MTR Corporation Limited

Shatin to Central Link –
Tai Wai to Hung Hom Section

Conservation Plan
for the Old Pillbox
at the former Tai Hom Village site

(March 2013)

Verified by: Tom Chapman T.S. Chapm

Position: Independent Environmental Checker

Date: 14/3/2013

MTR Corporation Limited

Shatin to Central Link –
Tai Wai to Hung Hom Section

Conservation Plan
for the Old Pillbox
at the former Tai Hom Village site

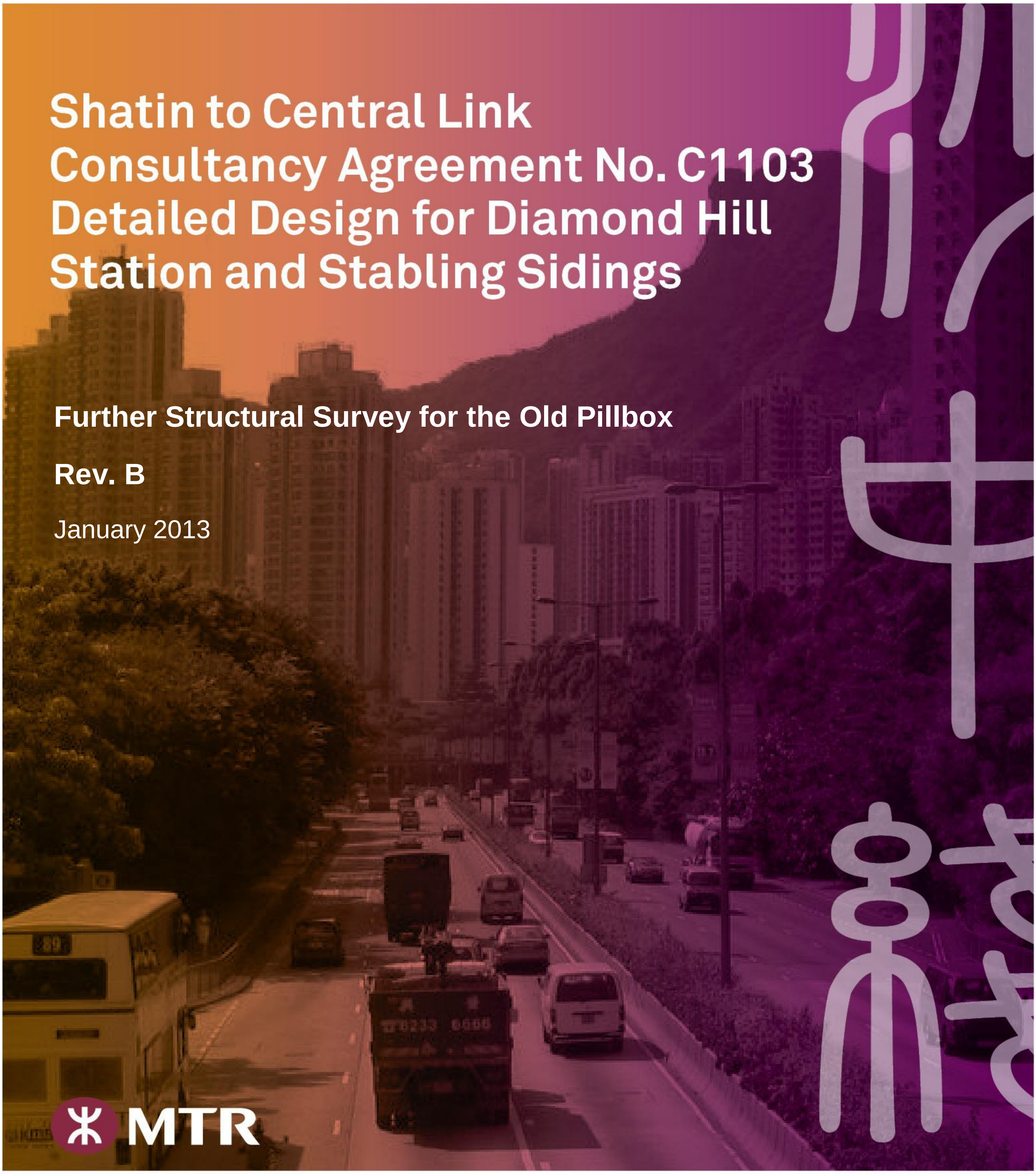
(March 2013)

Certified by: Richard Kwan R Kwan

Position: Environmental Team Leader

Date: 18 Mar 2013

AECOM



Shatin to Central Link
Consultancy Agreement No. C1103
Detailed Design for Diamond Hill Station and Stabling Sidings

Further Structural Survey for the Old Pillbox

Rev. B

January 2013

MTR

MTR Corporation Limited

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Date	Rev.	Prepared		Checked		Approved	
Nov 2012	A	SPC		HLHK		IMW	
Jan 2013	B	SPC		HLHK		IMW	

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1. INTRODUCTION

1.1 Background

1.1.1 The Shatin to Central Link (SCL) is one of the ten large-scale infrastructure projects announced by the Chief Executive in his 2007-2008 Policy Address. In mid-2008 the Executive Council requested the Corporation to proceed with further planning and design for this line. The Preliminary Design of the SCL was substantially completed in December 2009.

1.1.2 In January 2010, the MTR Corporation employed AECOM Asia Company Limited to undertake the Detailed Design for Consultancy Agreement C1103 – Diamond Hill Station and Stabling Sidings, including: an integrated KTL/SCL station, Diamond Hill Station (DIH), occupying part of a vacant Comprehensive Development Area (CDA) site; the semi-underground Diamond Stabling Sidings (DHS) with property development above, also on the CDA site; and modifications to Pat Heung Depot, all to suit commissioning of the East West Line (EWL) of SCL. The design of pedestrian links at Tsz Wan Shan is also included, although the Links are not part of SCL Project.

1.1.3 In March 2011, the Corporation identified the opportunity to provide part of the stabling facilities for SCL-EWL at the disused freight yard at Hung Hom. The proposed Hung Hom Stabling Sidings (HHS) is located at the east of the existing Hung Hom Station (HUH), with the sidings occupying the yard area formerly used for freight operations.

1.1.4 The “Cultural Heritage Impact” from the EIA Study for Tai Wai to Hung Hom Section recommended that the Old Pillbox would be moved in one piece; and the Former Royal Air Force Hangar would be dismantled and reassembled in some form.

1.1.5 It is a requirement that any proposal for dismantling and partial reassembly of heritage structures must be fully justified from the perspective of heritage preservation, with due considerations from the practicability of retaining/reusing the existing members/ components/materials.

1.1.6 A *Working Paper on Proposal for the Heritage Structures* was subsequently submitted to AMO in August 2010, which had provided more detailed justification on the relocation and reinstatement proposals from the heritage preservation view point, with due consideration given to the discussion and recommendations with AMO.

1.1.7 While the Working Paper has outlined the approach for preserving the heritage structures in line with principles agreed with AMO, the final schemes will depend on the ultimate users / maintenance bodies for these structures, who may impose specific requirements to suit their operation and maintenance needs.

1.1.8 Condition survey and structural investigation on the heritage structures should have commenced to collect more information for completing the preservation and reinstatement proposals. Following the conduction of an asbestos containing materials (ACM) survey by an independent consultants of MTR in March 2010, suspect ACM were found in the Former Royal Air Force Hanger. The Asbestos Investigation Report (AIR) and a draft Asbestos Abatement Plan (AAP) were forwarded to RDO in August 2010 for submission to EPD on behalf of Lands Department. Pending the completion of any asbestos abatement works as required by EPD, condition survey and structural investigation on the structure are to be arranged.

1.1.9 As no suspect ACM was found within the Pillbox, structural investigation on the Pillbox in the form of trial pit and core sampling and testing was conducted in July 2010. Proposed method statement for the investigation and reinstatement was submitted to AMO for agreement prior to carrying out the actual site works.

1.2 Scope of this Report

1.2.1 The purpose of this Report is to present the outcome of the structural investigation, based on which an appraisal on the existing structural and foundation conditions of the Pillbox is given.

1.2.2 An initial recommendation for relocating the Pillbox showing the design intent is provided, which shall be further developed pending a detailed geometric survey on the Pillbox and further study and review on method of construction, temporary support, transportation and storage.

1.3 Report Structure

1.3.1 This Report is structured as follows:

- Chapter 2: Summary of Findings of the Factual Investigation Report

  Provides a summary of the findings of investigation, materials testing results and critical geometric information as presented in the investigation report prepared by MTR’s term contractor.

- Chapter 3: Structural Appraisal

  Provides a qualitative assessment on the overall structural strength and conditions of the Pillbox, the anticipated form of construction and an estimation of its weight.

- Chapter 4: Geotechnical Appraisal

  Provides an assessment on the existing foundation and soil conditions of the Pillbox.

- Chapter 5: Initial Recommendation for Relocating the Pillbox

  Provides an initial recommendation on the method to underpin and remove the Pillbox, lifting and transportation, and means to safeguard its structural stability and integrity during the relocation.

- Chapter 6: Way Forward

  Provides conclusions and recommendations, and an outline of further work to be carried out in accomplishing the preservation and relocation proposal.

2. SUMMARY OF FINDINGS OF THE FACTUAL INVESTIGATION REPORT

2.1 Scope of Investigation

2.1.1 The purpose and scope of the structural investigation is to assess the materials used in the construction of the Pillbox, their current conditions, the possible form of construction and the existing foundation, soil conditions and any possible underground features. This information is necessary as input to the design of temporary measures required for the proposed removal, transportation and possible reinstatement of the Pillbox from its current location to an ultimate location where it is proposed to be preserved. It also serves to collect useful information required for the documentation and record of condition as part of the preservation process.

2.1.2 It was proposed to extract a total of 4 no. of core samples that would go through the full thickness of the elements being sampled; two located on the wall of the Pillbox, one on the roof dome and one through the base slab. 4 no. trial pits were proposed adjacent to the Pillbox to expose the side wall and foundation details, and to identify the soil materials. Two of them served also for taking the core samples through the wall of the Pillbox.

2.1.3 To safeguard against possible damage to the Pillbox during any part of the investigation, method statement for the investigation and reinstatement as well as precautionary measures as agreed by AMO were stipulated for the investigation contractor to observe and comply.

2.1.4 Scope of the investigation and method statement are included in **Appendix A**.

2.2 Structural Investigation

Concrete Block Wall

2.2.1 Two core samples were taken at two wall locations. However, due to the geometry of the hollow blocks, sufficient length of intact sample was not available for a standard compression test to determine the concrete strength of the structural component. An alternative test was carried out to test the strength of the complete hollow block using the two spare components found outside the Pillbox.

2.2.2 The compression test on the two hollow block samples revealed that their crushing strength are 13.8 MPa (2,000 psi) and 20.0 MPa (2,900 psi) respectively.

Reinforced Concrete Roof Slab

2.2.3 One concrete core sample was taken from the reinforced concrete roof slab for testing. The results revealed that the crushing strength of the core sample is only 6.5 MPa (940 psi). In addition, it should also be noted that there may be some deviation in the core test result due to the following:

- The size of core specimen cannot comply with the standard requirement due to the actual site constraints.
- The failure load of the roof specimen is lower than the minimum calibrated range of the compression machine 50kN.

- The sampling size is too small and cannot meet the rate of sampling concrete as stipulated from the building regulation. Thus the result of this isolated test is not conclusive to establish the concrete strength.

2.2.4 The surface of the roof was scanned by cover meter randomly. The result revealed that the roof slab is reinforced with re-bars of irregular spacing ranged between 160mm to 340mm in orthogonal directions.

Reinforced Concrete Base Slab

2.2.5 One concrete core sample was taken from the reinforced concrete base slab for testing. The core test result shows that its crushing strength is 13.5 MPa (1,960 psi).

2.2.6 The surface of the base slab was again scanned randomly by cover meter. The result revealed that the portion of the base slab next to the core hole S1 is reinforced with re-bars of irregular spacing ranged between 155mm to 210mm in orthogonal directions.

2.3 Trial Pits

2.3.1 Four trial pits were carried out adjacent to the four sides of the Pillbox to investigate the soil condition, to expose the side wall and foundation of the Pillbox for visual inspection, and to facilitate taking core samples at the wall. The location of the trail pits is shown on **Drawing No. 1106/K/301/ACM/C01/005** included in **Appendix E**.

2.3.2 According to the trial pit records, in general, the Pillbox is underlain by a thin layer of about 0.1m thick top soil comprising mainly soft, sandy silt. Below the top soil is a layer of fill with thickness varies from 0.2m to 1.5m. This fill mainly consists of dense, silty fine to coarse sand with occasional angular fine to coarse gravel sized quartz fragment with some decayed plant piece and occasional plastic fragments. Occasional pockets of fill comprise of loose, silty sand and firm, clayey sandy silt is also encountered. Below fill is alluvium comprise of stiff, moist, brown, clayey sandy silt. At least 300mm thick alluvium was found below the base slab of the Pillbox.

2.3.3 No seepage of water was observed in the trial pits during excavation. Several utilities / features were found in the trial pits and summarized as follows:

- A PVC pipe with diameter of about 50mm was encountered at trial pit no. 11202/SCL/TP154 just below the ground.
- Two cables with diameter of about 25mm were located in trial pit no. 11202/SCL/TP157 at about 0.7m and 0.9m below ground level and two HKTC PVC pipes were also encountered in the pit at about 1.15m below ground level.
- A concrete pipe with diameter of about 170mm connected to the Pillbox was encountered in trial pit no. 11202/SCL/TP156 at depth of about 1.1m below ground level.
- Concrete blocks were recorded in trial pit no. 11202/SCL/TP155 at about 0.2m below ground level with thickness about 0.25m.
- A concrete slab (about 0.1m thick) possible previous pavement was encountered at trial pits no. 11202/SCL/TP155 and TP157 at about 0.1m below ground level.

2.3.4 Block samples were taken at depth 0.5m below ground level in each trial pit. Laboratory testing was carried out to determine the following properties of soil:

- Density of soil (by linear measurement method);
- Moisture content of soil;
- Atterberg limits of soil;
- Particle size distribution of soil;
- Particle density;
- Dry density/moisture content relationship of soil;
- Chemical content of soil.

2.3.5 The results of the laboratory testing are summarized in the **Tables 2.1 and 2.2** below:

Table 2.1 Summary of result of density, moisture content, atterberg limits and particle density of soil

Trial Pit No.	Bulk Density Mg/m³	Dry Density Mg/m³	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index %	Particle Density Mg/m³
11202/SCL/TP154	2.01	1.74	14	41	20	21	0.238	2.64
11202/SCL/TP155	1.83	1.68	8.8	38	21	17	0.076	2.63
11202/SCL/TP156	1.72	1.56	11	44	22	22	0.032	2.64
11202/SCL/TP157	2.03	1.75	17	48	23	25	0.260	2.64

Table 2.2 Summary of result of particle size distribution of soil

Trial Pit No.	Sample Depth	Materials	Clay %	Silt %	Sand %	Gravel %
11202/SCL/TP154	0.5m b.g.l	Fill/Alluvium	29	11	59	1
11202/SCL/TP155	0.5m b.g.l	Fill	10	8	67	15
11202/SCL/TP156	0.5m b.g.l	Fill	19	11	61	9
11202/SCL/TP157	0.5m b.g.l	Fill	30	11	56	3

2.3.6 Determination of Dry Density / Moisture Content relationship of soil test was carried out in fill material sampled at 0.5m depth at trial pit no. 11202/SCL/TP155. Result shows that the maximum dry density is 2.03 Mg/m³ and optimum moisture content is 9.1%.

2.4 Factual Investigation Reports

2.4.1 Copy of the Final Fieldwork Report of Pillbox at Diamond Hill and Final Report on Laboratory Testing - Pillbox at Diamond Hill prepared by the investigation contractor are included in **Appendix B**.

3. STRUCTURAL APPRAISAL

3.1 Form of Construction

3.1.1 The Pillbox consists of a semi basement with its base slab sunken around 0.95m to 1.35m below existing ground. The maximum height of the roof is around 2.2m above existing ground and the maximum clear headroom inside is around 2.5m. The structure is composed of a dome shape reinforced concrete roof of thickness varies from 480mm to 580mm. The dome merges into a flatter roof at the entrance of the stair. The roof is supported by hollow concrete block wall of various thicknesses ranged between 665mm to 730mm around the perimeter of the Pillbox. The dome shape profile of the roof enables the roof slab to span with arching effect against vertical loads. The hollow block wall provides the lateral stability and vertical support to roof of the Pillbox and also acts as the basement wall to retain the underground soil. The circular layout of the Pillbox enables the wall to have some arching effect against lateral load. This wall rests on a reinforced concrete base slab of thickness varies from 120mm to 380mm.

3.2 Overall Strength and Conditions of Pillbox

3.2.1 A superficial and visual inspection has been carried out and it is found that the Pillbox is in fair condition in general with no sign of distress. There is spalled concrete at some spots on the roof, and reinforcement is exposed at these areas. Based on the testing results of samples taken from the structural elements and visual observations, a qualitative assessment of the anticipated strength of each structural element is discussed below.

Concrete Block Wall

3.2.2 The compression test on the two hollow block samples revealed that their crushing strength are 13.8 MPa (2,000 psi) and 20.0 MPa (2,900 psi) respectively. In accordance with the LCC By Law 1952, the crushing strength of loading bearing concrete block should achieve 750psi minimum for concrete to be for structural use. Therefore the strength of the hollow blocks is found to be qualified for load bearing elements.

3.2.3 However, from the opening up trial pit inspection, there is no evidence or trace of mortar between concrete blocks. The concrete blocks may have been dry packed together or the mortar has been washed away with time. There is not enough information to assess the strength of wall as the mechanism of concrete block wall rely on interaction between concrete blocks and mortar.

Reinforced Concrete Roof Slab

3.2.4 The crushing strength of the core sample taken from the concrete roof slab is only 6.5 MPa (940 psi) which is considered weak even in the Fifties. In accordance with the LCC By Law 1952, the crushing strength of the weakest concrete for structural use is Grade III (1:2:4) ordinary mix and the required crushing strength is at least 2,250 psi. Therefore, the crushing strength of the coring samples indicates that the concrete of the Pillbox does not satisfy the minimum strength for structural concrete.

3.2.5 Though surface scanning by cover meter revealed the presence of reinforcement bars in the roof slab, the actual strength of the reinforced concrete slab cannot be ascertained as there is not enough evidence on the reinforcement size and no test on the reinforcement strength was made.

3.2.6 Nevertheless, based on the limited structural information collected during the investigation together with some reasonable assumptions, an analytical assessment on the structural capacity of the dome shape roof has been performed (Details refer to **Appendix C**). The advantage of the arching effect can be easily demonstrated by comparing the modelling results of the roof as a flat roof of the same span. It is found that the moment on the flat roof will easily exceed the moment capacity of the roof. However, with a dome profile, the bulk of the roof is subject to compression while the perimeter of the roof is subject to tension. The magnitude of the tension is very small, and should be easily taken if there is minimal reinforcement provided in the perimeter ring as evidenced during the investigation. The moment on the roof together with the beneficial effect of a small compression due to the dome profile roof is barely within the estimated capacity of the roof slab with assumption in reinforcement size and strength to the prevailing code.

Reinforced Concrete Base Slab

3.2.7 The compression test result on the core sample taken from the concrete base slab shows that its crushing strength is 13.5 MPa (1,960 psi) which is about 13% lower than the Grade III concrete of the Fifties.

3.2.8 Though surface scanning by cover meter again revealed the presence of reinforcement bars at the portion of the base slab next to the core hole S1, it is imprudent to assess the strength of this base slab solely according to these core test and reinforcement scanning results for the similar reasons mentioned.

3.2.9 The base slab is believed to be a slab on grade. It also acts as a footing for the concrete block wall. The estimated soil bearing pressure is around 50kPa (Details refer to **Appendix D**), which is still barely within the bearing capacity in case it is resting on a very loose stratum.

3.3 Weight Estimation

Methodology of measurement

3.3.1 The overall and inside dimensions of the Pillbox were taken during the site inspection using measuring tape and other simple tools, or derived from the basic surveying measurements. The thicknesses of the roof slab, base slab and concrete block wall were measured through the cored holes where samples had been taken, the number of which being limited as destructive tests on the Pillbox should be kept minimal. Additional measurements on the thicknesses of the base slab were taken at the trial pits locations where the base slab was exposed. The configuration of the Pillbox together with its approximate dimensions and structural sizes thus measured and estimated are shown on **Drawing No. 1106/K/301/ACM/C01/005** included in **Appendix E**.

Principle of Weight Estimation

3.3.2 The above measurement takings revealed that the roof slab, base slab and concrete block walls are not of uniform thickness. To compensate the deficiency in the limited number of readings taken and the precision of the measuring tape used, it is desirable to use the upper bound readings of each element for weight estimation. The summary of the weight estimation and its breakdown is shown in **Appendix E**.

4. GEOTECHNICAL APPRAISAL

4.1 Existing Founding Conditions

4.1.1 Based on the trial pit records, the base slab of the Pillbox is basically founded on fill and alluvium materials. Trial pit nos. 11202/SCL/TP155 and TP157 revealed that it is founded on fill and the thickness of fill below the base slab is about 120mm. Trial pit nos. 11202/SCL/TP154 and TP156 showed that it is founded directly on alluvium with thickness of at least 300mm.

4.1.2 Based on the particle size distribution of soil test result, variation of fill material occurs in the study site and pocket of sandy silty clay fill is present.

4.1.3 No seepage of water was recorded during the trial pit excavation. Based on the available groundwater monitoring records, the measured highest groundwater level in the vicinity is up to about +9mPD which is at about 1.5m below the base slab of the Pillbox. The founding stratum is believed to be intermediate between dry and fully submerged. Moreover, seasonal fluctuation of water level may occur and the ground water level may higher than the excavation for underpinning works for relocation of the Pillbox.

5. RELOCATION OF THE PILLBOX

5.1 Strengthening and Temporary Bracing / Support

5.1.1 An empirical check on the Pillbox structure using the current Hong Kong wind code reveals that there is no stability problem in terms of overturning of the Pillbox. The dead weight imposed on each concrete block is heavy enough to prevent the individual block from uplifting due to wind effect even though there is no mortar between blocks. The maximum compressive stress on the block is less than 0.4MPa (58 psi) which is much less than the minimum crushing strength 750 psi of load bearing hollow block in accordance with the LCC By Law 1952. However, due to the unknown properties of the concrete, reinforcement and concrete blocks, it is recommended that strengthening work of the Pillbox should be installed to prolong the life of the structure as well as for protection during mobilisation.

5.1.2 The proposed permanent strengthening details are shown on **Drawing no. 1106/T/301/ACM/C21/504**.

5.2 Underpinning

5.2.1 Relocation of the Pillbox by removing the entire structure requires underpinning to support it during transportation. It is proposed to install a steel structure supporting frame underneath its base slab to support the whole Pillbox structure before transporting it to the temporary storage area.

5.2.2 The schematic proposal for installation of the steel structural frame and underpinning works are shown in **Drawing nos. 1106/W/301/ACM/C21/501 to 503**. The 1st layer of the steel frame will be formed by contiguous horizontal pipe piling at about half metre below the base slab of the Pillbox. The 2nd layer will be four steel universal beams at approximate equal spacing. The steel beams at the two edges will be installed by minor open excavation while the intermediate steel beams will be installed by mine tunnelling method (see **Drawing no. 1106/W/301/ACM/C21/501**). Finally the four steel beams will be tied up with another two steel beams above to form a rigid frame structure as shown in **Drawing no. 1106/W/301/ACM/C21/502**.

5.2.3 Before installation of the steel frame, eight pre-bored H-piles shall be installed to provide temporary support for the steel frame. The soil of approximately 2m depth below the steel frame shall be removed upon completion of the steel frame in order to free up working space for preparation of subsequent lifting operation.

5.2.4 Although the trial pit excavation did not reveal existence of cobbles/boulders and presence of utilities at shallow depth, possible obstruction from boulders/ cobbles, utilities and any other artificial hard material that may be encountered during the installation of pre-bored H-pile and steel structural frame cannot be ascertained as the depth of trial pit excavation was only to 1.5m below ground. Further investigation shall be carried out to obtain sufficient information to develop the final underpinning scheme.

5.3 Lifting and Transport

5.3.1 In order to limit the possible deformation during transportation and the resulting stresses imposed on the relatively weak structure of unknown strength, a separate study has been undertaken by an independent consultant VSL Hong Kong Ltd. Mechanically operated lifting jacks are proposed to be installed at the underpinning support platform to raise the structure off its supporting ground, as shown in **Appendix F**. The lifting jacks are evenly distributed along the edge of the platform, and the lifting operation is controlled to ensure the same and uniform movement takes place on all the jacks. In this manner, accidental tilting, unwanted movement and deflection, and vibration and transit stresses possibly induced by conventional crane lifting can largely be eliminated, and hence the risks of damage to the structure can be reduced.

5.3.2 With an appropriate choice of the travelling range of the jacks, the support platform can be raised from its underpinning installed level to the adjacent existing ground level. The structure can then be moved off its original position, either after backfilling the construction pit, or using some form of temporary bridging structure, and be transported to its temporary storage along temporary guide rails. This is illustrated in **Appendix F**.

5.4 Issues and Constraints

5.4.1 The lifting mechanism is subject to height restriction, and its usage will need to be reviewed if the proposed relocation of the Pillbox is underneath the existing Tate's Cairn Tunnel approaches flyover. In addition, the installation of sliding platform and associated guide rails will require significant space for working area which will constrain the station construction activities.

5.4.2 This transportation method has the merit that the entire Pillbox structure is relocated in one piece and no re-assembly is needed. The feasibility of this method shall be verified by the Contractor who shall prepare calculations and method statements to ensure his proposed method will protect the structural integrity of the Pillbox during the transportation operation.

5.4.3 Other potential risks relating to relocating the Pillbox as one whole unit include :

a) The operation is required to hoist a minimum of 120 tonnes.
b) The strengthening work requires substantial preparation.
c) Depending on the final location and the route, the structure has to undergo several direction/gradient changes during the course of relocation. Disjointing and cracking of the concrete blocks can easily occur if any of the movements are not synchronized, particularly when there is no mortar between the block.

5.4.4 Differential deflection of the steel supporting frame shown on **Drawings no. 1106/W/301/ACM/C21/501 and 502** shall be kept to an acceptable limit and shall be stipulated in the Contract for the Contractor to follow in his design and method statement submissions. The general rule L/1500 shall be followed and that the normal block wall can tolerate in the lifting operation. In addition, since no mortar is found between the blocks makes the wall even more susceptible to crack and disjointing during transportation, the steel frame with ring beams shall be of sufficient tightness to minimise deformation.

6. WAY FORWARD

6.1 Summary

Conditions of Pillbox

6.1.1 Based on a superficial and visual inspection on the Pillbox, it is found that the Pillbox is in fair condition as it stands.

6.1.2 In order that minimal damage is caused to the structure, testing and investigation information collected is minimal. The concrete strength of the roof slab and base slab is lower than acceptable even by the standards of the Fifties. This fact, coupled with the lacking in full information on the material properties, can only warrant a qualitative assessment on the anticipated strength of the structure to be made, on the basis of which strengthening works of the Pillbox is recommended for protection during relocation.

6.1.3 The trial pit records and laboratory testing results reveals that the base slab of the Pillbox is in general founded on fill or alluvium in dry condition. Based on the previous monitoring records, the groundwater level may rise to about 1.5m below the base slab.

Transporting the Entire Structure

6.1.4 While a sound engineering solution has been identified as possible for strengthening the Pillbox and enhancing its stability as an integral entity during the relocation process as well as in its prolonged life, the high risks associated with moving the fairly heavy object within a constrained site should not be overlooked.

6.1.5 While all effort shall be put to designing as rigid a base as possible to support the structure during relocation, this is limited by the available equipment and construction method as also related to the physical site constraints. The design of the steel structural frame shall ensure differential deflection due to transit movement is kept to an acceptable level.

6.1.6 Though the Pillbox shows no sign of distress as it currently stands, given the poor state of conditions of the various structural elements/components as revealed by this investigation together with the lacking of sufficient information to carry out a full structural analysis, the possibility of transit stresses induced by the deformation during the transportation should not be overlooked. Any consequential signs of distress, or cracking shall be checked after the relocation and proper remedial works shall be undertaken to reinstate the structure.

6.1.7 The identified solution included in this report shows the design intent only; the anticipated deformation and stresses and the resulting construction risks would very much relate to the ultimate relocation method adopted by the contractor, as well as subject to a detailed geometric survey. Should this option be adopted, it is proposed that the details should be developed as the contractor’s design in association with a heavy weight lifting specialist sub-contractor.

6.2 Way Forward

6.2.1 On the basis of the Pillbox investigation and assessment of the risks of the possible transportation methods, transporting the entire structure is a viable option for relocating the Pillbox.

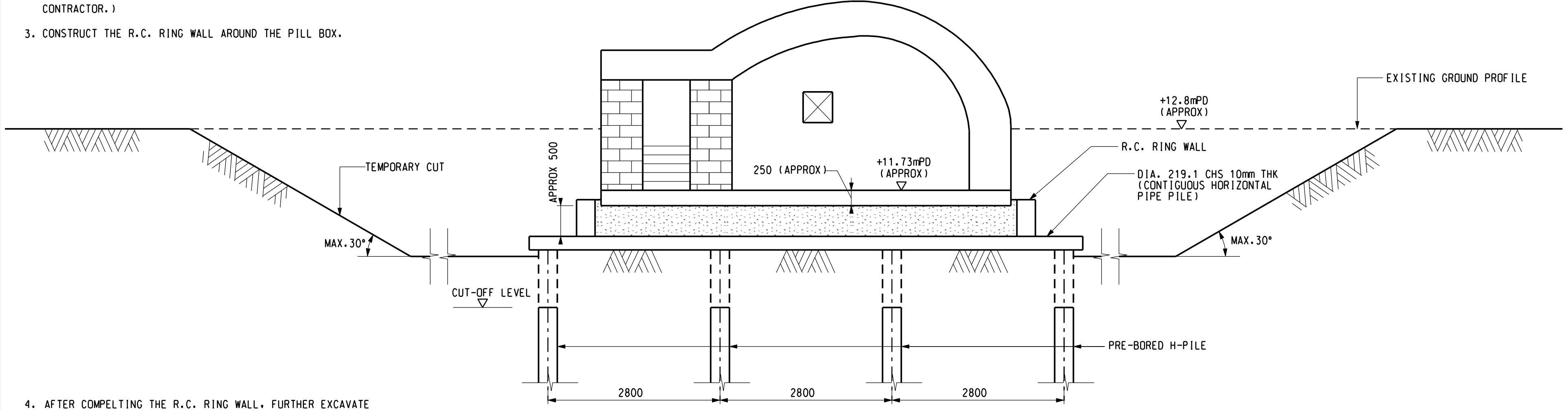
6.2.2 The option to relocate the Pillbox intact in one piece is in line with the on-going discussion with AMO.

6.2.3 It is necessary to carry out detailed survey of the dimensions and geometry of the Pillbox to ascertain its condition and integrity.

Drawings

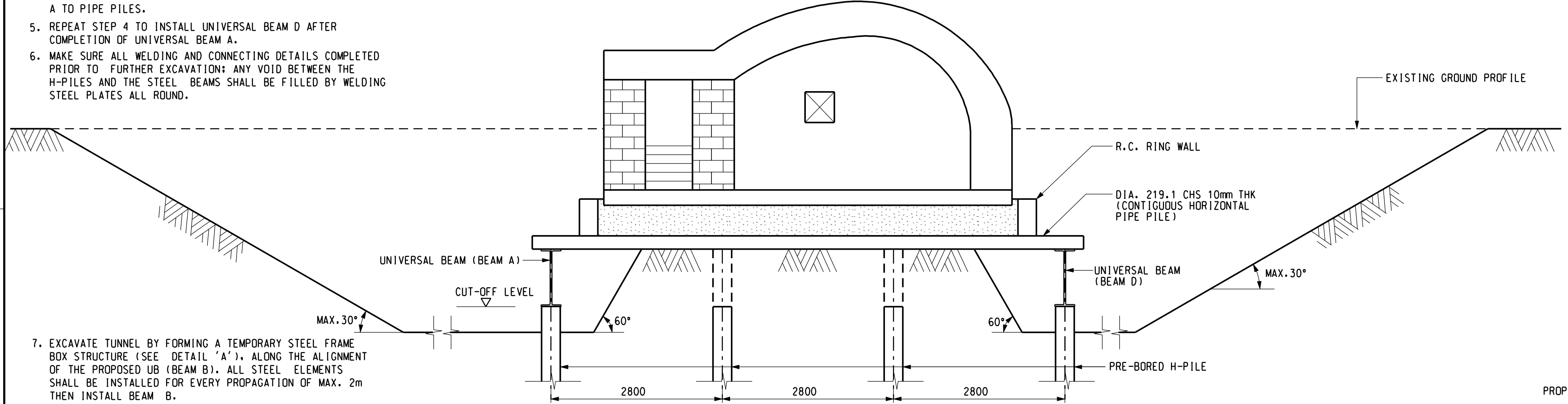
CONSTRUCTION SEQUENCE FOR UNDERPINNING WORKS

1. EXCAVATE DOWN AROUND THE PILLBOX BY FORMING TEMPORARY CUT OF MAX 30° TO PROVIDE ACCESS AND WORKING AREA FOR HORIZONTAL PIPE PILING.
2. INSTALL HORIZONTAL PIPE PILES AND H-PILES(PRE- BORED). TOLERANCE ON HORIZONALITY OF STEEL PIPE PILES SHALL NOT EXCEED 1 IN 100. THE TENTATIVE FOUNDING LEVEL OF H-PILES ARE -30mPD (FOR REFERENCE ONLY. ACTUAL FOUNDATION TYPE & FOUNDING LEVEL TO BE DESIGNED BY THE CONTRACTOR.)
3. CONSTRUCT THE R.C. RING WALL AROUND THE PILL BOX.



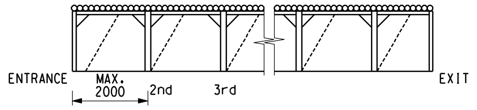
VIEW 1

4. AFTER COMPELTING THE R.C. RING WALL, FURTHER EXCAVATE DOWN UNDERNEATH ALONG THE EDGE OF THE PILL BOX AND EXCAVATE MAX. 1000 INWARD. INSTALL THE REQUIRED UNIVERSAL BEAM (BEAM A) UNDERNEATH AND AT DIRECTION PERPENDICULAR TO THE PIPE PILES. WELD UNIVERSAL BEAM A TO PIPE PILES.
5. REPEAT STEP 4 TO INSTALL UNIVERSAL BEAM D AFTER COMPLETION OF UNIVERSAL BEAM A.
6. MAKE SURE ALL WELDING AND CONNECTING DETAILS COMPLETED PRIOR TO FURTHER EXCAVATION; ANY VOID BETWEEN THE H-PILES AND THE STEEL BEAMS SHALL BE FILLED BY WELDING STEEL PLATES ALL ROUND.



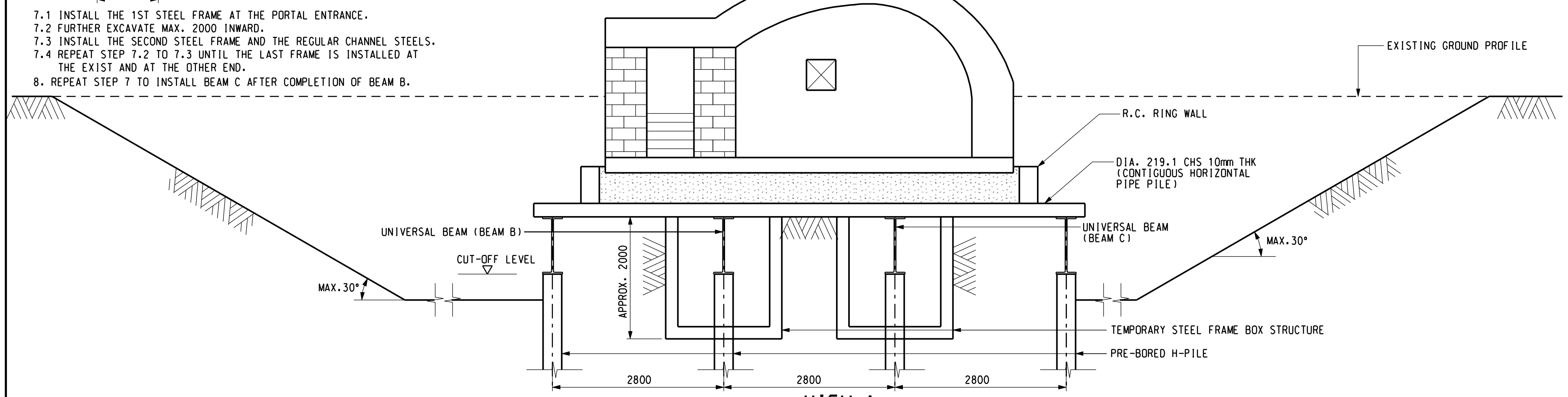
VIEW 1

7. EXCAVATE TUNNEL BY FORMING A TEMPORARY STEEL FRAME BOX STRUCTURE (SEE DETAIL 'A'), ALONG THE ALIGNMENT OF THE PROPOSED UB (BEAM B). ALL STEEL ELEMENTS SHALL BE INSTALLED FOR EVERY PROPAGATION OF MAX. 2m THEN INSTALL BEAM B.



7.1 INSTALL THE 1ST STEEL FRAME AT THE PORTAL ENTRANCE.
7.2 FURTHER EXCAVATE MAX. 2000 INWARD.
7.3 INSTALL THE SECOND STEEL FRAME AND THE REGULAR CHANNEL STEELS.
7.4 REPEAT STEP 7.2 TO 7.3 UNTIL THE LAST FRAME IS INSTALLED AT THE EXIST AND AT THE OTHER END.

8. REPEAT STEP 7 TO INSTALL BEAM C AFTER COMPLETION OF BEAM B.



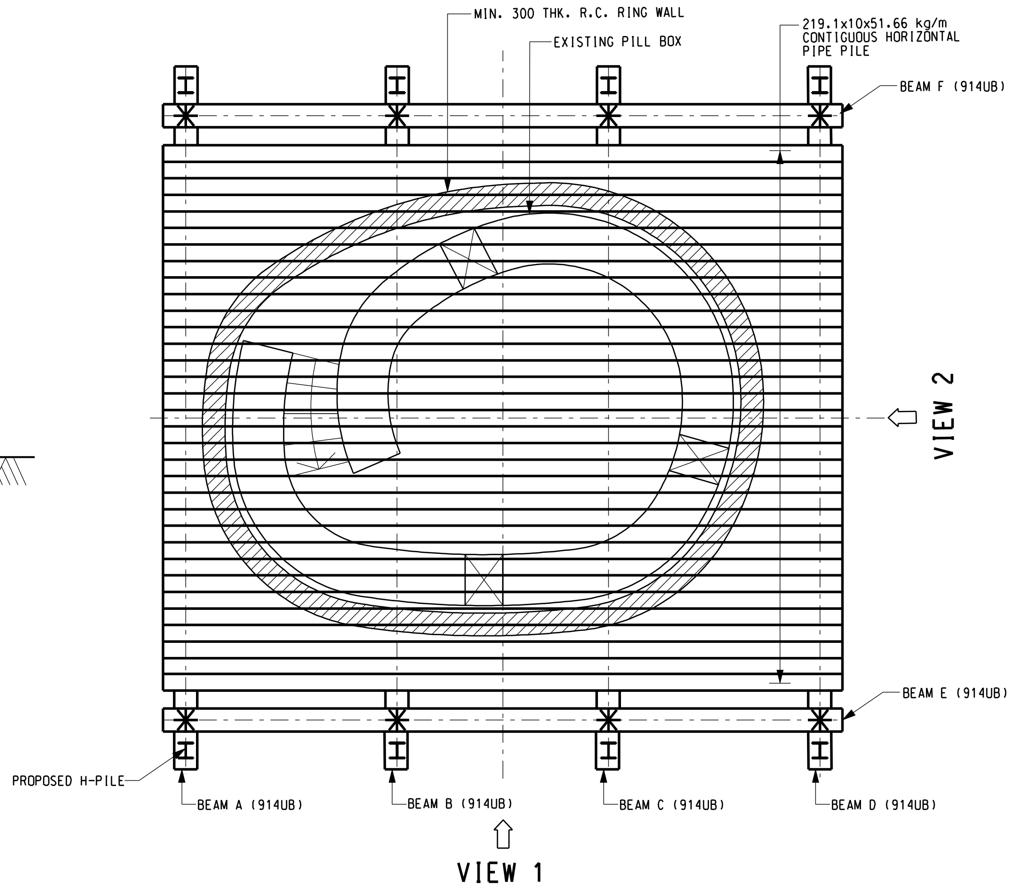
VIEW 1

NOTES:

1. ALL DIMENSION ARE IN MILLIMETER OR OTHERWISE SPECIFIED.
2. ALL LEVELS SHALL REFER TO METERS ABOVE PRINCIPLE DATUM OF HONG KONG.
3. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH DRAWING NO. 1106/W/301/ACM/C21/502 & 503.
4. ALL DIMENSIONS AND LEVELS OF THE EXISTING PILLBOX ARE INDICATIVE ONLY AND SHOULD BE VERIFIED BY THE CONTRACTOR ON SITE.
5. THE PILE PRE-BORING EXERCISE SHALL NOT CAUSE SETTLEMENT TO THE PILLBOX STRUCTURE.
6. DRAWING NOS. 1106/W/301/ACM/C21/501, 502 & 503 SHOW THE SCHEMATIC UNDERPINNING WORKS. ALL MEMBER SIZES, LENGTH AND LEVELS OF THE PROPOSED UNDERPINNING WORKS ARE INDICATIVE AND FOR REFERENCE ONLY. THE DETAILED DESIGN OF UNDERPINNING WORKS SHOULD BE DONE BY THE CONTRACTOR.

LEGEND:

✳ ENVISAGED LIFTING POINT FOR TRANSPORTING THE PILLBOX (INDICATIVE ONLY)



PLAN OF STEEL FRAME AND UNDERPINNING WORKS

FOR INFORMATION ONLY

REV	DESCRIPTION	BY	DATE	APPROVED	REV	DESCRIPTION	BY	DATE	APPROVED
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DRAWN	BCHF
DESIGNED	TCC
CHECKED	AKLN
APPROVED	IMW
DATE	17/DEC/2012

DO NOT SCALE DRAWINGS. ALL DIMENSIONS SHALL BE VERIFIED ON SITE.

MTR

SHATIN TO CENTRAL LINK

ORIGINATOR

AECOM in association with Aedas, MVA and DLS

CADD REF. 1106_W_301_ACM_C21_501A.DGN

TITLE
CONTRACT 1106
DIAMOND HILL STATION
HERITAGE - PILLBOX RELOCATION
UNDERPINNING
(SHEET 1 OF 3)

SCALE N.T.S.

DRAWING NO. 1106/W/301/ACM/C21/501

REV. A

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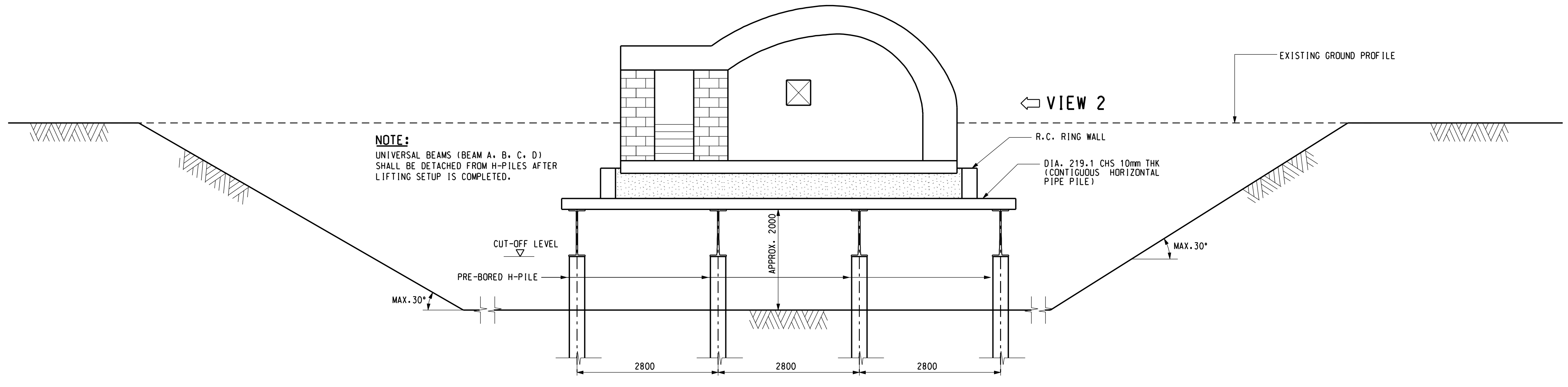
CONSTRUCTION SEQUENCE FOR UNDERPINNING WORKS

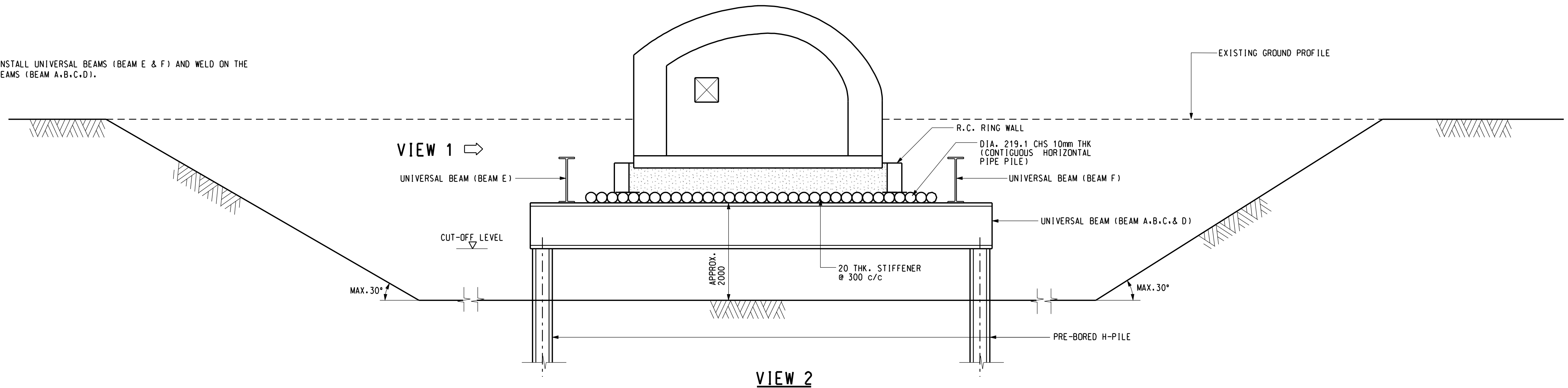
9. EXCAVATE TO THE BOTTOM LEVEL OF THE STEEL FRAME TUNNEL AND REMOVE THE TEMPORARY STEEL FRAME BOX STRUCTURE.
10. FURTHER EXCAVATE DOWN TO APPROX. 2m BELOW PIPE PILE.



NOTE:
UNIVERSAL BEAMS (BEAM A, B, C, D) SHALL BE DETACHED FROM H-PILES AFTER LIFTING SETUP IS COMPLETED.

VIEW 1

11. INSTALL UNIVERSAL BEAMS (BEAM E & F) AND WELD ON THE BEAMS (BEAM A,B,C,D).



VIEW 2

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FOR INFORMATION ONLY

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DRAWN	BCHF
DESIGNED	TCC
CHECKED	AKLN
APPROVED	IMW
DATE	17/DEC/2012

MTR

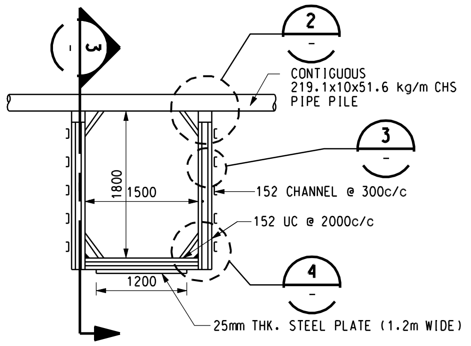
SHATIN TO CENTRAL LINK

ORIGINATOR
AECOM in association with Aedas, MVA and DLS

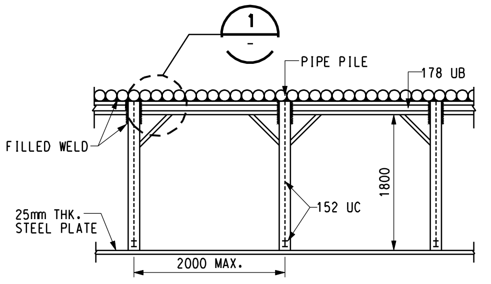
CADD REF. 1106_W_301_ACM_C21_502A.DGN

TITLE
CONTRACT 1106
DIAMOND HILL STATION
HERITAGE - PILLBOX RELOCATION
UNDERPINNING
(SHEET 2 OF 3)

SCALE N.T.S.
DRAWING NO. 1106/W/301/ACM/C21/502
REV. A

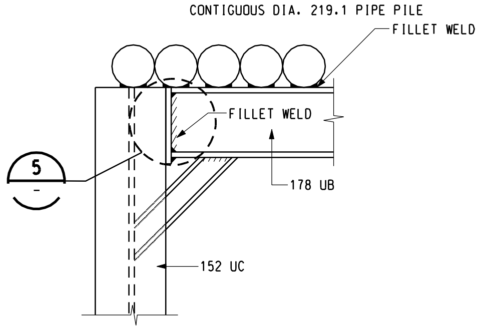


DETAIL A
SCALE N.T.S.

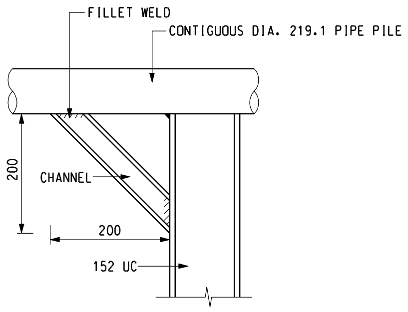


SECTION 3
SCALE N.T.S.

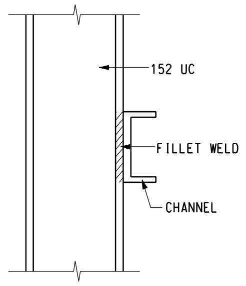
TYPICAL DETAIL FOR THE TEMPRORAY STEEL FRAME BOX STRUCTURE
N.T.S.



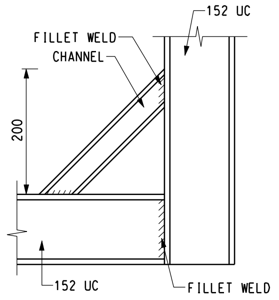
DETAIL 1
SCALE N.T.S.



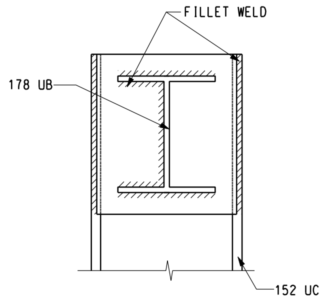
DETAIL 2
SCALE N.T.S.



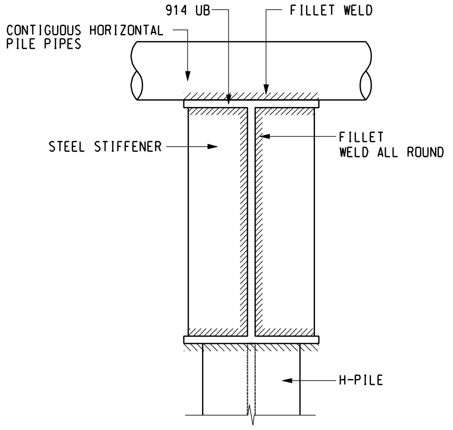
DETAIL 3
SCALE N.T.S.



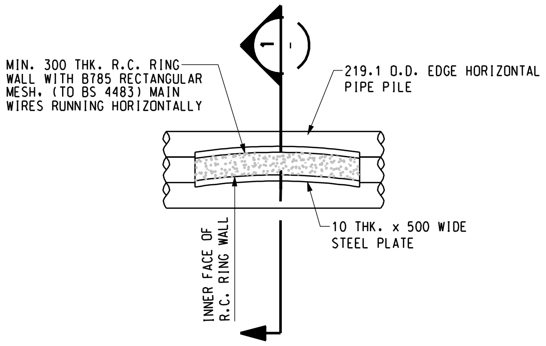
DETAIL 4
SCALE N.T.S.



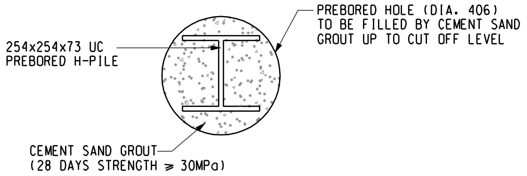
DETAIL 5
SCALE N.T.S.



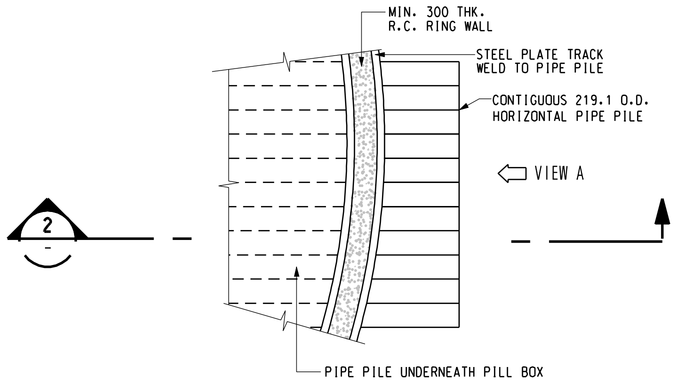
TYPICAL CONNECTION DETAIL BETWEEN H-PILE AND HORIZONTAL U.B.
N.T.S.

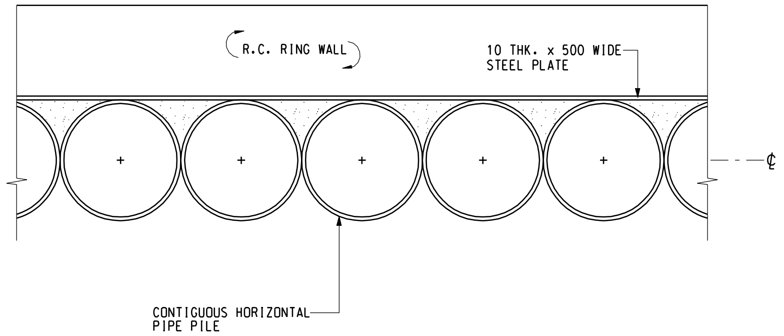


PLAN ON HORIZONTAL PIPE PILES
(MIN. LAP LENGH FOR WIRE MESH = 450mm)
N.T.S.

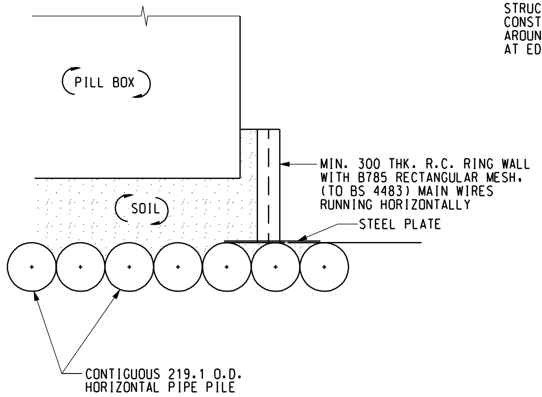


TYPICAL DETAILS OF PREBORED H-PILE INSTALLATION
N.T.S.

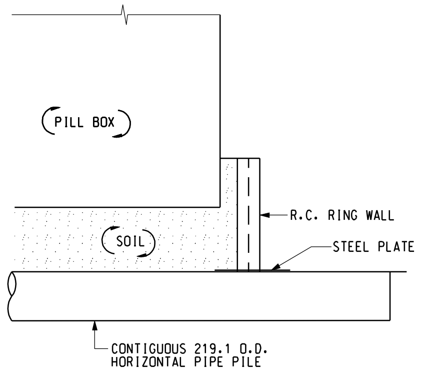




VIEW A
N.T.S.



SECTION 1
SCALE N.T.S.



SECTION 2
SCALE N.T.S.

NOTE:

1. THE RING WALL SHALL BE KEPT AWAY FROM THE PILLBOX STRUCTURE SUCH THAT WELDING OF SHEET PLATE FOR THE CONSTRUCTION OF RC RING WALL WILL NOT DISTURB SOIL AROUND PILLBOX BASE AND THEREBY CAUSING SETTLEMENT AT EDGE OF THE STRUCTURE (SECTION 1 AND 2 REFERS).

FOR INFORMATION ONLY

REV	DESCRIPTION	BY	DATE	APPROVED
A	WORKING DRAWING	AKLN	17DEC12	IMW

DRAWN	BCHF
DESIGNED	TCC
CHECKED	AKLN
APPROVED	IMW
DATE	17/DEC/2012

MTR

SHATIN TO CENTRAL LINK

ORIGINATOR
AECOM in association with
Aedas, MVA and DLS

CADD REF. 1106_W_301_ACM_C21_503A.DGN

TITLE
CONTRACT 1106
DIAMOND HILL STATION
HERITAGE - PILLBOX RELOCATON
UNDERPINNING
(SHEET 3 OF 3)

SCALE N.T.S.
DRAWING NO. 1106/W/301/ACM/C21/503
REV. A

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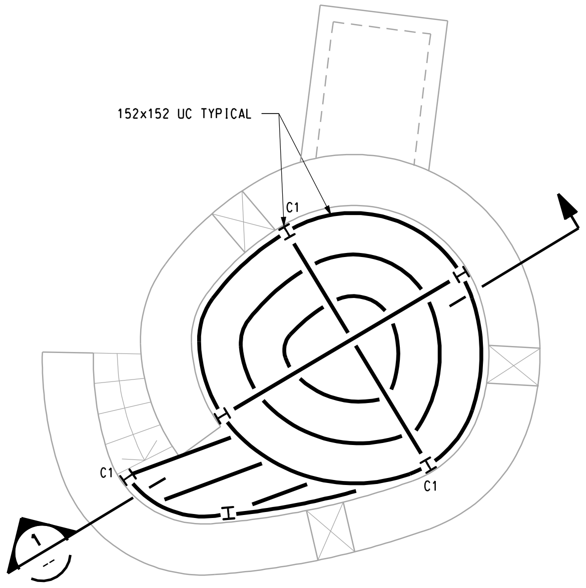
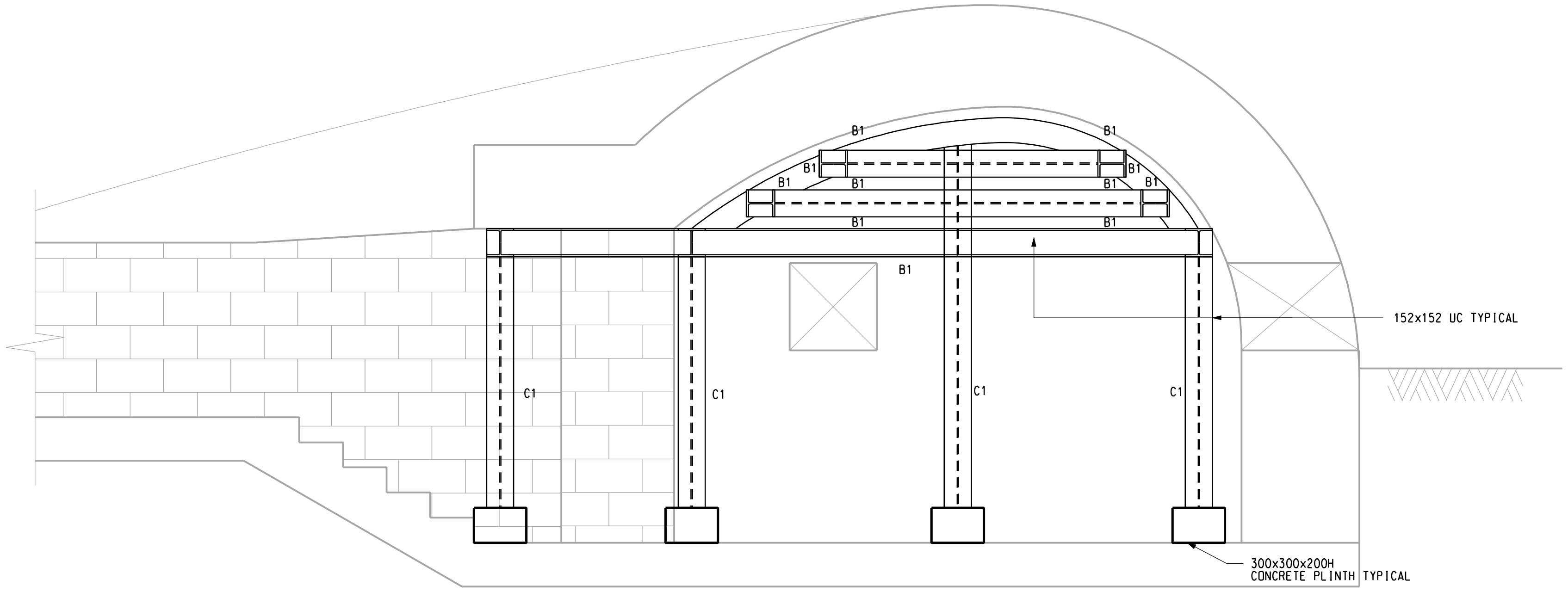


PILLBOX FRAMING PLAN

SCALE 1:50



SECTION 1

SCALE 1:20

--

NOTES:

1. THIS SCHEME INDICATES DESIGN INTENT. THE CONTRACTOR SHOULD DEVELOP HIS OWN DESIGN TO SUIT THE ACTUAL GEOMETRY OF THE PILLBOX AND THE RELOCATION METHOD ADOPTED.
2. GAP BETWEEN PILL BOX AND SPACE FRAME TO BE WEDGED TIGHT.
3. IT IS RECOMMENDED THE PILLBOX STRUCTURE SHALL BE SECURELY PROPPED AND ADEQUATELY SUPPORTED LATERALLY PRIOR TO THE INSTALLATION OF THE TEMPORARY STEEL LIFTING PLATFORM.
4. TIMBER PACKING SHALL BE PLACED TO PREVENT DIRECT CONTACT BETWEEN STEELWORKS AND THE PILLBOX STRUCTURE.
5. LOAD FROM THE STEEL POST SHALL BE SPREAD EVENLY AT THE BASE TO PREVENT EXCESSIVE LOAD ONTO THE EXISTING SLAB.
6. LATERAL LOOP IN STEEL RODS SHALL BE CONSIDERED TO WRAP ROUND THE ROOF DOME TO PREVENT CRACKING OF THE ROOF DUE TO LATERAL MOVEMENT.
7. THE PROPPING AND SUPPORTING WORKS SHALL BE INSPECTED TO ENSURE EFFECTIVENESS PRIOR TO EVERY LIFTING OPERATION.

FOR INFORMATION ONLY

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REV	DESCRIPTION	BY	DATE	APPROVED
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A	ISSUE FOR TENDER ADDENDUM	SPC	24JUL12	IMW

DRAWN	CTJ
DESIGNED	TWF
CHECKED	SPC
APPROVED	IMW
DATE	24/JUL/2012

DO NOT SCALE DRAWINGS. ALL DIMENSIONS SHALL BE VERIFIED ON SITE.

MTR

SHATIN TO CENTRAL LINK

ORIGINATOR

AECOM in association with Aedas, MVA and DLS

CADD REF. 1106_T_301_ACM_C21_504B.dgn

TITLE

CONTRACT 1106
DIAMOND HILL STATION
HERITAGE - PILLBOX
RELOCATION PROPOSED PERMANENT
STRENGTHENING METHOD FOR ENTIRE STRUCTURE

SCALE 1 : 50 @ A1

DRAWING NO. 1106/T/301/ACM/C21/504

REV. B

Appendix A

PROPOSED METHOD STATEMENT FOR ADDITIONAL TRIAL PITS AND STRUCTURAL INVESTIGATION FOR OLD PILLBOX

Proposed Method Statement for Additional Trial Pits and Structural Investigation for Old Pillbox

A) Structural Investigation

The purpose of this additional structural investigation is to assess the materials used in the construction of the Old Pillbox and their condition. This information is necessary as input to the design and planning of temporary measures required for the proposed removal, transportation and reinstatement of the Pillbox from its current location to an alternative location where it can be preserved. It also serves to provide useful information required for the documentation and record of condition and structural component inventory as part of the preservation process.

It is proposed to extract a total of 4 No. of 75mm to 100mm diameter core samples that will go through the full thickness of the elements being sampled. The attached plan shows the locations of the 4 core samples as below:

1. Located on the roof dome within a metre of the intersection with the wall but away from any wall openings as far as possible (R1);
2. Located within a trial pit on the wing wall of the stairs going down to the Pillbox (W1);
3. Located within a trial pit on the wall of the Pillbox (W2);
4. Located in approximately the centre of the base slab (S1).

The coring locations shall also avoid any area with features.

Visual examination of the extracted cores would confirm the thickness of the materials, the actual materials present (e.g. hollow blocks or concrete filled hollow blocks) and their visual condition. Additional testing that could also be performed on the cores if considered appropriate after visual examination would include:

1. Compressive strength;
2. Tensile strength;
3. Cement content;
4. Shell content;
5. Clay lumps/ friable particles;
6. Steel grade;
7. Salt/ chloride content;
8. Petrography;
9. Resistivity;
10. Potential survey;
11. Organic material content;
12. Etc.

In addition to the core sampling to obtain further information on the construction system and as a precautionary measure for the coring, a cover meter survey would be completed over approximately a $1m^2$ surface area at each of the core locations. The cover meter would be expected to identify the presence and position of embedded steel close to the surface e.g. reinforcement bars. Any identified steel would be avoided during the coring and could be separately exposed by hand breakout to access its condition/ purpose in the structure.

Core sampling would be completed in accordance with normal good practice for site coring by a HOKLAS accredited laboratory using a water cooled coring barrel and machine using the following procedure/ work sequence:

1. Select the required core sampling area from the approved sample location drawing;
2. Check that adequate safety measures are in place e.g. temporary support of trial pits;
3. Use cover meter to scan approximately a $1m^2$ area around the core location to check for embedded steel on both the inside and outside face of each location (except the floor slab where only the top surface would be available for cover meter survey);
4. Record the results of cover survey on site proforma and mark any steel locations on the structure using removable white chalk;
5. If steel is identified report for further instructions;
6. Select the precise core location to avoid embedded steel conflicting with both the core barrel and the core machine mounting bolt;
7. Install suitable core machine removable mounting bolts and firmly mount core machine onto structure, with necessary cushion materials / protective layers to protect the surface of the structure; check that the core machine will not move during coring;
8. Connect water and electricity supply to core machine and carefully core through full depth of element being cored;
9. Carefully extract core sample in order to preserve in as intact condition as possible;
10. Mark core clearly to identify location and orientation of the extracted sample. In the event that the core breaks into more than one piece, mark the individual pieces so that they can be easily assembled back into their original position/ orientation to permit examination/assessment;
11. Carefully photograph and measure element thickness and condition within core hole and record on site proforma;
12. After instruction to back fill core holes, fill the core holes with a proprietary non shrink repair mortar to finish flush with surrounding surfaces or as otherwise instructed;
13. Remove the core machine mounting bolts and fill the bolt holes using similar method;
14. Photographic records of each coring location as well as the mounting bolt hole locations shall be taken, both before commencement of coring/mounting and after completion of reinstatement.

The extracted cores shall be retained together with the relevant site proforma and all salient details logged.

B) Trial Pits

4 No. of trial pits are proposed to expose the side wall and foundation details of the Pillbox and identify the soil material against the structure for the planning of relocation. In addition, two of them are also required for taking core samples through the wall of the Pillbox, as noted above. Locations of the proposed trial pits are shown on the attached plan.

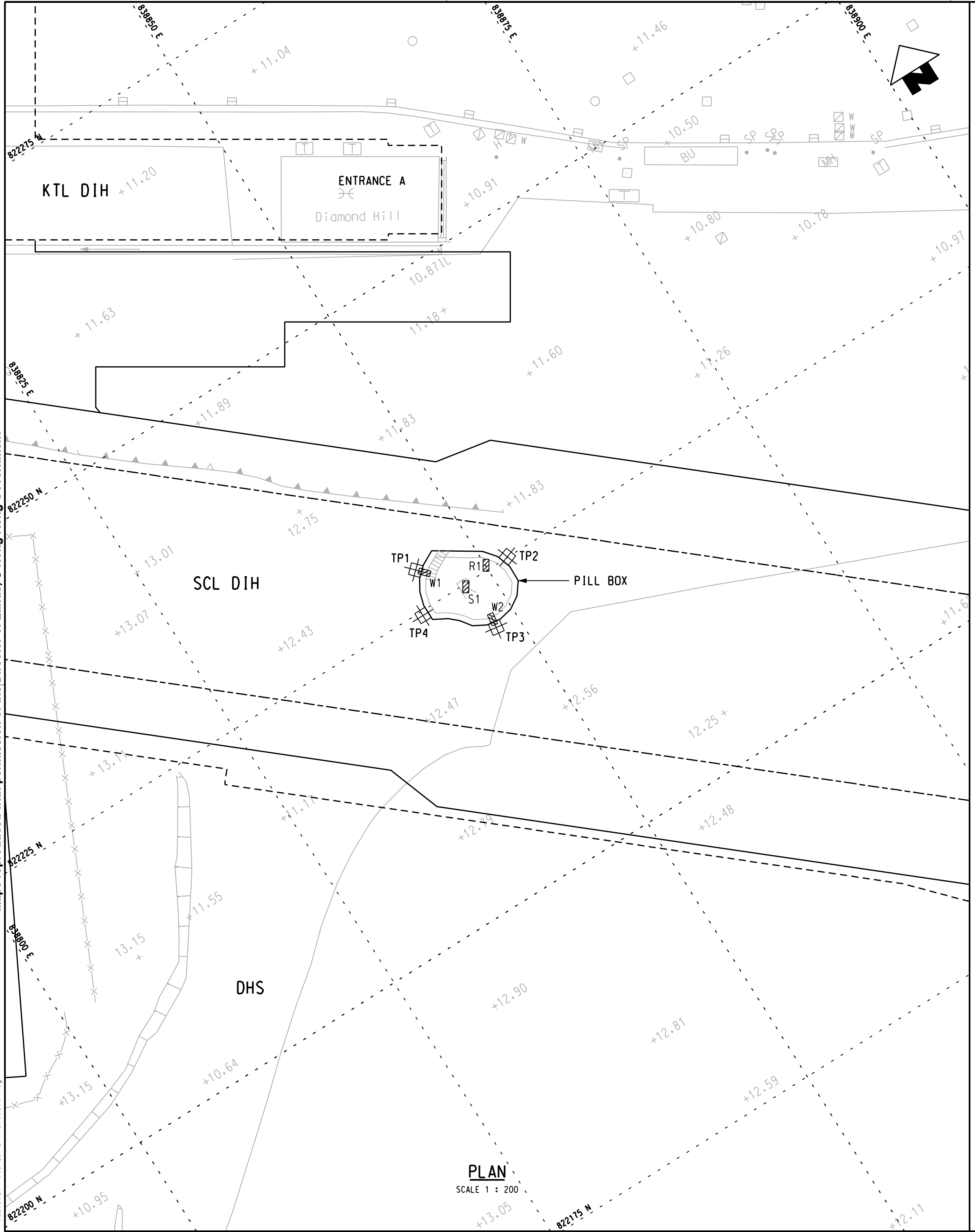
Details of the trial pit and method for excavating the trial pit are as follows:

1. The trial pit size shall not be larger than 1m x 1m on plan.
2. Exact location and size of trial pit to be agreed on site.
3. Depth of trial pit shall not exceed 3m or 300mm below the base of the Pillbox exposed, whichever is shallower, or as instructed by the Engineer on site and agreed with AMO.
4. Sand replacement tests shall be carried out to all trial pits at 0.5m and 1.5m below existing ground and at the base of excavation.
5. Block samples of size not less than 300mm cube at 0.5m depth below existing ground shall be taken for laboratory soil classification testing.
6. When each trial pit has been completed or if an obstruction is encountered and excavation is suspended, the Contractor shall immediately inform the Engineer.
7. Upon instruction by the Engineer, the trial pit shall be backfilled to its former density up to the original ground level. The ground surface shall be restored to its condition prior to the investigation.
8. The proposed trial pit shall comply with MTRC's "Materials and Workmanship Specification for Civil Engineering Works, Section 24 – Part 5: Trial Pitting" unless otherwise specified in this method statement.
9. Logging and photography of each trial pit shall be carried out before and upon completion of excavation approved by the Engineer.

The following precautionary measures shall be observed to safeguard against possible damage to the Pillbox:

1. Prior to the trial pitting, initial condition survey of the Pillbox shall be carried out.
2. The trial pit excavation shall be carried out vertically by hand digging; no mechanical tools shall be used.
3. It is assumed that at least 1m around the Pillbox was backfilled during construction. As the proposed inspection pit size is not exceeding 1m x 1m on plan, it is anticipated that the trial pit excavation would not touch relics. However, if the excavation shows signs of relics, the Contractor shall report immediately to the Engineer.
4. Excavation shall be carried out with due care, particularly during exposure of wall face and base of the Pillbox.
5. The sides of the trial pit excavation shall be adequately supported at all times to ensure the safety of property and of people working in the pits, and to protect any possible damage to the Pillbox.
6. In order to avoid any disturbance to the Pillbox, trial pits shall not be excavated concurrently. The first pit shall be backfilled before commencement of the second pit, etc.
7. The Contractor shall take all necessary measures to prevent ingress of surface water into the trial pit.

8. The proposed trial pitting shall be under full time supervision of a qualified structural engineer for close monitoring and ensuring the stability condition of the Pillbox during the course of works.
9. Backfilling of the trial pits shall be carried out by hand following a method proposed by the Contractor and agreed by the Engineer.



PLAN
SCALE 1 : 200

PROPOSED TRIAL PITS FOR PILL BOX - METHOD STATEMENT

SCOPE OF WORKS

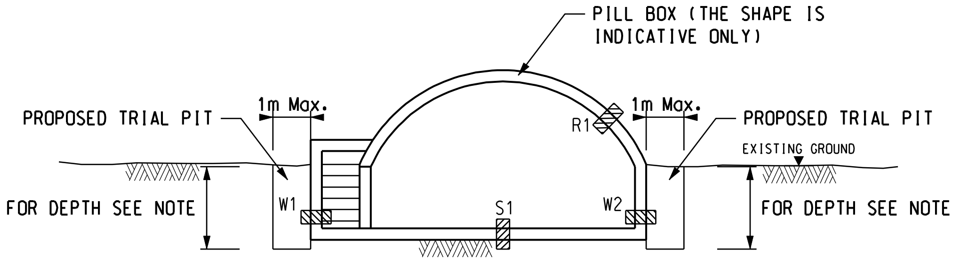
1. FOUR (4) TRIAL PITS ARE PROPOSED TO EXPOSE THE SIDE WALL AND FOUNDATION DETAILS OF THE PILL BOX AND IDENTIFY THE SOIL MATERIAL AGAINST THE STRUCTURE FOR THE PLANNING OF RELOCATION.
2. THE TRIAL PITS SIZE SHALL BE NOT LARGER THAN 1m x 1m ON PLAN.
3. EXACT LOCATION AND SIZE OF TRIAL PITS TO BE AGREED ON SITE.
4. DEPTH OF TRIAL PIT SHALL NOT EXCEED 3m OR 300mm BELOW THE BASE OF THE PILL BOX EXPOSED, WHICHEVER IS SHALLOWER OR AS INSTRUCTED BY THE ENGINEER ON SITE AND AGREED WITH AMO.
5. SAND REPLACEMENT TESTS SHALL BE CARRIED OUT TO ALL TRIAL PITS AT 0.5m AND 1.5m BELOW EXISTING GROUND AND AT THE BASE OF EXCAVATION.
6. TAKE BLOCK SAMPLES OF SIZE NOT LESS THAN 300mm CUBE AT 0.5m DEPTH BELOW EXISTING GROUND FOR LABORATORY SOIL CLASSIFICATION TESTING.
7. WHEN EACH TRIAL PIT HAS BEEN COMPLETED OR IF AN OBSTRUCTION IS ENCOUNTERED AND EXCAVATION IS SUSPENDED THEN THE CONTRACTOR SHALL IMMEDIATELY INFORM THE ENGINEER.
8. LOGGING AND PHOTOGRAPHY OF EACH TRIAL PITS SHALL BE CARRIED OUT UPON COMPLETION OF EXCAVATION APPROVED BY THE ENGINEER.
9. UPON INSTRUCTION FROM THE ENGINEER, BACKFILL THE TRIAL PITS TO ITS FORMER DENSITY UP TO ORIGINAL GROUND LEVEL. THE GROUND SURFACE SHALL BE RESTORED TO ITS CONDITION PRIOR TO THE INVESTIGATION.
10. THE PROPOSED TRIAL PITTING SHALL COMPLY WITH THE MTRC'S "MATERIALS AND WORKMANSHIP SPECIFICATION FOR CIVIL ENGINEERING WORKS, SECTION 24 - PART 5: TRIAL PITTING" UNLESS OTHERWISE SPECIFIED IN THIS METHOD STATEMENT.

