

# **REPORT OF THE DIRECTOR OF AUDIT**

## **EFFICIENCY AND EFFECTIVENESS OF SCHOOL BUILDING PROGRAMME**

**Ministry of Education, Culture and Human Resources**

**Performance Audit Report No 2**

**March 2010**

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## EXECUTIVE SUMMARY

In October 2006, an unfortunate incident occurred at a primary government school whereby a piece of concrete fell from the ceiling (spalling) inside a classroom. This triggered a national structural survey of schools, carried out by the Ministry of Public Infrastructure, Land Transport & Shipping (MPI). The survey showed that the problem of spalling was so acute that it was not worthwhile to go ahead with rehabilitation works. The MPI recommended the demolition of some buildings and their replacement by new classroom blocks giving rise to the Primary School Renewal Project (PSRP).

Under the PSRP schools will be completely renewed on a phase wise basis. The PSRP will spread over several consecutive fiscal years as from January 2010. Although the project has not yet started, five schools like those identified under the PSRP have already been renewed or are in the process of being renewed.

The performance audit focused on the five schools so as to assess whether the Ministry has an efficient and effective programme for the planning and construction of school buildings. The audit covered pre-planning and planning for school buildings and their construction. Lessons learned from this audit may be considered when implementing the PSRP.

### Key Findings.

1. The Ministry has an efficient and effective programme for planning and construction of school buildings. The programme covers pre-planning, planning and construction. Over recent months, it allowed the construction of four schools: E. Anquetil, Pt. Sharma Ayriga, Jean Lebrun and M.P. Kisnah GS. Several shortcomings were noted on the Jean Lebrun GS and they are detailed in a case study on this school that appears at Annex III. As regards the R. Moosun GS, the project has reached the tender stage.

The MPI is responsible for implementing government capital projects. As such, much of the programme is implemented in partnership with the MPI. However,

(a) there are issues about the independent quality assurance of the MPI. The works carried out by the MPI have never been subjected to independent reviews. No quality assurance mechanism has been set up that would ensure that its activities (design, quantity surveying and construction) are of an acceptable standard. Client Ministries do not independently review the works implemented/supervised by the MPI.

(b) the present government practices in construction procurement tend to focus more on the affordability of construction costs. Selection of contractors has been primarily on the basis of lowest tender price. There is the need to focus on achieving value for money which the lowest contract price does not always guarantee.

(c) while the MPI tried to meet targets specified by the Ministry, delays were noted. There were delays in obtaining preliminary drawings and the preparation of tender documents. The main cause for delays experienced at the MPI level is limited human resources coupled with heavy workload.

2. The Ministry's pre-planning was broadly effective. The MPI was called to carry out structural investigations of the old schools with a view to determining whether they could be repaired and/or rehabilitated or if it was better to pull them down and reconstruct new ones. Sizes of the new school blocks to be constructed were determined through an analysis of actual enrolment and demand. Cost estimates for the new buildings were worked out by the MPI. However, certain procedures were not complied with.

(i) *Structural investigations.* In addition to visual observations, a number of on-site and laboratory tests were performed by the MPI. These tests, according to the MPI, allow one to evaluate the soundness and the level of distresses suffered by the buildings. In the case of two schools no laboratory tests were performed; only visual inspections done.

(ii) *School size.* The Ministry has decided to construct a new school for 500 students at the site of the R. Moosun GS. However, student roll at this school has fallen from 394 in 2004 to 260 in 2009. No survey has been carried out in the region to determine future demand for the R. Moosun GS.

In the case of the MP Kisnah GS, size was reduced from 12 to 9 classrooms as land available at the site was limited. This land was made available by pulling down one of the two blocks condemned by the MPI. The Ministry had the option of demolishing both blocks to create more space. Therefore, original size (12 classrooms) of the new block was not determined based on enrolment trends at the school.

3. Efficient and effective systems and procedures exist at the Ministry for conducting planning for school buildings. These include the School Mapping Exercise that allows the Ministry to plan for the location, and, also, the size, of schools. Extent of land already available or to be acquired at the proposed location has then to be determined. The type of building that can be constructed on the land can ultimately be decided. School buildings are caused to be delivered, usually, before resumption of studies. An application of these systems and procedures allows the Ministry to clearly define its specifications and objectives with regards to school buildings. An efficient mechanism, also, exists that allows the Ministry to inform the MPI of its requirements and more specifically the time, cost and quality of buildings it needs. However, procedures were not always followed.

(a) *School Mapping Exercise.* This exercise is undertaken to plan for the location of new primary schools and the extension of existing ones. The Ministry has not carried out this exercise for schools that have been renewed. New school blocks that are replacing older ones will stand for some 30 or 40 years and involve substantial capital investments. A school mapping exercise would have helped the Ministry in determining the optimum location for the renewed schools – whether they should have been built at the site of the old school or should have been moved to another location.

(b) *Land survey*. Failure to carry a preliminary survey of the land available at the MP Kisnah GS school prevented the Ministry from defining the correct type and size of building it required and led to delays of some five months in finalising architectural drawings. A lack of technical resources at the Ministry was advanced as the main reason for not doing the survey.

(c) *Schools constructed on fast track basis*. The need to have school ready before resumption of studies and delays encountered to prepare tender documents compelled the Ministry to construct two schools on a fast track basis. This meant that no tender exercise was initiated for the selection of construction services and with government's approval works were assigned to MPI's District Contractors. These are private contractors employed by the MPI to maintain, repair and rehabilitate government buildings. Documents, performance bonds and all risk insurance policies, submitted under the contract for the ***Maintenance, Repairs and Rehabilitation of Government Buildings*** drawn with the contractors were not suitable for the construction of the school blocks.

4. The Ministry, in partnership with the MPI, is broadly delivering construction of school building projects efficiently and effectively. Two schools – the E. Anquetil and Pt. Sharma Ayrga GS were practically completed to time and cost. Delays were noted in attending to snags at the Pt. Sharma Ayrga GS. Construction of the new blocks at the Jean Lebrun and MP Kisnah GS was inordinately delayed and the MPI, quite rightly, applied penalty clauses to sanction the builders.

Regular site meetings involving MPI (project manager), the Ministry (represented by an engineer or a technical officer) and the contractor were held. This allowed the Ministry to be kept informed of progress, so that it can make adjustments to take account of delays. However, it was noted that certain meetings were not minuted. Notes of site meetings were available for projects that had been through a tender exercise and supervised by the Architect Section – MP Kisnah and Jean Lebrun GS. In the case of construction works carried out by MPI District Contractors (Emmanuel Anquetil and Pt. Sharma Ayrga GS) meetings were not seen.

The MPI generally ensures that contractors deliver to time, cost and quality. There is effective MPI contract management in most cases. MPI applied contract terms and exact penalties for any failure on the part of the contractor. However, the lack of independent quality assurance means that we cannot be sure that things have been done in the best way.

5. This audit covered planning and initial construction, and did not go into depth in reviewing maintenance of school buildings. However, the observations and comments on maintenance of schools building have been made at Annex II.

6. Government wants to make development sustainable through the *Maurice Ile Durable (MID) Project*. The MID concept is a long term commitment of government to improve the nation's energy portfolio and security, to endorse sustainable development and to address climate change threats to the public. Sustainable development in the construction sector implies investing in green buildings.

A green building or sustainable building is an outcome of a design philosophy which focuses on increasing the efficiency of resource use while reducing building impacts on human health and the

environment during the building's lifecycle, through better siting, design, construction, operation, maintenance, dismantling and recycling.

The Ministry has the opportunity, with the PSRP, to innovate and construct green buildings that reflect the MID concept. In designing new buildings, the Ministry should not require the MPI to stick to the standard design model which they have used for schools for so long. The design team should instead focus more on the sustainability of the building and its whole life costs. Whole life cost is important because the running and maintenance costs of a building over its useful life greatly exceed the construction cost. Sustainable features need to be considered.

### ***Main Recommendations***

1. Government has to develop ways to ensure that the MPI's important activities are properly reviewed by independent appropriate experts. An independent peer review exercise on a sample of projects with a view to ensuring that works are carried out to the appropriate standards would serve a long way towards providing assurance on the quality of works. This review will help government deliver, through the MPI, and obtain, by recipient client Ministries, best value from its spending.
2. The school mapping exercise needs to be carried out for all schools – new and renewals. The Ministry must be in a position to know the optimum location and, also, correct size for its schools. For the PSRP in which a number of schools will be concerned, the exercise has to be undertaken.
3. Relevant lab tests should be carried out so that conclusions reached on visual inspection can be confirmed.
4. The Ministry should avoid having recourse to the services of District Contractors for the construction of new buildings because there is the risk that its interests may not be adequately protected. The Ministry should start its planning for the construction of schools earlier, thereby, avoiding any urgency and building schools on a fast track basis through District Contractors.
5. An adequate preventive maintenance plan should be drawn for schools. Adequate staff and sufficient funds should be allocated for implementation of same.
6. The Ministry should have a broader assessment of the wider economic, social and environmental impact of buildings being constructed – to develop the move towards sustainable procurement in construction. There is a need for greater appreciation of the whole life costs of buildings. Construction project decisions should be based on the optimum combination of whole life costs and quality of the built asset. Emphasis should be placed on designing from the outset to deliver whole life value. Sustainable features need to be considered so that one is in line with the MID concept.

