

CHAPTER 6

**THE GOVERNMENT OF THE
HONG KONG SPECIAL ADMINISTRATIVE REGION**

CAPITAL WORKS RESERVE FUND

GOVERNMENT SECRETARIAT

Environment, Transport and Works Bureau

GOVERNMENT DEPARTMENT

Architectural Services Department

Quality management for government building projects

**Audit Commission
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QUALITY MANAGEMENT FOR GOVERNMENT BUILDING PROJECTS

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QUALITY MANAGEMENT FOR GOVERNMENT BUILDING PROJECTS

Summary and key findings

A. **Introduction.** The Architectural Services Department (ArchSD) provides the Government with professional services for developing modern public buildings. As at the end of 2002, the ArchSD's building programme covered 311 projects with an estimated total project cost of \$89 billion. The ArchSD endeavours to serve the community through the delivery of quality buildings and facilities. Since April 1995, the ArchSD has been operating a quality management system (QMS) certified to the International Organisation for Standardisation (ISO) 9001 standard. The ArchSD is committed to the development of its QMS and the continual improvement of the effectiveness of the QMS. The current ISO 9001 standard is in line with contemporary management concepts (paras. 1.1, 1.8, 1.11 and 1.12).

B. **Audit review.** Audit has recently conducted a review to examine whether the ArchSD met its QMS requirements in an efficient and effective manner, and to evaluate whether there is room for improvement (para. 1.14). The audit findings are summarised in paragraphs C to H below.

C. **Large number of ArchSD's capital works contracts with prolonged maintenance periods.** According to the General Conditions of Contract for Building Works (GCC), the works shall, at or as soon as practicable after the expiry of the maintenance period, be delivered to the Employer in the condition required by the contract. Audit noted that there were a large number of ArchSD's capital works contracts of which the maintenance periods were prolonged. The prolongation of maintenance periods could affect the normal operation of the user departments and cause inconvenience to the end-users. The ArchSD would also need to provide additional resources to monitor the progress of the works. Audit considers that the ArchSD should collect management data on the actual duration of the maintenance periods of its contracts for analysis, and should devise measures to improve the situation (para. 2.30).

D. **Excessively prolonged maintenance periods due to significant defects and outstanding works.** Audit reviewed some of the ArchSD's contracts with excessively prolonged maintenance periods. In particular, Audit selected four of these contracts for in-depth examination. The maintenance periods of the four contracts were prolonged by 17 months to 39 months. Audit noted that there were significant defects and outstanding works in all the four contracts after the certified dates of substantial completion. An undue length of time had been taken to rectify the defects and complete the outstanding works. The user departments had expressed concern over the slow progress of the defect rectification works and the completion of the outstanding works, which affected their normal operation. Audit considers that the ArchSD needs to conduct a review of its quality procedures to ensure that all the quality requirements stated in its quality manuals and the contract documents are met. The ArchSD needs to improve its administration of projects so as to ensure that the contractors deliver their works in the condition as specified in the contracts, at or as soon as practicable after the expiry of the maintenance periods (paras. 2.9, 2.13, 2.23, 2.26 and 2.31).

E. Rectification works required for a construction contract due to critical design requirement not identified at the outset. In 1998, the construction of a sports complex in Tsuen Wan was substantially completed under an ArchSD contract. After heavy rainfalls in late August 1999, part of the running track of the sports complex had become blistered and damaged. In May 2000, an independent consultant appointed by the ArchSD reported that the damage to the running track surfacing was caused by excessive water pressure on the underside of the all-weather athletic surfacing. In 2001, the ArchSD carried out rectification works to the damaged part of the running track and to install additional sub-soil drains for the sports complex. The Government incurred an additional cost of \$1.38 million for the rectification works. Audit considers that, for attainment of the ArchSD's quality objectives, the ArchSD needs to strengthen its design control procedures so as to ensure that all critical design requirements of a project are incorporated in the design before tendering (paras. 3.1, 3.4, 3.8 and 3.15 to 3.17).

F. Need to require contractors to submit quality plans for complex projects. The ArchSD's contractors have an important role to play in satisfying the clients' quality requirements and expectations. In the earlier Airport Core Programme projects, the Government required the contractors to submit quality plans for the construction works. The submission of contractors' quality plans enables works departments, consultants and contractors to have a more solid basis for monitoring the construction process and achieving the quality requirements of the projects. However, the ArchSD's contractors are not required to submit quality plans for their construction works. In January 2003, the Environment, Transport and Works Bureau (ETWB) issued a circular requiring public works contractors to submit Sub-contractor Management Plans (SMPs). The SMPs enable the works departments to strengthen control over the contractors' sub-contracting arrangement. In Audit's view, for complex projects, the ArchSD needs to consider incorporating provisions in contracts which require the contractors to submit quality plans, including SMPs, for the works (paras. 4.1, 4.2, 4.5, 4.10, 4.14 and 4.15).

G. Need to carry out adequate testing of end products. As required by the ETWB, the works departments need to carry out checks for the prevention of sub-standard works in public works construction. In line with the principles set by the ETWB, the ArchSD's guidelines state that an in-house independent multi-disciplinary team should carry out the checks. The checks should cover critical site activities and should include the testing of end products. The testing of end products is to check whether there are sub-standard works which may not be revealed by a documentary check of the records. However, for the half-yearly checks conducted by the ArchSD in June 2002, Audit noted that the ArchSD had relied on the documentary check of the records, instead of on the testing of the end products. Audit considers that the testing of end products should be adequately conducted to prevent sub-standard works (paras. 4.11, 4.12 and 4.16).

H. Need to set additional measurable quality targets. The current ISO 9001 standard emphasises a results-driven approach to achieving quality objectives and targets. Under the ISO 9001 standard, the ArchSD has developed a total of 38 measurable quality targets for 2002-03, including 7 at the departmental level, 30 at the branch level and 1 at the project level. Audit examined the ArchSD's list of measurable quality targets, and noted that the list had not included targets that would address the quality issues raised in this Audit Report. Audit considers that the ArchSD needs to set additional measurable quality targets (paras. 5.2 to 5.4).

I. Audit recommendations. Audit has made the following main recommendations:

- (a) the Director of Architectural Services should:
- (i) conduct a review of the ArchSD's quality procedures to ensure that the quality requirements stated in its quality manuals and the contract documents, especially those which are critical to the operation of client departments, are met during the construction stage (para. 2.34(a));
 - (ii) collect management data on the actual duration of the maintenance periods of the ArchSD's contracts for analysis and devise improvement measures to ensure that the contractors complete the defect rectification works and outstanding works within the maintenance periods specified in the contracts (para. 2.34(d));
 - (iii) consider giving adverse performance reports to contractors who have taken excessive time to rectify defects and complete outstanding works (para. 2.34(g));
 - (iv) strengthen the ArchSD's design control procedures so as to ensure that all critical design requirements of a project are incorporated in the design before tendering (para. 3.19(a));
 - (v) for complex projects, require contractors to submit quality plans, including SMPs, so as to facilitate monitoring and control of the contractors' works (para. 4.17(a));
 - (vi) conduct adequate testing of end products when carrying out checks for the prevention of sub-standard works (para. 4.17(c));
 - (vii) in managing the ArchSD's contracts, consider setting measurable quality targets so as to ensure that:
 - the certificates of completion of the ArchSD's contracts are issued no later than one month after the certified dates of substantial completion;
 - the ArchSD's projects are ready for handover to the client departments upon the certification of substantial completion; and
 - the outstanding works and defect rectification works of the ArchSD's contracts are completed within the maintenance periods specified in the contracts (para. 5.9(a)); and
 - (viii) develop measurable quality targets to monitor the efficiency and the quality of the outputs of the outsourced activities (para. 5.9(b)); and
- (b) the Secretary for the Environment, Transport and Works should consider notifying all works departments of the audit recommendations made to the Director of Architectural Services (see sub-para. (a) above), so that they may also be aware of possible areas for improvement (paras. 2.35(a), 4.18 and 5.10).

J. Response from the Administration. The Director of Architectural Services generally agrees with all the audit recommendations. The Secretary for the Environment, Transport and Works agrees to notify the works departments of the audit recommendations.

PART 1: INTRODUCTION

Background

1.1 The Architectural Services Department (ArchSD) provides the Government with professional services for developing modern public buildings. Its functions include designing facilities to meet clients' requirements, inspecting construction works to ensure that the facilities are built to the required standard, and administering the related works contracts. As at the end of 2002, the ArchSD's building programme covered 311 projects under planning, design and construction. The estimated total project cost was \$89 billion.

1.2 The ArchSD has four functional branches to implement new works projects, namely the Architectural Branch, the Building Services Branch, the Structural Engineering Branch and the Quantity Surveying Branch. Other than the functional branches, the ArchSD also operates a Project Management Branch for monitoring the performance of its building projects and to ensure that the delivery of projects is on time and within budget.

1.3 As at the end of 2002, the ArchSD deployed over half of its staff (1,154 out of a total of 2,038) in implementing building projects. The ArchSD also employed consultants in the architectural and associated disciplines (such as structural engineering and building services engineering) to supplement its resources and to provide specialist expertise.

1.4 As at the end of 2002, the ArchSD had an establishment of 346 site supervisory staff, including Clerks of Works, Building Services Inspectors and Works Supervisors for the inspection of new building works. The professional officers of the ArchSD were also required to regularly attend site meetings and check the construction works.

Quality management for building projects

1.5 Quality management is important for building projects. It provides a formal monitoring system, from the inception to the final completion of projects, in the following aspects:

- (a) assisting project teams in meeting clients' requirements; and
- (b) ensuring better planning of the design and production processes.

1.6 Quality management entails:

- (a) the establishment of a satisfactory level of performance;
- (b) the application of professional skills to the tasks undertaken;
- (c) good communication among the works agencies;
- (d) the ability to trace decisions taken on all aspects of the projects; and
- (e) the identification of responsibility at all the work stages, from the inception and outline proposal stages to the detailed design, documentation/tendering and construction stages.