PRECAUTIONARY MEASURES AGAINST POSSIBLE DAMAGE

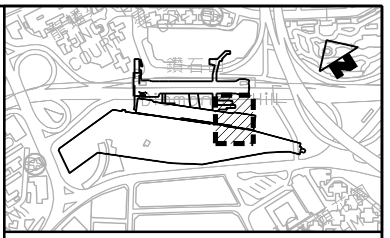
11. PRIOR TO THE TRIAL PITTING, INITIAL CONDITION SURVEY OF THE PILL BOX SHALL BE CARRIED OUT.
12. IT IS SUPPOSING THAT AT LEAST 1m AROUND THE PILL BOX WAS BACKFILLED DURING CONSTRUCTION. AS THE PROPOSED INSPECTION PIT SIZE IS NOT EXCEEDING 1m x 1m ON PLAN, IT IS ANTICIPATED THAT THE TRIAL PIT DIGGING WOULD NOT TOUCH RELICS.
13. THE TRIAL PIT EXCAVATION SHOULD BE CARRIED OUT VERTICALLY BY HAND DIGGING. NO MECHANICAL TOOLS SHALL BE USED.
14. EXCAVATION SHOULD BE CARRIED OUT WITH DUE CARE, PARTICULARLY DURING EXPOSURE OF WALL FACE AND BASE OF THE PILL BOX.
15. THE SIDES OF TRIAL PIT EXCAVATIONS SHALL BE ADEQUATELY SUPPORTED AT ALL TIMES TO ENSURE THE SAFETY OF PROPERTY AND OF PEOPLE WORKING IN THE PITS AND TO PROTECT ANY POSSIBLE DAMAGE TO THE PILL BOX.
16. IN ORDER TO AVOID ANY DISTURBANCE TO THE EXISTING PILL BOX, TRIAL PITS SHALL NOT BE EXCAVATED CONCURRENTLY. THE FIRST PIT SHALL BE BACKFILLED BEFORE COMMENCEMENT OF THE SECOND PIT.
17. THE CONTRACTOR SHALL TAKE ALL NECESSARY MEASURES TO PREVENT INGRESS OF SURFACE WATER INTO THE TRIAL PITS.
18. THE PROPOSED TRIAL PITTING SHOULD BE UNDER FULL TIME SUPERVISION BY A QUALIFIED STRUCTURAL ENGINEER FOR CLOSE MONITORING AND ENSURING THE STABILITY CONDITION OF PILL BOX DURING THE COURSE OF WORKS.
19. BACKFILLING OF THE TRIAL PITS SHALL BE CARRIED OUT BY HAND FOLLOWING A METHOD PROPOSED BY THE CONTRACTOR AND AGREED BY THE ENGINEER.

TRIAL PITS SCHEDULE

TRIAL PITS.	EASTING	NORTHING
TP1	838844.8646	822228.1771
TP2	838851.9226	822225.0472
TP3	838847.9942	822220.5454
TP4	838843.3535	822224.6466



TYPICAL SECTION OF PROPOSED TRIAL PIT
N.T.S.



KEY LOCATION PLAN

LEGEND :

⌖ TP1	PROPOSED TRIAL PIT (TP1-TP4)
▨ R1	PROPOSED COREHOLE ON ROOF (R1)
▨ W2	PROPOSED COREHOLE ON WALLS (W1 & W2)
▨ S1	PROPOSED COREHOLE ON FLOOR SLAB (S1)

REV	DESCRIPTION	BY	DATE	APPROVED
A	STRUCTURAL INVESTIGATION AND APPRAISAL REPORT FOR OLD PILLBOX.	GDCB	24DEC10	IMW

DRAWN	BCHF
DESIGNED	TCC
CHECKED	GDCB
APPROVED	IMW
DATE	24/DEC/2010

MTR

SHATIN TO CENTRAL LINK

ORIGINATOR
AECOM in association with Aedas, MVA and DLS

CADD REF. 1106_P_DIH_ACM_C05_601A.dgn

TITLE
CONTRACT 1106
DIH AND DHS
HERITAGE - PILLBOX
PROPOSED TRIAL PITS

SCALE 1 : 200 (A1)
DRAWING NO. 1106/P/DIH/ACM/C05/601
REV. A

PLOT DRV: Q:\C801\00_COMMON\B_SHARED_CADD_ADMIN\02_USTATION_PLOT_DRIVER\A3_BW_COL_SYSTEM.PLT
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Appendix B

FINAL FIELDWORK REPORT OF PILLBOX AT DIAMOND HILL AND FINAL REPORT ON LABORATORY TESTING - PILLBOX AT DIAMOND HILL

PREPARED BY GEOTECHNICS & CONCRETE ENGINEERING (HONG KONG) LTD.

GROUND INVESTIGATION REPORT

By

GEOTECHNICS & CONCRETE ENGINEERING (HONG KONG) LTD.

FINAL FIELDWORK REPORT OF PILLBOX AT DIAMOND HILL

CLIENT ... MTR Corporation Limited

CONTRACT NO. ... 11202

JOB NO. / WORKS ORDER NO. ... GCE1001SI

PROJECT TITLE ... Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

Checked and Certified by:

JAMES LU
Geotechnical Engineer
DATE ... 26 August 2010

6 KO SHAN ROAD,
GROUND FLOOR,
HUNG HOM, KOWLOON,
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TEL.: 852-2365 9123
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GCE Job No. GCE1001SI

Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

PILLBOX AT DIAMOND HILL

CONTENTS

TABLE

Table 1 – Investigation Station Co-ordinates and Ground Levels

INVESTIGATION STATION CO-ORDINATES AND GROUND LEVELS FOR PILLBOX

Contract No. : 11202 **Job No. :** GCE1001SI

Project : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

Page 1 of 1

	CO - ORDINATES		GROUND LEVEL (mPD)	REMARKS
	E	N		
S1	838848.53	822224.18	11.73	PILLBOX
W1	838844.01	822225.26	12.26	PILLBOX
W2	838851.16	822224.22	13.15	PILLBOX
R1	838850.58	822224.70	14.02	PILLBOX
ROOF	838848.52	822224.18	14.81	PILLBOX
11202/SCL/TP154	838843.82	822224.67	12.79	Point AB
	838842.66	822225.28	12.72	Point BC
	838843.16	822226.31	12.73	Point CD
	838844.30	822225.70	12.75	Point DA
11202/SCL/TP155	838848.81	822227.64	12.85	Point AB
	838849.54	822228.86	12.78	Point BC
	838850.32	822228.33	12.76	Point CD
	838849.71	822227.33	12.89	Point DA
11202/SCL/TP156	838851.68	822225.39	12.91	Point AB
	838852.94	822225.55	12.73	Point BC
	838853.13	822224.16	12.48	Point CD
	838851.82	822224.12	12.73	Point DA
11202/SCL/TP157	838850.13	822221.45	12.50	Point AB
	838851.20	822220.00	12.45	Point BC
	838849.99	822219.22	12.58	Point CD
	838849.11	822220.82	12.65	Point DA

APPENDICES

Appendix A – Checklists for Rock and Soil Descriptiond

CHECKLIST FOR ROCK DESCRIPTION

GEOTECHNICAL ENGINEERING OFFICE, HKSAR

1. STRENGTH

Term	Identification
Extremely weak	Easily crumbled by hand; indented deeply by thumbnail.
Very weak	Crumbled with difficulty; scratched easily by thumbnail; peeled easily by pocket knife.
Weak	Broken into pieces by hand; scratched by thumbnail; peeled by pocket knife; deep indentations (to 5 mm) by point of geological pick; hand-held specimen easily broken by single light hammer blow.
Moderately weak	Broken with difficulty in two hands; scratched with difficulty by thumbnail; difficult to peel but easily scratched by pocket knife; shallow indentations easily made by point of pick; hand-held specimen usually broken by single light hammer blow.
Moderately strong	Scratched by pocket knife; shallow indentations made by firm blow with point of pick; hand-held specimen usually broken by single firm hammer blow. Point load strength (PLS) 0.5 - 2 MPa.
Strong	Firm blows with point of pick cause only superficial surface damage; hand-held specimen requires more than one firm hammer blow to break. PLS 2 - 4 MPa.
Very strong	Many hammer blows required to break specimen. PLS 4 - 8 MPa.
Extremely strong	Specimen only chipped by hammer blows. PLS > 8 MPa.

2. COLOUR

Parameter	Terms
Value	Light, Dark
Chroma	Pinkish, Reddish, Yellowish, Orangish, Brownish, Greenish, Bluish, Purplish, Greyish
Hue	Pink, Red, Yellow, Orange, Brown, Green, Blue, Purple, White, Grey, Black

For uniform colour distribution, choose a hue, supplemented by a value and/or chroma if necessary.

For non-uniform distribution, repeat this procedure using one of the following descriptors: spotted, mottled, dappled, streaked, striped (e.g. light pinkish grey spotted with black).

State whether sample was wet or dry when described.

3. TEXTURE/FABRIC

Texture Terms (Applicable Mainly to Igneous Rocks)
Equigranular, Inequigranular, Megacrystic, Porphyritic, Crystalline, Cryptocrystalline, Aphanitic

Fabric
Describe preferred orientation of grains/crystals where apparent.

Describe intensity, spacing, continuity and any preferred orientation of microfractures where apparent.

4. MATERIAL WEATHERING/ALTERATION

Decomposition Term	Grade Symbol	Typical Characteristics
Residual Soil	VI	Original rock texture completely destroyed; can be crumbled by hand and finger pressure into constituent grains.
Completely Decomposed	V	Original rock texture preserved; can be crumbled by hand and finger pressure into constituent grains; easily indented by point of geological pick; slakes in water; completely discoloured compared with fresh rock.
Highly Decomposed	IV	Can be broken by hand into smaller pieces; makes a dull sound when struck by hammer; not easily indented by point of pick; does not slake in water; completely discoloured compared with fresh rock.
Moderately Decomposed	III	Cannot usually be broken by hand; easily broken by hammer; makes a dull or slight ringing sound when struck by hammer; completely stained throughout.
Slightly Decomposed	II	Not broken easily by hammer; makes a ringing sound when struck by hammer; fresh rock colours generally retained but stained near joint surfaces.
Fresh Rock	I	Not broken easily by hammer; makes a ringing sound when struck by hammer; no visible signs of decomposition (i.e. no discolouration).

This classification is applicable to igneous and volcanic rocks and other rocks of equivalent strength in fresh state.

Disintegration
Describe small-scale cracking and fracturing caused by mechanical weathering, where apparent.

Alteration
Describe state of alteration (e.g. mineralised, kaolinised) where apparent.

5. ROCK NAME (Including Grain Size)

Igneous	: Coarse- (6-20 mm), Medium- (2-6 mm) & Fine- (0.06-2 mm) grained GRANITE; GRANODIORITE. Very Fine-grained (< 0.06 mm) RHYOLITE; BASALT. (Common types only, see Geoguide 3 for others).
Pyroclastic	: PYROCLASTIC BRECCIA (> 60 mm), Lapilli TUFF (2-60 mm), Coarse ash TUFF (0.06-2 mm), Fine ash TUFF (< 0.06 mm).
Metamorphic	: Foliated - SCHIST (> 0.06 mm), PHYLLITE (< 0.06 mm). Non-foliated - MARBLE, QUARTZITE, FAULT BRECCIA.
Sedimentary	: CONGLOMERATE, BRECCIA (> 2 mm), SANDSTONE (0.06-2 mm), MUDSTONE (< 0.06 mm) = SILTSTONE (0.002-0.06 mm) + CLAYSTONE (< 0.002 mm). (Common types only).

If rock name cannot be identified, describe grain size quantitatively, including textural term where appropriate.

6. STRUCTURE

Structural Term	Rock Type
Bedded, Laminated, Massive	Sedimentary
Massive, Flow-banded	Igneous, Pyroclastic
Foliated, Banded, Cleaved	Metamorphic

Spacing of Planar Structures
Very thick (> 2 m), Thick (0.6-2 m), Medium (200-600 mm),
Thin (60-200 mm), Very thin (20-60 mm),
Thickly-laminated (Sedimentary) (6-20 mm) or Narrow (Igneous, Metamorphic) (6-20 mm),
Thinly-laminated (Sedimentary) (< 6 mm) or Very narrow (Igneous, Metamorphic) (< 6 mm).

Examples: Thickly-bedded SANDSTONE. Narrowly flow-banded RHYOLITE.

7. DISCONTINUITIES

Nature (Type of Discontinuity)

Fault zone
Fault
Joint
Cleavage
Schistocity
Shear plane
Fissure
Tension crack
Foliation
Bedding

Location and Orientation
Record location as co-ordinates or relative position along datum line, preferably on map or plan.

Record orientation as dip direction/dip in degrees (e.g. 032/55).

Spacing
Extremely widely-spaced (> 6 m), Very widely-spaced (2-6 m),
Widely-spaced (0.6-2 m), Medium-spaced (200-600 mm),
Closely-spaced (60-200 mm), Very closely-spaced (20-60 mm),
Extremely closely-spaced (< 20 mm).

In exposures, supplement spacing with description of rock block shape where possible. Descriptors: Blocky, Tabular, Columnar, Polyhedral.

Persistence (Areal extent or size of a discontinuity within a plane)
Measured maximum persistence dimension should be used where possible (e.g. the discontinuity trace length on the surfaces of rock exposures). For general descriptions of different discontinuity sets, relative terms should be used.

Roughness
Waviness (large-scale): Estimate/measure wavelength and amplitude in metres.
Unevenness (small-scale), use one term from the following:

Rough stepped
Rough undulating
Rough planar
Smooth stepped
Smooth undulating
Smooth planar
Slickensided stepped
Slickensided undulating
Slickensided planar

Aperture Size
Wide (> 200 mm), Moderately wide (60-200 mm), Moderately narrow (20-60 mm), Narrow (6-20 m), Very narrow (2-6 mm), Extremely narrow (> 0-2 mm), Tight (zero).

Infilling (Nature)

Clean
Non-cohesive soil
Calcite
Other (Specify)
Surface staining
Cohesive soil
Manganese
Decomposed/ disintegrated rock
Quartz
Kaolin

Give full description of infill materials/minerals where appropriate.

Seepage
Dry   Damp/wet   Seepage present (estimate quantity in 1/sec or 1/min)

Fracture State
In borehole cores, measure the following: Total Core Recovery (TCR), Solid Core Recovery (SCR), Rock Quality Designation (RQD), Fracture Index (FI). See Geoguide 3 for definitions.

8. MASS WEATHERING

Term	Zone Symbol	Typical Characteristics
Residual Soil	RS	**Residual soil derived from insitu weathering; mass structure and material texture/fabric completely destroyed: 100% soil**
Partially Weathered Rock	PW 0/30	**Less than 30% rock** **Soil retains original mass structure and material texture/fabric (i.e. saprolite)** Rock content does not affect shear behaviour of mass, but relict discontinuities in soil may do so. Rock content may be significant for investigation and construction.
	PW 30/50	**30% to 50% rock** Both rock content and relict discontinuities may affect shear behaviour of mass.
	PW 50/90	**50% to 90% rock** Interlocked structure.
	PW 90/100	**Greater than 90% rock** Small amount of the material converted to soil along discontinuities.
Unweathered Rock	UW	**100% rock** May show slight discolouration along discontinuities.

9. ADDITIONAL GEOLOGICAL INFORMATION

Record geological formation name if known. Avoid conjecture. Refer to HKGS maps & memoirs for further information.

NOTES:

1. Rock material description normally includes: strength, colour, texture/fabric, material weathering/alteration and ROCK NAME.
2. Rock mass description normally includes: strength, colour, structure, mass weathering , ROCK NAME, discontinuities and additional geological information. Can be supplemented with more detailed information on texture/fabric and material weathering/alteration of different materials within the mass where necessary.

CHECKLIST FOR SOIL DESCRIPTION

GEOTECHNICAL ENGINEERING OFFICE, HKSAR

1. STRENGTH (Compactness & Consistency)

Soil Type	Term	Identification
Very Coarse (COBBLES & BOULDERS)	Loose Dense	By inspection of voids and particle packing in the field.
Coarse (SANDS & GRAVELS)	Very loose	SPT 'N' value 0–4.
	Loose	SPT 4-10; can be excavated with spade; 50 mm peg easily driven.
	Medium dense	SPT 10-30.
	Dense	SPT 30-50; requires pick for excavation; 50 mm peg hard to drive.
	Very dense	SPT > 50.
Fine (CLAYS & SILTS)	Very soft	Undrained shear strength (USS) < 20 kPa; exudes between fingers when squeezed in hand.
	Soft	USS 20-40 kPa; moulded by light finger pressure.
	Firm	USS 40-75 kPa; can be moulded by strong finger pressure.
	Stiff	USS 75-150 kPa; cannot be moulded by fingers; can be indented by thumb.
	Very stiff or hard	USS > 150 kPa; can be indented by thumbnail.
Organic (ORGANIC CLAYS, SILTS SANDS & PEATS)	Compact	Fibres already compressed together.
	Spongy	Very compressible and open structure.
	Plastic	Can be moulded in hand and smears fingers.

Terms applicable only to transported soils. For soils derived from insitu rock weathering, record actual values of quantitative tests (e.g. SPT 'N' value) as part of the description, where appropriate.

2. COLOUR

Parameter	Terms
Value	Light, Dark
Chroma	Pinkish, Reddish, Yellowish, Orangish, Brownish, Greenish, Bluish, Purplish, Greyish
Hue	Pink, Red, Yellow, Orange, Brown, Green, Blue, Purple, White, Grey, Black

For uniform colour distribution, choose a hue, supplemented by a value and/or chroma if necessary.

For non-uniform distribution, repeat this procedure using one of the following descriptors: spotted, mottled, dappled, streaked, striped (e.g. light yellowish brown mottled with red).

State whether sample was wet or dry when described.

3. PARTICLE SHAPE & COMPOSITION

Characteristic	Terms
Form	Equidimensional, Flat, Elongate, Flat & Elongate
Angularity	Angular, Subangular, Subrounded, Rounded
Surface Texture	Smooth, Rough, Glassy, Honeycombed, Pitted, Striated

Describe composition of coarse particles where appropriate. Gravel and larger particles are usually rock fragments (e.g. granite, tuff); sand particles are usually individual minerals (e.g. quartz, feldspar).

4. STRUCTURE

Soil Type	Term	Identification
Coarse & Fine	Homogenous	Deposit consists essentially of one type.
	Interstratified (Interbedded or Interlaminated)	Alternating layers of varying types or with bands or lenses of other materials.
Coarse	Heterogenous	A mixture of types.
Fine	Fissured	Breaks into polyhedral fragments along fissures.
	Intact	No fissures.
Organic	Fibrous	Plant remains recognizable & retain some strength.
	Amorphous	No recognizable plant remains.

Describe spacing of bedding planes, fissures, shell bands, etc using the spacing terms given in items 6 & 7 for rock description (see other side).

Above terms applicable only to transported soils. For soils derived from insitu rock weathering, describe relict structures in accordance with item 6 of rock description (see other side).

5. WEATHERING

Soils Derived from Insitu Weathering of Rocks

There are two main types: saprolites (rock texture/structure retained) and residual soils (rock texture/structure completely destroyed). Describe state of weathering in accordance with items 4 & 8 for rock description (see other side).

Sedimentary (Transported) Soils

Coarse soils: Describe overall discolouration of soil and degree of decomposition of gravel and larger particles (see item 4, other side). Also note any signs of disintegration of large particles where apparent.

Fine Soils: Describe overall discolouration of soil where apparent.

6. SOIL NAME

A. Basic Soil Types

Soil Type	Particle Sizes (mm)		Identification
BOULDERS	–	> 200	Only seen complete in pits or exposures.
COBBLES	–	60 - 200	Often difficult to recover from boreholes.
GRAVELS	Coarse Medium Fine	20 - 60 6 - 20 2 - 6	Easily visible to naked eye; particle shape and grading can be described. Well-graded: wide range of grain sizes. Poorly-graded: not well-graded (split further into uniform or gap-graded).
SANDS	Coarse Medium Fine	0.6 - 2 0.2 - 0.6 0.06 - 0.2	Visible to naked eye; very little or no cohesion; grading can be described. May be well-graded or poorly-graded (uniform or gap-graded) as for gravel.
SILTS	Coarse Medium Fine	0.02 - 0.06 0.006 - 0.02 0.002 - 0.006	Only coarse silt barely visible to naked eye; exhibits little plasticity and marked dilatancy; slightly granular or silky to the touch. Disintegrates in water; lumps dry quickly; possesses cohesion but can be powdered easily between fingers.
CLAYS	–	< 0.002	Dry lumps can be broken by hand but not powdered between the fingers. Disintegrates in water more slowly than silt; smooth to the touch; exhibits plasticity but no dilatancy; sticks to the fingers and dries slowly; shrinks appreciably on drying, usually showing cracks. These properties more noticeable with increasing plasticity.
ORGANIC CLAYS, SILTS OR SANDS	–	varies	Contains much organic vegetable matter; often has a noticeable smell and changes colour on oxidation.
PEATS	–	varies	Predominantly plant remains; usually dark brown or black in colour, often with distinctive smell; low bulk density.

B. Composite Soil Types (Mixtures of Basic Types)

Principal Soil Type	Terminology Sequence	Term for Secondary Constituent	% of Secondary Constituent
Very coarse (BOULDERS & COBBLES) (> 50% of soil > 60 mm)	Secondary constituents (finer material) ▲ after principal	With a little	< 5
		With some	5 - 20
		With much	20 - 50
Coarse (GRAVELS & SANDS) (> 65% gravel & sand sizes)	Secondary constituents before principal (excluding cobbles & boulders) +	Slightly (silty, clayey or silty/clayey) *	< 5
		(silty, clayey or silty/clayey) *	5 - 15
		Very (silty, clayey or silty/clayey) * AND/OR	15 - 35
		Slightly (gravelly or sandy) *	< 5
		(gravelly or sandy) *	5 - 20
		Very (gravelly or sandy) *	20 - 50
Fine (SILTS & CLAYS) (> 35% silt & clay sizes)	Secondary constituents before principal (excluding cobbles & boulders) +	Slightly (gravelly or sandy or both) *	< 35
		(gravelly or sandy) *	35 - 65

▲ Full name of finer material should be given (see examples below).

* Secondary soil type as appropriate; use 'silty/clayey' when a distinction cannot be made between the two.

\+ If cobbles or boulders are also present in a coarse or fine soil, this can be indicated by using one of the following terms relating to the very coarse fraction after the principal: 'with occasional' (< 5), 'with some' (5-20), 'with many' (20-50), where figures in brackets are % very coarse material expressed as a fraction of the whole soil (see examples below).

Examples: Slightly silty/clayey, sandy GRAVEL. Slightly gravelly, sandy SILT. Very gravelly SAND. Sandy GRAVEL with occasional boulders. BOULDERS with much finer material (silty/clayey, very sandy gravel).

For fine soils, plasticity terms should also be described where possible, viz: 'non-plastic' (generally silts), 'intermediate plasticity' (lean clays), 'high plasticity' (fat clays).

7. DISCONTINUITIES

Full description of discontinuities, where necessary, should be made using the methods and terms given in item 7 for rock description (see other side).

8. ADDITIONAL GEOLOGICAL INFORMATION

Record geological name which indicates geological origin or soil type (e.g. Alluvium, Colluvium, Marine sand etc.). Refer to HKGS maps & memoirs for further information.

NOTES:

1. Mass characteristics of soils (i.e. structure, weathering, discontinuities) can only be described satisfactorily in undisturbed field exposures or large undisturbed samples.
2. For full descriptions of soils derived from insitu rock weathering:
   (a) saprolites - describe as rocks, supplemented by soil strength and soil name terms in brackets,
   (b) residual soils - describe as soils, supplemented by name of parent rock where apparent from field evidence.

Appendix B – Legend Patterns

Legend Code (Field GEOL LEG)

Material Code	Description
AGGLOM	Agglomerate
ASPHALT	Asphalt
BASALT	Basalt
BIOCLAST	Shells
BLANK	Void
BLDR	Boulders
BLDRCBBL	Boulders and Cobbles
BRECCIA	Breccia
CBBL	Cobbles
CLAY	Clay
CLAYSTON	Claystone
CONCRETE	Concrete
CONGLOM	Conglomerate
DOLOMITE	Dolomitic Limestone / Dolomite
FILL	Artificial Fill
FISSIN	Fissure Infill
GABBRO	Gabbro, Lamprophyre
GNEISS	Gneiss
GRANITE	Granite
GRAV	Gravel
GRAVCBBL	Gravel and Cobbles
LST	Limestone
LSTSLT	Interbedded Limestone and Siltstone
MARBLE	Marble
METACON	Metamorphic Rock - contact
METAREG	Metamorphic Rock - regional
MUDSTONE	Mudstone
ORGANICS	Organics, Peat
PEGMTITE	Pegmatite
PHYLLITE	Phyllite, Mylonite
QUARTZIT	Quartzite
RHYOLITE	Rhyolites
SAND	Sand
SANDSTON	Sandstone
SCHIST	Schist
SHALE	Shale
SILT	Silt
SILTSTON	Siltstone
SYENITE	Granodiorite, Syenite, Monzonite
TRACHYTE	Trachyte
TUFF	Coarse Ash Tuff, Lapilli Tuff
TUFFFINE	Fine Ash Tuff

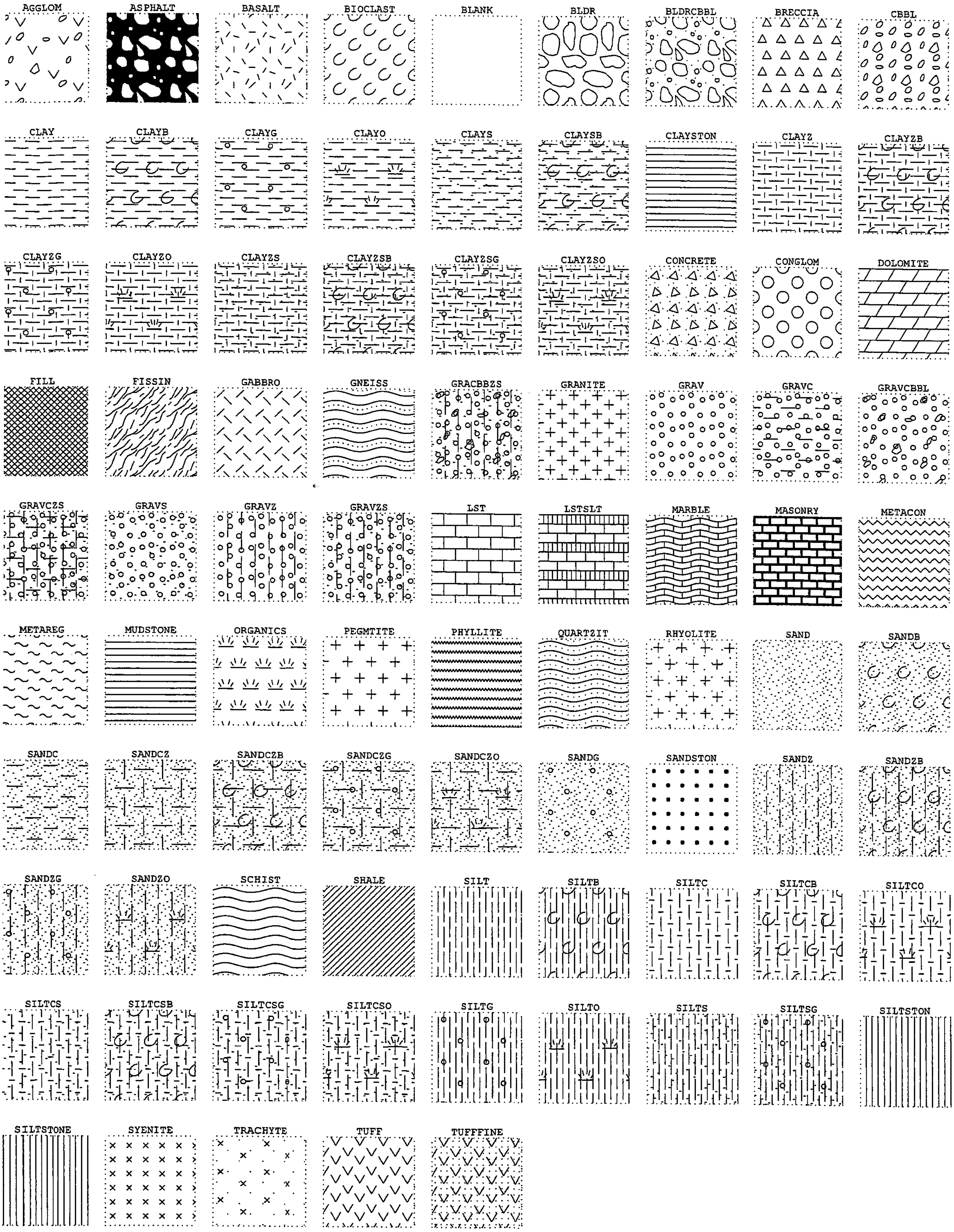
Notes :
In common ground the following codes should be added to the main descriptor in the order stated below to denote secondary constituents :

(i) C - clay
(ii) Z - silt
(iii) S - sand
(iv) G - gravel
(v) K - cobbles
(vi) O - organics
(vii) B - shells

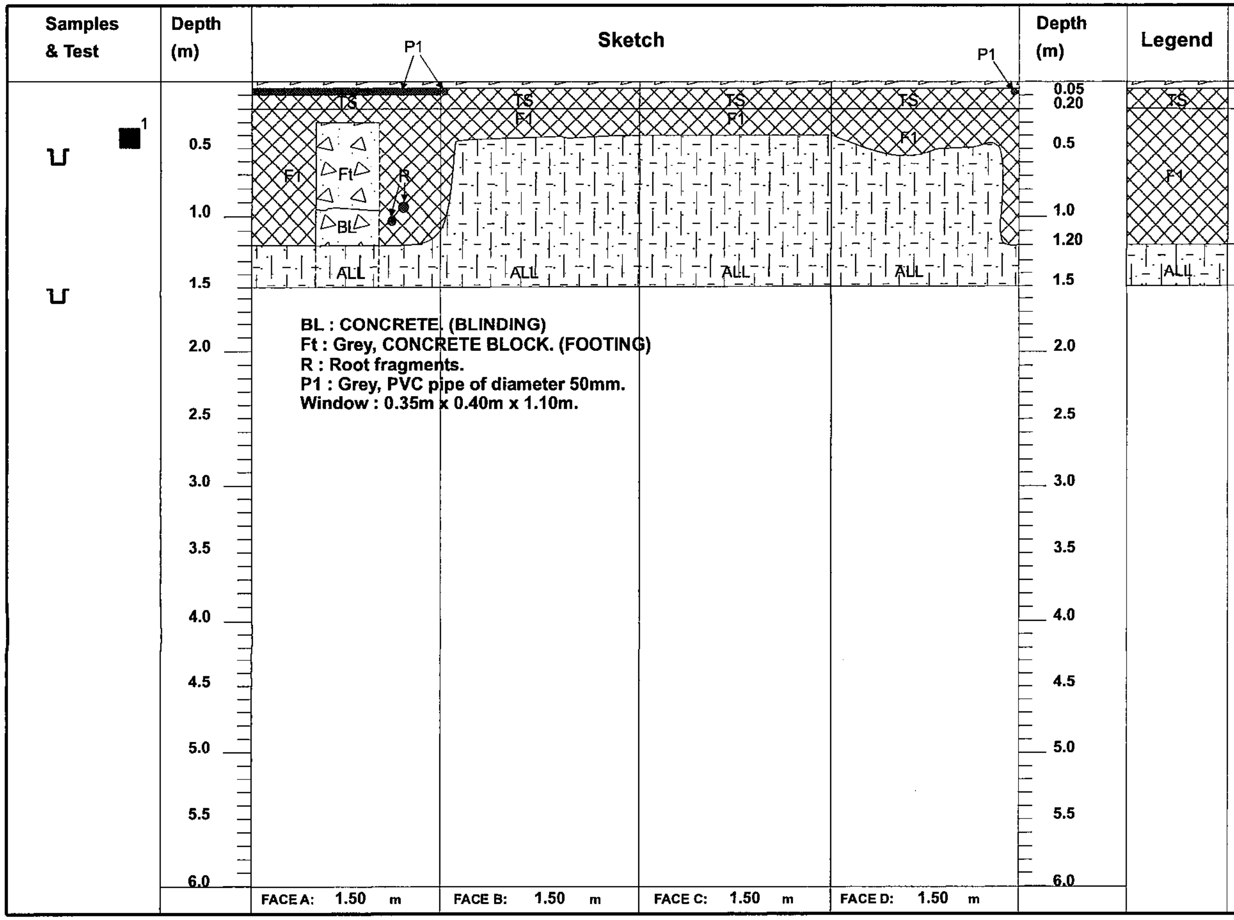
e.g. a silty CLAY with occasional shells and organic material would be coded as CLAYZOB

Material: x:\gintw\lib_2002.glb

27/02/2007 3:32:35 PM   1/1



Appendix C – Trial Pit Record



BL : CONCRETE. (BLINDING)
Ft : Grey, CONCRETE BLOCK. (FOOTING)
R : Root fragments.
P1 : Grey, PVC pipe of diameter 50mm.
Window : 0.35m x 0.40m x 1.10m.

Depth (m)	Legend	Description	Grade
0.05		Grey, CONCRETE. (PAVEMENT)	
0.20	TS	Soft, dry, dark brown, sandy SILT with much rootlet. (TOP SOIL / FILL)	
1.20	F1	Dense, moist, dark grey, clayey silty fine to coarse SAND with occasional angular fine to coarse gravel and cobble sized moderately decomposed tuff with much rootlet, occasional plastic fragments and root fragments. (FILL)	
1.5	ALL	Stiff, moist, yellowish brown, clayey sandy SILT. (ALLUVIUM)	

Trial pit was terminated at a depth of 1.50m.

Notes:
1. Block sample was taken at a depth of 0.50m.
2. Insitu density tests were carried out at the depths of 0.50m and 1.50m.

SYMBOLS

- ↕ Small Disturbed Sample
- ↕ Large Disturbed Sample
- | Undisturbed Vertical Sample
- ▬ Undisturbed Horizontal Sample
- ■ Block Sample
- ⊔ Insitu Density Test
- ▲ Water Sample
- ↓ Water Seepage

REMARKS

Ground Water
Nil
Plant Used
Hand dug
Shoring
Timber shoring over full height
Stability
Stable
Depth at pit centre
1.50m
Others
Nil

PLAN (not to scale)

See sheet 2 of 2 for details.

SECTION

See sheet 2 of 2 for details.

Contract No. : 11202
Job No. : GCE1001SI

Co-ordinates :

Point AB:	E 838843.82	N 822224.67
Point BC:	E 838842.66	N 822225.28
Point CD:	E 838843.16	N 822226.31
Point DA:	E 838844.30	N 822225.70

Ground Level:
Point AB: 12.79 mPD Point BC: 12.72 mPD
Point CD: 12.73 mPD Point DA: 12.75 mPD

Logged by : Y.K. Lee
Date logged : 15/07/2010
Checked by : James Lu
Date Checked : 16/07/2010

PROJECT

Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

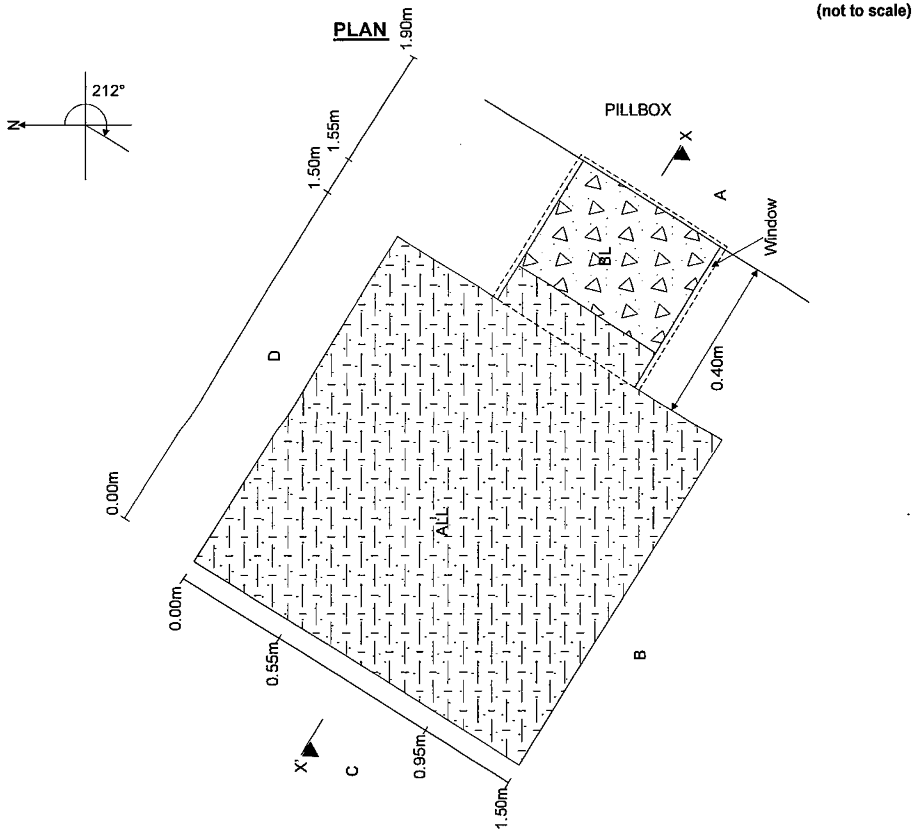
Sheet 1 of 2
Date excavated 14/07/2010 to 14/07/2010
Date Reinstated 16/07/2010 to 16/07/2010

TRIAL PIT NO.
11202/SCL/TP154

GEOTECHNICS & CONCRETE ENGG.
(HONG KONG) LIMITED
GROUND INVESTIGATION DEPARTMENT

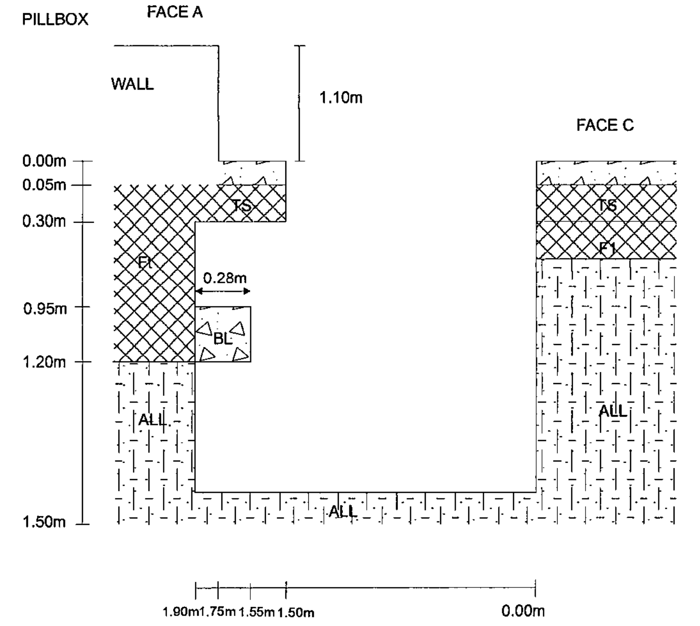
PLAN

(not to scale)



SECTION

(not to scale)



Section X-X'

SYMBOLS

- ↕ Small Disturbed Sample
- ↕ Large Disturbed Sample
- | Undisturbed Vertical Sample
- ▬ Undisturbed Horizontal Sample
- ■ Block Sample
- ⊔ Insitu Density Test
- ▲ Water Sample
- ↓ Water Seepage

REMARKS

Ground Water
Nil

Plant Used
Hand dug

Shoring
Timber shoring over full height

Stability
Stable

Depth at pit centre
1.50m

Others
Nil

Contract No. :	11202
Job No. :	GCE1001SI

Co-ordinates :

Point AB:	E 838843.82	N 822224.67
Point BC:	E 838842.66	N 822225.28
Point CD:	E 838843.16	N 822226.31
Point DA:	E 838844.30	N 822225.70

Ground Level:

Point AB: 12.79 mPD Point BC: 12.72 mPD
Point CD: 12.73 mPD Point DA: 12.75 mPD

Logged by :	Y.K. Lee
Date logged :	15/07/2010
Checked by :	James Lu
Date Checked :	16/07/2010

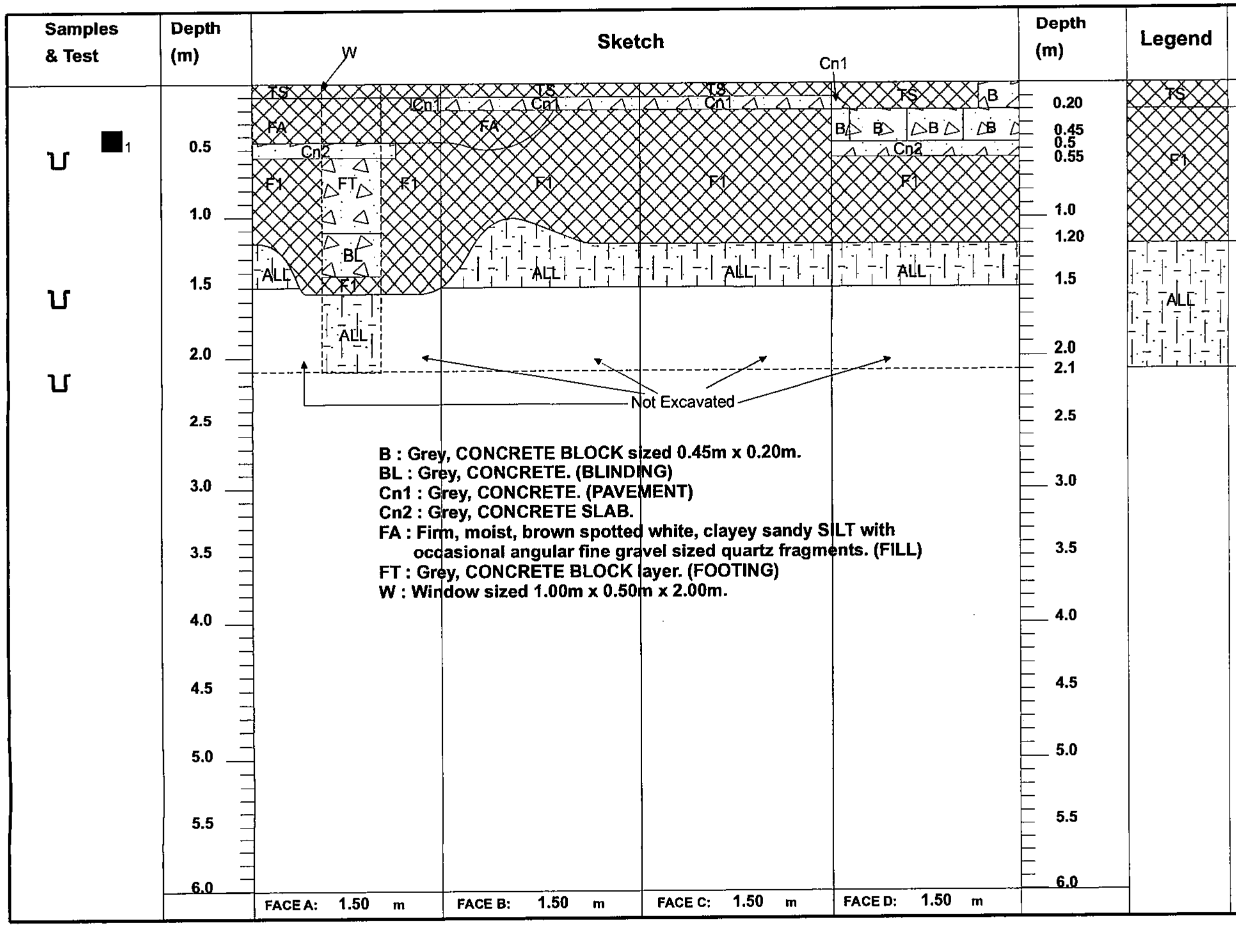
PROJECT

Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

Sheet	2	of	2
Date excavated	14/07/2010	to	14/07/2010
Date Reinstated	16/07/2010	to	16/07/2010

TRIAL PIT NO.
11202/SCL/TP154

GEOTECHNICS & CONCRETE ENGG.
(HONG KONG) LIMITED
GROUND INVESTIGATION DEPARTMENT



B : Grey, CONCRETE BLOCK sized 0.45m x 0.20m.
BL : Grey, CONCRETE. (BLINDING)
Cn1 : Grey, CONCRETE. (PAVEMENT)
Cn2 : Grey, CONCRETE SLAB.
FA : Firm, moist, brown spotted white, clayey sandy SILT with occasional angular fine gravel sized quartz fragments. (FILL)
FT : Grey, CONCRETE BLOCK layer. (FOOTING)
W : Window sized 1.00m x 0.50m x 2.00m.

Description	Grade
Soft, moist, dark grey, sandy SILT with much angular fine to coarse gravel sized concrete fragments. (TOP SOIL / FILL)	
Dense, moist, dark brownish grey, silty fine to coarse SAND with occasional angular fine to coarse gravel sized quartz fragments with some decayed plant piece. (FILL)	
Stiff, moist, brown, clayey sandy SILT. (ALLUVIUM)	

Trial pit was terminated at a depth of 1.50m.

Notes :
1. Block sample was taken at a depth of 0.50m.
2. Insitu density tests were carried out at the depths of 0.50m, 1.50m and 2.10m.

SYMBOLS

- ↕ Small Disturbed Sample
- ↕ Large Disturbed Sample
- | Undisturbed Vertical Sample
- ▬ Undisturbed Horizontal Sample
- ■ Block Sample
- ⊔ Insitu Density Test
- ▲ Water Sample
- ↓ Water Seepage

REMARKS

Ground Water
Nil
Plant Used
Hand dug
Shoring
Timber shoring over full height
Stability
Stable
Depth at pit centre
1.50m
Others
Nil

PLAN (not to scale)

See sheet 2 of 2 for details.

SECTION

See sheet 2 of 2 for details.

Contract No. : 11202
Job No. : GCE1001SI

Co-ordinates :

Point AB:	E 838848.81	N 822227.64
Point BC:	E 838849.54	N 822228.86
Point CD:	E 838850.32	N 822228.33
Point DA:	E 838849.71	N 822227.33

Ground Level:
Point AB: 12.85 mPD Point BC: 12.78 mPD
Point CD: 12.76 mPD Point DA: 12.89 mPD

Logged by : Y.K. Lee
Date logged : 22/07/2010
Checked by : James Lu
Date Checked : 23/07/2010

PROJECT

Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

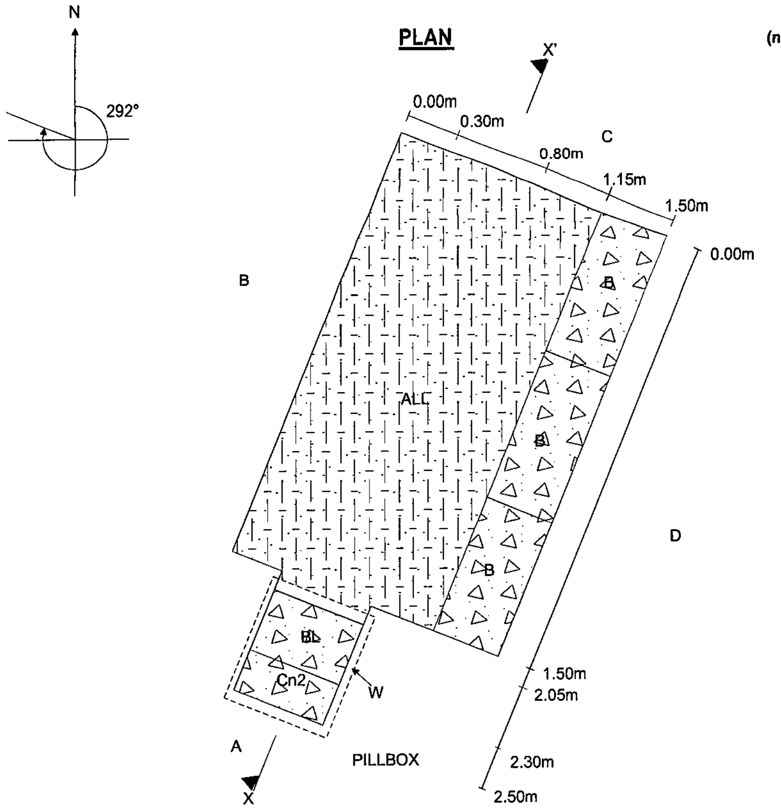
Sheet 1 of 2
Date excavated 20/07/2010 to 21/07/2010
Date Reinstated 31/07/2010 to 31/07/2010

TRIAL PIT NO.
11202/SCL/TP155

GEOTECHNICS & CONCRETE ENGG.
(HONG KONG) LIMITED
GROUND INVESTIGATION DEPARTMENT

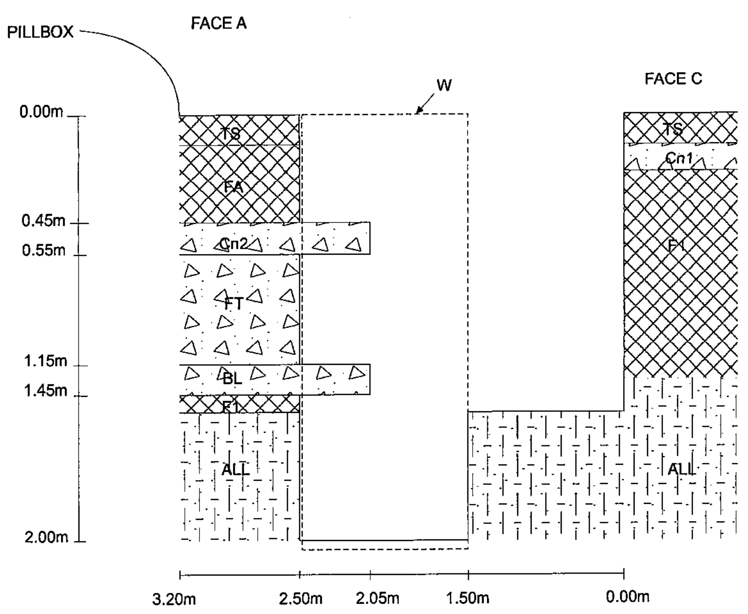
PLAN

(not to scale)



SECTION

(not to scale)



Section X-X'

SYMBOLS

- ↕ Small Disturbed Sample
- ↕ Large Disturbed Sample
- | Undisturbed Vertical Sample
- ▬ Undisturbed Horizontal Sample
- ■ Block Sample
- ⊔ Insitu Density Test
- ▲ Water Sample
- ↓ Water Seepage

REMARKS

Ground Water
Nil
Plant Used
Hand dug
Shoring
Timber shoring over full height

Stability
Stable

Depth at pit centre
1.50m
Others
Nil

Contract No. : 11202
Job No. : GCE1001SI

Co-ordinates :

Point AB:	E 838848.81	N 822227.64
Point BC:	E 838849.54	N 822228.86
Point CD:	E 838850.32	N 822228.33
Point DA:	E 838849.71	N 822227.33

Ground Level:
Point AB: 12.85 mPD Point BC: 12.78 mPD
Point CD: 12.76 mPD Point DA: 12.89 mPD

Logged by : Y.K. Lee
Date logged : 22/07/2010
Checked by : James Lu
Date Checked : 23/07/2010

PROJECT

Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

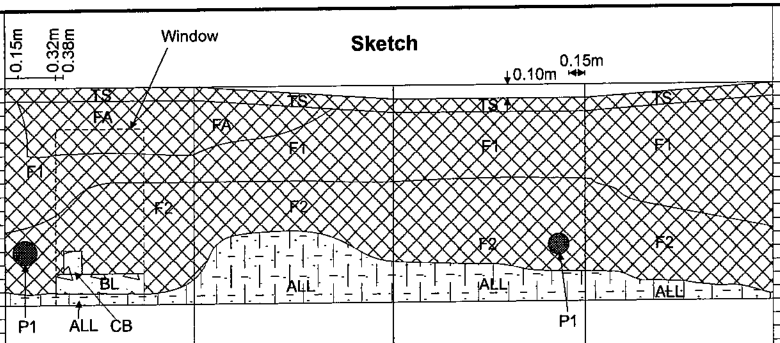
Sheet 2 of 2
Date excavated 20/07/2010 to 21/07/2010
Date Reinstated 31/07/2010 to 31/07/2010

TRIAL PIT NO.
11202/SCL/TP155

GEOTECHNICS & CONCRETE ENGG.
(HONG KONG) LIMITED
GROUND INVESTIGATION DEPARTMENT

Samples & Test	Depth (m)	Legend	Description	Grade
	0.10	TS	Soft, dry, dark brown, sandy SILT with much rootlet fragments. (TOP SOIL/FILL)	
⊔ ■ 1 (0.5)	1.05	F1	Dense, moist, yellowish brown spotted white, silty fine to coarse SAND. (FILL)	
	1.30	F2	Dense, moist, light brownish grey, silty fine to coarse SAND with occasional angular fine to coarse gravel and cobble sized moderately decomposed tuff fragments. (FILL)	
⊔ ⊔ (1.5)	1.60	ALL	Stiff, moist, yellowish brown, clayey sandy SILT. (ALLUVIUM)	
			Trial pit was terminated at a depth of 1.55m.	

Sketch



CB : Grey, CONCRETE BLOCK sized 0.20m x 0.23m.
BL : CONCRETE. (BLINDING)
FA : Loose, dry, brownish grey, silty fine to coarse SAND with much angular cobble and fine to coarse gravel sized concrete fragments. (FILL)
P1 : Grey, CONCRETE pipe of diameter 170mm.
Window : 0.50m x 0.70m x 1.30m.

FACE A: 1.50 m	FACE B: 1.50 m	FACE C: 1.50 m	FACE D: 1.50 m

Notes:
1. Block sample was taken at a depth of 0.50m.
2. Insitu density tests were carried out at the depths of 0.50m, 1.50m and 1.60m.

SYMBOLS

↕ Small Disturbed Sample
↕ Large Disturbed Sample
| Undisturbed Vertical Sample
— Undisturbed Horizontal Sample
■ Block Sample
⊔ Insitu Density Test
▲ Water Sample
↓ Water Seepage

REMARKS

Ground Water
Nil
Plant Used
Hand dug
Shoring
Timber shoring over full height

Stability
Stable

Depth at pit centre
1.55m
Others
Nil

PLAN

(not to scale)

See sheet 2 of 3 for details.

SECTION

See sheet 3 of 3 for details.

Contract No. : 11202
Job No. : GCE1001SI

Co-ordinates :

Point AB:	E 838851.68	N 822225.39
Point BC:	E 838852.94	N 822225.55
Point CD:	E 838853.13	N 822224.16
Point DA:	E 838851.82	N 822224.12

Ground Level:
Point AB: 12.91 mPD Point BC: 12.73 mPD
Point CD: 12.48 mPD Point DA: 12.73 mPD

Logged by : Y.K. Lee
Date logged : 15/07/2010
Checked by : James Lu
Date Checked : 16/07/2010

PROJECT

Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

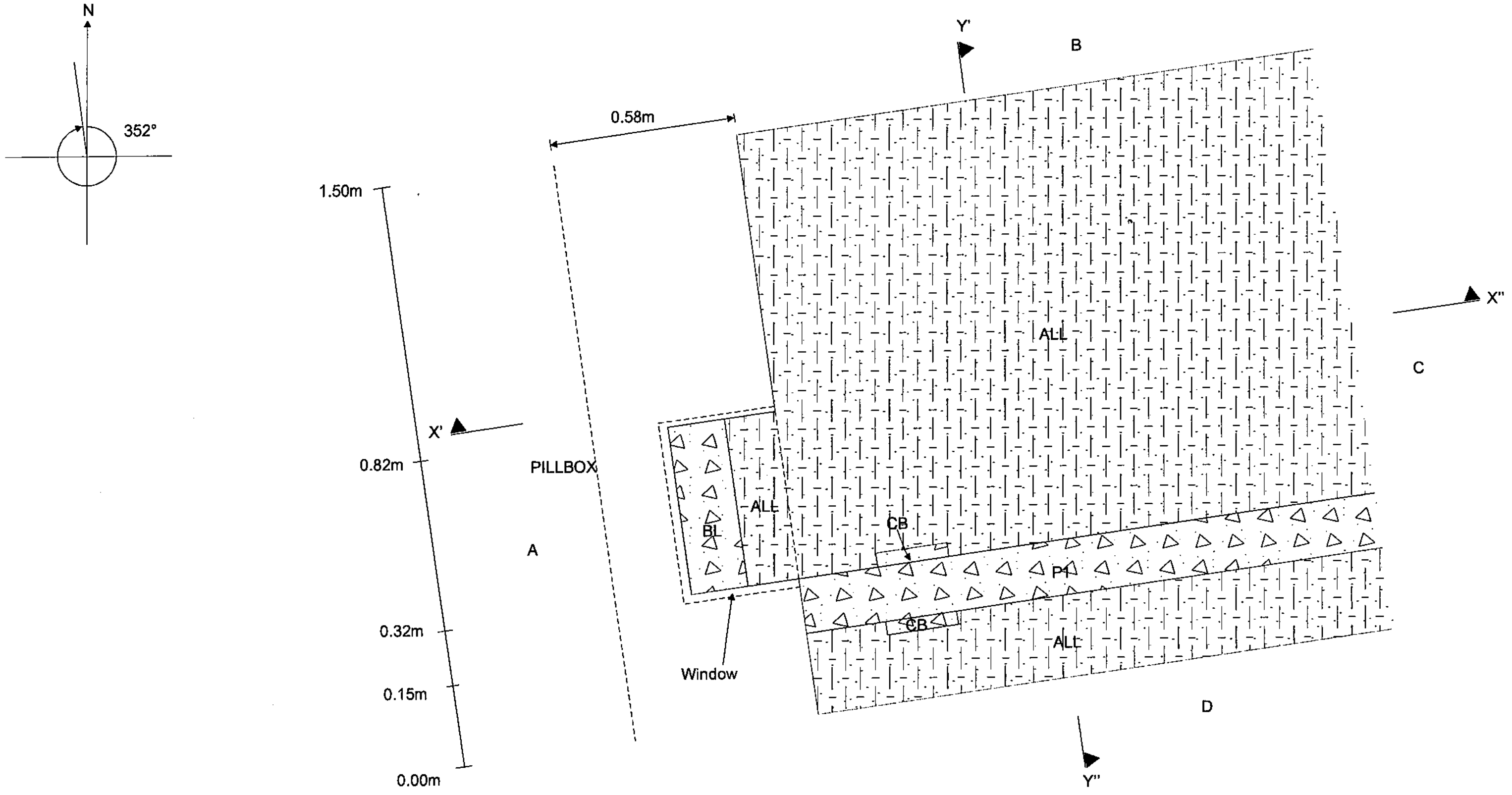
Sheet 1 of 3
Date excavated 14/07/2010 to 14/07/2010
Date Reinstated 16/07/2010 to 16/07/2010

TRIAL PIT NO.
11202/SCL/TP156

GEOTECHNICS & CONCRETE ENGG.
(HONG KONG) LIMITED
GROUND INVESTIGATION DEPARTMENT

PLAN

(not to scale)



SYMBOLS

- ↕ Small Disturbed Sample
- ↕ Large Disturbed Sample
- | Undisturbed Vertical Sample
- ▬ Undisturbed Horizontal Sample
- ■ Block Sample
- U Insitu Density Test
- ▲ Water Sample
- ↓ Water Seepage

REMARKS

Ground Water
Nil
Plant Used
Hand dug
Shoring
Timber shoring over full height

Stability
Stable

Depth at pit centre
1.55m
Others
Nil

Contract No. : 11202
Job No. : GCE1001SI

Co-ordinates :

Point AB:	E 838851.68	N 822225.39
Point BC:	E 838852.94	N 822225.55
Point CD:	E 838853.13	N 822224.16
Point DA:	E 838851.82	N 822224.12

Ground Level:

Point AB: 12.91 mPD	Point BC: 12.73 mPD
Point CD: 12.48 mPD	Point DA: 12.73 mPD

Logged by : Y.K. Lee
Date logged : 15/07/2010
Checked by : James Lu
Date Checked : 16/07/2010

PROJECT

Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

Sheet 2 of 3

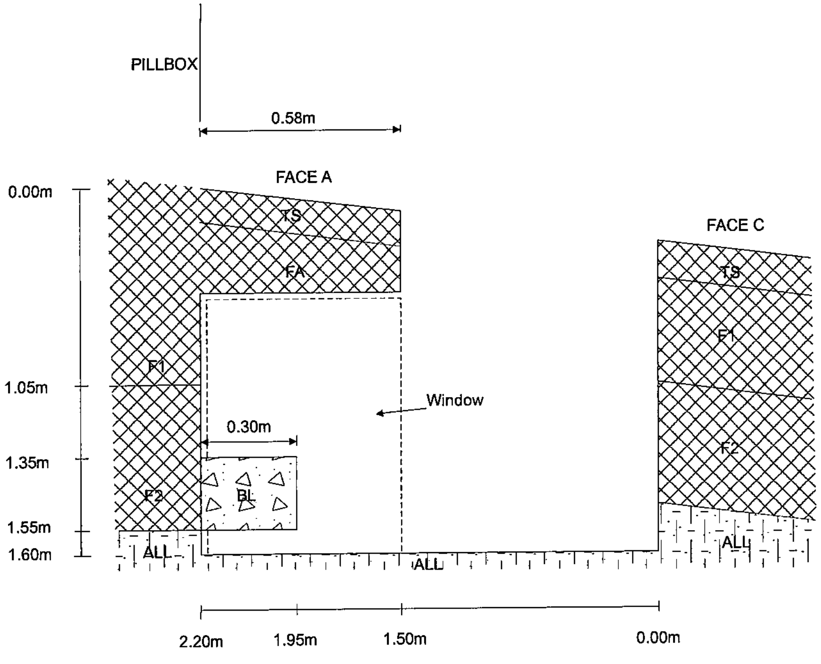
Date excavated	14/07/2010	to	14/07/2010
Date Reinstated	16/07/2010	to	16/07/2010

TRIAL PIT NO.
11202/SCL/TP156

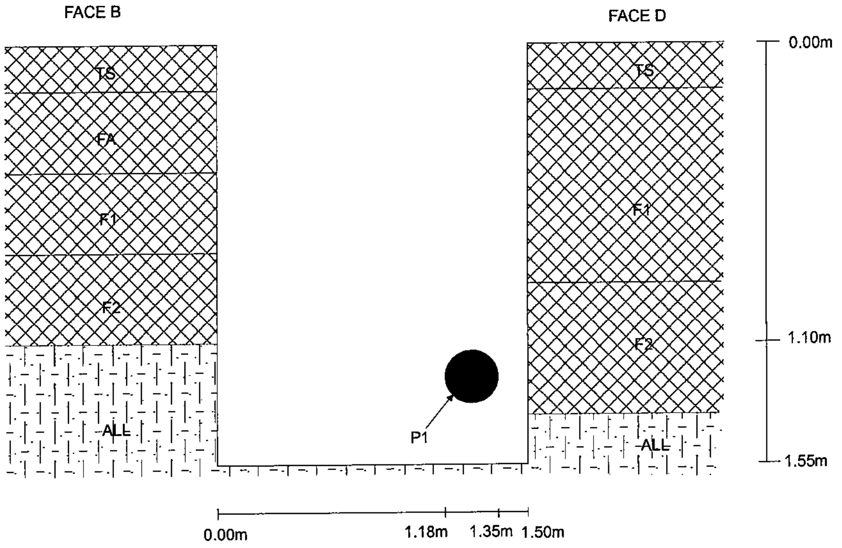
GEOTECHNICS & CONCRETE ENGG.
(HONG KONG) LIMITED
GROUND INVESTIGATION DEPARTMENT

SECTION

(not to scale)



Section X'-X"



Section Y'-Y"

SYMBOLS

↕	Small Disturbed Sample
↕	Large Disturbed Sample
|	Undisturbed Vertical Sample
▬	Undisturbed Horizontal Sample
■	Block Sample
⊔	Insitu Density Test
▲	Water Sample
↓	Water Seepage

REMARKS

Ground Water
Nil
Plant Used
Hand dug
Shoring
Timber shoring over full height

Stability
Stable

Depth at pit centre
1.55m
Others
Nil

Contract No. : 11202
Job No. : GCE1001SI

Co-ordinates :

Point AB:	E 838851.68	N 822225.39
Point BC:	E 838852.94	N 822225.55
Point CD:	E 838853.13	N 822224.16
Point DA:	E 838851.82	N 822224.12

Ground Level:
Point AB: 12.91 mPD Point BC: 12.73 mPD
Point CD: 12.48 mPD Point DA: 12.73 mPD

Logged by : Y.K. Lee
Date logged : 15/07/2010
Checked by : James Lu
Date Checked : 16/07/2010

PROJECT

Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

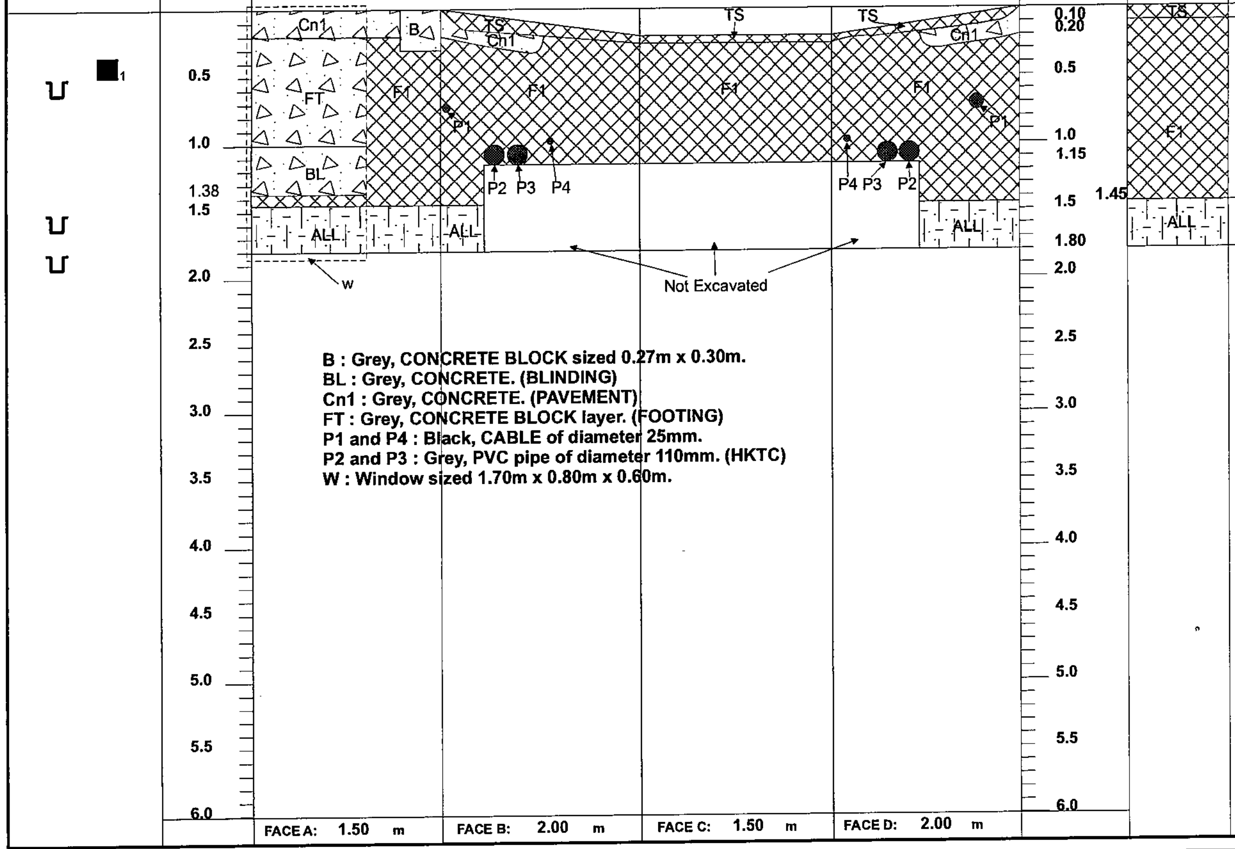
Sheet 3 of 3

Date excavated	14/07/2010	to	14/07/2010
Date Reinstated	16/07/2010	to	16/07/2010

TRIAL PIT NO.
11202/SCL/TP156

GEOTECHNICS & CONCRETE ENGG. (HONG KONG) LIMITED
GROUND INVESTIGATION DEPARTMENT

Samples & Test	Depth (m)	Sketch	Depth (m)	Legend	Description	Grade



B : Grey, CONCRETE BLOCK sized 0.27m x 0.30m.
BL : Grey, CONCRETE. (BLINDING)
Cn1 : Grey, CONCRETE. (PAVEMENT)
FT : Grey, CONCRETE BLOCK layer. (FOOTING)
P1 and P4 : Black, CABLE of diameter 25mm.
P2 and P3 : Grey, PVC pipe of diameter 110mm. (HKTC)
W : Window sized 1.70m x 0.80m x 0.60m.

Description

Soft, moist, dark grey, sandy SILT with much angular fine to coarse gravel sized concrete fragments. (TOP SOIL / FILL)

Dense, moist, dark brownish grey, silty fine to coarse SAND with occasional angular fine to coarse gravel sized quartz fragments. (FILL)

Stiff, moist, brown, clayey sandy SILT. (ALLUVIUM)

Trial trench was terminated at a depth of 1.80m.

Notes :
1. Block sample was taken at a depth of 0.50m.
2. Insitu density tests were carried out at the depths of 0.50m, 1.50m and 1.80m.

SYMBOLS

- ↕ Small Disturbed Sample
- ↕ Large Disturbed Sample
- | Undisturbed Vertical Sample
- ▬ Undisturbed Horizontal Sample
- ■ Block Sample
- ⊔ Insitu Density Test
- ▲ Water Sample
- ↓ Water Seepage

REMARKS

Ground Water
Nil
Plant Used
Hand dug
Shoring
Timber shoring over full height

Stability
Stable

Depth at trench centre
1.80m
Others
Nil

PLAN (not to scale)

See sheet 2 of 2 for details.

SECTION

See sheet 2 of 2 for details.

Contract No. : 11202
Job No. : GCE1001SI

Co-ordinates :

Point AB:	E 838850.13	N 822221.45
Point BC:	E 838851.20	N 822220.00
Point CD:	E 838849.99	N 822219.22
Point DA:	E 838849.11	N 822220.82

Ground Level:
Point AB: 12.50 mPD Point BC: 12.45 mPD
Point CD: 12.58 mPD Point DA: 12.65 mPD

Logged by :
Date logged : 28/07/2010
Checked by : James Lu
Date Checked : 29/07/2010

PROJECT

Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

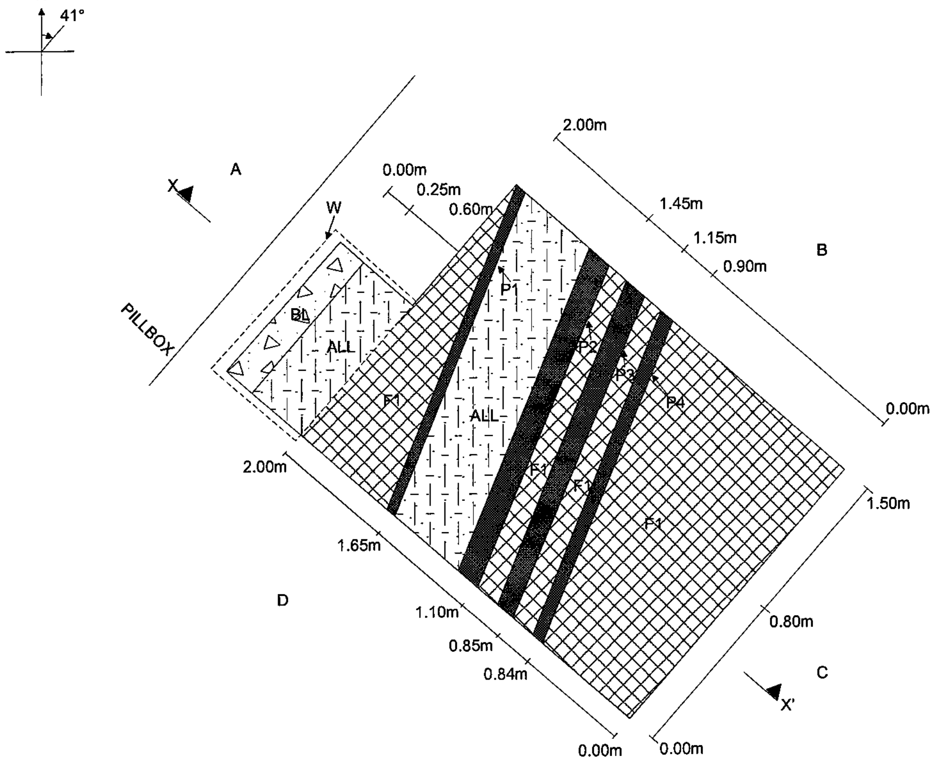
Sheet 1 of 2
Date excavated 26/07/2010 to 27/07/2010
Date Reinstated 31/07/2010 to 31/07/2010

TRIAL TRENCH NO.
11202/SCL/TP157

GEOTECHNICS & CONCRETE ENGG.
(HONG KONG) LIMITED
GROUND INVESTIGATION DEPARTMENT

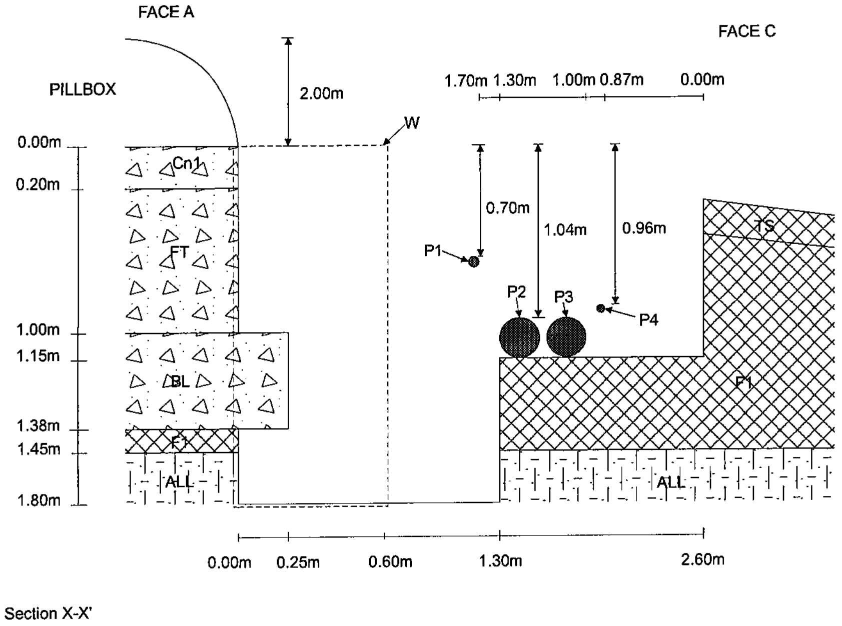
PLAN

(not to scale)



SECTION

(not to scale)



Section X-X'

SYMBOLS

- ↕ Small Disturbed Sample
- ↕ Large Disturbed Sample
- | Undisturbed Vertical Sample
- — Undisturbed Horizontal Sample
- ■ Block Sample
- ⊔ Insitu Density Test
- ▲ Water Sample
- ↓ Water Seepage

REMARKS

Ground Water
Nil

Plant Used
Hand dug

Shoring
Timber shoring over full height

Stability
Stable

Depth at trench centre
1.80m

Others
Nil

Contract No. : 11202
Job No. : GCE1001SI

Co-ordinates :

Point AB:	E 838850.13	N 822221.45
Point BC:	E 838851.20	N 822220.00
Point CD:	E 838849.99	N 822219.22
Point DA:	E 838849.11	N 822220.82

Ground Level:
Point AB: 12.50 mPD Point BC: 12.45 mPD
Point CD: 12.58 mPD Point DA: 12.65 mPD

Logged by : Y.K. Lee
Date logged : 28/07/2010
Checked by : James Lu
Date Checked : 29/07/2010

PROJECT

Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

Sheet	2	of	2	
Date excavated	26/07/2010	to	27/07/2010	
Date Reinstated	31/07/2010	to	31/07/2010	

TRIAL TRENCH NO.

11202/SCL/TP157

GEOTECHNICS & CONCRETE ENGG.
(HONG KONG) LIMITED
GROUND INVESTIGATION DEPARTMENT

Appendix D – Trial Pit Photograph


MTR CORPORATION LIMITED
GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
PROJECT : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link
DATE OF THE PHOTOGRAPH 15/7/2010
PIT NO
FACE : A


MTR CORPORATION LIMITED
GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
PROJECT : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link
DATE OF THE PHOTOGRAPH 15/7/2010
PIT NO
FACE : B


MTR CORPORATION LIMITED
GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
PROJECT : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link
DATE OF THE PHOTOGRAPH 15/7/2010
PIT NO.
FACE C


MTR CORPORATION LIMITED
GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
PROJECT : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link
DATE OF THE PHOTOGRAPH 15/7/2010
PIT NO.
FACE D


MTR CORPORATION LIMITED
PROJECT
DATE OF THE PHOTOGRAPH
PIT NO
FACE


MTR CORPORATION LIMITED
GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
PROJECT : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link
DATE OF THE PHOTOGRAPH 28-7-2010
PIT NO. :11202/SCL/TP155
FACE A (UPPER)


MTR CORPORATION LIMITED
GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
PROJECT : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link
DATE OF THE PHOTOGRAPH 28-7-2010
PIT NO. 11202/SCL/TP155
FACE A (LOWER)


MTR CORPORATION LIMITED
GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD
PROJECT : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link
DATE OF THE PHOTOGRAPH 28-7-2010
PIT NO 11202/SCL/TP155
FACE B


MTR CORPORATION LIMITED
GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
PROJECT : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link
DATE OF THE PHOTOGRAPH 28-7-2010
PIT NO 11202/SCL/TP155
FACE C

MTR CORPORATION LIMITED

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD

PROJECT : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

DATE OF THE PHOTOGRAPH 28-7-2010

PIT NO. : 11202/SCL/TP155

FACE : D

MTR CORPORATION LIMITED

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.

PROJECT : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

DATE OF THE PHOTOGRAPH 28-7-2010

PIT NO. 11202/SCL/TP155

FACE BOTTOM


MTR CORPORATION LIMITED
GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
PROJECT
Contract No. 11202 Stage II Ground
: Investigation for Shatin to Central Link
DATE OF THE PHOTOGRAPH: 15/7/2010
PIT NO
FACE A


MTR CORPORATION LIMITED
GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
PROJECT
Contract No. 11202 Stage II Ground
: Investigation for Shatin to Central Link
DATE OF THE PHOTOGRAPH 15/7/2010
PIT NO
FACE B


MTR CORPORATION LIMITED
GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
PROJECT
Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link
DATE OF THE PHOTOGRAPH
15/7/2010
PIT NO
FACE
C


MTR CORPORATION LIMITED
GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
PROJECT
Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link
DATE OF THE PHOTOGRAPH
15/7/2010
PIT NO
FACE
D


MTR CORPORATION LIMITED
PROJECT
DATE OF THE PHOTOGRAPH
PIT NO.
FACE
15/7/2010
Bottom


MTR CORPORATION LIMITED
GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD
PROJECT Contract No 11202 Stage II Ground Investigation for Shatin to Central Link
DATE OF THE PHOTOGRAPH 28-7-2010
PIT NO TP157
FACE A

MTR CORPORATION LIMITED

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD

PROJECT : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

DATE OF THE PHOTOGRAPH 28-7-2010

PIT NO. : 11202/SCL/TP157

FACE B1

MTR CORPORATION LIMITED

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.

