities. He remarked:

All of them Meneer. Ja. Every SMT member has a section of the school that he or she is responsible fo. If there's for example, a window pane broken, I expect that particular SMT member to inform me, it's either he gets the information from the general worker who is working around that or informs the general worker but he still has to report to me.

Some participants indicated that there was no long-term facilities maintenance planning. While some indicated that only the SMT and parents were involved, with others being informed of decisions taken. One participant, Ms L, indicated that they excluded learners, while Ms I indicated that they excluded educators because they had included the SMT. These responses most probably related to the school development or improvement planning processes. What is noteworthy is that some stakeholders were not involved in planning processes. Despite the fact that it was clear that no planning was done on facilities maintenance, these responses can be accepted as implying that in development planning processes at schools, not all stakeholders are involved.

It was also necessary to establish the kinds of maintenance categories most prevalent at schools, which links to observations made at schools.

4.4.1.5 **Maintenance categories**

Maintenance categories relate to types of maintenance processes and include preventive, predictive, emergency, deferred and corrective maintenance. However, this section focuses on the first three categories because they are the key categories for ensuring that school facilities are in a condition suitable for learning and teaching (cf. 2.9).

Interviews revealed a picture of facilities maintenance being an unfamiliar phenomenon for the participants. While there was evidence of facilities maintenance at schools, it was clear that the nature of the phenomenon was generally unknown. Questions related to whether there were plans for each of the three maintenance categories. Participants generally seemed not to know the terminology relating to these categories, which reinforces the notion that participants' knowledge of school facilities maintenance is less than adequate. For instance, Mr D answered: *"I think it's based on observation, you look and identify the problem and then you act accordingly..."* while Ms A remarked:

Ja, we don't. It is so scattered. Part of it is on the learners' code of conduct, part of it is on the educator code of conduct. ... Because

taking into account the kid who breaks a window deliberately. We look into the case and the parents are made to pay. ... but we don't have a full maintenance plan in a form of a policy.

This response indicates clearly that both participants thought of preventive maintenance as a way of preventing learners from causing damage to facilities, which while sensible, is a narrow view of preventive maintenance (cf. 2.4.2). This can also be gleaned from Mr. E's response, which was difficult to decipher, except for indicating a misunderstanding of what preventive maintenance entails:

No, no preventing maintenance. No, we don't have a plan as such. What we have with preventative maintenance, ... we have checklists in the classrooms with, with everything. ... Everything is functional and operational. Maybe that is an informal preventative maintenance.

Similar responses to predictive and emergency maintenance were proffered. Ms A remarked:

We predict that next year we'll be having this broken, and so many parents won't pay in time. And what we normally do is, we set aside a certain amount of money from the maintenance fund that is allocated. Because if a window is broken, the parents might take time in replacing or paying back and then we don't have a budget for that normally.

Mr D's response similarly demonstrated this lack of understanding of what these categories entail. He maintained:

You not gonna predict that there's gonna be a tornado coming to the school and but I do believe that you have to put some money away for ...things. But that is a very grey area. Ja, I also know that with management finances, you would much more concentrate on the things that you know will be happening and that's the money well-spent. Err, you could have, maybe, employed another teacher with the

R100 000 or whatever that you have put away for unplanned thing, which might not happen.

It was, however, found that some participants did have an understanding of these categories, if only from their linguistic connotations. An example is Mr. D's response which was:

Emergency maintenance I think will be based on emm, happening itself, emm, what we do have we make sure that our fire extinguishers are serviced every year, that I think is very important thing and that we have people who know how to work there. The staff will be trained you know and that we have boards and signs showing...where they are

Most principals asked for a copy of the interview schedule in order to ensure that they can approach their facilities maintenance practices from another angle. Mr N commented thus: *"No, we do not have such a plan. It's...for the first time I am hearing of them"*. This was also interpreted to mean that even the Department of Education approaches facilities maintenance in a "one size fits all" approach. There is only one plan or policy for all categories of maintenance in terms of the financial allocation. This is evident when the funding schools receive for facilities maintenance is considered.

4.4.1.6 Maintenance funding

Maintenance funding was found to be the basis of the maintenance challenges in most schools. Although the Department of Education allocates money to schools, participants indicated that it was not enough. All participants indicated that the department allocated 12% for maintenance, which was, as they said, "ring-fenced". This implies that even if maintenance needs exceeded the 12%, schools could not use funds allocated for other functions. However, some participants indicated that their maintenance budgets were higher than the allocated 12% and they had to raise funds to augment the allocated amounts. For example, Mr B stated:

At times we even go beyond that, as I'm speaking to you we are spending in the range of R50 000.00 towards the renovation of the school which is money that we won from Botle Ke Botho competition.

Similarly, Ms L. commented: *"12% of the whole school budget, however it does not suffice, we augment it by SGB fundraising cost centre"*. Mr C indicated as much and mentioned that they also raised funds towards the maintenance of the school. He replied: *"We have to raise funds to make ends meet, there are things that have to be maintained on a daily basis."* What was abundantly clear was that the allocated 12% was very inadequate considering the facilities maintenance needs of schools.

In suburban schools it was found that, although the principals indicated that they were also inappropriately funded, the money they allocate to facilities maintenance in fractions and in monetary terms is by far more than that of the township schools. For instance, Mr E commented: *"I can tell you that one, R 400 000.00 for maintenance..."* and Mr G similarly stated: *"... we're working on a R2m budget and I would say about R 500 000.00 is for maintenance..."* This is possible because the suburban schools charge monthly school fees of more than R200.00 per learner per month, while there are no fee paying schools among the township schools. For these schools the allocation is never enough. It is therefore not surprising to find that suburban schools are better maintained than township schools.

4.4.2 Service systems

The maintenance of systems and equipment involves the formulation of policies that clarify the standards necessary to equip, maintain and operate the school, finance these systems and ensure that these policies are implemented (cf. 2.6.3). The maintenance of service systems usually requires specialised expertise, and the people responsible for maintenance in this regard should be qualified. The most common service systems at schools are the electrical, plumbing, HVAC and waste management and disposal systems. Questions

regarding service systems sought to find out who was responsible for their maintenance at schools.

As alluded to elsewhere in this section, it seems that the general workers, gardeners and groundsmen play a prominent role in the maintenance of these systems. It was mentioned that this was because some of these staff members had skills, although elementary, in the maintenance of such systems as basic electricity and plumbing. It was also clear that waste disposal was their responsibility.

It was found that where electricity is concerned, schools hired qualified electricians to fix faults and electrical problems. In this case, principals mentioned that the electrical systems were their responsibility. Ms A indicated that she checked electrical systems and on finding faults, informed the school governing body, except in emergencies where immediate attention was needed. She remarked: *"I do it immediately. Like last week. I had a burst pipe (probably some wiring had "exploded"). I immediately called in the electrician to fix up something, because it goes with the computers and printers, and we can't wait. So we don't have specifically a person other than myself".* Similarly, Mr D indicated: *"It falls under my portfolio. The groundsmen report to me very much here, and we normally have an electrical contractor who we get in, a qualified person, who will come and fix that. Ja, but it falls on my portfolio and I report on that as well in the meeting."* Mr F also indicated that there was no specific person in charge of school facilities – it was his responsibility.

Plumbing works at schools seemed to be the responsibility of the male general workers. It must be stated that reference was really made to repairs of plumbing fixtures, rather than actual maintenance in terms of predictive and preventive measures. It was also mentioned that when major works were involved, these jobs were outsourced to professional companies or reported to the department. This was evident from comments such as:

Plumbing is done. We got this elementary knowledge. It is done by general assistant but if there is a major problem we also have people

who have better equipment and in terms of locating those plumbing material, we always invite people from, actually we hire them – Mr C.