Quality management undertaken by ArchSD

1.7 The focus of this audit review is on the quality management system (QMS) implemented by the ArchSD for its new works projects.

1.8 ***Quality policy.*** The ArchSD endeavours to serve the community through the delivery of quality buildings and facilities. The ArchSD's quality policy is:

- (a) to fulfil the agreed requirements of its clients to the highest professional standards; and
- (b) to promote the ArchSD's principles of quality to its partners in work, the construction industry and the general public.

1.9 ***Quality objectives and targets.*** The ArchSD aims to ensure that:

- (a) quality objectives with targets are established regularly for relevant functions and levels within the ArchSD; and
- (b) the quality objectives are measurable.

Documentation and management of the QMS

1.10 The ArchSD documents its QMS in the Policy Manual, Core Manual and Local Manuals (hereinafter referred to as the ArchSD's quality manuals — Note 1), as follows:

- (a) ***Policy Manual.*** The Policy Manual describes briefly the ArchSD's overall policy with respect to quality management. The Policy Manual provides linkage between the Core Manual and the Local Manuals and international management standards;
- (b) ***Core Manual.*** The Core Manual identifies the processes of the design, construction and maintenance of public facilities, their sequence and interactions needed for the QMS and their application throughout the ArchSD; and
- (c) ***Local Manuals and other relevant documentation.*** These documents determine the criteria and methods needed to ensure that both the operation and control of the work processes are effective.

1.11 The ArchSD is committed to the development of its QMS and the continual improvement of the effectiveness of the QMS. Its Quality and Environmental Management Committee is responsible for:

- (a) the promotion of awareness of client requirements throughout the ArchSD; and
- (b) the coordination of the development, implementation and maintenance of the QMS.

Conversion of the QMS to new ISO standard

1.12 In 1994, the International Organisation for Standardisation (ISO) introduced the ISO 9001: 1994 standard (Note 2). Since April 1995, the ArchSD had been operating a QMS certified to this standard. The ArchSD aimed to continue to improve the effectiveness of the QMS in accordance with the quality requirements of ISO 9001. In 2000, the ISO introduced the new ISO 9001: 2000 standard. The ISO 9001: 2000 standard is in line with contemporary management concepts, which focus on management control and effectiveness, system efficiency, measurable

Note 1: *The Policy Manual, Core Manual and Local Manuals of the ArchSD deal with both quality and environmental management.*

Note 2: *The ISO is a worldwide non-governmental federation of national standard bodies for promoting standardisation and related activities. One of the functions of the ISO is to set a quality standard (i.e. the ISO 9001 standard) that gives organisations guidance on what constitutes an effective quality management system.*

quality targets in essential work processes and key result areas, customer satisfaction, and continual improvement of the QMS.

1.13 The Hong Kong Quality Assurance Agency (HKQAA) is the accredited ISO certification body which certified the QMS of the ArchSD. In January 2002, to prepare for the migration of the QMS to the new ISO 9001: 2000 standard, the HKQAA conducted an analysis of the ArchSD's QMS against the new standard. The HKQAA concluded that the main improvements needed for migrating to the new standard should include the following:

- (a) **Quality objectives.** The new ISO 9001: 2000 standard required that measurable objectives should be defined for all relevant functions and levels within the ArchSD. These objectives should be consistent with the ArchSD's overall objectives, which should, in turn, be consistent with the quality policy;
- (b) **Process approach.** The new standard emphasised a process approach to management. The sequence and interaction of the essential processes of the QMS, together with the criteria for measuring and monitoring these processes, were required to be identified so as to determine the operational effectiveness;
- (c) **Analysis of data.** The new standard required the ArchSD to collect and analyse appropriate data to determine the suitability and effectiveness of the QMS and to identify areas where improvements could be made; and
- (d) **Outsourced activities.** The new standard required that, where the ArchSD chose to outsource any process that affected product conformity with requirements, the ArchSD should ensure control over such processes. The ArchSD had responsibility for outsourced work and should control consultants' work through the QMS.

In January 2003, the ArchSD obtained certification of its QMS to the ISO 9001: 2000 standard.

Audit review

1.14 Audit recently conducted a review to examine whether the ArchSD met its QMS requirements in an efficient and effective manner, and to evaluate whether there is room for improvement. Audit has found that there are a number of areas where improvements can be made. Audit has made a number of recommendations to address the issues.

PART 2: PROLONGED MAINTENANCE PERIODS DUE TO LATE RECTIFICATION OF DEFECTS AND COMPLETION OF OUTSTANDING WORKS

2.1 There were a large number of ArchSD's works contracts with prolonged maintenance periods (see para. 2.11 below). This PART examines the circumstances leading to the prolongation of maintenance periods of some of the ArchSD's works contracts. The audit has revealed that there are lessons to be learnt in contract administration and project implementation.

Certification of substantial completion of works

2.2 *Certificate of completion.* According to Clause 53(2) of the General Conditions of Contract for Building Works (GCC), the Architect shall issue a certificate of completion in respect of the works as soon as the works have been substantially completed and have satisfactorily passed any final test which may be prescribed by the contract. The maintenance period shall commence on the day following the date of completion stated in such certificate (Note 3).

2.3 *Take-over of completed works.* According to the ArchSD's quality manuals, the ArchSD should take over the completed works from a contractor with all major project problems resolved before the formal handover to the client department. **The ArchSD should only issue the certificate of completion to the contractor when the works have been substantially completed and have satisfactorily passed any final test that may be prescribed by the contract. The certificate of completion should be issued no later than one month after the certified date of substantial completion.**

Procedures prior to handover of project to client department

2.4 *List of defects and outstanding works.* Well in advance of the handover of a project to a client department, the project clerk of works and the project building services inspector (hereinafter referred to as the site supervisory staff) should carry out a joint inspection of the building, installations and the site with the contractor's representative and prepare a list of defects and outstanding works. The site supervisory staff should remind the contractor to put right all items on the list before the date of handover and, where necessary, ask the contractor to submit a programme for completing the outstanding works.

2.5 *Pre-handover inspection.* Before the project is handed over, the project architect and/or the project building services engineer (hereinafter referred to as the project architect/engineer) should carry out the necessary inspection and order any necessary testing to establish satisfactory completion of the works for subsequent handover to the client department. The project architect/engineer should review the list of defects prepared by the site supervisory staff. If, in his opinion, the defects are minor and are acceptable to the user for rectification works to be done after the handover, the project architect/engineer should arrange to hand over the works. If the defects are not minor and need to be rectified before handover, he should issue instructions to the contractor to rectify the defects. He should re-inspect the works until the project is fit for handover.

Note 3: *The maintenance period specified in the ArchSD's capital works contracts is normally 12 months.*

2.6 ***Handover of project.*** When the project architect/engineer considers that a project has been substantially completed and has passed all necessary inspections or testing, he should arrange to hand over the project with a handover certificate. The certificate serves as a record to show that the project has passed the inspections and/or tests according to client department's requirements. The project architect/engineer should sign the certificate, as he is the inspection authority responsible for the handover of the project.

Completion of outstanding works and defect rectification works

2.7 ***Outstanding works.*** According to GCC Clause 53(3), the contractor shall carry out any outstanding works as soon as practicable after the issue of the certificate of completion or as reasonably directed by the Architect and in any event before the expiry of the maintenance period.

2.8 ***Defect rectification works.*** According to GCC Clause 56(2), all maintenance work, whether or not required urgently by the Architect, shall be carried out by the contractor during the maintenance period or within 14 days after its expiry. The Architect may, by notice in writing, require the contractor to carry out maintenance work (including any work of repair or rectification, or make good any defect, imperfection, shrinkage, settlement or other fault) identified within the maintenance period, and the contractor shall carry out such works within the maintenance period or as soon as practicable thereafter.

2.9 ***Completion of outstanding works and defect rectification works.*** According to GCC Clause 56, the works shall, at or as soon as practicable after the expiry of the maintenance period, be delivered to the Employer in the condition required by the contract, fair wear and tear excepted. **If the contractor fails to carry out any outstanding works or maintenance work, the Employer shall be entitled, after giving reasonable notice in writing to the contractor, to have such works carried out by his own workers or by other contractors. If such works are works which the contractor would have been required to carry out at his own expense, the Employer shall be entitled to recover from the contractor the expenditure incurred.**

2.10 ***Issue of maintenance certificate.*** According to GCC Clause 80(1), upon the expiry of the maintenance period, and when all outstanding works and maintenance work shall have been completed, the Architect shall issue a maintenance certificate stating the date on which the contractor shall have completed his obligation to execute the works.

Prolonged maintenance periods in ArchSD's capital works projects

2.11 Audit's analyses of the ArchSD's capital works contracts revealed that there were a large number of ArchSD contracts of which the maintenance periods had been prolonged. Most of them were of the types of main/superstructure and alteration/improvement contracts (Note 4). Audit analysed these types of contracts to which contract numbers were assigned during the period 1995

Note 4: *Other types of ArchSD contracts, such as piling and lift installation contracts, were excluded from Audit's analyses because they involved works which were standardised and normally did not have the problem of prolonged maintenance period.*

to 1997 (Note 5). There were a total of 161 contracts of which the maintenance certificates had been issued. Table 1 below shows the number of capital works contracts with prolonged maintenance periods.

Table 1

Number of capital works contracts with prolonged maintenance periods

	No. of contracts	Percentage	
Contracts with prolonged maintenance periods			
<i>Maintenance period (Note 1) prolonged by</i>			
• up to 3 months	11	6%	
• > 3 months and up to 6 months	29	18%	
• > 6 months and up to 12 months	51	32%	}
• > 12 months	45	28%	
	136	84%	60%
Contracts without prolonged maintenance periods	25	16%	
Total	161	100%	
	(Note 2)		

Source: ArchSD's records

Note 1: The maintenance period specified in the ArchSD's capital works contracts is normally 12 months.

Note 2: This was the total number of the ArchSD's capital works contracts (to which the contract numbers were assigned during the period 1995 to 1997) for which the maintenance certificates had been issued.