PROJECT : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

DATE OF THE PHOTOGRAPH: 28-7-2010

PIT NO. : 11202/SCL/TP157

FACE : B2


MTR CORPORATION LIMITED
GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
PROJECT : Contract No. 11202 Stage 8 Ground Investigation for Shatin to Central Link
DATE OF THE PHOTOGRAPH 28-7-2010
PIT NO. 11202/SCL/TP157
FACE C


MTR CORPORATION LIMITED

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.

PROJECT : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

DATE OF THE PHOTOGRAPH 28-7-2010

PIT NO. : 11202/SCL/TP157

FACE : D1


MTR CORPORATION LIMITED

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.

PROJECT : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

DATE OF THE PHOTOGRAPH: 28-7-2010

PIT NO. : 11202/SCL/TP157

FACE : D2


MTR CORPORATION LIMITED
GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
PROJECT
Contract No. 11202 Stage B Ground Investigation for Shatin to Central Link
DATE OF THE PHOTOGRAPH
28-7-2010
PIT NO.
11202/SGI/TP157
FACE
BOTTOM 1


MTR CORPORATION LIMITED
GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
PROJECT
Contract No. 11202 Stage B Ground Investigation for Shatin to Central Link
DATE OF THE PHOTOGRAPH
28-7-2010
PIT NO.
11202/SGI/TP157
FACE
BOTTOM 2

Appendix E – In-situ Density Test Record

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

HOKLAS 024

REPORT ON DETERMINATION OF INSITU BULK & DRY DENSITIES OF SOIL

IN ACCORDANCE WITH GEOSPEC 3 : 2001 TEST 11.1

CLIENT* : MTR Corporation Limited
ADDRESS* : --
SITE* : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link
W.O. NO.* : --
CONTRACT NO.* : 11202
REPORT NO. : INS10070072
JOB NO. : GCE/PS/100476
TEST UNIT NO. : ITP 100437
DATE TESTED : 14/07/2010
DESCRIPTION : --

WEATHER CONDITION : Sunny
LOCATION OF TEST POSITION* : Pill Box at Tai Hom Tsuen
NAME AND AFFILIATION OF PERSON WHO LOCATED ON SITE* : Mr. K.H. Cheung (GFT)

CORRECTION FOR ENCOUNTERING LARGE EXCAVATED PARTICLES RETAINED ON 20mm AND 37.5mm TEST SIEVES :

Trial pit no.*		11202/SCL/ TP154	11202/SCL/ TP154	
Sample no.*		1	2	
Depth of hole*	mm	150	150	
Depth of trial pit*	m	0.5	1.5	
Depth of level*	mPD	--	--	
Mass of rock group retained on 20mm sieve	g	--	--	
Mass of rock group retained on 37.5mm sieve	g	--	--	
Mass of concrete/brick group retained on 20mm sieve	g	--	--	
Mass of concrete/brick group retained on 37.5mm sieve	g	--	--	

Note : Densities of rock and concrete/brick are assumed as 2.65 Mg/m^3 and 2.45 Mg/m^3 respectively.

TEST RESULTS :

Bulk density	Mg/m^3	1.68	1.62	
Moisture content (Ref. : GEOSPEC 3 : 2001 Test 5.2)	%	16	20	
Dry density	Mg/m^3	1.45	1.35	

FOR INFORMATION ONLY :

Laboratory compaction test results	Optimum moisture content	%	--	--	
	Maximum dry density	Mg/m^3	--	--	

Note : These results refer to test report no. -- which is in accordance with Test --

The following evaluations are only based on the opinion of the laboratory and are not under the scope of accreditation by HOKLAS :

Relative compaction	%	--	--	

(Ref. : Clause 6.68 of General Specification for Civil Engineering Works (1992))

NOTE : *Information provided by client

REMARKS:

TESTED BY : K.W. Cheung
POST : Lab. Technician
DATE : 14/07/2010

CHECKED BY : W.K.Chan
POST : Reporting Officer
DATE : 29/07/2010

CERTIFIED BY : CHEUNG WING TAI
POST : Deputy Manager
DATE : 29/07/2010

REPORT ON DETERMINATION OF INSITU BULK & DRY DENSITIES OF SOIL

IN ACCORDANCE WITH GEOSPEC 3 : 2001 TEST 11.1

CLIENT* : MTR Corporation Limited
ADDRESS* : --
SITE* : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link
W.O. NO.* : --
CONTRACT NO.* : 11202
REPORT NO. : INS10070072
JOB NO. : GCE/PS/100476
TEST UNIT NO. : ITP 100437
DATE TESTED : 20/07/2010
DESCRIPTION : --

WEATHER CONDITION : Sunny
LOCATION OF TEST POSITION* : Pill Box at Tai Hom Tsuen
NAME AND AFFILIATION OF PERSON WHO LOCATED ON SITE* : Mr. K.H. Cheung (GFT)

CORRECTION FOR ENCOUNTERING LARGE EXCAVATED PARTICLES RETAINED ON 20mm AND 37.5mm TEST SIEVES :

Trial pit no.*		11202/SCL/ TP155		
Sample no.*		1		
Depth of hole*	mm	150		
Depth of trial pit*	m	0.5		
Depth of level*	mPD	--		
Mass of rock group retained on 20mm sieve	g	--		
Mass of rock group retained on 37.5mm sieve	g	--		
Mass of concrete/brick group retained on 20mm sieve	g	--		
Mass of concrete/brick group retained on 37.5mm sieve	g	--		

Note : Densities of rock and concrete/brick are assumed as 2.65 Mg/m^3 and 2.45 Mg/m^3 respectively.

TEST RESULTS :

Bulk density	Mg/m^3	1.64		
Moisture content (Ref. : GEOSPEC 3 : 2001 Test 5.2)	%	16		
Dry density	Mg/m^3	1.41		

FOR INFORMATION ONLY :

Laboratory compaction test results	Optimum moisture content	%	--		
	Maximum dry density	Mg/m^3	--		

Note : These results refer to test report no. -- which is in accordance with Test --

The following evaluations are only based on the opinion of the laboratory and are not under the scope of accreditation by HOKLAS :

Relative compaction	%	--		

(Ref. : Clause 6.68 of General Specification for Civil Engineering Works (1992))

NOTE : *Information provided by client

REMARKS:

TESTED BY : K.W. Cheung
POST : Lab. Technician
DATE : 20/07/2010

CHECKED BY : W.K.Chan
POST : Reporting Officer
DATE : 29/07/2010

CERTIFIED BY : CHEUNG WING TAI
POST : Deputy Manager
DATE : 29/07/2010

REPORT ON DETERMINATION OF INSITU BULK & DRY DENSITIES OF SOIL

IN ACCORDANCE WITH GEOSPEC 3 : 2001 TEST 11.1

Page 3 of 6

CLIENT* : MTR Corporation Limited
ADDRESS* : --
SITE* : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link
W.O. NO.* : --
CONTRACT NO.* : 11202
REPORT NO. : INS10070072
JOB NO. : GCE/PS/100476
TEST UNIT NO. : ITP 100437
DATE TESTED : 21/07/2010
DESCRIPTION : --

WEATHER CONDITION : Cloudy
LOCATION OF TEST POSITION* : Pill Box at Tai Hom Tsuen
NAME AND AFFILIATION OF PERSON WHO LOCATED ON SITE* : Mr. K.H. Cheung (GFT)

CORRECTION FOR ENCOUNTERING LARGE EXCAVATED PARTICLES RETAINED ON 20mm AND 37.5mm TEST SIEVES :

Trial pit no.*		11202/SCL/ TP155	11202/SCL/ TP155	
Sample no.*		2	3	
Depth of hole*	mm	150	150	
Depth of trial pit*	m	1.5	2.1	
Depth of level*	mPD	--	--	
Mass of rock group retained on 20mm sieve	g	--	--	
Mass of rock group retained on 37.5mm sieve	g	--	--	
Mass of concrete/brick group retained on 20mm sieve	g	--	--	
Mass of concrete/brick group retained on 37.5mm sieve	g	--	--	

Note : Densities of rock and concrete/brick are assumed as 2.65 Mg/m^3 and 2.45 Mg/m^3 respectively.

TEST RESULTS :

Bulk density	Mg/m^3	1.65	1.43	
Moisture content (Ref. : GEOSPEC 3 : 2001 Test 5.2)	%	17	17	
Dry density	Mg/m^3	1.41	1.22	

FOR INFORMATION ONLY :

Laboratory compaction test results	Optimum moisture content	%	--	--	
	Maximum dry density	Mg/m^3	--	--	

Note : These results refer to test report no. -- which is in accordance with Test --

The following evaluations are only based on the opinion of the laboratory and are not under the scope of accreditation by HOKLAS :

Relative compaction	%	--	--	

(Ref. : Clause 6.68 of General Specification for Civil Engineering Works (1992))

NOTE : *Information provided by client

REMARKS:

TESTED BY : K.W. Cheung
POST : Lab. Technician
DATE : 21/07/2010

CHECKED BY : W.K.Chan
POST : Reporting Officer
DATE : 29/07/2010

CERTIFIED BY : CHEUNG WING TAI
POST : Deputy Manager
DATE : 29/07/2010

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REPORT ON DETERMINATION OF INSITU BULK & DRY DENSITIES OF SOIL

IN ACCORDANCE WITH GEOSPEC 3 : 2001 TEST 11.1

Page 4 of 6

CLIENT* : MTR Corporation Limited
ADDRESS* : --
SITE* : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link
W.O. NO.* : --
CONTRACT NO.* : 11202
REPORT NO. : INS10070072
JOB NO. : GCE/PS/100476
TEST UNIT NO. : ITP 100437
DATE TESTED : 14/07/2010
DESCRIPTION : --

WEATHER CONDITION : Sunny
LOCATION OF TEST POSITION* : Pill Box at Tai Hom Tsuen
NAME AND AFFILIATION OF PERSON WHO LOCATED ON SITE* : Mr. K.H. Cheung (GFT)

CORRECTION FOR ENCOUNTERING LARGE EXCAVATED PARTICLES RETAINED ON 20mm AND 37.5mm TEST SIEVES :

Trial pit no.*		11202/SCL/ TP156	11202/SCL/ TP156	11202/SCL/ TP156
Sample no.*		1	2	3
Depth of hole*	mm	150	150	150
Depth of trial pit*	m	0.5	1.5	1.6
Depth of level*	mPD	--	--	--
Mass of rock group retained on 20mm sieve	g	--	--	--
Mass of rock group retained on 37.5mm sieve	g	--	--	--
Mass of concrete/brick group retained on 20mm sieve	g	--	--	--
Mass of concrete/brick group retained on 37.5mm sieve	g	--	--	--

Note : Densities of rock and concrete/brick are assumed as 2.65 Mg/m^3 and 2.45 Mg/m^3 respectively.

TEST RESULTS :

Bulk density	Mg/m^3	1.45	1.45	1.44
Moisture content (Ref. : GEOSPEC 3 : 2001 Test 5.2)	%	14	16	17
Dry density	Mg/m^3	1.27	1.25	1.23

FOR INFORMATION ONLY :

Laboratory compaction test results	Optimum moisture content	%	--	--	--
	Maximum dry density	Mg/m^3	--	--	--

Note : These results refer to test report no. -- which is in accordance with Test --

The following evaluations are only based on the opinion of the laboratory and are not under the scope of accreditation by HOKLAS :

Relative compaction	%	--	--	--

(Ref. : Clause 6.68 of General Specification for Civil Engineering Works (1992))

NOTE : *Information provided by client

REMARKS:

TESTED BY : K.W. Cheung
POST : Lab. Technician
DATE : 14/07/2010

CHECKED BY : W.K.Chan
POST : Reporting Officer
DATE : 29/07/2010

CERTIFIED BY : CHEUNG WING TAI
POST : Deputy Manager
DATE : 29/07/2010

REPORT ON DETERMINATION OF INSITU BULK & DRY DENSITIES OF SOIL

IN ACCORDANCE WITH GEOSPEC 3 : 2001 TEST 11.1

Page 5 of 6

CLIENT* : MTR Corporation Limited
ADDRESS* : --
SITE* : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link
W.O. NO.* : --
CONTRACT NO.* : 11202
REPORT NO. : INS10070072
JOB NO. : GCE/PS/100476
TEST UNIT NO. : ITP 100437
DATE TESTED : 26/07/2010
DESCRIPTION : --

WEATHER CONDITION : Sunny
LOCATION OF TEST POSITION* : Pill Box at Tai Hom Tsuen
NAME AND AFFILIATION OF PERSON WHO LOCATED ON SITE* : Mr. K.H. Cheung (GFT)

CORRECTION FOR ENCOUNTERING LARGE EXCAVATED PARTICLES RETAINED ON 20mm AND 37.5mm TEST SIEVES :

Trial pit no.*		11202/SCL/ TP157		
Sample no.*		1		
Depth of hole*	mm	150		
Depth of trial pit*	m	0.5		
Depth of level*	mPD	--		
Mass of rock group retained on 20mm sieve	g	--		
Mass of rock group retained on 37.5mm sieve	g	--		
Mass of concrete/brick group retained on 20mm sieve	g	--		
Mass of concrete/brick group retained on 37.5mm sieve	g	--		

Note : Densities of rock and concrete/brick are assumed as 2.65 Mg/m^3 and 2.45 Mg/m^3 respectively.

TEST RESULTS :

Bulk density	Mg/m^3	1.68		
Moisture content (Ref. : GEOSPEC 3 : 2001 Test 5.2)	%	12		
Dry density	Mg/m^3	1.50		

FOR INFORMATION ONLY :

Laboratory compaction test results	Optimum moisture content	%	--		
	Maximum dry density	Mg/m^3	--		

Note : These results refer to test report no. -- which is in accordance with Test --

The following evaluations are only based on the opinion of the laboratory and are not under the scope of accreditation by HOKLAS :

Relative compaction	%	--		

(Ref. : Clause 6.68 of General Specification for Civil Engineering Works (1992))

NOTE : *Information provided by client

REMARKS:

TESTED BY : K.W. Cheung
POST : Lab. Technician
DATE : 26/07/2010

CHECKED BY : W.K.Chan
POST : Reporting Officer
DATE : 29/07/2010

CERTIFIED BY : CHEUNG WING TAI
POST : Deputy Manager
DATE : 29/07/2010

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GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
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TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

HOKLAS 024

REPORT ON DETERMINATION OF INSITU BULK & DRY DENSITIES OF SOIL

IN ACCORDANCE WITH GEOSPEC 3 : 2001 TEST 11.1

CLIENT* : MTR Corporation Limited
ADDRESS* : --
SITE* : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link
W.O. NO.* : --
CONTRACT NO.* : 11202
REPORT NO. : INS10070072
JOB NO. : GCE/PS/100476
TEST UNIT NO. : ITP 100437
DATE TESTED : 27/07/2010
DESCRIPTION : --

WEATHER CONDITION : Sunny
LOCATION OF TEST POSITION* : Pill Box at Tai Hom Tsuen
NAME AND AFFILIATION OF PERSON WHO LOCATED ON SITE* : Mr. K.H. Cheung (GFT)

CORRECTION FOR ENCOUNTERING LARGE EXCAVATED PARTICLES RETAINED ON 20mm AND 37.5mm TEST SIEVES :

Trial pit no.*		11202/SCL/TP157	11202/SCL/TP157	
Sample no.*		2	3	
Depth of hole*	mm	150	150	
Depth of trial pit*	m	1.5	1.8	
Depth of level*	mPD	--	--	
Mass of rock group retained on 20mm sieve	g	--	--	
Mass of rock group retained on 37.5mm sieve	g	--	--	
Mass of concrete/brick group retained on 20mm sieve	g	--	--	
Mass of concrete/brick group retained on 37.5mm sieve	g	--	--	

Note : Densities of rock and concrete/brick are assumed as 2.65 Mg/m^3 and 2.45 Mg/m^3 respectively.

TEST RESULTS :

Bulk density	Mg/m^3	1.40	1.44	
Moisture content (Ref. : GEOSPEC 3 : 2001 Test 5.2)	%	18	18	
Dry density	Mg/m^3	1.19	1.22	

FOR INFORMATION ONLY :

Laboratory compaction test results	Optimum moisture content	%	--	--	
	Maximum dry density	Mg/m^3	--	--	

Note : These results refer to test report no. -- which is in accordance with Test --

The following evaluations are only based on the opinion of the laboratory and are not under the scope of accreditation by HOKLAS :

Relative compaction	%	--	--	

(Ref. : Clause 6.68 of General Specification for Civil Engineering Works (1992))

NOTE : *Information provided by client

REMARKS:

TESTED BY : K.W. Cheung
POST : Lab. Technician
DATE : 27/07/2010

CHECKED BY : W.K.Chan
POST : Reporting Officer
DATE : 29/07/2010

CERTIFIED BY : CHEUNG WING TAI
POST : Deputy Manager
DATE : 29/07/2010

Appendix F – Testing Results of Pillbox

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
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REPORT ON DETERMINATION OF COMPRESSIVE STRENGTH OF PRECAST CONCRETE MASONRY UNITS

In accordance with BS 6073 : Part 1 : 1981 Appendix B (AMD 3944 & 4462)

Report No. : GCD100800671 Date of Issue : 16-8-2010

Sample Details as Supplied by Client :

Client : MTR Corporation Limited
Contract No. : 11202
Address : --
Project / Site : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link
Manufacturer : Unknown
Date Manufactured : --
Source of masonry units : Unkwon
Type of masonry units : Hollow concrete block
Specified strength : Unkwon
Colour of masonry units : Grey
Nominal Size : (440 x 215 x 225) mm with two perforated square holes (140x100) mm

Laboratory Test Results

Date Received : 29-7-2010
GCE Reg. No. : GCE 101157
Date Tested : 13-8-2010
Test Unit No. : PB 10028
Test Location : GCE Branch Laboratory at San Po Kong

TESTING OF BLOCK

Specimen No.	Nominal Length (mm)	Thickness (mm)	Nominal Height (mm)	Gross Area (mm^2)	Maximum Load (kN)	Crushing Strength (N/mm^2)
HB 1	440	225	214	99000	1976.3	20.0
HB 2	440	224	213	98560	1358.6	13.8
--	--	--	--	--	--	--
Standard Deviation, S					(N/mm^2)	--
Average crushing strength (Compressive Strength) of the sample					(N/mm^2)	--

Acceptance Criteria (Client's Specification : General Materials & Workmanship Specification - Clause 26.5.1a)

The average crushing strength of the sample shall be not less than 7 N/mm^2.

Notes :
1. All test results relate only to the sample tested.
2. A sample of masonry units shall consist of 10 individual blocks.
3. Test samples were spare concrete blocks found on site outside the Pillbox.

Remarks : --

Tested By : C.N. Huang
Approved Signatory : LAU SUN HUNG, IVAN
Checked By :
Post : Senior Testing Manager

PHOTOGRAPHIC RECORD

Report No. : GCD100800671 Date of Issue : 16-8-2010

Sample Details as Supplied by Client :

Client : MTR Corporation Limited Contract No. : 11202

Project / Site : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

GCE Reg. No. : GCE 101157 Test Unit No. : PB 10028

	SAMPLE NO.	
	HB 1	**HB 2**
As-received condition		
End preparation by cement mortar capping		
Compression test by Universal Testing Machine		
Failure pattern after test		

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
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RECORD ON OBTAINING OF CORE SAMPLES

In Accordance With CS 1 : 1990 Section 15 (AMD 1201)

Page 1 of 1

Sample Details as Supplied by Client :

Client : MTR Corporation Limited
Serial No. : --
Address : --
Project : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link
W.O. No. / Job No. : --
Contract No. : 11202
Concrete Mix I.D. : Unknown
Concrete Grade : Unknown
Admixture : Unknown

Sampling and Equipment Details :

Date of Drilling : 19-7-2010
Sampled By : W.F. Cheung
Coring Machine No. : N009-0001
Core Nominal Diameter (mm) : 75
Coring Barrel No. : N011-0001
Condition of Storage of Core : Good

Core Mark	Measured Length (mm)	Date Cast	Drilling Direction Relative to Casting Direction (H/V/D)	Description of Reinforcement	Location of Coring
S1	120	Unknown	Vertical	Nil	Base slab of Pillbox
--	--	--	--	--	--

Remarks : --

Recorded By :
W.F. Cheung
GCE-Drilling Team Technician
Date : 19-7-2010

Checked By :
TONY T.T. CHAN
Testing Manager
Date : 21-7-2010

Form No. : CON-S12/WS Issue 5 Rev. 0 (02-05-2003) Page 5 of 5

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

REPORT ON DETERMINATION OF COMPRESSIVE STRENGTH OF CONCRETE CORE

In Accordance With CS 1 : 1990 : Section 15 (AMD 1201, 1203 & 1205)

Report No. : COR10080036
Date of Issue : 16/08/2010

Sample Details as Supplied by Client :
Client : MTR CORPORATION LIMITED
Address : --
Project / Site : CONTRACT NO. 11202 STAGE II GROUND INVESTIGATION FOR SHATIN TO CENTRAL LINK
Contract No. : 11202
W.O. No. : -
Core Location : BASE SLAB OF PILLBOX
Job No. : -
Core Mark : S1
Concrete Grade : --
Concrete Mix I.D. : --
Date Cast : --
Date Drilled : 19/07/2010
Storage Condition : GOOD
Drilling Direction Relative to Casting Direction : VERTICAL
PWL Request No. : -
Client Request No. : --

Sampling Record : A SAMPLING RECORD IS AVAILABLE AND A COPY OF THE RECORD IS ATTACHED IN THIS REPORT.

Laboratory Test Results :
Date Received : 04/08/2010
GCE Reg. No. : GCE101157
Test Unit No. : CR10069
Date Commenced : 04/08/2010
Age at Test : -
Condition on Receipt : GOOD
Date Completed : 14/08/2010

Description of Specimen and Aggregate :
Presence of Cracks : NIL
Distribution of Materials : UNEVEN
Maximum Size : 40mm
Particle Shape : ANGULAR
General Type : GRANITE

		Small Voids	Medium Voids	Large Voids
Compaction of Concrete	-			
Extent of Voids	-	CONSIDERABLE	N/A	N/A

Measurement of Reinforcement :
Size of Reinforcing Bar : - / - / - / -
Position of Bar from Drilling Surface As-Received : - / - / - / -
Spacing of Reinforcing Bars : - / - / - / -
Position of Bar from Nearer End after Capping : - / - / - / -

Measurement of Cylindricity, Flatness, Squareness and Parallelism :
Cylindricity : PASS
Squareness : PASS
Flatness : PASS
Parallelism : PASS

Measurement of Dimensions and Density :
Minimum Length As-received : 107 mm
Maximum Length As-received : 114 mm
Cutting Location from Drilling Surface : 13 mm
Method of End Preparation : CAPPED /W SUL C
Average Diameter : 76.1 mm
Average Length before Capping : 83.2 mm
Average Length after Capping : 85.2 mm
Length after Capping / Diameter Ratio : 1.12
Saturated Density : 2290 kg/m^3
Corrected Saturated Density : -

Determination of Compressive Strength :
Maximum Load at Failure : 63.4 kN
Measured Compressive Strength : 14.0 N/mm^2
Estimated In-Situ Cube Strength : 13.5 N/mm^2
Type of Fracture : NORMAL

Notes :
1. All test results relate only to the samples tested.
2. Curing of concrete cores from date of receipt of specimen is in accordance with CS 1 : 1990 Section 10 (AMD 1101).

Remarks : 1) THE SIZE OF CORE SPECIMEN DOES NOT COMPLY WITH THE REQUIREMENT OF CLAUSE 15.3.1 OF CS 1 : 1990.

Tested By : K.S. SZE
Approved Signatory : YU LEE KIEN, PETER
Checked By : ____________
Post : Managing Director

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
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TEL.: 852-2365 9123 FAX No.: 852-2765 8034

REPORT ON DETERMINATION OF COMPRESSIVE STRENGTH OF CONCRETE CORE

In Accordance With CS 1 : 1990 : Section 15 (AMD 1201, 1203 & 1205)

Report No. : COR10080036 Date of Issue : 16/08/2010

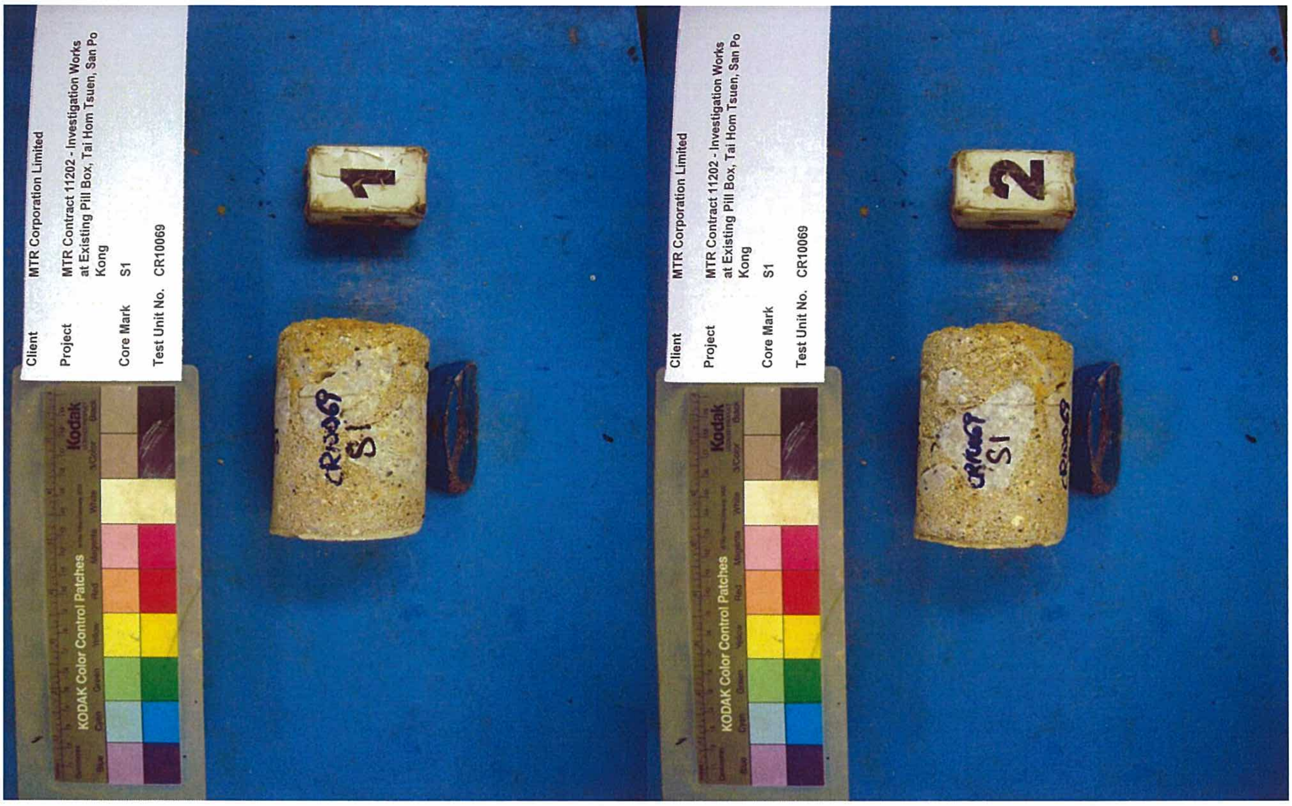
Contract No. : 11202 Job Title : CONTRACT NO. 11202 STAGE II GROUND INVESTIGATION FOR SHATIN TO CENTRAL LINK

W.I. / Job No. : -/-

Location of concrete from where core is taken : BASE SLAB OF PILLBOX

Core Mark : S1 Sample Lab. Ref. No. : COR10080036

Photographs of Core taken at 90 degrees intervals as received



Client	MTR Corporation Limited
Project	MTR Contract 11202 - Investigation Works at Existing Pill Box, Tai Hom Tsuen, San Po Kong
Core Mark	S1
Test Unit No.	CR10069

1st VIEW (0 - 90) degrees

2nd VIEW (90 - 180) degrees

Remark : 1) THE SIZE OF CORE SPECIMEN DOES NOT COMPLY WITH THE REQUIREMENT OF CLAUSE 15.3.1 OF CS 1 : 1990.

REPORT ON DETERMINATION OF COMPRESSIVE STRENGTH OF CONCRETE CORE

In Accordance With CS 1 : 1990 : Section 15 (AMD 1201, 1203 & 1205)

Report No. : COR10080036

Date of Issue : 16/08/2010

Contract No. : 11202

Job Title : CONTRACT NO. 11202 STAGE II GROUND INVESTIGATION FOR SHATIN TO CENTRAL LINK

W.I. / Job No. : -/-

Location of concrete from where core is taken : BASE SLAB OF PILLBOX

Core Mark : S1

Sample Lab. Ref. No. : COR10080036

Photographs of Core taken at 90 degrees intervals as received

3rd VIEW (180 - 270) degrees

4th VIEW (270 - 360) degrees

Remark : 1) THE SIZE OF CORE SPECIMEN DOES NOT COMPLY WITH THE REQUIREMENT OF CLAUSE 15.3.1 OF CS 1 : 1990.

-- END --

RECORD ON OBTAINING OF CORE SAMPLES

In Accordance With CS 1 : 1990 Section 15 (AMD 1201)

Page 1 of 1

Sample Details as Supplied by Client :

Client : MTR Corporation Limited
Serial No. : --
Address : --
Project : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link
W.O. No. / Job No. : --
Contract No. : 11202
Concrete Mix I.D. : Unknown
Concrete Grade : Unknown
Admixture : Unknown

Sampling and Equipment Details :

Date of Drilling : 20-7-2010
Sampled By : K.M. Tang
Coring Machine No. : N009-0001
Core Nominal Diameter (mm) : 75
Coring Barrel No. : N011-0001
Condition of Storage of Core : Good

Core Mark	Measured Length (mm)	Date Cast	Drilling Direction Relative to Casting Direction (H/V/D)	Description of Reinforcement	Location of Coring
R1	515	Unknown	Horizontal	Nil	Roof dome of Pillbox
--	--	--	--	--	--

Remarks : --

Recorded By :
K.M. Tang
GCE-Drilling Team Technician
Date : 20-7-2010

Checked By :
TONY T.T. CHAN
Testing Manager
Date : 21-7-2010

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

REPORT ON DETERMINATION OF COMPRESSIVE STRENGTH OF CONCRETE CORE

In Accordance With CS 1 : 1990 : Section 15 (AMD 1201, 1203 & 1205)

Report No. : COR10080035 Date of Issue : 16/08/2010

Sample Details as Supplied by Client :
Client : MTR CORPORATION LIMITED
Address : --
Project / Site : CONTRACT NO. 11202 STAGE II GROUND INVESTIGATION FOR SHATIN TO CENTRAL LINK

Contract No. : 11202
W.O. No. : -
Job No. : -
Concrete Mix I.D. : --
Storage Condition : GOOD
PWL Request No. : -
Client Request No. : --

Core Location : ROOF DOME OF PILLBOX
Core Mark : R1
Concrete Grade : --
Date Cast : --
Date Drilled : 20/07/2010
Drilling Direction Relative to Casting Direction : HORIZONTAL

Sampling Record : A SAMPLING RECORD IS AVAILABLE AND A COPY OF THE RECORD IS ATTACHED IN THIS REPORT.

Laboratory Test Results :
Date Received : 04/08/2010
Date Commenced : 04/08/2010
Date Completed : 14/08/2010
GCE Reg. No. : GCE101157
Age at Test : -
Test Unit No. : CR10069
Condition on Receipt : GOOD

Description of Specimen and Aggregate :
Presence of Cracks : NIL
Distribution of Materials : UNEVEN
Maximum Size : 40mm
Particle Shape : ANGULAR
General Type : GRANITE

		Small Voids	Medium Voids	Large Voids
Compaction of Concrete	-			
Extent of Voids	-	CONSIDERABLE	N/A	N/A

Measurement of Reinforcement :
Size of Reinforcing Bar : - / - / - / -
Spacing of Reinforcing Bars : - / - / - / -
Position of Bar from Drilling Surface As-Received : - / - / - / -
Position of Bar from Nearer End after Capping : - / - / - / -

Measurement of Cylindricity, Flatness, Squareness and Parallelism :
Cylindricity : PASS
Flatness : PASS
Squareness : PASS
Parallelism : PASS

Measurement of Dimensions and Density :
Minimum Length As-received : 95 mm
Maximum Length As-received : 129 mm
Cutting Location from Drilling Surface : 10 mm
Method of End Preparation : CAPPED /W SUL C
Average Diameter : 72.1 mm
Average Length before Capping : 81.4 mm
Average Length after Capping : 85.3 mm
Length after Capping / Diameter Ratio : 1.18
Saturated Density : 2190 kg/m^3
Corrected Saturated Density : -

Determination of Compressive Strength :
Maximum Load at Failure : 25.5 kN
Measured Compressive Strength : 6.0 N/mm^2
Estimated In-Situ Cube Strength : 6.5 N/mm^2
Type of Fracture : NORMAL

Notes :
1. All test results relate only to the samples tested.
2. Curing of concrete cores from date of receipt of specimen is in accordance with CS 1 : 1990 Section 10 (AMD 1101).

Remarks : 1) THE MAXIMUM LOAD AT FAILURE OF THE SPECIMEN IS LOWER THAN THE MINIMUM CALIBRATED RANGE OF COMPRESSION MACHINE (i.e 50kN). 2) THE SIZE OF CORE SPECIMEN DOES NOT COMPLY WITH THE REQUIREMENT OF CLAUSE 15.3.1 OF CS 1 : 1990.

Tested By : K.S. SZE
Checked By : ____________________
Approved Signatory : ____________________ YU LEE KIEN, PETER
Post : Managing Director

REPORT ON DETERMINATION OF COMPRESSIVE STRENGTH OF CONCRETE CORE

In Accordance With CS 1 : 1990 : Section 15 (AMD 1201, 1203 & 1205)

Report No. : COR10080035 Date of Issue : 16/08/2010

Contract No. : 11202

Job Title : CONTRACT NO. 11202 STAGE II GROUND INVESTIGATION FOR SHATIN TO CENTRAL LINK

W.I. / Job No. : -/-

Location of concrete from where core is taken : ROOF DOME OF PILLBOX

Core Mark : R1

Sample Lab. Ref. No. : COR10080035

Photographs of Core taken at 90 degrees intervals as received

1st VIEW (0 - 90) degrees

2nd VIEW (90 - 180) degrees

Remark : 1) THE MAXIMUM LOAD AT FAILURE OF THE SPECIMEN IS LOWER THAN THE MINIMUM CALIBRATED RANGE OF COMPRESSION MACHINE (i.e 50kN). 2) THE SIZE OF CORE SPECIMEN DOES NOT COMPLY WITH THE REQUIREMENT OF CLAUSE 15.3.1 OF CS 1 : 1990.

REPORT ON DETERMINATION OF COMPRESSIVE STRENGTH OF CONCRETE CORE

In Accordance With CS 1 : 1990 : Section 15 (AMD 1201, 1203 & 1205)

Report No. : COR10080035

Date of Issue : 16/08/2010

Contract No. : 11202

Job Title : CONTRACT NO. 11202 STAGE II GROUND INVESTIGATION FOR SHATIN TO CENTRAL LINK

W.I. / Job No. : -/-

Location of concrete from where core is taken : ROOF DOME OF PILLBOX

Core Mark : R1

Sample Lab. Ref. No. : COR10080035

Photographs of Core taken at 90 degrees intervals as received

3rd VIEW (180 - 270) degrees

4th VIEW (270 - 360) degrees

Remark : 1) THE MAXIMUM LOAD AT FAILURE OF THE SPECIMEN IS LOWER THAN THE MINIMUM CALIBRATED RANGE OF COMPRESSION MACHINE (i.e 50kN). 2) THE SIZE OF CORE SPECIMEN DOES NOT COMPLY WITH THE REQUIREMENT OF CLAUSE 15.3.1 OF CS 1 : 1990.

-- END --

Appendix G – Drilling and Core Extraction Record

DRILLING RECORD

Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

Date drilled : 15 July 2010

Core location : Trial Pit (TP154) – Wing Wall

Drill length : 665 mm

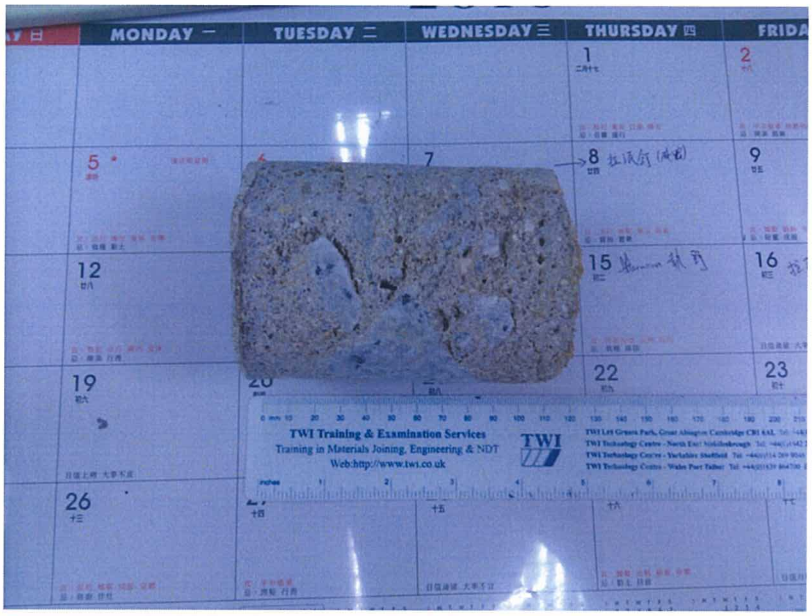
Date drilled : 15 July 2010

Core location : Wall of pillbox just above existing ground level of trial pit, TP156

Drill length : 665 mm

DRILLING RECORD

Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link



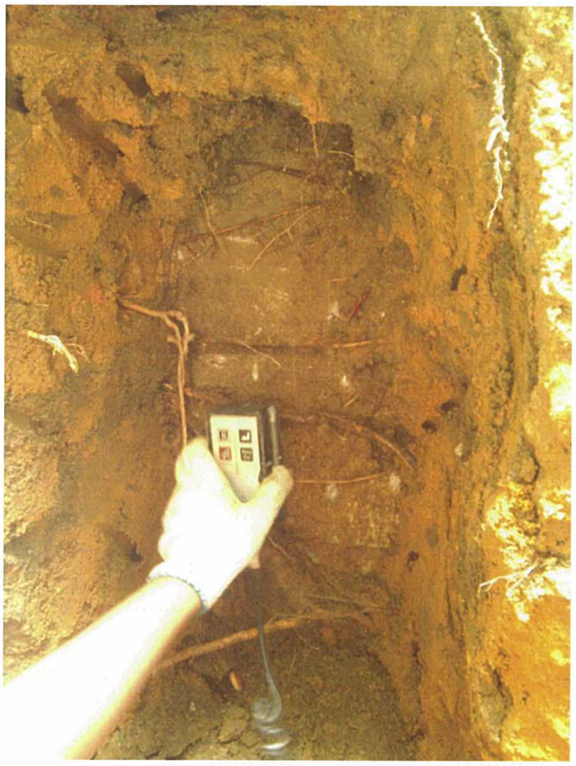
Date drilled : 19 July 2010
Core location : Base slab of Pillbox, S1
Drill length : 120 mm

Date drilled : 20 July 2010
Core location : Roof dome, R1
Drill length : 515 mm with top 15mm screed

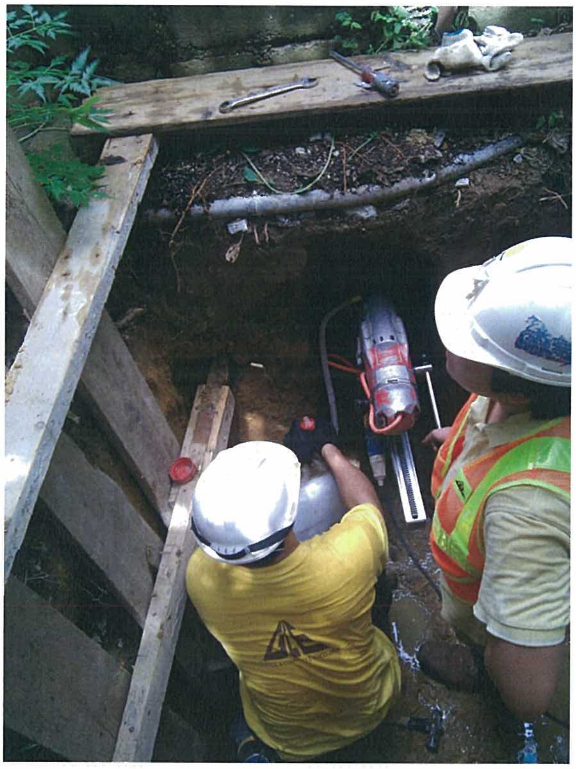
Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

Photographic Record for Core extraction

Core location : Trial Pit (TP154) – Wing Wall Date drilled : 15 July 2010



Cover-meter scanning for checking of reinforcement



Core drilling

Extracted core samples, mark W1-1 and W1-2, revealed the wing wall of pillbox was constructed by two rows of concrete hollow blocks

Thickness of wing wall measured through the core-hole is 665mm

Core-hole and bolt hole were reinstated by FORSOC Renderoc HB40 immediately after inspection

Internal and external wall were made good with client's satisfaction

Core location : Wall of pillbox just above existing ground level of trial pit, TP156

Core location of core mark, W2

Cover-meter scanning

Core Drilling

Extracted core samples, mark W2-1 and W2-2, revealed the wall of pillbox was constructed by two rows of concrete hollow blocks

Thickness of wing wall measured through the core-hole is 730mm

Core-hole and bolt hole were reinstated by FORSOC Renderoc HB40 immediately after inspection

Internal and external wall were made good with client's satisfaction

Core location : Base slab of Pillbox, S1

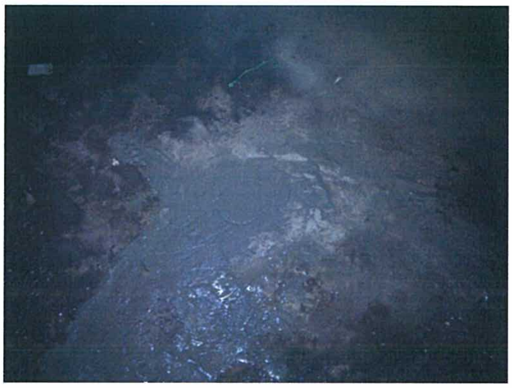
Date drilled : 19 July 2010

Cover-meter scanning

Core drilling

Extracted core

Thickness of slab is 120mm



Core-hole and bolt hole were reinstated by FORSOC Renderoc HB40 immediately after Inspection

Core location : Roof dome, R1

Date drilled : 20 July 2010

Cover-meter scanning at roof dome, R1

Core drilling

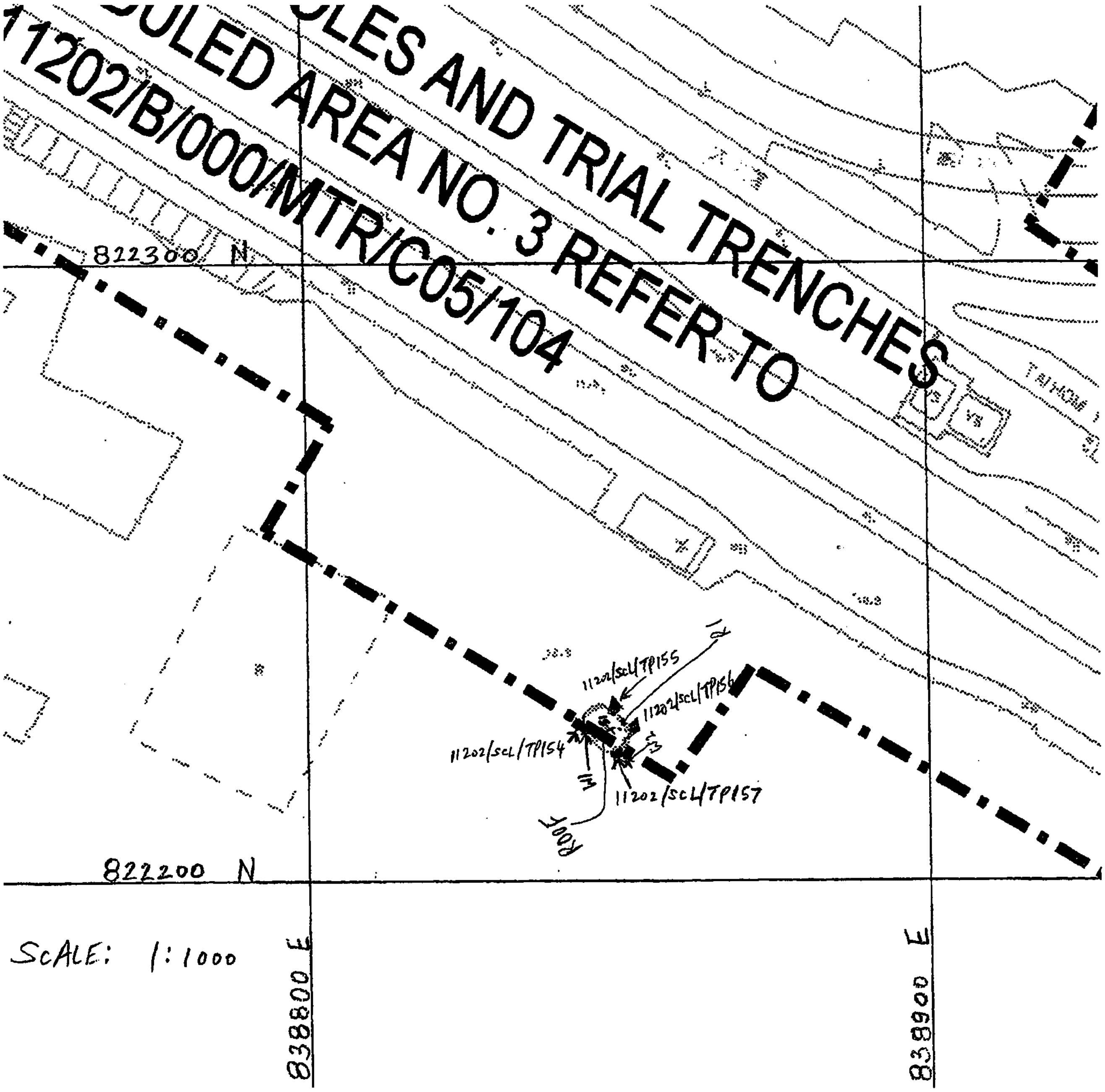
Extracted core

Thickness of roof dome is 515mm

Core-hole and bolt hole were reinstated

Rebar was encountered at 110mm

Appendix H – Ground Investigation Plan



SCALE: 1:1000

LEGEND: ■ - Trial Pit

PROJECT : Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link

GEOTECHNICS &
CONCRETE ENGINEERING
(H.K.) LTD

LOCATION : PILLBOX AT DIAMOND HILL

CONTRACT NO. : 11202

GCE JOB NO. : GCE1001SI

GEOTECHNICS & CONCRETE ENGINEERING (H. K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

香港土力混凝土工程有限公司
九龍紅磡高山道六號地下
電話：852-2365 9123

MATERIAL TESTING LABORATORY

FINAL REPORT ON LABORATORY TESTING

PILLBOX AT DIAMOND HILL

Client : **MTR Corporation Limited**

Contract No. : **11202**

Project : **Contract No. 11202 Stage II Ground Investigation for Shatin to Central Link**

Date : **6 October 2010**

CERTIFIED BY :

W.T. Cheung
Deputy Manager

Geotechnics & Concrete Engineering (H.K.) Ltd.

Soil & Rock Testing Laboratory

Note

- This laboratory report contains the testing results for which was accredited by HOKLAS and was NOT accredited by HOKLAS.

- The two sets of results are separated by a colour (green) divider sheet.

Geotechnics & Concrete Engineering (H.K.) Ltd.

Soil & Rock Testing Laboratory

Note

- The tests are divided into two sections.

- Section One contains results of tests for which the laboratory was accredited by HOKLAS.

- Section Two, following the colour (green) divider sheet, contains the results of tests for which the laboratory was NOT accredited at the date of testing.

CONTENTS

1) SUMMARY OF SOIL TEST RESULTS

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

SUMMARY OF SOIL TEST RESULTS

REPORT NO. SUM 10100022

CLIENT MTR Corporation Limited

SITE Stage II Ground Investigation for Shatin to Central Link

CONTRACT NO. 11202 **WORKS ORDER NO.** -

JOB NO. GCE/SI/PB **DATE** 06/10/2010

Site Data	**Hole No.**		11202/SCL/TP154				
	Sample / Specimen No.		1				
	Type		BLOCK				
	Sample Depth (m)		0.5				
Description			Moist orangish brown sandy SILT/CLAY (*FILL)				
In-situ	**MC 105°C (%)**		14				
	Density (Mg/m^3)	**Bulk**	2.01				
		Dry	1.74				
Specific gravity			2.64				
Atterberg Limits	**Liquid Limit (LL)**		41				
	Plastic Limit (PL)		20				
	Plasticity Index (PI)		21				
	Liquidity Index (LI)		0.238				
Particle Size	**Clay (%)**		29				
	Silt (%)		11				
	Sand (%)		59				
	Gravel (%)		1				
Triaxial Compr.	**Normal Stress (kPa)**	**s'**					
	Shear Stress (kPa)	**t**					
	σ_3' (kPa)						
	Type of test						
Chemical	**Organic Matter content (%)**		0.4				
	Carbonate content (%)		<1.0				
	Chloride content (%)		<0.01				
	pH value		7.0				
	Sulphate content (%)		<0.01				
	Resistivity (20°C) Ωm						
	Redox Potential mV						
	Presence of Hydrogen Sulphide		None				
	Presence of Carbonate Content						
Compr.	**Optimum m.c. (%)**						
	Max. dry density (Mg/m^3)						
	Type of test						
Remarks			*Information provided by client				

SUMMARY OF SOIL TEST RESULTS

REPORT NO. SUM 10100023

CLIENT MTR Corporation Limited

SITE Stage II Ground Investigation for Shatin to Central Link

CONTRACT NO. 11202 **WORKS ORDER NO.** -

JOB NO. GCE/SI/PB **DATE** 06/10/2010

Site Data	Hole No.		11202/SCL/TP155				
	Sample / Specimen No.		1				
	Type		BLOCK				
	Sample Depth	(m)	0.5				
Description			Moist dark brown clayey gravelly SAND (*FILL)				
In-situ	MC 105°C	(%)	8.8				
	Density Bulk	(Mg/m^3)	1.83				
	Density Dry	(Mg/m^3)	1.68				
Specific gravity			2.63				
Atterberg Limits	Liquid Limit (LL)		38				
	Plastic Limit (PL)		21				
	Plasticity Index (PI)		17				
	Liquidity Index (LI)		0.076				
Particle Size	Clay	(%)	10				
	Silt	(%)	8				
	Sand	(%)	67				
	Gravel	(%)	15				
Triaxial Compr.	Normal Stress (kPa)	s'					
	Shear Stress (kPa)	t					
	σ_3'	(kPa)					
	Type of test						
Chemical	Organic Matter content	(%)	0.6				
	Carbonate content	(%)	<1.0				
	Chloride content	(%)	<0.01				
	pH value		7.2				
	Sulphate content	(%)	0.09				
	Resistivity (20°C)	Ωm					
	Redox Potential	mV					
	Presence of Hydrogen Sulphide		None				
	Presence of Carbonate Content						
Compr.	Optimum m.c.	(%)	9.1				
	Max. dry density	(Mg/m^3)	2.03				
	Type of test		2.5kg				
Remarks			*Information provided by client				

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

SUMMARY OF SOIL TEST RESULTS

REPORT NO. SUM 10100024

CLIENT MTR Corporation Limited

SITE Stage II Ground Investigation for Shatin to Central Link

CONTRACT NO. 11202 **WORKS ORDER NO.** -

JOB NO. GCE/SI/PB **DATE** 06/10/2010

Site Data	**Hole No.**			11202/SCL/TP156				
	Sample / Specimen No.			1				
	Type			BLOCK				
	Sample Depth		**(m)**	0.5				
Description				Moist dark brown very clayey gravelly SAND (*FILL)				
In-situ	**MC 105°C**		**(%)**	11				
	Density	**Bulk**	**(Mg/m^3)**	1.72				
		Dry		1.56				
Specific gravity				2.64				
Atterberg Limits	**Liquid Limit (LL)**			44				
	Plastic Limit (PL)			22				
	Plasticity Index (PI)			22				
	Liquidity Index (LI)			0.032				
Particle Size	**Clay**		**(%)**	19				
	Silt		**(%)**	11				
	Sand		**(%)**	61				
	Gravel		**(%)**	9				
Triaxial Compr.	**Normal Stress (kPa)**	**s'**						
	Shear Stress (kPa)	**t**						
	σ_3'		**(kPa)**					
	Type of test							
Chemical	**Organic Matter content**		**(%)**	0.6				
	Carbonate content		**(%)**	<1.0				
	Chloride content		**(%)**	<0.01				
	pH value			6.5				
	Sulphate content		**(%)**	<0.01				
	Resistivity (20°C)		**Ωm**					
	Redox Potential		**mV**					
	Presence of Hydrogen Sulphide			None				
	Presence of Carbonate Content							
Compr.	**Optimum m.c.**		**(%)**					
	Max. dry density		**(Mg/m^3)**					
	Type of test							
Remarks				*Information provided by client				

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

SUMMARY OF SOIL TEST RESULTS

REPORT NO. SUM 10100025

CLIENT MTR Corporation Limited

SITE Stage II Ground Investigation for Shatin to Central Link

CONTRACT NO. 11202 **WORKS ORDER NO.** -

JOB NO. GCE/SI/PB **DATE** 06/10/2010

Site Data	**Hole No.**		11202/SCL/TP157				
	Sample / Specimen No.		1				
	Type		BLOCK				
	Sample Depth (m)		0.5				
Description			Moist orangish brown sandy SILT/CLAY (*FILL)				
In-situ	**MC 105°C. (%)**		17				
	Density (Mg/m^3)	**Bulk**	2.03				
		Dry	1.75				
Specific gravity			2.64				
Atterberg Limits	**Liquid Limit (LL)**		48				
	Plastic Limit (PL)		23				
	Plasticity Index (PI)		25				
	Liquidity Index (LI)		0.260				
Particle Size	**Clay (%)**		30				
	Silt (%)		11				
	Sand (%)		56				
	Gravel (%)		3				
Triaxial Compr.	**Normal Stress (kPa)**	**s'**					
	Shear Stress (kPa)	**t**					
	σ_3' (kPa)						
	Type of test						
Chemical	**Organic Matter content (%)**		0.6				
	Carbonate content (%)		<1.0				
	Chloride content (%)		<0.01				
	pH value		7.2				
	Sulphate content (%)		<0.01				
	Resistivity (20°C) Ωm						
	Redox Potential mV						
	Presence of Hydrogen Sulphide		None				
	Presence of Carbonate Content						
Compr.	**Optimum m.c. (%)**						
	Max. dry density (Mg/m^3)						
	Type of test						
Remarks			*Information provided by client				

SECTION ONE

Test result was accredited by HOKLAS.

Geotechnics & Concrete Engineering (H.K.) Ltd.

Soil & Rock Testing Laboratory

Note

- The following test results are for tests for which the laboratory was accredited by HOKLAS.

2) MOISTURE CONTENTS TEST RESULTS

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

REPORT ON DETERMINATION OF MOISTURE CONTENT OF SOIL

IN ACCORDANCE WITH GEOSPEC 3 : 2001

Page 1 of 1

CLIENT* : MTR Corporation Limited
ADDRESS* : 9/F, Citylink Plaza, 1 Shatin Station Circuit Shatin, New Territories
SITE* : Stage II Ground Investigation for Shatin to Central Link
TEST LOCATION : GROUND FLOOR, 18 PAK KUNG STREET, HUNG HOM, KOWLOON
JOB NO. : GCE/SI/PB
TEST UNIT NO. : STS 100001

REPORT NO. : MOI10100002
CONTRACT NO.* : 11202
W.O. NO.* : --
DATE RECEIVED : 01/09/2010

Hole No.*	Sample No.*	Sample Depth* (Spec. Depth) m	Sample Type*	Moisture Content %	M.C. Diff. %	Test	Drying Temp. °C	Date Started	Date Completed	Description
11202/SCL/TP154	1	0.50 (0.50)	BLOCK	14	--	5.2	105 ± 5	06/09	07/09	Moist orangish brown sandy SILT/CLAY (*FILL)
11202/SCL/TP155	1	0.50 (0.50)	BLOCK	8.8	--	5.2	105 ± 5	06/09	07/09	Moist dark brown clayey gravelly SAND (*FILL)
11202/SCL/TP156	1	0.50 (0.50)	BLOCK	11	--	5.2	105 ± 5	06/09	07/09	Moist dark brown very clayey gravelly SAND (*FILL)
11202/SCL/TP157	1	0.50 (0.50)	BLOCK	17	--	5.2	105 ± 5	06/09	07/09	Moist orangish brown sandy SILT/CLAY (*FILL)

* : Information provided by client

REMARKS:

TESTED BY : T.K. LAM
POST : Lab. Technician
DATE : 06/10/2010

CHECKED BY : W.K. Chan
POST : Reporting Officer
DATE : 06/10/2010

CERTIFIED BY : CHEUNG WING TAI
POST : Dept. Manager
DATE : 06/10/2010

HOKLAS 024

3) ATTERBERG LIMITS TEST RESULTS

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

HOKLAS 024

REPORT ON DETERMINATION OF ATTERBERG LIMITS OF SOIL

IN ACCRODANCE WITH GEOSPEC 3 : 2001 TESTS 6.1 & 6.2

Page 1 of 1
REPORT NO. : ALP10090020

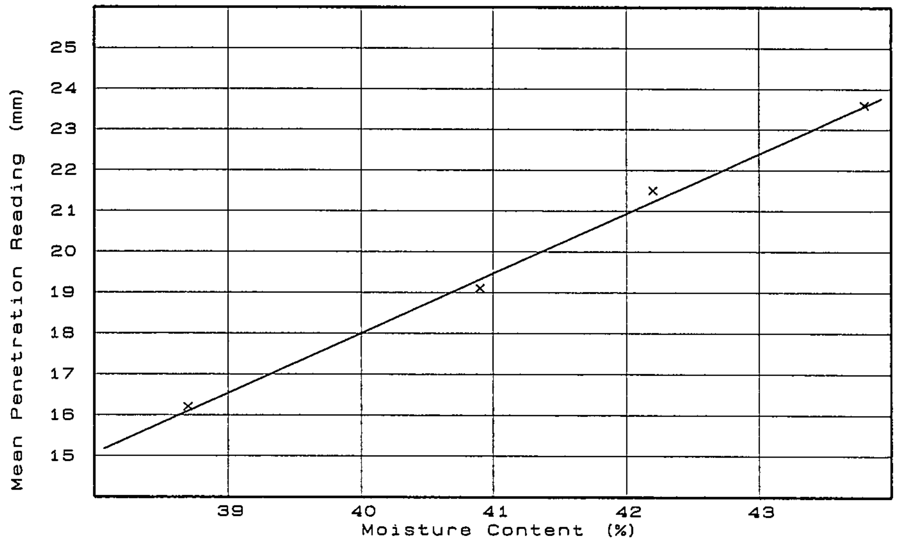
CLIENT* : MTR Corporation Limited
DATE RECEIVED : 01/09/2010
ADDRESS* : 9/F, Citylink Plaza, 1 Shatin Station Circuit Shatin, New Territories
SITE* : Stage II Ground Investigation for Shatin to Central Link
TEST LOCATION : GROUND FLOOR, 21-23 SAN WAI STREET, HUNG HOM, KOWLOON
DATE STARTED : 06/09/2010
W.O. NO.* : --
CONTRACT NO.* : 11202
DATE COMPLETED: 11/09/2010
JOB NO. : GCE/SI/PB
TEST UNIT NO. : STS 100001
SAMPLE TYPE* : BLOCK
HOLE NO.* : 11202/SCL/TP154
SAMPLE NO.* : 1
SAMPLE DEPTH* : 0.50 m
DESCRIPTION : Moist orangish brown sandy SILT/CLAY (*FILL)
SPEC. DEPTH : 0.50 m

SAMPLE PREPARATION :

Mass of wet / dry subsample : 336.52 g / 294.07 g ; Moisture content of subsample : 14.4 %
Total mass of wet / dry sample used for the test : 652.03 g / 569.96 g
Mass / Percentage of material retained on 425μm test sieve : 241.33 g / 42.3 %
Equivalent moisture content of fraction passing 425μm test sieve : 25.0 %
Condition of soil sample : sieved specimen
Type of drying process : tested after oven-drying at ≤ 50°C
Duration of soil equilibrated with distilled water : - hours
Mixing time of soil and distilled water : -- minutes

TEST RESULTS :

Test no.	LL1	LL2	LL3	LL4	PL1	PL2
Mass of wet soil + container g	73.36	75.30	71.23	50.38	38.41	37.84
Mass of dry soil + container g	69.24	70.28	66.88	45.33	36.75	36.44
Mass of container g	58.60	58.01	56.57	33.81	28.37	29.42
Mass of water g	4.12	5.02	4.35	5.05	1.66	1.40
Mass of dry soil g	10.64	12.27	10.31	11.52	8.38	7.02
Moisture content %	38.7	40.9	42.2	43.8	19.8	19.9
Mean penetration reading mm	16.2	19.1	21.5	23.6		
Mixing time min	14	12	10	10		



FINAL SUMMARY

LIQUID LIMIT = 41 %
PLASTIC LIMIT = 20 %
PLASTICITY INDEX = 21 %
LIQUIDITY INDEX = 0.238

Note : *Information provided by client
Remarks:

TESTED BY : Y.H. Kwok
CHECKED BY : W.K. Chan
CERTIFIED BY : CHEUNG WING TAI

POST : Lab. Technician
POST : Reporting Officer
POST : Dept. Manager
DATE : 11/09/2010
DATE : 06/10/2010
DATE : 06/10/2010

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

HOKLAS 024

REPORT ON DETERMINATION OF ATTERBERG LIMITS OF SOIL

IN ACCRODANCE WITH GEOSPEC 3 : 2001 TESTS 6.1 & 6.2

Page 1 of 1

REPORT NO. : ALP10090021

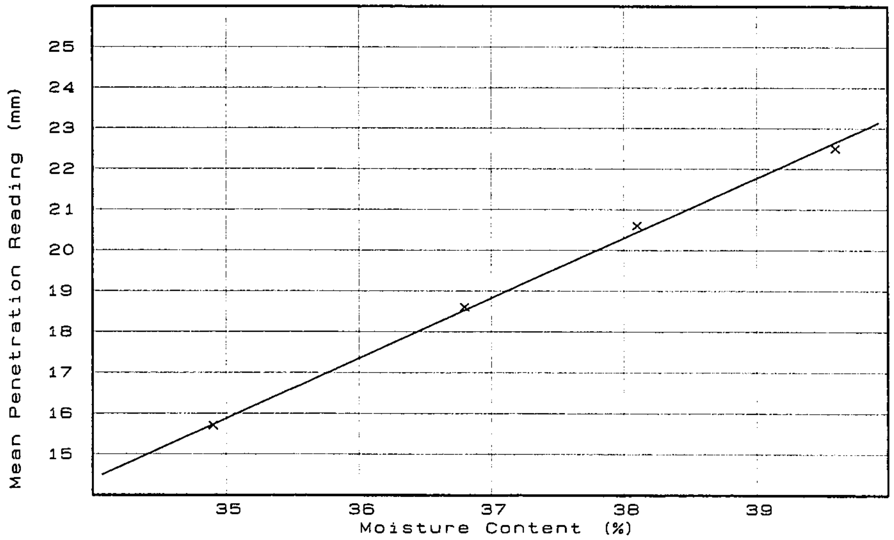
CLIENT* : MTR Corporation Limited
DATE RECEIVED : 01/09/2010
ADDRESS* : 9/F, Citylink Plaza, 1 Shatin Station Circuit Shatin, New Territories
SITE* : Stage II Ground Investigation for Shatin to Central Link
TEST LOCATION : GROUND FLOOR, 21-23 SAN WAI STREET, HUNG HOM, KOWLOON
DATE STARTED : 06/09/2010
W.O. NO.* : --
CONTRACT NO.* : 11202
DATE COMPLETED: 11/09/2010
JOB NO. : GCE/SI/PB
TEST UNIT NO. : STS 100001
SAMPLE TYPE* : BLOCK
HOLE NO.* : 11202/SCL/TP155
SAMPLE NO.* : 1
SAMPLE DEPTH* : 0.50 m
DESCRIPTION : Moist dark brown clayey gravelly SAND (*FILL)
SPEC. DEPTH : 0.50 m

SAMPLE PREPARATION :

Mass of wet / dry subsample : 553.04 g / 508.19 g ; Moisture content of subsample : 8.8 %
Total mass of wet / dry sample used for the test : 748.30 g / 687.78 g
Mass / Percentage of material retained on 425μm test sieve : 416.24 g / 60.5 %
Equivalent moisture content of fraction passing 425μm test sieve : 22.3 %
Condition of soil sample : sieved specimen
Type of drying process : tested after oven-drying at ≤ 50°C
Duration of soil equilibrated with distilled water : - hours
Mixing time of soil and distilled water : -- minutes

TEST RESULTS :

Test no.	LL1	LL2	LL3	LL4	PL1	PL2
Mass of wet soil + container g	95.39	72.62	52.05	51.34	38.17	36.70
Mass of dry soil + container g	91.32	68.31	47.57	47.33	36.62	35.28
Mass of container g	79.67	56.59	35.81	37.20	29.42	28.56
Mass of water g	4.07	4.31	4.48	4.01	1.55	1.42
Mass of dry soil g	11.65	11.72	11.76	10.13	7.20	6.72
Moisture content %	34.9	36.8	38.1	39.6	21.5	21.1
Mean penetration reading mm	15.7	18.6	20.6	22.5		
Mixing time min	13	13	11	10		



FINAL SUMMARY

LIQUID LIMIT = 38 %
PLASTIC LIMIT = 21 %
PLASTICITY INDEX = 17 %
LIQUIDITY INDEX = 0.076

Note : *Information provided by client
Remarks:

TESTED BY : Y.H. Kwok
CHECKED BY : W.K. Chan
CERTIFIED BY : CHEUNG WING TAI
POST : Lab. Technician
POST : Reporting Officer
POST : Dept. Manager
DATE : 11/09/2010
DATE : 06/10/2010
DATE : 06/10/2010

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GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034
HOKLAS 024

REPORT ON DETERMINATION OF ATTERBERG LIMITS OF SOIL

IN ACCRODANCE WITH GEOSPEC 3 : 2001 TESTS 6.1 & 6.2

Page 1 of 1

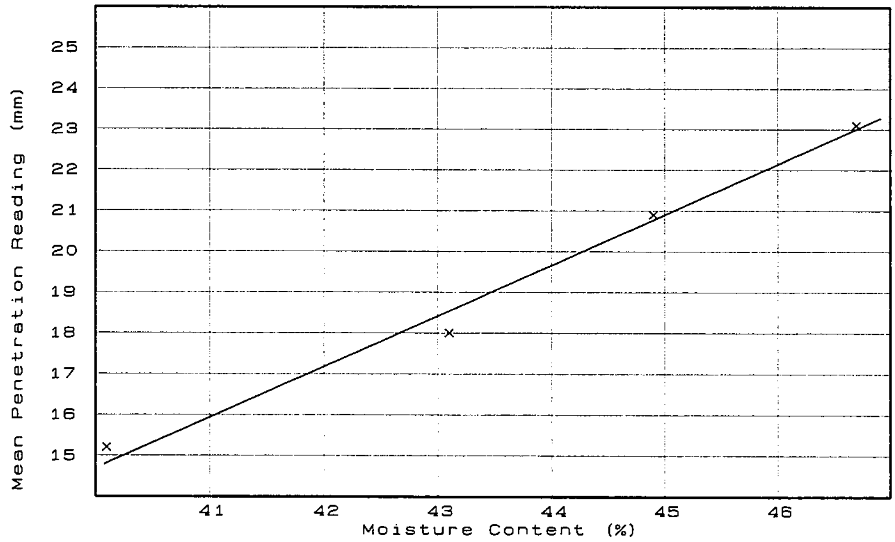
REPORT NO. : ALP10090022
CLIENT* : MTR Corporation Limited
DATE RECEIVED : 01/09/2010
ADDRESS* : 9/F, Citylink Plaza, 1 Shatin Station Circuit Shatin, New Territories
SITE* : Stage II Ground Investigation for Shatin to Central Link
TEST LOCATION : GROUND FLOOR, 21-23 SAN WAI STREET, HUNG HOM, KOWLOON
DATE STARTED : 06/09/2010
W.O. NO.* : --
CONTRACT NO.* : 11202
DATE COMPLETED: 11/09/2010
JOB NO. : GCE/SI/PB
TEST UNIT NO. : STS 100001
SAMPLE TYPE* : BLOCK
HOLE NO.* : 11202/SCL/TP156
SAMPLE NO.* : 1
SAMPLE DEPTH* : 0.50 m
DESCRIPTION : Moist dark brown very clayey gravelly SAND (*FILL)
SPEC. DEPTH : 0.50 m

SAMPLE PREPARATION :

Mass of wet / dry subsample : 408.45 g / 366.85 g ; Moisture content of subsample : 11.3 %
Total mass of wet / dry sample used for the test : 696.70 g / 625.97 g
Mass / Percentage of material retained on 425μm test sieve : 314.42 g / 50.2 %
Equivalent moisture content of fraction passing 425μm test sieve : 22.7 %
Condition of soil sample : sieved specimen
Type of drying process : tested after oven-drying at ≤ 50°C
Duration of soil equilibrated with distilled water : - hours
Mixing time of soil and distilled water : -- minutes

TEST RESULTS :

Test no.		LL1	LL2	LL3	LL4	PL1	PL2
Mass of wet soil + container	g	70.51	52.90	110.15	52.41	39.00	37.00
Mass of dry soil + container	g	66.52	48.35	105.08	47.21	37.27	35.47
Mass of container	g	56.57	37.79	93.79	36.07	29.34	28.44
Mass of water	g	3.99	4.55	5.07	5.20	1.73	1.53
Mass of dry soil	g	9.95	10.56	11.29	11.14	7.93	7.03
Moisture content	%	40.1	43.1	44.9	46.7	21.8	21.8
Mean penetration reading	mm	15.2	18.0	20.9	23.1		
Mixing time	min	14	13	12	11		



FINAL SUMMARY

LIQUID LIMIT = 44 %
PLASTIC LIMIT = 22 %
PLASTICITY INDEX = 22 %
LIQUIDITY INDEX = 0.032

Note : *Information provided by client
Remarks:

TESTED BY : Y.H. Kwok
POST : Lab. Technician
DATE : 11/09/2010

CHECKED BY : W.K. Chan
POST : Reporting Officer
DATE : 06/10/2010

CERTIFIED BY : CHEUNG WING TAI
POST : Dept. Manager
DATE : 06/10/2010

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

HOKLAS 024

REPORT ON DETERMINATION OF ATTERBERG LIMITS OF SOIL

IN ACCRODANCE WITH GEOSPEC 3 : 2001 TESTS 6.1 & 6.2

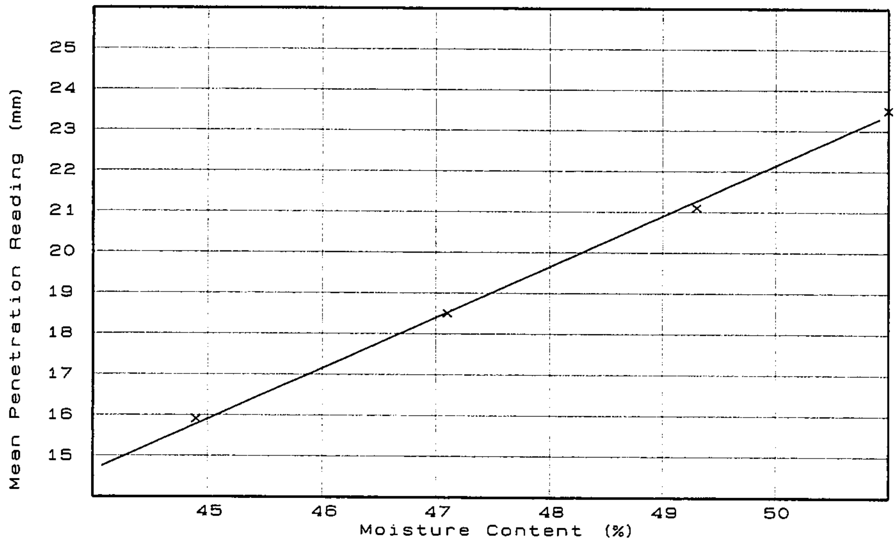
Page 1 of 1
REPORT NO. : ALP10090023
CLIENT* : MTR Corporation Limited
DATE RECEIVED : 01/09/2010
ADDRESS* : 9/F, Citylink Plaza, 1 Shatin Station Circuit Shatin, New Territories
SITE* : Stage II Ground Investigation for Shatin to Central Link
TEST LOCATION : GROUND FLOOR, 21-23 SAN WAI STREET, HUNG HOM, KOWLOON
DATE STARTED : 06/09/2010
W.O. NO.* : --
CONTRACT NO.* : 11202
DATE COMPLETED: 11/09/2010
JOB NO. : GCE/SI/PB
TEST UNIT NO. : STS 100001
SAMPLE TYPE* : BLOCK
HOLE NO.* : 11202/SCL/TP157
SAMPLE NO.* : 1
SAMPLE DEPTH* : 0.50 m
DESCRIPTION : Moist orangish brown sandy SILT/CLAY (*FILL)
SPEC. DEPTH : 0.50 m

SAMPLE PREPARATION :

Mass of wet / dry subsample : 542.16 g / 462.88 g ; Moisture content of subsample : 17.1 %
Total mass of wet / dry sample used for the test : 656.46 g / 560.60 g
Mass / Percentage of material retained on 425μm test sieve : 235.21 g / 42.0 %
Equivalent moisture content of fraction passing 425μm test sieve : 29.5 %
Condition of soil sample : sieved specimen
Type of drying process : tested after oven-drying at ≤ 50°C
Duration of soil equilibrated with distilled water : - hours
Mixing time of soil and distilled water : -- minutes

TEST RESULTS :

Test no.	LL1	LL2	LL3	LL4	PL1	PL2
Mass of wet soil + container g	88.77	105.54	53.36	53.07	37.76	37.06
Mass of dry soil + container g	84.69	99.55	47.63	47.33	36.01	35.49
Mass of container g	75.60	86.84	36.01	36.07	28.29	28.44
Mass of water g	4.08	5.99	5.73	5.74	1.75	1.57
Mass of dry soil g	9.09	12.71	11.62	11.26	7.72	7.05
Moisture content %	44.9	47.1	49.3	51.0	22.7	22.3
Mean penetration reading mm	15.9	18.5	21.1	23.5		
Mixing time min	14	12	10	10		



FINAL SUMMARY

LIQUID LIMIT = 48 %
PLASTIC LIMIT = 23 %
PLASTICITY INDEX = 25 %
LIQUIDITY INDEX = 0.260

Note : *Information provided by client
Remarks:

TESTED BY : Y.H. Kwok
CHECKED BY : W.K. Chan
CERTIFIED BY : CHEUNG WING TAI
POST : Lab. Technician
POST : Reporting Officer
POST : Dept. Manager
DATE : 11/09/2010
DATE : 06/10/2010
DATE : 06/10/2010

4) PARTICLE SIZE DISTRIBUTION CURVES

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

HOKLAS 024

REPORT ON DETERMINATION OF PARTICLE SIZE DISTRIBUTION OF SOIL

IN ACCORDANCE WITH GEOSPEC 3 : 2001 TEST(S) 8.1 / 8.5 / 8.7

Page 1 of 1

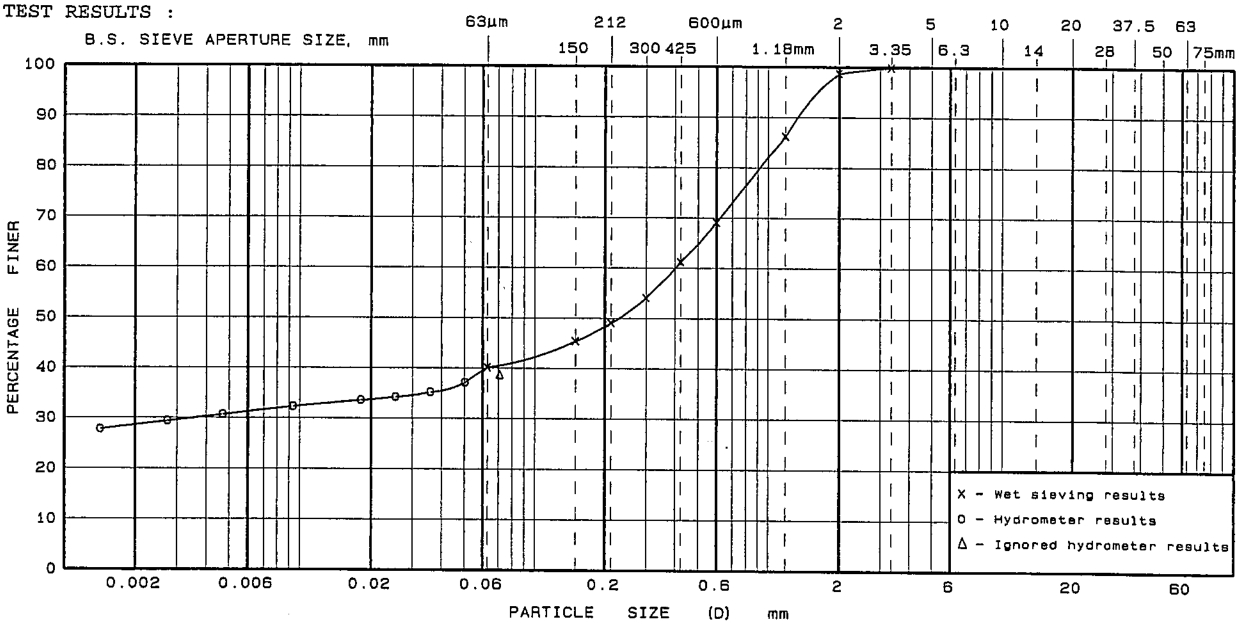
REPORT NO. : PSD10090029
DATE RECEIVED : 01/09/2010