## INTRODUCTION

### Mission of the Ministry of Education and Human Resources (MOEHR)

The mission of the MOEHR is:

- To develop a culture of achievement and excellence by promoting an efficient and effective education and training system that is inclusive and integrated, comprehensive and holistic.
- To foster innovation and to generate new knowledge for the socio-economic and sustainable development of the nation.
- To ensure learning opportunities accessible to all, provide learners with values and skills to further their personal growth, enhance their critical and exploratory thinking and encourage them to innovate and to adapt to changes in an increasingly globalised environment.

### Education Sector Objectives

The objectives of the Education sector include the following:

- To sustain equitable access to quality education, ensuring that all learners attain high levels of achievement in Literacy, Numeracy, Information and Communications Technology and such essential Life Skills as sound human values, healthy lifestyle and so forth as the basis for lifelong learning and good citizenship.
- To ensure that all students are given the opportunity to embark on and complete higher secondary education for employability and higher and further education and training with the required maturity and confidence.
- To build a system that ensures a supply of quality personnel that work collegially with a strong management and quality assurance system to improve and support learning achievement and overall development of all learners.
- To make Mauritius an intelligent island, a Knowledge Hub to serve the Region and a Centre for Higher Learning and Excellence.
- To build a creative and competent Human Resource base for Mauritius for sustainable national development.

### Reasons for the Audit

In line with Government's commitment to provide a quality education for all, the ministry has embarked in the construction and rehabilitation of old school buildings. During fiscal years 2008/2009 and 2009 (July-Dec), five schools with a total estimated cost of some Rs 116 million have already been renewed or are in the process of being renewed. The Ministry also identified 143 other primary schools where rehabilitation works are needed. A sum of Rs 150 million has been earmarked for fiscal year 2010 for renovation and upgrading works for 17 of them. A Performance

Audit was carried out on the five schools so that lessons learned could be considered when rehabilitation works start for the 143 primary schools.

## Why Performance Audit?

In a rapidly changing society there is a shift towards performance auditing, since the performance audit process results in recommendations, which initiate a process of renewal and change, leading to greater efficiency and effectiveness in government administration.

Government of Mauritius has amended the Finance and Audit Act to authorise the National Audit Office to carry out Performance Audit.

### *Benefits of Performance Auditing*

- *Identifying problem areas and causes and alternatives for improvement.* This is a major purpose of performance auditing. Although often aware of a problem, management cannot always define exactly its dimensions. As a third-party, the auditor's objective viewpoint helps to achieve the proper focus on operational problems.
- *Assessing management information and control systems.* Performance auditing helps to identify whether the reporting systems are adequate to provide management the information necessary to effectively operate all aspects of the organization.
- *Providing an independent, objective evaluation of operations.* Both management and operations personnel are often too close to what is going on within their own operations to effectively evaluate their results. Performance auditing can do this objectively, pointing out those areas in need of improvement as well as those that are being performed well.

The Ministry is responsible for the planning and construction of school buildings. As most existing primary schools are relatively old – aged 40 years or more there is a need for constant upkeep. The options available can vary from rehabilitation to complete overhaul or renewal of the schools. The option to be adopted is based on the recommendations of the Ministry of Public Infrastructure, Land Transport and Shipping (MPI), following structural surveys and investigations. Investigations include visual observations as well as a number of on-site and laboratory tests that allow one to evaluate the soundness and the level of distresses suffered by the buildings. The recommendations of the MPI also include cost estimates for rehabilitation works to facilitate the Ministry's decision to go for repairs and/or rehabilitated or whether it is better to pull them down and construct new ones.

When construction of new schools is considered an elaborate planning process is initiated. A School Mapping Exercise which allows the Ministry to plan for the location of new schools is undertaken. This is based on inter-alia, the demographic trend, population mobility, new growth poles, evolution of pupil enrolment, availability of adequate physical facilities for the provision of quality teaching and learning and implementation of innovative practices. Extent of land already available or to be acquired at the proposed location is then determined. The type of building that can be constructed can ultimately be decided.

The collaboration of the Ministry of Housing and Lands is sought for acquisition of land for new construction and its vesting in the Ministry of Education prior to the construction phase. Initial cost estimates for the new buildings are worked out by the MPI. School buildings are caused to be delivered, usually, before resumption of studies. The latter follows a period of school holidays during which the school building is made ready for use for the upcoming school term.

Construction projects are prioritised and implemented in partnership with the MPI. The system for the procurement of school buildings, from the time a request for construction is made to the MPI to delivery of the building and the different steps and stakeholders involved are shown at Annex I.

If the rehabilitation track is selected, works may be assigned to MPI pre-selected District Contractors when they cost up to Rs 5.0 million. For works costing more than Rs 5.0 million, normal tender procedures have to be followed. These works are supervised by MPI.

In October 2006, an unfortunate incident occurred at the MP Kisnah GS whereby a piece of concrete fell from the ceiling (spalling) inside a classroom. Consequently, the MPI carried out a national survey of the structural conditions of school buildings from October 2006 to March 2007 and came up with a list of 143 schools where the problem of spalling and exposed reinforcement was identified. At some schools the problem of spalling was so acute that it was not worthwhile to go ahead with rehabilitation works. The MPI recommended the demolition of some buildings and their replacement by new classroom blocks.

The need for renewal of old buildings is enhanced by the fact that in each fiscal year the Ministry has to attend to a number of requests from schools regarding:

- construction of additional classrooms, specialist rooms and staff room, and
- acquisition of land adjacent to school premises for provision of additional recreational space.

The lack of space in some primary schools cannot be solved through acquisition of land due to unavailability of undeveloped adjacent land to the school premises. Space can be created through demolition of old buildings usually of ground floor only and their replacement by school blocks of two or three levels.

The recommendation of the MPI and the above factors gave rise to the Primary School Renewal Project (PSRP). The PSRP would be implemented in phases and schools that need to be attended to urgently would be catered for under phase I. Seventeen schools have been identified for this phase. Demolition and reconstruction of each school would also follow a phase approach. The buildings in the most deplorable state would be pulled down first and replaced by new classroom blocks. It is expected the project will span over a period of at least five consecutive fiscal years as from January 2010.

Although, the project has not yet started, five schools like those identified under the PSRP have already been renewed or are in the process of being renewed. Details are as in Table 1.

***Table 1 Primary Schools Being Renewed/in the Process of Being Renewed***

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<b>Primary School</b>	<b>Works undertaken or to be carried out</b>
E. Anquetil GS	Two classroom blocks (ground floor buildings) have been demolished and replaced by a ground + 1 building. This has allowed the school to have some additional recreation space.
Pt. Sharma Ayrga GS	One classroom block (ground floor) has been demolished and replaced by a ground + 2 building. Consideration will be given, later, for the demolition of another block for creation of additional space.
M.P. Kisnah GS	One classroom block (ground floor) has been demolished and replaced by a ground + 2 building.
Jean Lebrun GS	One new pre-primary/primary block constructed. All existing ground floor classroom blocks will be demolished on a phasewise basis to be replaced by three new ground + 2 classroom blocks.
R. Moosun GS	All classroom blocks will be demolished on a phasewise basis to be replaced by 3 new blocks (including a pre-primary unit). Project is at tender stage.

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### **Objective of the Performance Audit**

The performance audit focused on these schools so as to assess whether the Ministry has an efficient and effective school building programme. The audit scope covered the following:

- Pre-planning stage (Chapter One)
- Main planning and construction stage (Chapter Two)
- Delivery of school building (Chapter Three)

As these schools are similar to those falling under the PSRP, lessons learned from this audit may be considered when implementing the latter. The report did not cover the maintenance of school buildings. However, some observations regarding maintenance are given in Annex II.

## CHAPTER ONE

### PRE-PLANNING STAGE

#### 1.1 Effective Pre-planning

The Ministry's pre-planning for its new schools was broadly effective. The MPI was requested to carry out structural investigations of the old schools with a view to determining whether they could be repaired and/or rehabilitated or whether it was advisable to pull them down and reconstruct new ones. Sizes of the new school blocks to be constructed are determined through an analysis of demand and supply for seats. This takes into account registration for intake at Standard I, pupil enrolment, school capacity and demographic trends. Based on these, the size of the school buildings determined by the Ministry was satisfactory except for the R. Moosun and MP Kisnah GS. Initial cost estimates for the new buildings are worked out by the MPI.

The MPI carried out structural investigations of the old school buildings. In addition to visual observations, a number of on-site and laboratory tests like core test for compressive strength, carbonation test, total chloride content and cover determination were performed. These tests allow one to evaluate the soundness and the level of distresses suffered by the buildings. Based on results obtained, professional experience and engineering judgement, the MPI recommended that some of the old buildings should be demolished and new blocks constructed.

At this point, it is worth mentioning that Government created the MPI to serve other Ministries in implementing their capital projects, but no quality assurance mechanism was set that would ensure that works performed (design, quantity surveying, construction and testing) are of an acceptable standard. Therefore, in the absence of a quality assurance mechanism, it was not known whether the tests were adequate and sufficient and whether recommendations made were correct.

