Chapter IV Tin Chung Court - Construction

Work stages and technical requirements

4.1 According to the Specification of the TCC Contract, the following stages of work and requirements must be followed or complied with:

(a) Preliminary piles, at least one for each block must be installed outside the boundary of each block before driving the working piles. The load testing of such preliminary piles was to be applied in three stages incrementally to determine the ultimate shaft friction and end-bearing capacity of the piles for the purpose of verifying the design method and parameters proposed for the working piles. The preliminary piles were required to pass the loading test at Stages I and II which were defined respectively as one time of the specified load plus two times of the negative skin friction, and two times of the specified load plus three times of the negative skin friction. The load would then be increased incrementally until failure or to 3.6 times of the specified load and of the negative skin friction at Stage III for the purpose of ascertaining the maximum end-bearing capacity of the piles;

(b) 1% of piles delivered to site were to be randomly selected for concrete coring tests prior to driving to ensure that the piles would comply with the specified strength. Should the coring test fail, all piles of the same concreting date would be deemed to be unacceptable and had to be removed from site;

(c) Working piles were to be properly spaced and the driving sequence was to be from the centre piles of a group first and working outwards. Such driving sequence was aimed to minimize any detrimental effects of heave and lateral displacement of the ground, as gradual densification of the subsoil could result in shortening of the piles as driving progressed;

(d) Underground obstructions encountered during piling were to be overcome by way of re-designing piles and/or pile caps, or abandoning, extracting and re-driving piles, or removal of underground obstructions by excavation, or by pre-boring (see PS 19.43 in **Appendix 12**);

(e) All piles were to be driven to such level to achieve the required embedded length in the bearing stratum on static formula, in addition to the driving formula, by using one of the specified references. The overall length of each pile must be the one whichever was the greater derived by either the driving formula or the static formula. The pile should withstand the designated working load of 2,700 kN with a design factor of safety of not less than two;

(f) 5% of the total number of driven piles were to be randomly selected for Pile Driving Analyzer (PDA) or Vibration Test for testing integrity of piles;

(g) 1.2% of the total number of driven piles were to be load tested;

(h) A settlement analysis based on as-built piles was to be submitted. The relative settlement of piles at working load between any two adjacent piles must not exceed 1/300 times the distance between the centre lines of piles;

(i) Pile heads were to be cut off to the required levels and pile caps were to be cast in accordance with the approved design; and

(j) The RSE appointed by the Contractor was responsible for the design of the piles, piling layouts and pile caps. The RSE must submit a report and certify that the piles as installed had properly penetrated into in-situ decomposed rock and that the completed job was satisfactory for the purpose intended.

Use of preliminary piles to reconfirm piling design

4.2 According to the Specification, Franki (B+B) was required to install at least one preliminary pile for each block before driving the working piles. The test results of the installation and loading of preliminary piles would provide empirical data on the drivability of piles under the proposed design and on the ultimate shaft friction and end-bearing capacity of the piles. This work process aimed to verify the piling design and the soil parameters used by Franki (B+B) in determining the founding depths of piles as calculated under the static formula. As explained in paragraph 4.1(a) above, the preliminary piles in TCC were required to be tested in three stages incrementally to 3.6 times of the specified load plus 3.6 times of the negative skin friction or until failure. As each of the 1,882 PPC piles of 500 mm diameter and 125 mm thick should be capable of supporting 2,700 kN, the preliminary piles were deemed to have passed the tests if the piles could withstand 5,400 kN at Stage II of loading and could satisfy the permanent settlement requirement when the load was removed. By loading the piles to 8,400 kN at Stage III or to failure, Franki (B+B) would be able to ascertain the ultimate bearing capacity of the piles. With this information, Franki (B+B) would be in a position to re-assess the piling design, including the pile length and the number of piles required, before driving the working piles.