Plumbing as it is part of the general work, the other general worker who has some little expertise will take care of plumbing issues since we are also trying to develop them in terms of our SIP – Mr H.

Plumbing, it's us, even if it is minor. The toilet is blocked, we have to do it. But for... what do you call it? Flush masters, that was done by Head Office – Ms L.

We normally get people from outside to do it. For minor plumbing work there's somebody, a parent who is skilled in small scale plumbing – Mr P.

It was found, generally, that not all township schools have HVAC systems. Maintenance in this regard, seemed to revolve around repairing broken portable heaters (which were only used in winter) and kettles. In suburban schools, the HVAC systems were not functional, especially those that had to do with classrooms. This was well-articulated by Mr D who said:

There is a system, but it hasn't worked for years. For many years, like in 12 years. It hasn't worked at all. It would be a massive, expensive job to fix that turbine which generates heat to the school. ... We have two rooms with air conditioning. There are two computer rooms. They have air cons. And this one (his office). So, eventually, if one of them breaks down, then we get a professional person, we don't have the skills.

Waste management and disposal at schools is a critical aspect of school facilities maintenance because waste affects the environment and public health by degrading water, air and soil. Maintenance regarding waste management relates to ensuring that equipment for waste disposal is clearly identified and marked. Waste management also seeks to ensure that no injuries occur because of wrongly disposed hazardous material like chemicals.

Waste management and disposal at schools seemed to be the responsibility of general workers. Some schools dug holes in which waste was disposed by burning. In this regard, Ms A commented: "*We've dug a hole where in we put everything in there and we understand we are not right by doing that because we shouldn't burn those things, we've been given the dustbins*". By her own admission she was aware that burning waste was a wrong practice since children could be injured playing in and around that hole. She was also aware that an alternative was to recycle their waste. In other schools, waste was disposed of in large bins collected regularly by the municipality. As regards chemicals, Ms L pointed out that they hired a person to collect the chemicals for proper disposal. It was, however, clear that the general workers and groundsmen were responsible for managing and disposing waste. This has implications for the safety of learners and staff, and for the safety of the general workers themselves, especially in having to dispose of waste that is hazardous as no mention was made of these general workers' skill or knowledge levels regarding different kinds of hazardous materials.

4.5 SYNTHESIS: EMERGENT THEMES

The analysis of data collected revealed a number of important factors regarding the current facilities maintenance practices at schools. Firstly, from the general appearance of school environments, it was clear that maintenance work is being carried out, albeit *ad hoc* and unsystematic. The average extent of experience of participants as facilities maintenance officers indicates that whatever approaches schools use for the maintenance of facilities, are a result of trial and error as well as experiential knowledge.

Secondly, facilities maintenance at school connotes the narrow definition of facilities maintenance, namely the repair and upkeep of facilities (cf. 2.2). This is perhaps the reason for lack of knowledge of maintenance categories and concepts. It can also explain the reason for deferred maintenance and the involvement of general workers and groundsmen in maintenance functions that require people with appropriate qualifications.

Thirdly, it was evident that without policy directives informing facilities management, and therefore maintenance at schools, it was always going to be difficult for schools to have systematic maintenance processes aimed at ensuring that school facilities maintenance served to promote educational programmes. Clearly participants attempt to maintain facilities, but without a policy framework, their attempts are constrained by numerous factors, including the following:

- Creating an organisational structure for facilities maintenance programmes is curtailed by poor resourcing. For instance, schools do not have dedicated facilities maintenance staff who are qualified or properly trained for the maintenance task. Clearly, most maintenance functions require specialised knowledge and skills, for example the electrical, plumbing, HVAC and waste management and disposal systems. The current practice at schools is for general and custodial workers to be responsible for maintenance, which in itself is a risky undertaking since they are not qualified maintenance workers.
- Staffing of general workers at schools is based on the staff provisioning norms, which are also based on the enrolment of schools. This, in essence implies that the number of general workers is determined by the ratio of staffing. This does not take into account the physical size of the school and the nature of facilities at the school. For example, a comprehensive school, that offers technical subjects would require more maintenance staff than a primary school offering the mainstream curriculum. Despite this reality, the number of general workers is determined on the same post-staffing norms, which also disregards the fact that a technical school has various machinery and equipment that require qualified maintenance personnel. Consequently, school governing bodies and principals have to decide on the maintenance staffing needs. This results in one school setting more custodial workers as a priority, while another would prefer more general workers.

- Funding for maintenance is less than adequate. Funding is also based on norms that determine the quintile classification of a school. In terms of these norms, suburban schools usually receive less funding than the so-called quintile 1 schools. This is regardless of the nature of facilities at these schools and the concomitant maintenance requirement. This is why most suburban schools, while having HVAC systems, cannot make use of them. As one participant stated, it would be too expensive to repair the system, let alone sustain its functionality. The non-functionality of the HVAC systems has a negative effect on the thermal conditions of classrooms and thus adversely affects academic performance.

Fourthly, it was evident that participants generally did not have knowledge of school facilities maintenance. This was evident from responses that misunderstood facilities maintenance concepts, such as maintenance categories like emergency and predictive maintenance. This clearly implies that facilities maintenance at schools, and perhaps at departmental level, has not been accorded the priority status that regards it as a component of schools' educational programmes. The candid request for the interview schedule and the expression of ignorance regarding some facilities maintenance concepts are indicative of this.

Fifthly, schools themselves seemed not to have direction in terms of systematising school facilities maintenance. This was evident from the fact that there were no policies informing facilities management and maintenance. Thus it is clear that in the schools' development planning and improvement planning processes, facilities maintenance was not considered a component. While in these processes, the school environment in terms of safety and security, are strategic levers, facilities maintenance was not regarded as an aspect of the strategic planning processes. For that reason, a maintenance approach is important.

Finally, it was also evident that stakeholder involvement in planning for facilities usage, management and maintenance was lacking. The fact that the administrative clerk is the head of facilities maintenance in one school attests to

this. In essence, this implies that SGBs do not have facilities maintenance sub-committees and, consequently, do not engage in strategic facilities maintenance planning, where all school stakeholders would be involved.

It must, however, be stated that there was evidence of some form of school facilities maintenance, with each school, on an *ad hoc* basis, attempting to maintain its facilities in its own way. The main weakness is the fact that there are no formal, systematic and organised facilities maintenance practises.

4.6 CHAPTER SUMMARY

This chapter presented the data analysis stemming from ethnographic observations and interviews. Firstly, the demographic profile presented indicated the general conditions of the research sites and shed insight into possible reasons for the status of facilities maintenance at schools.

Secondly, the observation presented and accompanied by exhibits of features at schools also shed light into schools' facilities maintenance practices. From the observations it was clear that schools did engage in facilities maintenance, albeit the narrow definition, which relates to the upkeep and repair of facilities.

Thirdly, the interviews indicated that due to lack of policy on infrastructure and facilities provisioning in the Department of Education, the knowledge of the nature of school facilities maintenance was less than ideal. Despite this shortcoming, it was clear that schools had, through "trial and error", perfected their own ways of maintaining facilities.

The next chapter present the study summary, main findings and recommendations, with the main recommendation presented in the form of a proposal for a whole school approach to facilities maintenance.