#### 1.2 Laboratory Tests

It was noted that the tests mentioned at paragraph 1.1 above were not performed at MP Kisnah and Jean Lebrun GS. Also recommendations as to the demolition of the blocks under investigation were made based on visual observations only. Given the age of these school buildings and the lack of proper maintenance, infrastructure is bound to have been affected.

In the case of the R. Moosun GS, the MPI recommended the demolition of three classroom blocks and the repairs/rehabilitation of the remaining buildings (two classroom blocks and one toilet block) after necessary laboratory tests were performed in May 2006 and February 2007. Nevertheless, following a visit by officials of the Ministry in 2008, it was decided to pull down **all** buildings and reconstruct a new school. No tests were carried out, then, to justify the decision taken for the buildings not originally condemned by the MPI.

It is our view that visual inspections are not enough for taking decisions. Relevant laboratory tests should be carried out so that conclusions reached on visual inspections can be confirmed. Scientific testing can be considered to establish if deterioration is located uniformly over the structures and the level of distress faced by the buildings.

### ***MPI's Response***

Appropriate laboratory tests can only be justified where warranted in cases of localised material failures. It is prescribed only in cases where it would help in taking a decision regarding the renewal of a member or part of a distressed structural member.

## **1.3 Size of School Building**

### ***1.3.1 Larger Capacity for the R. Moosun GS***

The Ministry has decided to construct a new school for 500 students. However, figures show that demand for seats at the school has been decreasing over the years as shown in Table 2.

***Table 2 Trend in School Population of R Moosun GS***

<b>School year</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
<b>School Population</b>	394	344	318	302	281	260

*Source: The Ministry*

It was explained that demand at this school will increase in the future due to new settlements as new morcellements are planned in the region. From information obtained at the Ministry of Housing and Lands, permits for six morcellements representing 602 lots have already been granted and permits for two new morcellements with a total of 248 lots are being processed. Of the 602 lots, 227 were granted to VRS (Voluntary Retirement Scheme) employees of the *Compagnie Sucriere de St Antoine* in 2003 and 66 lots were vested in other employees of the company who for years had leased the same lands. The remaining 309 lots were put on sale in 2007 and most of them have already been sold.

However, it is observed that those who were given ownership of land had always been occupying those properties. The 2003 VRS morcellement and the vested lands, therefore, have had no effect on demand for seats at the school. With regard to the plots of land sold, the number of "Building and Land Use" permits applied for and issued, number of construction started and/or completed and number of families settled could not be ascertained. Given that the lots have only recently been sold, it can reasonably be assumed that these numbers must be relatively few. The most important statistic which is the number of children of age to attend a primary school in the short or longer term is, also, not known.

It is our view that schools should be constructed on a phase wise basis, adding new blocks when needed rather than going for a very large school.

#### ***Ministry's Response***

The decision to extend a particular school is not based on the growing enrolment in that school only, but, also, on the need to relieve pressure on other schools in the vicinity. Moreover, it is worth pointing out that the size of a primary school depends on the number of streams which may normally vary from one stream up to a maximum of four streams. A one-stream school has a seat capacity for about 250 pupils and requires 10 classrooms. On the other hand, a two-streams school requires 17 classrooms and can accommodate up to 500 pupils.

#### ***1.3.2 Reduction in School Size at MP Kishnah GS***

Following the incident at the above school, whereby spalling of concrete fell from the ceiling inside a classroom, there was an urgency to have a new structurally safer school constructed.

The MPI had condemned two classroom blocks. The Ministry decided to pull down only one of these and build a new block of 12 classrooms. The space that would be made available following demolition of the old block was, however, insufficient to accommodate the proposed new building. While it was possible to pull down both condemned buildings to create more space, the Ministry opted for a reduction of the school size to nine classrooms only.

The decision to build a 12 classrooms block was not a planned one. Factors that would have helped in determining school size had not been considered.

#### ***1.4 Initial Cost Estimates***

Cost estimates worked out for the new schools by the MPI were sound except for the Jean Lebrun GS where costing was not based on final tender drawings. Indeed, the Quantity Surveyor's Section (QS) of the MPI, used drawings on which certain items were not clearly shown, as compared to the revised ones sold to bidders, to work out a cost estimate for the school building. Details and the implication of the incorrect costing on the tender exercise are given and explained in the case study of the Jean Lebrun GS in Annex III.

The MPI finalised tender drawings just before tenders were floated. Cost estimates prepared based on previous drawings may be substantially different from those worked out using drawings made available to bidders. As such, final tender drawings must be made available to the QS Section for preparation of cost estimates. A mechanism should be introduced such that these drawings can be clearly identified.

#### ***Ministry's Response***

Requests are now made for an updated estimate of costs before floating of tenders by the CPB or the DTC of this Ministry.

## CHAPTER TWO

### MAIN PLANNING AND CONSTRUCTION STAGE

#### 2.1 Efficient and Effective Systems

Appropriate systems and procedures exist at the Ministry for conducting planning for school buildings. These include the School Mapping Exercise (SME) that allows the Ministry to plan for the location, and also the size, of schools. Extent of land already available or to be acquired at the proposed location are then determined. The type of building that can be constructed on the land can ultimately be decided. School buildings are caused to be delivered, usually, before resumption of studies. The latter follows a period of school holidays during which the school building can be made ready for use for the upcoming school term. An application of these systems and procedures allows the Ministry to clearly define its specifications and targets with regards to school buildings.

(a) The Ministry carries out a SME to plan for the location of new primary schools and the extension of existing ones. This exercise is not carried out for schools that are renewed. The Ministry decided to pull down the old condemned classroom blocks and reconstruct new ones at the same site or planned to do same in the near future (as in the case of the R. Moosun GS). Therefore, it could not be known whether the new buildings should have been built at the same site of the old school or should have been moved to another location. New school blocks that are replacing older ones will stand for some 30 or 40 years and involve substantial capital investments. However, demand at these new schools, during their lifetimes, need not be the same as that experienced by the old schools during the previous 40 or more years. A SME could help the Ministry in determining the optimum location for the renewed schools.

The omission of this exercise may be attributed to an urgency to have new structurally safer schools for students. After the incident at the MP Kisnah GS, to avoid any social upheaval caused by parents who were worried about their wards' security, the Ministry decided to construct a new classroom block at the same site, on a fast track basis, thereby, disregarding a school mapping exercise. Other factors that contributed to not doing this exercise were availability of suitable land, time and cost to acquire such lands in case schools have to be built elsewhere than at the old site. The Ministry, also, advanced that consultation with the school community has to be considered. This can be a lengthy process as was experienced in the case of the relocation of the Chitrakoot GS which is located in a landslide-prone area.

(b) A SME is based on the principle to ensure both equity of access to, and efficiency in the utilisation of, educational facilities. Ideally, all primary school children should be able to walk to their nearest school and have access to a choice of travel modes including public transport. For *each region*, the Ministry considers the following elements to determine the location for schools, as well as their sizes:

- Number and location of existing schools,
- School population,
- Actual demand (based on registration for intake at Standard I and pupil enrolment) and supply (based on school size) for seats at each school,
- Travel distances covered to attend schools,
- Statistical projections on demographic structure and student population,
- Availability of facilities such as specialist rooms (science room, audio-visual room, computer room, Asian Language classes, integrated unit for children with special education needs) and staff room,
- Space needed for teaching and learning activities in line with new health and safety requirements,
- A lower pupil-teacher ratio (in poor performance schools) to facilitate remedial education,
- Provision of pre-primary units where such facilities are not available, and
- Availability of land in the region.

In addition to the above, other factors that need to be considered are the number of children aged 5-12 who are enrolled in pre-primary schools, private fee-paying primary schools and secondary schools. The demographic structure of the island shows a trend towards an ageing population implying less demand for seats at primary schools in the longer term. Enrolment has been declining steadily since 2000 (135,237 pupils) to reach 118,079 students in 2009, representing a fall of 12.7 per cent. The number of primary schools has also remained fairly constant over the last decade, except for a small rise in 2008 when 13 private fee paying schools operating with a partial stream were upgraded to full-fledged schools. About six per cent of all primary school going children opt for admission in private fee-paying schools.

In the light of the above and the *possible* diminution (growth) in populated areas around (away from) the existing schools, an SME is important to determine the best location and size of the future school.

The SME should therefore be carried out for all schools – new and renewals. The Ministry must be in a position to know the optimum location for its schools. For the PSRP, under which a number of schools will be concerned, the exercise has to be undertaken.

### ***Ministry's Response***

The rationale behind the Primary School Renewal Project (PSRP) is to have a proper planning for construction projects based on lessons learnt from problems encountered in the mentioned schools, namely, M.P. Kisnah GS, E. Anquetil GS, Pt. S. Ayrge GS, R. Moosun GS and Jean Lebrun GS.

The PSRP aims at avoiding any crisis situation as was the case before and as such any event of uproar on the part of the school community.

### ***2.1.2 Land Survey and Type of Building***

The area of land available helps determine the type (shape) of building that can be constructed thereon. School blocks built by the Ministry are most of the time horizontal in shape as standard architectural drawings of the MPI are for rectangular blocks.