4.3 The Specification, however, allowed Franki (B+B) to install working piles before the test results of preliminary piles were known. In the event that the test results proved that the proposed piling design could not

satisfy both the driving formula and the static formula, Franki (B+B) should revise the design parameters and submit them to HYA for approval. Any piles driven based on the original proposal should then be deemed to be unacceptable [13].

4.4 The Select Committee notes from the Specification that the liquidated damages for delayed completion of works amounted to almost $300,000 per day. If the test results of the preliminary piles could not substantiate the proposed piling design, the Contractor would have to revise the design parameters, which inevitably took time and would delay the progress of works. Given the hefty daily liquidated damages, the Contractor might be tempted to cover up test results which could not justify the piles driven. It was unlikely that HD and HYA were not aware of the financial and operational consequences if working piles were allowed to be installed prior to the availability of the test results of preliminary piles. However, the relevant PS was adopted as it was a standard provision in HD's specifications for such projects.

Installation of preliminary piles and test results

4.5 Record shows that the preliminary piles for Blocks 1 (PP1) and 2 (PP2) were installed in October 1996, at the same time when working piles in Blocks 1 and 2 were being driven. By the time the test results from the two preliminary piles were known, which was November 1996, 99% of the working piles had already been driven into the ground, of which around 87% and 66% of the working piles for Blocks 1 and 2 respectively had achieved final set.

4.6 The Select Committee also finds that in December 1996 when most of the working piles had already been driven to final set, Franki (B+B) proposed to install at its own expense two additional preliminary piles, namely PP1A for Block 1 and PP2A for Block 2. Despite the different reasons put forward by witnesses on the need for PP1A and PP2A, there was clear indication that the test results of PP1 and PP2 could not substantiate the piling design. PP1 was driven to final set at 28.3 m, and PP2 at 28.2 m, which were

[13] PS19.27(3)

much longer than the design lengths of 22 to 22.5 m and 22.5 to 23.5 m respectively for Blocks 1 and 2.

4.7 For PP2, there were two sets of strain gauge [14] readings: one dated 4 December 1996 and the other dated 5 December 1996. One of the readings must have been flawed and Franki (B+B) used the one which produced a better result for calculation. The other set, which was less favourable, had not been submitted to HYA. According to the expert appointed by HYA after the TCC incident, had the less favourable set of data been used in calculation, the piles in Block 2 would need to be over 30 m.

Locations of preliminary piles

4.8 Given the pivotal role of preliminary piles in verifying the piling design and in view of the significance of PP1A and PP2A, the Select Committee examined the principles governing the location for installing them. According to GEO Publication No. 1/96 on "Pile Design and Construction",

> *"where possible, the preliminary piles should be located in the area with the most adverse ground conditions."*

4.9 The Select Committee notes that PP1A and PP2A were installed at quite a distance away from the original preliminary piles PP1 and PP2 respectively. The locations of these four piles are shown in **Appendix 13**.

4.10 A witness told the Select Committee that the locations of all the preliminary piles, including PP1A and PP2A, were proposed by Franki (B+B). According to him, neither PSE/TCC nor JMK raised any objection to the proposed locations of the preliminary piles. HYA and PSE/TCC told the Select Committee that PP1 was located near borehole A31-100, which was the weakest borehole inside the footprint of the block. According to CMW, the area with the worst ground conditions in Block 1 was near borehole A31-75.

[14] Strain gauges are small instruments which can be attached to the pile to measure local elongation or compression due to stress.

The location of PP1A was, however, away from this borehole. The reference borehole of PP1A, borehole HY1, which was inside the footprint, was located 7 m away from PP1A. Such distance was too far away to make the borehole representative of the geology of the location of the preliminary pile, having regard to the varied geology at the subject site. Nevertheless, a witness pointed out that A31-75 was outside the footprint of Block 1 and was not as representative as those within the footprint. JMK, on the other hand, did not consider the locations of preliminary piles particularly significant. In JMK's view, the purpose of installing preliminary piles was to find out the relationship between the soil and the pile. Any location could serve the purpose provided that there was a borehole nearby. HYA also considered the distance of 7 m not far away.