CHAPTER 5

SUMMARY, OVERVIEW OF MAIN FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter presents the summary of this study by focusing on important aspects emerging from the literature study regarding the nature of facilities maintenance, as well as findings from the empirical study. Main findings of the study and recommendations are also presented. Guidelines for developing a whole-school approach to facilities maintenance are proposed for schools. This chapter is rounded off with the presentation of recommendations for further research and concluding remarks.

5.2 SUMMARY

Chapter 1 presented the background and rationale for the study. The research aim and objectives were outlined. The chapter presented assumptions, significance of the study, overview of the research design and methodology, the delimitation and study limitations.

Chapter 2 presented a literature review of the nature of school facilities maintenance. It also contextualised the phenomenon of facilities maintenance within the school as an organisation and as a component of facilities management, which then defined facilities maintenance as all activities undertaken by the school community in ensuring that school facilities are in a condition that delivers and supports educational programmes in a continuous and optimum manner (cf. 2.2). A legislative framework in terms of school facilities maintenance in South Africa was also given (cf. 2.3). This indicated that South Africa is at the initial stages of establishing policy and legislative directives for school infrastructure provisioning. The chapter further dealt with facilities maintenance categories (cf. 2.4), school facility standards (cf. 2.5), areas of school facilities maintenance (cf. 2.6) and challenges regarding

facilities maintenance at schools (cf. 2.7). Section 2.8 explained how facilities maintenance should be approached. The chapter was concluded by detailing the process of school facilities planning (cf. 2.9). This process foregrounds the whole-school facilities maintenance approach proposed in this study.

Chapter 3 outlined the research design and methodology. The paradigmatic orientation was first explained. To this end, this study used an interpretivist, qualitative approach in an attempt to understand phenomena through the meanings that people assign to them and by interacting with them in their natural settings and through their language. Thus the research method as presented (cf. 3.3) involves ethnographic observations (cf. 3.4.2.2) and interviews (cf. 3.4.2.3) as data collection strategies. This chapter also introduced the participants and the basis of their selection, as well as the selection of research sites (cf. 3.4.2.4). Data analysis (3.4.2.5) as is typical of qualitative research was then outlined. The chapter was concluded with the exposition of ethical considerations (cf. 3.5).

Chapter 4 presented the data analysis and interpretation. In this regard, the demographic profile of participants and research sites were presented (cf. 4.2) followed by the analysis of data relating to the conditions of school facilities (cf. 4.3) in terms of school buildings (cf. 4.3.1), school grounds (cf. 4.3.2) and service systems (cf. 4.3.3). The condition of school buildings was analysed in terms of the exterior appearance (cf. 4.3.1.1), the interior appearance (cf. 4.3.1.2) and the exterior structural conditions (cf. 4.3.1.3). The condition of school grounds (cf. 4.3.2) was analysed in terms of roadways and parking lots (cf. 4.3.2.1) and the site appearance (cf. 4.3.2.2), while the condition of service systems (cf. 4.3.3) was analysed in terms of the electrical (cf. 4.3.3.1), HVAC (cf. 4.3.3.2), plumbing systems (cf. 4.3.3.3) and waste management and disposal systems (cf. 4.3.3.4).

Section 4.4 presented the data analysis of how schools currently approach facilities maintenance. This was done in terms of activities related to facilities maintenance (cf. 4.4.2), which included maintenance organisation, facilities inspections, maintenance policies, maintenance planning, maintenance

categories, maintenance funding and service systems. A synthesis (cf. 4.5) of findings rounded off the chapter and presented a discussion on emergent themes from the data.

The next section presents the overview of the study.

5.3 OVERVIEW OF MAIN FINDINGS OF THE STUDY

The main findings are presented in terms of the research aim and objectives of this study.

5.3.1 Findings with regard to how a whole school approach to facilities maintenance can be developed

In reviewing the nature of school facilities maintenance (cf. chapter 2), it was found that facilities maintenance entails much more than just the repair and upkeep of school facilities. Facilities maintenance is premised on the coordination of the interface between *what* people do and *where* they do it. Because the school is an organisation comprising people interfacing with school facilities to achieve objectives of the school's educational programmes, a whole-school approach then involves the whole school in terms of, firstly, all stakeholders or people involved in the school and, secondly, the entire school facility comprising school buildings, grounds and service systems.

In determining what the current facilities maintenance practices are at schools (chapter 4), it was found that schools largely practised facilities maintenance, although the process was not well structured. This finding implies that schools do not maintain their facilities in a systematic and planned manner (cf. 4.5). Consequently, a strategic planning process seems the most prudent lever for developing a whole-school approach. Therefore in developing a whole-school approach to facilities maintenance, the point of departure for the school is to ensure the involvement of all stakeholders by creating an appropriate facilities maintenance organisational structure (cf. 2.8.1), conducting an initial school facilities inspection (cf. 2.8.2) and embarking on a comprehensive strategic planning process of establishing a school facilities maintenance programme (cf.

2.8.3). This is further outlined in the proposed whole-school approach to facilities maintenance recommended in this study.

5.3.2 Findings with regard to the nature of school facilities maintenance

The literature review revealed facilities maintenance as an organisational activity carried out by the school community in order to prolong the life expectancy of the school buildings, furniture and equipment. It is a continuous operation to keep the school building, furniture and equipment in the best form for normal use and is systematic and pro-active (cf. 2.2). This essentially comprises all activities undertaken by the school community to ensure that school facilities are in a condition that delivers and supports educational programmes in a continuous and optimum manner. In this sense, school facilities maintenance is about providing a clean and safe environment for learners and is also about creating a physical setting that is appropriate and adequate for learning, which then implies that school facilities maintenance is an integral component of the school's learning programme and must receive priority attention and be treated as part of whole-school programmes (cf. 1.1). The implication of this is that facilities maintenance has a strategic dimension that covers issues such as the design of facilities and their maintenance programmes, upgrading the knowledge and skills of the workforce, and deployment of tools and "manpower" to perform maintenance work (Tsang, 1998:88).

Facilities maintenance involves categories of activities done at various times for various reasons. To this end, emergency maintenance is concerned with the repair or replacement of facility components or equipment requiring immediate attention because the functioning of a critical system is impaired or because health, safety or security of life is endangered. Emergency maintenance therefore responds to unexpected equipment breakdowns, building component failures and accidental or deliberate vandalism (cf. 2.4.1).

Preventive maintenance aims at maximising the useful life of all building systems before failures occur and thus comprises all activities that can be

regularly scheduled to prevent premature failure or to maximise the useful life of a facility. Preventive maintenance applies to all building systems and components (cf. 2.4.2). Routine maintenance aims at generally repairing or replacing building components, equipment or operating systems, including the general upkeep of the grounds and buildings (cf. 2.4.3). Routine maintenance thus allows for the continued use of a space for its intended purpose and serves as an additional manifestation of ownership and caring, through *inter alia*, the regular maintenance of items such as burned out light bulbs or fluorescent tubes, dripping faucets, worn floor tiles and ceilings and damaged doors and windows, which result from normal use of the building.

Predictive maintenance aims at investigating and measuring to detect the onset of equipment or system degradation, thereby allowing stressors to be eliminated or controlled before they cause significant deterioration in the physical state of the components. The results of these investigations will indicate the current and future capability of the equipment or system (cf. 2.4.4).

Corrective maintenance addresses the deficiencies that inevitably result from unforeseen events, however diligently a preventive maintenance programme is conducted. Corrective maintenance includes, *inter alia*, vandalism, lightning strikes, hail and flooding, and does not call for any checking of services before system failure (cf. 2.4.5).