2.12 As mentioned in paragraph 2.9 above, the works should, at or as soon as practicable after the expiry of the maintenance period, be delivered to the Employer in the condition required by the contract. Accordingly, the contractor should complete all outstanding works and maintenance work within the maintenance period or as soon as practicable thereafter. However, as can be seen in Table 1 above, there was a high percentage (84%) of the ArchSD's capital works contracts of which the maintenance periods were prolonged.

Note 5: Audit only analysed the contracts to which contract numbers were assigned between 1995 and 1997 because the maintenance certificates of most of the contracts, to which contract numbers were assigned in 1998 and thereafter, had not been issued.

Audit examination of contracts with excessively prolonged maintenance periods

2.13 Audit reviewed some of the ArchSD capital works contracts with excessively prolonged maintenance periods. In particular, Audit selected four of these contracts for in-depth examination. The audit revealed that the prolonged maintenance periods of the four contracts were primarily due to the presence of significant defects and outstanding works as well as incomplete testing and commissioning of major systems. An undue length of time had been taken to rectify the defects and complete the outstanding works. The particulars and key dates of the prolongation of the maintenance periods of these four contracts are given in Table 2 below.

Table 2

Particulars and key dates of four major contracts with excessively prolonged maintenance periods

	Contract A	Contract B	Contract C	Contract D
(a) Contract	Construction of a prevocational school in Kwai Chung	Construction of a museum in Kowloon	Provisioning of air-conditioning and improvement works for a group of existing indoor recreation centres	Construction of a Precision Runway Monitor Tower and back-up air traffic control facilities for the new airport
(b) Certified date of substantial completion	17.8.1996	15.5.1998	4.10.1996	9.8.1999
(c) Date of issue of completion certificate	31.10.1996	31.8.1998	22.1.1997	19.12.2000
(d) Date of expiry of maintenance period	17.8.1997	15.5.1999	4.10.1997	9.8.2000
(e) Certified date of completion of obligation to execute the works (Note)	10.11.2000	21.6.2001	7.5.1999	18.1.2002
(f) Prolongation of maintenance period (i.e. the period between items (d) and (e) above)	39 months	25 months	19 months	17 months

Source: ArchSD's records

Note: According to the GCC, upon the expiry of the maintenance period, and when all outstanding works and maintenance work shall have been completed, the Architect shall issue a maintenance certificate stating the date on which the contractor shall have completed his obligation to execute the works.

2.14 The scope of works of the contracts mentioned in Table 2 above, and the significant defects and outstanding works which led to the prolonged maintenance periods, are further described in the paragraphs below, as follows:

- (a) Contract A — see paragraphs 2.15 to 2.16 below;
- (b) Contract B — see paragraphs 2.17 to 2.18 below;
- (c) Contract C — see paragraphs 2.19 to 2.20 below; and
- (d) Contract D — see paragraphs 2.21 to 2.22 below.

Late rectification of defects and completion of outstanding works

Contract A

2.15 This contract was for the construction of a prevocational school in Kwai Chung consisting of a classroom block attached to an assembly hall and a special classroom block. The sequence of the major events in the rectification of defects and the completion of outstanding works in Contract A is given in Table 3 below.

Table 3

Sequence of major events in rectification of defects and completion of outstanding works in Contract A

Date	Major events
(a) 17.8.1996	This was the certified date of substantial completion of the works (see item (c) below).
(b) 22.8.1996	The ArchSD handed over the prevocational school to the Education Department, now the Education and Manpower Bureau (EMB).
(c) 31.10.1996	The ArchSD issued the certificate of completion, certifying that the works were substantially completed on 17.8.1996 (see item (a) above).
(d) November 1996	The school principal complained that there were a lot of outstanding works (e.g. coating works to the play areas) and defects of the covered playground which hindered the school operation.
(e) February 1997	The school principal complained about defects relating to electrical installations, which had not been resolved since the handover. He expressed concern that the defects hindered the teaching activities and jeopardised the safety of the students.

Date	Major events
(f) July 1997	The EMB complained that no appropriate action had been taken to rectify the defects identified by the school principal.
(g) 17.8.1997	The 12-month maintenance period expired.
(h) March 1998	The ArchSD admitted that the progress of the defect rectification works was very slow and instructed the contractor to carry out the rectification works immediately.
(i) 18.9.1998	The contractor reported to the consultant architect that all the defect rectification works had been completed.
(j) March 1999	The ArchSD asked the contractor to submit the outstanding roofing warranty, microfilm list and the as-built records.
(k) April 2000	The ArchSD requested the consultant architect to liaise with the contractor for the submission of the as-built records.
(l) 10.11.2000	This was the certified date of completion of the contractor's obligation to execute the works (see item (m) below).
(m) 27.12.2000	The ArchSD issued the maintenance certificate, certifying that the contractor had completed his obligation to execute the works on 10.11.2000 (see item (l) above).

Source: ArchSD's records

2.16 As can be seen in Table 3 above, the defect rectification works were only completed in September 1998 (see item (i) above), which was 25 months after the certified date of substantial completion in August 1996 (see item (a) above). The EMB and the school principal complained about the defects and the outstanding works because they hindered the school operation. There was also a long delay in the submission of as-built records by the contractor. **The contractor only completed his obligation to execute the works in November 2000 (see item (l) above), which was 39 months after the expiry of the 12-month maintenance period in August 1997 (see item (g) above).**

Contract B

2.17 The contract was for the construction of a four-storey exhibition building and associated external works of a museum in Kowloon. The internal temperature and humidity of the exhibition area provided by the heating, ventilation and air-conditioning (HVAC) system were critical to the exhibits and collections of the museum. The sequence of the major events in the rectification of defects and the completion of outstanding works in Contract B is given in Table 4 below.

Table 4

**Sequence of major events in rectification of defects
and completion of outstanding works in Contract B**

Date	Major events
(a) 18.4.1998	The ArchSD handed over the 3rd floor office area of the museum building to the former Urban Services Department, now the Leisure and Cultural Services Department (LCSD).
(b) 15.5.1998	This was the certified date of substantial completion of the works (see item (g) below). There were over 100 items of outstanding works (e.g. HVAC installation, lighting fixtures, electrical, fire services and security systems) and a number of defects.
(c) 23.5.1998	The ArchSD handed over the 1st floor lobby, and the Permanent and Temporary Exhibition Areas at all floors to the LCSD.
(d) 4.6.1998	The ArchSD handed over the 2nd floor and the resting areas (ground floor to 2nd floor) to the LCSD.
(e) 23.6.1998	The ArchSD handed over the remaining ground floor and internal areas to the LCSD.
(f) July 1998	The contractor had not yet completed some of the testing and commissioning works for the building services installations.
(g) 31.8.1998	The ArchSD issued the certificate of completion, certifying that the works were substantially completed on 15.5.1998 (see item (b) above).
(h) 15.10.1998	The ArchSD handed over the external works to the LCSD.
(i) 15.5.1999	The 12-month maintenance period expired.
(j) July 1999	The LCSD expressed serious concern over the unacceptably slow progress of the defect rectification works and the repeated failure of the contractor in meeting his contractual obligation, which caused inconvenience to users and staff of the museum.
(k) November 1999	There were still over 340 items of defects of the HVAC installation not yet rectified.
(l) August 2000	The LCSD complained that no effective means had been introduced to ensure that the contractor would complete all the outstanding works.
(m) September 2000	Further test of the HVAC system at the exhibition area of the museum was carried out. The average temperature and relative humidity were considered stable and acceptable by the LCSD.
(n) March 2001	The contractor submitted all warranties, testing and commissioning reports, and microfilm of the as-built drawings.

	Date	Major events
(o)	21.6.2001	This was the certified date of completion of the contractor's obligation to execute the works (see item (p) below).
(p)	10.8.2001	The ArchSD issued the maintenance certificate, certifying that the contractor had completed his obligation to execute the works on 21.6.2001 (see item (o) above).

Source: ArchSD's records

2.18 As can be seen in Table 4 above, at the certified date of substantial completion in May 1998 (see item (b) above), there were still over 100 items of outstanding works, including defects of the HVAC installation which was critical to the operation of the museum. The LCSD only considered the HVAC system as stable and acceptable in September 2000 (see item (m) above), which was 28 months after the certified date of substantial completion. There was also a long delay in the submission of the as-built records and relevant documentation by the contractor. **The contractor only completed his obligation to execute the works in June 2001 (see item (o) above), which was 25 months after the expiry of the 12-month maintenance period in May 1999 (see item (i) above).**

Contract C

2.19 This contract was for the provision of air-conditioning systems, new plant rooms and air handling unit (AHU) rooms to four existing indoor recreation centres (IRCs). The sequence of the major events in the rectification of defects and the completion of outstanding works in Contract C is given in Table 5 below.

Table 5

Sequence of major events in rectification of defects and completion of outstanding works in Contract C

	Date	Major events
(a)	September 1996	The consultant architect expressed his disappointment that the builder's works and electrical and mechanical works for the IRCs had not yet been completed. The building services consultant was also disappointed that the roof decking and wall panel installation for the new plant rooms of the IRCs had not yet been completed.
(b)	26.9.1996	The ArchSD handed over three of the four IRCs to the LCSD.
(c)	October 1996	The building services consultant considered that the condition of the IRCs' plant rooms was unacceptable. The joints and gaps between the wall panels and the roof decking had not been properly sealed and water had been seeping through the joints to the plant rooms, causing damage to the control equipment.

Date	Major events
(d) 4.10.1996	This was the certified date of substantial completion of the works (see item (e) below). The ArchSD handed over the last (fourth) IRC to the LCSD.
(e) 22.1.1997	The ArchSD issued the certificate of completion, certifying that the works were substantially completed on 4.10.1996 (see item (d) above).
(f) August 1997	The LCSD complained about water leakage at some of the IRCs, which affected the normal operation of the IRCs. The IRC staff had to re-allocate bookings and temporarily close the venue.
(g) 4.10.1997	The 12-month maintenance period expired.
(h) November 1997	Many items in the updated list of defects still had not been carried out, including those causing water leakage.
(i) June 1998	There was still water leakage through the lap joints of the new AHU room at one of the IRCs.
(j) May 1999	All the defect rectification works and outstanding works of the four IRCs were completed. The contractor also submitted the microfilm of the relevant as-built drawings.
(k) 7.5.1999	This was the certified date of completion of the contractor's obligation to execute the works (see item (l) below).
(l) 12.6.1999	The ArchSD issued the maintenance certificate, certifying that the contractor had completed his obligation to execute the works on 7.5.1999 (see item (k) above).