Test results of additional preliminary piles

4.11 The Select Committee notes from evidence submitted to the Court that data from PP1A and PP2A turned out to be better than PP1 and PP2. HYA considered that data from PP1 and PP2 should not be ignored. Hence, Franki (B+B) suggested using a linear regression method of calculation, i.e. combining the two sets of data. The result after using the linear regression method was found to be able to justify the piling design. According to a prosecution expert witness called before the Court, although the linear regression method is an acceptable and widely-used engineering method to combine data, this method was not appropriate for the TCC site because it would mask the ground condition that was poor. The same witness said that based on the test results of PP1 alone and without the linear regression method, the length of the pile required would be 26 m [15]. However, the Select Committee finds that the majority of the working piles in Blocks 1 and 2 were made up of only two segments, 12 m plus 8 m, i.e. 20 m in total, with a 4-m follower (which was removed afterwards and did not form part of the pile) to drive the piles to final set.

[15] See pages 42, 53, 54 and 86 of the transcript of the summing-up of the trial

Installation of working piles

Concrete core tests

4.12 According to the Specification, piles delivered to site should be subject to core tests before driving. However, the Specification also allowed the Contractor to drive piles before test results were known. Should the tests fail, the Contractor would have to submit approved remedial proposals for those unacceptable piles which had already been driven. All subsequent remedial work was to be carried out at the Contractor's own expense and with no extension of time.

4.13 The Select Committee notes from CMW's report that samples of PPC piles cast in the factory on 24 September 1996 failed the core test, but the piles concerned had already been driven. Three sections of the PPC piles cast on the date were recorded to have been withdrawn. The other nine sections cast on the date were recorded to have been installed at Blocks 1 and 3, which, according to HYA, were later abandoned.

Driving of working piles

4.14 The first site staff of HYA, ACW/TCC, reported for duty on 12 September 1996 when the Contract commenced, and it took him a few days to set up an office. The two WSs reported for duty in early October 1996. According to evidence obtained, at the start of a working day, the staff of Franki (B+B) would inform ACW/TCC, and/or RE/TCC after the latter assumed duty, of the work to be done. ACW/TCC and the two WSs/TCC would divide among themselves the work to be inspected. To record the progress of pile driving work, ACW/TCC, who was placed for the first time in a supervisory post, devised on his own initiative a chart for the purpose. The chart was for recording the work progress of each pile, which was identified by a serial number. In addition, information on the progress was provided in daily reports compiled by the site agent of Franki (B+B). The chart prepared by ACW/TCC and the progress reports prepared by Franki (B+B) were the main documents which HYA relied on for keeping track of the progress of the piling works at site.

4.15 Most of the pile sections driven at each pile location were mainly of 8 m or 12 m in length. As piles were driven to the ground in batches, welding of piles also took place in batches. The site staff concerned were required to supervise the welding of piles to ensure that the completed piles were straight and that the surface welded was free from cavity or particles. This part of the work was carried out by ACW/TCC and the two WSs/TCC in turn. All three of them had no experience in PPC piling works.

4.16 Under the Specification [16], all loading tests of preliminary piles had to be completed within two months from the date of the commencement of works. If the Contractor failed to comply with this requirement, then all piling works except the loading tests must not proceed further until after the completion of the loading tests. Records show that the loading tests on preliminary piles for all the six domestic blocks were undertaken between 14 November 1996 and 21 January 1997. To comply with that requirement, all piling works except the loading tests should have been stopped on 12 November 1996, two months after the official commencement of works. Records showed that HYA sent a letter to Franki (B+B) on 23 November 1996 drawing its attention to that requirement. Evidence shows that works at the site were never suspended. Further, the majority of working piles for Blocks 1 and 2 were driven to final set between 26 October 1996 and 27 November 1996. This shows that Franki (B+B) took no heed of this letter. Neither did HYA take any follow-up action in respect of the letter.