Deferred maintenance includes scheduled activities that are delayed or postponed for reasons such as lack of funds or personnel, changes in priorities and change of use (cf. 2.4.6).

To realise support for and advancement of educational programmes and acceptable standards for the performance of educational facilities, schools should establish standards to institute baseline criteria and benchmarks for maintaining educational facilities, which reflect the expectations of school stakeholders (2.5). Such standards include:

- *safety*, which relates to school facilities being maintained to create a safe learning environment that is free from environmental hazards and occupational risks for learners, staff and the general public;
- *sanitation*, which means that school buildings have to be cleaned on a daily basis to promote health and ensure sanitary conditions, especially in classrooms, laboratories, kitchens and other areas that are prone to germs,
- *security*, which means that facilities are maintained in such a manner as to protect occupants, property and equipment from vandalism, theft, intrusion and natural disasters;
- *functional performance*, which means that all maintenance activities should ensure that buildings, grounds and equipment facilitate the educational process and function in an economic and efficient manner;
- *physical condition*, which relates to maintenance operations ensuring that buildings, components and equipment are sound, in good serviceable conditions and otherwise in good working order; and
- *appearance*, which implies that facilities must be maintained to achieve the desired level of appearance expected by a school community (cf. 2.5).

School facilities maintenance, as pointed out earlier, focuses on the whole school. In this regard, areas of maintenance can be classified into school buildings (cf. 2.6.1), including walls, floors, ceilings, roofing and windows and doors; school grounds (cf. 2.6.2), including landscaping, perimeter fencing, irrigation systems, trees and/or shrubs, flower bed plantings, turf or lawn and climbing plants; service systems (cf. 2.6.3), including electrical, plumbing, HVAC and waste management and disposal systems.

School facilities maintenance is not without challenges. Among other challenges, it includes poor or no documentation of facilities maintenance activities, maintenance plans not being updated, maintenance staff not being

properly trained, inadequate funding for facilities maintenance, and equipment documentation not being readily accessible (cf. 2.7). To deal with such challenges and develop effective school facilities maintenance programmes, a structured approach to school facilities maintenance is needed. This approach involves establishing an organisational structure (cf. 2.8.1), conducting facilities inspections using various tools like checklists to ensure that the process entails the whole school or is holistic (cf.2.8.2) and engaging in a facilities maintenance planning process with a strong strategic dimension (2.9).

5.3.3 Findings with regard to what the current facilities maintenance practices at schools are

A number of important findings emerged out of this study. Firstly it was found that facilities maintenance does take place at schools, but that this was in terms of its narrow definition, namely the repair, replacement and general upkeep of facilities and equipment. This was evident from the fact that most schools presented well-kept environments and that attempts were made to keep schools neat and facilities functioning, although there was evidence of deferred maintenance. Participants indicated knowledge and awareness of the need for ensuring that facilities were safe to use and that neat and attractive school environments had an impact on the school ethos and on how parents viewed the schools.

There was no evidence that facilities maintenance formed an integral component of school development planning and consequently, school programmes. For instance, budgeting for maintenance seemed to be for routine activities and emergencies. The focus seemed to be merely on the upkeep of facilities. This implies also that facilities maintenance is not considered an integral component of the educational programmes at schools. This is mainly because facilities maintenance was seen as an aspect of school safety and security, and thus did not stand alone as a fully-fledged component of the school's strategic levers for education delivery.

It was also found that the policy for school infrastructure provisioning and thus facilities management and maintenance was not yet in place. Consequently, schools do not have dedicated facility maintenance personnel. From personal experience as principal of a school, in terms of post-provisioning, the allocation of non-teaching staff is based on the school's enrolment, that is, for every 152 learners, one non-teaching post is allocated to the school, which will either be an administrative or custodial staff member. Based on the needs of the schools, decisions have to be made as to whether to employ a clerk, a cleaner or a gardener. This is regardless of the type of school, namely primary, secondary, comprehensive-technical or school for learners with special educational needs. This is why suburban schools charge higher fees than township schools and seem to have more custodial and gardening staff than township schools. They employ more staff on school governing body posts.

As a result of the absence of policy, it was also found that funding for maintenance is less than adequate and is based on norms that determine the quintile classification of a school. Consequently, schools have more custodial staff than actual maintenance staff.

There was no evidence of strategic facilities maintenance planning at schools. This is perhaps why the following was found:

- Principals had a poor knowledge of school facilities maintenance concepts, for example misconceptions about maintenance categories like predictive and emergency maintenance, the HVAC systems, facilities maintenance planning (mistaken for school development or improvement planning).
- Stakeholder involvement was only for fundraising and not specifically for facilities maintenance.
- No maintenance committees existed as part of the maintenance organisational structure.
- No policies existed for facilities maintenance.

- Facilities maintenance activities tended to be *ad hoc*, rather than being purposeful and planned activities.
- Evidence existed of deferred maintenance of facilities.

From the exposition above, it can be concluded that facilities maintenance practices at schools currently fall far below accepted facilities maintenance requirements and standards as exposed through the literature review. There is thus a need for providing recommendations and guidelines for developing a whole-school maintenance approach in an attempt to assist schools.

5.4 RECOMMENDATIONS

Schools need to attend to their short-term facilities maintenance needs and their long-term facilities maintenance approach. In terms of the short term, the following recommendations are made:

- Schools should conduct facilities inspections as a matter of urgency to identify all hazards and attend to them expeditiously. For instance, attention needs to be paid to missing circuit breakers, exposed electricity distribution boxes, tripping hazards, damaged ceilings and roofs, damaged floors in classrooms, broken windowpanes and graffiti on the walls.
- Where general workers and gardeners are also responsible for small-scale repairs of equipment and service systems, they should be provided with training to acquire basic skills in such functions.
- Interim school facilities maintenance committees should be established so as to have some functional organisational structure for school facilities maintenance. This will ensure that there is at least some structure pertaining to facilities maintenance. This will also assist in determining systems for ensuring that routine and corrective maintenance are planned for.

- Since schools already compile school development plans, facilities maintenance should be regarded as one of the major strategic levers in the development planning processes. This will ensure that facilities maintenance is planned and budgeted for, and also that it is included in the plans for the implementation of school development plans.

The overriding need for school facilities maintenance seems to be on developing comprehensive long-term strategies, because it is evident that while some maintenance work is done at schools, it is unsystematic, uncoordinated and not holistic. Therefore the main recommendation of this study for schools is that *there is a need for a whole-school approach to facilities maintenance*. Section 5.5 presents guidelines for developing such a whole-school approach to facilities maintenance.

5.5 GUIDELINES FOR DEVELOPING A WHOLE-SCHOOL APPROACH TO FACILITIES MAINTENANCE

The need for a school facilities maintenance approach is expressed in the National Department of Education's General Notice 1438, which calls for comments on the National Policy for an Equitable Provision of an Enabling School Physical Teaching and Learning Environment (Republic of South Africa, 2008). In the Notice (Republic of South Africa, 2008:11), the Minister of Education states the following:

By the end of 2010 the DoE will have developed a national policy on the management of immovable assets. Minimum parameters of that policy will include: ... efficient usage and adequate maintenance, rehabilitation, and disposal.

Within the same time span, the department of education will also develop a comprehensive maintenance policy for school infrastructure, basic services, furniture and equipment. The policy will entail norms and standards for preventive and corrective maintenance as well as replacements.