CLIENT* : MTR Corporation Limited
ADDRESS* : 9/F, Citylink Plaza, 1 Shatin Station Circuit Shatin, New Territories
SITE* : Stage II Ground Investigation for Shatin to Central Link
TEST LOCATION : GROUND FLOOR, 20 PAK KUNG STREET, HUNG HOM, KOWLOON
W.O. NO.* : --
CONTRACT NO.* : 11202
JOB NO. : GCE/SI/PB
TEST UNIT NO. : STS 100001
HOLE NO.* : 11202/SCL/TP154
SAMPLE NO.* : 1
DESCRIPTION : Moist orangish brown sandy SILT/CLAY (*FILL)

DATE STARTED : 06/09/2010
DATE COMPLETED: 10/09/2010
SAMPLE TYPE* : BLOCK
SAMPLE DEPTH* : 0.50 m
SPEC. DEPTH : 0.50 m

SAMPLE PREPARATION:
Procedure for sieving test : Method A

TEST RESULTS :



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COB-BLES
	SILT			SAND			GRAVEL			

The following information are only based on the opinion of the laboratory and are not under the scope of accreditation by HOKLAS :

ANALYSIS OF PARTICLE SIZE CURVE

Effective Diameter (D_{10}) = — mm
Median Diameter (D_{50}) = 0.23 mm
Uniformity Coefficient ($U = D_{60}/D_{10}$) = —
(Ref. : Clause 6.59(4) of General Specification for Civil Engineering Works (1992))

FINAL SUMMARY

CLAY = 29 %
SILT = 11 %
SAND = 59 %
GRAVEL = 1 %

Note : *Information provided by client
Remarks:

TESTED BY : C.H. CHOY
POST : Lab. Technician
DATE : 10/09/2010

CHECKED BY :
W.K. Chan
POST : Reporting Officer
DATE : 06/10/2010

CERTIFIED BY :
CHEUNG WING TAI
POST : Dept. Manager
DATE : 06/10/2010

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

HOKLAS 024

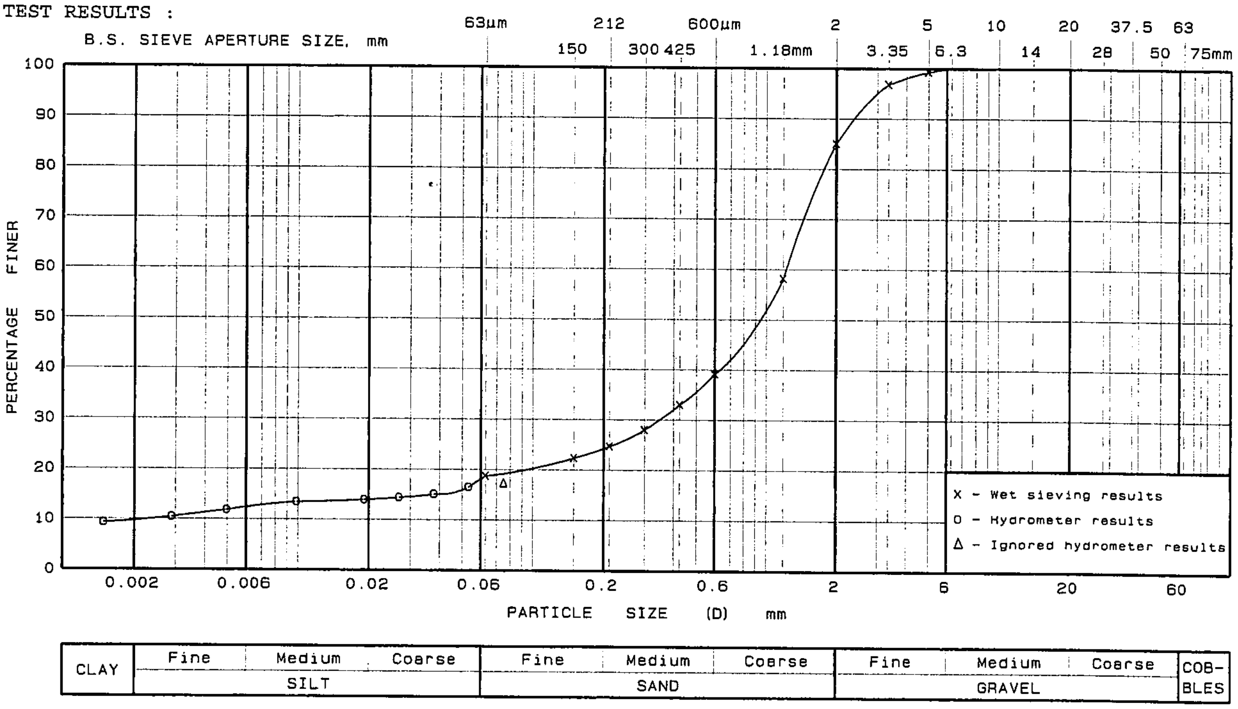
REPORT ON DETERMINATION OF PARTICLE SIZE DISTRIBUTION OF SOIL

IN ACCORDANCE WITH GEOSPEC 3 : 2001 TEST(S) 8.1 / 8.5 / 8.7

Page 1 of 1
REPORT NO. : PSD10090030
CLIENT* : MTR Corporation Limited
DATE RECEIVED : 01/09/2010
ADDRESS* : 9/F, Citylink Plaza, 1 Shatin Station Circuit Shatin, New Territories
SITE* : Stage II Ground Investigation for Shatin to Central Link
TEST LOCATION : GROUND FLOOR, 20 PAK KUNG STREET, HUNG HOM, KOWLOON
DATE STARTED : 06/09/2010
W.O. NO.* : --
CONTRACT NO.* : 11202
DATE COMPLETED: 10/09/2010
JOB NO. : GCE/SI/PB
TEST UNIT NO. : STS 100001
SAMPLE TYPE* : BLOCK
HOLE NO.* : 11202/SCL/TP155
SAMPLE NO.* : 1
SAMPLE DEPTH* : 0.50 m
DESCRIPTION : Moist dark brown clayey gravelly SAND (*FILL)
SPEC. DEPTH : 0.50 m

SAMPLE PREPARATION:
Procedure for sieving test : Method A

TEST RESULTS :



The following information are only based on the opinion of the laboratory and are not under the scope of accreditation by HOKLAS :

ANALYSIS OF PARTICLE SIZE CURVE

Effective Diameter (D_{10}) = 0.0024 mm
Median Diameter (D_{50}) = 0.97 mm
Uniformity Coefficient ($U = D_{60}/D_{10}$) = 518
(Ref. : Clause 6.59(4) of General Specification for Civil Engineering Works (1992))

FINAL SUMMARY

CLAY = 10 %
SILT = 8 %
SAND = 67 %
GRAVEL = 15 %

Note : *Information provided by client
Remarks:

TESTED BY : C.H. CHOY
POST : Lab. Technician
DATE : 10/09/2010

CHECKED BY : W.K. Chan
POST : Reporting Officer
DATE : 06/10/2010

CERTIFIED BY : CHEUNG WING TAI
POST : Dept. Manager
DATE : 06/10/2010

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

REPORT ON DETERMINATION OF PARTICLE SIZE DISTRIBUTION OF SOIL

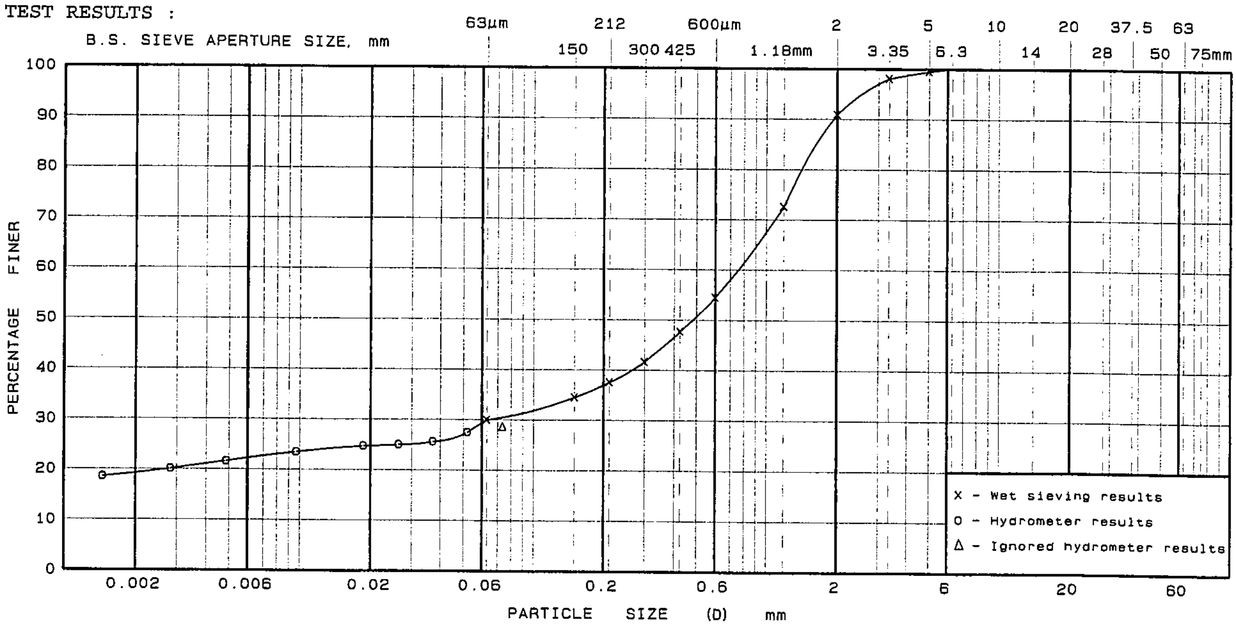
IN ACCORDANCE WITH GEOSPEC 3 : 2001 TEST(S) 8.1 / 8.5 / 8.7

Page 1 of 1

REPORT NO. : PSD10090031
CLIENT* : MTR Corporation Limited
DATE RECEIVED : 01/09/2010
ADDRESS* : 9/F, Citylink Plaza, 1 Shatin Station Circuit Shatin, New Territories
SITE* : Stage II Ground Investigation for Shatin to Central Link
TEST LOCATION : GROUND FLOOR, 20 PAK KUNG STREET, HUNG HOM, KOWLOON
DATE STARTED : 06/09/2010
W.O. NO.* : --
CONTRACT NO.* : 11202
DATE COMPLETED: 10/09/2010
JOB NO. : GCE/SI/PB
TEST UNIT NO. : STS 100001
SAMPLE TYPE* : BLOCK
HOLE NO.* : 11202/SCL/TP156
SAMPLE NO.* : 1
SAMPLE DEPTH* : 0.50 m
DESCRIPTION : Moist dark brown very clayey gravelly SAND (*FILL)
SPEC. DEPTH : 0.50 m

SAMPLE PREPARATION:
Procedure for sieving test : Method A

TEST RESULTS :



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COB-BLES
	SILT			SAND			GRAVEL			

The following information are only based on the opinion of the laboratory and are not under the scope of accreditation by HOKLAS :

ANALYSIS OF PARTICLE SIZE CURVE

Effective Diameter (D_{10}) = — mm
Median Diameter (D_{50}) = 0.49 mm
Uniformity Coefficient $(U = D_{60}/D_{10})$ = —
(Ref. : Clause 6.59(4) of General Specification for Civil Engineering Works (1992))

FINAL SUMMARY

CLAY = 19 %
SILT = 11 %
SAND = 61 %
GRAVEL = 9 %

Note : *Information provided by client
Remarks:

TESTED BY : C.H. CHOY
POST : Lab. Technician
DATE : 10/09/2010

CHECKED BY :
W.K. Chan
POST : Reporting Officer
DATE : 06/10/2010

CERTIFIED BY :
CHEUNG WING TAI
POST : Dept. Manager
DATE : 06/10/2010

Form No.: SOI-P19/R Issue 1 Rev.0 (29-03-2010) Page 38 of 40

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

HOKLAS 024

REPORT ON DETERMINATION OF PARTICLE SIZE DISTRIBUTION OF SOIL

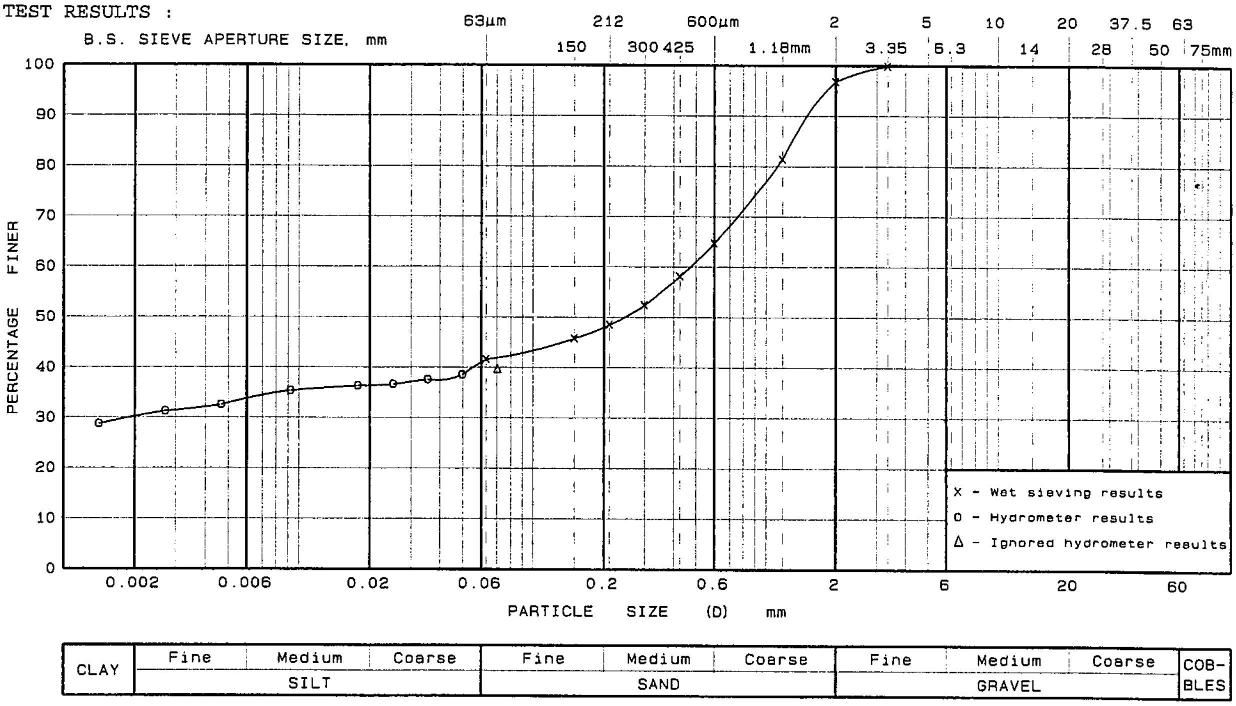
IN ACCORDANCE WITH GEOSPEC 3 : 2001 TEST(S) 8.1 / 8.5 / 8.7

Page 1 of 1

REPORT NO. : PSD10090032
CLIENT* : MTR Corporation Limited
DATE RECEIVED : 01/09/2010
ADDRESS* : 9/F, Citylink Plaza, 1 Shatin Station Circuit Shatin, New Territories
SITE* : Stage II Ground Investigation for Shatin to Central Link
TEST LOCATION : GROUND FLOOR, 20 PAK KUNG STREET, HUNG HOM, KOWLOON
DATE STARTED : 06/09/2010
W.O. NO.* : --
CONTRACT NO.* : 11202
DATE COMPLETED: 10/09/2010
JOB NO. : GCE/SI/PB
TEST UNIT NO. : STS 100001
SAMPLE TYPE* : BLOCK
HOLE NO.* : 11202/SCL/TP157
SAMPLE NO.* : 1
SAMPLE DEPTH* : 0.50 m
DESCRIPTION : Moist orangish brown sandy SILT/CLAY (*FILL)
SPEC. DEPTH : 0.50 m

SAMPLE PREPARATION:
Procedure for sieving test : Method A

TEST RESULTS :



The following information are only based on the opinion of the laboratory and are not under the scope of accreditation by HOKLAS :

ANALYSIS OF PARTICLE SIZE CURVE

Effective Diameter (D_{10}) = — mm
Median Diameter (D_{50}) = 0.25 mm
Uniformity Coefficient $(U = D_{60}/D_{10})$ = —
(Ref. : Clause 6.59(4) of General Specification for Civil Engineering Works (1992))

FINAL SUMMARY

CLAY = 30 %
SILT = 11 %
SAND = 56 %
GRAVEL = 3 %

Note : *Information provided by client
Remarks:

TESTED BY : C.H. CHOY
POST : Lab. Technician
DATE : 10/09/2010

CHECKED BY : W.K. Chan
POST : Reporting Officer
DATE : 06/10/2010

CERTIFIED BY : CHEUNG WING TAI
POST : Dept. Manager
DATE : 06/10/2010

Form No.: SOI-P19/R Issue 1 Rev.0 (29-03-2010) Page 38 of 40

5) BULK & DRY DENSITY TEST RESULTS

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

REPORT ON DETERMINATION OF DENSITY OF SOIL BY LINEAR MEASUREMENT METHOD

IN ACCORDANCE WITH BS 1377 : PART 2 : 1990 SECTION 7.2

Page 1 of 1

CLIENT* : MTR Corporation Limited

REPORT NO. : DEN10090005

ADDRESS* : 9/F, Citylink Plaza, 1 Shatin Station Circuit Shatin, New Territories

CONTRACT NO.* : 11202

SITE* : Stage II Ground Investigation for Shatin to Central Link

TEST LOCATION : Ground Floor, 18 - 20 Pak Kung Street, Hung Hom, Kowloon

W.O. NO.* : -

JOB NO. : GCE/SI/PB

TEST UNIT NO. : STS 100001

DATE RECEIVED : 01/09/2010

Hole No.*	Sample No.*	Sample Depth* (Spec. Depth) m	Sample Type*	Bulk Density Mg/m³	Dry Density Mg/m³	Date Started	Date Completed	Description
11202/SCL/TP154	1	0.50 (0.50)	BLOCK	2.01	1.74	06/09/2010	07/09/2010	Moist orangish brown sandy SILT/CLAY (*FILL)
11202/SCL/TP155	1	0.50 (0.50)	BLOCK	1.83	1.68	06/09/2010	07/09/2010	Moist dark brown clayey gravelly SAND (*FILL)
11202/SCL/TP156	1	0.50 (0.50)	BLOCK	1.72	1.56	06/09/2010	07/09/2010	Moist dark brown very clayey gravelly SAND (*FILL)
11202/SCL/TP157	1	0.50 (0.50)	BLOCK	2.03	1.75	06/09/2010	07/09/2010	Moist orangish brown sandy SILT/CLAY (*FILL)

NOTE : * : Information provided by client

REMARKS :

TESTED BY : W.K. WONG
POST : Technician
DATE : 07/09/2010

CHECKED BY : W.K. CHAN
POST : Reporting Officer
DATE : 10/09/2010

CERTIFIED BY : CHEUNG WING TAI
POST : Deputy Manager
DATE : 10/09/0201

HOKLAS 024

6) SPECIFIC GRAVITY TEST RESULTS

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

REPORT ON DETERMINATION OF PARTICLE DENSITY

IN ACCORDANCE WITH GEOSPEC 3 : 2001 TEST 7.2

Page 1 of 1

CLIENT* : MTR Corporation Limited
ADDRESS* : 9/F, Citylink Plaza, 1 Shatin Station Circuit Shatin, New Territories
SITE* : Stage II Ground Investigation for Shatin to Central Link
TEST LOCATION : GROUND FLOOR, 20 PAK KUNG STREET, HUNG HOM, KOWLOON
JOB NO. : GCE/SI/PB
TEST UNIT NO. : STS 100001

REPORT NO. : PDY10100002
CONTRACT NO.* : 11202
W.O. NO.* : --
DATE RECEIVED : 01/09/2010

Hole No.*	Sample No.*	Sample Depth* (Spec. Depth) m	Sample Type*	Particle Density (Mg/m³) ρ_s	Particle Density (Mg/m³) mean	Date Started	Date Completed	Description
11202/SCL/TP154	1	0.50 (0.50)	BLOCK	2.646 2.641	2.64	06/09	08/09	Moist orangish brown sandy SILT/CLAY (*FILL)
11202/SCL/TP155	1	0.50 (0.50)	BLOCK	2.637 2.630	2.63	06/09	08/09	Moist dark brown clayey gravelly SAND (*FILL)
11202/SCL/TP156	1	0.50 (0.50)	BLOCK	2.646 2.642	2.64	06/09	08/09	Moist dark brown very clayey gravelly SAND (*FILL)
11202/SCL/TP157	1	0.50 (0.50)	BLOCK	2.642 2.644	2.64	06/09	09/09	Moist orangish brown sandy SILT/CLAY (*FILL)

* : Information provided by client

REMARKS:

TESTED BY : S.L. KWONG
POST : Lab. Technician
DATE : 06/10/2010

CHECKED BY :
W.K. Chan
POST : Reporting Officer
DATE : 06/10/2010

CERTIFIED BY :
CHEUNG WING TAI
POST : Dept. Manager
DATE : 06/10/2010

HOKLAS 024

7) STANDARD COMPACTION TEST RESULTS

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

HOKLAS 024

REPORT ON DETERMINATION OF DRY DENSITY / MOISTURE CONTENT RELATIONSHIP OF SOIL

IN ACCORDANCE WITH GEOSPEC 3 : 2001 TEST 10.2

Page 1 of 1
REPORT NO. : COM10090001
DATE RECEIVED : 01/09/2010

CLIENT* : MTR Corporation Limited
ADDRESS* : 9/F, Citylink Plaza, 1 Shatin Station Circuit Shatin, New Territories
SITE* : Stage II Ground Investigation for Shatin to Central Link
TEST LOCATION : GROUND FLOOR, 21-23 SAN WAI STREET, HUNG HOM, KOWLOON
W.O. NO.* : --
CONTRACT NO.* : 11202
JOB NO. : GCE/SI/PB
TEST UNIT NO. : STS 100001
HOLE NO.* : 11202/SCL/TP155
SAMPLE NO.* : 1
DESCRIPTION : Moist dark brown clayey gravelly SAND (*FILL)

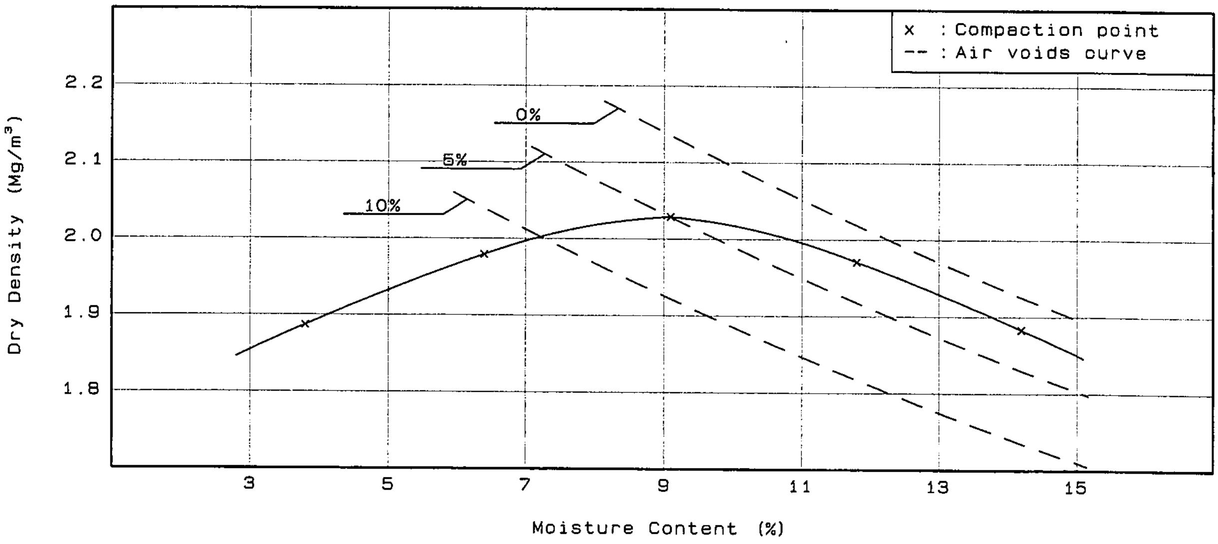
DATE STARTED : 06/09/2010
DATE COMPLETED: 10/09/2010
SAMPLE TYPE* : BLOCK
SAMPLE DEPTH* : 0.50 m
SPEC. DEPTH : 0.50 m

SAMPLE PREPARATION :

Total mass of wet / dry sample used for the test = 16640 g / 15294 g
Percentage of material retained on 37.5mm / 20mm test sieve = 0 % / 0 %
Mould pattern : 1000cc ; Blows per layer : 27 ; Separate batches
The type of drying process : oven-drying at a temperature of ≤ 50°C
Volume of mould (V) = 1003.9 cm^3 ; Particle density = 2.65 Mg/m^3 (Assumed)

TEST RESULTS :

Test no.		P1	P2	P3	P4	P5
Bulk density	Mg/m^3	1.958	2.106	2.213	2.203	2.151
Moisture content	%	3.8	6.4	9.1	11.8	14.2
Dry density	Mg/m^3	1.887	1.979	2.029	1.971	1.883



FINAL SUMMARY

MAXIMUM DRY DENSITY = 2.03 Mg/m^3
OPTIMUM MOISTURE CONTENT = 9.1 %

Note : *Information provided by client
Remarks:

TESTED BY : P.K. Yun
POST : Lab. Technician
DATE : 10/09/2010

CHECKED BY :
W.K. Chan
POST : Reporting Officer
DATE : 06/10/2010

CERTIFIED BY :
CHEUNG WING TAI
POST : Dept. Manager
DATE : 06/10/2010

8) CHEMICAL TEST RESULTS (SOIL)

(ORGANIC MATTER, CHLORIDE CONTENT, pH VALUE, MASS LOSS ON IGNITION & SULPHATE CONTENT)

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
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TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

HKAS
HOKLAS 024

TEST REPORT ON CHEMICAL ANALYSIS OF SOIL

Page 1 of 1

REPORT NO. : CHM 10090147

CLIENT* : MTR Corporation Limited
CLIENT ADDRESS* : 9/F, Citylink Plaza, 1 Shatin Station Circuit Shatin, New Territories
SITE* : Stage II Ground Investigation for Shatin to Central Link
TEST LOCATION : 1/F, 18 Pak Kung Street, Hung Hom, Kowloon.
DATE RECEIVED : 01/09/2010
REQUEST NO.* : -
CLIENT REF. NO.* : -
DATE STARTED : 15/09/2010
W.O. NO.* : -
CONTRACT NO.* : 11202
DATE COMPLETED : 30/09/2010
SERIAL NO. : -
SAMPLING DATE* : -
SAMPLE TYPE* : BLOCK
JOB NO. : GCE/SI/PB
TEST UNIT NO. : CTS 100001
SAMPLE DEPTH* : 0.50m
HOLE NO.* : 11202/SCL/TP154
SAMPLE NO.* : 1
SPEC. DEPTH : 0.50m
DESCRIPTION : Moist orangish brown sandy SILT/CLAY. (*FILL)

DESCRIPTION		TEST REFERENCE	RESULT
The Percentage by Dry Mass of the Original Sample Passing 2 mm Sieve	%	GEOSPEC 3 : 2001 Test 9.1	99
		BS 1377 : Part 3 : 1990 Cl. 3	-
Organic Matter Content	%	GEOSPEC 3 : 2001 Test 9.1	0.4
		BS 1377 : Part 3 : 1990 Cl. 3	-
Carbonate Content (as CO_2)	%	BS 1377 : Part 3 : 1990 Cl. 6.3	<1.0
Acid-Soluble Chloride Content (as Cl)	%	BS 1377 : Part 3 : 1990 Cl. 7.3	-
Water-Soluble Chloride Content (as Cl) Water : Soil ratio = [2:1]	%	GEOSPEC 3 : 2001 Test 9.4	<0.01
		BS 1377 : Part 3 : 1990 Cl. 7.2	-
pH Value		GEOSPEC 3 : 2001 Test 9.5	7.0
		BS 1377 : Part 3 : 1990 Cl. 9	-
Mass Loss On Ignition (LOI)	%	GEOSPEC 3 : 2001 Test 9.2	-
		BS 1377 : Part 3 : 1990 Cl. 4	-
Total Sulphate Content (as SO_3)	%	GEOSPEC 3 : 2001 Test 9.3	<0.01
		BS 1377 : Part 3 : 1990 Cl. 5	-
Water-Soluble Sulphate Content (as SO_3)	%	GEOSPEC 3 : 2001 Test 9.3	-
		BS 1377 : Part 3 : 1990 Cl. 5	-

* : Information provided by client

NOTE : This laboratory has no responsibility on sampling, all the test results relate only to the sample tested.

REMARKS : -

----- End -----

TESTED BY : P.F. YU, C.H. LEUNG
POST : Assistant Chemist, Laboratory Assistant
DATE : 30/09/2010

CHECKED BY : W.K. CHAN
POST : Reporting Officer
DATE : 02/10/2010

APPROVED SIGNATORY : GU CHIN
POST : Chemist
DATE : 02/10/2010

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HOKLAS 024

TEST REPORT ON CHEMICAL ANALYSIS OF SOIL

Page 1 of 1

REPORT NO. : CHM 10090148

CLIENT* : MTR Corporation Limited

CLIENT ADDRESS* : 9/F, Citylink Plaza, 1 Shatin Station Circuit Shatin, New Territories

SITE* : Stage II Ground Investigation for Shatin to Central Link

TEST LOCATION	:	1/F, 18 Pak Kung Street, Hung Hom, Kowloon.			DATE RECEIVED	:	01/09/2010
REQUEST NO.*	:	-	CLIENT REF. NO.*	: -	DATE STARTED	:	15/09/2010
W.O. NO.*	:	-	CONTRACT NO.*	: 11202	DATE COMPLETED	:	30/09/2010
SERIAL NO.	:	-	SAMPLING DATE*	: -	SAMPLE TYPE*	:	BLOCK
JOB NO.	:	GCE/SI/PB	TEST UNIT NO.	: CTS 100001	SAMPLE DEPTH*	:	0.50m
HOLE NO.*	:	11202/SCL/TP155	SAMPLE NO.*	: 1	SPEC. DEPTH	:	0.50m

DESCRIPTION : Moist dark brown clayey gravelly SAND. (*FILL)

DESCRIPTION		TEST REFERENCE	RESULT
The Percentage by Dry Mass of the Original Sample Passing 2 mm Sieve	%	GEOSPEC 3 : 2001 Test 9.1	85
		BS 1377 : Part 3 : 1990 Cl. 3	-
Organic Matter Content	%	GEOSPEC 3 : 2001 Test 9.1	0.6
		BS 1377 : Part 3 : 1990 Cl. 3	-
Carbonate Content (as CO_2)	%	BS 1377 : Part 3 : 1990 Cl. 6.3	<1.0
Acid-Soluble Chloride Content (as Cl)	%	BS 1377 : Part 3 : 1990 Cl. 7.3	-
Water-Soluble Chloride Content (as Cl) Water : Soil ratio = [2:1]	%	GEOSPEC 3 : 2001 Test 9.4	<0.01
		BS 1377 : Part 3 : 1990 Cl. 7.2	-
pH Value		GEOSPEC 3 : 2001 Test 9.5	7.2
		BS 1377 : Part 3 : 1990 Cl. 9	-
Mass Loss On Ignition (LOI)	%	GEOSPEC 3 : 2001 Test 9.2	-
		BS 1377 : Part 3 : 1990 Cl. 4	-
Total Sulphate Content (as SO_3)	%	GEOSPEC 3 : 2001 Test 9.3	0.09
		BS 1377 : Part 3 : 1990 Cl. 5	-
Water-Soluble Sulphate Content (as SO_3)	%	GEOSPEC 3 : 2001 Test 9.3	-
		BS 1377 : Part 3 : 1990 Cl. 5	-

* : Information provided by client

NOTE : This laboratory has no responsibility on sampling, all the test results relate only to the sample tested.

REMARKS : -

----- End -----

					APPROVED SIGNATORY	:	GU CHIN
TESTED BY	:	P.F. YU, C.H. LEUNG	CHECKED BY	: W.K. CHAN			
POST	:	Assistant Chemist, Laboratory Assistant	POST	: Reporting Officer	POST	:	Chemist
DATE	:	30/09/2010	DATE	: 02/10/2010	DATE	:	02/10/2010

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The Hong Kong Accreditation Services (HKAS) has accredited Geotechnics & Concrete Engineering (H.K.) Limited (GCE) under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report/certificate were determined by this laboratory in accordance with its term of accreditation. The copyright of this report/certificate is owned by GCE. It may not be reproduced except with prior written approval from the issuing laboratory.

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HOKLAS 024

TEST REPORT ON CHEMICAL ANALYSIS OF SOIL

Page 1 of 1

REPORT NO. : CHM 10090149

CLIENT* : MTR Corporation Limited
CLIENT ADDRESS* : 9/F, Citylink Plaza, 1 Shatin Station Circuit Shatin, New Territories
SITE* : Stage II Ground Investigation for Shatin to Central Link

TEST LOCATION :	1/F, 18 Pak Kung Street, Hung Hom, Kowloon.			DATE RECEIVED :	01/09/2010
REQUEST NO.* :	-	CLIENT REF. NO.* :	-	DATE STARTED :	15/09/2010
W.O. NO.* :	-	CONTRACT NO.* :	11202	DATE COMPLETED :	30/09/2010
SERIAL NO. :	-	SAMPLING DATE* :	-	SAMPLE TYPE* :	BLOCK
JOB NO. :	GCE/SI/PB	TEST UNIT NO. :	CTS 100001	SAMPLE DEPTH* :	0.50m
HOLE NO.* :	11202/SCL/TP156	SAMPLE NO.* :	1	SPEC. DEPTH :	0.50m

DESCRIPTION : Moist dark brown very clayey gravelly SAND. (*FILL)

DESCRIPTION		TEST REFERENCE	RESULT
The Percentage by Dry Mass of the Original Sample Passing 2 mm Sieve	%	GEOSPEC 3 : 2001 Test 9.1	92
		BS 1377 : Part 3 : 1990 Cl. 3	-
Organic Matter Content	%	GEOSPEC 3 : 2001 Test 9.1	0.6
		BS 1377 : Part 3 : 1990 Cl. 3	-
Carbonate Content (as CO_2)	%	BS 1377 : Part 3 : 1990 Cl. 6.3	<1.0
Acid-Soluble Chloride Content (as Cl)	%	BS 1377 : Part 3 : 1990 Cl. 7.3	-
Water-Soluble Chloride Content (as Cl) Water : Soil ratio = [2:1]	%	GEOSPEC 3 : 2001 Test 9.4	<0.01
		BS 1377 : Part 3 : 1990 Cl. 7.2	-
pH Value		GEOSPEC 3 : 2001 Test 9.5	6.5
		BS 1377 : Part 3 : 1990 Cl. 9	-
Mass Loss On Ignition (LOI)	%	GEOSPEC 3 : 2001 Test 9.2	-
		BS 1377 : Part 3 : 1990 Cl. 4	-
Total Sulphate Content (as SO_3)	%	GEOSPEC 3 : 2001 Test 9.3	<0.01
		BS 1377 : Part 3 : 1990 Cl. 5	-
Water-Soluble Sulphate Content (as SO_3)	%	GEOSPEC 3 : 2001 Test 9.3	-
		BS 1377 : Part 3 : 1990 Cl. 5	-

* : Information provided by client

NOTE : This laboratory has no responsibility on sampling, all the test results relate only to the sample tested.

REMARKS : -

----- End -----

				APPROVED SIGNATORY :	
TESTED BY :	P.F. YU, C.H. LEUNG	CHECKED BY :	W.K. CHAN		GU CHIN
POST :	Assistant Chemist, Laboratory Assistant	POST :	Reporting Officer	POST :	Chemist
DATE :	30/09/2010	DATE :	02/10/2010	DATE :	02/10/2010

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GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
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TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

HOKLAS 024

TEST REPORT ON CHEMICAL ANALYSIS OF SOIL

Page 1 of 1

REPORT NO. : CHM 10090150

CLIENT* : MTR Corporation Limited
CLIENT ADDRESS* : 9/F, Citylink Plaza, 1 Shatin Station Circuit Shatin, New Territories
SITE* : Stage II Ground Investigation for Shatin to Central Link
TEST LOCATION : 1/F, 18 Pak Kung Street, Hung Hom, Kowloon.
DATE RECEIVED : 01/09/2010
REQUEST NO.* : -
CLIENT REF. NO.* : -
DATE STARTED : 15/09/2010
W.O. NO.* : -
CONTRACT NO.* : 11202
DATE COMPLETED : 30/09/2010
SERIAL NO. : -
SAMPLING DATE* : -
SAMPLE TYPE* : BLOCK
JOB NO. : GCE/SI/PB
TEST UNIT NO. : CTS 100001
SAMPLE DEPTH* : 0.50m
HOLE NO.* : 11202/SCL/TP157
SAMPLE NO.* : 1
SPEC. DEPTH : 0.50m
DESCRIPTION : Moist orangish brown sandy SILT/CLAY. (*FILL)

DESCRIPTION		TEST REFERENCE	RESULT
The Percentage by Dry Mass of the Original Sample Passing 2 mm Sieve	%	GEOSPEC 3 : 2001 Test 9.1	99
		BS 1377 : Part 3 : 1990 Cl. 3	-
Organic Matter Content	%	GEOSPEC 3 : 2001 Test 9.1	0.6
		BS 1377 : Part 3 : 1990 Cl. 3	-
Carbonate Content (as CO_2)	%	BS 1377 : Part 3 : 1990 Cl. 6.3	<1.0
Acid-Soluble Chloride Content (as Cl)	%	BS 1377 : Part 3 : 1990 Cl. 7.3	-
Water-Soluble Chloride Content (as Cl) Water : Soil ratio = [2:1]	%	GEOSPEC 3 : 2001 Test 9.4	<0.01
		BS 1377 : Part 3 : 1990 Cl. 7.2	-
pH Value		GEOSPEC 3 : 2001 Test 9.5	7.2
		BS 1377 : Part 3 : 1990 Cl. 9	-
Mass Loss On Ignition (LOI)	%	GEOSPEC 3 : 2001 Test 9.2	-
		BS 1377 : Part 3 : 1990 Cl. 4	-
Total Sulphate Content (as SO_3)	%	GEOSPEC 3 : 2001 Test 9.3	<0.01
		BS 1377 : Part 3 : 1990 Cl. 5	-
Water-Soluble Sulphate Content (as SO_3)	%	GEOSPEC 3 : 2001 Test 9.3	-
		BS 1377 : Part 3 : 1990 Cl. 5	-

* : Information provided by client

NOTE : This laboratory has no responsibility on sampling, all the test results relate only to the sample tested.

REMARKS : -

----- End -----

APPROVED SIGNATORY : GU CHIN
POST : Chemist
DATE : 02/10/2010

TESTED BY : P.F. YU, C.H. LEUNG
POST : Assistant Chemist, Laboratory Assistant
DATE : 30/09/2010

CHECKED BY : W.K. CHAN
POST : Reporting Officer
DATE : 02/10/2010

SECTION TWO

Test result was NOT accredited by HOKLAS.

Geotechnics & Concrete Engineering (H.K.) Ltd.

Soil & Rock Testing Laboratory

Note

- The following test results are for tests for which the laboratory was NOT accredited by HOKLAS.

9) CHEMICAL TEST RESULTS
(PRESENCE OF HYDROGEN SULPHIDE)

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TEST REPORT OF QUALITATIVE CHECK ON CHEMICAL ANALYSIS OF SOIL

Page 1 of 1

Report No. : CHM 10090165

Client* : MTR Corporation Limited
Date Received : 01/09/2010
Client Address* : 9/F, Citylink Plaza, 1 Shatin Station Circuit Shatin, New Territories
Site* : Stage II Ground Investigation for Shatin to Central Link
Test Location : 1/F, 18 Pak Kung Street, Hung Hom, Kowloon.
Date Started : 15/09/2010
W.O. No.* : -
Contract No.* : 11202
Date Completed : 17/09/2010
Serial No. : -
Sampling Date* : -
Sample Type* : BLOCK
Job No. : GCE/SI/PB
Test Unit No. : CTS 100001
Sample Depth* : 0.50m
Hole No.* : 11202/SCL/TP154
Sample No.* 1
Specimen Depth : 0.50m
Description : Moist orangish brown sandy SILT/CLAY. (*FILL)

DESCRIPTION	TEST REFERENCE	RESULT
Presence of Sulphate Content in the Soil	BS 1377 : Part 3 : 1990 Section 5.5.3	-
Presence of Hydrogen Sulphide in the Soil	BS 1377 : Part 3 : 1990 Section 3.4.3	None
Presence of Carbonate Content in the Soil	BS 1377 : Part 3 : 1990 Section 6.3	-
Presence of Chloride Content in the Soil	BS 1377 : Part 3 : 1990 Section 7.2.3.3	-

* : Information provided by client

Note : This laboratory has no responsibility on sampling and all the test results relate only to the sample tested.

Remarks : -

----- End -----

Tested By : C.H. LEUNG
Checked By : GU CHIN
Post : Laboratory Assistant
Post : Chemist
Date : 17/09/2010
Date : 02/10/2010

Form No. : SOI-C14/R2 (16-01-2003)

TEST REPORT OF QUALITATIVE CHECK ON CHEMICAL ANALYSIS OF SOIL

Page 1 of 1

Report No. : CHM 10090166

Client* : MTR Corporation Limited

Date Received : 01/09/2010

Client Address* : 9/F, Citylink Plaza, 1 Shatin Station Circuit Shatin, New Territories

Site* : Stage II Ground Investigation for Shatin to Central Link

Test Location : 1/F, 18 Pak Kung Street, Hung Hom, Kowloon.

Date Started : 15/09/2010

W.O. No.* : -

Contract No.* : 11202

Date Completed : 17/09/2010

Serial No. : -

Sampling Date* : -

Sample Type* : BLOCK

Job No. : GCE/SI/PB

Test Unit No. : CTS 100001

Sample Depth* : 0.50m

Hole No.* : 11202/SCL/TP155

Sample No.* 1

Specimen Depth : 0.50m

Description : Moist dark brown clayey gravelly SAND. (*FILL)

DESCRIPTION	TEST REFERENCE	RESULT
Presence of Sulphate Content in the Soil	BS 1377 : Part 3 : 1990 Section 5.5.3	-
Presence of Hydrogen Sulphide in the Soil	BS 1377 : Part 3 : 1990 Section 3.4.3	None
Presence of Carbonate Content in the Soil	BS 1377 : Part 3 : 1990 Section 6.3	-
Presence of Chloride Content in the Soil	BS 1377 : Part 3 : 1990 Section 7.2.3.3	-

* : Information provided by client

Note : This laboratory has no responsibility on sampling and all the test results relate only to the sample tested.

Remarks : -

----- End -----

Tested By : C.H. LEUNG

Checked By : GU CHIN

Post : Laboratory Assistant

Post : Chemist

Date : 17/09/2010

Date : 02/10/2010

Form No. : SOI-C14/R2 (16-01-2003)

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TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

TEST REPORT OF QUALITATIVE CHECK ON CHEMICAL ANALYSIS OF SOIL

Page 1 of 1

Report No. : CHM 10090167

Client* : MTR Corporation Limited

Date Received : 01/09/2010

Client Address* : 9/F, Citylink Plaza, 1 Shatin Station Circuit Shatin, New Territories

Site* : Stage II Ground Investigation for Shatin to Central Link

Test Location : 1/F, 18 Pak Kung Street, Hung Hom, Kowloon.

Date Started : 15/09/2010

W.O. No.* : -

Contract No.* : 11202

Date Completed : 17/09/2010

Serial No. : -

Sampling Date* : -

Sample Type* : BLOCK

Job No. : GCE/SI/PB

Test Unit No. : CTS 100001

Sample Depth* : 0.50m

Hole No.* : 11202/SCL/TP156

Sample No.* 1

Specimen Depth : 0.50m

Description : Moist dark brown very clayey gravelly SAND. (*FILL)

DESCRIPTION	TEST REFERENCE	RESULT
Presence of Sulphate Content in the Soil	BS 1377 : Part 3 : 1990 Section 5.5.3	-
Presence of Hydrogen Sulphide in the Soil	BS 1377 : Part 3 : 1990 Section 3.4.3	None
Presence of Carbonate Content in the Soil	BS 1377 : Part 3 : 1990 Section 6.3	-
Presence of Chloride Content in the Soil	BS 1377 : Part 3 : 1990 Section 7.2.3.3	-

* : Information provided by client

Note : This laboratory has no responsibility on sampling and all the test results relate only to the sample tested.

Remarks : -

----- End -----

Tested By : C.H. LEUNG

Checked By : GU CHIN

Post : Laboratory Assistant

Post : Chemist

Date : 17/09/2010

Date : 02/10/2010

Form No. : SOI-C14/R2 (16-01-2003)

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
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TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

TEST REPORT OF QUALITATIVE CHECK ON CHEMICAL ANALYSIS OF SOIL

Report No. : CHM 10090168

Client* : MTR Corporation Limited
Date Received : 01/09/2010

Client Address* : 9/F, Citylink Plaza, 1 Shatin Station Circuit Shatin, New Territories

Site* : Stage II Ground Investigation for Shatin to Central Link

Test Location : 1/F, 18 Pak Kung Street, Hung Hom, Kowloon.
Date Started : 15/09/2010

W.O. No.* : -
Contract No.* : 11202
Date Completed : 17/09/2010

Serial No. : -
Sampling Date* : -
Sample Type* : BLOCK

Job No. : GCE/SI/PB
Test Unit No. : CTS 100001
Sample Depth* : 0.50m

Hole No.* : 11202/SCL/TP157
Sample No.* 1
Specimen Depth : 0.50m

Description : Moist orangish brown sandy SILT/CLAY. (*FILL)

DESCRIPTION	TEST REFERENCE	RESULT
Presence of Sulphate Content in the Soil	BS 1377 : Part 3 : 1990 Section 5.5.3	-
Presence of Hydrogen Sulphide in the Soil	BS 1377 : Part 3 : 1990 Section 3.4.3	None
Presence of Carbonate Content in the Soil	BS 1377 : Part 3 : 1990 Section 6.3	-
Presence of Chloride Content in the Soil	BS 1377 : Part 3 : 1990 Section 7.2.3.3	-

* : Information provided by client

Note : This laboratory has no responsibility on sampling and all the test results relate only to the sample tested.

Remarks : -

----- End -----

Tested By : C.H. LEUNG
Checked By : GU CHIN

Post : Laboratory Assistant
Post : Chemist

Date : 17/09/2010
Date : 02/10/2010

Appendix C

STRUCTURAL ASSESSMENT OF CAPACITY OF DOME PROFILE ROOF

Structural Assessment of Capacity of Dome Profile Roof

Method of Analysis:

1. The dome profile roof is modelled in the SAP Program as attached.
2. The roof slab is divided into strips in orthogonal directions with peripheral ring beam at the edge.
3. The perimeter of the roof is supported by a series of pin supports to simulate the continuous block wall which is confined by underground soil, supporting the dome profile roof.
4. The dome is loaded with its self weight and the internal forces of the structural elements are found.
5. Design Code CP114 (Permissible Stress) is used for the capacity check.

Qualifications on missing information:

1. Reinforcement Size
2. Reinforcement Strength
3. Reinforcement spacing of slab
4. Reinforcement in ring beam
5. Concrete strength
6. Detail survey on the dimensions and configuration of the dome profile roof
7. Design Code used

Assumptions on the missing information:

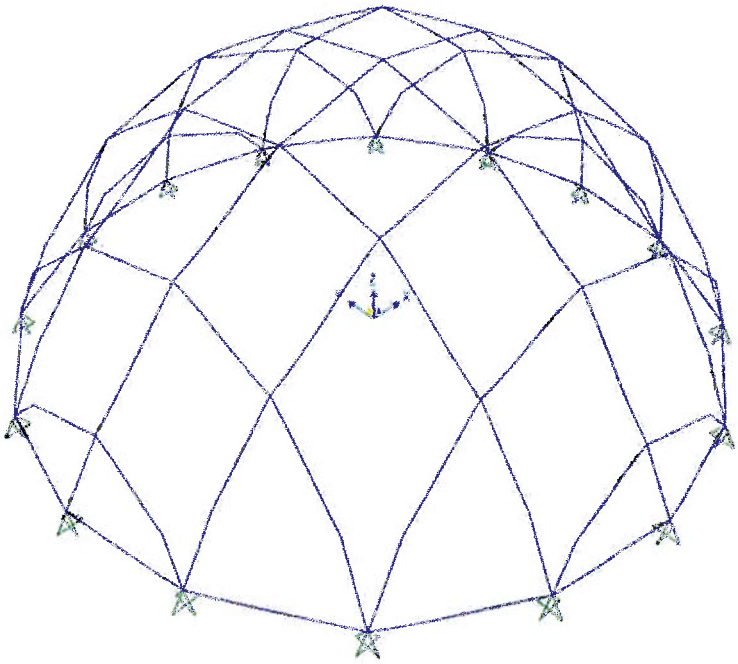
1. Reinforcement Size: 8mm diameter
2. Reinforcement Strength: allowable stress 124MPa (LCC By law 1938)
3. Reinforcement spacing of slab: 300mm on average
4. Reinforcement in ring beam: no assumption made
5. Concrete strength: fc=6.5MPa (Coring Test Result)
6. Detail survey on the dimensions and configuration of the dome profile roof: Own rough measurement by simple tool
7. Design Code used: no assumption made

Initial Findings:

The dome profile RC roof slab is barely sufficient to withstand its own weight under the present state.

SAP2000

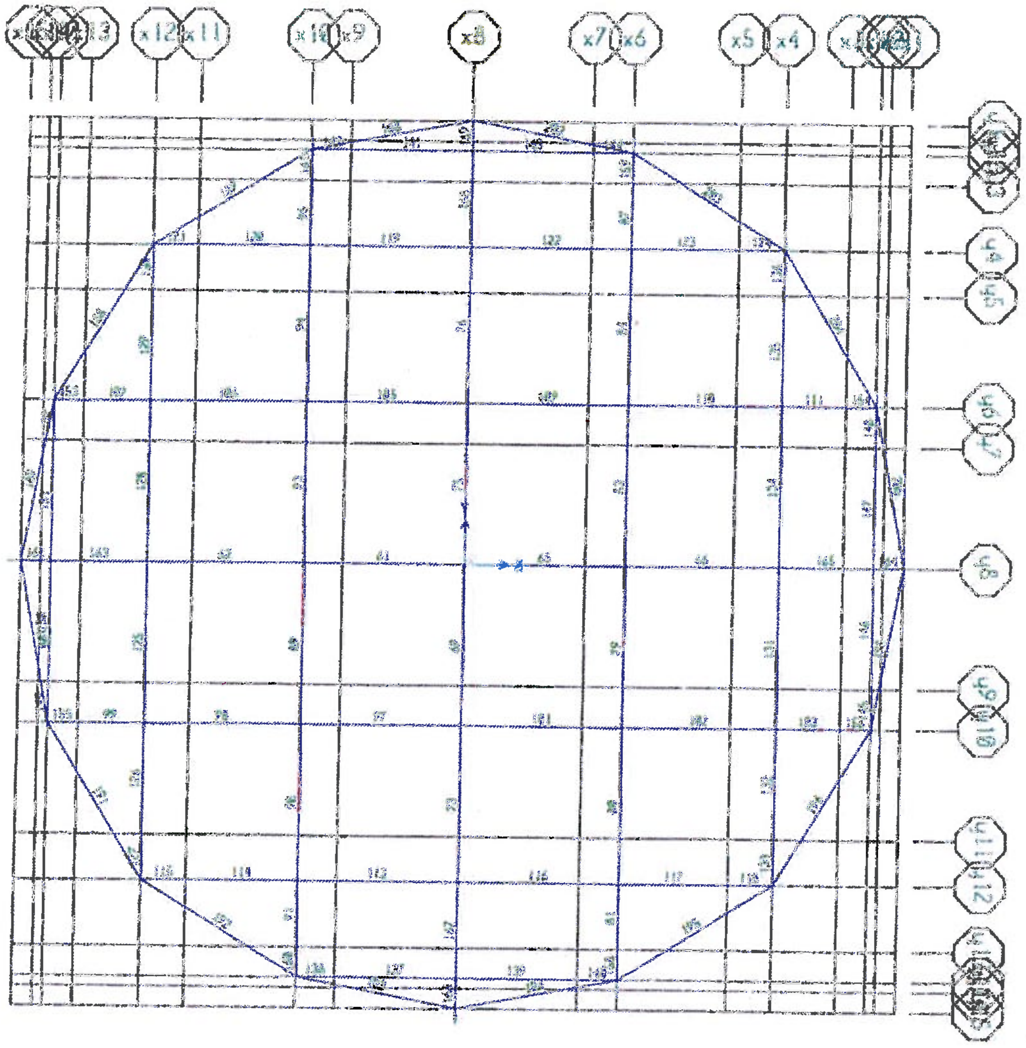
11/11/10 9:36:21



SAP2000 v11.0.4 - File:pillbox 1 - Deformed Shape (MODAL) - Mode 1 - Period 0.01002 - KN, m, C Units

SAP2000

11/11/10 17:11:02



SAP2000 v11.0.4 - File:pillbox 1 - 3-D View - KN, m, C Units

TABLE: Element Forces - Frames

Frame Text	Station m	OutputCase Text	CaseType Text	P KN	V2 KN	V3 KN	T KN-m	M2 KN-m	M3 KN-m	FrameElem Text	ElemStation m
61	0	DEAD	LinStatic	-9.799	-1.837	-1.13E-15	9.986E-16	-5.189E-16	0.4916	61-1	0
61	0.40697	DEAD	LinStatic	-10.217	0.39	-1.13E-15	9.986E-16	-5.901E-17	0.7862	61-1	0.40697
61	0.81394	DEAD	LinStatic	-10.635	2.617	-1.13E-15	9.986E-16	4.009E-16	0.1744	61-1	0.81394
62	0	DEAD	LinStatic	-10.164	-0.575	1.393E-15	-7.856E-17	6.446E-16	0.4601	62-1	0
62	0.44809	DEAD	LinStatic	-11.417	1.583	1.393E-15	-7.856E-17	2.024E-17	0.2342	62-1	0.44809
62	0.89617	DEAD	LinStatic	-12.67	3.741	1.393E-15	-7.856E-17	-6.041E-16	-0.9586	62-1	0.89617
65	0	DEAD	LinStatic	-9.799	-1.837	-8.299E-16	-5.046E-16	-2.252E-16	0.4916	65-1	0
65	0.40697	DEAD	LinStatic	-10.217	0.39	-8.299E-16	-5.046E-16	1.126E-16	0.7862	65-1	0.40697
65	0.81394	DEAD	LinStatic	-10.635	2.617	-8.299E-16	-5.046E-16	4.503E-16	0.1744	65-1	0.81394
66	0	DEAD	LinStatic	-10.164	-0.575	-6.124E-16	-2.494E-16	2.804E-17	0.4601	66-1	0
66	0.44809	DEAD	LinStatic	-11.417	1.583	-6.124E-16	-2.494E-16	3.025E-16	0.2342	66-1	0.44809
66	0.89617	DEAD	LinStatic	-12.67	3.741	-6.124E-16	-2.494E-16	5.769E-16	-0.9586	66-1	0.89617
69	0	DEAD	LinStatic	-9.799	-1.837	8.839E-17	-1.985E-16	-4.695E-16	0.4916	69-1	0
69	0.40697	DEAD	LinStatic	-10.217	0.39	8.839E-17	-1.985E-16	-5.055E-16	0.7862	69-1	0.40697
69	0.81394	DEAD	LinStatic	-10.635	2.617	8.839E-17	-1.985E-16	-5.415E-16	0.1744	69-1	0.81394
73	0	DEAD	LinStatic	-12.67	-3.741	-1.539E-15	9.58E-17	-5.09E-16	-0.9586	73-1	0
73	0.44809	DEAD	LinStatic	-11.417	-1.583	-1.539E-15	9.58E-17	1.804E-16	0.2342	73-1	0.44809
73	0.89617	DEAD	LinStatic	-10.164	0.575	-1.539E-15	9.58E-17	8.697E-16	0.4601	73-1	0.89617
75	0	DEAD	LinStatic	-9.799	-1.837	1.64E-15	-2.711E-16	9.741E-16	0.4916	75-1	0
75	0.40697	DEAD	LinStatic	-10.217	0.39	1.64E-15	-2.711E-16	3.065E-16	0.7862	75-1	0.40697
75	0.81394	DEAD	LinStatic	-10.635	2.617	1.64E-15	-2.711E-16	-3.611E-16	0.1744	75-1	0.81394
76	0	DEAD	LinStatic	-10.164	-0.575	1.298E-15	-1.279E-16	5.305E-16	0.4601	76-1	0
76	0.44809	DEAD	LinStatic	-11.417	1.583	1.298E-15	-1.279E-16	-5.106E-17	0.2342	76-1	0.44809
76	0.89617	DEAD	LinStatic	-12.67	3.741	1.298E-15	-1.279E-16	-6.326E-16	-0.9586	76-1	0.89617
79	0	DEAD	LinStatic	-8.334	-1.601	0.446	-0.1038	0.2216	0.4736	79-1	0
79	0.40697	DEAD	LinStatic	-8.751	0.627	0.446	-0.1038	0.0401	0.6718	79-1	0.40697
79	0.81394	DEAD	LinStatic	-9.169	2.854	0.446	-0.1038	-0.1414	-0.0364	79-1	0.81394
80	0	DEAD	LinStatic	-8.999	-0.667	1.107	-0.1761	0.6543	0.4004	80-1	0
80	0.46804	DEAD	LinStatic	-10.461	1.49	1.107	-0.1761	0.1361	0.2078	80-1	0.46804
80	0.93608	DEAD	LinStatic	-11.922	3.648	1.107	-0.1761	-0.382	-0.9945	80-1	0.93608
81	0	DEAD	LinStatic	-12.265	-0.173	0.911	-0.0405	0.5704	-0.2504	81-1	0
81	0.28777	DEAD	LinStatic	-13.588	0.731	0.911	-0.0405	0.3082	-0.3307	81-1	0.28777
81	0.57554	DEAD	LinStatic	-14.91	1.636	0.911	-0.0405	0.0461	-0.6714	81-1	0.57554
83	0	DEAD	LinStatic	-8.334	-1.601	-0.446	0.1038	-0.2216	0.4736	83-1	0
83	0.40697	DEAD	LinStatic	-8.751	0.627	-0.446	0.1038	-0.0401	0.6718	83-1	0.40697
83	0.81394	DEAD	LinStatic	-9.169	2.854	-0.446	0.1038	0.1414	-0.0364	83-1	0.81394
84	0	DEAD	LinStatic	-8.999	-0.667	-1.107	0.1761	-0.6543	0.4004	84-1	0
84	0.46804	DEAD	LinStatic	-10.461	1.49	-1.107	0.1761	-0.1361	0.2078	84-1	0.46804
84	0.93608	DEAD	LinStatic	-11.922	3.648	-1.107	0.1761	0.382	-0.9945	84-1	0.93608
87	0	DEAD	LinStatic	-12.265	-0.173	-0.911	0.0405	-0.5704	-0.2504	87-1	0
87	0.28777	DEAD	LinStatic	-13.588	0.731	-0.911	0.0405	-0.3082	-0.3307	87-1	0.28777
87	0.57554	DEAD	LinStatic	-14.91	1.636	-0.911	0.0405	-0.0461	-0.6714	87-1	0.57554
89	0	DEAD	LinStatic	-8.334	-1.601	-0.446	0.1038	-0.2216	0.4736	89-1	0
89	0.40697	DEAD	LinStatic	-8.751	0.627	-0.446	0.1038	-0.0401	0.6718	89-1	0.40697
89	0.81394	DEAD	LinStatic	-9.169	2.854	-0.446	0.1038	0.1414	-0.0364	89-1	0.81394
90	0	DEAD	LinStatic	-8.999	-0.667	-1.107	0.1761	-0.6543	0.4004	90-1	0
90	0.46804	DEAD	LinStatic	-10.461	1.49	-1.107	0.1761	-0.1361	0.2078	90-1	0.46804
90	0.93608	DEAD	LinStatic	-11.922	3.648	-1.107	0.1761	0.382	-0.9945	90-1	0.93608
91	0	DEAD	LinStatic	-12.265	-0.173	-0.911	0.0405	-0.5704	-0.2504	91-1	0
91	0.28777	DEAD	LinStatic	-13.588	0.731	-0.911	0.0405	-0.3082	-0.3307	91-1	0.28777
91	0.57554	DEAD	LinStatic	-14.91	1.636	-0.911	0.0405	-0.0461	-0.6714	91-1	0.57554
93	0	DEAD	LinStatic	-8.334	-1.601	0.446	-0.1038	0.2216	0.4736	93-1	0
93	0.40697	DEAD	LinStatic	-8.751	0.627	0.446	-0.1038	0.0401	0.6718	93-1	0.40697
93	0.81394	DEAD	LinStatic	-9.169	2.854	0.446	-0.1038	-0.1414	-0.0364	93-1	0.81394
94	0	DEAD	LinStatic	-8.999	-0.667	1.107	-0.1761	0.6543	0.4004	94-1	0
94	0.46804	DEAD	LinStatic	-10.461	1.49	1.107	-0.1761	0.1361	0.2078	94-1	0.46804
94	0.93608	DEAD	LinStatic	-11.922	3.648	1.107	-0.1761	-0.382	-0.9945	94-1	0.93608
95	0	DEAD	LinStatic	-12.265	-0.173	0.911	-0.0405	0.5704	-0.2504	95-1	0
95	0.28777	DEAD	LinStatic	-13.588	0.731	0.911	-0.0405	0.3082	-0.3307	95-1	0.28777
95	0.57554	DEAD	LinStatic	-14.91	1.636	0.911	-0.0405	0.0461	-0.6714	95-1	0.57554
97	0	DEAD	LinStatic	-8.334	-1.601	0.446	-0.1038	0.2216	0.4736	97-1	0
97	0.40697	DEAD	LinStatic	-8.751	0.627	0.446	-0.1038	0.0401	0.6718	97-1	0.40697
97	0.81394	DEAD	LinStatic	-9.169	2.854	0.446	-0.1038	-0.1414	-0.0364	97-1	0.81394
98	0	DEAD	LinStatic	-8.999	-0.667	1.107	-0.1761	0.6543	0.4004	98-1	0
98	0.46804	DEAD	LinStatic	-10.461	1.49	1.107	-0.1761	0.1361	0.2078	98-1	0.46804
98	0.93608	DEAD	LinStatic	-11.922	3.648	1.107	-0.1761	-0.382	-0.9945	98-1	0.93608

99	0	DEAD	LinStatic	-12.265	-0.173	0.911	-0.0405	0.5704	-0.2504	99-1	0
99	0.28777	DEAD	LinStatic	-13.588	0.731	0.911	-0.0405	0.3082	-0.3307	99-1	0.28777
99	0.57554	DEAD	LinStatic	-14.91	1.636	0.911	-0.0405	0.0461	-0.6714	99-1	0.57554
101	0	DEAD	LinStatic	-8.334	-1.601	-0.446	0.1038	-0.2216	0.4736	101-1	0
101	0.40697	DEAD	LinStatic	-8.751	0.627	-0.446	0.1038	-0.0401	0.6718	101-1	0.40697
101	0.81394	DEAD	LinStatic	-9.169	2.854	-0.446	0.1038	0.1414	-0.0364	101-1	0.81394
102	0	DEAD	LinStatic	-8.999	-0.667	-1.107	0.1761	-0.6543	0.4004	102-1	0
102	0.46804	DEAD	LinStatic	-10.461	1.49	-1.107	0.1761	-0.1361	0.2078	102-1	0.46804
102	0.93608	DEAD	LinStatic	-11.922	3.648	-1.107	0.1761	0.382	-0.9945	102-1	0.93608
103	0	DEAD	LinStatic	-12.265	-0.173	-0.911	0.0405	-0.5704	-0.2504	103-1	0
103	0.28777	DEAD	LinStatic	-13.588	0.731	-0.911	0.0405	-0.3082	-0.3307	103-1	0.28777
103	0.57554	DEAD	LinStatic	-14.91	1.636	-0.911	0.0405	-0.0461	-0.6714	103-1	0.57554
105	0	DEAD	LinStatic	-8.334	-1.601	-0.446	0.1038	-0.2216	0.4736	105-1	0
105	0.40697	DEAD	LinStatic	-8.751	0.627	-0.446	0.1038	-0.0401	0.6718	105-1	0.40697
105	0.81394	DEAD	LinStatic	-9.169	2.854	-0.446	0.1038	0.1414	-0.0364	105-1	0.81394
106	0	DEAD	LinStatic	-8.999	-0.667	-1.107	0.1761	-0.6543	0.4004	106-1	0
106	0.46804	DEAD	LinStatic	-10.461	1.49	-1.107	0.1761	-0.1361	0.2078	106-1	0.46804
106	0.93608	DEAD	LinStatic	-11.922	3.648	-1.107	0.1761	0.382	-0.9945	106-1	0.93608
107	0	DEAD	LinStatic	-12.265	-0.173	-0.911	0.0405	-0.5704	-0.2504	107-1	0
107	0.28777	DEAD	LinStatic	-13.588	0.731	-0.911	0.0405	-0.3082	-0.3307	107-1	0.28777
107	0.57554	DEAD	LinStatic	-14.91	1.636	-0.911	0.0405	-0.0461	-0.6714	107-1	0.57554
109	0	DEAD	LinStatic	-8.334	-1.601	0.446	-0.1038	0.2216	0.4736	109-1	0
109	0.40697	DEAD	LinStatic	-8.751	0.627	0.446	-0.1038	0.0401	0.6718	109-1	0.40697
109	0.81394	DEAD	LinStatic	-9.169	2.854	0.446	-0.1038	-0.1414	-0.0364	109-1	0.81394
110	0	DEAD	LinStatic	-8.999	-0.667	1.107	-0.1761	0.6543	0.4004	110-1	0
110	0.46804	DEAD	LinStatic	-10.461	1.49	1.107	-0.1761	0.1361	0.2078	110-1	0.46804
110	0.93608	DEAD	LinStatic	-11.922	3.648	1.107	-0.1761	-0.382	-0.9945	110-1	0.93608
111	0	DEAD	LinStatic	-12.265	-0.173	0.911	-0.0405	0.5704	-0.2504	111-1	0
111	0.28777	DEAD	LinStatic	-13.588	0.731	0.911	-0.0405	0.3082	-0.3307	111-1	0.28777
111	0.57554	DEAD	LinStatic	-14.91	1.636	0.911	-0.0405	0.0461	-0.6714	111-1	0.57554
113	0	DEAD	LinStatic	-5.14	-1.632	0.521	-0.1165	0.3903	0.2258	113-1	0
113	0.41552	DEAD	LinStatic	-5.767	0.596	0.521	-0.1165	0.1739	0.4411	113-1	0.41552
113	0.83104	DEAD	LinStatic	-6.393	2.823	0.521	-0.1165	-0.0425	-0.2691	113-1	0.83104
114	0	DEAD	LinStatic	-6.927	-0.525	1.277	-0.2268	1.0299	0.2929	114-1	0
114	0.36336	DEAD	LinStatic	-8.25	1.006	1.277	-0.2268	0.566	0.2057	114-1	0.36336
114	0.72672	DEAD	LinStatic	-9.572	2.537	1.277	-0.2268	0.1021	-0.438	114-1	0.72672
115	0	DEAD	LinStatic	-9.865	-0.86	1.277	-0.1787	0.173	-0.438	115-1	0
115	0.22947	DEAD	LinStatic	-10.979	-0.234	1.277	-0.1787	-0.12	-0.3124	115-1	0.22947
115	0.45894	DEAD	LinStatic	-12.093	0.393	1.277	-0.1787	-0.413	-0.3307	115-1	0.45894
116	0	DEAD	LinStatic	-5.14	-1.632	-0.521	0.1165	-0.3903	0.2258	116-1	0
116	0.41552	DEAD	LinStatic	-5.767	0.596	-0.521	0.1165	-0.1739	0.4411	116-1	0.41552
116	0.83104	DEAD	LinStatic	-6.393	2.823	-0.521	0.1165	0.0425	-0.2691	116-1	0.83104
117	0	DEAD	LinStatic	-6.927	-0.525	-1.277	0.2268	-1.0299	0.2929	117-1	0
117	0.36336	DEAD	LinStatic	-8.25	1.006	-1.277	0.2268	-0.566	0.2057	117-1	0.36336
117	0.72672	DEAD	LinStatic	-9.572	2.537	-1.277	0.2268	-0.1021	-0.438	117-1	0.72672
118	0	DEAD	LinStatic	-9.865	-0.86	-1.277	0.1787	-0.173	-0.438	118-1	0
118	0.22947	DEAD	LinStatic	-10.979	-0.234	-1.277	0.1787	0.12	-0.3124	118-1	0.22947
118	0.45894	DEAD	LinStatic	-12.093	0.393	-1.277	0.1787	0.413	-0.3307	118-1	0.45894
119	0	DEAD	LinStatic	-5.14	-1.632	-0.521	0.1165	-0.3903	0.2258	119-1	0
119	0.41552	DEAD	LinStatic	-5.767	0.596	-0.521	0.1165	-0.1739	0.4411	119-1	0.41552
119	0.83104	DEAD	LinStatic	-6.393	2.823	-0.521	0.1165	0.0425	-0.2691	119-1	0.83104
120	0	DEAD	LinStatic	-6.927	-0.525	-1.277	0.2268	-1.0299	0.2929	120-1	0
120	0.36336	DEAD	LinStatic	-8.25	1.006	-1.277	0.2268	-0.566	0.2057	120-1	0.36336
120	0.72672	DEAD	LinStatic	-9.572	2.537	-1.277	0.2268	-0.1021	-0.438	120-1	0.72672
121	0	DEAD	LinStatic	-9.865	-0.86	-1.277	0.1787	-0.173	-0.438	121-1	0
121	0.22947	DEAD	LinStatic	-10.979	-0.234	-1.277	0.1787	0.12	-0.3124	121-1	0.22947
121	0.45894	DEAD	LinStatic	-12.093	0.393	-1.277	0.1787	0.413	-0.3307	121-1	0.45894
122	0	DEAD	LinStatic	-5.14	-1.632	0.521	-0.1165	0.3903	0.2258	122-1	0
122	0.41552	DEAD	LinStatic	-5.767	0.596	0.521	-0.1165	0.1739	0.4411	122-1	0.41552
122	0.83104	DEAD	LinStatic	-6.393	2.823	0.521	-0.1165	-0.0425	-0.2691	122-1	0.83104
123	0	DEAD	LinStatic	-6.927	-0.525	1.277	-0.2268	1.0299	0.2929	123-1	0
123	0.36336	DEAD	LinStatic	-8.25	1.006	1.277	-0.2268	0.566	0.2057	123-1	0.36336
123	0.72672	DEAD	LinStatic	-9.572	2.537	1.277	-0.2268	0.1021	-0.438	123-1	0.72672
124	0	DEAD	LinStatic	-9.865	-0.86	1.277	-0.1787	0.173	-0.438	124-1	0
124	0.22947	DEAD	LinStatic	-10.979	-0.234	1.277	-0.1787	-0.12	-0.3124	124-1	0.22947
124	0.45894	DEAD	LinStatic	-12.093	0.393	1.277	-0.1787	-0.413	-0.3307	124-1	0.45894
125	0	DEAD	LinStatic	-5.14	-1.632	-0.521	0.1165	-0.3903	0.2258	125-1	0
125	0.41552	DEAD	LinStatic	-5.767	0.596	-0.521	0.1165	-0.1739	0.4411	125-1	0.41552
125	0.83104	DEAD	LinStatic	-6.393	2.823	-0.521	0.1165	0.0425	-0.2691	125-1	0.83104

126	0	DEAD	LinStatic	-6.927	-0.525	-1.277	0.2268	-1.0299	0.2929	126-1	0
126	0.36336	DEAD	LinStatic	-8.25	1.006	-1.277	0.2268	-0.566	0.2057	126-1	0.36336
126	0.72672	DEAD	LinStatic	-9.572	2.537	-1.277	0.2268	-0.1021	-0.438	126-1	0.72672
127	0	DEAD	LinStatic	-9.865	-0.86	-1.277	0.1787	-0.173	-0.438	127-1	0
127	0.22947	DEAD	LinStatic	-10.979	-0.234	-1.277	0.1787	0.12	-0.3124	127-1	0.22947
127	0.45894	DEAD	LinStatic	-12.093	0.393	-1.277	0.1787	0.413	-0.3307	127-1	0.45894
128	0	DEAD	LinStatic	-5.14	-1.632	0.521	-0.1165	0.3903	0.2258	128-1	0
128	0.41552	DEAD	LinStatic	-5.767	0.596	0.521	-0.1165	0.1739	0.4411	128-1	0.41552
128	0.83104	DEAD	LinStatic	-6.393	2.823	0.521	-0.1165	-0.0425	-0.2691	128-1	0.83104
129	0	DEAD	LinStatic	-6.927	-0.525	1.277	-0.2268	1.0299	0.2929	129-1	0
129	0.36336	DEAD	LinStatic	-8.25	1.006	1.277	-0.2268	0.566	0.2057	129-1	0.36336
129	0.72672	DEAD	LinStatic	-9.572	2.537	1.277	-0.2268	0.1021	-0.438	129-1	0.72672
130	0	DEAD	LinStatic	-9.865	-0.86	1.277	-0.1787	0.173	-0.438	130-1	0
130	0.22947	DEAD	LinStatic	-10.979	-0.234	1.277	-0.1787	-0.12	-0.3124	130-1	0.22947
130	0.45894	DEAD	LinStatic	-12.093	0.393	1.277	-0.1787	-0.413	-0.3307	130-1	0.45894
131	0	DEAD	LinStatic	-5.14	-1.632	0.521	-0.1165	0.3903	0.2258	131-1	0
131	0.41552	DEAD	LinStatic	-5.767	0.596	0.521	-0.1165	0.1739	0.4411	131-1	0.41552
131	0.83104	DEAD	LinStatic	-6.393	2.823	0.521	-0.1165	-0.0425	-0.2691	131-1	0.83104
132	0	DEAD	LinStatic	-6.927	-0.525	1.277	-0.2268	1.0299	0.2929	132-1	0
132	0.36336	DEAD	LinStatic	-8.25	1.006	1.277	-0.2268	0.566	0.2057	132-1	0.36336
132	0.72672	DEAD	LinStatic	-9.572	2.537	1.277	-0.2268	0.1021	-0.438	132-1	0.72672
133	0	DEAD	LinStatic	-9.865	-0.86	1.277	-0.1787	0.173	-0.438	133-1	0
133	0.22947	DEAD	LinStatic	-10.979	-0.234	1.277	-0.1787	-0.12	-0.3124	133-1	0.22947
133	0.45894	DEAD	LinStatic	-12.093	0.393	1.277	-0.1787	-0.413	-0.3307	133-1	0.45894
134	0	DEAD	LinStatic	-5.14	-1.632	-0.521	0.1165	-0.3903	0.2258	134-1	0
134	0.41552	DEAD	LinStatic	-5.767	0.596	-0.521	0.1165	-0.1739	0.4411	134-1	0.41552
134	0.83104	DEAD	LinStatic	-6.393	2.823	-0.521	0.1165	0.0425	-0.2691	134-1	0.83104
135	0	DEAD	LinStatic	-6.927	-0.525	-1.277	0.2268	-1.0299	0.2929	135-1	0
135	0.36336	DEAD	LinStatic	-8.25	1.006	-1.277	0.2268	-0.566	0.2057	135-1	0.36336
135	0.72672	DEAD	LinStatic	-9.572	2.537	-1.277	0.2268	-0.1021	-0.438	135-1	0.72672
136	0	DEAD	LinStatic	-9.865	-0.86	-1.277	0.1787	-0.173	-0.438	136-1	0
136	0.22947	DEAD	LinStatic	-10.979	-0.234	-1.277	0.1787	0.12	-0.3124	136-1	0.22947
136	0.45894	DEAD	LinStatic	-12.093	0.393	-1.277	0.1787	0.413	-0.3307	136-1	0.45894
137	0	DEAD	LinStatic	-2.967	-1.013	0.677	-0.0856	0.4479	0.366	137-1	0
137	0.31623	DEAD	LinStatic	-3.524	0.658	0.677	-0.0856	0.2337	0.4221	137-1	0.31623
137	0.63246	DEAD	LinStatic	-4.081	2.328	0.677	-0.0856	0.0195	-0.05	137-1	0.63246
138	0	DEAD	LinStatic	-4.691	0.257	0.677	-0.0678	0.0557	-0.05	138-1	0
138	0.14142	DEAD	LinStatic	-5.248	0.814	0.677	-0.0678	-0.0401	-0.1257	138-1	0.14142
138	0.28284	DEAD	LinStatic	-5.805	1.371	0.677	-0.0678	-0.1359	-0.2803	138-1	0.28284
139	0	DEAD	LinStatic	-2.967	-1.013	-0.677	0.0856	-0.4479	0.366	139-1	0
139	0.31623	DEAD	LinStatic	-3.524	0.658	-0.677	0.0856	-0.2337	0.4221	139-1	0.31623
139	0.63246	DEAD	LinStatic	-4.081	2.328	-0.677	0.0856	-0.0195	-0.05	139-1	0.63246
140	0	DEAD	LinStatic	-4.691	0.257	-0.677	0.0678	-0.0557	-0.05	140-1	0
140	0.14142	DEAD	LinStatic	-5.248	0.814	-0.677	0.0678	0.0401	-0.1257	140-1	0.14142
140	0.28284	DEAD	LinStatic	-5.805	1.371	-0.677	0.0678	0.1359	-0.2803	140-1	0.28284
141	0	DEAD	LinStatic	-2.967	-1.013	-0.677	0.0856	-0.4479	0.366	141-1	0
141	0.31623	DEAD	LinStatic	-3.524	0.658	-0.677	0.0856	-0.2337	0.4221	141-1	0.31623
141	0.63246	DEAD	LinStatic	-4.081	2.328	-0.677	0.0856	-0.0195	-0.05	141-1	0.63246
142	0	DEAD	LinStatic	-4.691	0.257	-0.677	0.0678	-0.0557	-0.05	142-1	0
142	0.14142	DEAD	LinStatic	-5.248	0.814	-0.677	0.0678	0.0401	-0.1257	142-1	0.14142
142	0.28284	DEAD	LinStatic	-5.805	1.371	-0.677	0.0678	0.1359	-0.2803	142-1	0.28284
143	0	DEAD	LinStatic	-2.967	-1.013	0.677	-0.0856	0.4479	0.366	143-1	0
143	0.31623	DEAD	LinStatic	-3.524	0.658	0.677	-0.0856	0.2337	0.4221	143-1	0.31623
143	0.63246	DEAD	LinStatic	-4.081	2.328	0.677	-0.0856	0.0195	-0.05	143-1	0.63246
144	0	DEAD	LinStatic	-4.691	0.257	0.677	-0.0678	0.0557	-0.05	144-1	0
144	0.14142	DEAD	LinStatic	-5.248	0.814	0.677	-0.0678	-0.0401	-0.1257	144-1	0.14142
144	0.28284	DEAD	LinStatic	-5.805	1.371	0.677	-0.0678	-0.1359	-0.2803	144-1	0.28284
145	0	DEAD	LinStatic	-5.805	-1.371	0.677	-0.0678	0.1359	-0.2803	145-1	0
145	0.14142	DEAD	LinStatic	-5.248	-0.814	0.677	-0.0678	0.0401	-0.1257	145-1	0.14142
145	0.28284	DEAD	LinStatic	-4.691	-0.257	0.677	-0.0678	-0.0557	-0.05	145-1	0.28284
146	0	DEAD	LinStatic	-4.081	-2.328	0.677	-0.0856	-0.0195	-0.05	146-1	0
146	0.31623	DEAD	LinStatic	-3.524	-0.658	0.677	-0.0856	-0.2337	0.4221	146-1	0.31623
146	0.63246	DEAD	LinStatic	-2.967	1.013	0.677	-0.0856	-0.4479	0.366	146-1	0.63246
147	0	DEAD	LinStatic	-2.967	-1.013	-0.677	0.0856	-0.4479	0.366	147-1	0
147	0.31623	DEAD	LinStatic	-3.524	0.658	-0.677	0.0856	-0.2337	0.4221	147-1	0.31623
147	0.63246	DEAD	LinStatic	-4.081	2.328	-0.677	0.0856	-0.0195	-0.05	147-1	0.63246
148	0	DEAD	LinStatic	-4.691	0.257	-0.677	0.0678	-0.0557	-0.05	148-1	0
148	0.14142	DEAD	LinStatic	-5.248	0.814	-0.677	0.0678	0.0401	-0.1257	148-1	0.14142
148	0.28284	DEAD	LinStatic	-5.805	1.371	-0.677	0.0678	0.1359	-0.2803	148-1	0.28284