4.17 The explanation given to the Select Committee was that HYA assessed the merits of ordering Franki (B+B) to suspend all works except the loading tests and concluded that it was in the interest of the project to allow Franki (B+B) to continue with the works. The consideration was that the piling programme was very tight and the liquidated damages for delayed completion of the piling works amounted to almost $300,000 per day. Since the actual driving of working piles only commenced in mid-October 1996 as understood by HYA, HYA considered that the risk borne by Franki (B+B) in continuing with the works was not excessive. Even if the working piles had achieved final set before the completion of the loading tests on the preliminary

[16] PS 19.71(6)

piles, it did not mean that the pile founding level had been approved. In any case, the Specification allowed PSE/TCC as the Supervising Officer to permit the continuation of works after taking into account the circumstances of the site.

Overcoming underground obstructions

4.18 According to PS 19.43, when underground obstructions were encountered at any depth during piling operations, the Contractor must at his own cost and time overcome such underground obstructions by any means he considered practical.

4.19 The Select Committee notes from Franki (B+B)'s method statement submitted to HYA on 22 July 1996 its proposed ways to overcome underground obstructions. They included, among others, driving through obstructions by auguring method and down-the-hole hammer. After taking into account the comments from JMK that the use of the down-the-hole hammer method would disturb the surrounding soil, Franki (B+B) withdrew this method as one of the means to overcome underground obstructions. Despite all these discussions about the technique of preboring, and the advice in the Acer Report that PPC piles would have difficulties in overcoming the "hard pans", and that about 20% to 75% of piles for the six residential blocks would require preboring, no preboring was actually conducted throughout the entire project.

4.20 As described in paragraph 3.17 above, it is apparent that Franki (B+B) had no intention of undertaking preboring works from the outset. A witness said without hesitation to the Select Committee that hard pans had never been a concern to Franki (B+B) because it had envisaged that piles could be founded on levels before hard pans were encountered. No provision was made in the tender price for preboring and no predetermined problem areas was identified for preboring work in the entire project. It should nevertheless be noted that preboring was not an express requirement of the Contract. Franki (B+B)'s obligation under it was simply to overcome underground obstructions.

4.21 According to JMK's Final Foundation Advice Report dated September 1996, PPC piles could be founded on bedrock or on the very dense in-situ decomposed rock of SPT N-values of some 50 to 100. However, as there was no requirement on the minimum SPT N-value at final set point in the Specification, it was considered by HYA and HD witnesses that so long as the requirements in respect of static formula, dynamic formula, uneven settlement and load tests were satisfied, the question of whether the piles were founded on layers underlain by soft soil below a certain SPT N-value was immaterial. For example, two witnesses said that the average SPT N-value of Block 5 was 42 only, but the performance of Block 5 in terms of differential settlement was found to be the best amongst all the blocks.

4.22 A witness advised the Select Committee that where there was question on whether a pile might be resting on boulders or hard layers with uncertain soil conditions underneath, it was common practice in other projects to sink a borehole next to the pile in question to obtain more information about the soil conditions. In the case of TCC, as the site was formed by reclamation over fish ponds, the question of piles resting on boulders did not arise. This understanding on the geology of Tin Shui Wai, however, does not tally with that of GE/TCC. GE/TCC told the Select Committee his experience of managing an in-house project using PPC piles in Area 13 of Tin Shui Wai. The contractor for that project had encountered on a number of occasions underground obstructions and the piles could not be driven further. The contractor then proposed to drill a hole nearby to ascertain the soil conditions. In some situations, it was found that the obstructions were underlain by soft layers and the contractor concerned had to install additional piles in the adjacent areas.

Piling sequence

4.23 The Specification [17] stipulated that the driving sequence should be from the centre piles of a group and working outwards. The reason for this stipulation, according to evidence given by witnesses in the geotechnical profession, was to avoid densification effect. PPC piles, being large

[17] GS 19.39(9)

displacement piles, could be driven easily at the start of the piling process. As the density of soil increased, driving of piles would progressively become difficult. The closing effect, i.e., tightening-up of the ground, would be obviated if piling commenced at the centre, working outwards to all directions.