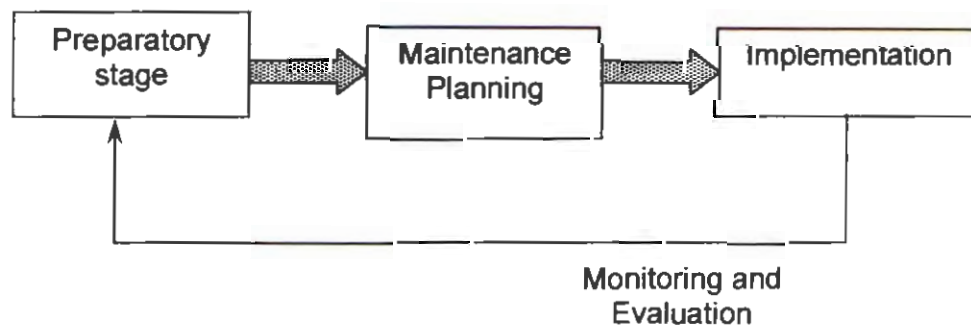
From this policy pronouncement, it is clear that there is indeed a recognised need for school facilities maintenance that is not only the concern of the school, but includes the Department of Education through policy formulation. While laudable, it is also clear that the area of school facilities maintenance is currently the responsibility of schools. This implies that schools currently are, as it were, “alone” in so far as the school facilities maintenance is concerned and they need to take “*advantage of the strong links between staff, pupils, parents and the wider community*” (The Carbon Trust, 2008:2). A whole-school approach to facilities maintenance proposed in this study, and presented in the form of a model, attempts to address the immediate facilities maintenance needs of schools, while pre-emptively foregrounding the policy implementation of school infrastructure management for which the Department of Education is calling for comments (Republic of South Africa, 1998). A model is generally defined as a representation of reality so that sense can be made out of the world around us as well as an abstract representation of essential characteristics of phenomena of interest (Grimm & Railsback, 2009:309). A model thus depicts a set of relationships that are being defined.

A whole-school approach denotes a way of doing things that is underpinned by the involvement of all stakeholders working together (The Guyana Ministry of Education, 2009). School stakeholders include the principal, teaching staff, support staff, school governors, parents, learners and, in many instances, workers and extended school coordinators, including departmental officials (Phillips, 2006:9). As indicated earlier, and according to The Carbon Trust (2008:2), “*a whole school approach recognises that schools are uniquely placed to take advantage of the strong links between staff, pupils, parents and the wider community*”. Therefore the Whole-School Facilities Maintenance Model (WSFMM) represents a strategic facilities maintenance approach to school facilities maintenance, which, according to Florida Department of Education (2004:17), focuses on practical notions and rational actions that are intended to be proactive or visionary and should build on existing school strengths while seeking to overcome weaknesses through the introduction of qualitative improvements in all aspects of operations. It also describes, according to

International Facility Management Association (2009:5), “a process by which a facility management organisation envisions its future by linking its purpose to the strategy of the overall organisation and then developing goals, objectives and action plans to achieve that future”. The WSFMM therefore introduces a strategic facilities maintenance planning process into schools using the whole-school concept. The whole-school concept firstly propounds the *involvement of stakeholders in school educational processes*, and secondly, advocates the *focus on a programme that embodies all school facilities in the school programme*.

The WSFMM proposed in this study comprises three stages namely, the preparatory, planning and implementation stages (cf. figure 5.1).

Figure 5.1 **The whole school facilities maintenance model**



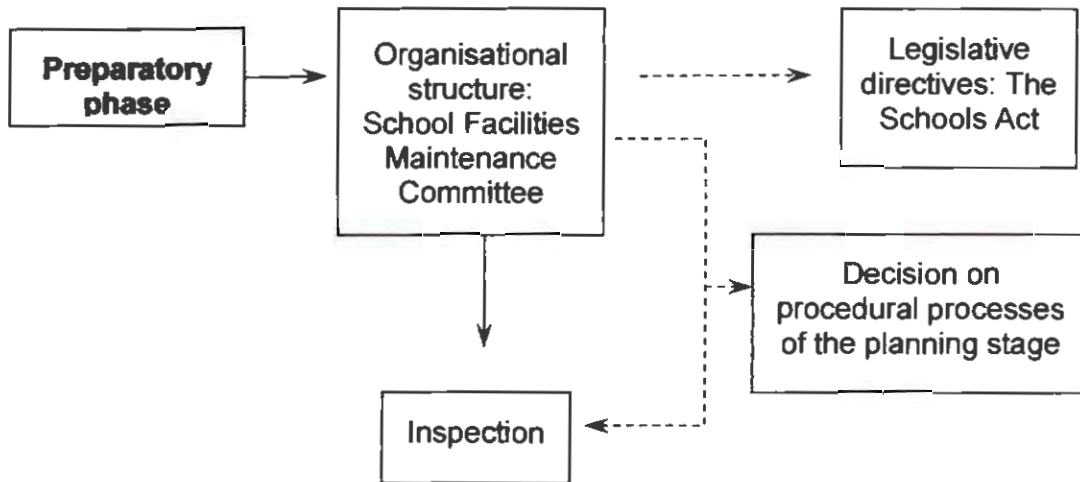
As illustrated in figure 5.1 above, the WSFMM comprises three stages, which unfold in the following manner:

Stage 1: Preparatory stage

At this stage, the school initiates the whole process of developing a facilities maintenance programme. Because this has to be a deliberate and systematic process, it needs to be managed. At this stage, the process is preparatory for developing a facilities management programme, which aims at integrating employees, work processes and workplaces into a coherent, productive, holistic system (cf.2.2). For this reason, the principal is the prime initiator of the process

as school manager. Two steps are involved at this stage as illustrated in figure 5.2.

Figure 5.2 **Stage 1 of the WSFMM: the preparatory stage**



Step one involves setting up or creating an organisational structure for facilities maintenance (cf. 2.8.1). The principal identifies the team to initiate the process of developing the facilities maintenance programme. Based on the whole-school concept, it is important for the team to be reflective of the whole school in terms of stakeholder involvement and in terms of a focus on the whole-school infrastructure and facilities. This step should be informed by legislation informing school maintenance. Since there is no policy relating to school facilities maintenance as yet, the Schools Act should guide this step. To this end, the Schools Act provides that the school governing body should be responsible for facilities maintenance. It further directs that the school governing body should form committees for various functions at the school.

The principal, having considered the legislative imperatives, should then involve the School Management Team, school governing body chairperson, a parent and educator governor in preparation of the next step, that of creating an organisational structure for school facilities maintenance. This exercise should culminate into the establishment of the school facilities maintenance committee (SFMC) as a subcommittee of the school governing body. Depending on the type of school and the nature of facilities, a decision can be made as to whether

there should be one SFMC or more subcommittees, each responsible for a sector of school facilities, for example a subcommittee for grounds, for buildings or for service systems.