Failure to survey land available at the MP Kisnah GS prevented the Ministry from defining the correct type and size of building it required and led to delays of some five months in finalising architectural drawings. Indeed, no preliminary land survey was carried out at the site to assess whether sufficient space would be available, following the demolition of the larger of the two condemned buildings, for the construction of a new classroom block. A lack of technical resources at the Ministry was advanced as the main reason for not doing the survey. In order to save time on drawings, as there was an urgency to have a structurally safer school built, the MPI was requested to initiate action for construction based on its standard architectural drawings for a block with 12 classrooms.

A land survey carried out by the MPI revealed that its standard drawings which are horizontal in shape could not be used as the area of land available at the site was too small. Specific L-shaped drawings for a block with 12 classrooms were submitted on 4 April 2007. However, an L-shaped construction would have affected the ventilation for the existing adjacent three-storeyed classroom block. Consequently, the requirements of the block were revised from 12 to 9 classrooms so that a horizontal shaped building could be erected. It was stated that if the need for additional rooms would arise, the other condemned block would be demolished. The change in school capacity shows that the original size of the new block was not determined based on enrolment trends and demand at the school. Revised drawings for a classroom block with nine rooms (horizontal shape) was submitted by end May 2007 and approved by the Ministry on 5 June 2007.

No proper planning was carried out at the Ministry level. Had a preliminary survey of the site been done, the MPI would have been in a better position to promptly prepare the necessary drawings for the building required. From the above, it can be observed that it took some five months for the drawings to be approved.

## **2.2 Role of MPI in Government Buildings Projects**

The Public Infrastructure Division (PID) of the MPI is responsible for the implementation of building projects. The PID is also responsible for the preparation of tender documents for all building construction projects. It participates in the evaluation of bids received for projects costing up to Rs 50 million.

### ***2.2.1 Delays in Implementation of Projects***

While the MPI tried to meet targets specified by the Ministry, delays were noted. Two to three months lapsed before preliminary drawings for the Pt. Sharma Ayrge and E. Anquetil GS could be obtained. Consequently, obtaining the necessary approvals and preparation of tender documents were deferred.

Delays were also noted in preparation of tender documents. For the new block at Pt. Sharma Ayrge GS, the MPI agreed that draft tender documents would be submitted by end June 2008, but they were still under preparation in July 2008.

### ***MPI's Response***

New surveys had to be carried out and new architectural preliminary design including new structural design had to be prepared and tender documents prepared thereafter. This explains delays in preparation of bid documents and implementation.

#### ***2.2.2 Effects of Delays***

There is a cost for delays, but the main impact is social and political. Indeed, the Ministry had to face social and political pressures when schools were not ready in time.

The old condemned block at the Pt. Sharma Ayrge GS was demolished in December 2007. Parents were told that construction of a new school block would be completed by September 2008. Contingency arrangements were made to temporarily house students in a rented building about 200 metres from the school. Due to delays in the preparation of tender documents, the planned completion date of the new building was revised to end December 2008. The Ministry did not follow the normal tender process for the school as there was an urgency to have it ready before resumption of studies in January 2009. With government's approval, the MPI issued a works order to its pre-selected District Contractor in July 2008 to build the school; the scheduled completion date was mid-March 2009. Although the school was substantially completed on 10 March 2009, it was finally delivered in end June 2009, around the end of the second school term, due to delays in attending to snags.

Parents were annoyed and frustrated with the successive delays. The more so, as they were not happy with contingency arrangements made, since December 2007, which according to them, were not safe and deprived their children from certain facilities such as ICT classes, mediathèque, audio-visual and library.

#### ***2.2.3 Cost Implications***

On the cost chapter, rentals were payable for buildings let to temporarily accommodate students pending the construction of their schools. A monthly rent of Rs 25,000 was paid for the hall near the Pt. Sharma Ayrge GS. Delays in delivery of schools obviously inflated the rent paid. More importantly, however, are construction costs that tend to increase with time and any delay in selecting construction services adversely impacts on the cost of the project. This was illustrated in

the MP Kisnah GS case where a delay of five months to finalise drawings increased cost of the new school block by Rs 600,000.

Architectural drawings for this classroom block, approved by the Ministry in early June 2007, contained decorative features which according to Ministry of Finance inflated the cost of the project to Rs 13 million. After lengthy exchanges of correspondences and documents between the Ministry, Ministry of Finance and MPI, it was finally decided to omit the decorative designs. New drawings and cost estimates of Rs 13.6 million were submitted on 4 October 2007 and 28 November 2007 respectively.

The preparation of new drawings and cost estimates caused the project to be further delayed by some five months. Due to rising costs of materials and labour during this period, the cost estimates rose to Rs 13.6 million. This was higher than the original estimate of Rs 13 million which included the decorative features.

The contract was awarded to the successful bidder in December 2008, on the recommendations of the CPB, for some Rs 16.3 million. It may be argued that the latter, by far, exceeds the estimates made – Rs 13 million (June 2007) and Rs 13.6 million (November 2007) – and, therefore, they were outweighed. The most important point, however, is that delay in selecting construction services adversely affects the cost of a project. Had the delay in finalising drawings been avoided, the final contract sum could well have been under Rs 16.3 million.

(The construction of the classroom block at M.P Kisnah GS was among the first projects falling under the Public Procurement Act 2006 proclaimed in January 2008. The Ministry had to carry the tender exercise through the CPB. After the submissions of bids in end July 2008, the CPB took some four months to evaluate same.)

### **2.3 Schools Constructed on Fast Track Basis**

The Ministry constructed two school blocks without going through a tender exercise for the selection of the builders. Construction of the school buildings at Pt. Sharma Ayriga and E. Anquetil GS was entrusted to MPI's pre-selected District Contractors. Government's approval had to be sought for the Pt. Sharma Ayriga GS.

For both schools, there was an urgency to have the new blocks ready for resumption of studies in January 2009. The classroom block at Pt. Sharma Ayriga GS was planned to be completed by end December 2008. In July 2008, tender documents were still under preparation. As the award of contract through normal tender procedures would have taken several months and given the above urgency, the Ministry decided to discard the tender exercise. For the E. Anquetil GS, decision had already been taken to have the building constructed on a very fast track basis. After preliminary drawings had been received, a tender exercise was not initiated.

### 2.3.1 MPI District Contractors

In each fiscal year, since 2004-05, the civil engineering section of the MPI employs private contractors, on a region-wise basis, to maintain, repair and rehabilitate government buildings. Works to be carried out by the contractors are indicated on Works Orders issued by the MPI, under a contract for the *Maintenance, Repairs and Rehabilitation of Government Buildings* drawn with each contractor. The works order is signed by representatives of the MPI and the contractor. A single Performance Bond and an All Risk Insurance Policy, valid for the one year contract period (and six months maintenance period) covering all works to be done are requested from the contractor irrespective of the number of works orders issued and their values. As mentioned above, major construction works were, also, assigned to these contractors.

### 2.3.2 Risk Associated with District Contractors.

The new school blocks at Pt. Sharma Ayrga and E. Anquetil GS were built by two distinct district contractors. Each contractor had submitted only **one** performance bond for the sum of Rs 500,000 and **one** all risk insurance policy for Rs 5 million, to guarantee contractor's performance and provide cover against risks respectively for **all** works executed under dozens of works orders issued to them during the contract period. During fiscal year 2007-08, period for which they had been selected to do maintenance, repairs and rehabilitation of government buildings, the two contractors concerned had shared 102 works orders between them with a total value of some Rs 207.3 million as shown in Table 3.

*Table 3 Value of Work Orders*

	No of Works Orders	Value (Rs)
<i>Port Louis District Contractor</i> (builder for E. Anquetil GS classroom block)	61	135,421,226
<i>Pamplemousses/Riviere du Rempart District Contractor</i> (builder for Pt. Sharma Ayrga GS classroom block)	41	71,864,590
	<b>102</b>	<b>207,285,816</b>

Source: MPI

Furthermore, during the construction periods for the classroom blocks the contractors were, also, carrying out works simultaneously at several other sites as detailed in Table 4.

**Table 4 Details of Works Allocated to Two District Contractors**

	<b>Works order</b>	<b>Issue date*</b>	<b>Description of works</b>	<b>Value (Rs)</b>	<b>Start date</b>	<b>Completion date</b>
<b>Port Louis District Contractor</b>	1/036/1	07.07.08	<b>Construction of classroom block at E. Anquetil GS</b>	<b>4,942,200</b>	<b>10.07.08</b>	<b>20.12.08</b>
	1/043/1	04.08.08	Upgrading of toilets at Nicolay GS	1,275,000	05.08.08	30.12.08
	1/055/1	20.10.08	Plumbing works – ADSU building	40,000	17.11.08	31.12.08
<b>Pamplemousses/Riv. du Rempart District Contractor</b>	2/036/1	10.07.08	Upgrading works at Poudre D’Or hospital	2,150,000	21.07.08	12.09.08
	2/037/1	29.07.08	<b>Construction of classroom block at Pt Sharma Ayrga GS</b>	<b>13,761,781</b>	<b>01.08.08</b>	<b>15.03.09</b>
	2/038/1	15.09.08	Upgrading works at P Shibchurn GS	3,250,000	22.09.08	15.03.09

\* The initial one year contract period ended on 20 August 2008 and was extended by another two months.