149	0	DEAD	LinStatic	-5.805	-1.371	-0.677	0.0678	-0.1359	-0.2803	149-1	0
149	0.14142	DEAD	LinStatic	-5.248	-0.814	-0.677	0.0678	-0.0401	-0.1257	149-1	0.14142
149	0.28284	DEAD	LinStatic	-4.691	-0.257	-0.677	0.0678	0.0557	-0.05	149-1	0.28284
150	0	DEAD	LinStatic	-4.081	-2.328	-0.677	0.0856	0.0195	-0.05	150-1	0
150	0.31623	DEAD	LinStatic	-3.524	-0.658	-0.677	0.0856	0.2337	0.4221	150-1	0.31623
150	0.63246	DEAD	LinStatic	-2.967	1.013	0.677	0.0856	0.4479	0.366	150-1	0.63246
151	0	DEAD	LinStatic	-2.967	-1.013	0.677	-0.0856	0.4479	0.366	151-1	0
151	0.31623	DEAD	LinStatic	-3.524	0.658	0.677	-0.0856	0.2337	0.4221	151-1	0.31623
151	0.63246	DEAD	LinStatic	-4.081	2.328	0.677	-0.0856	0.0195	-0.05	151-1	0.63246
152	0	DEAD	LinStatic	-4.691	0.257	0.677	-0.0678	0.0557	-0.05	152-1	0
152	0.14142	DEAD	LinStatic	-5.248	0.814	0.677	-0.0678	-0.0401	-0.1257	152-1	0.14142
152	0.28284	DEAD	LinStatic	-5.805	1.371	0.677	-0.0678	-0.1359	-0.2803	152-1	0.28284
153	0	DEAD	LinStatic	-14.869	-1.974	-0.911	0.0283	-0.0544	-0.6714	153-1	0
153	0.2136	DEAD	LinStatic	-15.983	-1.556	-0.911	0.0283	0.1401	-0.2943	153-1	0.2136
153	0.4272	DEAD	LinStatic	-17.096	-1.139	-0.911	0.0283	0.3347	-0.0065	153-1	0.4272
154	0	DEAD	LinStatic	-14.869	-1.974	0.911	-0.0283	0.0544	-0.6714	154-1	0
154	0.2136	DEAD	LinStatic	-15.983	-1.556	0.911	-0.0283	-0.1401	-0.2943	154-1	0.2136
154	0.4272	DEAD	LinStatic	-17.096	-1.139	0.911	-0.0283	-0.3347	-0.0065	154-1	0.4272
155	0	DEAD	LinStatic	-14.869	-1.974	0.911	-0.0283	0.0544	-0.6714	155-1	0
155	0.2136	DEAD	LinStatic	-15.983	-1.556	0.911	-0.0283	-0.1401	-0.2943	155-1	0.2136
155	0.4272	DEAD	LinStatic	-17.096	-1.139	0.911	-0.0283	-0.3347	-0.0065	155-1	0.4272
156	0	DEAD	LinStatic	-14.869	-1.974	-0.911	0.0283	-0.0544	-0.6714	156-1	0
156	0.2136	DEAD	LinStatic	-15.983	-1.556	-0.911	0.0283	0.1401	-0.2943	156-1	0.2136
156	0.4272	DEAD	LinStatic	-17.096	-1.139	-0.911	0.0283	0.3347	-0.0065	156-1	0.4272
158	0	DEAD	LinStatic	-14.869	-1.974	0.911	-0.0283	0.0544	-0.6714	158-1	0
158	0.2136	DEAD	LinStatic	-15.983	-1.556	0.911	-0.0283	-0.1401	-0.2943	158-1	0.2136
158	0.4272	DEAD	LinStatic	-17.096	-1.139	0.911	-0.0283	-0.3347	-0.0065	158-1	0.4272
159	0	DEAD	LinStatic	-14.869	-1.974	-0.911	0.0283	-0.0544	-0.6714	159-1	0
159	0.2136	DEAD	LinStatic	-15.983	-1.556	-0.911	0.0283	0.1401	-0.2943	159-1	0.2136
159	0.4272	DEAD	LinStatic	-17.096	-1.139	-0.911	0.0283	0.3347	-0.0065	159-1	0.4272
160	0	DEAD	LinStatic	-14.869	-1.974	-0.911	0.0283	-0.0544	-0.6714	160-1	0
160	0.2136	DEAD	LinStatic	-15.983	-1.556	-0.911	0.0283	0.1401	-0.2943	160-1	0.2136
160	0.4272	DEAD	LinStatic	-17.096	-1.139	-0.911	0.0283	0.3347	-0.0065	160-1	0.4272
161	0	DEAD	LinStatic	-14.869	-1.974	0.911	-0.0283	0.0544	-0.6714	161-1	0
161	0.2136	DEAD	LinStatic	-15.983	-1.556	0.911	-0.0283	-0.1401	-0.2943	161-1	0.2136
161	0.4272	DEAD	LinStatic	-17.096	-1.139	0.911	-0.0283	-0.3347	-0.0065	161-1	0.4272
162	0	DEAD	LinStatic	-18.346	0.256	-7.778E-16	7.522E-19	3.17E-18	-0.0109	162-1	0
162	0.2136	DEAD	LinStatic	-17.233	0.674	-7.778E-16	7.522E-19	1.693E-16	-0.1102	162-1	0.2136
162	0.4272	DEAD	LinStatic	-16.119	1.092	-7.778E-16	7.522E-19	3.354E-16	-0.2988	162-1	0.4272
163	0	DEAD	LinStatic	-16.647	-1.584	-1.315E-16	-3.41E-17	2.569E-16	-0.7444	163-1	0
163	0.42297	DEAD	LinStatic	-14.698	-0.262	-1.315E-16	-3.41E-17	3.126E-16	-0.354	163-1	0.42297
163	0.84595	DEAD	LinStatic	-12.75	1.061	-1.315E-16	-3.41E-17	3.682E-16	-0.5229	163-1	0.84595
164	0	DEAD	LinStatic	-18.346	0.256	5.594E-16	-1.144E-17	-3.051E-17	-0.0109	164-1	0
164	0.2136	DEAD	LinStatic	-17.233	0.674	5.594E-16	-1.144E-17	-1.5E-16	-0.1102	164-1	0.2136
164	0.4272	DEAD	LinStatic	-16.119	1.092	5.594E-16	-1.144E-17	-2.695E-16	-0.2988	164-1	0.4272
165	0	DEAD	LinStatic	-16.647	-1.584	5.091E-16	-8.66E-17	-1.346E-16	-0.7444	165-1	0
165	0.42297	DEAD	LinStatic	-14.698	-0.262	5.091E-16	-8.66E-17	-3.499E-16	-0.354	165-1	0.42297
165	0.84595	DEAD	LinStatic	-12.75	1.061	5.091E-16	-8.66E-17	-5.652E-16	-0.5229	165-1	0.84595
166	0	DEAD	LinStatic	-18.346	0.256	3.103E-16	2.429E-17	6.477E-17	-0.0109	166-1	0
166	0.2136	DEAD	LinStatic	-17.233	0.674	3.103E-16	2.429E-17	-1.508E-18	-0.1102	166-1	0.2136
166	0.4272	DEAD	LinStatic	-16.119	1.092	3.103E-16	2.429E-17	-6.779E-17	-0.2988	166-1	0.4272
167	0	DEAD	LinStatic	-16.647	-1.584	-1.658E-15	2.883E-16	-3.767E-16	-0.7444	167-1	0
167	0.42297	DEAD	LinStatic	-14.698	-0.262	-1.658E-15	2.883E-16	3.248E-16	-0.354	167-1	0.42297
167	0.84595	DEAD	LinStatic	-12.75	1.061	-1.658E-15	2.883E-16	1.026E-15	-0.5229	167-1	0.84595
168	0	DEAD	LinStatic	-12.75	-1.061	-2.302E-16	4.467E-17	-3.347E-16	-0.5229	168-1	0
168	0.42297	DEAD	LinStatic	-14.698	0.262	-2.302E-16	4.467E-17	-2.374E-16	-0.354	168-1	0.42297
168	0.84595	DEAD	LinStatic	-16.647	1.584	-2.302E-16	4.467E-17	-1.4E-16	-0.7444	168-1	0.84595
169	0	DEAD	LinStatic	-16.119	-1.092	-6.212E-16	7.488E-18	-2.859E-16	-0.2988	169-1	0
169	0.2136	DEAD	LinStatic	-17.233	-0.674	-6.212E-16	7.488E-18	-1.532E-16	-0.1102	169-1	0.2136
169	0.4272	DEAD	LinStatic	-18.346	-0.256	-6.212E-16	7.488E-18	-2.056E-17	-0.0109	169-1	0.4272
186	0	DEAD	LinStatic	0	-2.266	0	0.0055	0	0	186-1	0
186	0.40697	DEAD	LinStatic	0	4.441E-16	0	0.0055	0	0.4611	186-1	0.40697
186	0.81394	DEAD	LinStatic	0	2.266	0	0.0055	0	-2.776E-16	186-1	0.81394
187	0	DEAD	LinStatic	0	-2.531	0	-0.0424	0	0	187-1	0
187	0.45449	DEAD	LinStatic	0	4.441E-16	0	-0.0424	0	0.5751	187-1	0.45449
187	0.90898	DEAD	LinStatic	0	2.531	0	-0.0424	0	-4.441E-16	187-1	0.90898
188	0	DEAD	LinStatic	0	-2.531	0	0.0424	0	0	188-1	0
188	0.45449	DEAD	LinStatic	0	-8.882E-16	0	0.0424	0	0.5751	188-1	0.45449
188	0.90898	DEAD	LinStatic	0	2.531	0	0.0424	0	6.661E-16	188-1	0.90898

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				P	V2	V3	T	M2	M3		
189	0	DEAD	LinStatic	0	-2.266	0	-0.0055	0	0	189-1	0
189	0.40697	DEAD	LinStatic	0	0	0	-0.0055	0	0.4611	189-1	0.40697
189	0.81394	DEAD	LinStatic	0	2.266	0	-0.0055	0	0	189-1	0.81394
190	0	DEAD	LinStatic	0	-2.266	0	0.0055	0	0	190-1	0
190	0.40697	DEAD	LinStatic	0	4.441E-16	0	0.0055	0	0.4611	190-1	0.40697
190	0.81394	DEAD	LinStatic	0	2.266	0	0.0055	0	-2.776E-16	190-1	0.81394
191	0	DEAD	LinStatic	0	-2.531	0	-0.0424	0	0	191-1	0
191	0.45449	DEAD	LinStatic	0	4.441E-16	0	-0.0424	0	0.5751	191-1	0.45449
191	0.90898	DEAD	LinStatic	0	2.531	0	-0.0424	0	-4.441E-16	191-1	0.90898
192	0	DEAD	LinStatic	0	-2.531	0	0.0424	0	0	192-1	0
192	0.45449	DEAD	LinStatic	0	4.441E-16	0	0.0424	0	0.5751	192-1	0.45449
192	0.90898	DEAD	LinStatic	0	2.531	0	0.0424	0	-4.441E-16	192-1	0.90898
193	0	DEAD	LinStatic	0	-2.266	0	-0.0055	0	0	193-1	0
193	0.40697	DEAD	LinStatic	0	4.441E-16	0	-0.0055	0	0.4611	193-1	0.40697
193	0.81394	DEAD	LinStatic	0	2.266	0	-0.0055	0	-2.776E-16	193-1	0.81394
194	0	DEAD	LinStatic	0	-2.266	0	0.0055	0	0	194-1	0
194	0.40697	DEAD	LinStatic	0	0	0	0.0055	0	0.4611	194-1	0.40697
194	0.81394	DEAD	LinStatic	0	2.266	0	0.0055	0	0	194-1	0.81394
195	0	DEAD	LinStatic	0	-2.531	0	-0.0424	0	0	195-1	0
195	0.45449	DEAD	LinStatic	0	-8.882E-16	0	-0.0424	0	0.5751	195-1	0.45449
195	0.90898	DEAD	LinStatic	0	2.531	0	-0.0424	0	6.661E-16	195-1	0.90898
196	0	DEAD	LinStatic	0	-2.531	0	0.0424	0	0	196-1	0
196	0.45449	DEAD	LinStatic	0	4.441E-16	0	0.0424	0	0.5751	196-1	0.45449
196	0.90898	DEAD	LinStatic	0	2.531	0	0.0424	0	-4.441E-16	196-1	0.90898
198	0	DEAD	LinStatic	0	-2.266	0	-0.0055	0	0	198-1	0
198	0.40697	DEAD	LinStatic	0	4.441E-16	0	-0.0055	0	0.4611	198-1	0.40697
198	0.81394	DEAD	LinStatic	0	2.266	0	-0.0055	0	-2.776E-16	198-1	0.81394
202	0	DEAD	LinStatic	0	-2.266	0	-0.0055	0	0	202-1	0
202	0.40697	DEAD	LinStatic	0	0	0	-0.0055	0	0.4611	202-1	0.40697
202	0.81394	DEAD	LinStatic	0	2.266	0	-0.0055	0	0	202-1	0.81394
203	0	DEAD	LinStatic	0	-2.531	0	0.0424	0	0	203-1	0
203	0.45449	DEAD	LinStatic	0	-8.882E-16	0	0.0424	0	0.5751	203-1	0.45449
203	0.90898	DEAD	LinStatic	0	2.531	0	0.0424	0	6.661E-16	203-1	0.90898
204	0	DEAD	LinStatic	0	-2.531	0	-0.0424	0	0	204-1	0
204	0.45449	DEAD	LinStatic	0	-8.882E-16	0	-0.0424	0	0.5751	204-1	0.45449
204	0.90898	DEAD	LinStatic	0	2.531	0	-0.0424	0	6.661E-16	204-1	0.90898
205	0	DEAD	LinStatic	0	-2.266	0	0.0055	0	0	205-1	0
205	0.40697	DEAD	LinStatic	0	0	0	0.0055	0	0.4611	205-1	0.40697
205	0.81394	DEAD	LinStatic	0	2.266	0	0.0055	0	0	205-1	0.81394

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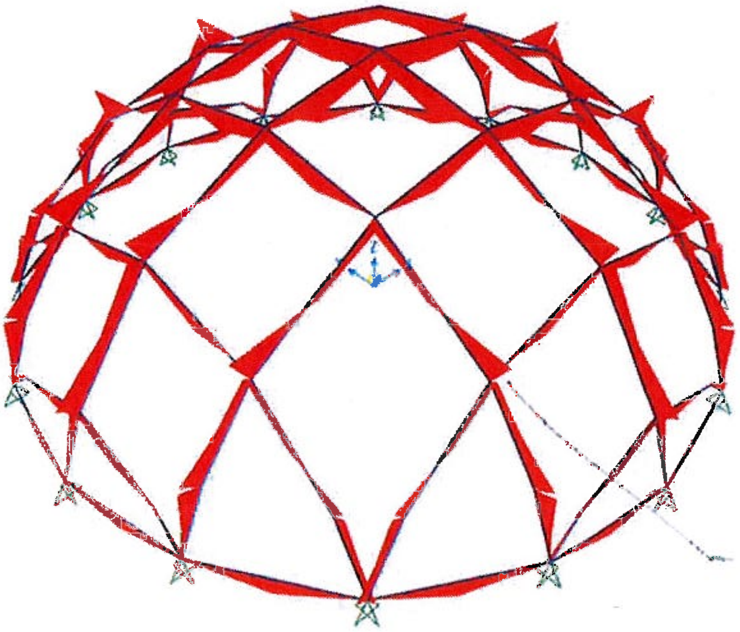
TABLE: Joint Displacements

Joint	OutputCase	CaseType	U1	U2	U3	R1	R2	R3
Text	Text	Text	m	m	m	Radians	Radians	Radians
✓ 55	DEAD	LinStatic	0	0	-0.000011	0	0	0
56	DEAD	LinStatic	0.000001169	0	-0.000009315	0	0.000003312	0
57	DEAD	LinStatic	4.991E-07	0	-0.000004503	0	0.000003731	0
59	DEAD	LinStatic	0	0	0	0	9.651E-07	0
60	DEAD	LinStatic	-0.000001169	0	-0.000009315	0	-0.000003312	0
61	DEAD	LinStatic	-4.991E-07	0	-0.000004503	0	-0.000003731	0
63	DEAD	LinStatic	0	0	0	0	-9.651E-07	0
64	DEAD	LinStatic	0	0.000001169	-0.000009315	-0.000003312	0	0
67	DEAD	LinStatic	0	0	0	-9.651E-07	0	0
68	DEAD	LinStatic	0	4.991E-07	-0.000004503	-0.000003731	0	0
69	DEAD	LinStatic	0	-0.000001169	-0.000009315	0.000003312	0	0
70	DEAD	LinStatic	0	-4.991E-07	-0.000004503	0.000003731	0	0
72	DEAD	LinStatic	0	0	0	9.651E-07	0	0
73	DEAD	LinStatic	-9.719E-07	9.719E-07	-0.000007557	-0.000002715	-0.000002715	0
74	DEAD	LinStatic	-0.000000538	1.695E-07	-0.000003237	-0.000002952	-0.000001527	2.865E-07
75	DEAD	LinStatic	-2.114E-07	-3.533E-07	-0.000001177	-0.000001573	-9.427E-07	8.273E-08
77	DEAD	LinStatic	-9.719E-07	-9.719E-07	-0.000007557	0.000002715	-0.000002715	0
78	DEAD	LinStatic	-0.000000538	-1.695E-07	-0.000003237	0.000002952	-0.000001527	-2.865E-07
81	DEAD	LinStatic	-2.114E-07	3.533E-07	-0.000001177	0.000001573	-9.427E-07	-8.273E-08
82	DEAD	LinStatic	9.719E-07	9.719E-07	-0.000007557	-0.000002715	0.000002715	0
83	DEAD	LinStatic	0.000000538	1.695E-07	-0.000003237	-0.000002952	0.000001527	-2.865E-07
84	DEAD	LinStatic	2.114E-07	-3.533E-07	-0.000001177	-0.000001573	9.427E-07	-8.273E-08
86	DEAD	LinStatic	9.719E-07	-9.719E-07	-0.000007557	0.000002715	0.000002715	0
87	DEAD	LinStatic	0.000000538	-1.695E-07	-0.000003237	0.000002952	0.000001527	2.865E-07
88	DEAD	LinStatic	2.114E-07	3.533E-07	-0.000001177	0.000001573	9.427E-07	8.273E-08
90	DEAD	LinStatic	1.695E-07	0.000000538	-0.000003237	-0.000001527	0.000002952	2.865E-07
91	DEAD	LinStatic	-3.533E-07	2.114E-07	-0.000001177	-9.427E-07	0.000001573	8.273E-08
93	DEAD	LinStatic	-1.695E-07	0.000000538	-0.000003237	-0.000001527	-0.000002952	-2.865E-07
94	DEAD	LinStatic	3.533E-07	2.114E-07	-0.000001177	-9.427E-07	-0.000001573	-8.273E-08
96	DEAD	LinStatic	1.695E-07	-0.000000538	-0.000003237	0.000001527	0.000002952	-2.865E-07
97	DEAD	LinStatic	-3.533E-07	-2.114E-07	-0.000001177	9.427E-07	0.000001573	-8.273E-08
99	DEAD	LinStatic	-1.695E-07	-0.000000538	-0.000003237	0.000001527	-0.000002952	2.865E-07
100	DEAD	LinStatic	3.533E-07	-2.114E-07	-0.000001177	9.427E-07	-0.000001573	8.273E-08
102	DEAD	LinStatic	1.209E-07	4.534E-08	-0.000001106	-0.000001181	0.000002053	-5.871E-07
103	DEAD	LinStatic	0	0	0	-0.000001064	0.000001064	0
104	DEAD	LinStatic	-1.209E-07	4.534E-08	-0.000001106	-0.000001181	-0.000002053	5.871E-07
105	DEAD	LinStatic	0	0	0	-0.000001064	-0.000001064	0
106	DEAD	LinStatic	1.209E-07	-4.534E-08	-0.000001106	0.000001181	0.000002053	5.871E-07
107	DEAD	LinStatic	0	0	0	0.000001064	0.000001064	0
108	DEAD	LinStatic	-1.209E-07	-4.534E-08	-0.000001106	0.000001181	-0.000002053	-5.871E-07
109	DEAD	LinStatic	0	0	0	0.000001064	-0.000001064	0
110	DEAD	LinStatic	4.534E-08	1.209E-07	-0.000001106	-0.000002053	0.000001181	5.871E-07
111	DEAD	LinStatic	4.534E-08	-1.209E-07	-0.000001106	0.000002053	0.000001181	-5.871E-07
112	DEAD	LinStatic	-4.534E-08	1.209E-07	-0.000001106	-0.000002053	-0.000001181	-5.871E-07
113	DEAD	LinStatic	-4.534E-08	-1.209E-07	-0.000001106	0.000002053	-0.000001181	5.871E-07
114	DEAD	LinStatic	0	-1.754E-07	-0.000001346	-0.000001308	0	0
115	DEAD	LinStatic	1.482E-07	-9.891E-09	-5.252E-07	-7.938E-07	0.000001354	-3.533E-07
116	DEAD	LinStatic	0	0	0	-7.267E-07	0.000001102	-2.322E-07
117	DEAD	LinStatic	-1.482E-07	-9.891E-09	-5.252E-07	-7.938E-07	-0.000001354	3.533E-07
118	DEAD	LinStatic	0	0	0	-7.267E-07	-0.000001102	2.322E-07
119	DEAD	LinStatic	0	1.754E-07	-0.000001346	0.000001308	0	0
120	DEAD	LinStatic	1.482E-07	9.891E-09	-5.252E-07	7.938E-07	0.000001354	3.533E-07
121	DEAD	LinStatic	0	0	0	7.267E-07	0.000001102	2.322E-07
122	DEAD	LinStatic	-1.482E-07	9.891E-09	-5.252E-07	7.938E-07	-0.000001354	-3.533E-07
123	DEAD	LinStatic	0	0	0	7.267E-07	-0.000001102	-2.322E-07

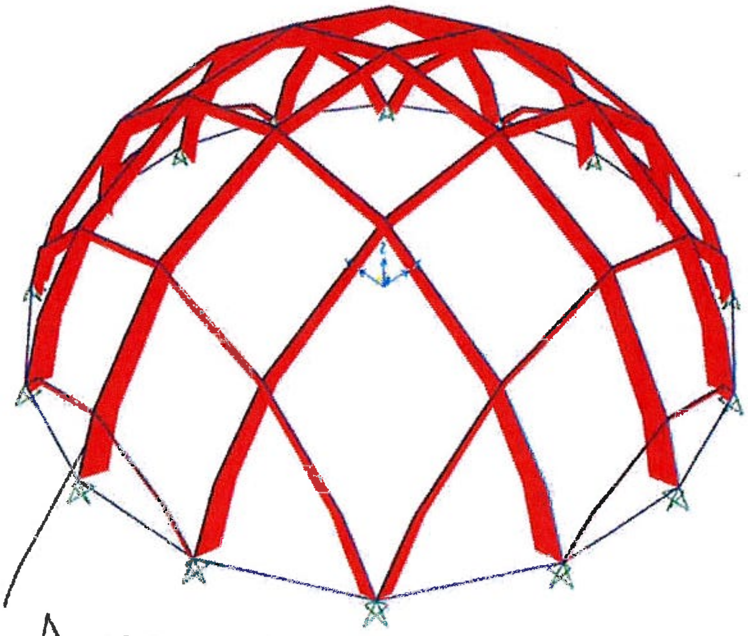
PILLBOX 1

~~124~~	~~DEAD~~	~~LinStatic~~	~~0~~	~~0~~	~~0~~	~~-0.000001102~~	~~-7.267E-07~~	~~-2.322E-07~~
125	DEAD	LinStatic	9.891E-09	1.482E-07	-5.252E-07	-0.000001354	-7.938E-07	-3.533E-07
126	DEAD	LinStatic	1.754E-07	0	-0.000001346	0	-0.000001308	0
127	DEAD	LinStatic	9.891E-09	-1.482E-07	-5.252E-07	0.000001354	-7.938E-07	3.533E-07
128	DEAD	LinStatic	0	0	0	0.000001102	-7.267E-07	2.322E-07
129	DEAD	LinStatic	0	0	0	-0.000001102	7.267E-07	2.322E-07
130	DEAD	LinStatic	-9.891E-09	1.482E-07	-5.252E-07	-0.000001354	7.938E-07	3.533E-07
131	DEAD	LinStatic	-1.754E-07	0	-0.000001346	0	0.000001308	0
132	DEAD	LinStatic	-9.891E-09	-1.482E-07	-5.252E-07	0.000001354	7.938E-07	-3.533E-07
133	DEAD	LinStatic	0	0	0	0.000001102	7.267E-07	-2.322E-07



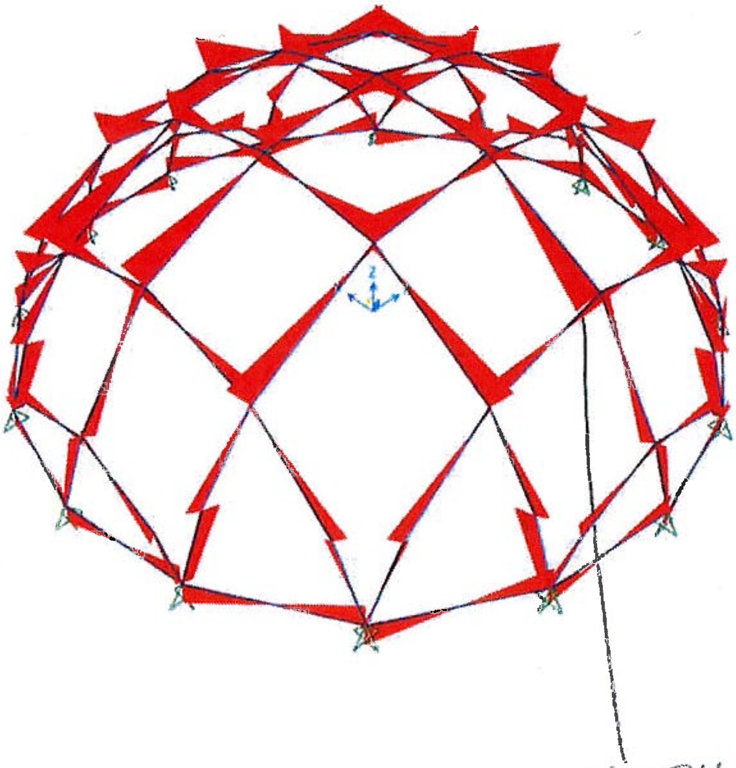
0.99KNm/0.8m

SAP2000 v11.0.4 - File:pillbox 1 - Moment 3-3 Diagram (DEAD) - KN, m, C Units



A=18.34kN/0.8m

SAP2000 v11.0.4 - File:pillbox 1 - Axial Force Diagram (DEAD) - KN, m, C Units



V=3.74 kN/0.8 m

SAP2000 v11.0.4 - File:pillbox 1 - Shear Force 2-2 Diagram (DEAD) - KN, m, C Units

PILLBOX 1

PROJECT No.

DATE

SHEET

BY DT

CHKD

Existing concrete

Rebar $\phi 8$ @ 300   b = 800

$A_{st} = \frac{1000}{300} \times 50.2 = 167$ mm²/m

$P_{st} = 124$ MPa $f_{cu} = 6.5$ MPa

$P_{cc} = 6.5/4 = 1.625$ MPa $P_V = 0.21$

$d_1 = 580 - 50 - 10 - 5 = 515$ mm

$P_{cd} = 6.5/3 = 2.16$ MPa   (CP114)

Design shear

$$V = \frac{3.74\,E3}{800 \times 515} = 0.009 \text{ N/mm}^2$$

$$< 0.5\,P_V = 0.5 \times 0.21 = 0.1 \quad \text{ok}$$

Design moment + Axial

$$\frac{P}{P_{cc}\,b\,d} = \frac{18.34\,E3}{1.625 \times 800 \times 515} = 0.027$$

$$\frac{M}{P_{cc}\,b\,d^2} = \frac{0.99\,E6}{1.625 \times 800 \times 515^2} = 0.0029$$

$$r = \frac{A_{st}}{b\,d} = \frac{167}{1000 \times 515} = 3.24\,E{-4}$$

$$\frac{r\,P_{st}}{P_{cc}} = \frac{3.24\,E{-4} \times 124}{1.625} = 0.025$$

check with Pannel chart ok

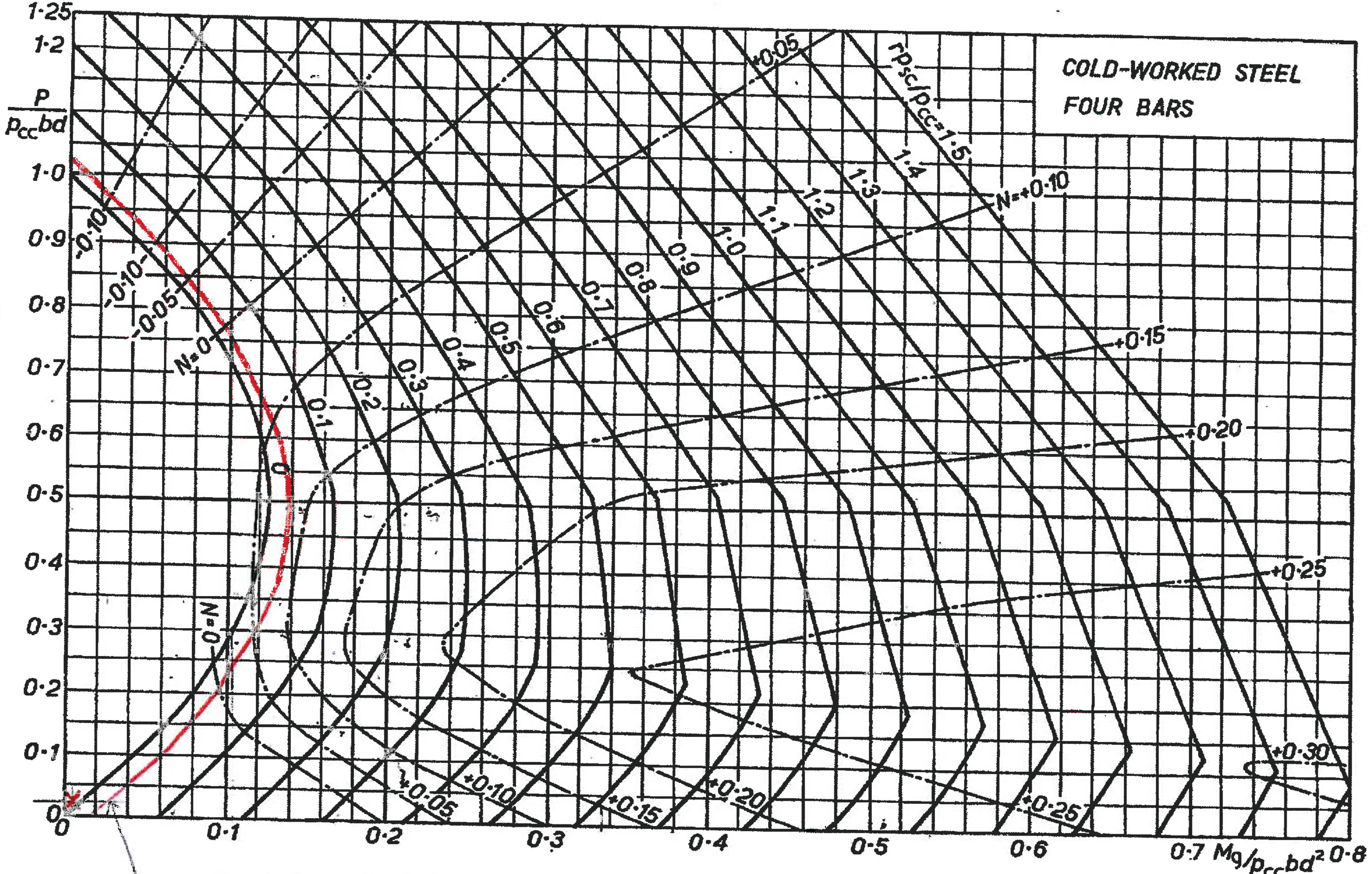


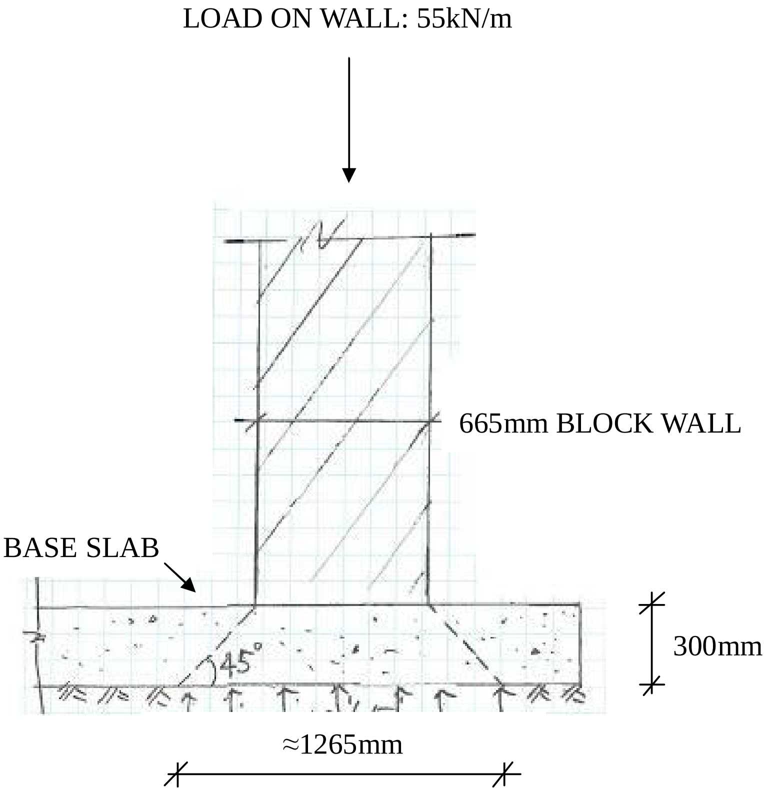
Chart 6 : Rectangular Members Symmetrically Reinforced with Four Cold-worked Steel Bars NOT Exceeding $\frac{3}{8}$ in. Diam.

Member Capacity

Appendix D

ESTIMATION OF SOIL BEARING PRESSURE AT BASE OF WALL

APPENDIX D



Soil Bearing Pressure $= (55kN/1.265m^2) + 24 \times 0.3kPa$

$\approx 50kPa$

Appendix E

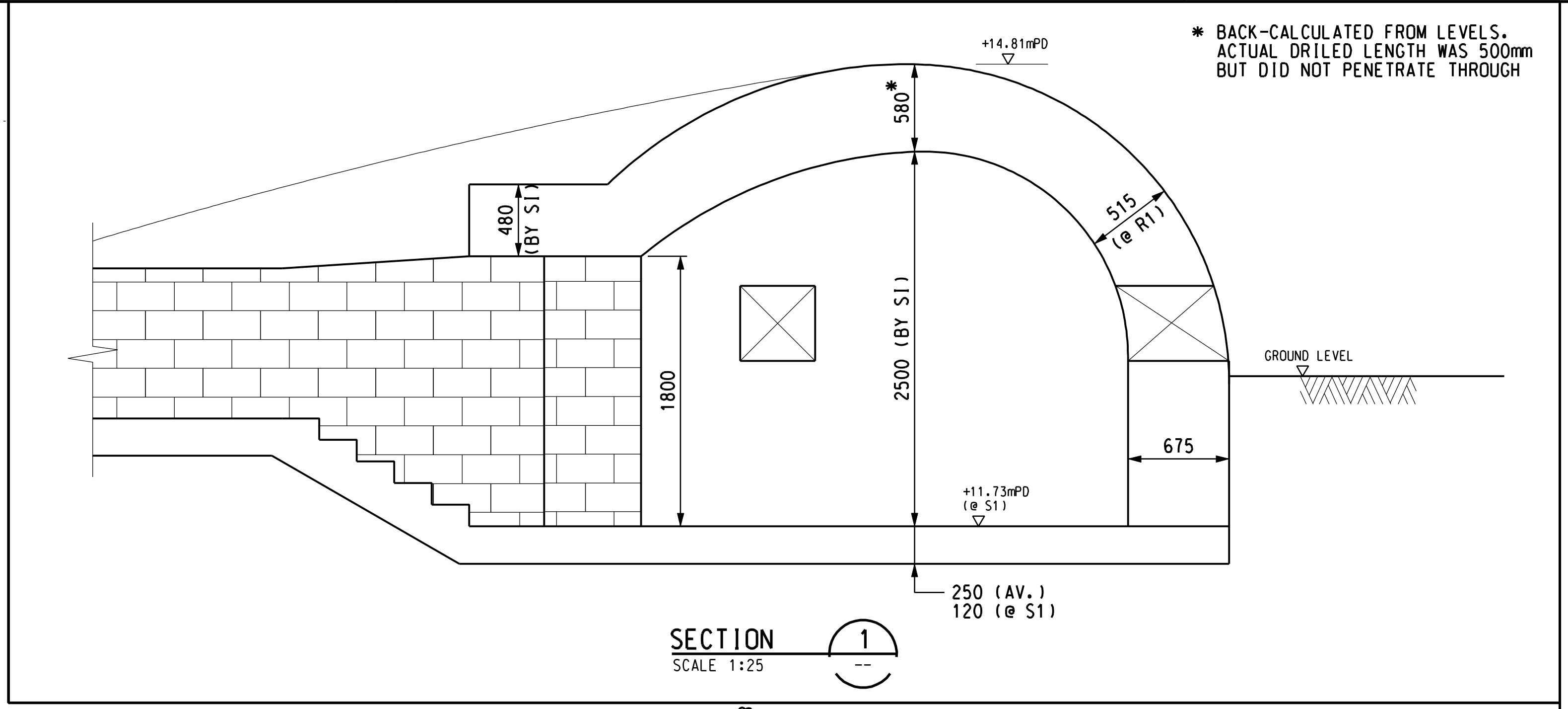
CONFIGURATION AND BASIC APPROXIMATE DIMENSIONS AND WEIGHT ESTIMATION OF PILLBOX

Weight Estimation of the Pillbox structure

Structural Member	**Weight (kN)**
Reinforced Concrete Roof	330
Concrete Block Walls	460
Reinforced Concrete Base Slab	250
Underground Storage Chamber	120
Total	1160

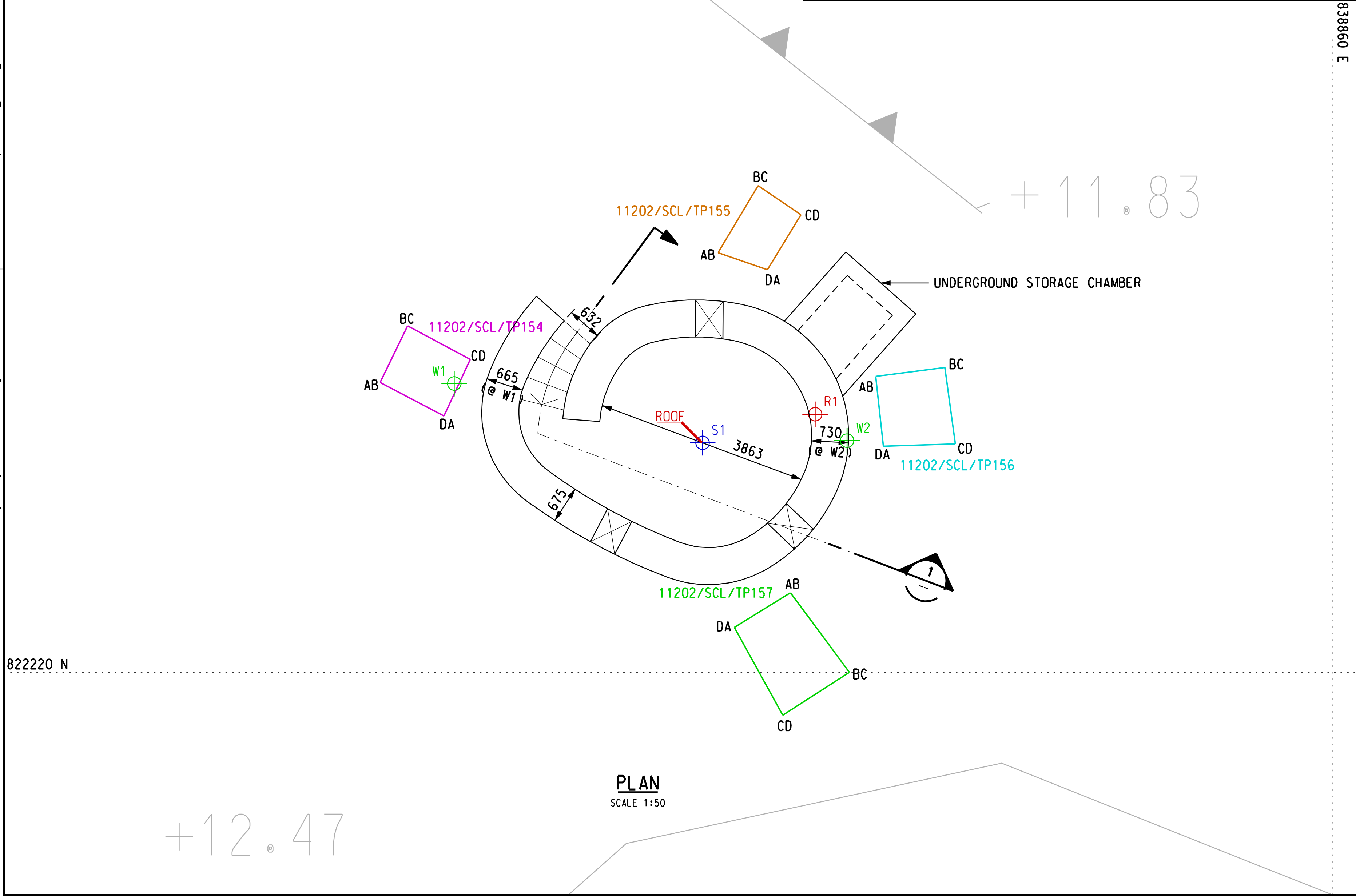
Notes:

1. The estimated weight is based on the upper bound of the readings taken on site.
2. No measurement on the structural member size is taken at the Underground Storage Chamber and the weight above is based on engineering judgement. (refer to Drawing 1106/K/301/ACM/C01/005 for its overall size)



SECTION

SCALE 1:25



PLAN

SCALE 1:50

SUMMARY OF MEASUREMENTS FROM
TRIAL PIT INVESTIGATION

TP	AVERAGE GROUND LEVEL (mPD)	DEPTH TO SLAB (m)	THICKNESS OF SLAB (mm)	LEVEL OF SLAB (mPD)
1/154	12.76	0.95	250	11.81
2/154	12.87	1.15	300	11.872
3/154	12.82	1.35	200	11.47
4/154	12.58	1.00	380	11.58
S1				11.73

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MODELNAME: Default PRINTED BY: erickwan 24/12/2010 3:16:34 PM
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REV	DESCRIPTION	BY	DATE	APPROVED

REV	DESCRIPTION	BY	DATE	APPROVED
A	STRUCTURAL INVESTIGATION AND APPRAISAL REPORT FOR OLD PILLBOX	AWTS	23DEC10	IMW

DRAWN	ELO
DESIGNED	AWTS
CHECKED	HLHK
APPROVED	IMW
DATE	23/DEC/2010

DO NOT SCALE DRAWINGS. ALL DIMENSIONS SHALL BE VERIFIED ON SITE.

MTR

SHATIN TO CENTRAL LINK

ORIGINATOR

AECOM in association with
Aedas, MVA and DLS

CADD REF. 1106_K_301_ACM_C01_005A.dgn

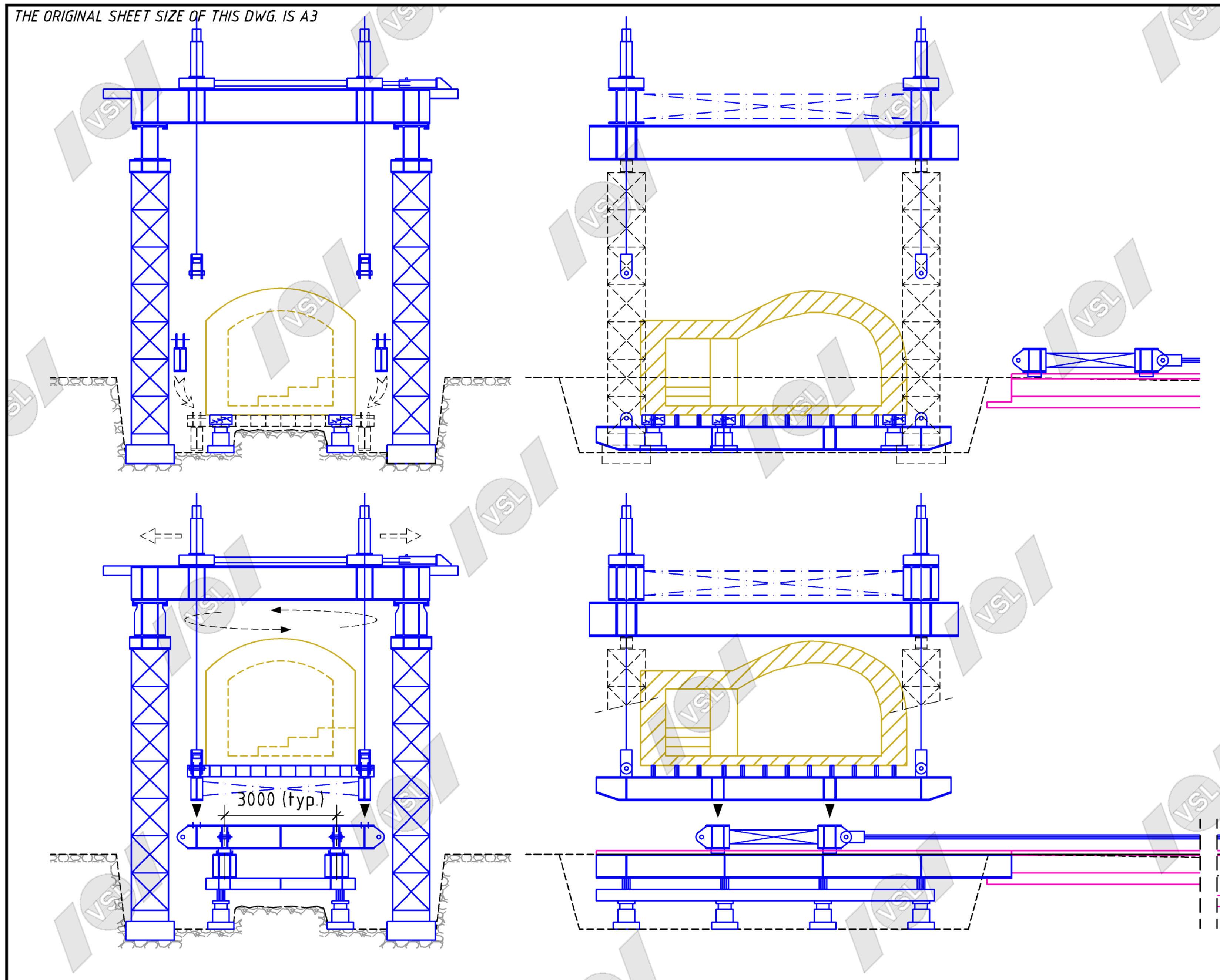
TITLE
CONTRACT 1106
DIH AND DHS
HERITAGE - PILLBOX
EXISTING GENERAL ARRANGEMENT

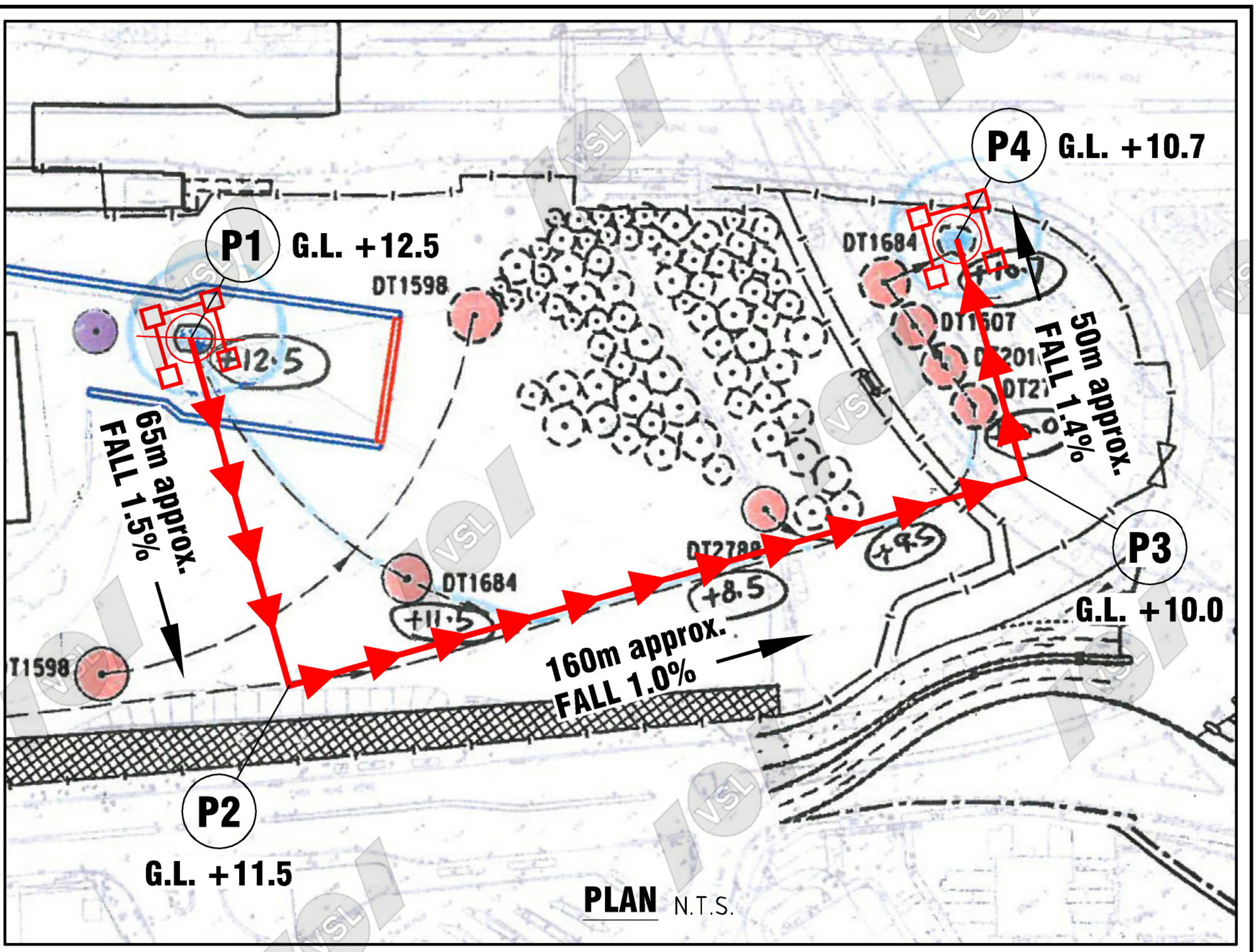
SCALE AS SHOWN (A1)
DRAWING NO. 1106/K/301/ACM/C01/005
REV. A

Appendix F

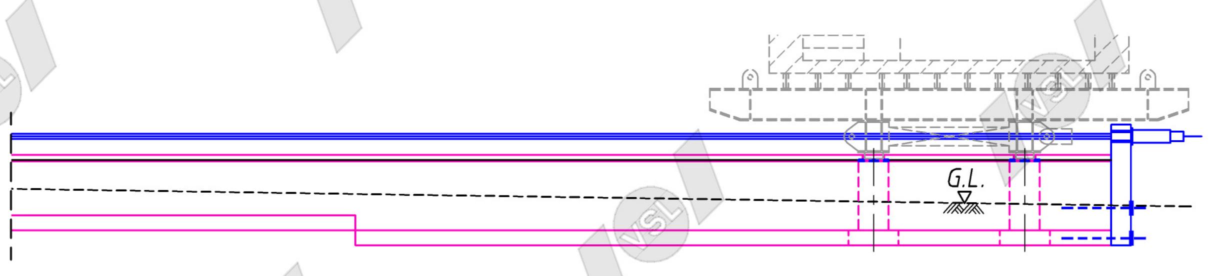
PROPOSED LIFTING AND TRANSPORTING METHOD FOR OLD PILLBOX PREPARED BY VSL HONG KONG LTD.

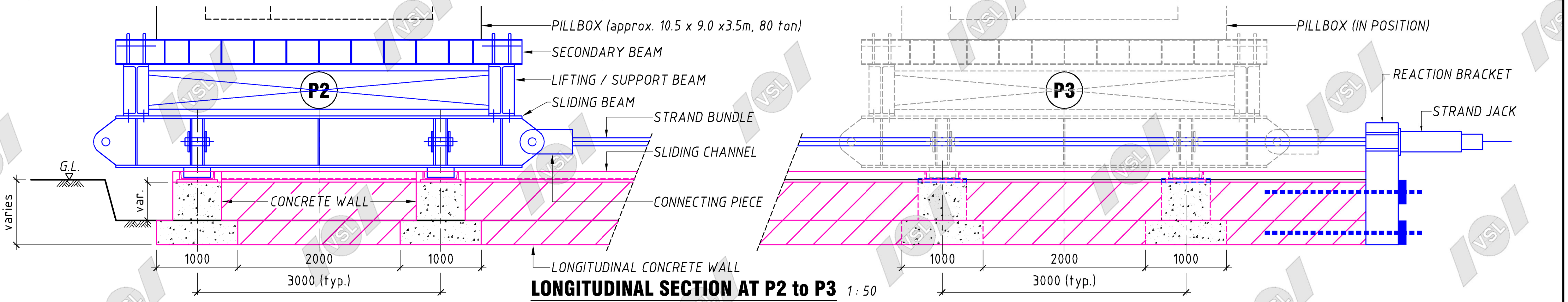
THE ORIGINAL SHEET SIZE OF THIS DWG. IS A3





PLAN N.T.S.





LONGITUDINAL SECTION AT P2 to P3 1 : 50

REV.	DATE	BY	APP	DESCRIPTION
△				
△				
△				
0	11/11/10	VSL	VSL	FIRST ISSUE

DRAWN VSL
DESIGN VSL
CHECKED VSL
APPROVED VSL
DATE 11/11/2010

VSL HONG KONG LIMITED

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PROJECT
CONTRACT 1106
DIH & DHS

TITLE
SHATIN TO CENTRAL LINK
PILLBOX RELOCATION

SCALE AS SHOWN
REVISION 0
PAGE 1/1
DRAWING NO. VSL / 1106 / 001
CAD FILE : GENERAL ARRANGEMENT (by:ken.cheung)

Appendix G

RESPONSES TO COMMENTS (REF. AMO’S E-MAIL DATED 16 NOV 2012 & AMO’S LETTER REF. ( ) IN LCSD/CS/AMO 81-5/21 PT.19 DATED 14 DECEMBER 2012)

SCL – C1103 Detailed Design for Diamond Hill Station
Further Structural Survey for the Old Pillbox
(AMO’s e-mail dated 16 November 2012)

Ref	**Comment**	**Response from MTR Corporation**
	Comment from AMO **(e-mail dated 16 November 2012)**	
	Part A – Preliminary Comments on Proposed Relocation of Pillbox	
1.	It is noted that piled foundation is used to support the temporary lifting platform. The pile pre-boring exercise shall not cause settlement to the pillbox structure.	Noted.
2.	Please clarify if the underground storage chamber (Drawing 1106/K/301/ACM/C01/005) is part of the pillbox construction and whether it would be retained as current lifting/relocation exercise failed to address this item in the temporary lifting platform.	The underground storage chamber is currently not intended to be retained based on available data.
3.	The estimated weight of the pillbox at 1160kN does not include the weight of soil, ring wall and temporary steelworks and these shall be allowed in the final lifting calculation.	The estimated weight given in Appendix E is only the self weight of the pillbox. The weight of the soil and the support systems will be allowed in the final lifting calculation which will be assessed by the Contractor.

Ref	Comment	Response from MTR Corporation
4.	The report Appendix XI clause 2.2.3 stated the core sample of the roof slab was not the standard requirement and the compression test of the core sample at 6.5 MPa is not conclusive to establish the concrete strength. Please confirm if further test be carried out to establish the concrete quality such that the roof is not too fragile to accommodate the relocation exercise.	The size of the core sample was reduced to 75mm to ensure as little damage as possible to the roof slab. Further tests can be carried out subject to AMO's agreement that destructive testing of the heritage structure is permitted.
5.	The report Appendix XI clause 3.2.3 also stated there is no evidence or trace of mortar between the concrete blocks in the load bearing walls. Care must be taken to minimize any vibration or lateral loads during the relocation exercise onto the pillbox structure.	Noted. The requirement to ensure the structure's stability during the relocation operation is stipulated in the Contract. Furthermore, the Contractor shall undertake an assessment and structural appraisal of the Old Pillbox structure after its relocation to ascertain the structural integrity and condition of the structure.
6.	The re-location exercise shall be studied further if there is sufficient space between the temporary storage location, final pillbox location and any new built structures on site to allow for the final relocation exercise. As the pillbox is not relocated to its final location, the consultant shall also be confident that the pillbox structure would not suffer further damage during another relocation.	Noted. As the final location for the Old Pillbox has yet to be identified, we are only able to prepare for the relocation operation to the temporary storage location. As stated in item 5 above, the Contractor shall undertake further assessment of the structure after its relocation to verify its integrity such that the subsequent relocation operation can address the mitigation measures required, if any.
7.	Please note that the concrete block work is much stronger than that shown on the test report as gross area was wrongly used in the calculation instead of the net area of the hollow block. However since the block sample was taken from site and justification shall be given as whether the sample block was truly the same block used for the pillbox construction.	As stipulated in the Contract, the Contractor shall undertake further tests to verify the condition of the Old Pillbox.

Ref	Comment	Response from MTR Corporation
8.	Please note that the above comments are not exhaustive and a more detailed study shall be carried out incorporating the comments in additional to the comments on drawings below.	Noted. See response to Item 7 above.
9.	Please delete the alternative scheme from the CMP as well as this structural survey as we understand that this scheme will not be further pursued.	The report has been revised as requested.
10.	Please include sequence schematics (diagram) for the removal of Pillbox and the dismantling of the Hangar.	These have been included in the CMP report.
11.	Drawing 1106/T/301/ACM/C21/501 1. The levelled temporary steel lifting platform shall acknowledge the inclined base of the entrance steps with adequate vertical and lateral support as the RC ring wall is not able to retain the soil beneath the steps.	The staircase is above the base of the lifting platform, however, should this not be the case, layout of the RC ring wall can be adjusted to suit the inclined base.
	2. Consideration shall be given to prevent soil escape into the side walls during the excavation of the tunnels beneath the pillbox.	Steel lagging plates or channels can be installed progressively to prevent soil escape into the excavation.
	3. It is suggested the soil above the temporary steel lifting platform be consolidated with grouts.	Grouting requires drilling horizontal holes for installation of grout tubes within the 500mm gap between the horizontal pipe piles and the Pillbox base, the drilling operation might disturb the structure. Moreover, the grout under pressure might enter into the pillbox causing potential damage to the structure. This is not recommended.
	4. Jacking of steel H sections shall be considered in lieu of pipe piles to improve the stiffness of the temporary lifting platform as the estimated deflection during the relocation is	Agreed that whilst steel H sections will improve the stiffness of the temporary platform, the jacking of the stiffer H sections will result in greater disturbance of the adjacent ground and

Ref	Comment	Response from MTR Corporation
	considered excessive.	could damage the pillbox structure. This is not recommended. However, we would suggest contiguous pipe piles to form the base of the platform to improve the stiffness if required.
	5. The 914 mm universal beams A to F shall be drawn in the true scale to reflect the right proportion.	Noted.
12.	Drawing 1106/T/301/ACM/C21/502 1. The 914 mm universal beams A to F shall be drawn in the true scale to reflect the right proportion.	Noted.
13.	Drawing 1106/T/301/ACM/C21/503 1. The ring wall shall be kept away from the pillbox structure as welding of steel plate for the construction of RC ring wall will disturb soil around pillbox base and thereby causing settlement at edge of the structure (Section 3 refers).	The RC ring wall can be set back to give a 500mm clearance from the pillbox base edges so that a 45 degree slope with height of 500mm can be maintained in front of the pillbox to minimise disturbance to the soil around it.
	2. Consideration shall be given to prevent soil escape between pipe piles prior to welding of steel plates (View A refers).	Considering that the 219mm dia. horizontal pipe piles are closely spaced at 500mm c/c so that the gap is around 281mm, soil escape should be minimal. More stringent control can be achieved by carrying out the excavation of the subsequent welding of steel plates bay-by-bay such that exposed bare soil face can be further reduced.

Ref	Comment	Response from MTR Corporation
14.	Drawing 1106/T/301/ACM/C21/504 1. It is recommended the pillbox structure shall be propped and adequately supported laterally prior to the installation of the temporary steel lifting platform. 2. Timber packing shall be placed to prevent direct contact between steelworks and the pillbox structure. 3. Load from the steel post shall be spread at the base to prevent excessive load onto the existing slab. 4. Lateral loop in steel rods shall be considered to wrap round the roof dome to prevent cracking of the roof due to lateral movement. 5. The drawing title shows permanent strengthening details. Please clarify if the details are only temporary to facilitate the relocation and all strengthening work will be removed once in the final position.	Additional notes have been added to drawing C21/504 to address comments 1 to 4. The strengthening works are proposed to be permanent to ensure structural stability of the structure after its relocation.
15.	Drawing 1106/T/301/ACM/C21/505 1. Scheme would not be commented as this lifting of roof option is withdrawn.	This drawing has been deleted.

SCL – C1103 Detailed Design for Diamond Hill Station
Further Structural Survey for the Old Pillbox
(AMO's letter ref. ( ) in LCSD/CS/AMO 81-5/21 Pt.19 dated 14 December 2012))

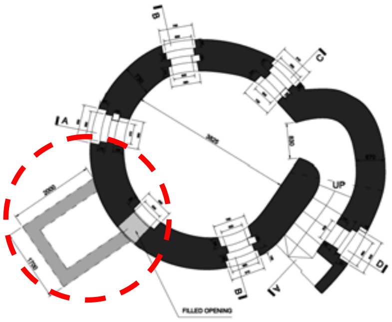
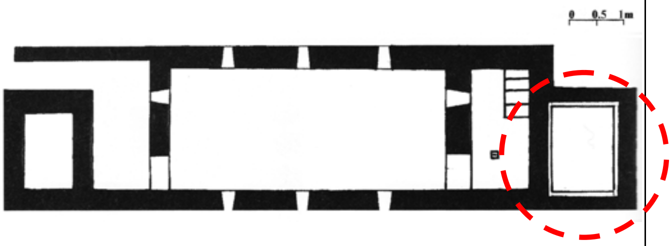
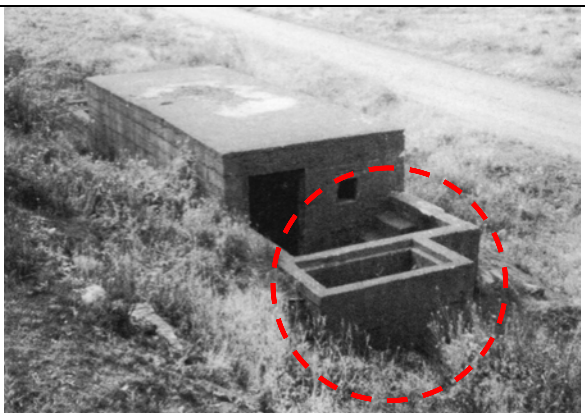
AMO's Comments on Further Structural Survey for the Old Pillbox	Response from MTR Corporation
AMO's letter ref. ( ) in LCSD/CS/AMO 81-5/21 Pt.19 dated 14 December 2012	
General comments	
It is noted in Section 5.2.4 that there are still uncertainties in the structural information of the Pillbox. Please clarify what further investigation would be carried out. Please confirm if the proposed underpinning scheme, lifting up and transportation method is feasible.	Regarding underground condition, the Contractor should carry out pre-drilling for pre-bored H-piles and other additional vertical and horizontal boreholes where considered necessary to verify the ground condition prior to the relocation works. Moreover, the pile installation method adopted by the Contractor should be capable of drilling through underground obstruction.
Detailed comments	
1. In Section 3.2.2, Compression test results of blocks (commented previously) shall be revised.	The test results carried out by the testing contractor GCE were based on gross area to give an indication of the strength of the in-situ blocks. The strength with net area as commented will give a higher strength. The strength of masonry wall depends heavily on the interaction with mortar and not just the masonry block alone. These test results are for indication only and as stipulated in the Contract, the Contractor shall undertake further tests to verify the condition of the Old Pillbox.

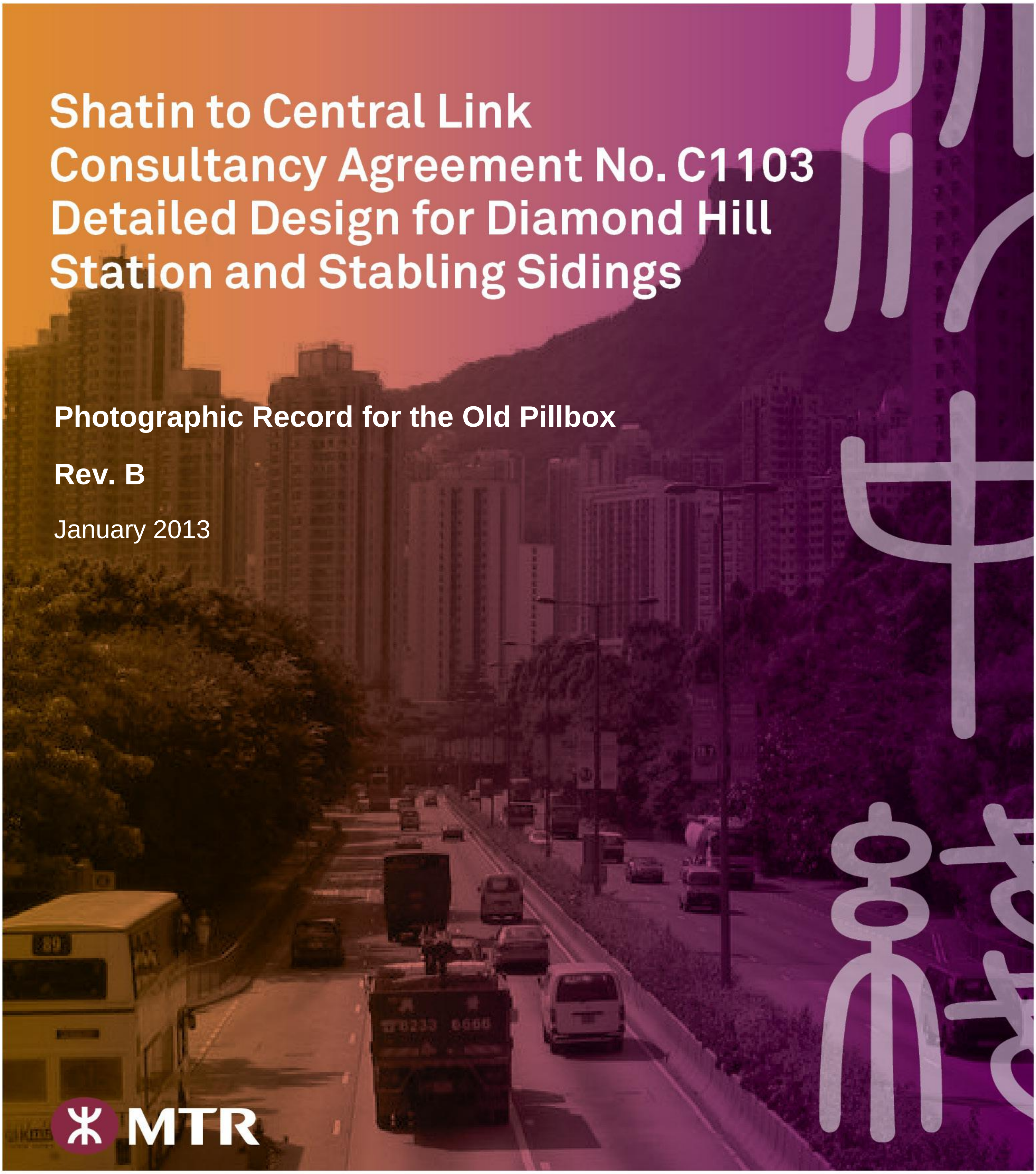
AMO's Comments on Further Structural Survey for the Old Pillbox	Response from MTR Corporation
2. As mentioned in Section 5.3.1, a separate study has been undertaken by VSL Hong Kong Ltd., please provide more information of this company such as specialization, job reference etc.	VSL was consulted by the C1103 Diamond Hill Station detailed design consultant to appraise the feasibility of lifting the entire Old Pillbox for relocation. We would advise that the construction contract 1106 for the construction of the Diamond Hill Station has been awarded in December 2012. The Contractor is required to engage suitably qualified party to undertake the relocation works, details of the proposed company and job reference will be submitted by the Contractor in due course.
3. In Section 6.1.7, a heavy weight lifting specialist sub-contractor is mentioned. Please clarify what a heavy weight lifting specialist contractor is and if there is any job reference or other information of the sub-contractor.	Please see responses to item 2 above.
4. Our further comments to Appendix G, Responses to comments are as follow:-	
➢ For Item 2, justification shall be given as to why the underground chamber is less significant in heritage value or whether it was not part of the pillbox.	The underground chamber is not considered as a part of the pillbox because: 1 According to site inspection of the Old Pillbox, there is no physical connection between the chamber and the interior of the Old Pillbox. 2. No sign of military purpose regarding this kind of covered underground chamber could be identified. According to general typological study of pillboxes, no such structure was found, except, there is one pillbox in Britain with structure form similar to that of the Diamond Hill pillbox. However, they differed from

AMO's Comments on Further Structural Survey for the Old Pillbox	Response from MTR Corporation
	their location, size and appearance. Please see the attached document showing the comparison of both pillboxes.
➢ For Item 11, sub-item 2, no matter how minimal is the soil escape, there must be soil loss. If contiguous pipe piles are proposed, there would not be such concern.	Drawings 1106/W/301/ACM/C21/501A, 502A and 503A are revised to show contiguous pipe piles accordingly.
➢ For Item 11, sub-item 3 & 4, in view of the excavation method will result soil loss between the pipe piles prior to welding of steel plates, grouting is necessary to fill up the void left and does not allow soil readjusting itself during the re-location. We would accept contiguous pipe piles hopefully with greater diameter to improve stiffness while at the same time avoid the need of plate welding between the pipes and thus alleviate soil loss between the pipes.	Drawings 1106/W/301/ACM/C21/501A, 502A and 503A are revised to show contiguous pipe piles such that the stiffness is doubled and soil loss between pipes is alleviated.
5. It is inexplicable that the responses to our previous comments were not incorporated into the report and the design.	The comments are addressed in the report Rev B.

According to general typological study of pillboxes, no such structure was found, except, there is one pillbox in Britain with structure looked similar to that of Diamond Hill pillbox. However, they differ from their location, size and appearance.

Table below: Comparison of the Diamond Hill pillbox and one of the pillboxes in Britain.

	Diamond Hill Pillbox	**British Pillbox**
Location		
	The structure is away from entry	The structure is next to entry
Appearance		
	(Covered) underground chamber	(Open) pit
Size	Approx. 2m x 1.7m *(size estimation refers to p.9, Condition Survey for the Existing Stone House and Pillbox at DIH, Feb 2009)*	Approx. 2.5m x 2m
Function	Unidentified	For mounting small mortars



Shatin to Central Link
Consultancy Agreement No. C1103
Detailed Design for Diamond Hill Station and Stabling Sidings

Photographic Record for the Old Pillbox

Rev. B

January 2013

MTR Corporation Limited

Shatin to Central Link

Consultancy Agreement No. C1103

Detailed Design for Diamond Hill Station and Stabling Sidings

Photographic Record for the Old Pillbox

Rev. B

January 2013

Date	Rev.	Prepared		Checked		Approved	
29 Nov 2012	0	PC		HLHK		IMW	
24 Dec 2012	A	PC		HLHK		IMW	
30 Jan 2013	A	PC		HLHK		IMW	

ePMS Transmittal No.: C1103-COR-ACM-SUR-000004A
File: 60146520 / 15.9.21

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Appendix

Photographic Record for the Old Pillbox

December 2012

Prepared for

MTR Corporation Limited

Preparded by

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13/F., Tower 2, Grand Central Plaza, 123 Shatin Rural Committee Road,
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Supported by

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Kwai Chung, New Territories, Hong Kong SAR
T 2127 4503   F 307 9037   www.project-see.net

Contents

List of Appendices

1. Introduction

1.1. SEE Network Limited (hereafter SEE) was commissioned by AECOM to carry out a photographic survey of the historic-grade Old Pillbox located within the construction area of the Shatin to Central Link.

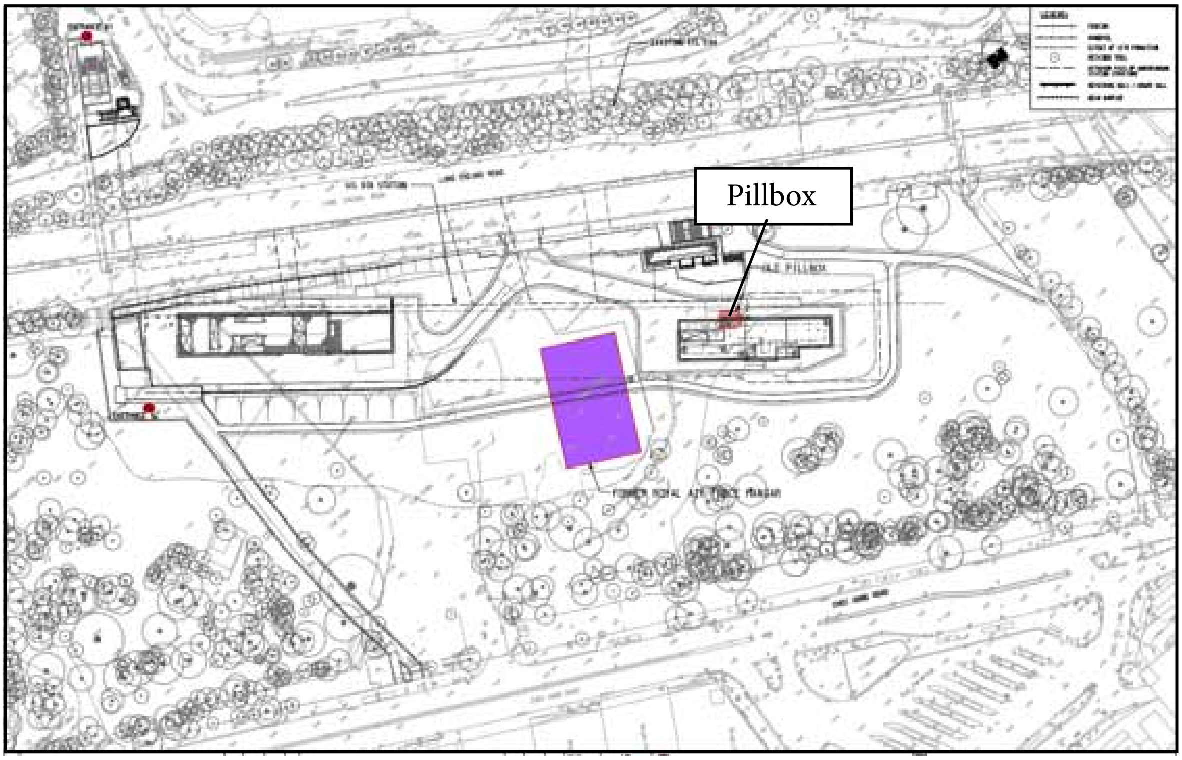
1.2. The survey conforms to a specification making reference to *Understanding Historic Buildings: A guide to good recording practice.*

1.3. This photographic documentary archive will be submitted to the Antiquities and Monuments Office for long-term storage.