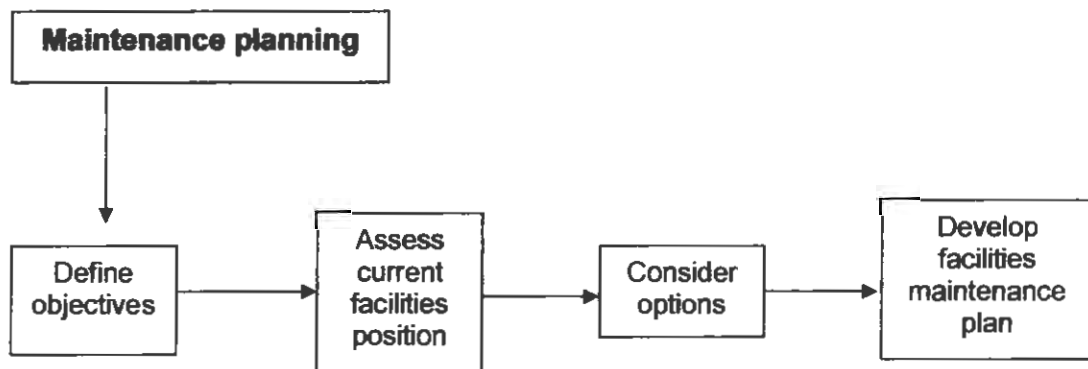
The second step of the preparatory stage comprises the initial or preliminary school facilities inspection. The SFMC conducts an inspection of the whole school or the condition of all school facilities in order to prepare for school facilities maintenance planning and, most importantly, to gather information during the preliminary school building inspection to form the basis for the maintenance programme (cf.2.8.2). This step could be facilitated by the use of facilities maintenance checklists or inventories (cf. 2.8.2). The third step in the preparatory stage involves the preparation for the actual school facilities maintenance planning meeting. The SCFM should, during this step, decide on the procedure to be followed in the planning stage. The procedure for this exercise could be arranged in a double-session, procedural process. The first session could be the plenary session during which the SFMC outlines how the process will unfold and then organises break-away groups to brainstorm on the objectives to be set. The second session could be the plenary session during which different groups report on the outcomes of their deliberations. The stakeholders then have the opportunity to interrogate each group's presentation. Through this interactive process, the whole-school concept becomes effective in that decision-making becomes consensual and democratic.

Stage 2: Strategic school facilities maintenance planning

This stage pertains to formulating a strategy for school facilities maintenance. In essence, the strategic outlook in this stage is concerned with the formulation of a strategy for getting an organisation from the here and now to the future and is thus a process with an underlying purpose of achieving a better use of school facilities and of minimising the cost of resources tied up in grounds and buildings (cf. 2.9). The presentations are refined to the satisfaction of the whole school.

The strategic school facilities planning stage consists of four steps illustrated in figure 5.3.

Figure 5.3 **Stage 2 of the WSFMM: Strategic facilities maintenance planning**



Step 1 relates to defining facilities maintenance objectives. This is an important step in that it reflects the long-term sustainability of strategies and involves the identification of stakeholders, roles and responsibilities and the scope of the plan in terms of school policies and circumstances (cf. 2.9.1). The identification of objectives should reflect the school's vision and mission, which, in essence, will ensure that school facilities maintenance becomes an integral component of the school's educational programmes.

Being focussed on the whole school, this step is important in that all stakeholders are represented at this stage. It allows for the integration of school facilities maintenance into the school's educational programmes in that each group of stakeholders will be looking at objectives in terms of how they impact on their areas of school programmes. Objectives set, for example, will be in terms of how they promote, among others aspects, learner achievement, parental involvement, human rights and safety and security. An example of an objective in this regard could be ensuring access to school facilities for all. This objective would be set with consideration of human rights relating to, for instance, people with disabilities, people who need special facilities, including

ramps to facilitate access, hearing aids, thermal comfort and air quality (cf. 2.9.1).

Step 2 of this stage relates to assessing the current school facilities position. This entails an audit of the existing school property – taking into account the condition, sufficiency, suitability, life cycle management and design – and the extent to which it currently meets the set objectives (cf. 2.9.2). As articulated by Szuba and Young (2003:27), facilities audits are accomplished by assessing buildings, grounds and equipment, documenting the findings, and recommending service options to increase efficiency, reduce waste and save money, thus providing the landscape against which all facilities maintenance efforts and planning occur.

This step is crucial in that it determines the current condition of school facilities and what the condition should be. School facilities maintenance will eventually be based on the outcomes of this step. The procedural execution of this step could be similar to the foregoing one, where teams are assigned areas to brainstorm and report to the plenary session. The guiding theme at this step should be controlled by the questions:

- What is the current condition of school facilities?
- How do the condition of the facilities currently facilitate the school's educational programmes?
- What should the condition of the facilities be in order to facilitate the school's educational programmes?

The answers to these questions will determine what the school's facilities needs are and will form the basis for planning. At this level, the generation of needs through a facilities audit will be extensive, especially since the focus is on the facilities of the whole school. Step 3 addresses this situation.

At this step, needs or identified gaps in school facilities point to what needs to be addressed and the order of doing so. This will be a function of priority in

terms of how needs impact on educational programmes. As alluded to in paragraph 2.9.3 in this text, the audit must identify and assess the range of options to meet the facilities maintenance objectives and each option must be appraised using economic evaluation techniques by considering the costs and benefits of each option over the short and long term, taking account of resources, and identifying the option that offers the best solution. Thus, good planning requires a process for ranking maintenance projects, including preventive maintenance, general maintenance and projects necessary to correct deficiencies, because a ranking process recognises that not all projects share equal importance. Some projects left undone, for instance, would involve too great a risk to building occupants' safety or could result in premature and expensive equipment failure. To perfect this step, facilities checklists are crucial, especially at schools, because staff may not be knowledgeable in determining the prioritisation of needs.

Once priorities have been considered and determined, the next step is embarked upon. Step 4 concerns developing the actual strategic facilities maintenance planning process. The planning process forms the most important activity of the WSFMM, because the developed plan will determine the activities that will be carried out in terms of facilities maintenance. It is important that the maintenance plan be as detailed as is possible in order to cover aspects of the whole school. To this end, the plan includes short- and long-term objectives, budgets and time frames – all of which demonstrate the school's commitment to facilities maintenance. In developing the school's facilities maintenance plan, a procedural process, similar to the one that has been put forth above, can be followed, that is, first a plenary session during which the process of planning is explained and with breakaway groups that will detail the plan, and finally, the plenary session during which all the school stakeholders as participants scrutinise the different inputs and finally document the entire plan. The final document could have all activities listed as in the template in figure 5.4.

The planning template should, at the end of the exercise detail the *maintenance area, the objective, activities to achieve the objective ,performance indicators or*

expected outcomes, resources needed for the completion of the activity, possible funding needed, funding source, person(s) responsible and co-responsible for the activity, due date and feedback as to the completion of the task.

Figure 5.4 An example of a facilities maintenance planning template

Facilities maintenance area: School buildings

Objective: to paint the exterior walls of Block C

Activity	Indicators	Resources	Possible costs	Funding source	Person responsible	Person (s) co-responsible	Due date	Feedback
1. Convene meeting of the SFMC to plan for the painting of Block C exterior walls	Meeting convened and plan drawn	Staff room	R0-00	N/A	Chairperson of the SFMC	SFMC	03/03/09	
2. Inspect Block C and determine work requirements	Block C inspected and work requirements determined	Checklist for painting of buildings	R0-00	N/A	Mr. X.	Building maintenance staff	06/03/09	
3. Make a presentation to the SGB and seek permission and funds for work	Presentation made to SGB and funds secured for the work	Staff room Requisition forms	R0-00	N/A	SFMC chairperson	SFMC members	16/03/09	

While this is the most important step in the WSFMM, plans are useless unless they are meticulously implemented as is evident in the next stage.

Stage 3: Implementation of the facilities maintenance plan

The implementation of the WSFMM requires that the persons responsible for activities, as assigned in the planning stage, should manage the process. This implies that they should also produce implementation plans to be able to track the activities and give feedback. As stated earlier (cf. 2.9.5), the implementation of the plan should take into account the procurement routes, budgets, time frames, maintenance matters, sustainability, staffing implications and other relevant factors. To this end, the implementation plan can be scheduled using a template that specifies activities to be completed as illustrated in figure 5.5, which details an example of the implementation plan for the first activity.