Source: MPI

A performance bond for Rs 500,000 and an all risk insurance cover for Rs 5,000,000 are too little to guarantee contractor’s performance and provide cover against risks, respectively, on works worth Rs 72 million or Rs 135 million carried out during the contract period. The documents are not even adequate for the construction of a school block worth Rs 13.8 million. They provide guarantee and cover for six months maintenance period – only half the normal duration of one year for a construction project.

A performance bond is a security for proper performance provided by a contractor. It entitles the client to make a claim up to the amount of the bond – normally equivalent to one tenth of the value of the works – in case of default by the contractor. An all risk insurance policy provides cover for risk of accidents, injuries and damages at the site of work. Under the insurance policy, the whole value of the works should normally be insured. An adequate performance bond and insurance cover should be submitted for each work executed.

In the event the bond is forfeited for non-performance by the contractor on one works order, no guarantee is then available for contractor's performance on other works orders that were being executed concurrently. Due to inadequacy of the above documents, there is the risk that the client's interests are not safeguarded. As District Contractors carry out maintenance, repairs and rehabilitation of government buildings, the same risk applies when they are chosen to maintain schools.

It is recommended that the Ministry should avoid as far as possible building schools on a fast track basis through District Contractors because of the risk that its interests may not be adequately protected.

The civil engineering section has argued that it has been issuing hundreds of work orders and it would not be practical to request for a performance bond and an insurance cover for each work order as this would delay the implementation of projects given that works would not start until these documents are received. It is our view that the MPI should seek advice from the State Law Office on what guarantee and cover against risks should be requested from the contractor for its contract for the *Maintenance, Repairs and Rehabilitation of Government Buildings* where such a large number of work orders are involved. The possibility to increase the number of contractors in each region could, also, be considered such that works may be executed on a queuing basis by each contractor. This approach will make each contractor's single performance bond and all risk insurance policy satisfactory.

### ***Ministry's Response***

The Ministry proposes to request the Engineering Division of the MPI to review the policy of performance bond and insurance cover for the next batch of District Contractors to safeguard the interests of the Ministry. The possibility of increasing the value of the performance bond should be explored, taking into consideration the total value of works orders issued for school projects over the past three years.

## **2.4 The PSRP and Green Buildings.**

As environmental and energy concerns become more prominent in the discussions of politics and economics throughout the world, there is a corresponding increase in attention to the subject of green or sustainable development in all sectors including construction. In Mauritius, government wants to make development sustainable through the *Maurice Ile Durable (MID) Project*. The MID concept is a long term commitment of government to improve the nation's energy portfolio and security, to endorse sustainable development and to address climate change threats to the public. Sustainable development in the construction sector implies the capacity to invest or reinvest one's time, energy, resources and funds into an eco-friendly capital – a green building.

A green building or sustainable building is an outcome of a design philosophy which focuses on increasing the efficiency of resource use while reducing building impacts on human health and the environment during the building's lifecycle, through better siting, design, construction, operation, maintenance, dismantling and recycling. Though green building is interpreted in many different

ways, a common view is that they should be designed and operated to reduce the overall impact of the built environment on human health and the natural environment by:

- Efficiently using energy, water, and other resources,
- Protecting occupant health and improving employee productivity, and
- Reducing waste, pollution and environmental degradation.

A similar concept is natural building which tends to focus on the use of natural materials that are available locally.

The Ministry has the opportunity, with the PSRP, to innovate and apply new concepts to construct new green buildings and be in line with the MID concept. In designing new buildings, the Ministry should not require the MPI to stick to the standard design model which they have used for schools for so long. The design team should instead focus more on the sustainability of the building and its whole life costs (WLC). Quite often, building designs with the lowest initial cost of construction will require higher maintenance and generate higher energy costs during the building's service life. Thus, these buildings will have a higher WLC. Conversely, durable designs often have a lower WLC. Sustainable features need to be considered. The following are suggested:

- New design and arrangement of windows in the building to capture a maximum amount of natural light. The present steep and vertical canopies, efficient in protecting users from rain, but cutting off natural light, should be redesigned such that in addition to shielding users from rain, they let a maximum amount of light in. These will help keep electricity bills lower.
- The use of "V" shaped top roof to collect all rainwater to be used to flush toilets, washing of premises and for irrigation of lawns, reducing the demand for mains water.
- The maximum use of building materials from renewable sources and construction techniques to minimise the amount of energy used in its construction and at the time when it is dismantled and recycled.

### ***MPI's Response***

The Architects Section has already started to adopt the Green Architectural and MID concept by implementing the following:

- Study of collection of rain water for re-use.
- Proper orientation by making use of optimum architect natural light and ventilation.
- Using ½ flush capacity cisterns in toilets.
- Using maintenance free material.
- Using local material such as stone, block and paving block, etc.

- Using renewable energy such as solar energy, wind energy, etc

However, there is the need for further training on green design to be dispensed to technical staff.

## CHAPTER THREE

### DELIVERY OF SCHOOL BUILDINGS

#### 3.1 Effective System for Delivery of School Buildings

The Ministry, in partnership with the MPI, is broadly delivering construction of school building projects efficiently and effectively. Two of the four schools constructed were completed to time and cost. Construction of the new blocks at the Jean Lebrun and MP Kisnah GS was inordinately delayed and the MPI, quite rightly, applied penalty clauses to sanction the builders.

The Ministry-MPI partnership has an effective strategy for delivery of school buildings. There is no Memorandum of Understanding or equivalent setting out roles, and responsibilities between the two Ministries, but Government created the MPI to serve other Ministries on capital projects, and it is clear what the Ministry can expect from the MPI. Communication and coordination between the two Ministries worked effectively through an application of recommended government practices. Meetings were held, when necessary, to clear any divergent issue so that matters can proceed smoothly.

There are effective mechanisms to ensure that the Ministry provides clear specifications to the MPI and that the latter designs what the client Ministry asked for. There is a “sign-off mechanism” to demonstrate that the client is agreeable with the MPI’s design specifications before construction starts. The Ministry informs the MPI about its requirements. Preliminary architectural drawings prepared by the MPI are approved by the client Ministry by way of a letter of approval. Drawings are then sent to relevant authorities and the Building Plans Committee for examination, comments and approval.

#### 3.1.1 Building Requirements

Any building has to satisfy three basic requirements, namely, functionality, safety and habitability. Functional requirements include the utility of the building, accessibility to and within the building and access to communications. Safety requirements include structural safety, safety in case of fire, and safety of use. In short, a building should be such that it poses no risk of accident to people. Habitability requirements would ensure that safety, hygiene and environmental protection are of an acceptable level of healthiness with adequate protection against noise, energy savings and other functional aspects. In designing a building, the MPI would take the above into consideration.

### **3.1.2 Examination of Building Plans**

Preliminary drawings are independently examined by a number of authorities such as *Ministry of Health and Quality of Life, Ministry of Housing and Lands and the Fire Services Department* to ensure that the basic requirements are satisfied. Approval of the following Ministries and authorities are also important

- Ministry of Finance
- Ministry of Public Utilities (Energy Services Division)
- The Traffic Management and Road Safety Unit Safety
- Road Development Authority

Once clearances from the above Ministries/authorities are obtained, the plans are sent to the Building Plans Committee (BPC) for final approval. The BPC, established under the aegis of the MPI, ensures inter-alia that maximum economy in design compatible with the retention of sound building standards and maximum standardisation of building materials are achieved and that considerations of architectural merit are not lost sight of in the pursuit of functional convenience. All the aforementioned Ministries/authorities and the client Ministry are represented on the committee.

The approved sketch plans are, thereafter, submitted to the MPI for further elaboration. Preparation of cost estimates and tender documents follow.

### **3.2 Supervision of Construction**

*There is a project steering committee or equivalent to supervise building of schools and its works.* Regular site visits and meetings involving the client Ministry (represented by an engineer or a technical officer), the MPI (project manager) and the contractor are held throughout construction. The attendance of the Ministry at site meetings allows it to be kept informed of progress, so that it can make adjustments to take account of delays, variations or de-scoping. The Ministry gets the opportunity to say if it is satisfied or not with the progress and execution of the works.

However, it was noted that certain meetings were not minuted. Notes of site meetings were available only for projects that had been through a tender exercise and supervised by the Architect Section: MP Kisnah and Jean Lebrun GS. In the case of construction works carried out by MPI District Contractors (Emmanuel Anquetil and Pt. Sharma Ayrga GS), meetings were not seen recorded.

Site meetings are very important activities in construction works. Various information are shared and important decisions are taken at these meetings. It is therefore vital that minutes of all site meetings should be recorded so as to ensure that decisions and actions resulting from the meeting are not lost or forgotten.

### ***3.2.1 Contract Management***

The MPI generally ensures that contractors deliver to time, cost and quality. Contract documents showing start and completion dates, value (including contingency amounts), and specifications for the project were drawn. Contract documents follow the model recommended by the *Federation Internationale des Ingenieurs-Conseils*.

MPI applied contract terms and exacted penalties for the late delivery of school buildings. Liquidated and ascertained damages at the appropriate rates were applied on the Jean Lebrun GS and MP Kisnah GS projects for latenesses.

There is effective MPI contract management in most cases. However, the lack of independent quality assurance on MPI works means that we cannot be sure that things were done in the best way.