4.24 On 12 November 1996, Franki (B+B) proposed the driving of piles from one side of the footprint of the block to the other when the majority of the working piles for Blocks 1 and 2 had already been pitched. That proposal was approved by PSE/TCC. Although there is evidence that the meaning of the phrase *"the centre piles of a group"* in the Specification was not clear to the PSE/TCC, he approved the alternative piling sequence after taking the view that the effect of driving of piles from one side of the footprint of the block to the other would not be different from driving from the centre piles and working outwards. He did not see the need to seek clarification from the Liaison Team. In HYA's view, the piling sequence specified in the Contract was a suggestion and not a requirement.

4.25 When questioned by the Select Committee on the difference between driving from the centre piles of a group, working outwards, and driving from one side of the footprint of a block to the other, a number of witnesses said that the difference was not great as far as densification of soil was concerned. The sequence to be avoided was to start driving from the four sides of the site and closing in at the centre.

4.26 The Select Committee notes that according to the piling records for Block 1, the driving of piles was basically from the right side to the left side. However, for the final set of piles, the sequence started from the outside and closed in at the centre, as shown in **Appendix 14**. Various witnesses were questioned about the densification effect of this sequence of final set, hence facilitating piles to be final set at a level shallower than required. CMW considered that this sequence of final set was not in compliance with the Specification. Given that a driving process with the use of a 4-m follower took place in the final set, some degree of densification of soil might have arisen. HYA, however, held the view that the additional densification as a result of approximately 10 blows to achieve final set would not densify the soil further to any significant extent.

Final set of piles

4.27 According to the Specification, all piles must be driven to such level to achieve the required embedded length. The final set process involves the movement of driving machines from one pile to another, loosening the last driven pile segment before proceeding to pile driving, driving in the follower to almost final set and inviting HD's site staff concerned to inspect the final process. During its visit to a PPC piling site, the Select Committee was advised by HD officers that a device was fixed to the pile head for plotting the settlement and rebound of each blow when a pile was driven to final set. The final set graph so plotted would indicate the piling behaviour and movement when a pile was subject to driving force.

4.28 In the TCC project, when piles were expected to achieve final set, the staff of Franki (B+B) would request the site staff to supervise the final set of each pile alongside with QCE/TCC. The site staff had to certify acceptance of final set on a form which set out the commencement date of the driving of the piles, the date of final set, the length of pile sections, the final set for the last 10 blows, the pile level and the embedded length of the piles. ACW/TCC and the WSs took turns to supervise the final set of piles. They told the Select Committee that although they were aware of the inspection procedures governing final set, they had practical difficulty in checking and recording the blow count per minute and at the same time ensuring that the pencil on the reference beam for drawing the final set graph was properly placed. The interview records of ICAC revealed that some of the final set graphs certified by them were flawed. The site staff said that they should not have certified these graphs as the graphing method as shown on these graphs had distorted the results, which should not have satisfied the specified requirements for those piles [18].

4.29 Piling records also show that as many as 60 piles at Block 1 achieved final set on a single day (for example, on 16 November 1996). Evidence reveals that the site operated from 7:00 am to 7:00 pm at the

[18] See pages 6507 to 6542 of the transcript of the video interview conducted by ICAC with WSI/TCC, and pages 7300 to 7315 of the transcript of the video interview conducted by ICAC with WSII/TCC

beginning of works and there were at the most two machines being utilized to drive piles to final set at any one time. Having regard to the different steps involved in the complex final set process (see paragraphs 4.27 and 4.28 above), the Select Committee has serious doubt as to whether it was practically feasible to drive so many piles to final set on a single day, not to mention that there were only three site staff performing the required supervision duties.