Source: ArchSD's records

2.20 As can be seen in Table 5 above, at the certified date of substantial completion in October 1996 (see item (d) above), there were still incomplete and defective works (see item (c) above). The defects caused disruption to the operation of the IRCs (see item (f) above). **The defect rectification works and outstanding works were only completed in May 1999 (see item (j) above), which was 19 months after the expiry of the 12-month maintenance period in October 1997 (see item (g) above).**

Contract D

2.21 The contract was for the provision of a Precision Runway Monitor (PRM) Tower and back-up air traffic control facilities for the new airport. It included the construction of an ancillary air traffic control tower cum building for the Civil Aviation Department (CAD) and other government departments. The sequence of the major events in the rectification of defects and the completion of outstanding works in Contract D is given in Table 6 below.

Table 6

Sequence of major events in rectification of defects and completion of outstanding works in Contract D

Date	Major events
(a) 9.8.1999	This was the certified date of substantial completion of the works (see item (h) below).
(b) 10.8.1999	The ArchSD handed over the PRM Tower to the CAD.
(c) August 1999	The CAD noted that the glazing installed at the control cabin was defective with image distortion. The glazing should provide perfect vision for the air traffic control operation.
(d) November 1999	A list of defects and outstanding works, which covered over 100 pages and included a large number of testing and commissioning works for building services installations, was forwarded to the contractor for his follow-up action.
(e) February 2000	The CAD said that the replacement of the glazing had to be completed in the shortest possible time because it would affect the operation of the PRM Tower.
(f) July 2000	The CAD complained that the rectification of the defective glazing installed at the control cabin had dragged on for a long time.
(g) 9.8.2000	The 12-month maintenance period expired.
(h) 19.12.2000	The ArchSD issued the certificate of completion certifying that the works were substantially completed on 9.8.1999 (see item (a) above).
(i) May 2001	The replacement of the defective glazing commenced on 12.5.2001 and was completed on 20.5.2001.
(j) August 2001	An updated list of defects and outstanding works was forwarded to the contractor for his follow-up action.
(k) December 2001	The contractor reported that he had completed all the defects and outstanding works and had submitted the microfilm of the as-built drawings.
(l) 18.1.2002	This was the certified date of completion of the contractor's obligation to execute the works. The ArchSD issued the maintenance certificate on the same date.

Source: ArchSD's records

2.22 As can be seen in Table 6 above, there were still a large number of defects and outstanding works in November 1999 (see item (d) above) after the certified date of substantial completion of 9 August 1999 (see item (a) above). One major defect was the glazing installed at

the control cabin of the PRM Tower, which did not meet the visual performance requirements as specified in the contract. The defective glazing required replacement (see photographs 1 and 2 on the centre pages). The replacement of the defective glazing was only completed in May 2001 (see item (i) above), which was 22 months after the certified date of substantial completion of the works. The replacement works caused inconvenience to the CAD. There was also a long delay in the submission of the as-built drawings by the contractor. **The contractor only completed his obligation to execute the works in January 2002 (see item (l) above), which was 17 months after the expiry of the 12-month maintenance period in August 2000 (see item (g) above).**

Audit observations on late rectification of defects and completion of outstanding works

Operationally critical defects and outstanding works after certified dates of substantial completion

2.23 According to GCC Clause 53(2), a certificate of completion shall only be issued to the contractor when the works have been substantially completed and have satisfactorily passed any final test that may be prescribed by the contract. The ArchSD requires that defects, which would affect subsequent works and/or hinder the operation of the user departments, should be rectified by the contractor before handover. **Audit noted that in all four contracts under examination, there were still significant defects and outstanding works after the certified dates of substantial completion.**

2.24 Audit noted that, in response to the recommendations made by the Independent Commission Against Corruption in its assignment report on “ArchSD’s administration of building services works in new works projects” of September 1999, the ArchSD had issued guidelines to its staff on the type of inspections and tests on building services installations that should be satisfactorily completed before the certification of the substantial completion of a project. The guidelines aim to ensure that essential aspects of building services installations had been satisfactorily tested and inspected for acceptance before the works were certified as substantially completed. **Audit considers that the ArchSD needs to require its staff to review thoroughly any defects and outstanding works of a project which are critical to the client’s operation. If necessary, the ArchSD needs to consider deferring the certification of the substantial completion of the project.**

2.25 According to GCC Clause 53(5)(a), the ArchSD shall give a certificate of completion in respect of any part of the works which has been completed to the satisfaction of the Architect and is required by the Employer for permanent occupation or use before the completion of the whole of the works. **Audit considers that for Contracts B, C and D, the ArchSD could have, as allowed by the GCC, chosen the option of giving a certificate of completion in respect of only the completed part of the works. This option, if chosen, could have provided the ArchSD with more flexibility in negotiating with the contractors for the early completion of the remaining parts of the works, and could have also allowed the ArchSD to impose liquidated damages (LD) on the contractors for the late completion of the outstanding works.**

Quality requirement stipulated in particular specification of Contract D not implemented

2.26 According to the particular specification of Contract D, the glazing installed at the control cabin of the PRM Tower should be distortion-free to provide perfect vision in all directions for air traffic control operations. However, before installation, the ArchSD had not checked the mock-up glazing against the distortion-free quality requirement. In the event, the glazing installed at the control cabin was defective. **Audit considers that the ArchSD needs to conduct a review of its quality procedures to ensure that the quality requirements stated in its quality manuals and the contract documents, especially those which are critical to the operation of client departments, are met during the construction stage so as to obviate the need for major defect rectification works after the handover of projects.**

Additional LD could have been imposed on the contractor of Contract B

2.27 As mentioned in the ArchSD's quality manuals, the premature certification of the substantial completion of the works may deprive the Government of the right to impose LD on the contractor for the delay. Audit noted that, in Contract B, the 3rd floor office area of the museum building was handed over to the client department on 18 April 1998, which was before the date of substantial completion of 15 May 1998. However, due to the defects and outstanding works, the rest of the building was handed over in separate floor areas to the client department subsequently (between 23 May 1998 and 23 June 1998).

2.28 Audit also noted that there was a delay of 41 days against the extended contract completion date of 4 April 1998. Due to the delay, the ArchSD had imposed LD of \$5.8 million on the contractor (Note 6). **If the handover dates of the various areas of the museum building had been used in calculating the amount of LD (this was the method used by the ArchSD as suggested by the contractor — see Note 6 below), additional LD of \$0.49 million (see Audit's calculation at Appendix A) could have been imposed on the contractor.**

Delay in issuing certificates of completion of Contracts A, B, C and D

2.29 According to the ArchSD's quality manuals, the certificate of completion should be issued no later than one month after the certified date of substantial completion of the works. The certificates of completion of Contracts A, B and C were only issued about three months after the certified dates of substantial completion of the works, and for Contract D, the certificate of completion was only issued 17 months after the certified date of substantial completion. The ArchSD recognised that the delay in the issue of the certificates of completion was undesirable as it could lead to contractual disputes and claims. In fact, in November 2000, the HKQAA raised the same concern during its visit to the ArchSD. The ArchSD agreed that the delay in (or dating back of) the issue of certificates of completion should be avoided. **Audit considers that the ArchSD needs to set a measurable quality target for the timely issue of the certificate of completion (see para. 5.5 below).**

Note 6: *The original amount of LD imposed on the contractor was about \$6.2 million (41 days × \$150,000 per day) from 4 April to 15 May 1998. However, the contractor argued that the 3rd floor office area had been handed over on 18 April 1998 instead of on the certified date of substantial completion of 15 May 1998. On this basis, the ArchSD agreed to reduce the LD to \$5.8 million.*

Significant number of contracts with prolonged maintenance periods

2.30 According to the GCC, the works shall, at or as soon as practicable after the expiry of the maintenance period, be delivered to the Employer in the condition required by the contract. Audit noted that there was a high percentage (84%) of the ArchSD's capital works contracts of which the maintenance periods were prolonged. The maintenance periods of about 60% of the ArchSD's contracts had been prolonged by more than six months (see Table 1 in para. 2.11 above). The prolongation of the maintenance periods could affect the normal operation of the user departments and cause inconvenience to the end-users. The ArchSD would also need to provide additional resources to monitor the progress of the works. **Audit considers that the ArchSD should collect management data on the actual duration of the maintenance periods of its contracts for analysis. The ArchSD needs to devise improvement measures to ensure that the contractors complete the defect rectification works and outstanding works within the maintenance periods.**

Excessively long maintenance periods

2.31 As mentioned in paragraph 2.12 above, the contractor should complete all outstanding works and maintenance work within the maintenance period or as soon as practicable thereafter. The maintenance periods of the four contracts under examination were prolonged by 17 months to 39 months (see Table 2 in para. 2.13 above). In all the cases, the client departments had expressed concern over the slow progress of the defect rectification works and completion of the outstanding works. The ArchSD and the consultants had issued warning letters to the contractors urging them to expedite their works, but in vain. **Audit considers that, if a contractor fails to carry out the defect rectification works and outstanding works within a reasonable period of time after the expiry of the maintenance period, the ArchSD needs to, after giving reasonable notice in writing to the contractor, consider having such works carried out by other contractors as allowed by the GCC. The ArchSD can subsequently recover the expenditure incurred from the non-performing contractor.**

Adverse performance reports not given to contractors

2.32 According to the Contractor Management Handbook issued by the Secretary for the Environment, Transport and Works, apart from the assessment of the contractor's performance during the construction stage, the works departments should also assess the contractor's performance at the following times:

- (a) six months after the substantial completion of the works (which would cover the contractor's performance in the completion of outstanding works);
- (b) upon the issue of the maintenance certificate for the works (which would cover the contractor's performance in the repair of defects); and
- (c) upon the issue of the final payment certificate (which would cover the contractor's performance in the resolution of claims).