### ***3.2.2 Quality Assurance on MPI Works***

As mentioned earlier, Government created the MPI to serve other Ministries in implementing their capital projects, but no quality assurance mechanism was set that would ensure that works performed (design, quantity surveying, construction and testing) are of an acceptable standard. Client Ministries do not independently review the works implemented/supervised by the MPI. Project management standards that require independent review are not used as yet.

An **independent** peer review exercise on a sample of projects with a view to ensuring that the laws, decrees, professional and ethical standards in the practice of architecture, civil engineering and quantity surveying would serve a long way towards providing assurance on the quality of works carried out by the MPI. Where things are correctly done, the MPI would be encouraged to follow the same path and where improvements are needed, necessary adjustments will have to be made with a view to enhancing the level of services offered. On the other hand, client Ministries will have the assurance of receiving value for their money spent on projects. This review exercise will need to be carried out at regular intervals, preferably on an annual basis. This exercise will help government deliver, through the MPI, and obtain, through recipient client Ministries, best value from its spending.

### ***Ministry's Response***

The Ministry would like to set up an independent Quality Assurance team to ensure compliance with set specifications, standards and norms, ensure value for money and promote quality assurance.

### ***3.2.3 Quality of Works***

The MPI applies mainly the British and Mauritian Standards relevant to the construction industry on all projects it manages. A standard is an agreed, repeatable way of doing something. It contains a technical specification or other precise criteria designed to be used consistently as a rule, guideline, or definition. Compliance with standards in the construction industry ensures appropriate selection of materials and components used on the work and good level of workmanship. The *Specifications and Performance Requirements* section in contracts drawn abounds with standards to be followed by the builder so that respected levels of quality, safety and performance are conformed with.

Compliance with standards, appropriate level of workmanship and, thereby, quality of construction works can be ensured through constant supervision. As project manager, the MPI supervised all construction works at the schools. Contractors were requested to submit compliance (with relevant standards) certificates, samples and, test certificates from independent laboratories for materials used on site. In case the materials/suppliers were changed, new certificates and samples were requested. Materials used in construction were mainly steel, aggregates and cement. Suppliers for these items are few in the country and most of them have laboratories for compliance testing. Independent testing is done by the Mauritius Standards Bureau, the national standards body, and the MPI, at the request of, the suppliers and, also, the MPI when their materials are used on site. Therefore, compliance and test certificates received were reliable. However, several irregularities were noted and are discussed in the following paragraphs.

### ***3.2.4 No testing for District Contractors Materials.***

In the case of schools constructed by District Contractors, no testing of materials including concrete (see below) used was done. These contractors were appointed by the MPI to carry out maintenance, repairs and rehabilitation of government buildings. Under their contracts, they were requested to submit compliance certificates, samples and test certificates for materials **only once** for **all** works orders issued during their one-year contract period. In case the materials/supplier were changed, new test certificates, samples, compliance certificates were requested.

Works orders for the construction of the E. Anquetil and Pt. Sharma Ayrga GS were not the first issued to their respective District Contractors. As the MPI was satisfied with documents and samples submitted (which could not be produced to audit) on previous works orders, it did not request testing and samples for materials used for these schools. This is incorrect as materials used at the schools could have been different from those previously certified. Thus, quality control on materials used for the buildings was inexistent.

### ***MPI's Response***

Necessary tests on materials and concrete used for the construction of these schools should have been done.

### ***3.2.5 Test on Concrete***

Quality control on concrete was, also, inadequate. Concrete cube tests were performed to determine the compressive strength of the concrete used. Strength is the most important property and the quality of concrete is often judged by its strength. The way these tests were carried out was not satisfactory.

(a) Requests for cube tests were not made in writing. Therefore, it was not known how many cubes were requested to be prepared and sent for testing. In the absence of a record, the number of test reports submitted by the contractor cannot be cross-checked with the number of cube tests requested. As the contractor will obviously submit results of passed cubes only, the correct strength and quality of concrete cannot be assessed in case testing revealed low strength for certain cubes.

(b) Freshly prepared cubes were not marked. Failure to do so, there is the risk that cubes prepared with materials used on site could be exchanged with cubes of better materials used elsewhere. Thus, quality of concrete used at the site would not be known.

(c) Most of the times cubes were brought, by the contractors themselves, to the MPI laboratory one or two days before the scheduled destructive tests. Some were even brought on the day of testing itself i.e. on the 7<sup>th</sup> or 28<sup>th</sup> day. The contractors, therefore, have the liberty to exchange cubes between the times they are prepared and brought for testing.

The contract provides that transport facilities should be put at the disposal of the engineer or his representative at their request as and when required, for the routine checking/supervision of the works and the approval thereof. Thus, transport facilities can be made available for the proper testing of concrete.

It is recommended that arrangements should be made so that cubes are sent to MPI laboratory on the next day after preparation, under the supervision of MPI officers. Tests have to be adequately performed to ensure right quality of concrete is used in construction works.

### ***MPI Response***

Cube tests are carried out as per the conditions of contract. Should the concrete cubes be of insufficient strength, the Contractor will have to take the matter up with his supplier who will have to assume all responsibility. In case doubts exist on a contractor, then the Materials Testing Laboratory will be requested to take the cubes, as is the current practice.

## CONCLUSION

Overall, the Ministry has an efficient and effective programme for planning and construction of school buildings. The programme covers pre-planning, planning and construction with each stage having well established systems and procedures. The main issues in securing value for money revolve around adherence to procedures, timely planning and quality assurance on works carried out by the MPI.

Non-observance of certain procedures like the non performance of the School Mapping Exercise that allows the Ministry to determine the best location for its schools, the non consideration of relevant factors like registration, enrolment, school capacity, demographic trends and land availability to determine size and type of the school to be constructed may lead to the wrong use of limited resources, namely land and finance.

Construction projects are implemented jointly with the MPI. The latter has to carry out capital projects of not only the Ministry, but of whole government. Under these circumstances, timely and proper planning is essential lest delays are experienced in the implementation of school building projects. There is a cost for the delays noted in the construction of school buildings. A delay of some five months to finalise drawings for one school caused the estimated project cost to increase by some Rs 600,000 due to rising costs of materials and labour during this period. However, the main impact is social and political. In fact, the Ministry had to face social (with parents' frustration) and political pressures when schools were not ready in time.

Delays experienced at the MPI level in the preparation of tender documents led to the discard of a tender exercise and the construction of schools on fast track basis by MPI's pre-selected District Contractors. With this approach, the Ministry runs the risk that its interests may not be adequately protected mainly due to the fact that guarantees and insurance covers submitted are not appropriate for construction of school buildings.

Government created the MPI to serve other Ministries in implementing their capital projects, but no quality assurance mechanism is available to ensure that works performed (design, quantity surveying, construction, testing, project and contract management) are of an acceptable standard. An independent peer review exercise on projects implemented would definitely help towards providing assurance on the quality of works carried out by the MPI. This review will help government deliver, through the MPI, and obtain, through recipient client Ministries, best value from its spending.

With the PSRP, the Ministry has the opportunity to innovate and apply new concepts to construct new green buildings and attune to government's intention to make development sustainable under the *Maurice Ile Durable Project*. This calls for due attention to be given to durable designs and the whole life costs of the buildings.

Maintenance is a crucial part of the school building programme. Presently, a preventive maintenance programme for schools is not available. Curative maintenance works are carried out following requests from schools. An adequate preventive maintenance plan with sufficient staff and funds would help in preserving buildings in better conditions over a longer period, thereby, providing higher value for money. Proper implementation of this plan would, also, help in timely identifying buildings nearing a beyond repairs stage (with assistance from the MPI). Consequently, the whole planning process for construction of new buildings for these schools could be triggered early, avoiding urgencies that lead to the omission of certain steps and activities. Ultimately, schools should be ready for use at the expected time.

## AUDIT METHODOLOGY

**Scope of this study.** The National Audit Office examined how far the Ministry of Education, Culture and Human Resources has an efficient and effective programme for the pre-planning, planning and construction of school buildings.

**Main aspects of the National Audit Office's methodology.** The examination covered procedures – how the Ministry went about the various tasks.

The purpose of the NAO's examination was to assess the extent to which the Ministry's procedures were well chosen and likely to give an outcome in line with their objectives.

To carry out the examination, the NAO:

- collected information on procedures relating to pre-planning, planning and construction of schools buildings, and
- evaluated the information received.

### 1. *Collection of Information*

The NAO collected information from the following sources:

- a review of the Ministry's and MPI's documents;
- interviews with officials of the Ministry, MPI, the Ministry of Land and Housing and the Central Statistics Office;
- examination of statistical reports; and
- internet searches.

### 2. *Evaluation of the Information Collected*

The NAO examined procedures used by the Ministry to see:

- how the major decisions taken by the Ministry impacted on the achievement of the Ministry's objectives; and
- whether the procedures followed good practice.