Figure 5.5 Example of an implementation plan

Facilities maintenance area: School buildings

Objective: to convene a meeting of the SFMC to plan for the painting of Block C's exterior walls

Activity	Indicators	Person (s) co-responsible	Due date	Feedback
1. Prepare provisional agenda for meeting and circulate for comment to SFMC members 2. 3. 4.	Provisional agenda prepared and circulated for comment	SFMC Secretary	05/03/09	

As illustrated in figure 5.5, the implementation plan derives its activities from delegated or assigned activities from the main plan (fig. 6.4). For purposes of effective implementation, the plan should be viewed as a living document that reports findings and makes considered recommendations for implementation within a realistic time frame, yet maintains flexibility to adapt as a school requires (cf. 2.9.5). This will facilitate the monitoring and evaluation processes, which are part of the implementation. In this regard, progress against the school facilities maintenance objectives should be regularly monitored and evaluated. The implementation plan should be reviewed, maintained and regularly updated so that it can continue to provide good quality maintenance information (cf.2.9.6).

Monitoring and evaluation should be carried out at every level of the school organisation. This implies that the principal, SFMC members and the SGB

should continuously monitor and evaluate progress. To facilitate this, checklists for monitoring should be used regularly. Figure 6.7 illustrates a typical example of such a checklist.

Figure 5.6 A typical monitoring and evaluation checklist

Objective	Person (s) responsible	Due date	Completed	Comments:
1. to paint the exterior walls of Block C 2. to ...	SFMC Chairperson	03/03/09	Yes/No	Satisfactory/ Unsatisfactory/ Follow-up

The compilation of the school facilities maintenance plan and the implementation plans constitute the WSFMM. However, the model is not without limitations.

The WSFMM may be limited by various factors, including the following:

- The WSFMM requires knowledge and planning skills to develop. The inspection and identification of the condition of school facilities may need experts in equipment requirements and assessment, for instance, knowledge about environmental and health effects of using certain facilities is imperative, for example, asbestos. It might also be necessary to enlist the help of facilitators who are skilled in strategic planning to ensure that details of the plan are not superfluous, especially during the assessment stage.
- In the absence of policy interventions in issues like staffing, schools may be overwhelmed by the sheer enormity of the planning task where financial requirements are concerned. This may lead to planning for the sake of planning.

- Schools may be tempted to identify facilities maintenance needs only to be discouraged by the demands of implementation, which might be construed as an unnecessary add-on to their already heavy workloads.

Despite the limitations cited above, the WSFMM presents some strengths, including the following:

- It directs school facilities to being a component of the whole-school educational programmes.
- It provides ample opportunities for the involvement of all school stakeholders through representation because during the process the plenary and break-away teams engage in facilities planning issues. Attempts are also made to get every stakeholder involved, thus catering for the involvement of even the general workers, who often are left out of school processes such as planning, even when the outcomes would affect their functioning.
- It allows for flexibility in school facilities maintenance planning in that each school would be able to consider its own unique circumstances. No school would, for example, be constrained by “one size fits all” prescriptions. In other words, planning for a comprehensive secondary school would be different from that of a mainstream secondary school.

Notwithstanding the strengths and limitations of the WSFMM espoused above, the role of policy directives in relation to school infrastructure management and, by implication, facilities maintenance is currently of paramount importance in South African schools. It is hoped that, like in many western countries, they will play a major role in equipping schools with the necessary school facilities management and maintenance directives.

5.6 RECOMMENDATIONS FOR FURTHER RESEARCH

Considering the nature of school facilities maintenance and findings of the empirical study, it would be important and interesting to conduct research into the following:

- the impact of the quality of school facilities on learner academic achievement;
- the influence of school facilities on educator morale and job satisfaction;
- the influence of school facilities on school enrolments;
- the influence of school facilities on parental choice;
- the appropriateness of current school facilities to the promotion of the culture of effective learning and teaching (inspired by the possibility of inclusive education in the current school designs and facility provisioning);
- the effect of the HVAC systems of learners' academic achievement and the effectiveness of educators' performance; and
- the role of the school governing body in facilities maintenance.

5.7 CONCLUSION

This chapter presented the summation of the entire study in terms of findings and recommendations, as well as limitations of the study and areas for further research.

The entire study investigated the phenomenon of school facilities maintenance. From the literature review it was clear that this phenomenon has received little or no attention in education. It was only in 2008 that the National Ministry of Education published a call for comments regarding school infrastructure. The state of facilities maintenance at schools was found to be less than adequate and this can be ascribed to a lack of policy directives with regard to school

facilities management and thus maintenance. Consequent to findings in this regard, a Whole-School Facilities Maintenance Model is proposed as an approach that will, hopefully, assist schools to address their immediate and long-term facilities maintenance needs. While having shortcomings, the strengths of the model present schools with avenues to customise their facilities maintenance operations to their circumstances and needs.

5.8 CLOSING REMARKS

Being exploratory, this study presented research challenges. First, the literature review presented challenges regarding finding literature sources. Consequently, most sources consulted are American. However, these sources presented useful information regarding facilities maintenance at schools, especially because America is at an advanced stage in terms of school facilities maintenance and management in general. Second, most sources are of an industrial and or business orientation. This presented a challenge in terms of customising business-industrial facilities maintenance jargon to educational settings. This is, however, not unique to this study and opens up avenues for further research and debate into the study phenomenon. In this regard, numerous internet sources came in handy in providing information in ways that made it accessible to educational settings. Consequently, the study was able to achieve its objectives as discussed in chapter 2 – 5.

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Ethics Committee

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Dr. I Xaba

22 September 2009

ETHICS APPROVAL OF PROJECT

The North-West University Ethics Committee (NWU-EC) hereby approves your project as indicated below. This implies that the NWU-EC grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the project may be initiated, using the ethics number below.

Project title: A whole school approach to facilities maintenance	
Student: VA Nhlapo	
Ethics number:	N W U - 0 0 0 4 9 - 0 9 - A 2
Approval date: 30 Julie 2009	Expiry date: 29 Julie 2014

Special conditions of the approval (if any): None

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following:

- The project leader (principle investigator) must report in the prescribed format to the NWU-EC:
 - annually (or as otherwise requested) on the progress of the project,
 - without any delay in case of any adverse event (or any matter that interrupts sound ethical principles) during the course of the project.
- The approval applies strictly to the protocol as stipulated in the application form. Would any changes to the protocol be deemed necessary during the course of the project, the project leader must apply for approval of these changes at the NWU-EC. Would there be deviation from the project protocol without the necessary approval of such changes, the ethics approval is immediately and automatically forfeited.
- The date of approval indicates the first date that the project may be started. Would the project have to continue after the expiry date, a new application must be made to the NWU-EC and new approval received before or on the expiry date.
- In the interest of ethical responsibility the NWU-EC retains the right to:
 - request access to any information or data at any time during the course or after completion of the project;
 - withdraw or postpone approval if:
 - any unethical principles or practices of the project are revealed or suspected,
 - it becomes apparent that any relevant information was withheld from the NWU-EC or that information has been false or misrepresented,
 - the required annual report and reporting of adverse events was not done timely and accurately,
 - new institutional rules, national legislation or international conventions deem it necessary.

The Ethics Committee would like to remain at your service as scientist and researcher, and wishes you well with your project. Please do not hesitate to contact the Ethics Committee for any further enquiries or requests for assistance.