2.33 For the four contracts under examination, Audit reviewed the contractors' performance reports. Audit noted that:

- (a) for Contracts B and D (see Table 2 in para. 2.13 above), the ArchSD had given satisfactory performance reports to the contractors six months after the certified dates of substantial completion. However, the ArchSD did not give any performance reports to the contractors upon the issue of the maintenance certificates and the final payment certificates; and
- (b) for Contracts A and C (see Table 2 in para. 2.13 above), the ArchSD did not give any performance reports to the contractors at the times after the certified dates of substantial completion as specified in the Contractor Management Handbook (see para. 2.32(a) to (c) above).

In Audit's view, the ArchSD needs to consider giving adverse performance reports to contractors who have taken excessive time to rectify the defects and complete the outstanding works, so that their poor performance can be taken into consideration when assessing their future tender bids.

Audit recommendations on late rectification of defects and completion of outstanding works

2.34 **Audit has *recommended* that the Director of Architectural Services should:**

- (a) **conduct a review of the ArchSD's quality procedures to ensure that the quality requirements stated in its quality manuals and the contract documents, especially those which are critical to the operation of client departments, are met during the construction stage so as to obviate the need for major defect rectification works after the handover of projects (see para. 2.26 above);**
- (b) **require the ArchSD staff to review thoroughly any defects and outstanding works of a project which are critical to the client's operation and, if necessary, consider deferring the certification of the substantial completion and handover of the project (see para. 2.24 above);**
- (c) **as allowed by the GCC, where appropriate, choose the option of giving a certificate of completion in respect of only the completed part of the works so as to enable the ArchSD to have more flexibility in negotiating with the contractor for the early completion of the outstanding works (see para. 2.25 above);**
- (d) **collect management data on the actual duration of the maintenance periods of the ArchSD's contracts for analysis and devise improvement measures to ensure that the contractors complete the defect rectification works and outstanding works within the maintenance periods specified in the contracts (see para. 2.30 above);**

Photograph 1

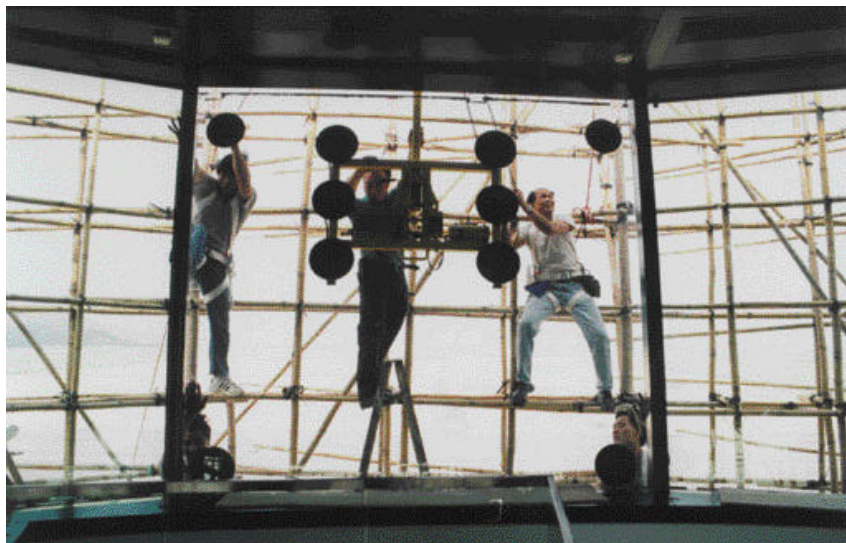
**Defective glazing installed at the control cabin of the PRM Tower
(para. 2.22 refers)**



Source: Photograph taken by the ArchSD

Photograph 2

**Workers replacing the defective glazing
at the control cabin of the PRM Tower
(para. 2.22 refers)**



Source: Photograph taken by the ArchSD

Photograph 3

**Blistered running track surface
after heavy rainfalls in late August 1999
(para. 3.4 refers)**



Source: Photograph taken by the LCSD

Photograph 4

**Blistered running track surface
(about 10 metres by 140 metres)
(para. 3.4 refers)**



Source: Photograph taken by the LCSD

- (e) **if a contractor fails to carry out defect rectification works and outstanding works within a reasonable period of time after the expiry of the maintenance period, consider having such works carried out by other contractors as allowed by the GCC, and recover the expenditure incurred from the non-performing contractor (see para. 2.31 above);**
- (f) **comply with the Contractor Management Handbook issued by the Secretary for the Environment, Transport and Works and issue reports on contractors' performance after the substantial completion of the works (see para. 2.32 above); and**
- (g) **consider giving adverse performance reports to contractors who have taken excessive time to rectify defects and complete outstanding works, so that their poor performance can be taken into consideration when assessing their future tender bids (see para. 2.33 above).**

2.35 Audit has recommended that the Secretary for the Environment, Transport and Works should:

- (a) **consider notifying all works departments (e.g. by promulgating Environment, Transport and Works Bureau (ETWB) Technical Circulars (Works)) of the audit recommendations mentioned in paragraph 2.34 above, so that they may also be aware of possible areas for improvement in their administration and implementation of projects; and**
- (b) **monitor closely the works departments' compliance with the requirement of the Contractor Management Handbook so as to ensure that they duly report on contractors' performance after the substantial completion of the works.**

Response from the Administration

2.36 The Director of Architectural Services generally agrees with the audit recommendations. He has said that:

- (a) **he will strengthen the monitoring of the performance of contractors regarding the completion of outstanding works and defect rectification works. All works that are critical to the operation of the client departments should be completed, inspected and tested before handover. The option of certifying completion in respect of part of the works will depend on whether the outstanding works can be safely and physically separated from the completed areas. The employment of another contractor to carry out**

the rectification works can be considered provided that the Government would not be liable contractually to claims and that the Government's interests are not compromised;

- (b) to safeguard the Government's interests, he aims to prevent the premature issuance of maintenance certificates which could release the contractors from their contractual obligations. He has the responsibility to ensure that all defects are rectified and all contractual requirements are complied with, before issuing the maintenance certificates. Nonetheless, the prompt issue of the maintenance certificates has always been his objective;
- (c) for Contract B, the testing and commissioning of the HVAC system for the museum was a very complicated process, as the museum required a very stringent temperature and humidity control. With the exhibits being fabricated on site by a separate contractor after the substantial completion of the building contract, it was not possible to conduct the fine-tuning and testing of the HVAC system. The internal conditions were stabilised only after the major fabrication of exhibits had been completed, and the final testing and commissioning were completed in September 2000; and
- (d) for Contract D, the ArchSD had difficulties in getting the contractor to agree with the glazing replacement. Subsequently, when the contractor agreed to carry out the glazing replacement works, the implementation had to be arranged in such a way as not to affect the operation of the CAD.

2.37 The **Director-General of Civil Aviation** agrees with the audit recommendation that the Director of Architectural Services should consider having long delayed rectification works carried out by the ArchSD's other contractors as allowed by the GCC, and recovering the expenditure incurred from the non-performing contractor. He has said that, in respect of the construction of the PRM Tower and back-up air traffic control facilities under Contract D, there was a long delay in the replacement of the defective glazing installed in the PRM Tower. He opines that adequate control measures should be in place to ensure that contractors could complete major defect rectification works within a reasonable period of time.

2.38 The **Secretary for the Environment, Transport and Works** agrees with the audit recommendations as mentioned in paragraph 2.35 above. She would issue a circular memorandum advising the works departments of the audit recommendations as mentioned in paragraph 2.34 above.

PART 3: RECTIFICATION WORKS OF A SPORTS COMPLEX

3.1 In 1998, the construction of a sports complex in Tsuen Wan was substantially completed under an ArchSD contract. In 2001, the ArchSD carried out rectification works, at government expense, to resurface part of the all-weather athletic surface running track of the sports complex and to install additional sub-soil drains. This PART examines the circumstances leading to the need for the rectification works. The audit has revealed that there are lessons to be learnt in the design control for construction contracts for the attainment of the ArchSD's quality objectives.

Design control for construction contracts

3.2 The purpose of design control for construction contracts is to ensure that there are proper review, planning and verification of all design requirements. This is a key part of a quality management system. Design control recognises the significance of the design function in the achievement of quality objectives and in the meeting of specified requirements. The ArchSD has developed the following design control procedures:

- (a) *Identification of design input requirements.* The design input requirements, which include client requirements, functional requirements, technical data, statutory requirements and standards of all relevant disciplines, are identified; and
- (b) *Production of design output.* The design output, which meets the design input requirements, is produced in the form of reports, calculations, drawings, specifications, bills of quantities or tender documents.

Construction of a sports complex

3.3 The sports complex project mentioned in paragraph 3.1 above included the construction of two covered spectator stands, a grass soccer pitch, an eight-lane 400-metre all-weather athletic surface running track, and associated soil and surface water drainage. In January 1998, the works were substantially completed for handover to the LCSD.

Running track surface became blistered after heavy rainfalls

3.4 After heavy rainfalls in late August 1999 (Note 7), the LCSD noticed that part of the running track of the sports complex had become blistered. The affected area was about 10 metres by 140 metres (see photographs 3 and 4 on the centre pages). The rainwater under the track surface would spread out if pressure was applied to its surface.

Note 7: *According to statistical records on return period of rainfalls, the intensities of rainfalls in late August 1999 were not extreme as they would occur once between two to five years. According to the Civil Engineering Manual (Sewerage & Drainage), the rainfall intensity adopted for the design for stormwater drainage networks in developed areas should not have a return period of less than 50 years.*

3.5 In September 1999, the ArchSD and the Contractor held a meeting to discuss the problem of damage to the all-weather athletic surfacing. The meeting identified a number of possible causes of the defects, as follows:

- (a) abnormally heavy rainfall preceding the defects;
- (b) high water table; and
- (c) the site location, because the sports complex was in a valley.