4.30 The Select Committee notes that the records of the final set data, on which the signature of QCE/TCC appeared, were submitted for checking by ACW/TCC two months after completion of the final set. The Select Committee was not given a convincing reason for the late submission of the piling records. The Select Committee, however, notes from evidence given to the Court that ACW/TCC and Franki (B+B)'s site staff developed cordial relationship after having lunches and sometimes dinners together [19]. Evidence given to the Court also showed that when ACW/TCC was confronted with irregularities or discrepancies, he handled the matter leniently. ACW/TCC admitted to the ICAC officers that he knew Franki (B+B) had amended some of the final set records and the length of some piles in Block 1 were not exactly as what was recorded, probably short by 1 to 2 m [20].

Load tests

4.31 To ensure that driven piles had sufficient strength to withstand the maximum working load, 1.2 % of the piles must be load tested according to the Specification of TCC. According to the Site Inspection Manual, the piles considered to have comparatively low bearing capacity and/or defects were normally selected for static load tests [21]. JMK recommended that two load tests should be carried out for each wing and core of the blocks. In supervising the load tests, the site staff were required to monitor the readings round the clock. In the TCC project, of the 297 piles for Block 1, only three piles were selected for static load tests. PSE/TCC claimed that he had

[19] See pages 5973 to 5978 of the transcript of the video interview conducted by ICAC with ACW/TCC.

[20] See pages 6264 to 6271 and 6286 to 6289 of the video interview conducted by ICAC with ACW/TCC.

[21] Activity 1112(1) of the Engineering Division

selected the piles on the basis of the final set results, PDA test results, borehole data, possible location of hard pans, etc.

Differential settlement

4.32 After working piles had been installed and before the pile caps were cast, it was necessary to verify the piling design and, if needed, undertake remedial measures in accordance with the Specification. One important yardstick was that the differential settlement of piles at the working load between any two adjacent piles within the same building/structure must not exceed 1 in 300 times the distance between the centre lines of the piles. Although the Specification required that the calculations of uneven settlement be based on adjacent piles, according to evidence given to the Select Committee, it was common practice that the calculations were based on a pile next to a borehole. As there were only 15 boreholes in Blocks 1 and 2, out of a total of 591 piles for Blocks 1 and 2, the data of only 15 piles were used for the purpose of calculating differential settlement. The piles selected for measurement were chosen by Franki (B+B). The data and calculations were expected to be incorporated in the RSE Report, which was to be submitted to HYA before the Certificate of Completion could be issued.

Casting of pile caps

4.33 According to the Specification [22], Franki (B+B) was required to submit the working drawings and design calculations for the pile caps to HYA for approval before the commencement of any pile cap works on site. However, the Specification did not expressly state that the design calculations for piling had to be approved before the casting of pile caps. Nevertheless, records show that the design parameters and the differential settlement calculations for the six blocks in TCC had been checked and confirmed by JMK to be in order before the pile caps were cast. By 21 May 1997, all pile caps had been installed.

[22] PS 19.33(1)

Submission of Registered Structural Engineer Report

4.34 On 23 June 1997, Franki (B+B) submitted the draft RSE Report to HYA. Noting that the Report did not incorporate the information as specified in the Specification [23], HYA advised Franki (B+B) to include in the Report the required information, including all piling records and settlement calculations. On 15 July 1997, Franki (B+B) submitted the revised draft RSE Report. On the same day, HYA issued the Certificate of Completion, although it did not endorse the Report until 16 October 1997, after JMK's confirmation on 13 October 1997 that the RSE Report was in order.

4.35 According to a witness, HYA was aware that the RSE Report had yet to be endorsed when issuing the Certificate of Completion. The issue of the Certificate was conditional in that the RSE Report was listed as one of the outstanding items. HYA considered it in order to issue the Certificate of Completion without the RSE Report, since the information contained in the RSE Report had previously been checked and found to be in order. PSE/TCC, nevertheless, requested JMK to check the contents in detail, recognizing that it was the last chance to check the regularity or otherwise of the data included. According to another witness, the practice of issuing the Certificate of Completion before the endorsement of the RSE Report was not uncommon and was acceptable to HD.