Yours sincerely

Prof MMJ Lowes
 (chair NWU Ethics Committee)

Prof M. Monteith
 (Chairman: NWU Ethics Committee: Teaching and Learning)

ANNEXURE B



UMnyango WezeMfundo
Department of Education

Lefapha la Thuto
Departement van Onderwys

Enquiries
Tel. no.

: Shadrack Phele [MIRMSAJ :
+27 11 355 0285

Thursday, July 02, 2009

Mr Nhlapo Velaphi Aaron
PO Box 17
Sebokeng
1983

Dear Mr Nhlapo Velaphi Aaron

PERMISSION TO CONDUCT RESEARCH: PROJECT

The Gauteng Department of Education hereby grants permission to conduct research in its institutions as per application.

Topic of research : "A whole school approach to facilities maintenance."
Nature of research : PhD [Educational Management]
Name of institution : North-West University: Vaal Triangle
Supervisor/Promoter : Dr. Ml Xaba

Upon completion of the research project the researcher is obliged to furnish the Department with copy of the research report (electronic or hard copy).

The Department wishes you success in your academic pursuit.

Yours in Tirisano,

p.p. Shadrack Phele [MIRMSAJ

Ms Mmapula Kekana

Chief Director: Information Systems and Knowledge Management
Gauteng Department of Education



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ANNEXURE C

Checklist for School Facilities Maintenance

Item	Satisfactor y	Not satisfactory	N/A
Roadways and parking lots			
✓ <i>Parking spaces clearly marked</i>			
✓ <i>Pedestrian crossings safe and identified</i>			
Site appearance			
✓ <i>Lawns and plants manicured</i>			
✓ <i>Pruning of overgrown, dead or diseased branches</i>			
✓ <i>Depression or tripping hazards</i>			
✓ <i>Leaves or debris against building walls</i>			
Site utilities			
✓ <i>Water supply is protected from vandalism and contamination</i>			
✓ <i>Storm drains and inlets are free of leaves and other debris</i>			
✓ <i>Manhole covers are identified (sanitary, storm, electrical etc.)</i>			
✓ <i>Fire hydrants are flushed and tested regularly</i>			
Exterior appearance			
✓ <i>Painted surfaces are well maintained</i>			
✓ <i>Building graffiti is covered</i>			
✓ <i>There are bird droppings all over</i>			
Exterior structural conditions			
✓ <i>Foundation- settlement</i>			
✓ <i>Floors on grade- cracks, movement, water penetration</i>			
✓ <i>Walls - cracks</i>			
✓ <i>Building projections- columns, supports, stairways and railings</i>			
Gutters and Downspouts			
✓ <i>There are breaks, open joints and sags</i>			

✓ Gutters, spouts and rain leaders are clean and free flowing			
✓ Attachments and fasteners are intact			
Windows			
✓ Window-sills movement, openings around sash, cracks and tightness, hardware.			
✓ Ability to clean windows			
Sidewalks			
✓ Broken, cracked or uneven surfaces			
✓ Handicapped accessibility, curb cuts, ramps etc.			
✓ Railings and barriers in place and securely fastened			
Interior appearance			
✓ Overall cleanliness and sanitation			
✓ Clean, bright and cheerful			
Floors			
✓ Tile: broken, cracked or missing			
✓ Uneven surfaces, tripping hazards			
✓ Carpet: torn, seam separation etc.			
Walls			
✓ In need of painting or repair			
✓ Structurally sound			
Ceilings			
✓ Stained, missing or broken			
✓ Plaster- surfaces are sound, flaking, cracking, moisture damaged (check which one)			
Electrical distribution			
✓ Light switches are working, properly wired and grounded			
✓ Circuits are overloaded			
✓ All wiring is properly enclosed			
Lighting			
✓ Bulbs are needed			
✓ Wiring properly enclosed			

Fire and safety			
✓ Exits- clearly marked			
✓ Extinguishers- missing, outdated, discharged			
✓ Combustible materials- chemicals inventoried, identified and properly stored			
Equipment rooms / Generator			
✓ Equipment/mechanical rooms are clearly marked			
✓ Not used as storage rooms			
✓ Is machinery identified?			
✓ Is generator operational, maintained and recorded?			
Air conditioning			
✓ Fans			
✓ Pumps			
✓ Motors			
✓ Condensers			
Ventilation equipment			
✓ Filters in need of service			
✓ Heating/cooling coils dirty or leaking			
✓ Electrical lines disconnected			
✓ Drive belts broken, improperly sized			
✓ Water/steam piping leaking, uninsulated, unidentified			
✓ Outside air intakes obstructed			
Electrical service			
✓ Access limited to authorized persons			
✓ Supply and service panels clearly marked including all breakers			
Plumbing			
✓ Pipes are leaking, corrosion, insulation			
✓ Water closets, urinals, flushometers are leaking			
✓ Sanitary waste lines properly vented			

ANNEXURE D

Interview schedule

- Does your school have a written facility maintenance plan that guides your planning for facility improvement?
- Is facility maintenance planning a component of overall school development planning?
- The long-term planning for the school's facilities maintenance includes which of the following groups?
 - School Management Team
 - Administrative staff
 - Facilities/maintenance/custodial representatives/general workers
 - Educators
 - Parents
 - Learners
- Do you have a system of assessing the condition of your school facilities?
- Who carries out facilities assessment and at what intervals?
- Facility condition assessment is:
 - Recorded using standard checklists and forms
 - Recorded by writing assessment reports
 - Not done
- Is there a functional policy on school facilities maintenance?
- Is there a plan for preventive maintenance?
- Is there a plan for predictive maintenance?
- Is there a plan for emergency maintenance?
- What fraction of the whole school budget is allocated facilities maintenance?
- Is there a detailed asset register?
- Who compiles and updates the asset register?
- Who is responsible for facilities maintenance in terms of:
 - Electrical fittings and systems?
 - Plumbing?
 - Heating, Air Conditioning and Ventilation?
 - Waste management and disposal?

ANNEXURE E
INFORMED CONSENT FORM

RESEARCHER: Nhlapo V.A.

TITLE OF RESEARCH PROJECT: A whole school approach to facilities maintenance.

PURPOSE OF THE RESEARCH is to investigate the current school facilities maintenance practices at schools and to provide guidelines on how a whole school approach to facilities maintenance can be developed.

DURATION: The duration of each interview session will be approximately 45 min – 1 hour. Ethnographic observations will take approximately 2 hours.

PROCEDURES: Interviews will be one-to-one, after school hours. Ethnographic observations will be conducted during times convenient for your school. You are requested to provide guidance in this regard.

POSSIBLE RISKS: No possible risks to participants are envisaged. However, in the event of questions that may be perceived as threatening or causing discomfort, you may decline to answer such questions without providing any reason for doing so.

BENEFITS: No direct benefits or compensation will be due to any participant.

VOLUNTARY PARTICIPATION: Participation in this research is completely voluntary. You may at any stage, refuse to participate and or withdraw at any time.

CONFIDENTIALITY: Data in this study will be confidential. As such all data collected will be coded in terms of (1) names; (2) data collected; (3) use of identification keys, which will be known only to the researcher; (4) audio tapes being kept confidential until they are erased after a year.

CONTACT: The research is conducted by Doctoral student, NHLAPO V.A, under the supervision of DR. MI XABA from the School of Educational Sciences: North-West University – Vaal Triangle Campus. Dr MI Xaba can be reached at 016 910 3068 (o/h) for questions regarding this research project.

This research has been ethically approved by the North West University Ethics Committee.

CONSENT:

I have read and understand the nature of my participation in this research project and agree to participate.

Name

Signature

Date