The meeting agreed that an independent consultant should be appointed to carry out an investigation of the causes of the defects.

3.6 In view of the urgent need to reopen the running track to the public, in mid-October 1999, emergency repair works were carried out to the affected areas on lanes 4 to 8 by the Contractor. The arrangement enabled schools to use lanes 4 to 8 for their athletic activities in the 1999 school year, while lanes 1 to 3 were closed for investigation.

3.7 *An independent consultant study.* In April 2000, an independent consultant (hereinafter called **Consultant A**) was appointed to carry out the investigation. The scope of the investigation included the following:

- (a) investigating and ascertaining the causes of the defects in the running track surfacing;
- (b) establishing liability for the defects;
- (c) formulating long term remedial measures to prevent a recurrence of the defects; and
- (d) ascertaining the extent, if any, to which the running track was not constructed in accordance with the contract drawings.

Outcome of the independent consultancy study

3.8 In May 2000, Consultant A submitted his investigation report. After studying the as-built drawings of the site formation and of the running track, and carrying out further site investigation, Consultant A concluded that:

- (a) the Contractor had constructed the track in accordance with the drawings and specifications with minor localised exceptions;

- (b) the damage to the running track surfacing was caused by excessive water pressure on the underside of the all-weather athletic surfacing, resulting in blistering of the track. The water pressure was due to heavy rainfalls and the high infiltration of water into the ground, resulting in high groundwater flows and water pressure;
- (c) there was no cut-off drain around the outside of the running track to prevent groundwater from flowing into the sub-base and the hard-core layers under the running track; and
- (d) the sub-formation for the site, which was constructed under an earlier contract administered by the Territory Development Department (TDD), did not have sufficient drainage capacity to absorb the water from the heavy rainfalls. Furthermore, the drainage facilities constructed under the ArchSD contract did not appear to have the capacity to remove the water.

3.9 Consultant A recommended that:

- (a) additional porous sub-soil 450mm-diameter pipes should be installed along the outer perimeter of the running track on the eastern side of the sports complex. The additional sub-soil drains should be connected to the existing rainwater system. The provision of the additional sub-soil drains was to prevent groundwater from entering the sub-base and the hardcore layers under the running track; and
- (b) further checks and reconstruction of some existing catchpits and drainage pipes might be required to ensure that the system had sufficient capacity to remove the water from the sports complex.

3.10 *Contractor not responsible for the damage.* Consultant A concluded that the damage to the running track was due to factors other than materials and workmanship under the Contract, and that the track had generally been constructed in accordance with the drawings. Therefore, the ArchSD did not hold the Contractor responsible for the damage.

Comments from the design consultant and the TDD

3.11 Consultant A concluded that the sub-formation of the site did not have sufficient drainage capacity to absorb the water from the heavy rainfalls experienced in August 1999, and that the drainage facilities constructed under the ArchSD contract did not appear to have the capacity to remove the water (see para. 3.8(d) above). Subsequently, the ArchSD wrote to the design consultant of the sports complex (appointed by the ArchSD and hereinafter called **Consultant B**) and the TDD to seek their comments.

3.12 **Consultant B's comments.** Consultant B commented that apparently the sub-soil drainage system as identified by Consultant A was not the sub-soil drainage system that Consultant B had been commissioned to design for the soccer pitch area. Consultant B believed that the deficient sub-soil drainage system that Consultant A was referring to was the overall system for the related valley development area and not for the sportsground alone.

3.13 **TDD's comments.** The TDD commented that, under its earlier contract, the site formation works of the platform for the sports complex included the surface drainage system but not the sub-soil drains. The requirement of any sub-soil drains should have been determined by the user according to the nature of the facility.

Rectification works for sub-soil drainage system and running track surfacing

3.14 **Detailed design for additional sub-soil drains.** In October 2000, to prevent a recurrence of similar damage to the running track surfacing, the ArchSD commissioned Consultant A to carry out a detailed design of additional sub-soil drains for the sports complex.

3.15 **Rectification works.** In December 2000, upon the completion of the detailed design, the ArchSD decided to carry out the following rectification works for the sports complex:

- (a) excavating the outer perimeter of the running track on its eastern side and installing sub-soil porous pipes to collect sub-soil water;
- (b) connecting the new sub-soil drains to the existing rainwater system; and
- (c) repairing the running track surfacing (lanes 1 to 3) damaged by the heavy rainfalls.

The works commenced in March 2001 and were completed in September 2001.

3.16 **Additional cost incurred due to the damage.** The total additional cost incurred for rectifying the damaged running track surfacing amounted to \$1.38 million. The amount was the sum of the consultancy fee for the investigation (see para. 3.7 above), and the cost of repair works for lanes 4 to 8 (see para. 3.6 above) and lanes 1 to 3 (see para. 3.15 above). As the Contractor and the design consultant were not held liable for the damage, the additional cost was borne by the Government.

Audit observations on rectification works of a sports complex

Critical design requirements not identified at the outset

3.17 The purpose of design control for construction contracts is to ensure that there are proper review, planning and verification of all design requirements. The damage to the all-weather athletic surfacing of the running track could have been avoided if the ArchSD had fully considered and identified, at the inception/feasibility stage, the sub-soil drainage requirement which was critical to the construction of the running track. This critical design requirement should have been included in the design brief. The ArchSD should have, during the design review, ensured that all relevant parties, such as the TDD, had been properly consulted so as to ensure that the sub-soil drains were designed to meet the requirement of a properly constructed all-weather athletic surfacing. **Audit considers that the ArchSD needs to strengthen its design control procedures so as to ensure that all critical design requirements of a project are incorporated in the design before tendering.**

3.18 In February 1998, the ArchSD issued a technical information paper on the design of all-weather athletic surfacing. In view of the design deficiencies mentioned in this PART, **Audit considers that the ArchSD needs to revise this technical information paper to ensure that all relevant requirements for a properly constructed all-weather athletic surfacing are incorporated in the technical information paper.**

Audit recommendations on rectification works of a sports complex

3.19 **Audit has recommended that the Director of Architectural Services should:**

- (a) **strengthen the ArchSD's design control procedures so as to ensure that all critical design requirements of a project are incorporated in the design before tendering;**
- (b) **during the design review stage, ensure that the designers (either in-house or consultant) have properly consulted all relevant parties on matters that would affect the project design; and**
- (c) **revise the ArchSD's technical information paper on all-weather athletic surfacing so as to ensure that all relevant requirements for a properly constructed all-weather athletic surfacing (such as the provision of sub-soil drains) are incorporated in the technical information paper.**

Response from the Administration

3.20 The **Director of Architectural Services** agrees with the audit recommendations. He has said that he will strengthen the design control procedures and review the technical information paper on all-weather athletic surfacing.

PART 4: QUALITY PLANNING AND CONTROL OF CONTRACTORS' WORKS

4.1 This PART examines quality planning and control of the contractors' works. The ArchSD's contractors have an important role to play in satisfying the clients' quality requirements and expectations. The contractors are required by the ETWB to have obtained certification of their quality management systems to the ISO standard. Audit noted that there were cases of lack of quality control of the contractors' works. The audit has revealed that there is room for improvement.

Submission of quality plans by contractors

4.2 Audit noted that in the earlier Airport Core Programme (ACP) projects, the Government required the contractors to submit quality plans for the construction works, which included Management Quality Plan, and Construction and Installation Quality Plan. In particular, the contractors had to:

- (a) define in the Management Quality Plan:
 - (i) the procedures for the selection, engagement and monitoring of sub-contractors and the procedures for quality control of the works carried out by sub-contractors; and
 - (ii) the procedures for the identification of training needs and for the provision of training to all personnel performing activities affecting quality; and
- (b) define in the Construction and Installation Quality Plan the procedures for inspection and testing of equipment and construction materials, final inspection and testing, and maintenance of test records.

4.3 **The ACP projects required all tenderers to submit outline quality plans as part of the tenders. The quality plans were to be developed, implemented and monitored during the contract period, and be periodically evaluated and revised to ensure their continual suitability and effectiveness.**

4.4 The contractors of the ACP projects were also required to appoint a suitably qualified and experienced person, not otherwise engaged in the performance of the contract, as the quality manager and to provide such other resources as might be required to ensure effective operation of the quality system.

4.5 The quality plans submitted under the ACP projects were useful for the planning and control of quality requirements. **Audit noted that the ArchSD's contractors are not required to submit quality plans for their construction works. It is a good practice for contractors to submit quality plans for complex projects.**

Poor quality control of contractors' works

4.6 *Consultant for Contract C expressed concern over poor quality control of contractor's works.* In Contract C for the provisioning of air-conditioning and improvement works for the IRCs, as examined in PART 2 of this Report, the consultant repeatedly wrote to the contractor, expressing his concern over the quality control of the contractor's works. The consultant said that:

- (a) during the site visits, examination of the welds revealed that the quality of the welding was very poor. Loose pieces had been welded together to make full-length pieces. The surface of the erected steelworks was not prepared to the specified standard; and
- (b) many of the drilled hole locations, especially those critical ones located along concrete edges, bore no resemblance to the arrangement shown on the structural drawings and had to be relocated significantly.

The consultant considered that these problems would not have occurred if there was project quality control. The consultant told the contractor that good workmanship had to be maintained and should not be compromised with the need to expedite the works, or in the expectation of carrying out remedial works subsequently.

Site visits revealed instances of lack of quality control of contractors' works

4.7 In November 2002, Audit visited two of the ArchSD's construction sites to check whether the contractors properly exercised quality control over their works. During the visit, Audit examined some of the site records and noted that there was a lack of project quality control.

4.8 *Request for inspection of works which were not yet ready for inspection.* According to the ArchSD's quality procedures, the site supervisory staff for the project is required to inspect and approve works that will be covered up or put out of view. The contractor is required to give adequate notice to the site supervisory staff whenever the works are ready for inspection, using a standard request-for-inspection form. On receipt of the request-for-inspection form, the site supervisory staff carries out detailed checking to see if the works conform to the contract requirements and are up to the required standard of workmanship. Audit's examination of the records of the request-for-inspection forms submitted by the contractors at both sites revealed that there were numerous cases in which the works were actually not yet ready at the time when the site supervisory staff carried out the inspection. As a result, the site supervisory staff had to re-inspect the works at a later date. This unnecessarily increased the workload of the site supervisory staff and put strain on the staff resources.