2. Site location and description

2.1. The pillbox is located at a vacant site in Diamond Hill. The site comprises approximately 7.2 hectares of land bounded by four vehicular roads: the Kwun Tong by-pass to the east, Choi Hung Road to the south, Po Kong Village Road to the west and Lung Cheung Road to the north.

2.2. The pillbox lies to the eastern side of the vacant site.



3. Methodology

3.1. The building survey was undertaken by Leung Chi Fai on 24-25 February, 28 February and 1 and 3 March 2011, using a Canon 1Ds camera with a 16-35mm lens.

3.2. Photographs were taken of the following: -

- All external elevations
- All external elevations
- The roof structure of the pillbox, internally and externally
- Architectural details, i.e. the embrasure, the signage, loop-holed blast wall
- A general internal photographic record of the building. Shots were taken of each side from sufficient points to show the form, general appearance and methods of construction.

3.3. Limitations:

- No direct overhead view has been taken to show the irregular dome-shape of the pillbox, due to difficulties in accessing above the pillbox.
- Full overview of the ceiling is not available because the low ceiling height limits the view angle.

4. Acknowledgement

4.1. SEE Network would like to thanks AECOM for this commission.

Photo # 1

View of pillbox roof.

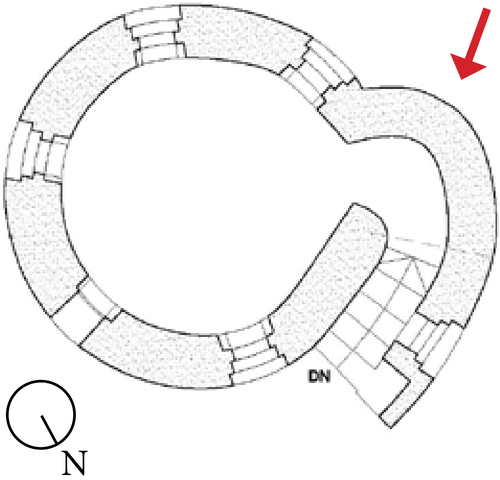


Photo # 2

View of pillbox roof.

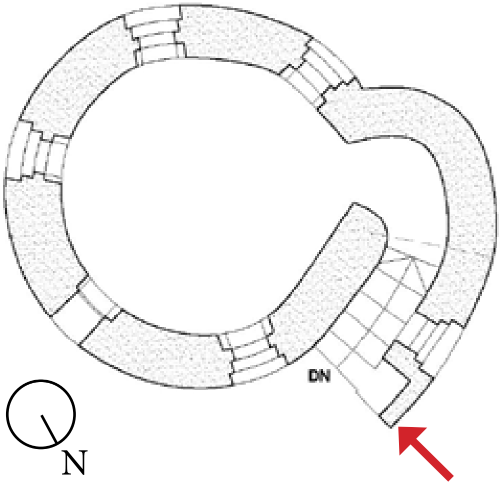


Photo # 3

Elevated view of pillbox entrance.

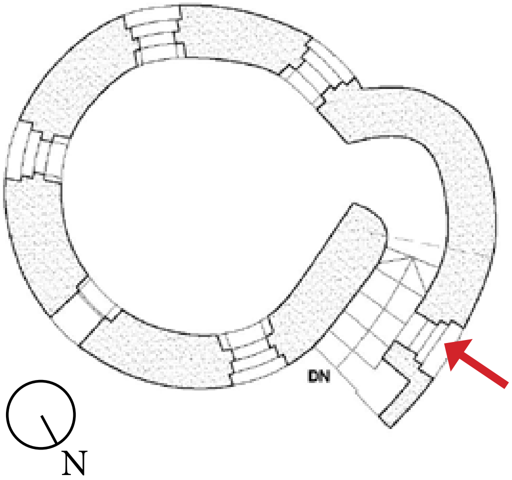
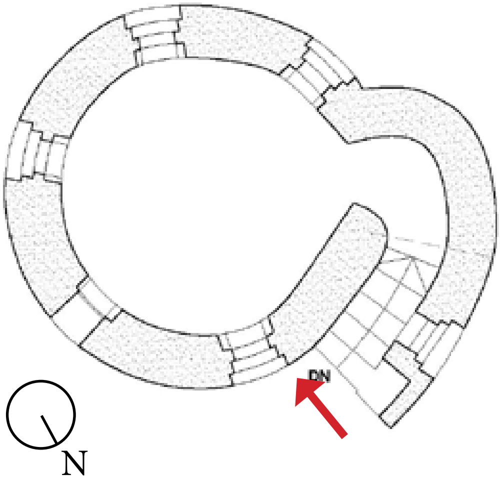


Photo # 4

Elevated view of pillbox.



View from exterior

Photo # 5

Elevation of the pillbox.

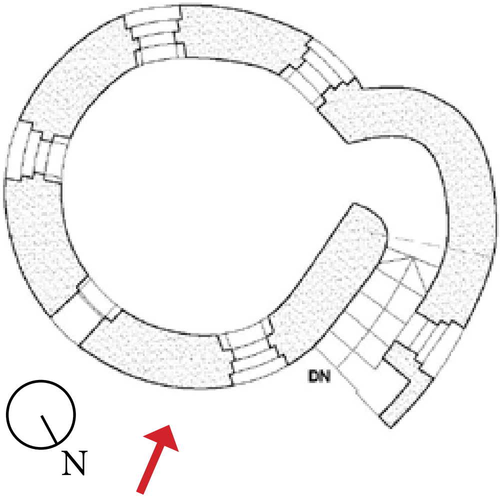


Photo # 6

Elevation of the pillbox. An above ground embrasure is seen.

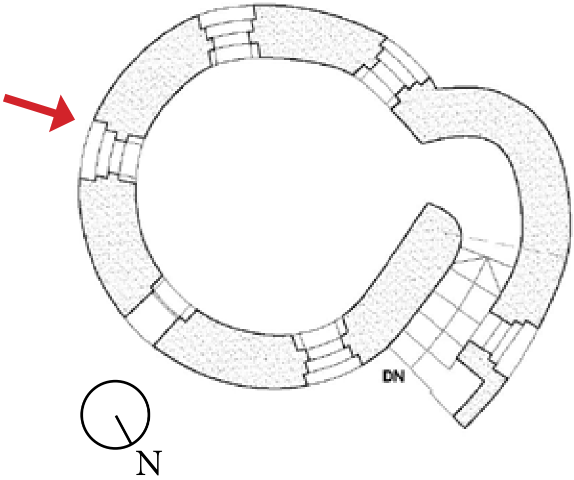


Photo # 7

Elevation of the pillbox.

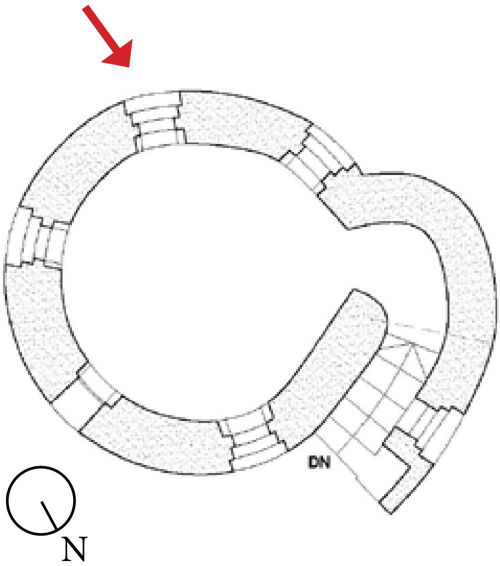


Photo # 8

Elevation of the pillbox.

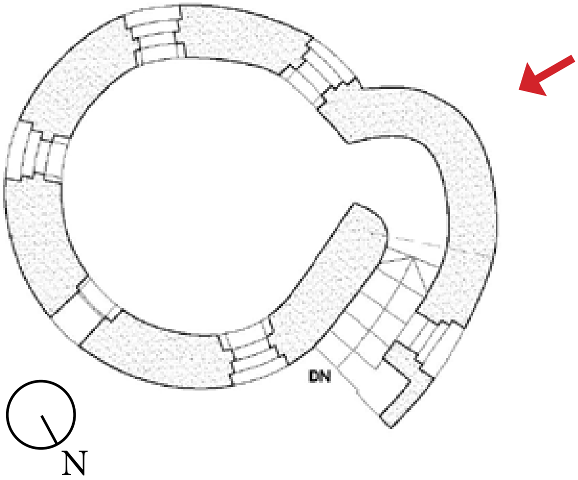


Photo # 9

Elevation of the pillbox.

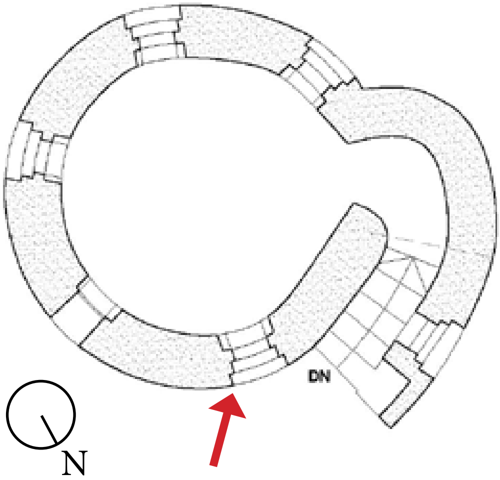


Photo # 10

View of the entrance. A spiral staircase leads to the semi-underground pillbox.

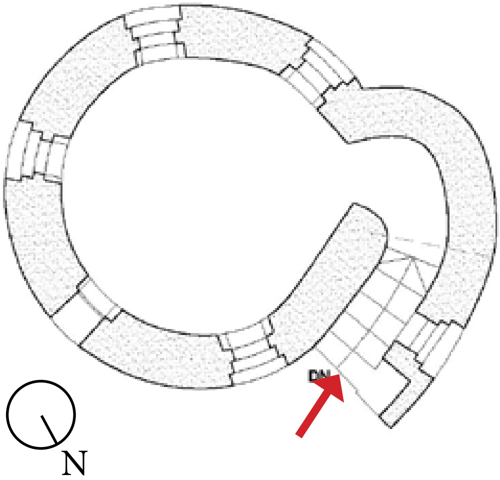


Photo # 11

View of the entrance.

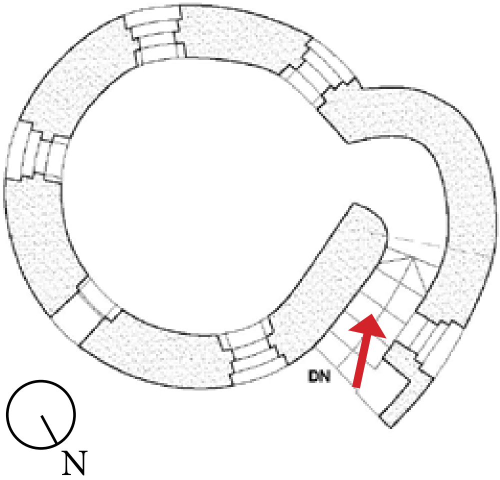
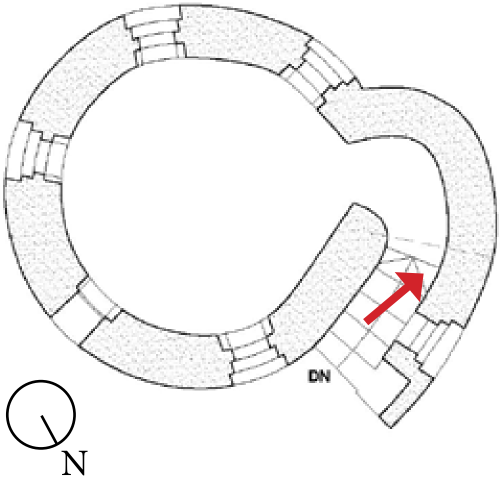


Photo # 12

View of the loopholed blast wall with narrow mounting.



View from Interior

Photo # 13

An inside view of the entrance.

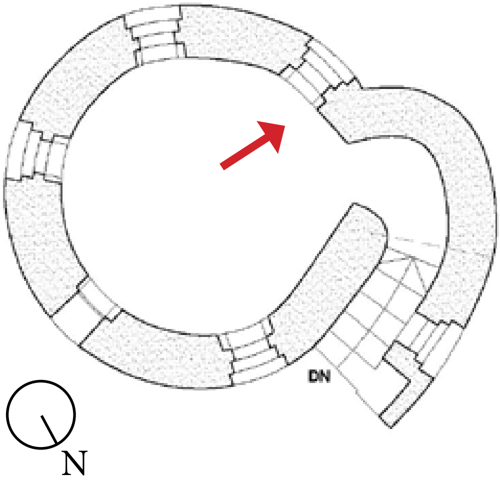


Photo # 14

View of the embrasure.

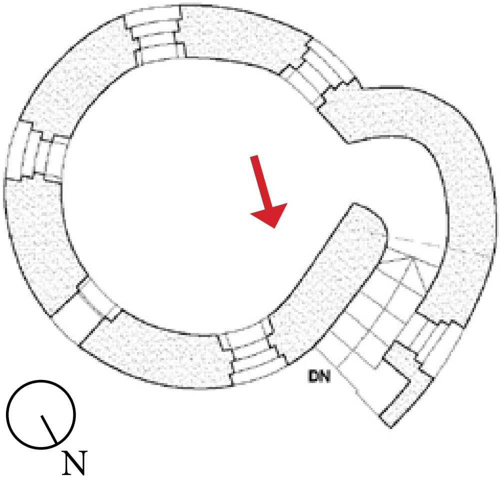


Photo # 15

View of the embrasure.

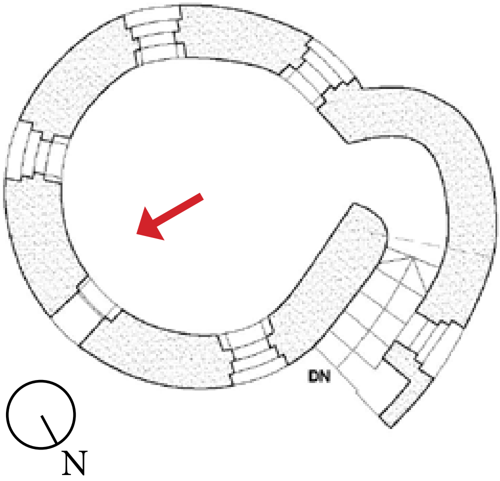


Photo # 16

View of the embrasure.

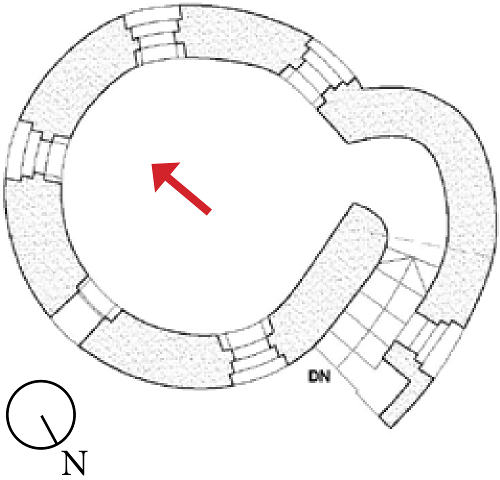


Photo # 17

View of the embrasure.

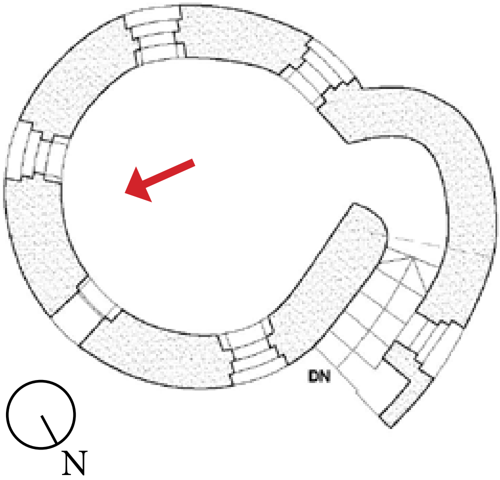


Photo # 18

View of the embrasure.

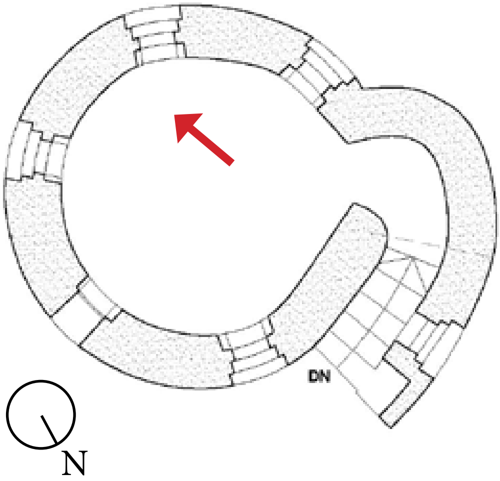


Photo # 19

The floor of the pillbox.

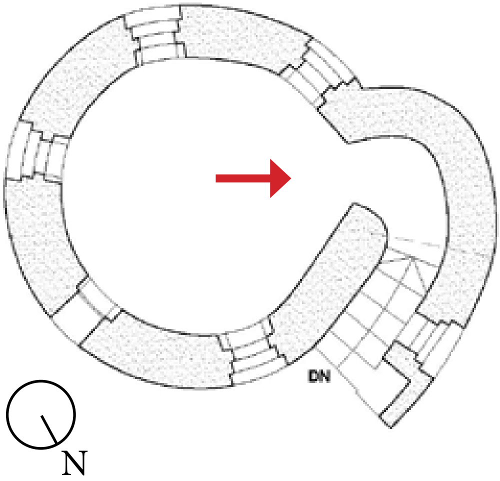


Photo # 20

The floor of the pillbox.

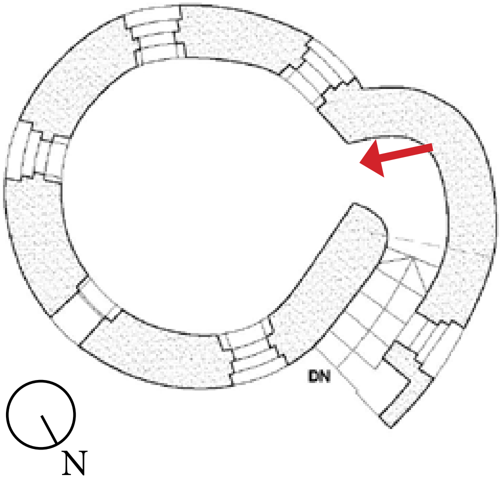


Photo # 21

The ceiling of the pillbox. Exposed steel bars can be seen.

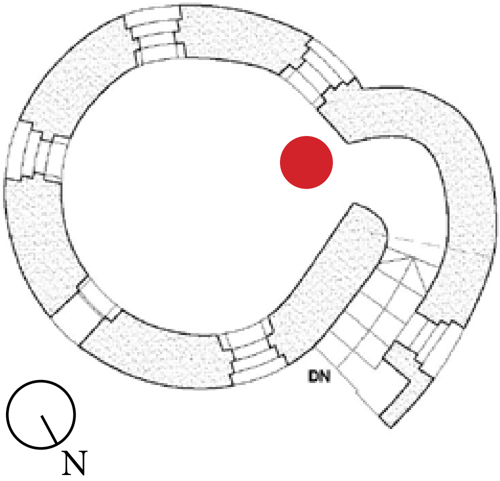


Photo # 22

The ceiling at the pillbox entrance.

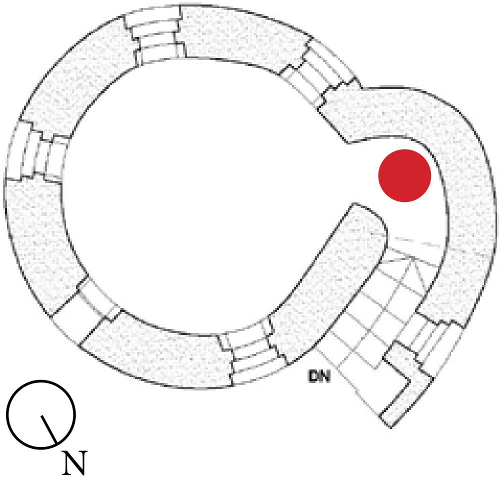


Photo # 23

An inside-looking out view of the entrance.

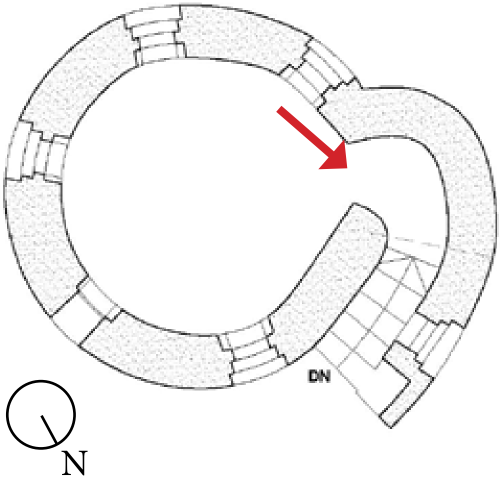
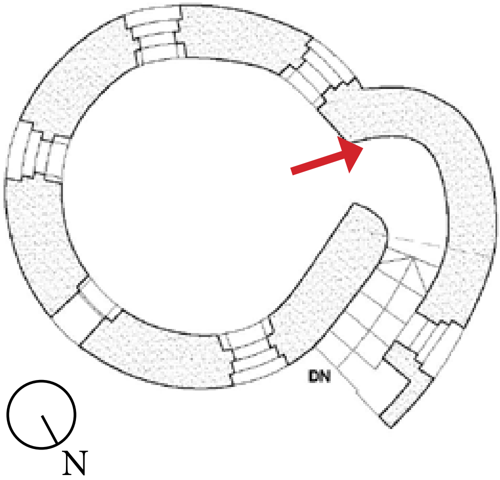


Photo # 24

View of the blast wall.



Close-up Details

Photo # 25

The embrasure - detail.

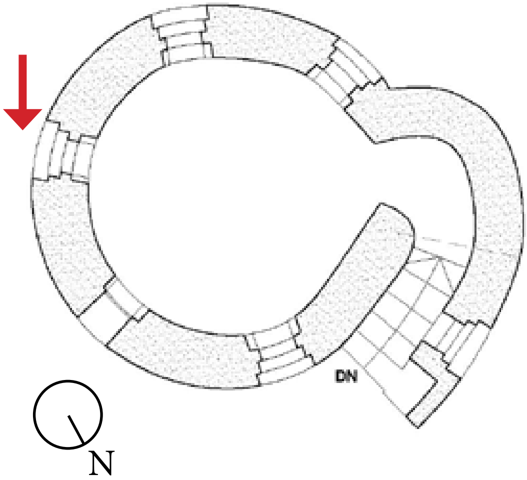


Photo # 26

The embrasure -detail.

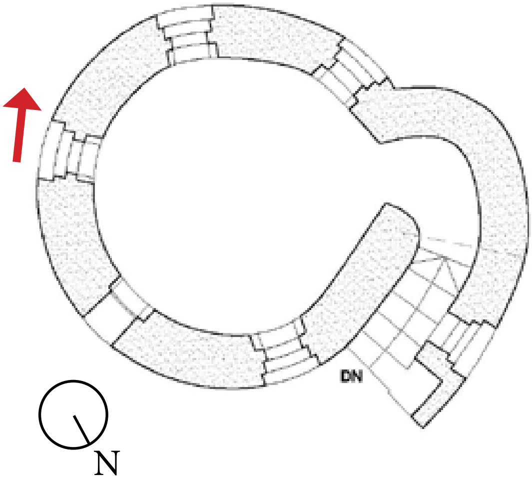


Photo # 27

The splayed embrasure -detail.

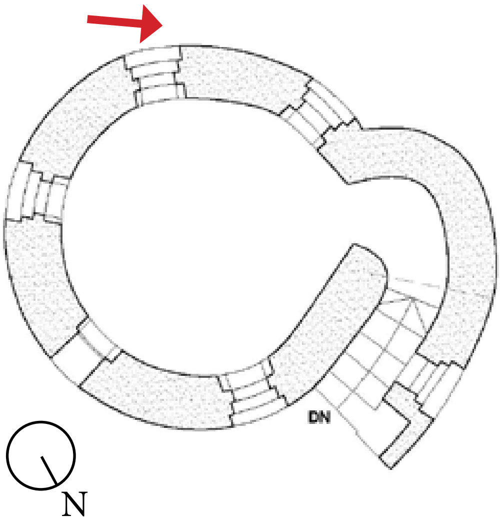
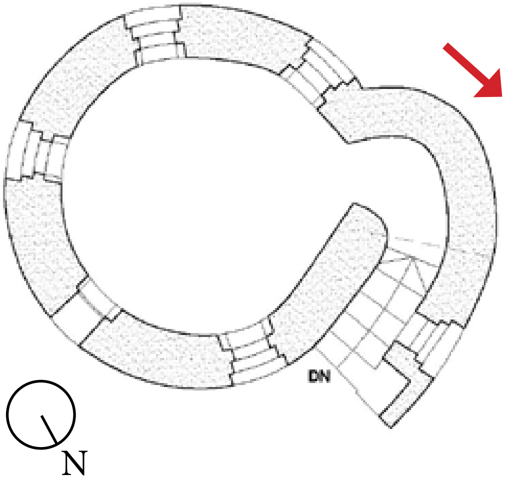


Photo # 28

A sign, “Ha Yuen Ling Fire Brigade no. 6”, attached on the external wall.



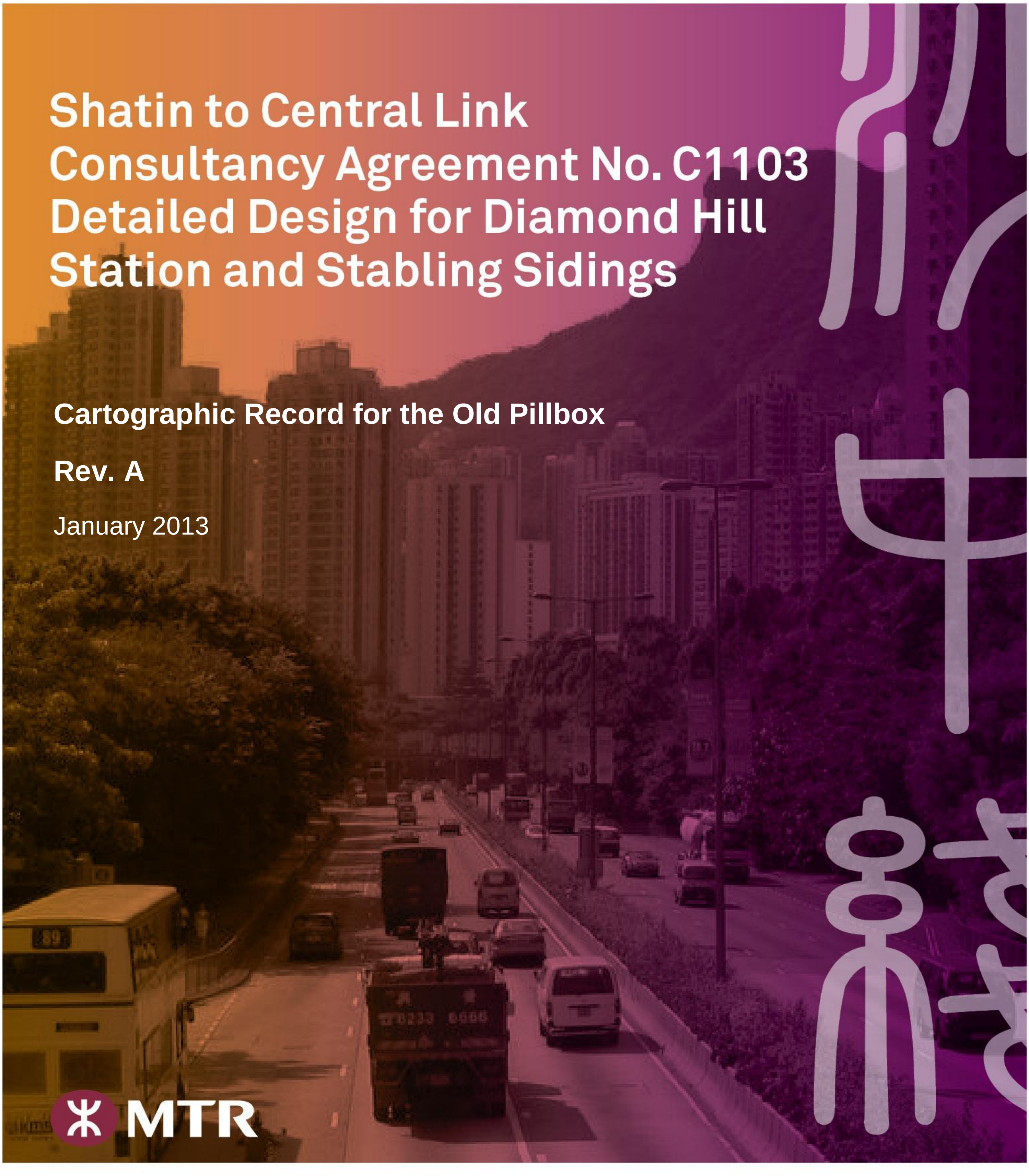
Appendix A

Responses to Comments

SCL – C1103 Detailed Design for Diamond Hill Station
Photographic Record for the Old Pillbox
(AMO's letter ref. ( ) in LCSD/CS/AMO 81-5/21 dated 17 January 2013)

AMO's Comments on Photographic Record for the Old Pillbox	Response from MTR Corporation
AMO's letter ref. ( ) in LCSD/CS/AMO 81-5/21 dated 17 January 2013	
Thank you for your letter dated 27.12.2012. Please note our comments as follow:- For the Old Pillbox	
1. Good quality photos in printed & jpeg form. However it would be even better if files of larger resolution are submitted.	The resolution of the photos will become larger when opened in "Photoshop", which should generally good enough for viewing and printing in reasonable size. Moreover, the issue is being dealt with separately and separate submission of soft copy photos will be made if deem necessary.
2. The entrance roof (photo 2) is greatly distorted. Please submit a replacement photo taken at a higher level when available.	All photos were taken via standard camera lens as stated in Section 3.1 of the report. Photo no. 2 was taken at a front view of the Pillbox with an appropriate manner and reasonable skill. Distance factor should be taken into account for interpretation of the photo.
3. Please check if statements in Section 3.3 have been repeated. Please also explain the reason for no provision of photo for the overview of the ceiling of the Pillbox in Section 3.3.	Noted. The repeated statement due to typo was deleted. For interior, full overview of the ceiling is not available because of the low ceiling height that limits the view angle. The best practicable photos have been provided in Photo nos. 21 and 22. Such limitations are also stated in Section 3.3 of the report.

AECOM



Shatin to Central Link
Consultancy Agreement No. C1103
Detailed Design for Diamond Hill Station and Stabling Sidings

Cartographic Record for the Old Pillbox

Rev. A

January 2013

MTR

MTR Corporation Limited

Shatin to Central Link

Consultancy Agreement No. C1103

Detailed Design for Diamond Hill Station and Stabling Sidings

Cartographic Record for the Old Pillbox

Rev. A

January 2013

Date	Rev.	Prepared		Checked		Approved	
Nov 2012	0	PC		HLHK		IMW	
Jan 2013	A	PC	pp	HLHK		IMW	

ePMS Transmittal No.: C1103-COR-ACM-SUR-000007
File: 60146520 / 17.A3.0J3

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Drawings

Appendix

1. INTRODUCTION

1.1 The EIA study for Tai Wai to Hung Hom Section recommended that the Old Pillbox to be affected by the construction of the DIH would be relocated. Cartographic record would be required to document the Old Pillbox prior to its relocation.

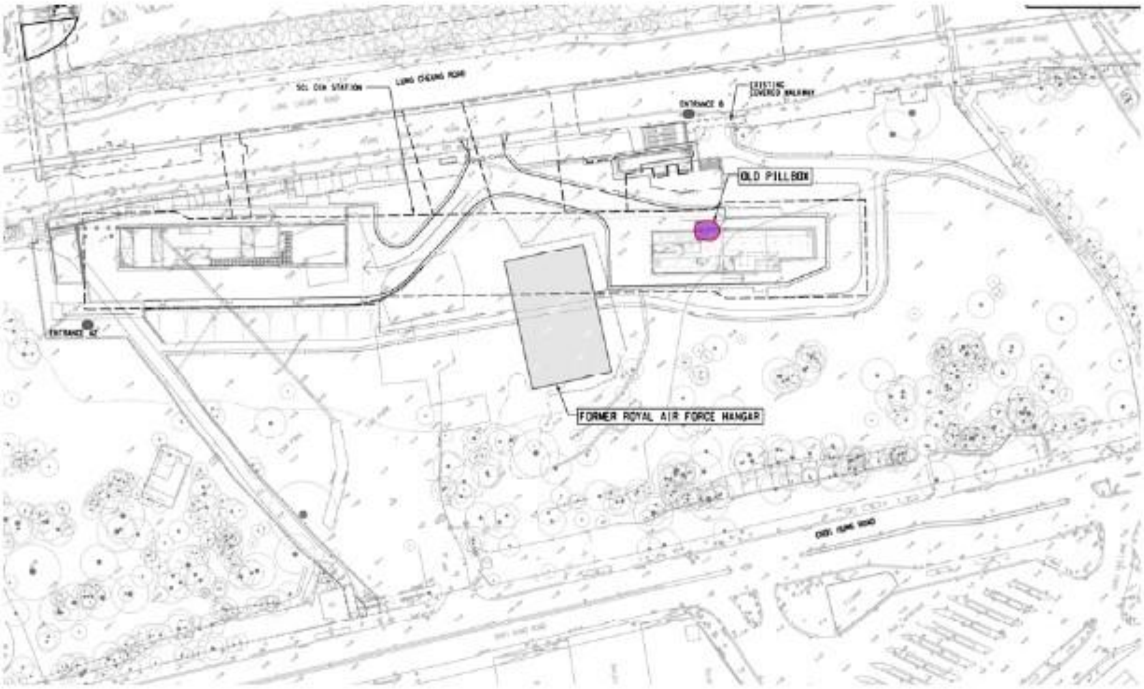
1.2 This Record is to present the drawn to scale of the existing Old Pillbox on site. The documentation can help recreate the referential information that can show the possible original form, both visually and physically, of the historical structure for future relocation and reinstatement purposes.

1.3 This Record will be submitted to the Antiquities and Monuments Office for documentary archive.

2. SITE LOCATION AND DESCRIPTION

2.1 The Old Pillbox is presently located at a vacant site in Diamond Hill. The site comprises approximately 7.2 hectares of land bounded by four vehicular roads: the Kwun Tong by-pass to the east, Choi Hung Road to the south, Po Kong Village Road to the west and Lung Cheung Road to the north.

2.2 The pink hatched area indicated in the map shown below is the location of the Old Pillbox.



3. METHODOLOGY

3.1 The cartographic record will involve direct measurement, sketch and surveying. A team of 6-8 would carry out fieldwork to take measurement and record all dimensions of major architectural features of the structure by using simple measuring devices like measuring tape and sonic meter. The team would avoid climbing up high level for measurements. Instead, electronic theodolite or alternative instruments would be used to determine the heights and elevations the structure.

3.2 This exercise would be completed in accordance with normal good practice using the following procedure and work sequence. The safety guidelines for future inspection and surveys prepared by David Blair of Envex (HK) Ltd. would then be followed:

- Make sketches of layouts, elevations and sections;
- Measure the structure by simple measuring devices;
- Take visual examination of building materials used for the structure;
- Use electronic theodolite or alternative instruments to determine the elevations of the structure;
- Take photographic record as cross reference and visual archive;
- Verify all dimensions and check for discrepancies between each measurement;
- Visit site again if discrepancies found;
- Represent the record of the structure by orthographic drawings.

Drawings

DWG. NO.	DWG. TITLE	REVISION									
	d/m	28/11	9/1	/							
PL-00	DRAWING LIST	/	/								
PLANS											
PL-01	FLOOR PLAN & ROOF PLAN	/	/								
ELEVATIONS											
EL-01	SOUTH ELEVATION & EAST ELEVATION	/	/								
EL-02	NORTH ELEVATION & WEST ELEVATION	/	/								
SECTION											
SE-01	SECTION A & SECTION D	/									
SE-02	SECTION B & SECTION C	/									

	DESIGNATION	INITIAL	DATE
AUTHORIZED			
CHECKED			
DRAWN			

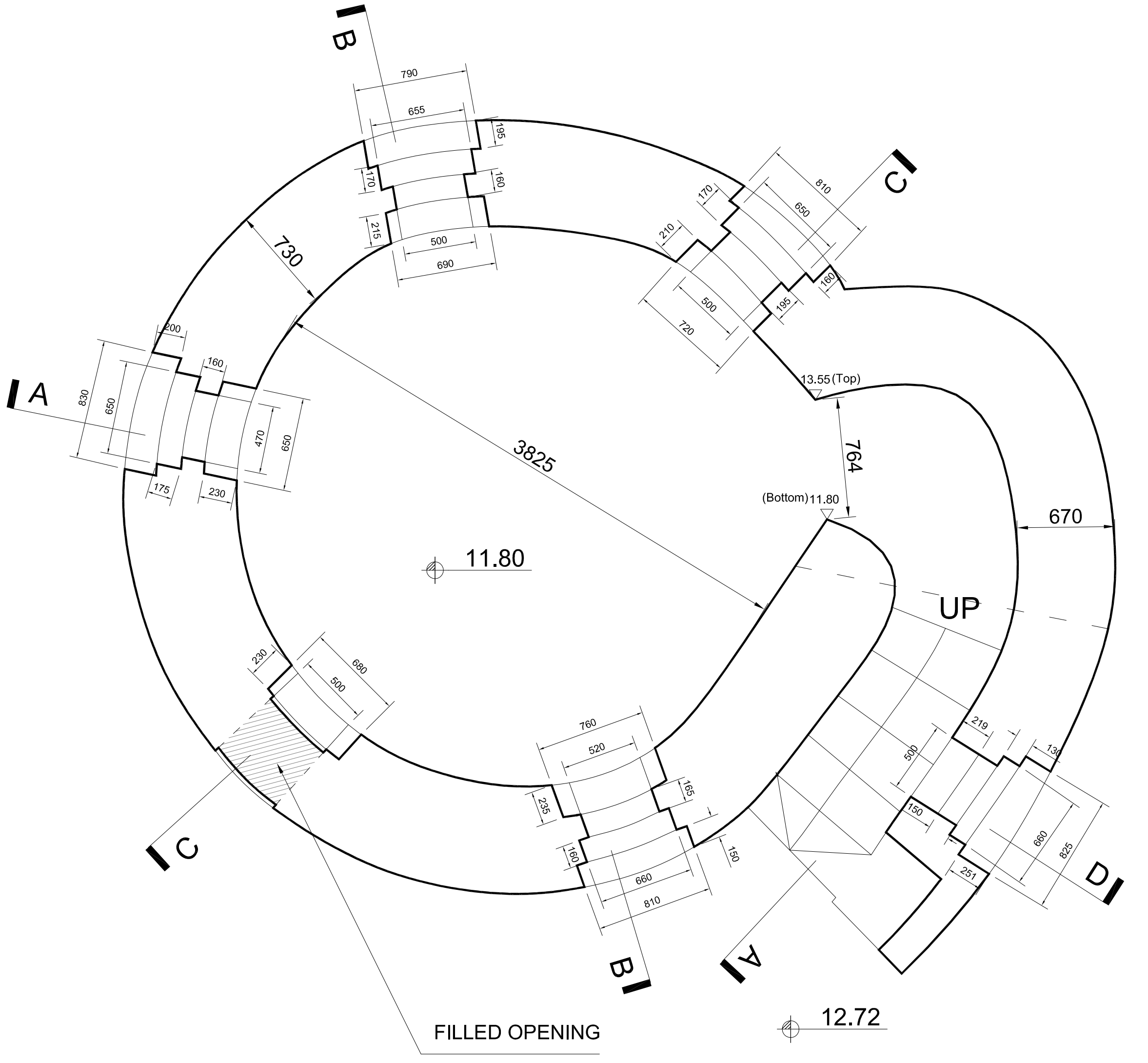
PROJECT
HERITAGE CONSULTANCY
PILLBOX AT DIAMOND HILL

DRAWING TITLE
DRAWING LIST

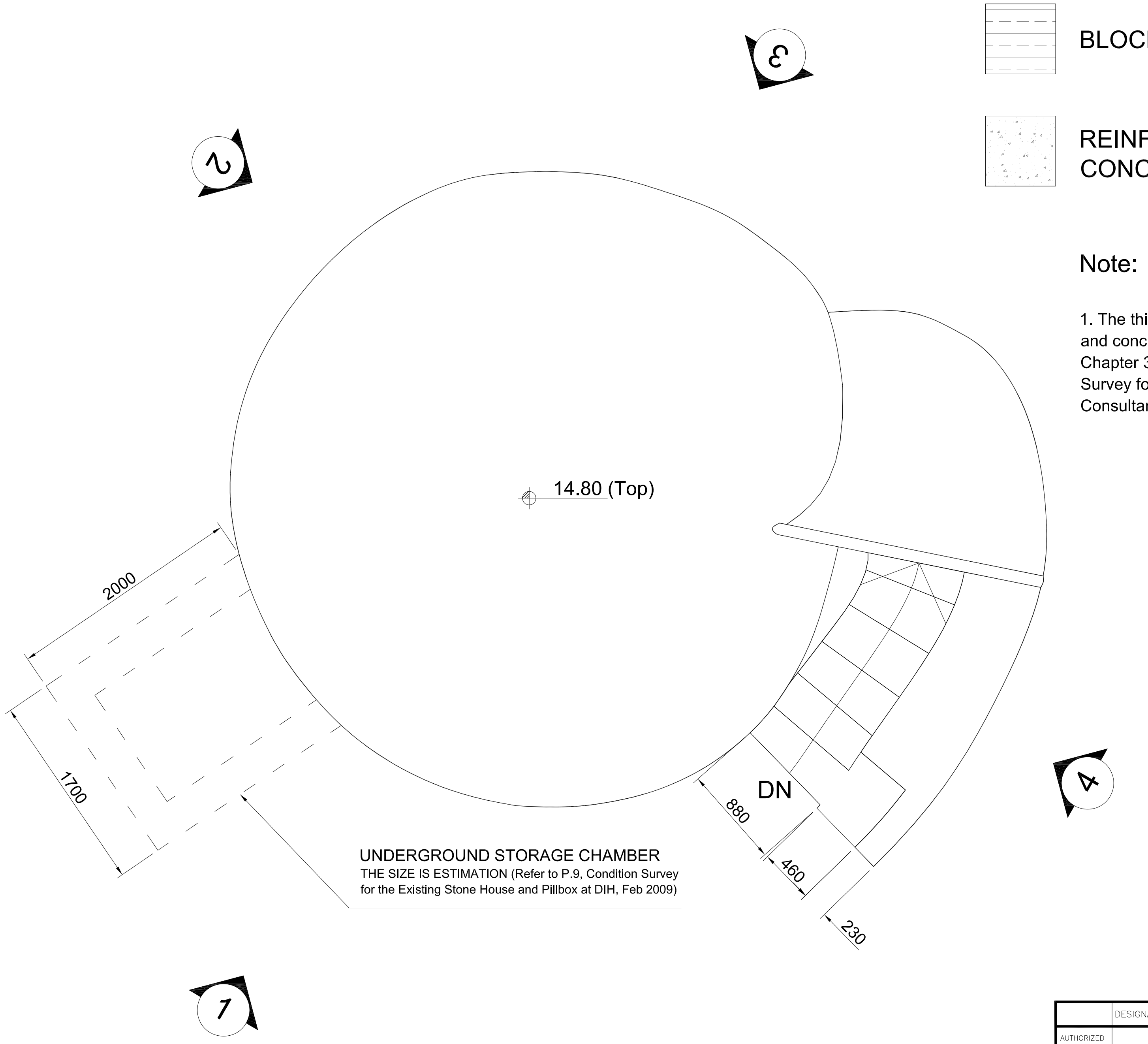
SCALE -

DRAWING NO
PILLBOX-PL-00

SOURCE -



FLOOR PLAN



ROOF PLAN

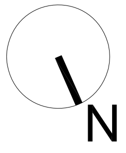
▤ BLOCKWORK

▨ REINFORCED CONCRETE

Note:

1. The thickness of block wall and concrete slab refer to Chapter 3 of <Further Structural Survey for the Old Pillbox, Consultancy Agreement C1103>

FLOOR PLAN AND ROOF PLAN
PILLBOX
DIAMOND HILL



	DESIGNATION	INITIAL	DATE
AUTHORIZED			
CHECKED			
DRAWN			

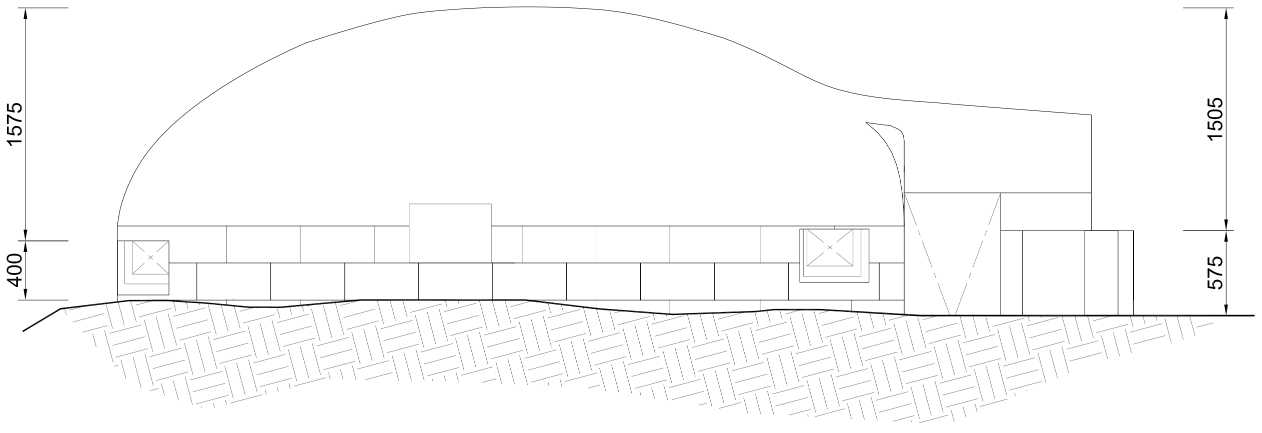
PROJECT
HERITAGE CONSULTANCY
PILLBOX AT DIAMOND HILL

DRAWING TITLE
FLOOR PLAN & ROOF PLAN

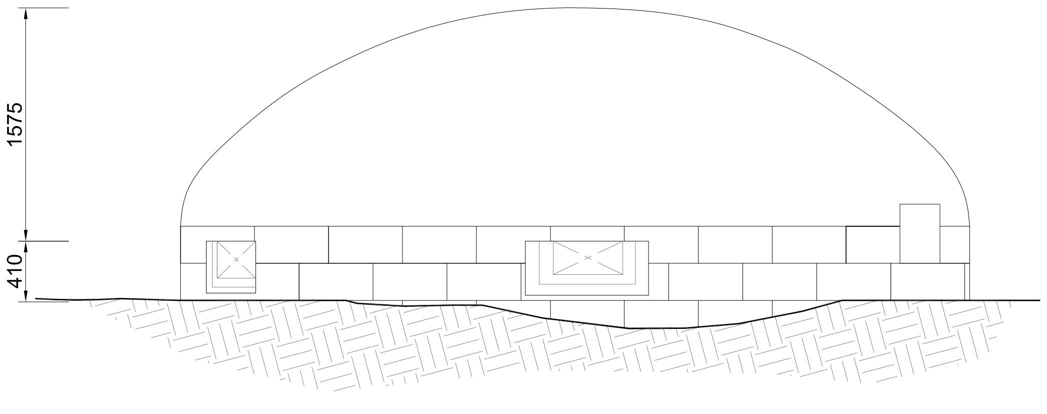
SCALE **1 : 50 (A3)**

DRAWING NO
PILLBOX-PL-01

SOURCE
-



EAST ELEVATION
(VIEW 1, PILLBOX-PL-01)



SOUTH ELEVATION
(VIEW 2, PILLBOX-PL-01)

ELEVATIONS
PILLBOX
DIAMOND HILL

	DESIGNATION	INITIAL	DATE
AUTHORIZED			
CHECKED			
DRAWN			

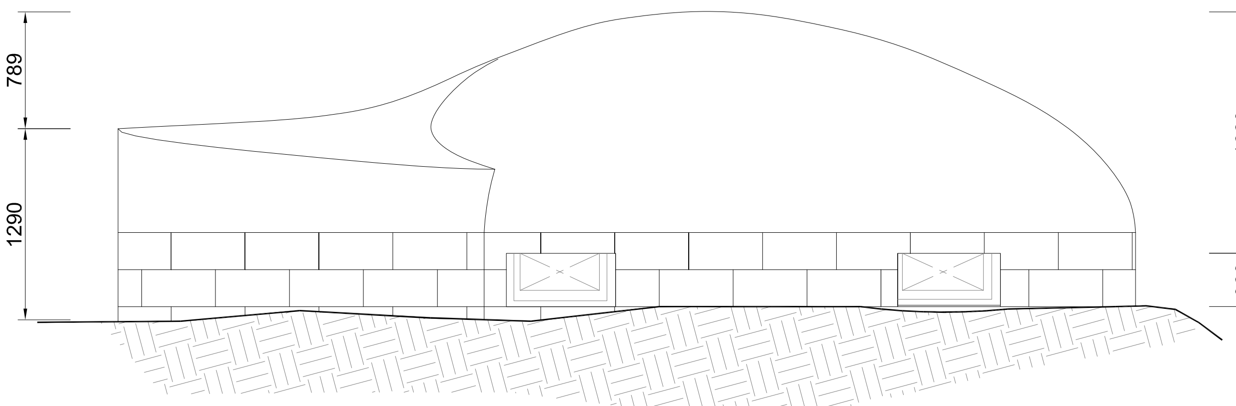
PROJECT
HERITAGE CONSULTANCY
PILLBOX AT DIAMOND HILL

DRAWING TITLE
SOUTH ELEVATION
& EAST ELEVATION

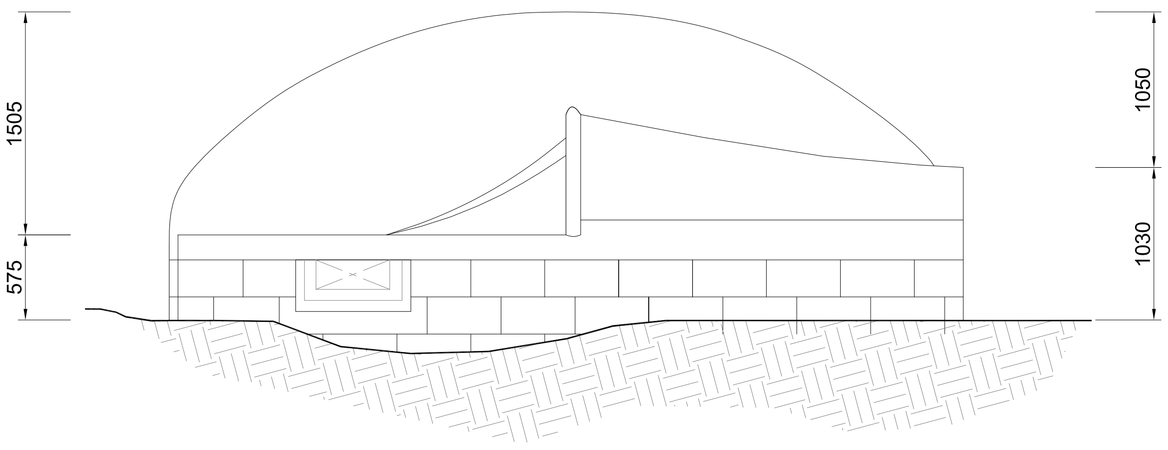
SCALE **1 : 50 (A3)**

DRAWING NO
PILLBOX-EL-01

SOURCE -



WEST ELEVATION
(VIEW 3, PILLBOX-PL-01)



NORTH ELEVATION
(VIEW 4, PILLBOX-PL-01)

ELEVATIONS
PILLBOX
DIAMOND HILL

	DESIGNATION	INITIAL	DATE
AUTHORIZED			
CHECKED			
DRAWN			

PROJECT
HERITAGE CONSULTANCY
PILLBOX AT DIAMOND HILL

DRAWING TITLE
NORTH ELEVATION
& WEST ELEVATION

SCALE **1 : 50 (A3)**

DRAWING NO
PILLBOX-EL-02

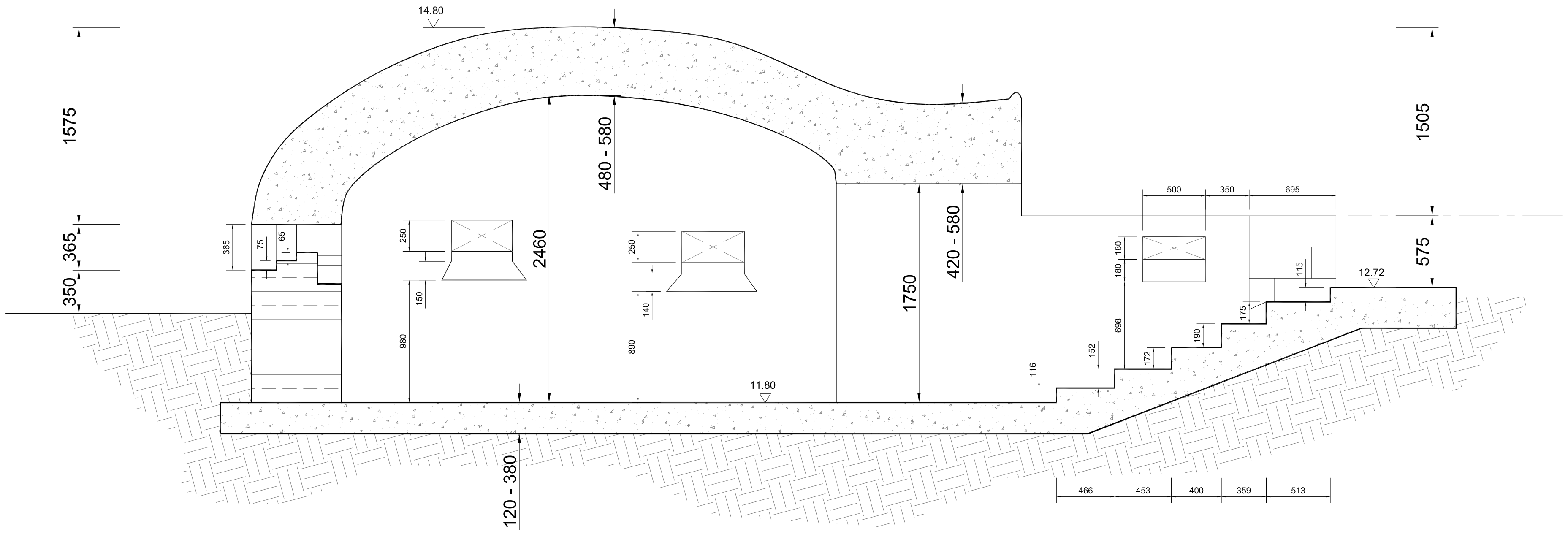
SOURCE **-**

▤ BLOCKWORK

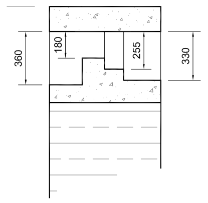
▨ REINFORCED CONCRETE

Note:

1. The thickness of block wall and concrete slab refer to Chapter 3 of <Further Structural Survey for the Old Pillbox, Consultancy Agreement C1103>



SECTION A



SECTION D

0 1 2 5m

	DESIGNATION	INITIAL	DATE
AUTHORIZED			
CHECKED			
DRAWN			

PROJECT
HERITAGE CONSULTANCY
PILLBOX AT DIAMOND HILL

DRAWING TITLE
SECTION A
& SECTION D

SCALE **1 : 50 (A3)**

DRAWING NO
PILLBOX-SE-01

SOURCE -

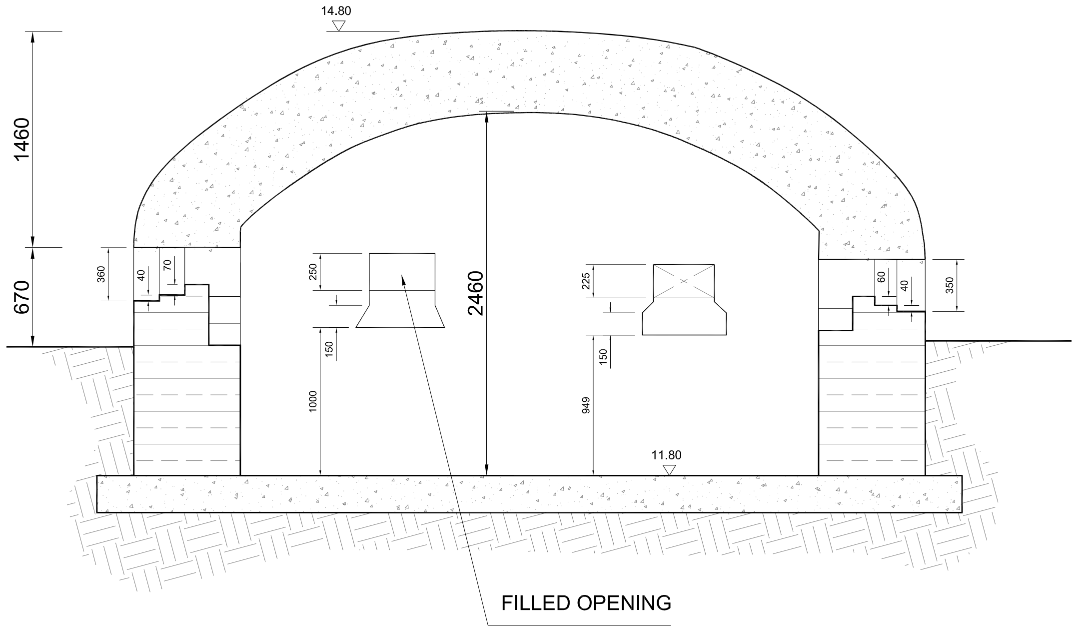
SECTIONS
PILLBOX
DIAMOND HILL

▤ BLOCKWORK

▨ REINFORCED CONCRETE

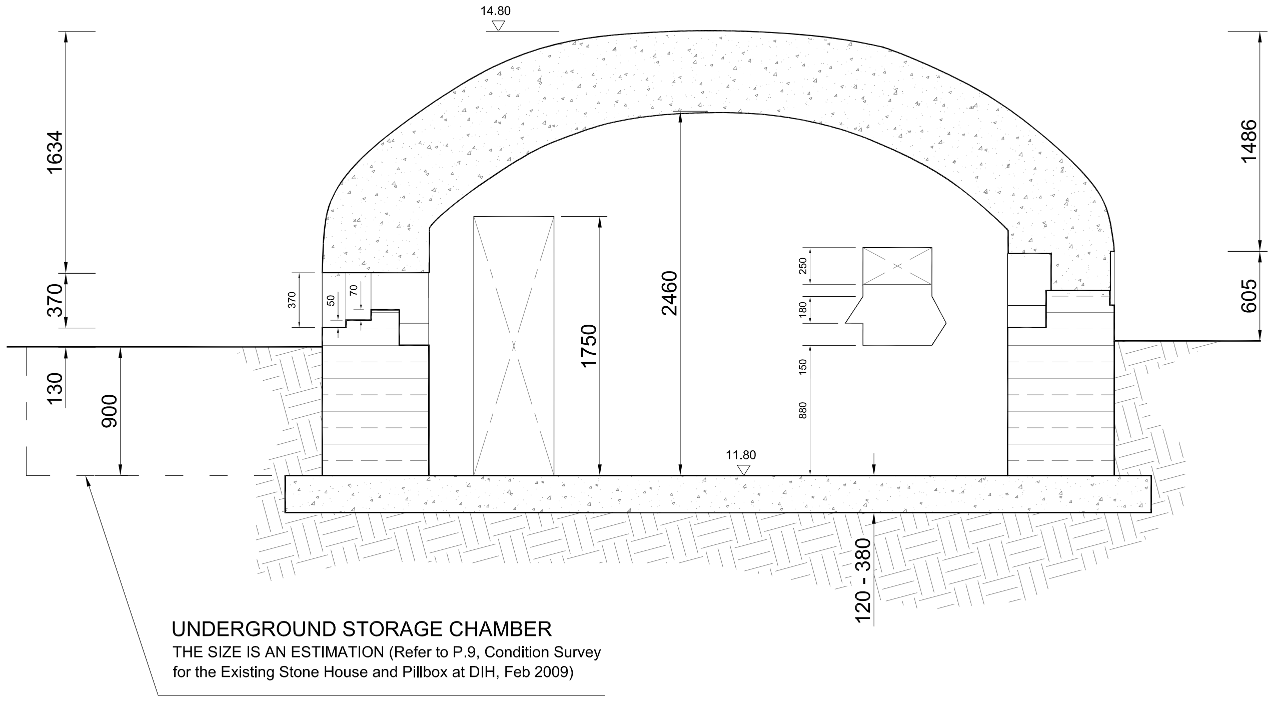
Note:

1. The thickness of block wall and concrete slab refer to Chapter 3 of <Further Structural Survey for the Old Pillbox, Consultancy Agreement C1103>



FILLED OPENING

SECTION B



UNDERGROUND STORAGE CHAMBER
THE SIZE IS AN ESTIMATION (Refer to P.9, Condition Survey for the Existing Stone House and Pillbox at DIH, Feb 2009)

SECTION C

	DESIGNATION	INITIAL	DATE
AUTHORIZED			
CHECKED			
DRAWN			

PROJECT
HERITAGE CONSULTANCY
PILLBOX AT DIAMOND HILL

DRAWING TITLE
SECTION B
& SECTION C

SCALE **1 : 50 (A3)**

DRAWING NO
PILLBOX-SE-02

SOURCE
-

SECTIONS
PILLBOX
DIAMOND HILL

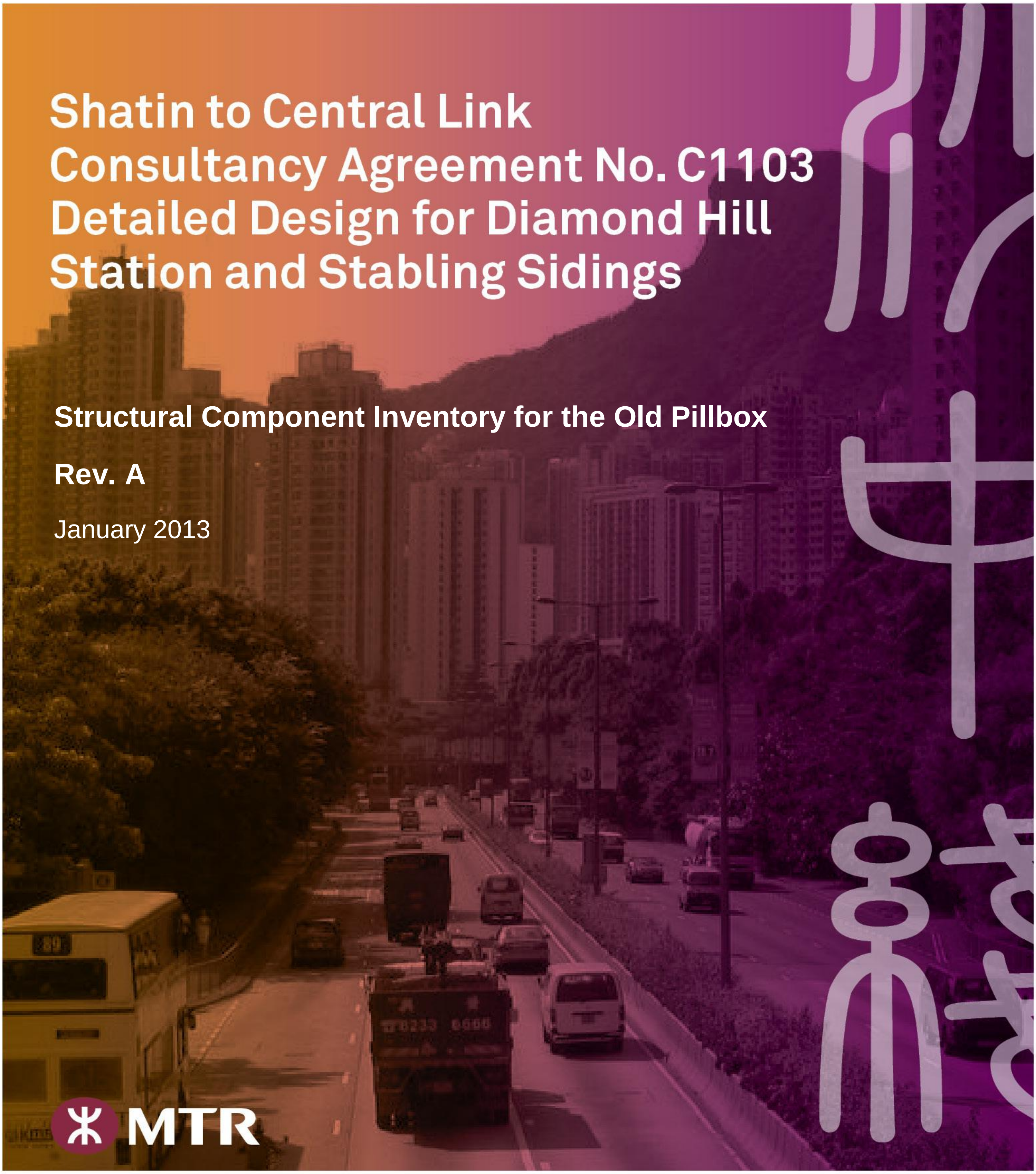
Appendix A

Responses to Comments

SCL – C1103 Detailed Design for Diamond Hill Station
Cartographic Record for the Old Pillbox
(AMO's letter ref. ( ) in LCSD/CS/AMO 81-5/21 Pt.20 dated 2 January 2013)

AMO's Comments on Cartographic Record for the Old Pillbox	**Response from MTR Corporation**
(AMO's letter ref. ( ) in LCSD/CS/AMO 81-5/21 Pt.20 dated 2 January 2013)	
General comments	
A. Regarding the underground storage chamber, please carry out further study and investigation for more information such as structure, use and condition, in order to assess the significance of the Pillbox. This should also be applied in the CMP.	Further structural investigation of the pillbox will be undertaken by the Contractor.
B. Please study how to handle the underground storage chamber when lifting up the Pillbox.	Further structural investigation of the pillbox will be undertaken by the Contractor.
Specific comments	
Drawing No. PILLBOX-PL-01 1. In the Floor Plan, please use thicker lines to indicate the wall of the pillbox to be consistent with the portion between A & B.	Thicker lines have been indicated on the drawings.
Drawing No. PILLBOX-EL-01 & 02 2. Please include the view no. (as shown in Drawing No.PILLBOX-PL-01) beside the caption.	View nos. have been included on the drawing.

AECOM



Shatin to Central Link
Consultancy Agreement No. C1103
Detailed Design for Diamond Hill Station and Stabling Sidings

Structural Component Inventory for the Old Pillbox

Rev. A

January 2013

MTR

MTR Corporation Limited

Shatin to Central Link

Consultancy Agreement No. C1103

Detailed Design for Diamond Hill Station and Stabling Sidings

Structural Component Inventory for the Old Pillbox

Rev. A

January 2013

Date	Rev.	Prepared		Checked		Approved	
Dec 2012	0	PC		HLHK		IMW	
Jan 2013	A	PC	pp	HLHK		IMW	

ePMS Transmittal No.: C1103-COR-ACM-SUR-000009
File: 60146520 / 17.A3.0J1

This report is prepared for MTR Corporation Limited (MTR) and is given for its sole benefit in relation to and pursuant to Shatin to Central Link Consultancy Agreement No. C1103 – Detailed Design for Diamond Hill Station and Stabling Sidings and may not be disclosed to, quoted to or relied upon by any person other than MTR (and other 3rd party recipient(s) as identified by MTR in accordance with Clause 14 of the General Conditions of Employment in relation to the Shatin to Central Link Entrustment Agreements) without our prior written consent. No person (other than MTR) into whose possession a copy of this report comes may rely on this report without our express written consent and MTR may not rely on it for any purpose other than as described above.

Table of Contents

Appendices

Drawings

1. INTRODUCTION

1.1 The EIA study for Tai Wai to Hung Hom Section recommended that the Old Pillbox to be affected by the construction of the DIH would be relocated. Structural Component Inventory would be required to document the Old Pillbox prior to its relocation.

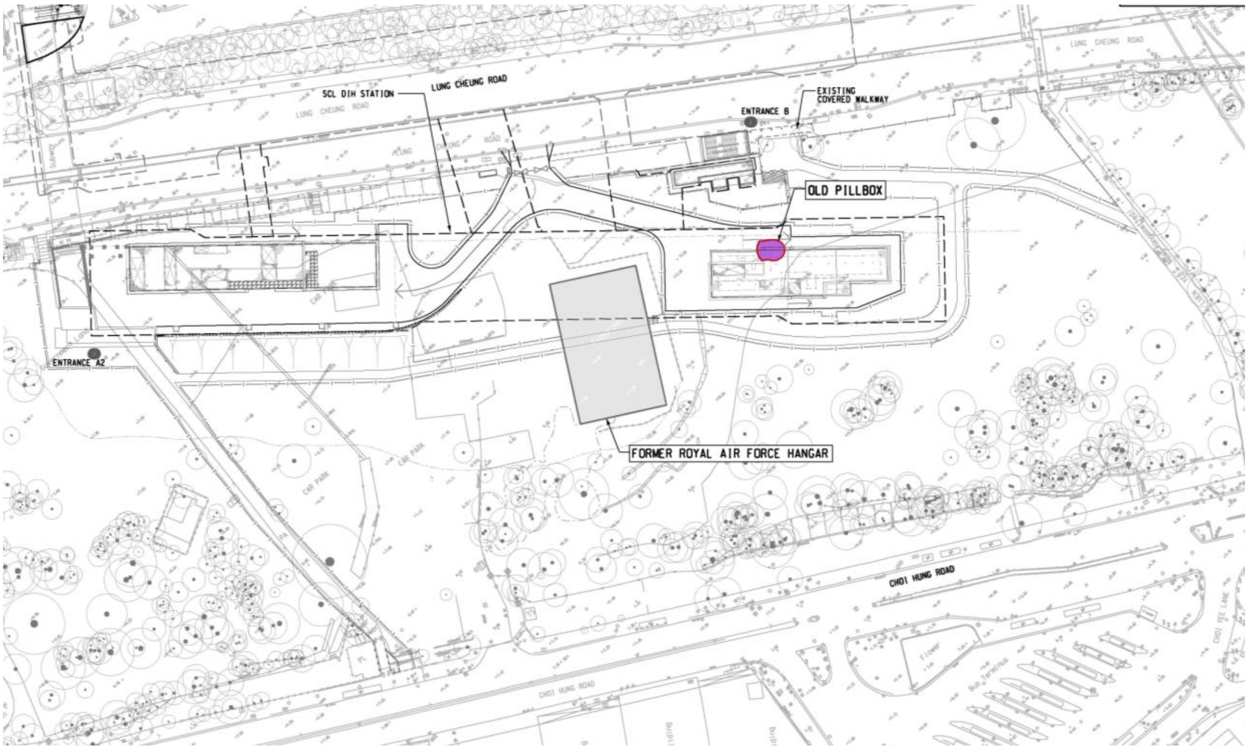
1.2 This inventory is to provide a proper record of all components of the Old Pillbox. The record forms the basis for the Pillbox database. The database may then be analyzed to formulate the reinstatement strategy in future.

1.3 This Inventory will be submitted to the Antiquities and Monuments Office for documentary archive.

2. SITE LOCATION AND DESCRIPTION

2.1 The Old Pillbox is presently located at a vacant site in Diamond Hill. The site comprises approximately 7.2 hectares of land bounded by four vehicular roads: the Kwun Tong by-pass to the east, Choi Hung Road to the south, Po Kong Village Road to the west and Lung Cheung Road to the north.

2.2 The pink hatched area indicated in the map shown below is the location of the Old Pillbox.



Site plan showing the location of Old Pillbox

3. METHODOLOGY

3.1 The Inventory will involve numbering and labelling of the components of the Old Pillbox. The data will be updated during the relocation process.

3.2 The Inventory will provide the following information:

- A real component checklist of the structure that included part numbers and locations;
- Drawings to indicate the locations of the components;
- Photographs of the components.