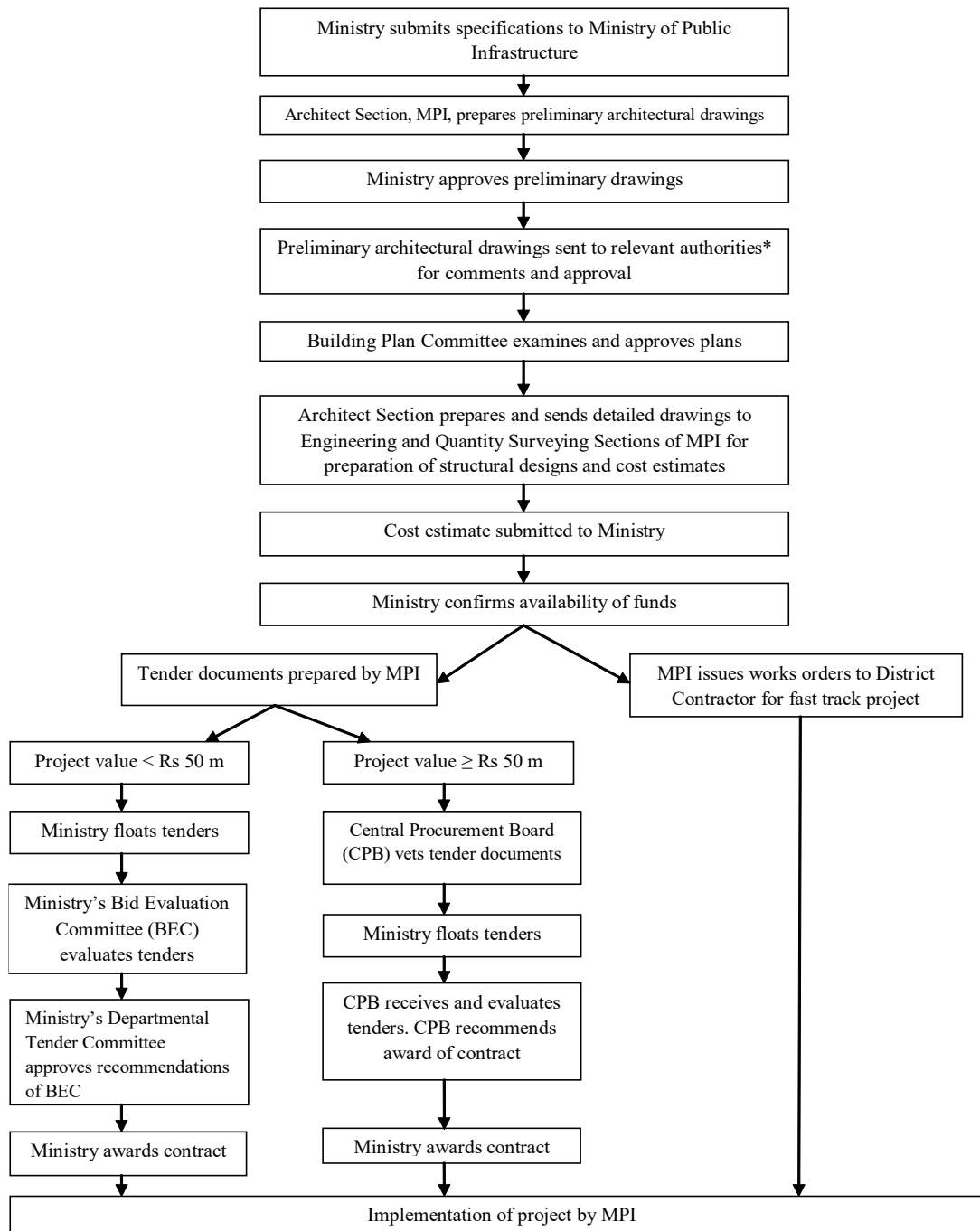
### 3. *Site Visits*

Visits to schools already constructed or under construction were made with representatives of the Ministry and MPI.

### 4. *External Technical Experts*

No external technical experts were engaged for this audit.

## SYSTEM FOR PROCUREMENT OF SCHOOL BUILDING



\*Traffic Management & Road Safety Unit, Wastewater Management Authority, Road Development Authority, Ministry of Housing and Lands, Energy Services Division, Ministry of Health and Quality of Life, Fire Services Department and Ministry of Finance.

## ISSUES ON MAINTENANCE OF SCHOOL BUILDINGS

- (i) Of the 219 primary schools existing in 2009, 149 (68 per cent) are relatively old – aged 40 years or more – and need constant maintenance works.
- (ii) A preventive maintenance programme for schools is not available. Repairs and maintenance are carried out as and when required in an isolated manner. Curative maintenance works are carried out following requests from head teachers and rectors to remedy the ‘ills’ that are suffered by their schools.
- (iii) Maintenance works in schools (both primary and secondary) are carried through the zonal maintenance units, the Infrastructure Management Unit (IMU) and the MPI as described below:
- *Zone Maintenance Unit.* Maintenance work costing up to Rs 500,000 comprising of minor repairs are undertaken at the level of zones. The island is divided into four zones and each zone has a maintenance unit comprising of inspector of works, tradesman, carpenters, painters, plumbers, welders and electricians, among others, under the supervision of a Technical Officer (TO). The latter surveys school buildings, prepare scope of work and advise the zone director on maintenance and infrastructural issues. Minor repairs carried out include replacement of doors, windows, glass panes, painting, tiling and fencing works.
  - *Infrastructure Management Unit.* Maintenance work costing from Rs 500,000 and up to Rs 50 m is handled by the IMU. The IMU has a civil engineer on secondment from the MPI. The engineer receives very limited assistance from the four zones’ TOs and draughtsmen. The unit carries out surveys and prepares cost estimates, drawings, specifications and tender documents. Works are carried out by private contractors. Supervision is done by the unit. Works undertaken by the IMU are more complex in nature and of larger scope like replacement of nacoframes, construction of blockwall, upgrading of toilets and waterproofing works.
  - *MPI.* Although, legislation allows the IMU to carry out works with value of up to Rs 50 million, the unit has so far implemented projects costing at most Rs 2.2 million. For costlier works, procurement of the services of a contractor was effected by the Ministry and project implementation was done by the MPI. Since fiscal year 2004-05, the MPI has been selecting private District Contractors to carry out maintenance, repairs and rehabilitation of government buildings. These contractors undertake upgrading, renovation and refurbishment works, among others. The works are supervised by MPI’s Engineering Section.

The inability of the IMU to do larger works is due to staff constraints. The four zones’ technical officers have to oversee works undertaken by their respective zone’s maintenance unit. Only half a day is spent in each week reviewing works undertaken by the IMU. This being so, and given the number of schools which have to be maintained (an average of 221 primary and 59 secondary schools during the last ten years), only a limited amount of work can be done at each school.

- (iv) During the last seven years budgeted sums for maintenance varied between Rs 20 million and Rs 32 million. Amount spent annually at each school averaged Rs 68,895 over the last ten years. Details are shown in Table 5). This is low. The Ministry of Finance recommended that a minimum of one per cent of the total built asset's value should be devoted towards maintenance costs in each year.

**Table 5 Average Cost of Maintenance Per School**

Fiscal Year	No of School (Primary and Secondary)	Budgeted amount (Rs million)	Actual expenditure (Rs million)	Maintenance cost per school(Rs)
1999-2000	259	15	14	54,054
2000-01	259	7.5	6	23,166
2001-02	262	15	13	49,618
2002-03	284	20	18	63,380
2003-04	287	20	19	66,202
2004-05	291	20	20	68,728
2005-06	290	20	20	68,965
2005-06	289	25	25	86,505
2006-07	288	32	32	111,111
2007-08	288	*	28	97,222

\* Exact figure unknown as it is lumped with zones' budget amounts.

Source: Ministry and Treasury Accounts.

As a result of the above factors and constraints proper maintenance could not be carried out in schools leading to deterioration of infrastructures. There is a need to formulate an adequate preventive maintenance plan and sufficient staff and funds be allocated for implementation of same.

### **Ministry's Response**

This Ministry had requested on various occasions for additional technical staff from the MPI, but to no avail. Furthermore, action was initiated to recruit Project Managers (Architecture, Quantity Surveying, Civil Engineering and Mechanical Engineering) under the Capacity Building Programme. The only one Project Manager (civil engineering) who turned up, left after one month due to the unattractive package offered to such scarce experienced professionals. The additional infrastructural works allocated to him had consequently been redistributed amongst the two Engineers at IMU.

The Ministry should be provided with the capacity and expertise so as to be able to implement and monitor the projects for the pre-primary, primary and secondary sub-sectors.

## **CASE STUDY: JEAN LEBRUN GS.**

### **Introduction.**

Jean Lebrun GS is a high demand school with 984 students on roll for school year 2009. The school was built in 1954 and consists of five classroom blocks of concrete blockwall construction with corrugated iron sheet roofs. In 1968, a sixth block of reinforced concrete consisting of six classrooms was built and, some 30 years later, six additional classrooms were added onto it.

Following a site visit by IMU officers, in February 2005, cracks of varying dimensions, some quite severe in nature, were reported at many places in the school. These cracks had developed, over many years, as a result of a lack of proper and timely maintenance/rehabilitation. Remedial works had been carried out to repair the cracks, but some had worsened – widening and spreading throughout the school. Located on a foothill, the school is subject to direct surface runoff during rainy periods. The swelling and shrink characteristics of high clay content soil on which the school stands adversely affect the structural behaviour of the buildings. The school suffered from improper rainwater drainage; water entered into the foundations instead of being diverted away.