Submission of Sub-contractor Management Plans

4.9 One of the reasons for poor quality of works was the inadequate supervision by the contractors over the works carried out by their sub-contractors. The Construction Industry Review

Committee (CIRC — Note 8), in its report submitted to the Chief Executive in January 2001, considered that the standards of local sub-contractors varied considerably and that tight supervision over sub-contractors was necessary to guard against sub-standard works. The CIRC recommended that for public works projects, the ETWB and the works departments should exercise more effective control over sub-contractors.

4.10 ***Sub-contractor Management Plan.*** In January 2003, in taking forward the CIRC's recommendations, the ETWB introduced a Special Condition of Tender and a Special Condition of Contract requiring tenderers to submit with their tenders Sub-contractor Management Plans (SMPs). The scope and contents of a SMP are given at Appendix B. The SMPs submitted by the tenderers are contractually binding, and enable the works departments to strengthen control over the contractors' sub-contracting arrangement.

Checks carried out by ArchSD for prevention of sub-standard works

4.11 ***Checks for the prevention of sub-standard works required by ETWB.*** Under Works Bureau Technical Circular No. 4/2002 issued in January 2002, the works departments are required to carry out independent checks for the prevention of sub-standard works in public works construction (Note 9). The works departments should submit reports to the ETWB annually on the checks carried out in each calendar year. The works departments are also required to critically review the findings arising from the checks and take follow-up actions with a view to rectifying any non-compliance and avoiding recurrence. As the works departments operate differently with different nature and value of works, each department is allowed to decide on the staffing, frequency and procedures of the checks consistent with the principles set by the ETWB.

4.12 ***Guidelines issued by ArchSD.*** The ArchSD has issued guidelines for conducting checks for the prevention of sub-standard works by contractors, following the principles set by the ETWB. The guidelines state that the ArchSD should select a total of three projects for independent checks within each half-yearly period, i.e. a total of six projects each year. An in-house independent multi-disciplinary team (including senior professional staff from the architectural, building services and structural engineering disciplines) would conduct checks in respect of the three disciplines of each of the selected projects. **In line with the principles set by the ETWB, the ArchSD's guidelines state that the checks should cover critical site activities including the testing of end products. The checks should not be simply the documentary checks of records.**

Note 8: *In April 2000, the Chief Executive of the Hong Kong Special Administrative Region appointed the CIRC to comprehensively review the state of the construction industry. In January 2001, the CIRC completed its report and recommended improvement measures covering the whole spectrum of activities in the construction industry.*

Note 9: *Since August 1999, the works departments have been carrying out checks for the prevention of sub-standard works. In January 2001, the CIRC recommended that the checks should be carried out on a regular basis as work progresses and any malpractices identified should be sanctioned to deter foul play.*

4.13 **Implementation of checks by ArchSD.** Audit reviewed the half-yearly checks for the prevention of sub-standard works conducted in June 2002 by the ArchSD. According to the inspection reports on the three projects (Note 10) submitted by the ArchSD to the ETWB:

- (a) the workmanship and materials of the works were in general satisfactory, only some minor non-conformities of architectural works were identified in one of the projects;
- (b) the testing and commissioning of the works were carried out in accordance with the approved procedures;
- (c) the records of testing and inspection of the works were in order and managed under a proper system; and
- (d) **no additional tests were required during and after the checks, except for a concrete test that had been carried out for the structural works of one of the projects.**

Audit observations on quality planning and control of contractors' works

Need for contractors to submit quality plans for complex projects

4.14 **In Audit's view, for complex projects, the ArchSD needs to consider incorporating provisions in contracts which require the contractors to submit quality plans for the works so as to improve the quality control of the contractors' works. This is similar to the good practice of the ACP projects (see para. 4.2 above).** With the submission of the quality plans, which clearly define how the contractors should manage and implement the quality systems during construction, the ArchSD, the consultants and the contractors have a more solid basis for monitoring the construction process and achieving the quality requirements of the projects.

4.15 Audit considers that the requirement for tenderers to submit SMPs (see para. 4.10 above) is a major step forward to improve the management and control of sub-contracting for enhancing construction quality. **The SMPs may form an integral part of the quality plans to be submitted by the contractors as suggested by Audit in paragraph 4.14 above.**

Note 10: *The three projects selected by the ArchSD included the construction and fitting-out of a medical centre, the construction of a primary school, and the expansion of kiosks and other facilities at a land border control point.*

Need to carry out adequate testing of end products for prevention of sub-standard works

4.16 In line with the principles set by the ETWB, the ArchSD's guidelines on checks for the prevention of sub-standard works state that an independent multi-disciplinary team should carry out checks covering critical site activities including the testing of end products (see para. 4.12 above). The intention of the testing of end products is to check whether there are sub-standard works due to malpractices which may not be revealed by the documentary check of records. **However, Audit noted that, for the half-yearly checks conducted by the ArchSD in June 2002, the ArchSD had relied on the documentary check of the records instead of on the actual testing of the end products (see para. 4.13 above). This may defeat a main purpose of the exercise which is to identify any possible malpractices that should be sanctioned to deter foul play. Audit considers that the testing of end products (e.g. pile foundations) should be adequately conducted when carrying out checks for the prevention of sub-standard works.**

Audit recommendations on quality planning and control of contractors' works

4.17 **Audit has recommended that the Director of Architectural Services should:**

- (a) **for complex projects:**

 - (i) **during the tender stage, require tenderers to submit outline quality plans (including SMPs) as part of the tenders for the purpose of tender assessment;**
 - (ii) **during the construction stage, require contractors to submit quality plans (including updated SMPs) so as to facilitate monitoring and control of the contractors' works; and**
 - (iii) **monitor the performance of the contractors in implementing the quality plans (including SMPs) and in exercising quality control over their works;**

- (b) **issue warning letters and, where appropriate, adverse performance reports to contractors, if the contractors repeatedly request ArchSD staff to inspect works which are not yet ready for inspection; and**
- (c) **conduct adequate testing of end products (e.g. pile foundations) when carrying out checks for the prevention of sub-standard works.**

4.18 **Audit has recommended that, in order to improve the quality planning and control of contractors' works, the Secretary for the Environment, Transport and Works should consider notifying the works departments (e.g. by promulgating ETWB Technical Circulars (Works)) of the audit recommendations.**

Response from the Administration

4.19 **The Director of Architectural Services** agrees with the audit recommendations. He has said that:

- (a) he will liaise with the Secretary for the Environment, Transport and Works on the submission of outline quality plans by the tenderers for complex projects during the tender stage;
- (b) he will strengthen the monitoring and reporting system on the performance of contractors; and
- (c) whenever the site conditions permit, the ArchSD staff will conduct on-site testing of end products when carrying out checks for the prevention of sub-standard works.

4.20 **The Secretary for the Environment, Transport and Works** agrees to issue a circular memorandum advising the works departments of the audit recommendations as mentioned in paragraph 4.17 above.

PART 5: MEASURABLE QUALITY TARGETS

5.1 This PART examines the measurable quality targets developed by the ArchSD for its QMS under the ISO 9001: 2000 standard. The audit has revealed that there is room for improvement in setting the measurable quality targets.

Setting of measurable quality targets

5.2 The ISO 9001: 2000 standard emphasises a results-driven approach, together with greater integration of initiatives, to achieving quality objectives and targets. In May 2002, the Hong Kong Productivity Council (HKPC — Note 11), in its report on “Modification of Certified Quality Management System to ISO 9001: 2000 for ArchSD”, recommended that the ArchSD should develop measurable quality targets for all relevant functions and levels within the ArchSD, as follows:

- (a) **Departmental level.** The ArchSD should establish departmental level measurable quality targets, including those relevant to outsourced activities and customer perception on satisfaction;
- (b) **Branch level.** The ArchSD should develop a specific set of measurable quality targets for departmental branches which would demonstrate their unique performance; and
- (c) **Project level.** The ArchSD should establish measurable quality targets which would demonstrate the overall performance of project delivery and achievement of common goal of the project team.

In considering the need for the ArchSD to continue reviewing its quality objectives and targets, the HKPC recommended that the results of the setting of the measurable quality targets should be documented. The results could be documented by means of a performance monitoring plan, or records of meetings, instead of documenting the details in the ArchSD’s quality manuals.

5.3 Following the HKPC’s recommendations, the ArchSD developed a total of 38 measurable quality targets (Note 12) for 2002-03, including:

Note 11: *The HKPC was commissioned by the ArchSD to provide consultancy service for the conversion of the QMS to ISO 9001: 2000.*

Note 12: *Some of the measurable quality targets developed by the ArchSD are listed at Appendix C for illustration.*

- (a) 7 at the departmental level;
- (b) 30 at the branch level; and
- (c) 1 at the project level.

In November 2002, the ArchSD submitted the list of measurable quality targets to the HKQAA for its first stage assessment of the ArchSD's implementation of the ISO 9001: 2000 standard. The HKQAA recommended that the ArchSD should review and reconsider its measurable quality target levels at the quarterly/yearly reviews.

Audit observations on measurable quality targets

5.4 Audit examined the list of measurable quality targets as documented by the ArchSD, and noted that the list had not included measurable quality targets that would address the quality issues raised in PART 2 of this Report. Audit considers that the ArchSD needs to set additional measurable quality targets (see paras. 5.5 to 5.8 below).