Appendix A

Inventory Catalog of Components

Item	* Code	Description		Location		Remarks
		Component Type	Material	Zoning	Plan Ref.	
001	R-001	Roof slab (main)	Reinforced concrete	Over the Pillbox	SE-01	-
002	W-002	Wall	Block works	Pillbox wall and staircase	PL-01	-
003	G-003	Floor slab	Reinforced concrete	Pillbox floor and staircase	SE-01	-
004	W-004	Embrasure	Concrete	Pillbox wall (North side)	PL-01	-
005	W-005	Embrasure	Concrete	Pillbox wall (East side)	PL-01	Filled opening
006	W-006	Embrasure	Concrete	Pillbox wall (South East side)	PL-01	-
007	W-007	Embrasure	Concrete	Pillbox wall (South side)	PL-01	-
008	W-008	Embrasure	Concrete	Pillbox wall (West side)	PL-01	-
009	W-009	Embrasure	Concrete	Wing wall	PL-01	-

Legend

* R-001: Roof Slab No. 001
W-002: Wall No. 002
G-003: Ground Slab No. 003

Appendix B

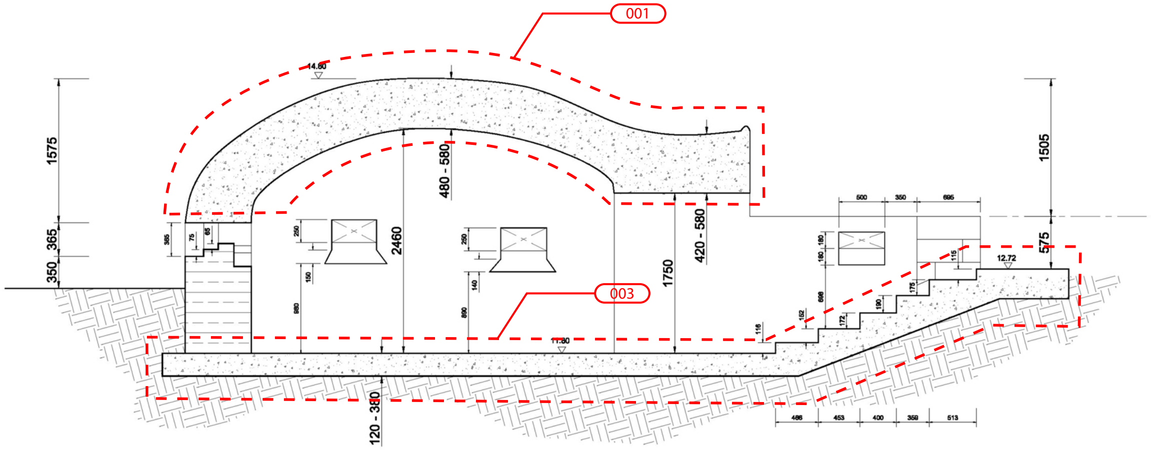
Location Drawings of Components

▤ BLOCKWORK

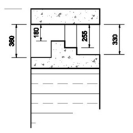
▨ REINFORCED CONCRETE

Note:

1. The thickness of block wall and concrete slab refer to Chapter 3 of <Further Structural Survey for the Old Pillbox, Consultancy Agreement C1103>



SECTION A



SECTION D

	DESIGNATION	INITIAL	DATE
AUTHORIZED			
CHECKED			
DRAWN			

PROJECT
HERITAGE CONSULTANCY
PILLBOX AT DIAMOND HILL

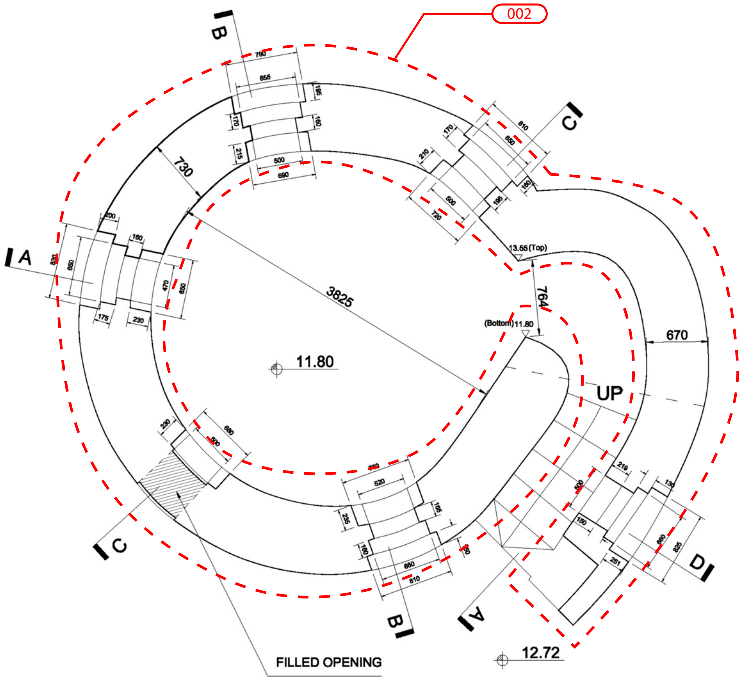
DRAWING TITLE
SECTION A
& SECTION D

SCALE **1 : 50 (A3)**

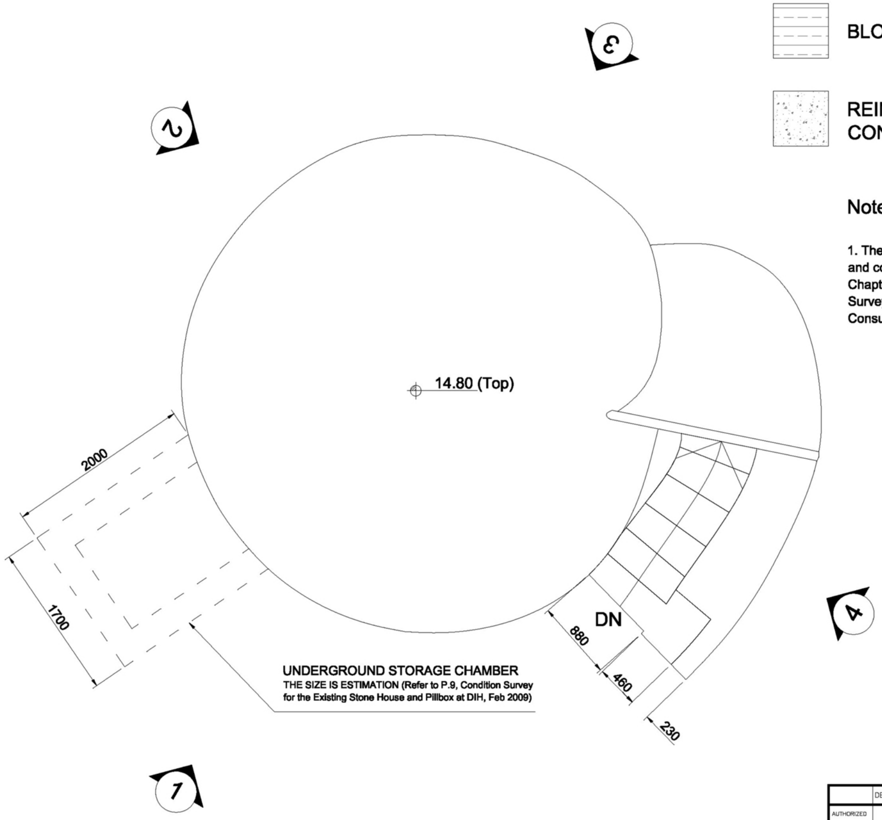
DRAWING NO
PILLBOX-SE-01

SOURCE -

SECTIONS
PILLBOX
DIAMOND HILL



FLOOR PLAN



UNDERGROUND STORAGE CHAMBER
THE SIZE IS ESTIMATION (Refer to P.9, Condition Survey for the Existing Stone House and Pillbox at DIH, Feb 2009)

ROOF PLAN

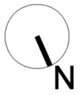
▤ BLOCKWORK

▨ REINFORCED CONCRETE

Note:

1. The thickness of block wall and concrete slab refer to Chapter 3 of <Further Structural Survey for the Old Pillbox, Consultancy Agreement C1103>

FLOOR PLAN AND ROOF PLAN
PILLBOX
DIAMOND HILL



	DESIGNATION	INITIAL	DATE
AUTHORIZED			
CHECKED			
DRAWN			

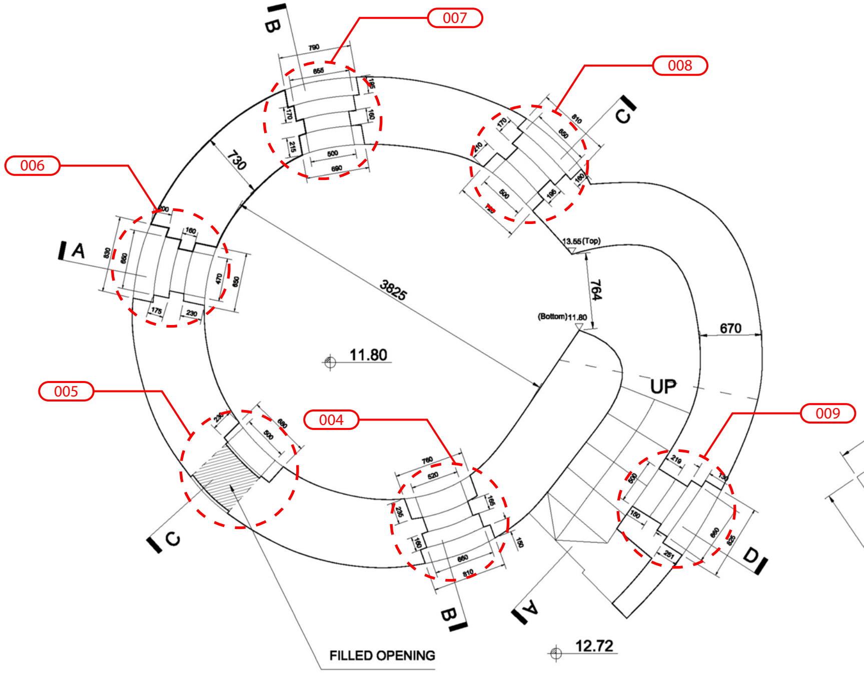
PROJECT
HERITAGE CONSULTANCY
PILLBOX AT DIAMOND HILL

DRAWING TITLE
FLOOR PLAN & ROOF PLAN

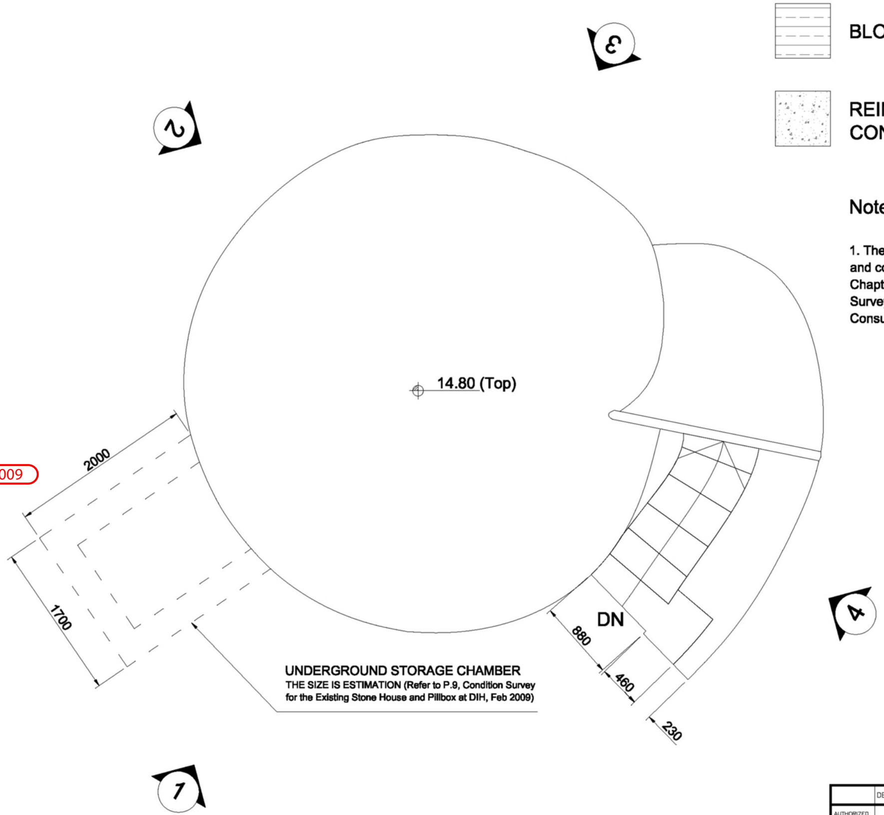
SCALE **1 : 50 (A3)**

DRAWING NO
PILLBOX-PL-01

SOURCE -



FLOOR PLAN



UNDERGROUND STORAGE CHAMBER
THE SIZE IS ESTIMATION (Refer to P.9, Condition Survey for the Existing Stone House and Pillbox at DIH, Feb 2009)

ROOF PLAN

▤ BLOCKWORK

▨ REINFORCED CONCRETE

Note:

1. The thickness of block wall and concrete slab refer to Chapter 3 of <Further Structural Survey for the Old Pillbox, Consultancy Agreement C1103>

FLOOR PLAN AND ROOF PLAN
PILLBOX
DIAMOND HILL

	DESIGNATION	INITIAL	DATE
AUTHORIZED			
CHECKED			
DRAWN			

PROJECT
HERITAGE CONSULTANCY
PILLBOX AT DIAMOND HILL

DRAWING TITLE
FLOOR PLAN & ROOF PLAN

SCALE **1 : 50 (A3)**

DRAWING NO
PILLBOX-PL-01

SOURCE -

Appendix C

Photographs of Components

Item	Code	Photo Ref.	Item	Code	Photo Ref.
001	R-001		006	W-006	
002	W-002		007	W-007	

Item	Code	Photo Ref.	Item	Code	Photo Ref.
003	G-003	 	008	W-008	
004	W-004		009	W-009	

Item	Code	Photo Ref.	Item	Code	Photo Ref.
005	W-005		-	-	-

Appendix D

Responses to Comments

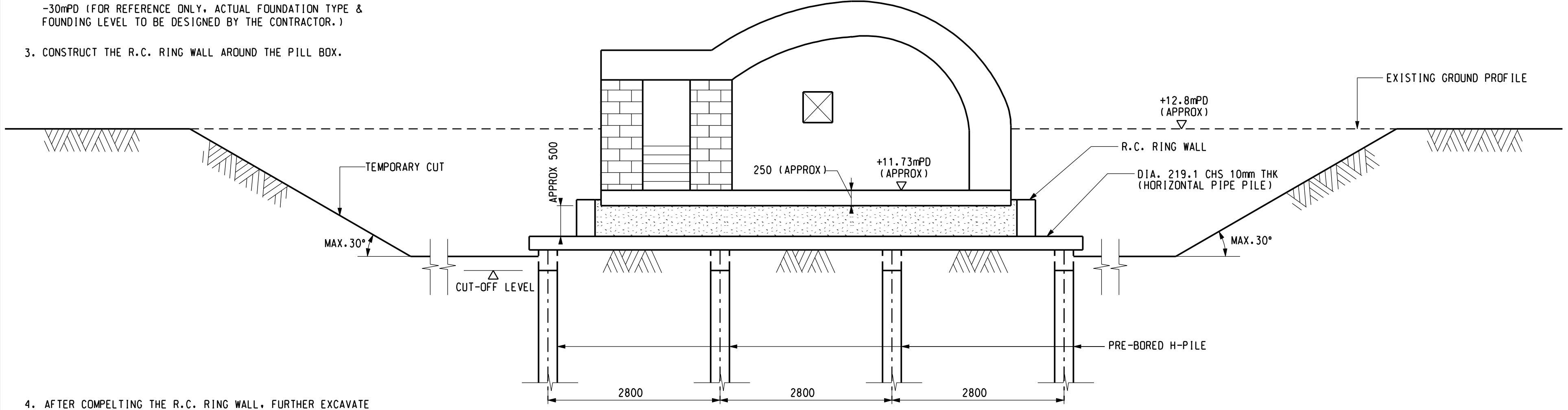
SCL – C1103 Detailed Design for Diamond Hill Station
Structural Component Inventory for the Old Pillbox
(AMO's letter ref. ( ) in LCSD/CS/AMO 81-5/21 dated 17 January 2013)

AMO's Comments on Structural component Inventory for the Old Pillbox	**Response from MTR Corporation**
(AMO's letter ref. ( ) in LCSD/CS/AMO 81-5/21 dated 17 January 2013)	
1. It is suggested the line of the element e.g. 001 be drawn at the interface of two different construction materials.	Noted. This has been incorporated on the drawing.
2. Please provide legends for the alphabet in the "Code" column, if any.	Noted. Legend has been included for R = roof, W = wall, G = ground. These legends do not have any specific meaning, only to provide member references.

Drawings

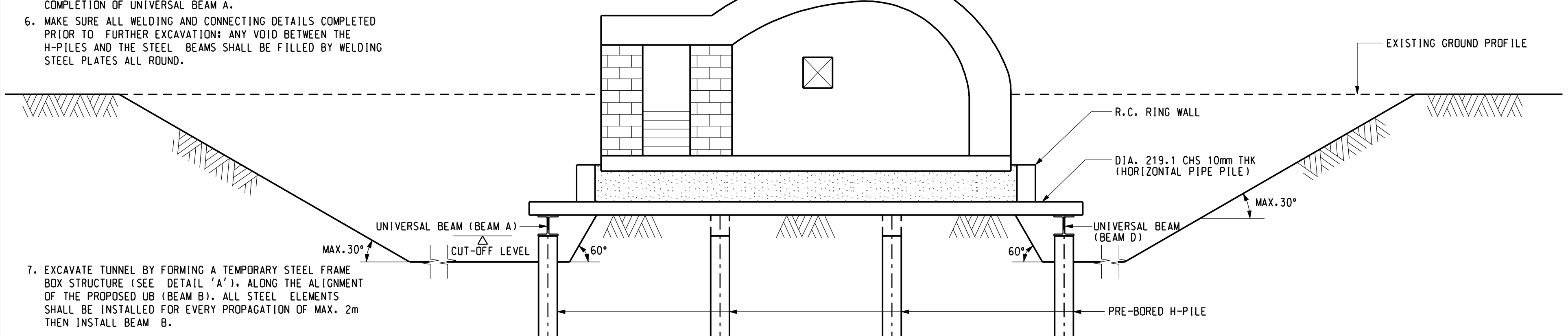
CONSTRUCTION SEQUENCE FOR UNDERPINNING WORKS

1. EXCAVATE DOWN AROUND THE PILLBOX BY FORMING TEMPORARY CUT OF MAX 30° TO PROVIDE ACCESS AND WORKING AREA FOR HORIZONTAL PIPE PILING.
2. INSTALL HORIZONTAL PIPE PILES AND H-PILES(PRE- BORED). TOLERANCE ON HORIZONALITY OF STEEL PIPE PILES SHALL NOT EXCEED 1 IN 100. DRILLING SHALL FIRSTLY BE CARRIED OUT FOR ALTERNATE PIPE PILES AND THEN FOR INTERMEDIATE PIPE PILES. THE TENTATIVE FOUNDING LEVEL OF H-PILES ARE -30mPD (FOR REFERENCE ONLY, ACTUAL FOUNDATION TYPE & FOUNDING LEVEL TO BE DESIGNED BY THE CONTRACTOR.)
3. CONSTRUCT THE R.C. RING WALL AROUND THE PILL BOX.



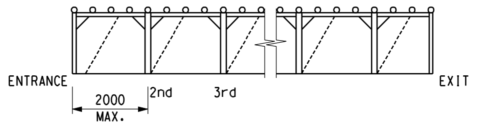
VIEW 1

4. AFTER COMPELTING THE R.C. RING WALL, FURTHER EXCAVATE DOWN UNDERNEATH ALONG THE EDGE OF THE PILL BOX AND EXCAVATE MAX. 1000 INWARD. INSTALL THE REQUIRED UNIVERSAL BEAM (BEAM A) UNDERNEATH AND AT DIRECTION PERPENDICULAR TO THE PIPE PILES, WELD UNIVERSAL BEAM A TO PIPE PILES.
5. REPEAT STEP 4 TO INSTALL UNIVERSAL BEAM D AFTER COMPLETION OF UNIVERSAL BEAM A.
6. MAKE SURE ALL WELDING AND CONNECTING DETAILS COMPLETED PRIOR TO FURTHER EXCAVATION; ANY VOID BETWEEN THE H-PILES AND THE STEEL BEAMS SHALL BE FILLED BY WELDING STEEL PLATES ALL ROUND.



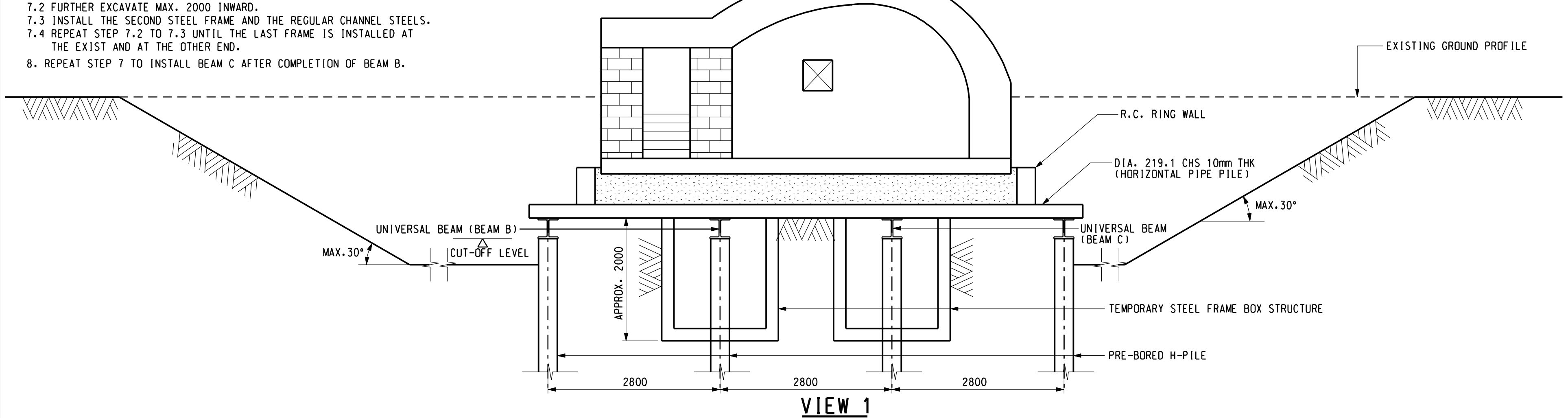
VIEW 1

7. EXCAVATE TUNNEL BY FORMING A TEMPORARY STEEL FRAME BOX STRUCTURE (SEE DETAIL 'A'), ALONG THE ALIGNMENT OF THE PROPOSED UB (BEAM B). ALL STEEL ELEMENTS SHALL BE INSTALLED FOR EVERY PROPAGATION OF MAX. 2m THEN INSTALL BEAM B.



7.1 INSTALL THE 1ST STEEL FRAME AT THE PORTAL ENTRANCE.
7.2 FURTHER EXCAVATE MAX. 2000 INWARD.
7.3 INSTALL THE SECOND STEEL FRAME AND THE REGULAR CHANNEL STEELS.
7.4 REPEAT STEP 7.2 TO 7.3 UNTIL THE LAST FRAME IS INSTALLED AT THE EXIST AND AT THE OTHER END.

8. REPEAT STEP 7 TO INSTALL BEAM C AFTER COMPLETION OF BEAM B.



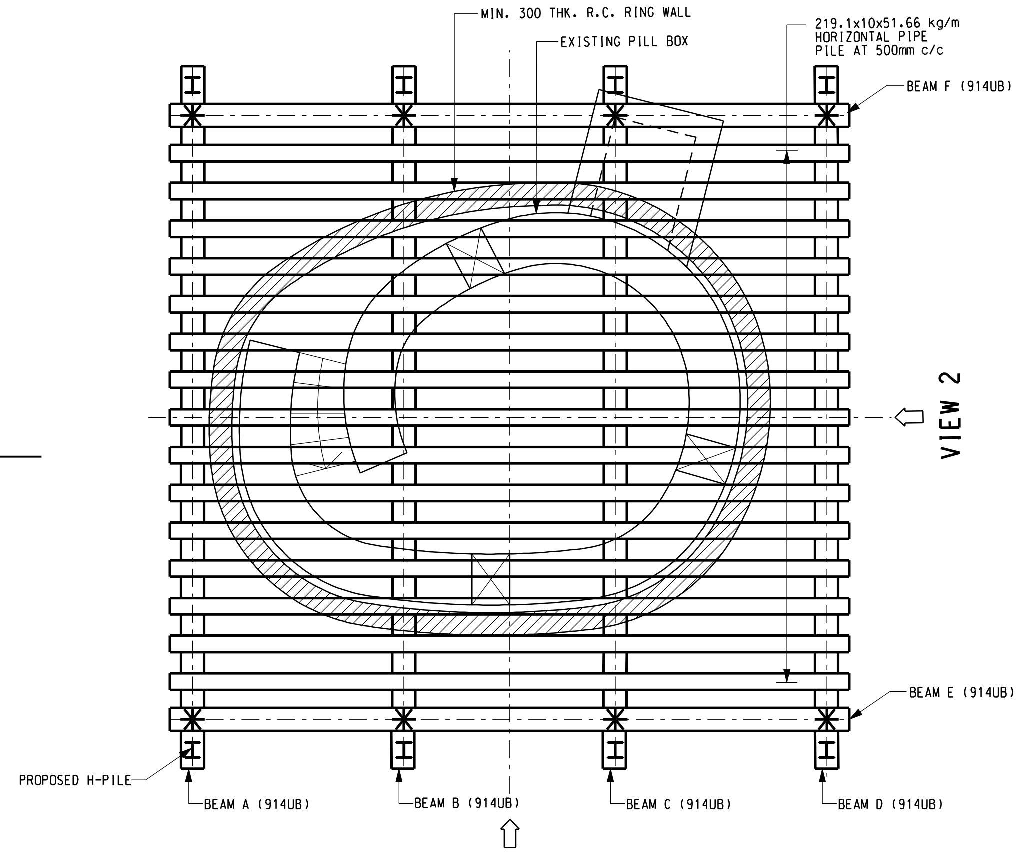
VIEW 1

NOTES:

1. ALL DIMENSION ARE IN MILLIMETER OR OTHERWISE SPECIFIED.
2. ALL LEVELS SHALL REFER TO METERS ABOVE PRINCIPLE DATUM OF HONG KONG.
3. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH DRAWING NO. 1106/T/301/ACM/C21/502 & 503.
4. ALL DIMENSIONS AND LEVELS OF THE EXISTING PILLBOX ARE INDICATIVE ONLY AND SHOULD BE VERIFIED BY THE CONTRACTOR ON SITE.
5. DRAWING NOS. 1106/T/301/ACM/C21/501, 502 & 503 SHOW THE SCHEMATIC UNDERPINNING WORKS. ALL MEMBER SIZES, LENGTH AND LEVELS OF THE PROPOSED UNDERPINNING WORKS ARE INDICATIVE AND FOR REFERENCE ONLY. THE DETAILED DESIGN OF UNDERPINNING WORKS SHOULD BE DONE BY THE CONTRACTOR.

LEGEND:

✳ ENVISAGED LIFTING POINT FOR TRANSPORTING THE PILLBOX (INDICATIVE ONLY)



VIEW 1

PLAN OF STEEL FRAME AND UNDERPINNING WORKS

FOR INFORMATION ONLY

REV	DESCRIPTION	BY	DATE	APPROVED
B	GENERAL REVISION	AKLN	26NOV12	IMW
A	ISSUE FOR TENDER ADDENDUM	AKLN	24JUL12	IMW

DRAWN	BCHF
DESIGNED	TCC
CHECKED	AKLN
APPROVED	IMW
DATE	24/JUL/2012

MTR

SHATIN TO CENTRAL LINK

ORIGINATOR
AECOM in association with
Aedas, MVA and DLS

CADD REF. 1106_T_301_ACM_C21_501B.dgn

TITLE
CONTRACT 1106
DIAMOND HILL STATION
HERITAGE - PILLBOX RELOCATION
UNDERPINNING
(SHEET 1 OF 3)

SCALE N.T.S.
DRAWING NO. 1106/T/301/ACM/C21/501
REV. B

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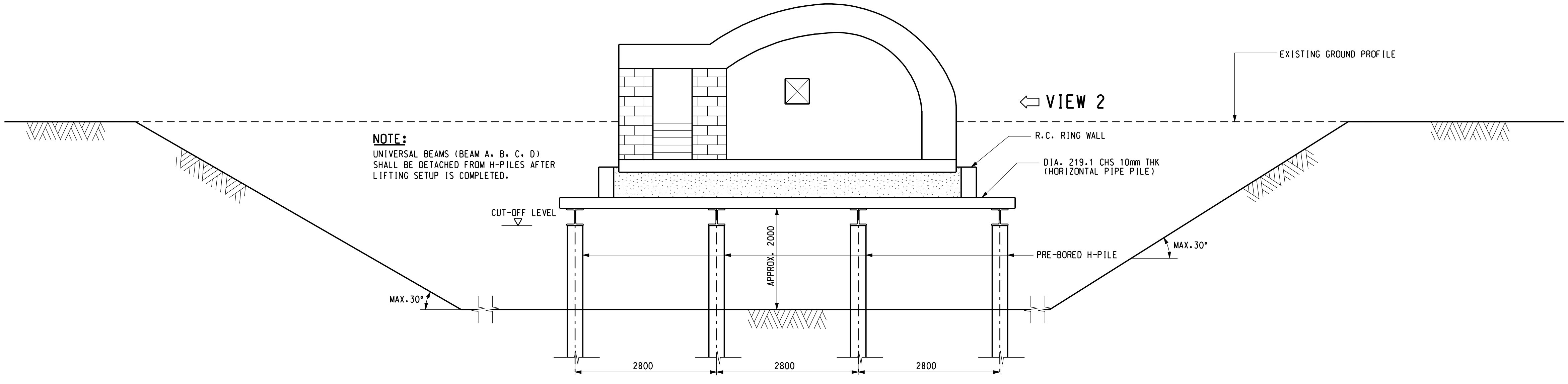
CONSTRUCTION SEQUENCE FOR UNDERPINNING WORKS

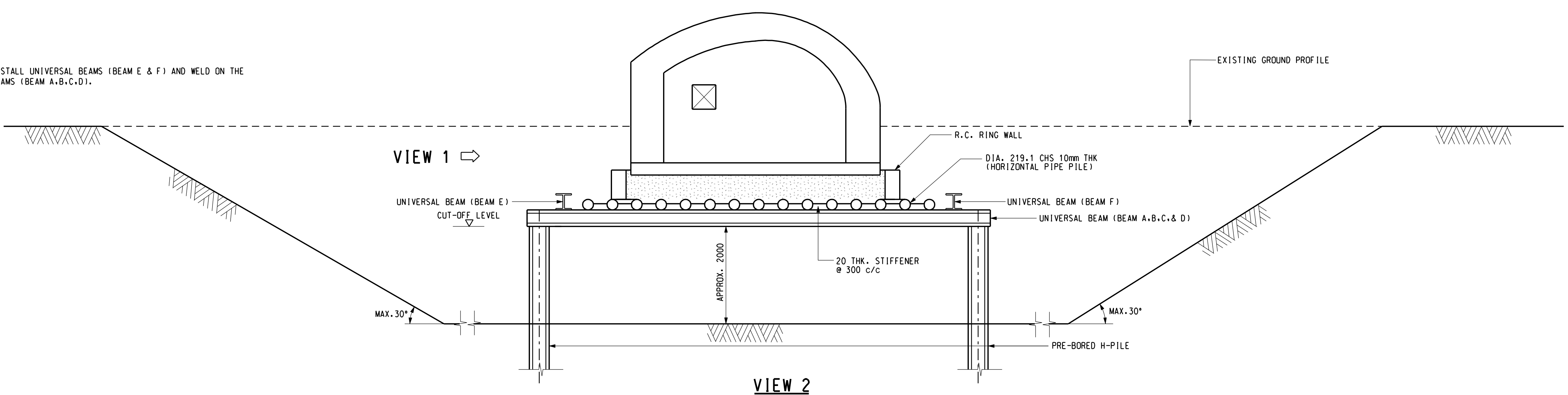
9. EXCAVATE TO THE BOTTOM LEVEL OF THE STEEL FRAME TUNNEL AND REMOVE THE TEMPORARY STEEL FRAME BOX STRUCTURE.
10. FURTHER EXCAVATE DOWN TO APPROX. 2m BELOW PIPE PILE.



NOTE:
UNIVERSAL BEAMS (BEAM A, B, C, D) SHALL BE DETACHED FROM H-PILES AFTER LIFTING SETUP IS COMPLETED.

VIEW 1

11. INSTALL UNIVERSAL BEAMS (BEAM E & F) AND WELD ON THE BEAMS (BEAM A,B,C,D).



VIEW 2

FOR INFORMATION ONLY

REV	DESCRIPTION	BY	DATE	APPROVED
B	GENERAL REVISION	AKLN	26NOV12	IMW
A	ISSUE FOR TENDER ADDENDUM	AKLN	24JUL12	IMW

DRAWN	BCHF
DESIGNED	TCC
CHECKED	AKLN
APPROVED	IMW
DATE	24/JUL/2012

DO NOT SCALE DRAWINGS. ALL DIMENSIONS SHALL BE VERIFIED ON SITE.

MTR

SHATIN TO CENTRAL LINK

ORIGINATOR
AECOM in association with Aedas, MVA and DLS

CADD REF. 1106_T_301_ACM_C21_502B.dgn

TITLE
CONTRACT 1106
DIAMOND HILL STATION
HERITAGE - PILLBOX RELOCATION
UNDERPINNING
(SHEET 2 OF 3)

SCALE N.T.S.
DRAWING NO. 1106/T/301/ACM/C21/502
REV. B

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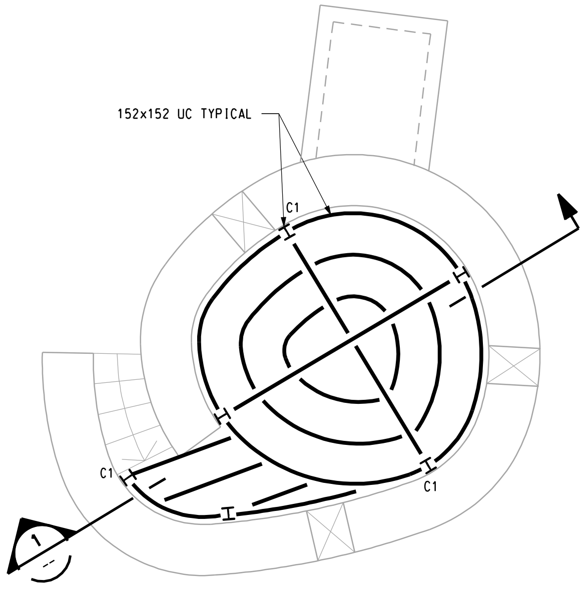
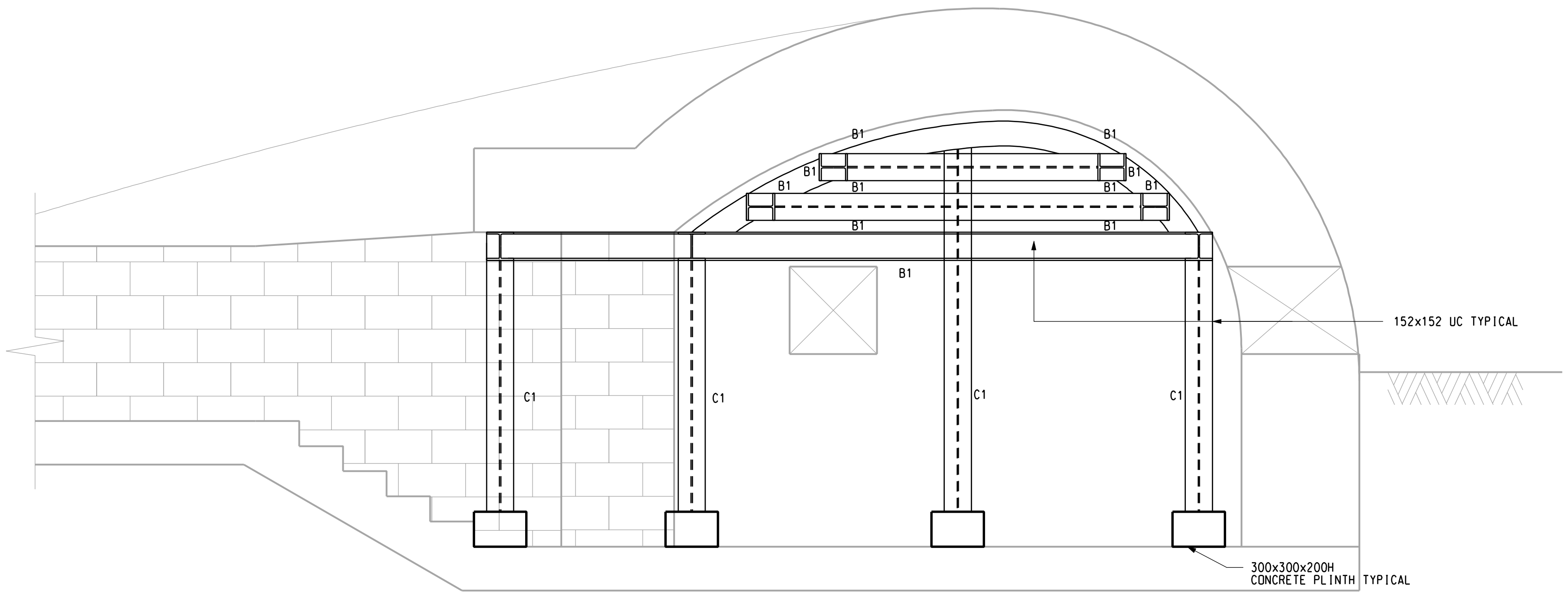


PILLBOX FRAMING PLAN

SCALE 1:50



SECTION 1

SCALE 1:20

NOTES:

1. THIS SCHEME INDICATES DESIGN INTENT. THE CONTRACTOR SHOULD DEVELOP HIS OWN DESIGN TO SUIT THE ACTUAL GEOMETRY OF THE PILLBOX AND THE RELOCATION METHOD ADOPTED.
2. GAP BETWEEN PILL BOX AND SPACE FRAME TO BE WEDGED TIGHT.
3. IT IS RECOMMENDED THE PILLBOX STRUCTURE SHALL BE SECURELY PROPPED AND ADEQUATELY SUPPORTED LATERALLY PRIOR TO THE INSTALLATION OF THE TEMPORARY STEEL LIFTING PLATFORM.
4. TIMBER PACKING SHALL BE PLACED TO PREVENT DIRECT CONTACT BETWEEN STEELWORKS AND THE PILLBOX STRUCTURE.
5. LOAD FROM THE STEEL POST SHALL BE SPREAD EVENLY AT THE BASE TO PREVENT EXCESSIVE LOAD ONTO THE EXISTING SLAB.
6. LATERAL LOOP IN STEEL RODS SHALL BE CONSIDERED TO WRAP ROUND THE ROOF DOME TO PREVENT CRACKING OF THE ROOF DUE TO LATERAL MOVEMENT.
7. THE PROPPING AND SUPPORTING WORKS SHALL BE INSPECTED TO ENSURE EFFECTIVENESS PRIOR TO EVERY LIFTING OPERATION.

FOR INFORMATION ONLY

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REV	DESCRIPTION	BY	DATE	APPROVED
B	REPLY AMO'S COMMENT	SPC	26NOV12	IMW
A	ISSUE FOR TENDER ADDENDUM	SPC	24JUL12	IMW

DRAWN	CTJ
DESIGNED	TWF
CHECKED	SPC
APPROVED	IMW
DATE	24/JUL/2012

DO NOT SCALE DRAWINGS. ALL DIMENSIONS SHALL BE VERIFIED ON SITE.

MTR

SHATIN TO CENTRAL LINK

ORIGINATOR

AECOM in association with Aedas, MVA and DLS

CADD REF. 1106_T_301_ACM_C21_504B.dgn

TITLE

CONTRACT 1106
DIAMOND HILL STATION
HERITAGE - PILLBOX
RELOCATION PROPOSED PERMANENT
STRENGTHENING METHOD FOR ENTIRE STRUCTURE

SCALE 1 : 50 @ A1

DRAWING NO. 1106/T/301/ACM/C21/504

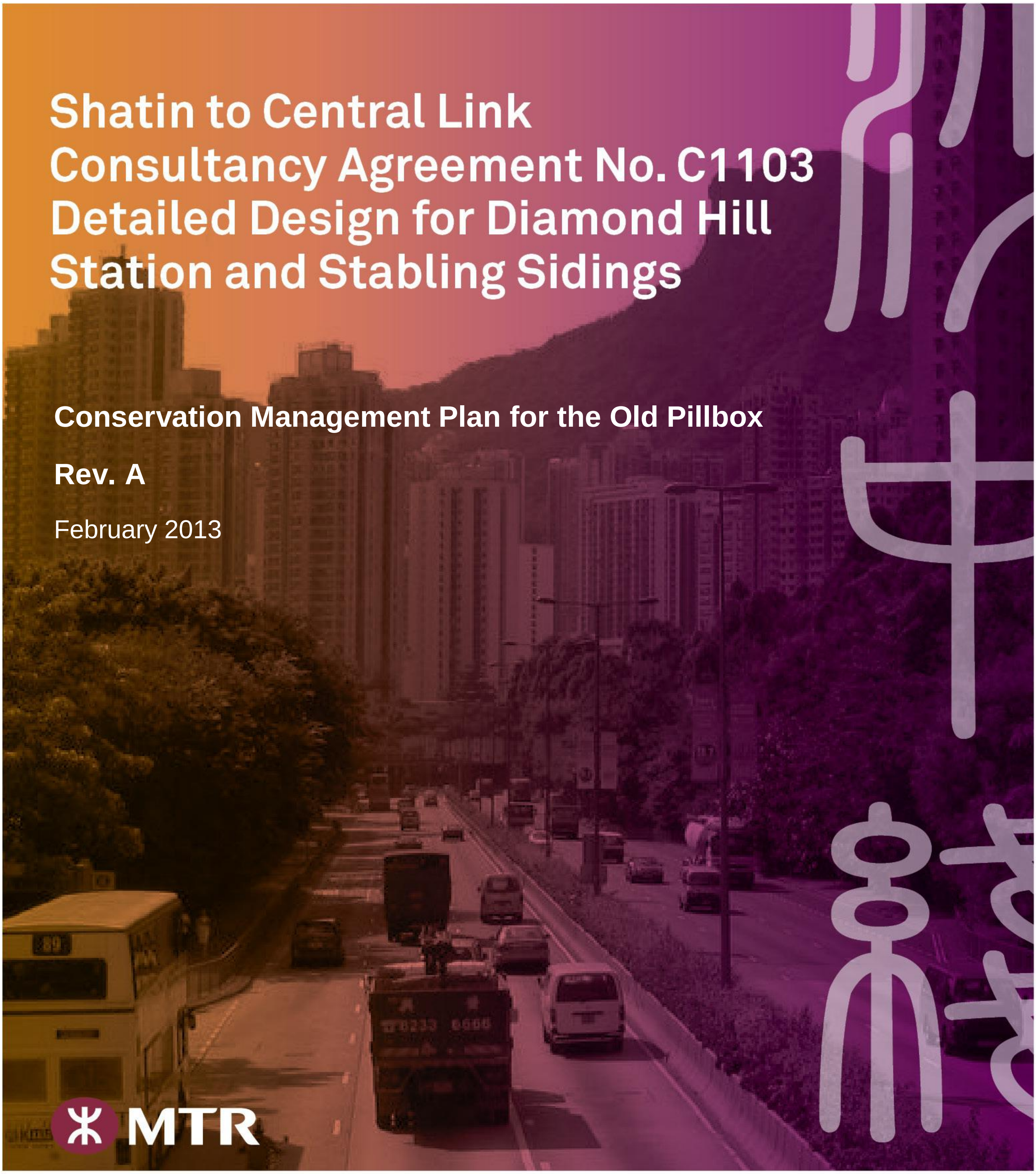
REV. B

Shatin to Central Link
Consultancy Agreement No. C1103
Detailed Design for Diamond Hill Station and Stabling Sidings

Conservation Management Plan for the Old Pillbox

Rev. A

February 2013



MTR Corporation Limited

Shatin to Central Link

Consultancy Agreement No. C1103

Detailed Design for Diamond Hill Station and Stabling Sidings

Conservation Management Plan for the Old Pillbox

Rev. A

February 2013

Date	Rev.	Prepared		Checked		Approved	
24 Dec 2012	0	PC		HLHK		IMW	
27 Feb 2013	A	PC		HLHK		IMW	

ePMS Transmittal No.: C1103-COR-ACM-SUR-000002A
File: 60146520 / 15.9.19

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Appendices

February 2013

CONSERVATION MANAGEMENT PLAN FOR THE OLD PILLBOX

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Appendices

Acknowledgments

We would like to acknowledge the permission given by the following organizations and persons for the use of their records, maps, photographs and information included in the report:

- Antiquities and Monuments Office
- MTR Corporation
- AECOM
- Public Records Office
- Survey & Mapping Office, Lands Department

A special acknowledgement to the engineering team of AECOM, without whose professionalism and sensitivity to heritage conservation this report and the relocation of the Diamond Hill heritage structures would not have been possible.

Research Team

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Director of SEE Network Limited

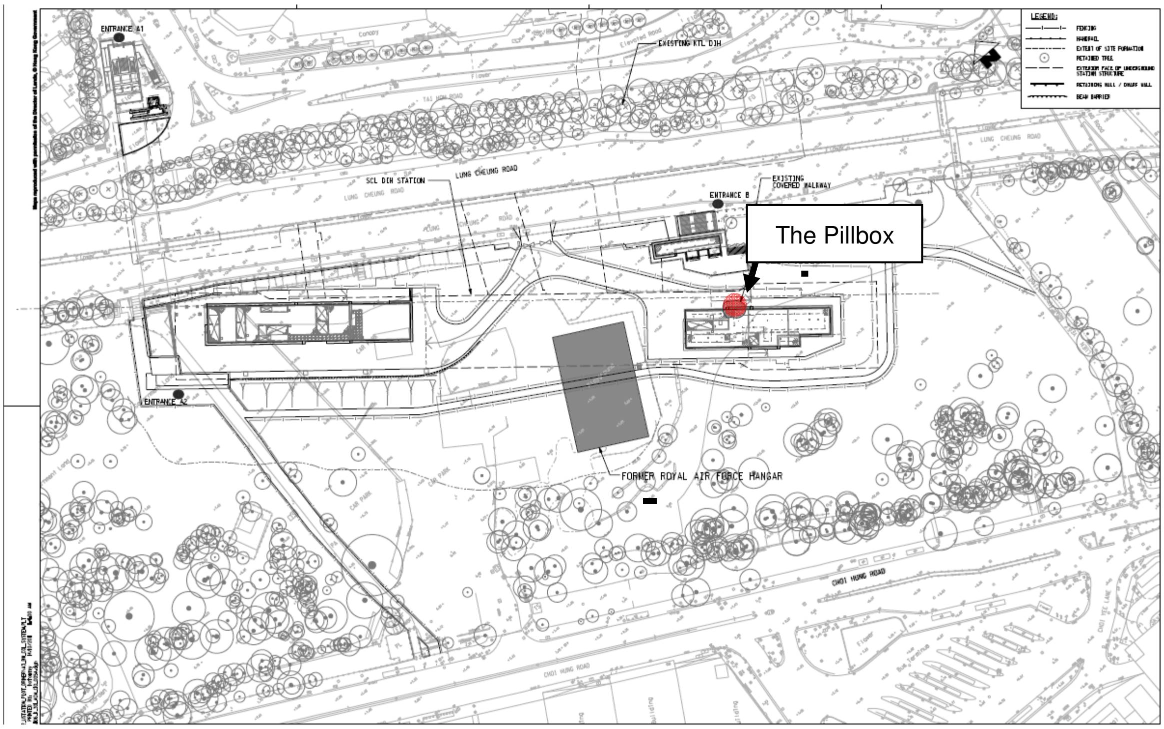
Gary YEUNG Wai Keung
BSSc (Arch Studies), MArch
Registered Architect, H.K.I.A.
VBAS Assessor (List 2A)

Phoebe CHAU Wing Yan
BA (Com Lit)

1

Introduction

1.1 Background



Map 1.1 Map showing the location of the Old Pillbox in the construction area of the proposed new Diamond Hill MTR Station (AECOM, 2012).

The MTR Corporation's Shatin to Central Link (SCL) is a strategic railway line recommended in the Railway Development Strategy 2000. This proposed new alignment links Tai Wai and Admiralty with intervening railway stations covering the East Kowloon area and connecting to the existing railway network on Hong Kong Island.

Diamond Hill Station will be the interchange station for the Kwun Tong Line and SCL and will become the main railway hub for East Kowloon. In response to feedback and views collected from the public, the original proposal of locating stabling sidings in Diamond Hill is now cancelled and a new site at the former freight yard under the podium of Hung Hom Station will now accommodate the train stabling requirements of the SCL.

Under this revised plan, two graded historic structures, the Former RAF Hangar and the Old Pillbox, located within the SCL construction area (see Map 1.1) will be affected. The approved Environment Impact Assessment Study (EIA-197/2011) relating to the SCL works recommended these two historic structures be disassembled, placed in temporary storage compound, and reinstated within the Comprehensive Development Area (CDA) site, as on-site preservation is not practicable, since the Old Pillbox and the Hangar are directly impacted by the SCL Diamond Hill Station.

A separate Conservation Management Plan, further structural survey and documentation (cartographic and photographic records) and structural component inventory for these historic structures are required to be submitted to the Antiquities and Monuments Office before the works start.

The MTR Corporation's engineering consultant, AECOM, commissioned SEE Network Limited to undertake this Conservation Management Plan (CMP), conducted in the period October 2011 to December 2012. The CMP entails a conservation study, statement of cultural significance and the management plans for conserving the Old Pillbox. The CMP for the Former RAF Hangar has been prepared in a separate report.

During the duration of the study, planning for the future CDA site within which the Former RAF Hangar and Old Pillbox are proposed to be located is yet to be determined. Consequently, to enable adequate consideration of the reinstatement location for the heritage structures within the future CDA site and due to the pending commencement of the SCL construction works in 2013, this CMP will only focus on: understanding the cultural significance; identifying the character-defining elements; and, the most possible and proper dismantling and temporary storage plans for the historic structures in order to ensure the greatest flexibility for future reinstatement planning.

1.2 Objectives of this CMP for the Old Pillbox

The proposed conservation for the site's heritage item is subject to the location and context of the future usage of the site and adjacent areas. The planning of the future CDA Site is yet to be determined.

Therefore, this CMP, with the yet unknown reinstatement location(s) of the affected Old Pillbox, seeks to achieve the following objectives:

1) To understand the cultural significance of the Old Pillbox;
2) To identify the character-defining elements based on its cultural significance and that will affect its dismantling and storage proposal;
3) To establish a set of dismantling and storage guidelines and methods for the Old Pillbox in a cautious approach to maximize its future reinstatement options, with the aim to retain its cultural significance as far as possible;
4) To propose the possible and feasible management arrangement for the dismantled Old Pillbox during the storage period.

1.3 General Conservation Principles of "Relocation"

Relocation of a structure or feature of cultural heritage value, where its removal is required in order to clear its site for a different purpose or construction, or where its removal is required to enable its use on a different site, is not a desirable outcome and usually not recommended in a conservation process.

Therefore, in this exceptional case, the general conservation principles, based on the internationally recognized Australia ICOMOS Charter for Places of Cultural Significance, known as The Burra Charter (adopted in 1979 and revised in 1999) are highlighted and re-examined:

> *"6.1 The cultural significance of a place and other issues affecting its future are best understood by a sequence of collecting and analyzing information before making decisions. Understanding cultural significance comes first, then development of policy and finally management of the place in accordance with the policy."*

> *"6.2 The policy for managing a place must be based on an understanding of its cultural significance."*

> *"6.3 Policy development should also include consideration of other factors affecting the future of a place such as the owner's needs, resources, external constraints and its physical condition."*

> *"15.1 Change may be necessary to retain cultural significance, but is undesirable where it reduces cultural significance. The amount of change to a place should be guided by the cultural significance of the place and its appropriate interpretation."*

> *"15.3 Demolition of significant fabric of a place is generally not acceptable. However, in some cases minor demolition may be appropriate as part of conservation. Removed significant fabric should be reinstated when circumstances permit."*

A Conservation Management Plan (CMP) is a comprehensive review document referencing The Burra Charter and other internationally recognized heritage conservation agreements. These agreements act as a guide for all involved in the various aspects of conservation work, including collecting relevant information, understanding cultural significance, developing a conservation policy and management measures.

Each heritage item is different in terms of its history, values, current physical condition and limitations; therefore, no single conservation measure fits all cases. Drawing up a CMP is a process of exploration – and undertaken by using a cautious approach - to understand the tangible and intangible value of the heritage, and establish possible ways to retain or achieve minimum loss of the cultural significance as far as possible of each heritage item, even in this special relocation case.

1.4 Definitions and Key Concepts

1. The Old Pillbox	Refers to the name identifying the heritage-grade pillbox located in the Diamond Hill site described in the List of Graded Historic Buildings given by the Antiquities and Monuments Office and in the Environmental Impact Assessment Study (EIA-197/2011).
2. Located Site / former Tai Hom Village	Refers to the vacant site in Diamond Hill, and generally known as the "former Tai Hom Village". It was bounded by Choi Hung Road, Kwun Tong by-pass, Po Kong Village Road and Lung Cheung Road. The site is now zoned as a Comprehensive Development Area (CDA). Within the former Tai Hom Village, three historic structures are located: the Former RAF Hangar, the Old Pillbox and the No.4 Stone House, but only the first two structures are graded.
3. Boundary of Construction Area	Area of the proposed Diamond Hill Station (DIH). It covers part of the located site, and only two historic structures are within the construction area. They are the Former RAF Hangar and the Old Pillbox.
4. Related Place	In this report, "related place" refers to the former Kai Tak Airfield and general Diamond Hill area, as they contribute to the cultural significance of the two identified historic structures.
5. Cultural Significance	Cultural significance is a concept which helps in estimating the value of places. The places that are likely to be of significance are those which help an understanding of the past or enrich the present, and

	which will be of value to future generations. Although there are a variety of adjectives used in definitions of cultural significance, based on Guidelines to the Burra Charter: Cultural Significance (1999) the following adjectives: “aesthetic”, “historic”, “scientific” and “social”, are commonly and non-exclusively framed as assessment dimensions.
6. Tai Hom Village	The location and size of Tai Hom Village has varied slightly from time to time: ▪ Before the Second World War (WWII): Tai Hom Village refers to the old village established by the Chu family. ▪ After WWII: Tai Hom Village refers to a village inside the Diamond Hill squatter area.
7. Reassembly	Means to put existing but disarticulated parts of a structure back together.
8. Reinstatement	Means to put material components of a place, including the products of reassembly, back in its former position.
9. Reconstruction	Means to build again as closely as possible to a documented earlier form, using new materials.
10. Relocation	Means to relocate the structure to a new site, which provides a setting compatible with its cultural heritage value.

1.5 Scope of Study

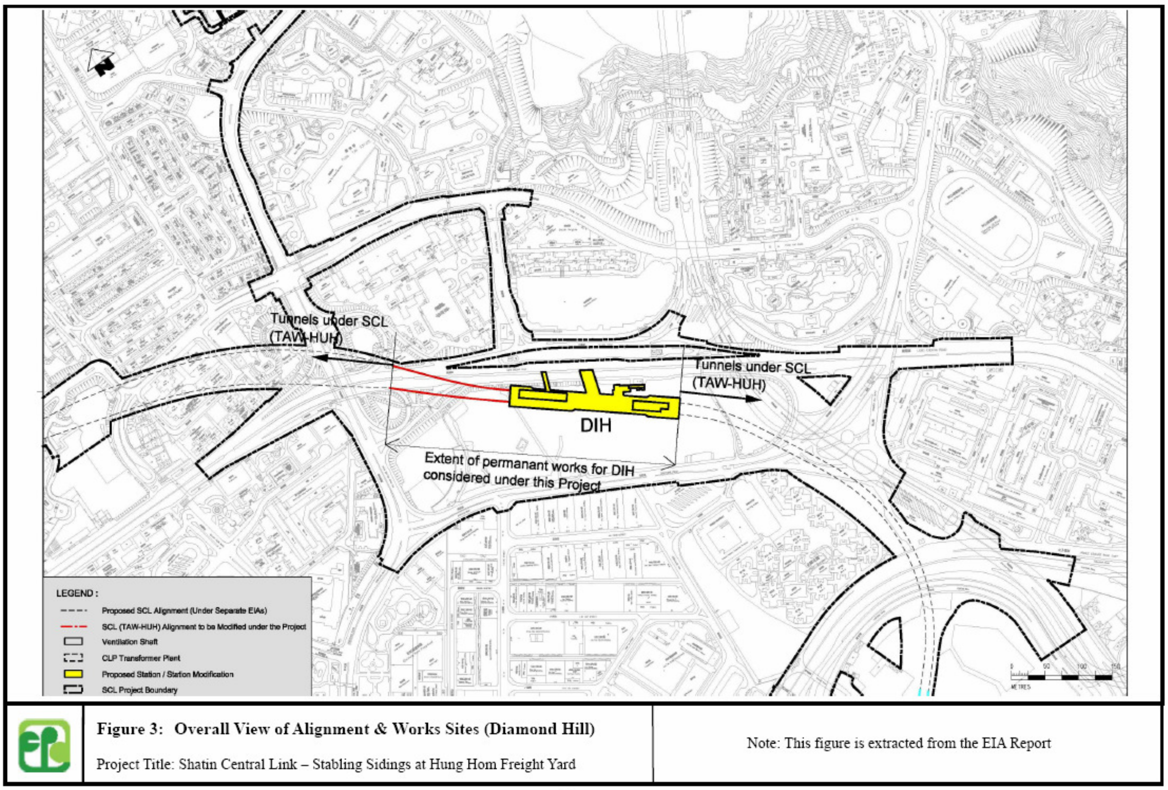
1.5.1 Site Description

Map 1.2 Aerial photograph of a close view of the site, showing the location of the Old Pillbox. (Google Maps, 2011)

The Old Pillbox is presently located at a vacant site in Diamond Hill. The site comprises approximately 7.2 hectares of land bounded by four vehicular roads: the Kwun Tong by-pass (觀塘繞道) to the east, Choi Hung Road (彩虹道) to the south, Po Kong Village Road (蒲崗村道) to the west and Lung Cheung Road (龍翔道) to the north. Since the 1990s, the site was commonly known as the "Tai Hom Village" or the "Diamond Hill squatter area". It was cleared and has been vacant since 2001.

1.5.2 Study Aspects

This study covers part of the area known as the former Tai Hom Village. The Old Pillbox and the Former RAF Hangar will be affected by the construction of the SCL. It is noted that another historic structure, the stone house, is also located within this area but is unaffected by the SCL project. The two subject historic structures will be studied, and their associated context will also be addressed in this report; including through the development of local aviation and during WWII, as well as their adjacent areas, such as the former Kai Tak Airport and Diamond Hill Area.



Map 1.3 Overall View of SCL Alignment & Works Site in Diamond Hill

The scope of the CMP is mainly outlined in the Environmental Impact Assessment Study for the Stabling Sidings at Hung Hom Freight Yard (application number: EIA-197/2011), with guidelines given by the Antiquities and Monuments Office. The following key aspects will be discussed in this report, including:

1. Assessment of Cultural Significance;
2. Assessment of Analysis of Conservation Needs;
3. Identification of Constraints and Opportunities;
4. The Proposed Use: in existing stage, it becomes Dismantling and Storage Proposal that allows maximum future reinstatement options;
5. Review Arrangements; and
6. Supplementary Information, e.g. Bibliography and references, survey data.

1.6 Methodology

1.6.1 Literature Review

A comprehensive review was undertaken of historical records, old maps and photographs, books, periodicals and working papers including the Environmental Impact Assessment (EIA) report, engineering reports, and statutory documents, such as the Outline Zoning Plan and Buildings Ordinance.

1.6.2 Case Referencing

War-time and similar structures in Hong Kong and overseas are the reference points to position the identified structure and assess its significance.

1.6.3 Cross-disciplinary Review Meetings and Discussions

Conservation plans and different technical supporting surveys require input from different disciplines, including a conservation architect, structural engineer and community-planning consultant. Their different inputs put together can contribute the most feasible conservation approach to the historic structure.

2

History

2.1 Site Context

Figure 2.1 Aerial photograph of East Kowloon showing the location of the former Tai Hom Village, where two historic structures are located and its surroundings. (Google Maps, 2011)

The two historic structures are set within Diamond Hill of East Kowloon, which was just adjacent to the Kai Tak Airport, including during the period of Japanese Occupation. To the north of the site is a residential area that includes the Galaxia (星河明居) and Bel Air Heights (悅庭軒) developments and the Housing Ownership Scheme (HOS) flats of Lung Poon Court (龍蟠苑). Nan Lian Garden is on its right; on its left are several community facilities.

South of the site is San Po Kong, an industrial area developed after the 1960s, mainly comprising warehouses, godowns, and more recently, office and hotel developments. During WWII, this area became part of the Kai Tak airport extension, so the site was once adjacent to the border of the airport. The relocation and construction of the existing hangar and pillbox are believed to be closely related to this wartime airport expansion, so it is necessary to consider the history of this area as it may contribute to the cultural significance of the historic structures.

2.2 Historical Background of the Site – a Summary

The demolition of the Tai Hom Village squatter area in Diamond Hill was completed in 2001 and soon thereafter the existence of a wartime pillbox was rediscovered. Together with the nearby hangar and stone house, these historic structures drew public attention with regards to their future use.

Photo 2.1 The Old Pillbox was rediscovered in 2001 during the demolition of Tai Hom Village. (Photograph from 《晴天雨天大磡村》)

Appendix I provides a comprehensive overview of the background and history of the located site and related places, namely Tai Hom Village and nearby villages, the Kai Tak Bund and Kai Tak Airport, as they may contribute to understanding the cultural significance of the identified structures.

Briefly speaking, the location and size of Tai Hom Village has slightly varied from time to time. Whether it was referred to as an agricultural village in the 19th century or as a squatter village in the 1950s, its exact location within the boundary of the existing located site has varied. Naming this site "Tai Hom Village" could therefore be perceived as false, but it has over time become the prevalent name.

The Chu family established Tai Hom Village in the 18th century and by the 1920s Hong

Kong's population had considerably grown leading to a housing demand. Wealthy Chinese investors initially bought property in the area to build country villas and later the Kai Tak reclamation was begun as a housing development that later financially failed. The government took over this development in 1927 and soon after the land was utilized as the Kai Tak Airfield.

Phase Three of the Kai Tak reclamation was completed in 1930 and a permanent base for the Royal Air Force Kai Tak, established in 1927, was completed in 1932. Additionally, the facilities at the airfield were continuing to be upgraded, including the erection of aircraft hangars. To cope with demand a recommendation to further reclaim into Kowloon Bay and extend the airfield was made, but this plan was shelved because of Japanese military hostilities in Asia.

The invasion of Hong Kong by Japan commenced on 8 December 1941 - eight hours after the attack on Pearl Harbour - with Japanese aircraft attacking Kai Tak Airfield; a few minutes later the Japanese controlled Hong Kong airspace. During the Japanese Occupation, the Airfield was greatly expanded and extended inland, villages were cleared and streams diverted into a single nullah.

After the war and again after 1949, the area saw a great influx of refugees into illegal squatter housing in the area. After a few decades, squatter housing in the Diamond Hill area was cleared in stages and the final areas of Tai Hom Village and Ha Yuen Ling were cleared in 2001. Prior to this final clearance, Hong Kong film director Fruit Chan captured the final months of life in Tai Hom Village in his film *Hollywood-Hong Kong*.

2.3 Development History of the Old Pillbox

No plans and documentation can be found to prove the exact time of construction of the pillbox, however discussions on who built this pillbox is as follows:

(a) Pillboxes Erected for RAF Station, Kai Tak

The Hong Kong Defence Scheme was prepared in 1936 and describes possible wartime arrangements planned for the RAF Station, Kai Tak. During attacks by armed or partially armed personnel, "two platoons of infantry are to be provided by the British Garrison", and the area's pillboxes as defensive structures were also mentioned:

> "The Commanding Officer, R.A.F. Station, Kai Tak, will in any emergency take over

> command of the Army Detachments for the protection of the aerodrome. Arrangements for the defence of the aerodrome consist of the provision of a number of pill-boxes, each to hold two Vickers gun, sited at suitable intervals around the aerodrome"[1]

No plans were attached in this Defence Scheme to show the exact location of the above-mentioned pillboxes. However, the pillbox design dimensions for holding two Vickers guns and the "suitable (placement) intervals" around the aerodrome are two crucial factors to infer if the existing pillbox in the former Tai Hom Village was one of the pillboxes planned for RAF Station, Kai Tak before the Japanese occupation.

Analysis 1: "suitable intervals"?

The two illustrations below show Kai Tak Airfield's layout and the surrounding area, the location of the pillbox and whether it had been placed in a line of similar pillboxes at "suitable intervals" prior to the Japanese Occupation

When comparing the boundaries of Kai Tak Airfield before and after WWII (Figures 2.2 and 2.3 are digested illustrations from the attached map on public record – HKRS156-88), it can be seen that the existing pillbox in Tai Hom Village was located far from the airfield before WWII, but was very close to the hangar re-erected by the Japanese during wartime.

There has been active discussion by historians and local amateur history buffs on whether the pillbox was built by either the RAF or the Japanese army. Some heritage concern groups and local amateur historians have discussed the origin of the pillbox on Internet forums, including the websites 'Gwulo: Old Hong Kong' (http://gwulo.com) and 'Hong Kong Place' (http://www.hk-place.com) and commonly supported the alternative opinion that the pillbox might have been built by the Japanese. Given the fact that it is of a unique design, situated on the northern border of the Kai Tak Airport extension, and 100 metres south-east of the re-erected Japanese hangar, it is highly possible that the pillbox is of a later construction and protected the Japanese airplane hangars and the extended airfield.

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[1] Hong Kong Defence Scheme, 1936.

Figure 2.2 Layout of pre-WWII Kai Tak Airfield

Figure 2.3 Layout of Kai Tak Airfield during WWII

Analysis II: Design Dimensions - British Pillbox Standards to Hold Vickers Guns

In 1936, the United Kingdom War Office issued a *Manual of Field Engineering*, giving details for six standard designs of machine-gun pillboxes, one of which is specifically for a Vickers machine-gun[2] (see Figure 2.4).

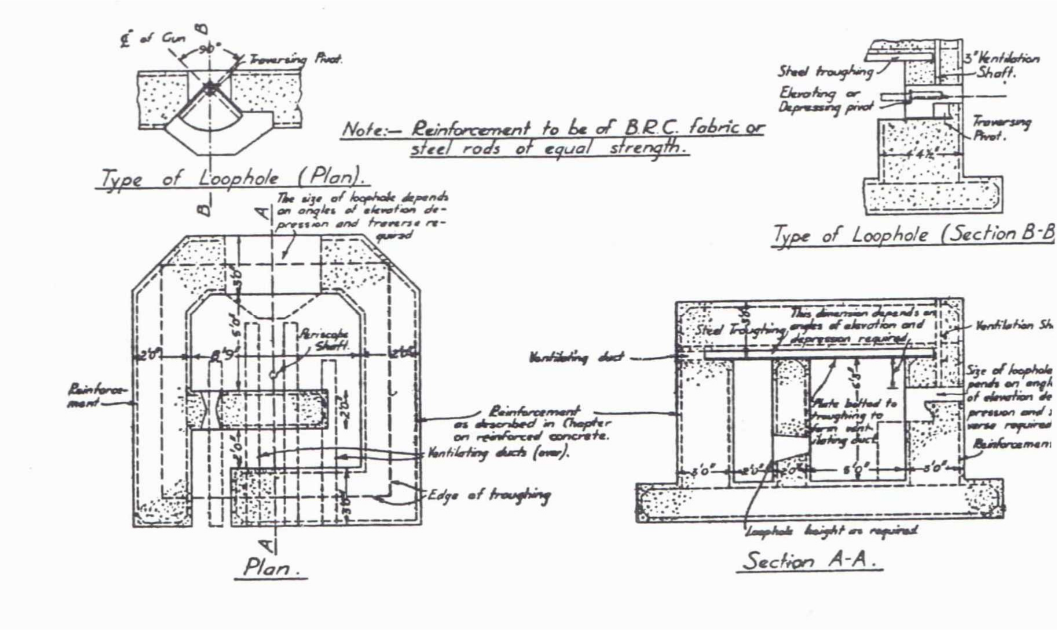

Figure 2.4 Plan of the standard pillbox for a Vickers Gun (see Wills, *Pillbox: A Study of UK Defences*, 1940)

Photo 2.2 & 2.3 Photographs from vickersgun.com: http://www.vickersgun.com/gallery.html

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[2] Wills, Henry. *Pillbox: A Study of UK Defences, 1940*. London: Leo Cooper in association with Secker and Warburg, 1985. Print.

The Vickers gun is a water-cooled, .303 inch (7.7mm) machine gun produced by Vickers Limited, originally for the British Army. The machine gun, together with the water tank and tripod, weigh around 40kg[3]. Typically, it required a six to eight-man team to operate on a battlefield: one to fire, one to feed the ammunition, and the others to help carry the weapon and ammunition. For a pillbox intended to hold a Vickers gun, a Vickers mounting was a required design element for this type of pillbox (see Photo 2.4).

Photo 2.4 (Left) Non-firing museum-piece set up for a Vickers gun with mounting.
Photo 2.5 (Right) Interior of the Tai Hom Village pillbox with no mounting.

From site observations and comparisons with the design of specifically designed Vickers gun pillboxes, no Vickers mounting or its traces can be found in the pillbox in Tai Hom Village. If it is purposely constructed to defend the colonial-era Kai Tak Airfield, the pillbox should have been constructed based on the design requirements set out by the UK War Office; however, judging from the outlook, structure and design, it is in no way similar to any of the standard designs.

During our study, we contacted a specialized "Pillbox study group" (http://www.pillbox-study-group.org.uk/) in the UK, which hosts an online forum. Some of their members replied that "the design (of the pillbox in the former Tai Hom Village) is unlike anything in the UK", and "the Royal Engineers followed very general design patterns, none of which match your pillbox."

(b) Pillboxes Erected by the Japanese

Furthermore, the Pillboxes erected by Japanese during wartime are the very useful source to support the discussion above.

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[3] Bishop, Chris. *The Encyclopedia of Weapons: From World War II to the Present Day*. USA: Thunder Bay Press, 2006. 66. Print.

According to documents produced by the British Army Aid Group (henceforth shortened as BAAG), the Old Pillbox in the Former Tai Hom Village has many physical similarities with other Japanese-erected pillboxes in Hong Kong during the Japanese Occupation (See table 2.1). Both pillboxes are circular in shape with a dome-shaped roof. Embrasures are opened along the periphery. The locations of embrasures are near ground level in which the interior space may probably be semi-sunken as well. One difference between the two is that Diamond Hill Pillbox has a winding staircase, while the pillbox recorded by BAAG has a direct entry.

Table 2.1

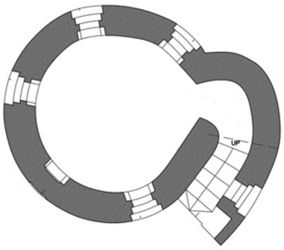
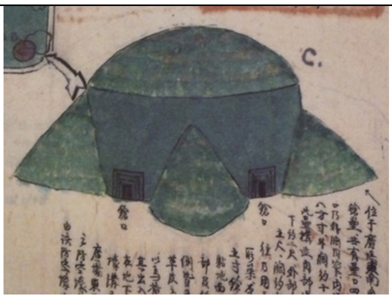
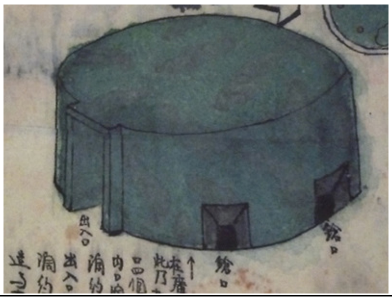
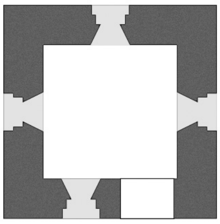
Tai Hom Pillbox	**Japanese Pillbox in Hong Kong (recorded by BAAG)**	**British Pillbox**
 	 	 

Table 2.1 comparing the appearance of three different pillboxes: the Tai Hom pillbox; a Japanese pillbox in Hong Kong drawn by the BAAG; and, a typical British pillbox

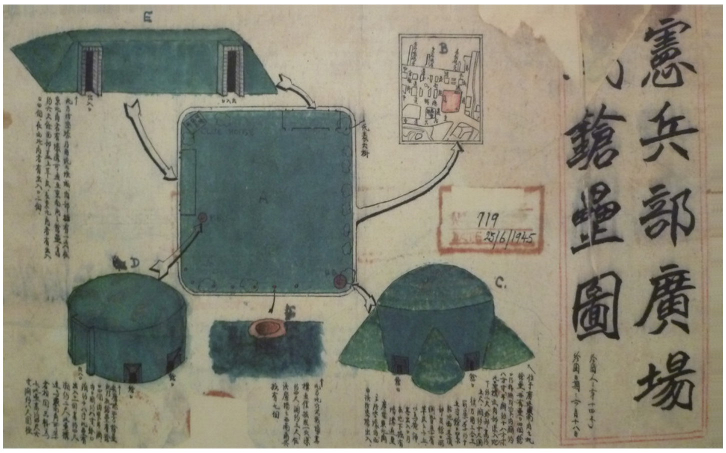


Figure 2.5 Pillbox housing a Japanese machine gun, positioned in the Japanese Kempeitai Square (present-day Chater Garden, Queen's Road Central – the former Hong Kong Cricket Club), circa 1943. (Source: drawing extracted from BAAG, held in the archives of the Australian War Memorial, Canberra.)

BAAG was founded by Colonel Lindsay Tasman Ride (1898-1977) during WWII. He was briefly detained at Sham Shui Po Prisoner-of-War Camp during the Japanese Occupation, but later escaped to Shaoguan. The drawings in Figure 2.5 are military intelligence drawn by BAAG secret agents and although very small, they show great detail of a Japanese pillbox located in Central Hong Kong. Official materials about Japanese facilities in wartime Hong Kong are rarely found and these drawings are a valuable resource for future reference and comparison.

The book *Pillboxes of Britain and Ireland* records more than a hundred different types of British pillbox, most of which were constructed with a flat roof slab, while the layout plans are usually rectangular or hexagonal in shape. A circular layout was seldom found. Also, there were always mountings for Vickers machine-guns inside British pillboxes. Looking at the Japanese pillbox drawn by BAAG, the roof is dome-shaped and the body is circular, which is very similar to the existing pillbox in Diamond Hill. This visual analysis may not allow a conclusive statement to justify the origins of the pillbox, however, it may help contribute to knowledge gaps, and provide a future reference for historians.

Photo 2.6 Interior of British-built pillbox

Photo 2.7 Interior of Diamond Hill pillbox

After the war, the former Tai Hom Village pillbox was abandoned and soon occupied as accommodation in the Diamond Hill squatter area (see photo 2.8 & 2.9) where it was discovered and retained after the clearance and demolition of Tai Hom Village.

Figure 2.8 & 2.9 Photographs show the pillbox converted into a domestic living space after WWII (Photographs from 《晴天雨天大磡村》)

2.4 Chronological Outline of History

Year	Event
1943	It is believed that the pillbox was built near the relocated hangar, as a defence military structure to protect the hangar that housed combat aircraft. As archive shows that the hangar was built in 1943, it is hypothesized that the pillbox was constructed in the same year.
Post-war	The pillbox was abandoned soon after the war and occupied by people as accommodation in the Diamond Hill Squatter Area.
2000	The pillbox was discovered and retained after the clearance and demolition of Tai Hom Village.

3

Architectural Appraisal

3.1 Setting and Layout

The pillbox is situated about 40 metres from the western side of the hangar. A winding staircase facing east leads to its semi-sunken interior. This is the only access into the pillbox. There is an underground concrete chamber next to the pillbox which appears to have no physical connection to the pillbox after superficial inspection. (Refer to P.9, Condition Survey for the Existing Stone House and Pillbox at DIH, February 2009). No sign of military purpose regarding this kind of covered underground chamber could be identified.

Photo 3.1 & 3.2 The above photos show the outlook and entrance of the pillbox.

3.2 Physical Description

The pillbox is semi-sunken with a winding staircase leading to its interior, 900mm below the existing ground level. The staircase headroom is 1.8m. The internal diameter of the pillbox is approximately 3.8 metres wide while the highest clear headroom is 2.5m.

The structure is composed of a dome shaped reinforced concrete roof of varying thickness of between 480mm to 580mm. The roof is supported by a hollow concrete block wall of various thicknesses ranging between 665mm to 730mm around the pillbox perimeter. The roof’s dome shape profile spans to the periphery with an arching effect to compensate against vertical loads. The hollow block wall provides vertical support to the roof. The circular layout of the pillbox enables the wall to have some arching effect against the underground soil. This wall rests on a reinforced concrete base slab of thickness varying between 120mm to 380mm.

There are six embrasures with various dimensions along the perimeter of the dome. One has been blocked; while another is on the wing wall of the staircase. The thickness of the wing wall is approximately 700mm. The physical condition of the pillbox is generally good, except for spalled concrete found at some spots on the roof surface. The external cement mortar between masonry blocks has been lost due to weathering. The structural bonding has drastically weakened.

3.3 Physical Assessment

3.3.1 Typology of the Pillbox

As mentioned in the previous chapter, the Diamond Hill pillbox was most likely built by the Japanese army during WWII, rather than by the British.

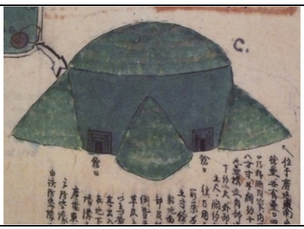
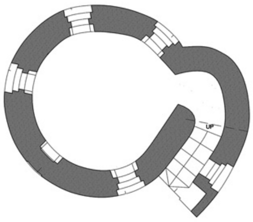
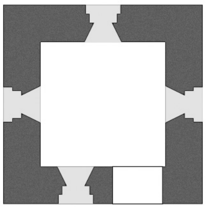
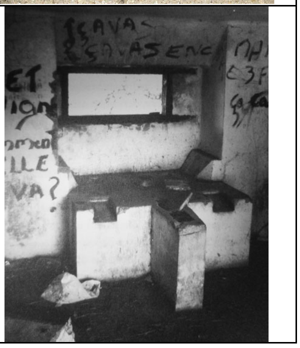
	Diamond Hill Pillbox	**Japanese Pillbox in Hong Kong** *(recorded by BAAG)*	**Typical British Pillbox**
Exterior			
Layout		*N/A*	
Embrasures		*N/A*	
Interior		*N/A*	

Table 3.1 Comparison of Pillboxes: the Diamond Hill pillbox (Left); a Japanese pillbox in Hong Kong drawn by the BAAG (Middle); a typical British pillbox (Right).

The table above demonstrates a morphological comparison between the three different pillboxes. It is observed that both the Diamond Hill pillbox and the pillbox recorded by BAAG have dome-shaped roof slabs. Furthermore, both pillboxes have a circular structure and layout plan; with embrasures that open along the exterior wall and probably no blindspots.

Pillboxes of Britain and Ireland is a publication outlining over a hundred different types of British pillboxes. Most of the British pillboxes were constructed with a flat roof slab, while the layout plans are usually rectangular or hexagonal in shape. A circular layout was seldom found. In addition, there were always mountings for Vickers machine-guns inside British pillboxes, of which there is no such similar installation inside the Diamond Hill pillbox. A shared characteristic is the splayed wall with stepped profile of the embrasure. However, this feature should be standard for all types of pillbox serving such a similar purpose. In Addition, there are still some military remains in Hong Kong which were built by British Army during WWII. They possesses similar physical characteristic of those pillboxes in Britain. Further information regarding Hong Kong pillboxes can refer to Appendix II.

This visual analysis may not allow a conclusive statement to justify the origins of the pillbox, however, it may help contribute to knowledge gaps, and provide future reference for historians.

Comparison with other pillboxes in Hong Kong

According to the general survey of other surviving pillboxes in Hong Kong, seldom do they have dome-shaped appearances. Besides, all of them have not yet been graded, in which the Pillbox in Diamond Hill built an additional heritage value as part of Hong Kong’s military history.

The common rectangular shape Pillboxes built by British Army before WWII in Tai Tam Gap (left) and Waterfall Bay (right).

3.3.2 Pragmatic Design for Military Purposes

The pillbox is a pragmatic structure built purely for defensive military purposes. It can be deduced from all available information that the pillbox is most probably the only surviving WWII military structure built by the Japanese army in Hong Kong.

Size, Shape and Embrasure

The purpose of a pillbox is simple and direct and its size was carefully designed. It should be small in order to attain a defensive purpose; this is achieved by its circular form and semi-sunken nature to minimize any exposure to an enemy. On the other hand, the internal space should be large enough for armed soldiers to move around. The dome-shaped roof design can minimize the external (military target) surface area but, at the same time, can maintain a maximum internal space capacity.

The splayed walls (the interior opening is small while the exterior opening is large) of the embrasures allow greater sight coverage to guard a nearby strategic facility (the adjacent hangar, in this case), while, at the same time, keep soldiers inside secure if fired upon. Furthermore, one of the embrasures is open on the wing wall of the staircase: this design ensures all-round sight coverage with no blindspots towards its surrounding.

Construction

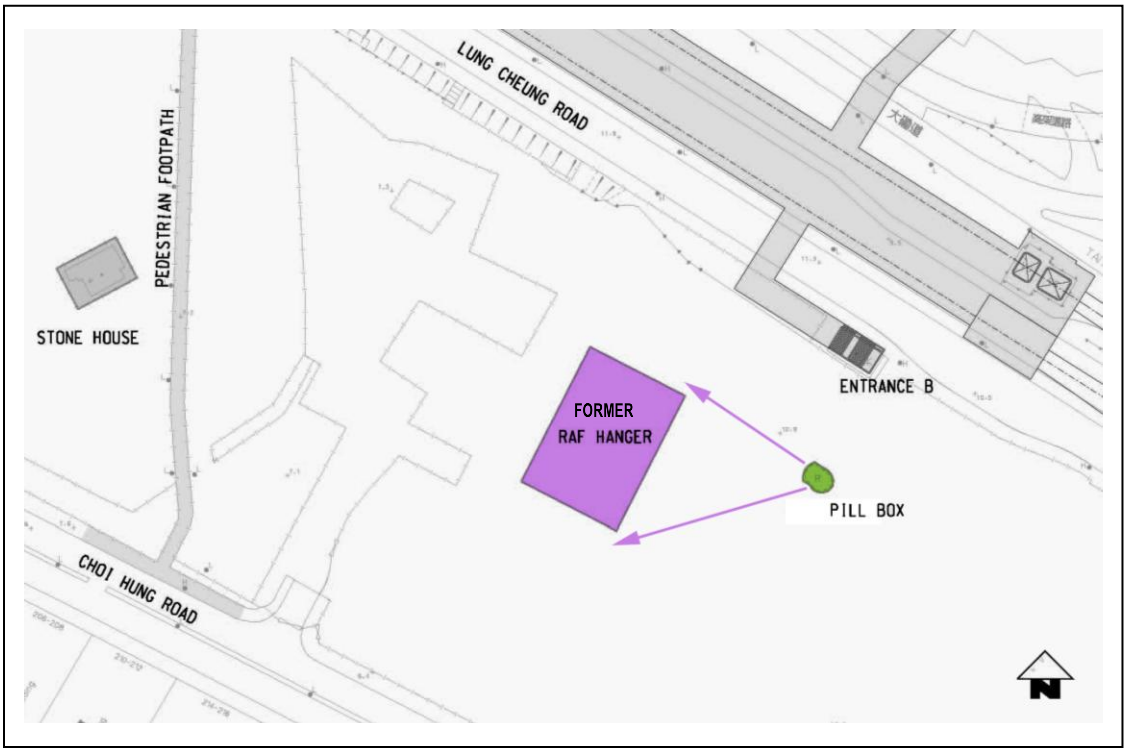
The pillbox was built using masonry blocks and a concrete roof slab. Masonry work is flexible and allows speedy construction. The dome-shaped roof both minimizes the exposure to an enemy and is more structurally sound than a flat roof and more efficient supporting vertical loads. A flat roof may also encounter problems of surface drainage and any accumulated rooftop rainwater will cause additional loading to the structure.