A structural investigation report prepared by the MPI, based on visual observations made in February and March 2005, contained several recommendations to remedy the situation. Given the old age of the school blocks (more than 50 years), the Ministry, in July 2005, requested the MPI to initiate action for the demolition of the five blocks and to undertake the construction of new buildings. For the sixth building, it was decided to carry out the necessary repairs.

### **Project Description.**

The project consists of the construction of a four-stream primary school comprising of three new classroom blocks at the existing Jean Lebrun GS, on a phase wise basis. Phase I (subject of this audit) involves the construction of a school building with a pre-primary unit on the ground floor and four classrooms on each of the first and second floors. In subsequent phases, all old ground floor classroom blocks will be demolished to be replaced by new three levels buildings.

### **Wrong Project Cost Estimate and Incorrect Invitation to Tender.**

On 14 June 2007, the Quantity Surveyor's (QS) Section of the MPI, based on a drawing available then, worked out a cost estimate of Rs 17.6 million for the school building. On 16 August 2007, a drawing showing with more clarity items like high level fencing, retaining wall, new covered drain and indicating additional foundation works was submitted by the Architect Section for the tender exercise. These items had not been accounted for in the above cost estimate.

Based on cost estimates prepared by the QS Section, the MPI invites contractors of appropriate grades to tender for construction projects. Using the estimated cost of Rs 17.6 million, tenders were called from grades A to D contractors in mid August 2007. From information obtained, had the items, initially, not taken into consideration, been accounted for, using 2007 prices, the cost estimate would have risen by some Rs 3.7 million, to Rs 21.3 million for the school block. This would have changed the invitation to tender significantly, as only grades A to C contractors would have been eligible to bid.

### ***Recommendation***

Final tender drawings must be made available to the QS Section for preparation of cost estimates.

### **Selection of Contractor.**

By the closing date, five offers were received. The two lowest quotes were from a grade D builder (Rs 21.8 million) and a grade A contractor (Rs 24.5 million). The practice of the MPI being to award a contract to the lowest bidder, the grade D contractor was selected. However, as the latter could only quote up to a ceiling of Rs 20 million only, the tender evaluation committee recommended the second lowest quote, from the grade A contractor, for the sum of Rs 24.5 million.

The MPI, however, recommended to the then Central Tender Board (CTB) that this contract be exceptionally awarded to the lowest tenderer (grade D contractor) as this would allow government to save some Rs 2.7 million. Following advice from the CTB, the matter was referred to the State Law Office. The latter stated that “... *if the grade D contractor (lowest tenderer) has all in the opinion of the Ministry the capabilities and fiscal ability required for the present contract same may be awarded to it whilst keeping in mind the past record for his work as a contractor for Government (if any)*”.

As a result of the above, the MPI requested the contractor to submit evidence of his human resources, plants and equipment, updated financial standing, and a list of contracts completed and/or in progress during the preceding five years.

From documents submitted, the contractor had been carrying out mainly maintenance, repairs and rehabilitation of government buildings and premises. Building construction projects for government were few – five social welfare centres and three police stations. Of these, the highest value was Rs 12.7 million for a police station in Rodrigues. Details are shown in Table 6.

**Table 6 List of Contract Works Performed by Contractor**

Project	Value (Rs)	Nature of work	Remarks
Maintenance, repairs & rehabilitation of Government buildings & premises:	23.1 million (32 jobs)	Maintenance, repair and renovation/upgrading of buildings, fencing, painting, waterproofing, tiling works and construction of boundary walls.	Builder was appointed as District Contractor by MPI. The value of each work ranged from Rs 8,567 to Rs 4.3 million.
○ 2004-05	15.6 million (several jobs)		
○ 2005-06 (Rodrigues)			
○ 2005-06 (Mauritius)	32.8 million (32 jobs)		
Construction and upgrading of football grounds	9.1 million (3 jobs)	Construction of blockwall, fencing, leveling and turfing.	Cost of work: Rs 1.7 million to Rs 4.2 million.
Construction of five social welfare centres in Rodrigues	19 million	Construction of buildings.	Estimated cost of one centre: Rs 3.8 million.
Construction of new police stations:			
○ Rodrigues	12.7 million	Construction of buildings.	
○ Grand Bois	7.2 million		
○ Pte aux Canoniers	7.7 million		

The list, also, included a *private* medi-clinic which was, then, under construction for the sum of Rs 22 million. From the above, whether the contractor had the capability and experience to handle a larger construction project worth more than Rs 20 million is questionable. The grade D builder was awarded the contract for the sum of Rs 21,820,310 on 14 December 2007.

### ***MPI's Response***

According to information submitted by the contractor it appeared to have the capacity to undertake the work. However, the problem that arose (during project implementation – see below) was more related to poor allocation of resources and poor management.

### **Delays during Project Implementation.**

Works started on 11 January 2008 and was scheduled for completion on 11 July 2008. Adverse climatic conditions from mid January to end March 2008 hindered works on site. Extension of 24 working days was granted deferring completion date to 08 August 2008. The school building was

practically handed over to the Ministry on 07 July 2009 with a delay of eleven months. This delay was caused by:

- *Inadequate labour force.* During the first five months of construction labour force used was insufficient – an average of only seven workers was deployed on site. As at end May 2008, 10 weeks delay had already been accumulated. It was only following repeated requests made by the MPI to increase manpower to catch up with delays that additional workers were brought in. As from June 2008, the number of workers ranged from 14 to 35.
- *Late submission of test results and samples.* At the start of the project, the contractor was requested to submit compliance certificates and test results for materials (concrete, cement, steel bars and aggregates) used on site. The contractor showed a definite lack of professionalism by submitting old and irrelevant results. Details are as shown in Table 7.

**Table 7 Details of Test Results**

<b>Material</b>	<b>Specifications</b>	<b>Test results date</b>	<b>Remarks</b>
Steel	8, 12, 16, 20 and 25 mms	June & August 2007	Too old. No results submitted for 20 and 25 mms. Recent test reports requested. Compliance certificates from one supplier submitted, but test reports were for steel from another supplier.
In-situ concrete	Grades 30/20 & 25/10	May/June 2004	Irrelevant. Concrete had been used on another project in 2004. Results not submitted for grade 25/10.
Ready (pump) mix concrete	Grades 30/20 & 25/10	-	Requested to send results for both grades from supplier. Results not to be older than 3 months.

Despite numerous reminders at site meetings, test results for concrete were not submitted as at end May 2008. It was only after a special retention of Rs 120,000 for non-submission of cube tests results was, quite rightly, applied on the second payment certificate dated 30 May 2008 that proper test reports were sent in June/July 2008.

Samples for a number of items such as metal handrail, play equipment for pre-primary and concrete imprint were, also, submitted late. Without appropriate clearance the contractor may not be allowed to proceed with that part of the work where the materials requiring testing will be used. For samples, approval must be obtained before materials may be used on site. Delays in obtaining the necessary approval retarded the completion of the project.

- *Non-abeyance of architect's instruction in time.* In March 2008, after a period of heavy rainfall, the architect requested the contractor to pump out accumulated water from excavated pits. This was done in mid May 2008 only, i.e. some one and a half month later. During this period progress of work was slow.
- *Extensive remedial works.* Due to its shoddy workmanship, the contractor was requested on several occasions to carry out remedial works. Alignment of columns for high level fencing and tile laying in staircase had to be corrected. Wall and floor tiles in the pre-primary toilet had to be removed and replaced by new ones. Extensive remedial works were required to the external plastering to bring it to an acceptable standard. At one point, pre-cast panels had been deshuttered before lapse of the minimum period. These had to be re-shuttered and re-casted.

### ***MPI's Response***

We agree that the contractor was not diligent in performing the works.

### **Lack of Firmness to Sanction the Contractor.**

The MPI has allowed works at the Jean Lebrun GS to drag over a too long period of time (delays of 11 months). During all that time, the contractor was repeatedly requested to proceed with due diligence in the performance of the works to catch up with the delays, without any firm action taken against it to ensure same.

On 27 May 2008, after delays of ten weeks had been noted, the MPI threatened to terminate the contract as per clause 55 of the General Conditions of Contract. On 16 February 2009, eight and a half months later, the MPI did issue a notice in accordance with the same clause. On both occasions the contractor responded by submitting a revised programme of works. However, he failed to adhere to same.

Although, the MPI had noted that the contractor lacked competent supervisory site staff to properly manage progress of works and adhere to the programmes submitted, poorly complied with specifications and methodology for structural works, had poor quality of finishing work and had poor coordination with subcontractor (e.g. for waterproofing works), among others, still it offered too many chances to him to redress his lack of diligence. The correct application of liquidated and ascertained damages totalling some Rs 832,500 had no effect on the builder. He did not apply the necessary corrective measures and progress of work continued to be slow leading to inordinate delays. There was a lack of firmness on the part of the MPI to take the appropriate measures so that the school could be completed within a reasonable time period.

### ***MPI's Response***

Although, the employer can determine the contract following lack of diligence from the contractor, this course of action would have delayed further the use of the building as the procedure involved in appointment of a new contractor is lengthy. However, in order to give the correct signal to defaulting contractors, MPI will henceforth apply the terms of the contract with firmness.