4.36 Section 205(6) of the Project Procedures Manual for Public Housing Development Programme (Volume 2), which was in use during the period of the TCC project, stated that the contract manager must issue the Substantial or Partial Completion Certificate as appropriate to the contractor upon satisfactory completion of the works.

[23] GS and PS 19.06

Supervision of works on site

Site supervision by HYA

4.37 HYA relied heavily on its site staff to monitor the progress of works on the site and check the satisfactory completion of each step of work. Notwithstanding the lack of experience of the entire team, none of the site staff received any briefing or training by HD or HYA after appointment to their respective posts. According to evidence, RE/TCC and ACW/TCC were respectively given very short briefings by HYA on their duties when they took up the posts. None of the site staff concerned was aware of the existence of the Acer Report. Except RE/TCC, the other three site staff were not aware of the features of the site, such as the extensive presence of hard pans. ACW/TCC and the two WSs/TCC had little knowledge about the characteristics of PPC piles or the areas they should be alerted to when supervising the driving of this type of piles in a site of complex geological condition. They were not informed of the need for preboring where necessary to drive the PPC piles through the hard pans. Although a copy of the Specification was deposited at the site office, the Select Committee has the impression that ACW/TCC and the WSs/TCC could not fully comprehend the technical contents. Neither could they fully understand the relevant manuals which they were expected to follow, as the manuals were all written in English without Chinese translation. They witnessed the conduct of various tests and works processes as required under the manuals, which included core tests, welding tests, PDA tests, load tests, final set of piles and casting of pile caps, and they signed the relevant forms and records. They, however, did not have sufficient technical knowledge to judge whether the piles passed or failed the tests in accordance with the specified criteria, or whether a particular works process was carried out at the right time. ACW/TCC and the WSs/TCC took turns to witness the driving of piles to final set and signed the relevant inspection forms. Nevertheless, they could not explain to the Select Committee the meaning of each and every column in the inspection forms. Before RE/TCC assumed duty, ACW/TCC was the leader of the resident site staff, and the two WSs/TCC looked up to him for advice and guidance on all matters relating to works.

4.38 At a meeting held with the Liaison Team on 13 September 1996, HYA undertook that PSE/TCC would conduct more frequent site visits and inspections to maintain the quality of site supervision before the arrival of RE/TCC. The site record book shows that PSE/TCC visited the site six times during the two-month period before the assumption of duty by RE/TCC. PSE/TCC first visited the site on 16 October 1996, one month after the piling works commenced. During the initial contract period, PSE/TCC had kept track of the activities at site mainly through telephone contacts with ACW/TCC.

4.39 The Select Committee finds that the availability or otherwise of RE/TCC made little difference to ACW/TCC and the two WSs/TCC on supervision of works at site. They did not understand the role played by or the responsibilities of RE/TCC who should be their leader on site supervision. Notwithstanding the presence of RE/TCC at site and his claim to have provided guidance to the site staff, the WSs/TCC continued to turn to ACW/TCC for advice when they encountered difficulties at work. ACW/TCC seldom sought advice from RE/TCC because, as he said, even if he had done so, he would not have been able to get any guidance from RE/TCC on technical matters. After RE/TCC assumed duty, the two WSs/TCC continued to look up to ACW/TCC for advice, witness the various works processes and tests on their own, with little idea of whether the processes were done properly and at the right time, and whether the piles had passed or failed the tests.

4.40 Notwithstanding that 61 piles for Block 1 and 41 piles for Block 2 had yet to achieve final set when RE/TCC reported duty, the Select Committee notes that RE/TCC had the perception that all the piles for Blocks 1 and 2 had achieved final set by the time he took up the post. He stressed that he was given such understanding by PSE/TCC. However, the piling records which were kept at the site office readily showed the progress of works, and he could have inspected such records. The final set forms for Blocks 3 to 6 which were available, totalling 1,292, did not bear any initial of RE/TCC, although he told the Select Committee that he witnessed the driving of some piles for each of these blocks to final set, and initialled on the final set forms concerned. One of the duties of RE/TCC was to ensure that the execution of works by Franki (B+B) was in compliance with the Contract requirements. Yet RE/TCC was