Measurable quality target on issue of certificate of completion

5.5 According to the ArchSD's quality manuals, the certificate of completion should be issued no later than one month after the certified date of substantial completion. However, Audit noted that for three of the four contracts examined in PART 2 of this Report (i.e. Contracts A, B and C in Table 2 in para. 2.13 above), the certificates of completion were issued about 3 months after the certified dates of substantial completion. For the fourth contract, Contract D, the certificate of completion was issued about 17 months after the certified date of substantial completion. **Audit considers that the ArchSD needs to set a measurable quality target for the timely issue of the certificates of completion.**

Measurable quality target on handover of project to client department

5.6 According to the ArchSD's quality manuals, completed works should be taken over from the contractor with all difficulties or problems resolved before the formal handover to the client department. However, Audit noted that for the construction of the museum (Contract B), most parts of the museum building and the external works were not yet ready for handover at the date the contract was certified as substantially completed in mid-May 1998. The major parts of the building were actually handed over to the client department between 23 May 1998 and 23 June 1998. **Audit considers that the ArchSD needs to set a measurable quality target so as to ensure that the projects are ready for handover to the client departments upon the certification of substantial completion.**

Measurable quality target on maintenance period

5.7 As mentioned in paragraph 2.30 above, there was a high percentage (84%) of the ArchSD's contracts with prolonged maintenance periods. Some of the contracts even had their maintenance periods prolonged by two to three years. **Audit considers that the ArchSD needs to set a measurable quality target for the timely completion of outstanding works and defect rectification works within the maintenance periods.**

Measurable quality target on outsourced activities

5.8 Audit noted that the HKPC, in its report on "Modification of Certified Quality Management System to ISO 9001: 2000 for ArchSD" of May 2002, recommended that the quality objectives and targets set at the departmental level should also cover those relevant to outsourced activities, such as the commissioning of consultants for design work and/or project management and supervision work (see para. 5.2(a) above). In this regard, the ArchSD had developed a quality target measured in terms of the percentage value of new projects outsourced to the private sector (see item (d) in Appendix C). However, the ArchSD had not developed any measurable quality target to monitor the efficiency and the quality of the outputs of the outsourced activities. **Audit considers that, with more and more activities that are to be outsourced by the ArchSD under its re-engineering programme, the ArchSD needs to set measurable quality targets so as to monitor the efficiency and the quality of the outputs of its outsourced activities.**

Audit recommendations on measurable quality targets

5.9 **Audit has recommended that the Director of Architectural Services should:**

- (a) **in managing the ArchSD's contracts, consider setting measurable quality targets so as to ensure that:**
 - (i) **the certificates of completion of the ArchSD's contracts are issued no later than one month after the certified dates of substantial completion (see para. 5.5 above);**
 - (ii) **the ArchSD's projects are ready for handover to the client departments upon the certification of substantial completion (see para. 5.6 above); and**
 - (iii) **the outstanding works and defect rectification works of the ArchSD's contracts are completed within the maintenance periods specified in the contracts (see para. 5.7 above); and**

- (b) **develop measurable quality targets to monitor the efficiency and the quality of the outputs of the outsourced activities (see para. 5.8 above).**

5.10 **Audit has also *recommended* that the Secretary for the Environment, Transport and Works should consider requesting the works departments to develop measurable quality targets similar to those developed by the ArchSD and those recommended by Audit in paragraph 5.9 above.**

Response from the Administration

5.11 **The Director of Architectural Services agrees with the audit recommendations. He has said that he will:**

- (a) **set measurable quality targets with regard to:**
 - (i) **the issuance of certificates of completion;**
 - (ii) **the time for handover of projects to client departments after substantial completion; and**
 - (iii) **the completion of outstanding works and defect rectification works; and**
- (b) **develop measurable quality targets in monitoring the efficiency and the quality of outputs of the outsourced activities.**

5.12 **The Secretary for the Environment, Transport and Works has said that she will consider, where practicable, developing with the works departments some measurable quality targets covering the aspects as mentioned in paragraph 5.10 above.**

Appendix A
(para. 2.28 refers)

**Audit's calculation of additional LD
that could have been imposed on the contractor of Contract B**

Section of works	Proportional value percentage (PVP)	Proportional value of LD based on PVP	Certified date of substantial completion	Handover date	No. of days between (C) and (D)	Estimated amount of additional LD	Additional LD that could have been imposed
	(A)	(B)= \$150,000 (i.e. LD per day) (A)	(C)	(D)	(E)= (D) - (C)	(F)= (B) x (E)	(G)
	(%)	(\$ per day)				(\$)	(\$)
(a) Remaining ground floor and internal areas	8.44	12,660	15.5.1998	23.6.1998	39	493,740	493,740
(b) 1st floor lobby, Permanent and Temporary Exhibition Areas at all floors	58.68	88,020	15.5.1998	23.5.1998	8	704,160	N.A. (Note 1)
(c) 2nd floor and the resting areas at ground to 2nd floor	21.14	31,710	15.5.1998	4.6.1998	20	634,200	N.A. (Note 1)
(d) 3rd floor office area and some common areas	9.56	14,340	15.5.1998	18.4.1998	N.A.	N.A.	N.A.
(e) External areas	2.18	3,270	15.5.1998	15.10.1998	153	500,310	N.A. (Note 2)
Total	<u>100.00</u>	<u>150,000</u>				<u>2,332,410</u>	<u>493,740</u>

(say \$0.49M)

Source: Audit's calculation based on ArchSD's records

Note 1: According to the ArchSD, for items (b) and (c) above, taking into consideration the time required for the arrangement of handing-over and that required to implement additional works required by the client department, a time gap of three to four weeks between the certified date of substantial completion (see column (C) above) and the handover date (see column (D) above) was considered acceptable. As such, Audit had not included the estimated amount of LD for items (b) and (c) as additional LD that could have been imposed on the contractor.

Note 2: According to the ArchSD, the outstanding works at the external areas had minimal impact on the take-over of the museum building by the LCSD for occupation. As such, Audit had not included the estimated amount of LD for item (e) as additional LD that could have been imposed on the contractor.

Appendix B
(para. 4.10 refers)

Guidelines on scope and contents of SMP

The guidelines on the scope and the contents of the SMP to be specified in the Special Conditions of Tender/Special Conditions of Contract are as follows:

- (a) scope of works to be sub-contracted including the form and extent of sub-contracting arrangement such as labour only, labour and plant, labour and material, plant only, lump sum or any other combination of types. Proof of ownership of construction plant and material should be addressed;
- (b) arrangement for each sub-contract including the names of sub-contractors known to the contractor, proposed form of sub-contracts and the programme;
- (c) criteria for selection of sub-contractors;
- (d) details of the contractor's own staff employed for direct supervision and management of his sub-contractors. An organisation chart showing the responsibilities of contractor's direct staff in supervision and management of his sub-contractors should be submitted;
- (e) the contractor's approach to demand/ensure his sub-contractors to (i) abstain from sub-contracting the whole of the works sub-contracted to them; and (ii) submit written declarations of no "hidden" sub-contracting of works;
- (f) the contractor's approach to encourage his sub-contractors to adopt written contracts in their sub-contracting;
- (g) the contractor's proposed measures to demand his sub-contractors to report upward their sub-contracting arrangement and any subsequent changes;
- (h) the contractor's proposed measures for monitoring and assessing the works programme, quality, safety and environmental performance of his sub-contractors;
- (i) the contractor's proposed measures for ensuring timely payment to downstream sub-contractors after his payment to his sub-contractors;
- (j) the contractor's approach for monitoring early industrial disputes problems;
- (k) the contractor's approach for handling complaints from workers on site regarding wages arrears disputes and co-ordinate with Labour Department for earlier action. Contractors are required to keep the Architect/Engineer/Supervising Officer's site representatives informed of the latest situation;
- (l) the contractor's proposed measures for maintaining updated daily attendance records of all workers on site; and
- (m) the contractor's proposed measures for site security and workers' daily access control if applicable.

**List of some of ArchSD's measurable quality targets
(2002-03)**

The following are some of the measurable quality targets developed by the ArchSD for 2002-03 (Note):

Departmental level

- (a) To ensure the timely delivery of at least 75% of projects that have been scheduled at the start of the financial year for completion in the year.
- (b) To deliver 85% of the public works projects that have been scheduled at the start of the financial year for completion in the year within the approved budget.
- (c) To monitor the expenditure on Public Works Programme projects within ArchSD's purview against the original estimates, ensuring that the underspending is less than 5% of the original estimates for each financial year.
- (d) To harness the resources in the private sector through outsourcing the public projects. The target is to be measured in terms of percentage value of new projects outsourced to private sector.
- (e) To conduct client satisfaction survey for at least 16 newly completed projects in a year. Based on client survey results, to set up a client satisfaction index to reflect the level of client satisfaction for different projects.

Branch level

- (f) To ensure 80% capital works projects with Technical Feasibility Statement are completed within 4 months after receipt of the Project Definition Statement.
- (g) To ensure 60% of all tender reports, except design-and-build contracts and those with a marking scheme, shall be completed for presentation to the appropriate Tender Board within 8 weeks of the tender closing date.
- (h) To ensure 60% of all pre-tender estimates shall be within the range of plus or minus 15% when compared with the accepted tender.
- (i) To ensure 80% of the Independent Checking of Structural Design and Calculation will be completed within 20 working days and that non-conformance to the Structural Scheme Design Report will be less than 10%.

Project level

- (j) To ensure 80% of projects obtained approval from Project Brief and Design Vetting Committee at first attempt.

Note: The ArchSD has developed a total of 38 measurable quality targets for 2002-03. This appendix only lists some of the measurable quality targets for illustration.

Appendix D

Acronyms and abbreviations

ACP	Airport Core Programme
AHU	Air handling unit
ArchSD	Architectural Services Department
CAD	Civil Aviation Department
CIRC	Construction Industry Review Committee
EMB	Education and Manpower Bureau
ETWB	Environment, Transport and Works Bureau
GCC	General Conditions of Contract for Building Works
HKPC	Hong Kong Productivity Council
HKQAA	Hong Kong Quality Assurance Agency
HVAC	Heating, ventilation and air-conditioning
IRC	Indoor recreation centre
ISO	International Organisation for Standardisation
LCSD	Leisure and Cultural Services Department
LD	Liquidated damages
PRM	Precision Runway Monitor
PVP	Proportional value percentage
QMS	Quality Management System
SMP	Sub-contractor Management Plan
TDD	Territory Development Department