unsure whether the set of Specification he made reference to was a complete copy and he admitted to the Select Committee that he had only gone through roughly the contents of his copy of Specification. Although the Specification required the driving of piles from the centre piles of a group first, RE/TCC said that he could not monitor the piling sequence because the piles were pitched all over the site, and the sequence of driving of piles could not be observed readily. It appears to the Select Committee that RE/TCC's major concern throughout the project was to minimize and resolve complaints lodged by residents about noise and environmental nuisances.

Inspection of works by the Structural Sub-consultant

4.41 Apart from site supervision by the resident site staff, the Consultancy Agreement also required the Structural Sub-consultant to inspect periodically the structural works on site to ensure that the workmanship and quality of works complied with the Specification. PSD/TCC claimed that he would from time to time ask PSE/TCC about the progress of the project and the submissions made by Franki (B+B) for vetting. He also signed the RSE Report. However, he claimed to have no knowledge of many significant details of the project, including the installation of additional preliminary piles and the sinking of additional drillholes by Franki (B+B) from March to June 1997. During the course of the Contract, PSD/TCC visited the site twice to attend site meetings. He told the Select Committee that PSE/TCC had never raised with him any technical difficulties in the project.

4.42 The Select Committee notes that PSE/TCC handled technical matters by himself although he had not had any experience with PPC piles prior to the TCC project and he only learnt the characteristics of this type of piles during the course of the works. However, he told the Select Committee that all ongoing correspondence by him were vetted by PSD/TCC prior to issue and the latter was fully informed about the installation of additional preliminary piles. During the course of the Contract, PSE/TCC conducted 16 site inspections. The site record book shows that out of his 16 visits to site, seven coincided with site meetings with the Liaison Team, Franki (B+B) and the site staff. It is difficult to quantify the extent of inspection of works by PSE/TCC at site on those occasions.

Inspection of works by the Geotechnical Sub-consultant

4.43 The Consultancy Agreement also required the Geotechnical Sub-consultant to inspect periodically the geotechnical works on site to confirm the validity of geotechnical design assumptions. The Select Committee notes from a letter dated 22 December 1995 from JMK to HYA that the fees payable by HYA to JMK for the job did not include full-time supervision during construction. According to a letter dated 1 August 1996 from JMK to HYA, JMK would provide services in the "project design" and "contract document" stages. JMK stressed to the Select Committee that under its agreement with HYA, its scope of service did not extend to the construction stage.

4.44 HYA, on the other hand, explained to the Select Committee that JMK had to provide services throughout the construction of the foundations. According to the Director of HYA, the construction stage described in the Consultancy Agreement referred to the construction of the superstructure. In other words, construction of foundation fell within the stages before the construction stage. This, however, was not the understanding of JMK, which regarded "construction" stage as actual construction works, be it foundation or superstructure. As the matter is a subject of dispute between JMK and HYA, the Select Committee does not intend to comment on the respective responsibilities of JMK and HYA in the supervision of geotechnical works on site. Nevertheless, under the Consultancy Agreement, HYA was to be responsible for the work undertaken by its sub-consultants.

4.45 Records show that JMK attended the initial contract meeting on 11 September 1996. According to the Work Record Diary, the Project Geotechnical Engineer of JMK visited the site twice together with PSE/TCC during the early construction period. Design parameters for the piling works adopted by Franki (B+B) and all data relating to settlement calculations were forwarded by HYA to JMK for comments. HYA also consulted JMK on the locations of the preliminary piles proposed by Franki (B+B). Towards the end of the Contract, JMK commented on the draft RSE Report and the final RSE Report. JMK wrote to HYA on 13 October 1997 to confirm that it had checked the final RSE Report in detail and found it to be in order. It appears

that JMK carried out its work purely on the basis of the data/records forwarded to it. No in-situ verification of data was conducted.