The semi-sunken setting minimizes the pillbox’s surface area and reduces the chance of it becoming an enemy target. In addition, the inward loading from the underground soil can in turn strengthen the integrity of the whole structure.

Authenticity of the structure

This simple structure with no suspicious addition or removal has been noticed, except one of the embrasures on the eastern side of the Pillbox has been filled with plaster. It is probably to be done by the squatters who had occupied this space.

Location



Map 3.1 The map shows the position and distance between pillbox and hangar – both serving a military function.

The pillbox is located about 40 metres away from the hangar to provide military protection on the rear-side of the hangar. The pillbox is semi-sunken, however, it is situated on a sloping topography, higher than the surrounding ground. Although the hangar is much taller than the pillbox, this site setting makes the elevation of the pillbox similar to the hangar. The level of the pillbox roof is +14.80m above the principle datum; while the level of the hangar roof is +15.70m. This is a deliberate site design strategy to achieve the defensive purpose.

3.3.3 Underground Concrete Chamber

There is an underground concrete chamber next to the pillbox being found during the general survey and structural investigation. (Refer to P.9, Condition Survey for the Existing Stone House and Pillbox at DIH, February 2009). According to general typological study of pillboxes, no such structure was identified, except, there is one pillbox in Britain with structure looked similar to that of Diamond Hill pillbox. However, they differ from their location, size and appearance.

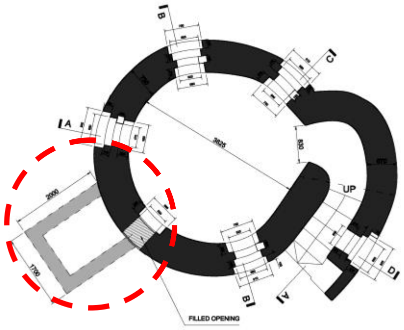
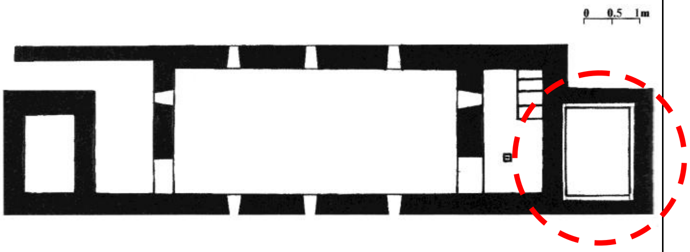
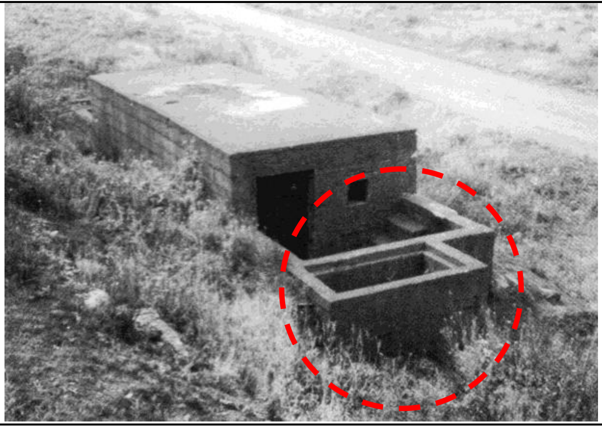
	Diamond Hill Pillbox	**British Pillbox**
Location		
	The structure is away from entry	The structure is next to entry
Appearance		
	(Covered) underground chamber	(Open) pit
Size	Approx. 2m x 1.7m *(size estimation refers to p.9, Condition Survey for the Existing Stone House and Pillbox at DIH, Feb 2009)*	Approx. 2.5m x 2m
Function	Unidentified	For mounting small mortars

Table 3.2 Comparison of the chamber: Diamond Hill pillbox (left); British pillbox (right).

Although there is no proof of physical relationship between the chamber and Diamond Hill pillbox, it is still inconclusive that the chamber is historically, culturally or architecturally insignificant. Further investigation should be carried out by contractor to understand and identify the role of this structure.

3.3.4 Surrounding Trees

The pillbox was built by the Japanese army to protect the hangar 40 metres away. The present surrounding mature trees may not be the original intention, because they would block sightlines to the hangar. These trees may obscure the understanding of the place.

4

Statement of Cultural Significance

4.1 Historical Significance

As the pillbox is most probably the only surviving WWII military facility built by the Japanese army in Hong Kong, it witnessed the Japanese occupation of Hong Kong and the first tactical military steps to take control of the entire Far East. It was specifically built to defend Japanese military flights at a strategically important military air base during WWII.

During the period of Japanese Occupation, a few pillboxes were built in urban areas, including in Central and Wan Chai, these can be identified in old photographs. Most pillboxes were demolished after the Japanese surrender and retreat from Hong Kong. The pillbox in Kai Tak Airport survived only because it had a domestic use in an area that was largely left undeveloped: it was a shelter for people during the difficult post-war economic period. Together with the hangar, the pillbox contributes a richer wartime history and its detailed design visualizes military considerations on this specific site.

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Photo 4.1 (top) & 4.2 (bottom) Photos from after 1941 show other pillboxes located at Hennessy Road Wan Chai and Central.

4.2 Architectural Significance

The Pillbox can be deduced from all available information that it is most probably the only surviving WWII military structure built by the Japanese Army in Hong Kong. As part of Hong Kong's military it has built heritage value.

It is pragmatic, purely an engineering construct. Its form and shape already speaks itself. The circular form, the dome-shaped roof and semi-sunken nature are aimed at minimizing the exposure to enemy; while its altitude with respect to the Hangar and the all-rounded embrasures ensures the full surveillance to its surroundings. Most probably, the Pillbox was once covered with vegetation and painted in earth tone to achieve the camouflage effect.

The building form, embrasures, entry leading to underground, internal space and semi-sunken arrangement are all inseparable character-defining elements to reflect the identity of the pillbox and contributes significantly to the Japanese military architecture of WWII. Pillbox is armored unit. Its essential role is to defend an area, or military facilities (to protect the Hangar in this case). Isolating the Pillbox or detaching its physical relationship (position and distance with respect to the Hangar) may substantially spoil its significance.

4.3 Social Significance

With its particular construction period during wartime, it is of historical local interest to military enthusiasts and historians and has a curiosity value to others.

After WWII, the pillbox was converted into a domestic living space and became part of the Diamond Hill squatter area, witnessing the poor living condition of refugees after World War Two, thus it also signifying the ‘recent history’ of the site. Squatter areas throughout Hong Kong were a social phenomenon after WWII due to the great influx of refugees from the mainland. The colonial government systematically planned the clearing of all squatter areas through its comprehensive housing and resettlement policies between the 1950s to 1990s. Prior to the Diamond Hill squatter area being cleared in 2001, it was the largest squatter area at that time and housed over 2,300 families.

Assessment and Analysis of the Level of Significance

5

5.1 Definition of Character-Defining Elements

Although it was once occupied by squatters after WWII, the pillbox was built as a military structure solely for defensive purposes. Its dome-shape design, semi-sunken profile and close physical relationship (position and distance) with the hangar links the pillbox to the historic wartime period.

To understand the heritage value of an item, it is a common practice to analyze the significance of each part as well as a whole. The heritage value can be quantified or categorized into character-defining elements (CDEs) possessing different degrees of significance. According to the Standards and Guidelines for the Conservation of Historic Places in Canada, character-defining element refers to the materials, forms, location, spatial configurations, uses and cultural associations or meanings that contribute to the heritage value of an historic place, which must be retained to preserve its heritage value. A hierarchy of significance can then be established by specifying a degree of significance for a particular item. This method is useful as a basis to formulate a conservation policy, and then, the appropriateness of any conservation work can be justified.

CDEs are the specific attributes of a building, structure or place that determine heritage value and reveal the unique context behind the construction or its function. They refer to all those visual aspects and physical features, such as the overall shape of the buildings, its materials, craftsmanship, decorative details, interior spaces and features, as well as the various aspects of its site and environment.

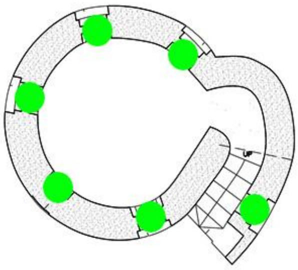
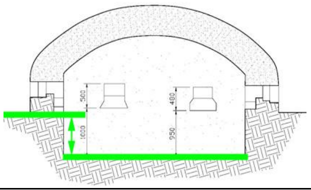
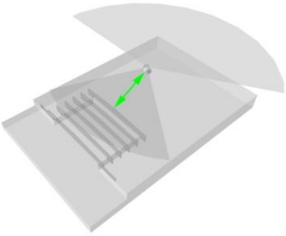
Table 5.1 Grading and Definitions of Character-Defining Elements

Degree of significance	**Meaning**
High	Individual space, fabric or element that displays a major contribution to the overall significance of the place. Space, fabric or element exhibits a high degree of intactness and quality, though minor alterations or degradation may be evident.
Medium	Individual space, fabric or element that makes a substantial contribution to the overall significance of the place. Space, fabric or element originally of some intrinsic quality, and may have undergone minor or extensive alteration or degradation.
Low	Individual space, fabric or element that makes a minor contribution to the overall significance of the place. Space, fabric or element originally of little intrinsic quality, and may have undergone alteration or degradation. This category also includes original spaces, fabrics or elements of any quality, which have undergone extensive alteration or adaptation to the extent that only isolated remnants survive.

The CDE summary below identifies the materials, form, and spatial configurations, and cultural associations that contribute to the heritage value of a historic place or item, in this case, the Old Pillbox - and highlights elements that should be retained in order to preserve its heritage value.

5.2 Identification of Character-Defining Elements of Pillbox

Table 5.2 Pillbox

	Item	**Photo**	**Level of significance**	**Remarks**
1	Existing building form		High	
2	Embrasures (Number and location)		High	The size and location of embrasures are critical to provide comprehensive military defence.
3	Stepped profile of embrasures		High	
4	Semi-sunken construction		Medium	
5	Physical relationship - distance and relative position with the hangar		Medium	The pillbox is an 'armored' structure. Its essential role is to defend an area, or military facilities (to protect the hangar, in this case). Isolating the pillbox or detaching its physical relationship away from the hangar may substantially spoil its significance.

6

Identification of Opportunities and Constraints

6.1 Scheduled Timeframe for Infrastructure

The construction works of SCL is scheduled to commence in early 2013 in order to meet the targeted opening of the SCL in 2018. The conservation management plan for handling the Old Pillbox is required to be submitted before construction work begins. Within this timeframe, the conservation details such as the relocation site and forms are yet to be confirmed, and therefore, in this special case, maximum flexibility for future reinstatement and minimum loss of cultural significance are the criteria to follow in drafting the management plan. The purpose of heritage conservation is always to care for places and items of cultural heritage value and to take necessary steps to retain and reveal those values.

6.2 Land Availability and Compatibility with Future Planning

The Former Tai Hom Village Site is zoned as a Comprehensive Development Area (CDA), and is unallocated government land. The development planning on the future site will highly affect the reinstatement arrangements.

Part of this site is temporarily granted for SCL railway construction use and sufficient open space will also be needed and should be provided for preparatory work and repair of the pillbox. Proper access roads for mechanical plant are also anticipated to enable the relocation of the pillbox.

6.3 Structural and Safety Constraint

According to the “Structural Investigation and Appraisal Report for Old Pillbox”, dated March 2011 and conducted by AECOM, the pillbox is generally in fair condition with no signs of distress. However, as there is no mortar between the masonry, the wall has an increased susceptibility to cracking and disjointing during transportation. There is spalled concrete at some spots on the roof, and the reinforcement steel is exposed. The crushing strength of the concrete roof slab is considered weak; therefore, the masonry wall and the concrete roof structure should be reinforced to enhance the integrity of the pillbox.

6.4 Chance to Halt Further Deterioration

The pillbox was left unattended after WWII and then occupied by squatters within the Diamond Hill village and again left unattended after squatter eviction was completed. It has only been during recent development proposals for the Diamond Hill CDA that the heritage value of the pillbox has been recognized. Although the pillbox has to be relocated and some heritage value may be lost, the structure should be securely stored to prevent further deterioration. Furthermore, the masonry wall can be repaired with appropriate mortar to enhance the stability and integrity of the whole pillbox structure after its future reinstatement.

6.5 Monumental Structures can be Integrated into Public Space

The dismantling proposal for the pillbox in this CMP and for its storage on site allows for future opportunities that can be conducive to providing a sense of belonging for local residents and the community. Any proposal or opportunities for the pillbox's future use and location should be developed together with discussions about plans for the future CDA site; therefore allowing the overall environment and usage of the pillbox to be considered in a holistic manner.

7

Conservation Principles and Guidelines

7.1 Introduction

The purpose of heritage conservation is always to care for places and items of cultural heritage value and to take necessary steps to retain and reveal those values. The physical relocation of cultural heritage items has great shortcomings as such action will separate the heritage from its historical location and the heritage could be irreversibly damaged during relocation. This practice is generally not encouraged unless this is the sole practical means of ensuring its survival.

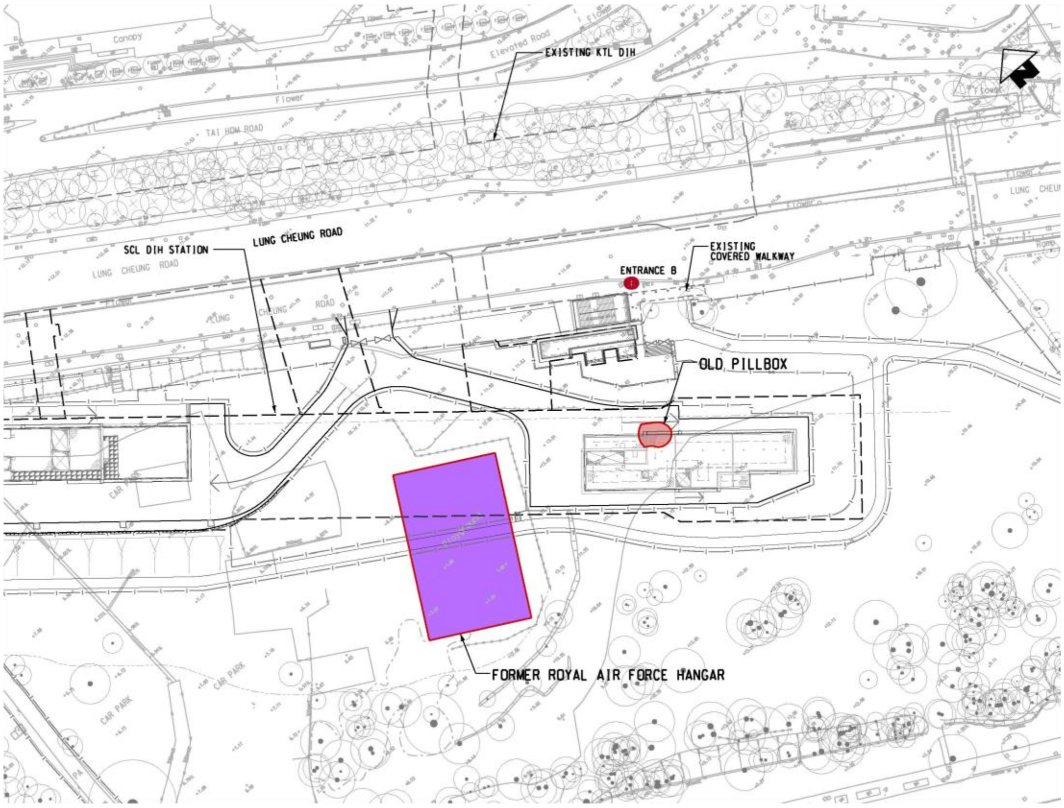


Figure 7.1 Map showing the location of a new Diamond Hill Station.

As shown in the diagram above, the location of the hangar and pillbox overlaps the physical location of a new Diamond Hill Station for the SCL – thus, also, overlapping the construction area for this new station. It is therefore recommended that the pillbox be conserved by relocation and later reinstatement.

The reinstatement proposal will be determined within the context of the planning for the future CDA site. In order to facilitate the approaching construction of the Diamond Hill Station, the two structures are recommended to be relocated and properly stored.

Considering the development history, architectural merits, and technical constraints of the pillbox, the following heritage conservation guidelines are generally recommended:

1. Respect its changes and its various uses over time. It is not necessary to simulate the original state;

2. Remove or alter the elements that may affect the comprehensiveness of the heritage value;

3. Replace such damaged elements only when they are too deteriorated to reuse and the replacement should match the forms, materials, and details of the original elements;

4. Respect the original character, architectural style, or building method of the heritage;

5. Retain its traditional material or structural system as much as possible;

6. Recognize the relevant location that can sustain the structure its heritage value;

7. Maintain the heritage value by minimum intervention in general;

8. Maintain any intervention physically and visually significant to the heritage;

9. Document any intervention made for future reference;

7.2 Identification of Constraints on Relocation Work and Temporary Storage

The pillbox is an integrated masonry structure with a reinforced concrete roof. It weighs approximately 120 tonnes. Relocation of the whole pillbox requires installation of substantial temporary reinforcement and bracing over and underneath the structure. Large mechanical lifting equipment is required to lift the whole structure to make it ready for relocation delivery to the temporary storage compound. Disjointing and cracking of the masonry wall may occur due to any unsynchronized movement during the course of transportation. A reinforced concrete ring wall may be installed to tie together the pillbox wall. It is noted that this process must be repeated from the storage area to the newly assigned site for reinstatement. Therefore, further site investigation, especially of the buried sections of the pillbox's walls and base slabs will be necessary to determine the feasibility of installing a temporary 'raft' to entirely support and suspend the pillbox.

7.3 Relocation Work Proposal

Generally, relocation of the pillbox in one piece can reduce loss to the heritage value of the pillbox. However, this process has inherent technical difficulties that may inadvertently induce damage to the structure during the course of transportation. Extensive site investigation of the structure should be carried out in order to formulate a comprehensive strategy. The relocation work sequence to the temporary storage is proposed as shown below:

1. Excavate down and around the pillbox by forming a temporary cut of a maximum 30 degrees to provide access and working area for horizontal pipe piling.
2. Install horizontal pipe piles and pre-bored piles underneath the pillbox structure.
3. Construct a reinforced concrete ring wall around the pillbox.
4. Further excavate down and underneath along the edge of the pillbox and excavate a maximum of one metre inwards. Install the required universal beam underneath and at a perpendicular direction to the pipe piles, weld universal beam to the pipe piles.
5. Repeat step 4 above to install three more universal beams, and weld universal beams to the pipe piles.
6. Further excavate down to two metres below the horizontal pipe piles, and expose the pre-bored piles.
7. Install and weld another two universal beams to the previous four universal beams.
8. The universal beams form a steel frame platform underneath the pillbox. The platform together with the pillbox structure are hoisted and transferred to a sliding channel for delivery.

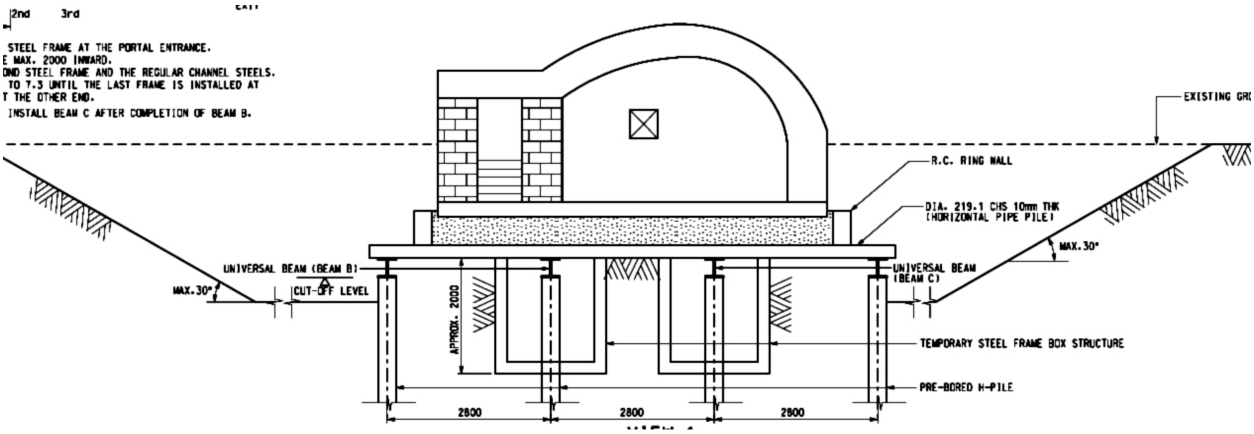


Figure 7.2 Site section shows the excavation and installation of pipe piling underneath the pillbox.

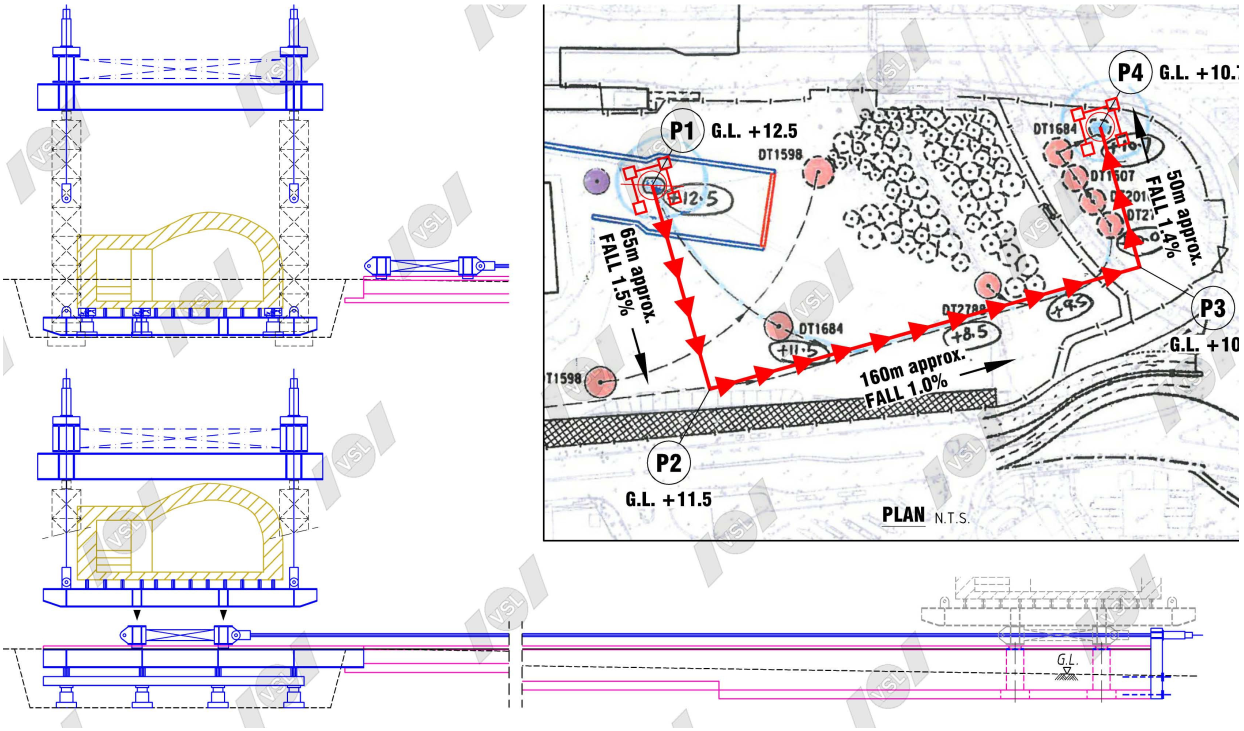


Figure 7.3 Diagrams show the proposed relocation process and tentative route to the temporary storage compound.

It is noted that the pillbox should be strengthened by installation of steel framing inside the pillbox prior to the course of delivery and should not be removed until reinstatement at a new location.

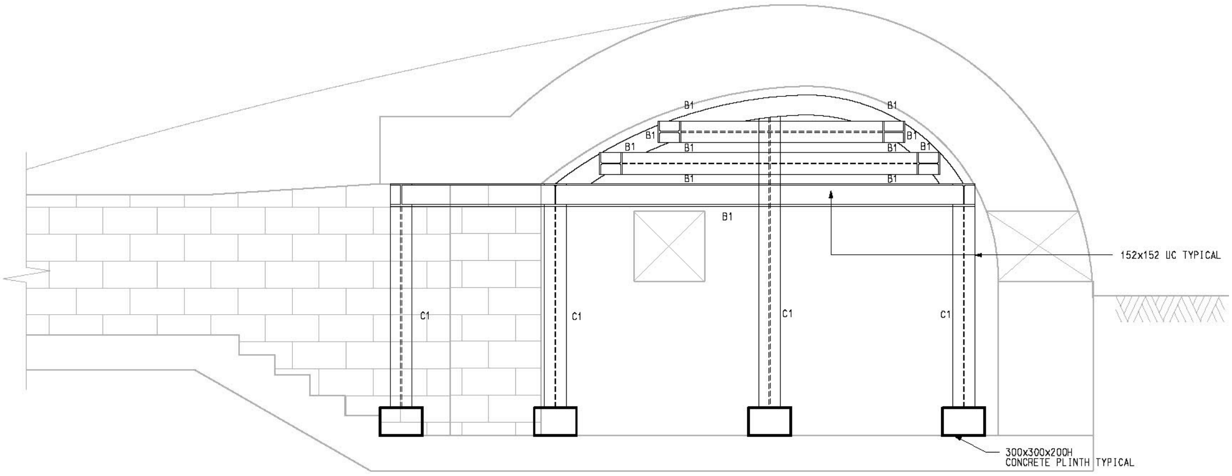
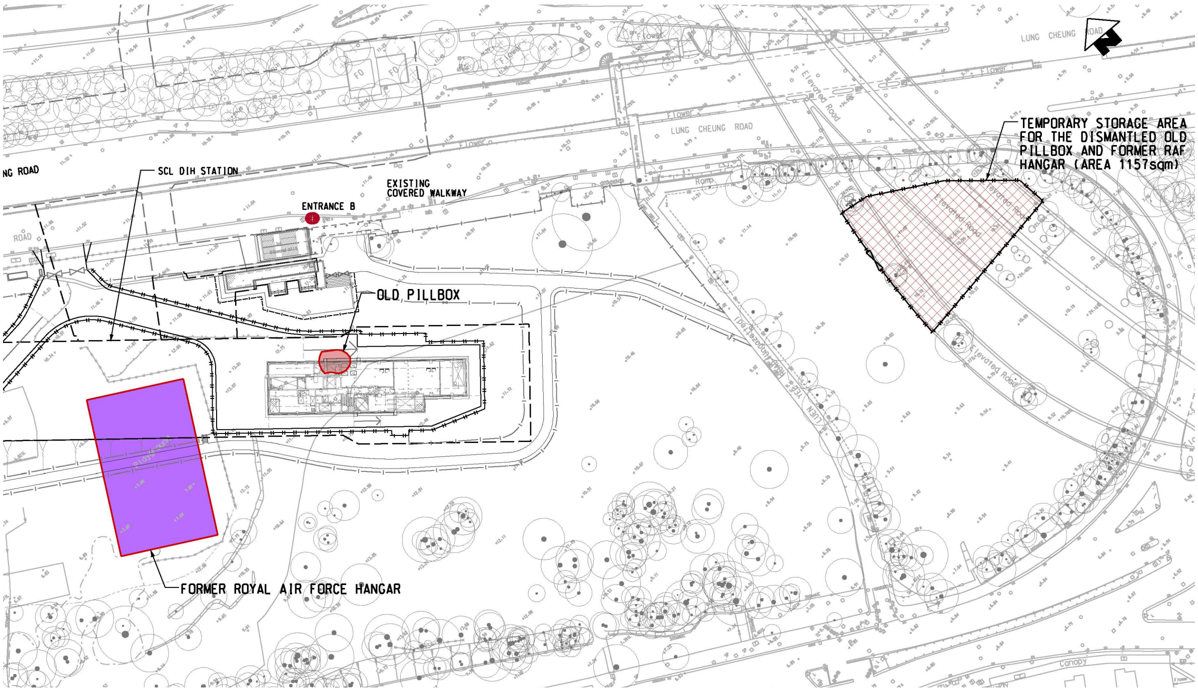


Figure 7.4 Steel framing to be installed inside the pillbox.

7.4 Temporary Storage Proposal

The reinstatement proposal has not yet been consolidated, however, in the interim; the dismantled elements should be securely stored and archived. The proposed storage place is located under the flyover to the Tate's Cairn Tunnel, which is located at the eastern side of the Diamond Hill site.



Map 7.2 The map above shows the proposed location of the pillbox storage place (red hatched area).

The storage place should be in the form of a temporary compound with enclosure to avoid rain and sunlight. The interior space should be well-illuminated, and well-ventilated either by mechanical fan or window at a high-level. The internal layout should be clear and direct, and should facilitate regular inspections. The floor should be paved with concrete and ground drains should be properly installed. All dismantled elements should be securely placed on concrete plinths at least 600mm above ground level.

7.5 Impact Assessment and Mitigation Measures

The relocation of the pillbox is unavoidable and its later reinstatement means that it cannot feasibly be kept intact. Under this circumstance, the impact to the heritage can never be negligible. A comprehensive mitigation measures should be carried out in order to minimize the loss of its significance, in which the community can still enjoy and understand the heritage value even the said extensive changes (relocation and reinstatement) have been carried out.

1. Complete photography and cartographic survey of all structural components and overall geometric measurements for future reference;

2. Slight alterations may be required by a prescribed structural engineer to meet the current structural and fire safety standards.

3. Sufficient temporary bracing and underpinning should be installed to support the whole structure during transportation;

4. The route to the storage area should be carefully planned to minimize any accidental vibration during the course of transportation;

7.6 Management and Maintenance Plan

1. The reinstatement proposal will be determined together with the development of the CDA site planning.

2. In order to avoid any loss of information and heritage value of the pillbox, all the elements from the structure of the pillbox should be retained and properly stored.

3. The masonry structure should be carefully labeled with photographic records before transportation to the storage area.

4. The pillbox is enclosed by a hollow concrete block wall which supports a dome-shape reinforced concrete roof that rests on a reinforced concrete base slab. During relocation, care should be taken to preserve the pillbox's existing geometry, elevations, dimensions and masonry units.

5. The proposed relocation method should be fully supervised by a prescribed structural engineer and conservation consultant for close monitoring and to ensure safety and quality control during the course of all removal and reinstatement work.

6. The temporary storage area will be within the site bounded by Lung Chung Road and Choi Hung Road.

7. A temporary storage compound should be provided with appropriate measures to prevent further damage to the heritage structures.

8. All elements should be securely protected to avoid any physical damage and the area should be fenced off to prevent trespassing and to secure the structures.

9. Proper surface drainage should be constructed throughout the storage area. The retained structures should be elevated to keep the heritage items out of water.

10. The structure should be archived in a methodical way that they can easily be accessible for examination during the period of storage.

11. A directory or guidebook indicating the location of every dismantled part should be kept in the shelter for reference. Apart from the accommodation, the shelter should provide a working space to allow staff to withdraw the structure for examination and testing if necessary.

12. Maintenance work should be governed by The Burra Charter principle of 'do as much as necessary and as little as possible'. A maintenance schedule should be developed which includes:
    i. Regular inspection to check the degree of any deterioration over time of all the retained parts;
    ii. Regular inspection on the reinforced roof structure, floor slab and stairs of the pillbox;
    iii. Regular monitoring of the site’s drainage and of any sign of water entering into the storage shelter;
    iv. Remedial procedures to handle any non-conforming situations.

13. The maintenance plan should be reviewed every six months by prescribed building management and conservation consultants to ensure the proper execution of the programme and meet current standards of quality control.

14. A maintenance manual or handbook delineating the recommended procedures of carrying out necessary maintenance work should be compiled and should be provided to future frontline maintenance staff to ensure their adequate understanding of their duties and the need to better maintain the stored structure.

15. The proposed Implementation Programme and Maintenance and Management Schedule are attached as Appendix V.

8

Conclusion

The dismantling work and temporary storage of the pillbox heritage structure is at a midway point in the whole conservation process. The objective at this stage should be to keep the dismantled parts in order and in good condition so that all the dismantled parts can be properly delivered to the next, reinstatement, stage.

8.1 Site Supervision

The dismantling work should comply with the Buildings Ordinance. Good practice should take reference from other relevant statutory requirements to ensure the quality of the work. Apart from technical considerations, qualified supervision by a registered structural engineer and a conservation consultant are required to ensure that the dismantling work and temporary storage can be properly carried out. A site safety and quality supervision plan should be prepared before the commencement of work.

8.2 Documentation

Comprehensive documentation of every procedure should be carried out. Photographic and cartographic surveying should be conducted, with every component being numbered before dismantling. The whole dismantling process should also be recorded for future reference. All survey reports, conservation studies, progress reports, record drawings as well as site inspection records should be kept at the site office of the storage shed. The information should be made available for operators who are responsible for managing any changes to the heritage items.

8.3 Management Structure

Conservation consultants and prescribed building professionals should be appointed in the project team during the design and working stages to ensure that the conservation policies stated in the Conservation Management Plan can be properly executed. A management committee consisting of building professionals should be set up to monitor the operation of the management plan as well as to coordinate with the Planning Department to formulate the reinstatement proposal for the two structures.

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Sheet number 11-NE-6D. 1975. Crown Lands and Survey Office, Hong Kong

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“Inspection visit to Kowloon Tong Model Village rescheduled – airfield extension work commences on the 15th, villagers should take the bypass" *Overseas Chinese Daily News* 13 Sep 1942. Print.

"Age of aviation in Hong Kong, description of new civil hangar built at Kai Tak Aerodrome, stimulus for local services" *South China Morning Post*. 5 April 1932. Print.

Report

Archaeological Survey a Tai Hom Tsuen.

"Historic Building Appraisal – Old Pillbox, Diamond Hill, Hong Kong". The Antiquities and Monument Office.

Appendices

Appendix I

Historical Context Relevant to an Understanding of the Old Pillbox

Introduction

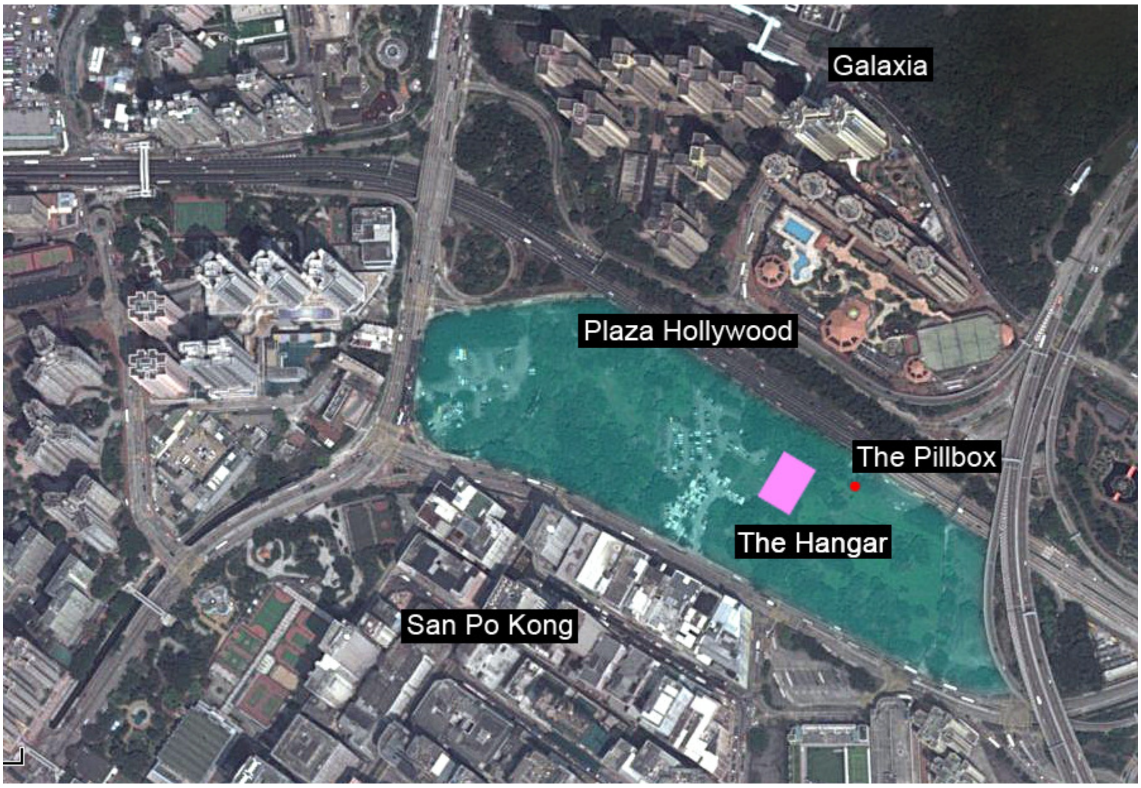

Figure a1 Map showing the CDA site and the historic structures.

The clearing and resumption of the Tai Hom Village squatter area was completed in 2001 and after this date the existence of a wartime pillbox was rediscovered. The following sections will explore the historical value(s) of the old pillbox and, provide an overview of the background of this area, covering the located site and the related place, namely Tai Hom Village and nearby villages. Also covered are the Kai Tak Bund and Kai Tak Airport, as they may each contribute to the cultural significance relating to the old pillbox.

While examining the history of this area, the location and size of Tai Hom Village has slightly varied from time to time. Whether it was referred to as an agricultural village in the 19th century or as a squatter village in the 1950s, its exact location within the boundary of the existing located site has varied. Calling this site "Tai Hom Village" could be perceived as false, but it has become the prevalent name. To understand any misconception related to the name of Tai Hom Village, it is necessary to analyse the origins of the village.

Tai Hom Village during the Qing Dynasty

The Chu family (朱氏家族) established Tai Hom Village, located south of Diamond Hill, in the 18th century. The Chu family's apical/titular ancestor lived in Kwangsi Province (廣西省) in the late

Ming Dynasty, but then moved to Waizhou in Guangdong Province. A sixteenth generation descendant born in 1771 moved to Kowloon City, and then to Diamond Hill and is said to have become wealthy from quarrying and construction, later acquiring many houses and farmland. In Tai Hom (Tai Tan Tsun in Figure a2), they formed three family branches (三房) derived from each of the sons[1].

At the time when Tai Hom was founded, some villages had long been established in East Kowloon, of which Nga Tsin Wai (衙前圍) and Po Kong (蒲崗) were the two leading villages, each with their own temple serving as a centre to discuss community affairs. Nga Tsin Wai was a walled city established in the 16th century. It headed an inter-village union named the "Kowloon League of Seven"(九龍七約), which comprised nine villages, namely: Nga Tsin Wai itself, Kak Hang (隔坑), Tai Hom (大磡), Shek Kwu Lung (石鼓壟), Ta Kwu Leng (打鼓嶺), Sha Po (沙浦), Nga Tsin Long (衙前塱), Ma Tau Wa (馬頭圍) and Ma Tau Chung (馬頭涌). Another alliance, called the "Six Villages Alliance" (六鄉) comprised: Po Kong (蒲崗), Chuk Yuen (竹園), Sha Tei Yuen (沙地園), Nga Yiu Tau (瓦窰頭), Ngau Chi Wan (牛池灣) and Yuen Ling (元嶺)[2].

The inter-village alliance is a mutual defence grouping against outside attack. For more effective protection, alliance members usually comprised of adjacent villages. Though nearer to Po Kong (蒲崗), Tai Hom joined the more distant "Kowloon League of Seven" (九龍七約) (see Figure a2). The reason is unknown, but Tai Hom's isolation from surrounding villages eventually led to the establishment of their own temple in front of their village.

The story of how the temple evolved is as follows: on the paddy fields where the Chu family grew rice, one family member placed an image of the Goddess of Mercy (觀音) near the field, after which better crops were produced. The village elders then erected a small Kuan Yan temple (觀音廟) in the 1840s[3]. The Chu clan managed this temple, and it soon became the religious focus for all the villages. In 1904, with financial support of merchants from the Nam Pak Hong (南北行) on Hong Kong Island, a new Tung Shan temple (東山廟) was built, just next to the Kuan Yam Temple[4]. These temples were treated by people as one entity and became the predominant community temples in East Kowloon in the early years of the 20th century and maintained their popularity until the 1930s. These two temples were demolished during WWII as the villagers felt that the temple gods no longer offered protection for the community.

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[1] Smart, Alan. *Making Room: Squatter Clearance in Hong Kong*. Hong Kong: Centre of Asian Studies, University of Hong Kong, 1992. 70 Print.

[2] Archaeological Survey at Tai Hom Tsuen. 19.

[3] Hayes, James. "The Kwun Yan – Tung Shan Temple of East Kowloon 1840-1940." *Journal of the Royal Asiatic Society Hong Kong Branch*. 23. (1983):212. Print

[4] Ibid:213

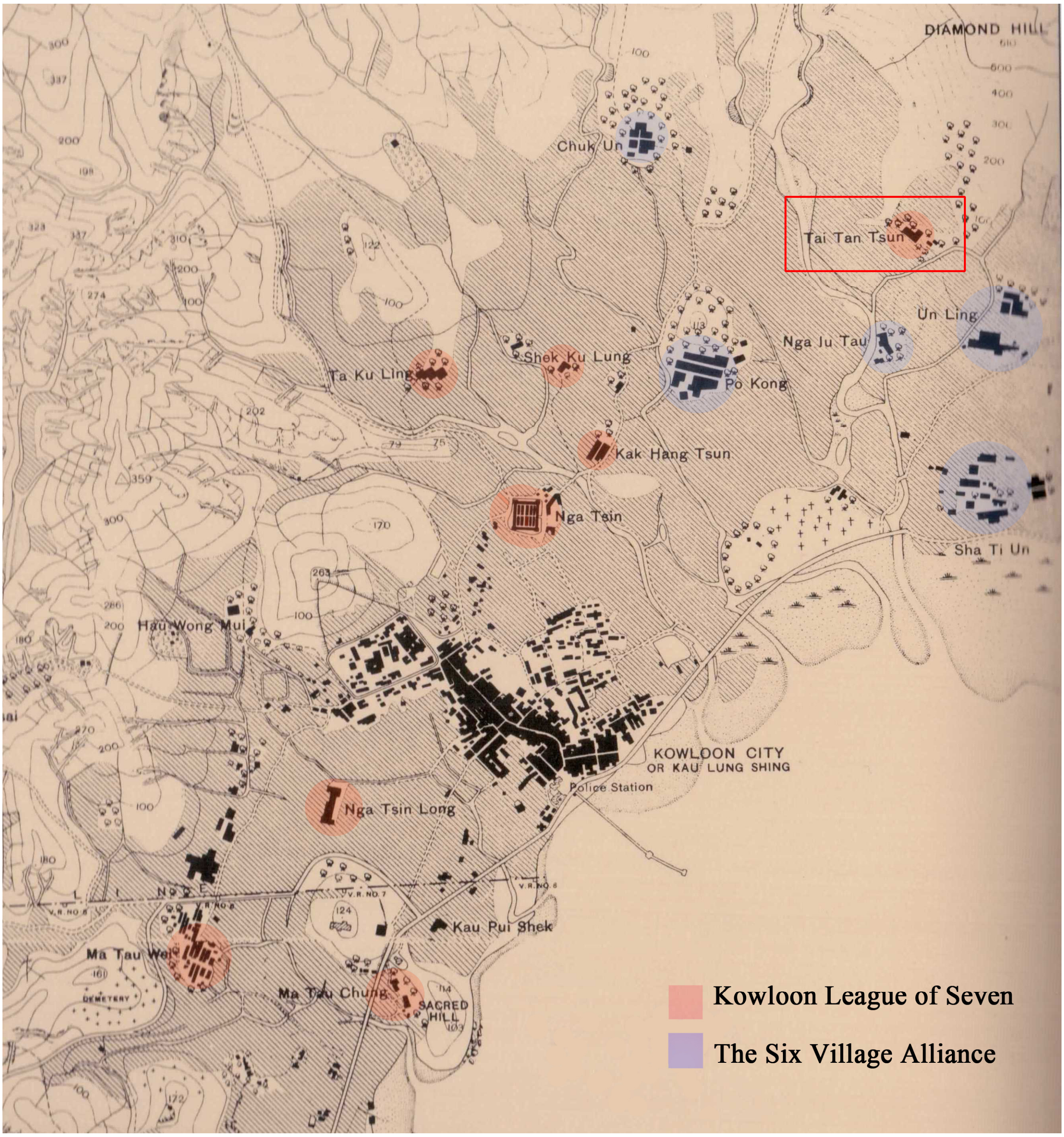

Figure a2. Map of Kowloon showing inter-village alliances, 1904

Early Development in the Diamond Hill Area

Hong Kong's population steadily grew during the 1920s, leading to an increase in housing demand. Large-scale private development schemes, such as the Kowloon Tong Estate and Kai Tak Bund, were launched in Kowloon and near Diamond Hill and the Kai Tak Company planned to reclaim

230 acres to build 6,000 houses, targeting wealthy Chinese businessmen.

However, the Diamond Hill area remained primarily an agricultural area unaffected by large development schemes because of its inaccessibility (see Figure a3). Some wealthy Chinese investors instead began buying land lots in the Diamond Hill area for building country villas; and a comprador, Mr. Leung Yan Po (梁仁甫), was one of a few people to apply for conversion of a block of hillside agricultural lots into a single building lot in 1921. This dispatch reply from the South District Office showed that Leung's private building project was one of many in Diamond Hill:

> "This is an instance of development which is becoming more common in the district. Well-to-do Chinese purchase privately a collection of adjoining lots – convert a portion for a bungalow & have what really is a small country estate? (sic) They develop them gradually…"[5]

Leung's own European-style residence was not completed until 1931, seriously behind its scheduled completion due to the 1925 strike and labour boycott. This was not an isolated case as other local land developers suffered financial losses because of construction delays due to the strike and the fall in value of local shares.

The developer of the Kai Tak Bund suffered severe financial losses and was unable to complete the remaining phases of the Kai Tak Bund reclamation. This project was taken over by the government in late 1927, and, as this Study outlines below, this reclaimed land was later used as an airfield - known before WWII as Kai Tak Airfield and after the war as Kai Tak Airport.

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[5] "Lots 1937 & 1928 S.D.2 – Conversion of an area in Lot 731, D.D.2 into Building Land and Purchase of certain lots in the neighbourhood". HKRS58-1-99

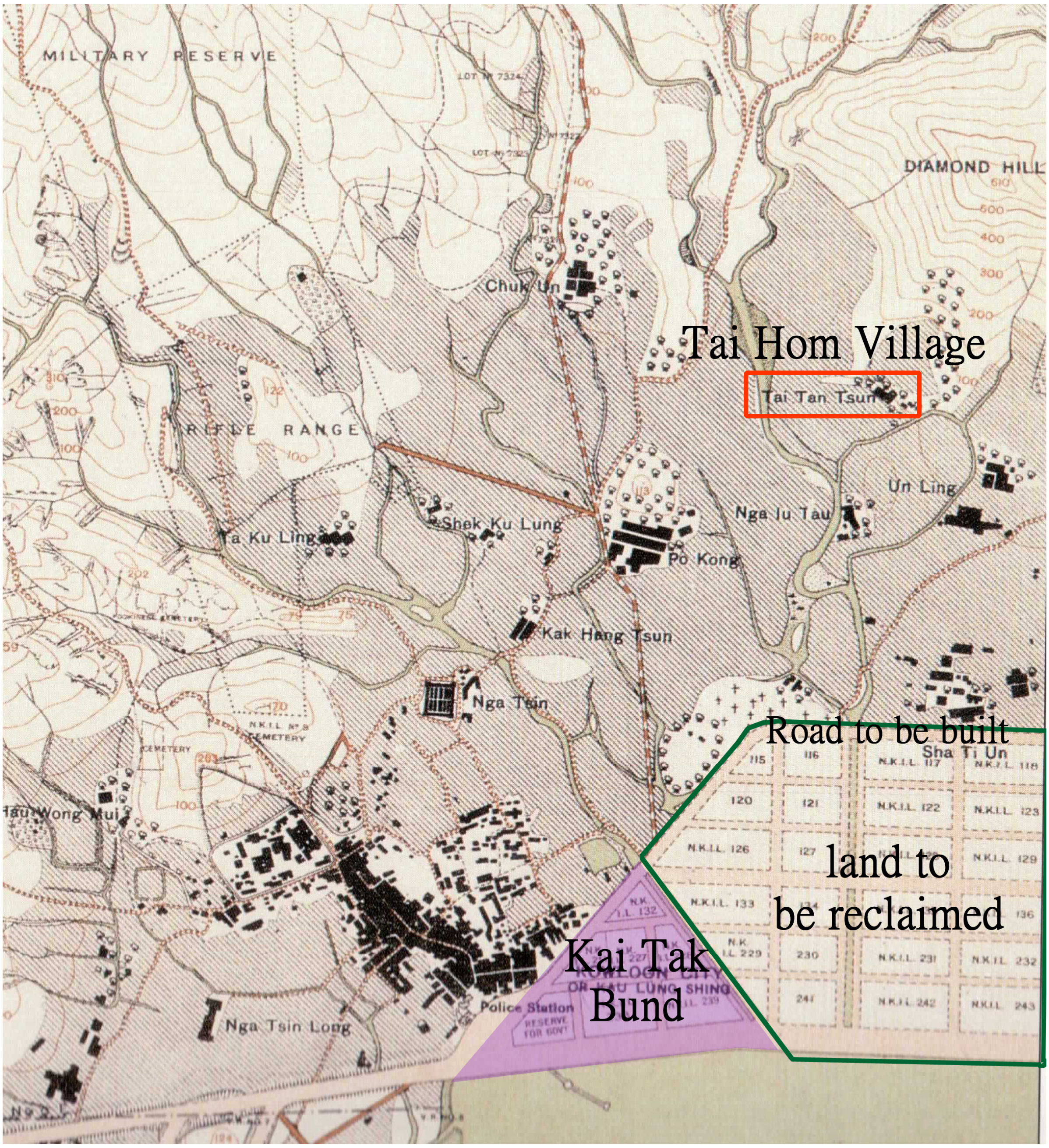

Figure a3 Map of Kowloon, 1924

Development of Kai Tak Aerodrome/Airfield (1925-1941)

To understand why and under what circumstances the Kai Tak Airfield was built, the political situation at that time should be considered. The 1911 Xinhai Revolution (辛亥革命) marked the end of over 2,000 years of dynastic rule in Imperial China, and subsequently there was great political unrest during the Republican period.

Alongside political disturbances in China, the establishment of the Chinese Air Force in 1924 encouraged the British Air Ministry to review the exigency of building an air base in Hong Kong. Discussions, however, were suspended by the Committee of Imperial Defence as Britain was restrained by the terms of Article 19 of the 1922 Washington Naval Treaty. According to these terms, Britain as a signatory agreed that there be "no increase…in the coast defences of (its) territories and possessions…."[6] The *status quo* was reiterated in subsequent years, as seen in the document, "Notes on Proposals for Air Base at Hongkong" dispatched by the General Officer Commanding the Troops (in Hong Kong) on 4 December 1925:

> "…(if) developments of Chinese Air Forces occur, or the present situation in China be materially altered, the Government might seem it necessary, in order to safeguard our interests in China, to establish an Air Base in Hong Kong in spite of the difficulties and great expense involved. There is, however, no intention of doing so at the moment…"[7]

After the death of Sun Yat-sen (孫逸仙) in 1925, his successor Chiang Kai-shek (蔣介石) led the Northern Expedition (北伐), wiping out the Beiyang warlords (北洋軍閥) in Beijing and other warlords in Southern and Northern China. Due to political instability in China, further evaluations to construct an air base in Hong Kong were being discussed. On 22 November 1926 the Committee of Imperial Defence (in Britain) made a final decision:

> "The Overseas Defence Committee at their 271st Meeting also expressed general agreement that, from the point of view of defence, the acquisition of the Kai Tak reclamation area was highly desirable."[8]

This Committee also pointed out that the future airfield should fulfill five needs in the event of wartime operations:

a) To accommodate air units to resist enemy air and sea-borne attacks;
b) To co-operate with naval forces in the defence of Hong Kong and to furnish shore facilities for the Fleet Air Arm;
c) To allow air co-operation with the Army in connection with coastal and landward defences of Hong Kong;
d) To form an airport in the scheme of Empire Air Defence;
e) To provide facilities for the work of aircraft dispatched to Hong Kong for possible operations against the Chinese.

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[6] "Conference on the Limitation of Armament, Washington, November 12, 1921-February 6, 1922" (sic) *Papers Relating to the Foreign Relations of the United States: 1922*. Vol. 1. Web. 13 Nov 2011. <http://www.ibiblio.org/pha/pre-war/1922/nav_lim.html>.

[7] Aerodrome. CO129/498. P.443.

[8] Hong Kong: Defence of. CO129/497. P.374

Raising capital for constructing the new airport was a major problem for the Hong Kong colonial government. In early 1926, the estimated construction cost was HK$1,738,000, of which a million dollars was budgeted to resume the reclaimed Kai Tak land. By January 1927, the construction cost rose sharply to HK$2,036,500, which was thought to be too high for Hong Kong to pay on its own. The British Government initially agreed to contribute three quarters of the cost, but as time went by, the cost had increased to at least HK$2.5 million. With no further financial support from Britain, the Hong Kong Legislative Council appropriated HK$1,080,000 as a Public Works Loan, to fund construction of the Kai Tak Aerodrome.

Phase Three of the Kai Tak Reclamation was completed by 1930, entailing basic construction, including sea walls, covering of nullahs, drainage and seaplane slipways. Prior to this, the Royal Air Force Kai Tak, established on 19 March 1927, occupied land just across the nullah. The RAF base began as a complex of matshed buildings on the western perimeter of the airfield, and its permanent base was not established until 1932. This was a makeshift measure to meet the terms of the 1922 Washington Naval Treaty, and which the British Government technically adhered to by designating Kai Tak a civilian aerodrome. As a civilian aerodrome there would be no restriction on receiving any aircraft and service[9].

Civil aviation at Kai Tak began with the Hong Kong Flying Club's formation in mid-1929, and flight training commenced in the second half of 1930. The club started with two Avro Avian 594 MK 1V/M planes, which held the colony's initial aircraft registrations. Club membership grew significantly when Governor Sir Cecil Clementi became an active supporter. His intervention became so supportive that in 1930 the Legislative Council voted the club $60,000 and an annual subsidy of $30,000[10]. In 1931 there were 1,100 flights comprising civil aircraft and totalling 300 flying hours[11], the Hong Kong Flying Club was the principal user.

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[9] Eather, Charles Edward James. *Airport of the Nine Dragons Kai Tak, Kowloon*. Surfers Paradise: ChingChic Publishers, 1996. 12. Print.

[10] Ibid:15-17

[11] Hong Kong. Harbour Master and Director of Air Services. *Report of the Harbour Master and Director of Air Services for the Year 1931.* Hong Kong: Hong Kong Government, 1932.

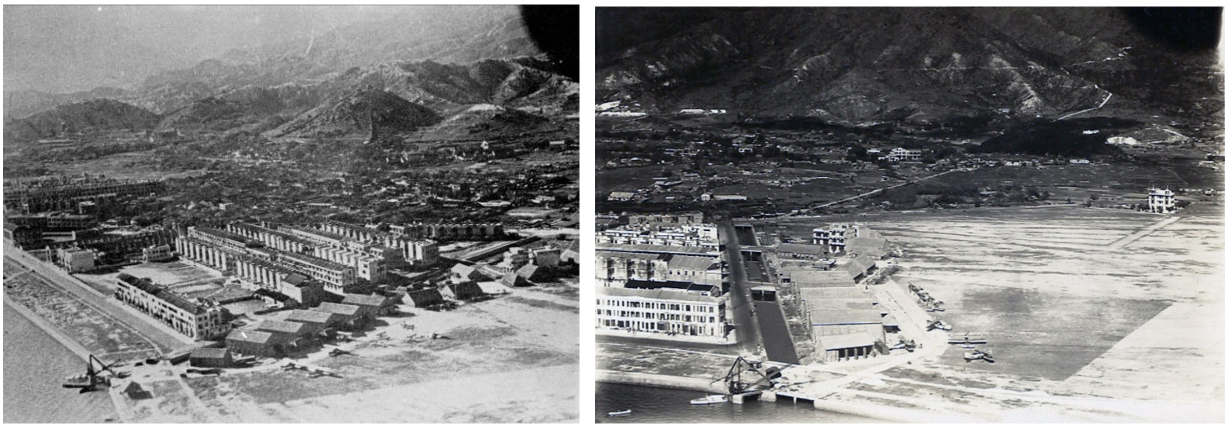

Photo a1 & a2 Aerial views of RAF base (circa late 1920s to early 1930s)

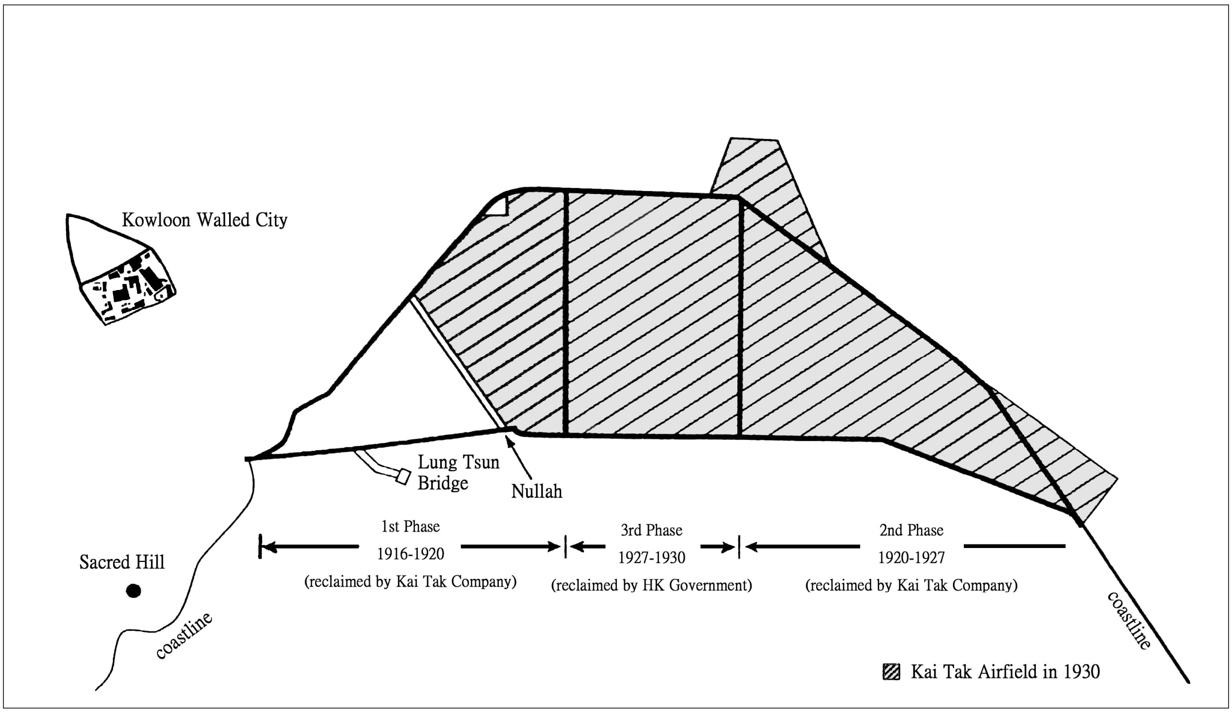

Figure a4 Kai Tak reclamation phases and Airfield location (shaded area) in 1930

In the Airfield’s early days, passenger traffic appeared to play a secondary role to postal traffic. The Hong Kong Post Office had participated in the United States Trans-Continental Air Mail Service since 19 November 1924[12] and its air postal service had subsequently grown significantly. In 1933, an additional airmail service to Europe and intermediate countries opened, with an average transit time between Hong Kong and Great Britain of 15 days[13].

Hong Kong's fledging aviation industry can be traced back to the mid-1920s with Charles Ricou's

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[12] Hong Kong. Breen, M. J., *Report on the General Post Office, Hong Kong, for the Year 1924*. Hong Kong: Hong Kong Government, 1924.

[13] Hong Kong. Postmaster General. *Report of the General Post Office, Hong Kong, for the Year 1933*. Hong Kong: Hong Kong Government, 1933.

short-lived commercial service using amphibian aircraft between Macau and Repulse Bay. However a more significant day in Hong Kong's aviation history was the first commercial flight using Kai Tak Airfield, which arrived from Malaysia on 24 March 1936. The first commercial passenger to land at Kai Tak was a Kuala Lumpur man, Ong Eee Lim, who sat the entire journey from take-off to touch-down on 16 mailbags the aircraft carried. This event inaugurated the weekly air service between Penang (檳城) and Hong Kong and connected with the Imperial Airways routes to Australia and Great Britain[14].

The continued growth of civil aviation caused a significant increase in the amount of traffic handled at Kai Tak Airport with the number of arrival and departure passengers rising from 3,685 in 1937 to 9,969 just a year later[15]. By 1938, Kai Tak had already become the Far East's major aviation terminal with four airline companies providing service to Hong Kong: Imperial Airways Limited, Air France, Pan American Airways and China National Aviation Corporation[16].

In an effort to cope with increased demand, Kai Tak Airfield continued to update its facilities, and erected an additional hangar, constructing a pontoon landing stage and a temporary terminal building. On 22 September 1938, the Governor appointed a committee to study and make recommendations concerning the aerodrome expansion. After five meetings and sending out questionnaires to airline companies and pilots, they submitted a report to Hong Kong's Colonial Secretary in May 1939. Amongst a range of recommendations, the most significant was the suggestion to further reclaim Kowloon Bay and to extend the airfield south, on which were to be built three intersecting runways, with a minimum width of 150 yards (see figure a5). Other suggestions included erecting an up-to-date terminal building and at least two additional hangars[17]. The British-based Air Council finally approved the proposal in 1940, as they considered it of great benefit to aviation development[18]. The plan, however, was suspended because of Japanese military hostilities in Asia and the eventual invasion of Hong Kong.

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[14] Allaz, Camille. *The History of Air Cargo and Airmail from the 18th Century*. London: Christopher Foyle Publishing, 2004. 88.

[15] Administration Reports for the Year 1938. 41

[16] Ibid: 41

[17] Report of the committee to enquire into the adequacy of the facilities at Kai Tak Aerodrome. CO129-587-1. 40-47

[18] "Kai Tak Aerodrome - Duplicate sub-file containing spare copies of enclosures". HKRS163-1-356

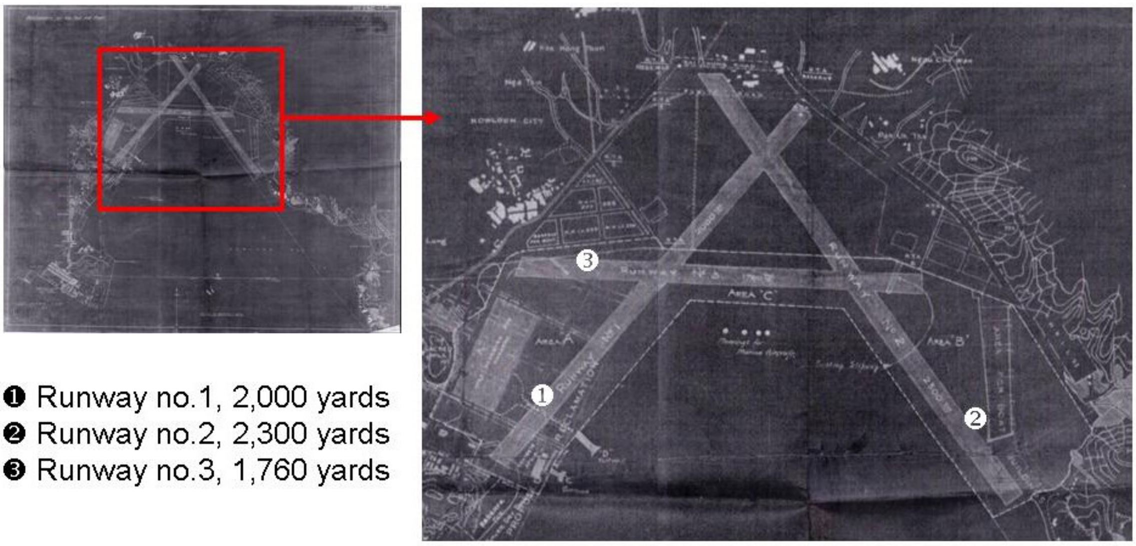

Figure a5. Plan of Kai Tak Airfield's proposed expansion, 1938. (Source: HKRS163-1-356)

Local History in the Early 1940s (WWII & Japanese Occupation of Hong Kong)

Britain was aware of a Japanese military threat to Hong Kong from as early as 1931, when the Japanese provoked the Mukden Incident (九一八事變) in Manchuria. The Committee of Imperial Defence decided in March 1932 to further strengthen the defences of the British Empire in the Far East[19]. Various British defence studies had already concluded that Hong Kong would be extremely difficult to defend in the event of an attack, so Britain focused on Singapore, where a massive and (supposedly, at the time) well-protected naval base was constructed.

The first review of Hong Kong in light of its defence against a possible Japanese attack appears to have been made in 1935. The Inspector of Fixed Defences, General Barron, made a personal inspection of the colony's defences and submitted a report. He described the Hong Kong defences as "deplorable" and stated that the island of Hong Kong would be "easy prey…and that in the face of a determined attack by land or sea the fortress could not hold out even for the arbitrary period before relief." Because of the irregular coastline, the only practical defence was proposed to be built inland on the (Kowloon) mainland stretching from Junk Bay via Razor Hill (鷓鴣山) to Tide Cove (沙田海), and from there along the Shing Mun River (城門河) to Smuggler's Ridge (孖子徑) and Gin Drinker's Bay (醉酒灣)[20].

The 1936 Hong Kong defence scheme stated that, despite the gloomy prognostication of previous

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[19] Ko, Tim Keung, and Jason Wordie. *Ruins of War: a Guide to Hong Kong's Battlefields and Wartime Sites*. Hong Kong: Joint Publishing (H.K.) Co., Ltd., 1996. 16. Print.

[20] Carl, Vincent. *No Reason Why: the Canadian Hong Kong Tragedy: An Examination*. Ontario: Canada's Wings Inc., 1981. 6-7. Print

defence studies, “Hong Kong is …a strategic point vital to the conduct of our Fleet, Army, and Air Force.” Barron’s recommendation was adopted, with slight adjustments. A line of pillboxes and bunkers, subsequently known as the Gin Drinker’s Line (醉酒灣防線), was built in 1936 in the western New Territories. The British believed this defence line could protect the colony from Japanese invasion for at least six months – and, even called it the "Oriental Maginot Line" (東方馬奇諾防線).

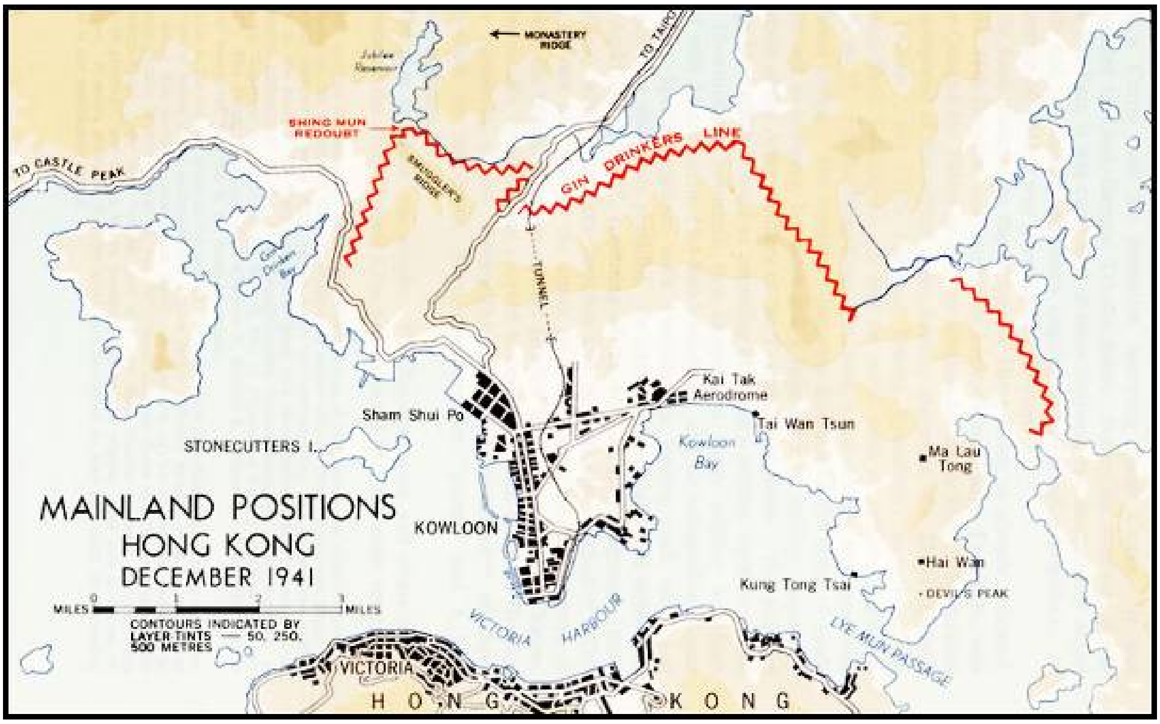

Figure a6 Location of Gin Drinker’s Line (Source from website, “Six Years of War”, http://www.ibiblio.org/hyperwar/UN/Canada/CA/SixYears/SixYears-14.html)

The Sino-Japanese War began on 7 July 1937, and within a year, Beijing, Nanjing and Shanghai had fallen. In October 1938, 30,000 Japanese troops landed at Bias Bay (大亞灣), now known as Daya Bay, Guangdong, just 24 kilometers north-east of Hong Kong. Within two weeks of landing, they had captured Guangzhou[21]. Despite this increased deployment of Japanese troops, no further major British reinforcement troops were deployed to Hong Kong. The Hong Kong Government decided to consolidate defence forces on Hong Kong Island, leaving only a minimal number of defensive sentry points in Kowloon and the New Territories to delay any enemy attack.

In the meantime, Japanese preparations for the attack and capture of Hong Kong had been in hand for some time. After 1938, the Japanese military had initiated military intelligence gathering activities on Hong Kong’s defence forces, carried out by spies, secret agents and some Hong

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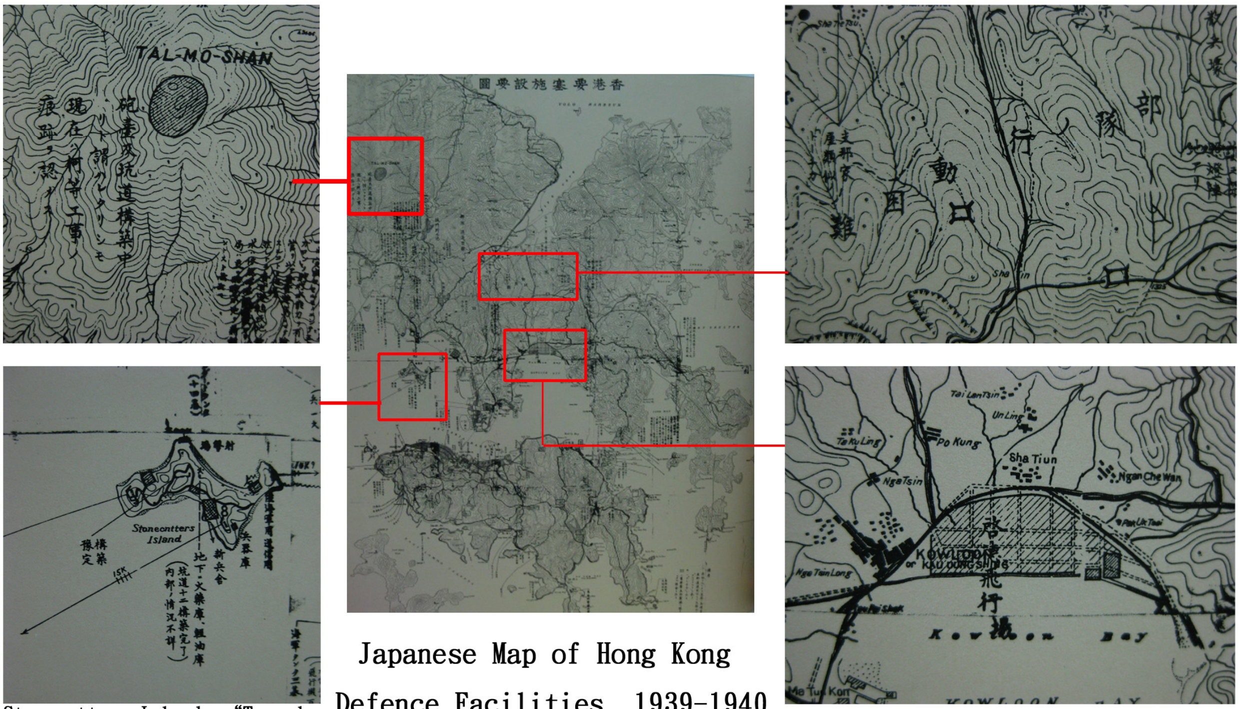
[21] Banham, Tony. *Not The Slightest Chance, The Defence Of Hong Kong, 1941*. Hong Kong: Hong Kong University Press, 2003. 8. Print.

Kong-based Japanese civilians, reporting information such as the location of British forces and important traffic positions. Based on this data, the Imperial Japanese Army General Staff Office produced a “Map of Hong Kong Defence Facilities” (《香港防禦設施圖》) drawn to a scale of 1: 25000, on which it accurately marked the location of facilities, including barracks, ammunition depots, searchlights, firing points, and the under-construction gun emplacement positions on Tsing Yi Island[22].

Tai Mo Shan: “Pillboxes and tunnels are under construction”

Ma On Shan: “Troops will find it hard to advance”



Japanese Map of Hong Kong Defence Facilities, 1939-1940

Stonecutters Island: “Tunnels constructed. Inner situation unknown”

Kai Tak Airport

Figure a7. Japanese map of Hong Kong defence facilities (香港軍事要塞圖), annotated with observations in Japanese, 1930-1940. Source: *Mapping Hong Kong*, 146.

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[22] 沈克尼. *沈克尼：日軍島嶼兵要地志忽略了生存調查*. Interview. 新浪讀書. 23.03.2011. Web. < http://book.sina.com.cn/author/2011-03-23/1505284549.shtml >.

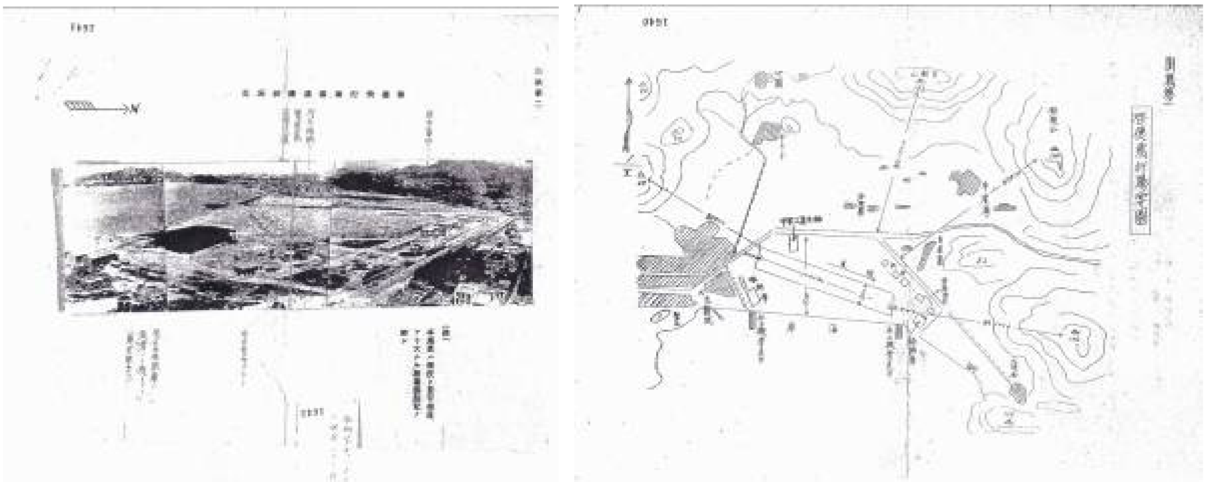

Figure a8 & a9 Japanese military intelligence diagrams of Kai Tak Airfield, before WWII

The Japanese Imperial General Headquarters ordered its Commander-in-Chief, China to prepare plans for the capture of Hong Kong in November 1941. The 38th Division of the 23rd Japanese Army was instructed to form the core of the invasion force and all preparations were to be completed by the end of November.

Eight hours after the Japanese Air Force devastated the U.S. Pacific Fleet at Pearl Harbour, the Japanese Empire launched an attack on the British Crown Colony of Hong Kong. On 8 December 1941 at 8:00 a.m., the colonial government was informed of the outbreak of war – and twenty minutes later, Japanese aircraft attacked Kai Tak Airfield, and within a few minutes they controlled Hong Kong airspace. Simultaneously, infantry units of the Japanese 23rd Army's 38th Division began to cross Shenzhen River into the New Territories by two routes: one advanced along the Kowloon-Canton Railway, entering Tai Po and Shatin; the other unit moved south-west and broke the defence at Gin Drinker's Line. The Japanese forces took Kowloon and the last British troops retreated to Hong Kong Island on 13 December 1941.

Photo a3 Japanese Army crossing the border between Hong Kong and Guangdong in December 1941

Photo a4 The Japanese Army crossing the Kwong Fuk Bridge near Tai Po Market in December 1941

On the night of 17 December 1941, the final essential preparations for an attack on Hong Kong Island were made by Japanese troops. They struck out across Victoria Harbour and reconnoitered a number of possible landing sites. Using only their rifles, they proceeded to disable British searchlights and mines that the British had laid. On the night of 18 December, 7,500 Japanese troops of the 38th Division commandeered every rowing boat, raft, rubber dinghy and junk they could muster, crept across the Harbour and made landfall in the districts of North Point and Shau Kei Wan (and separately, Aberdeen) on Hong Kong Island[23]. Finally defeated on 25 December 1941, British colonial officials headed by the Governor of Hong Kong, Mark Aitchison Young (楊慕琦) formally surrendered. Local people referred to the day as "Black Christmas".

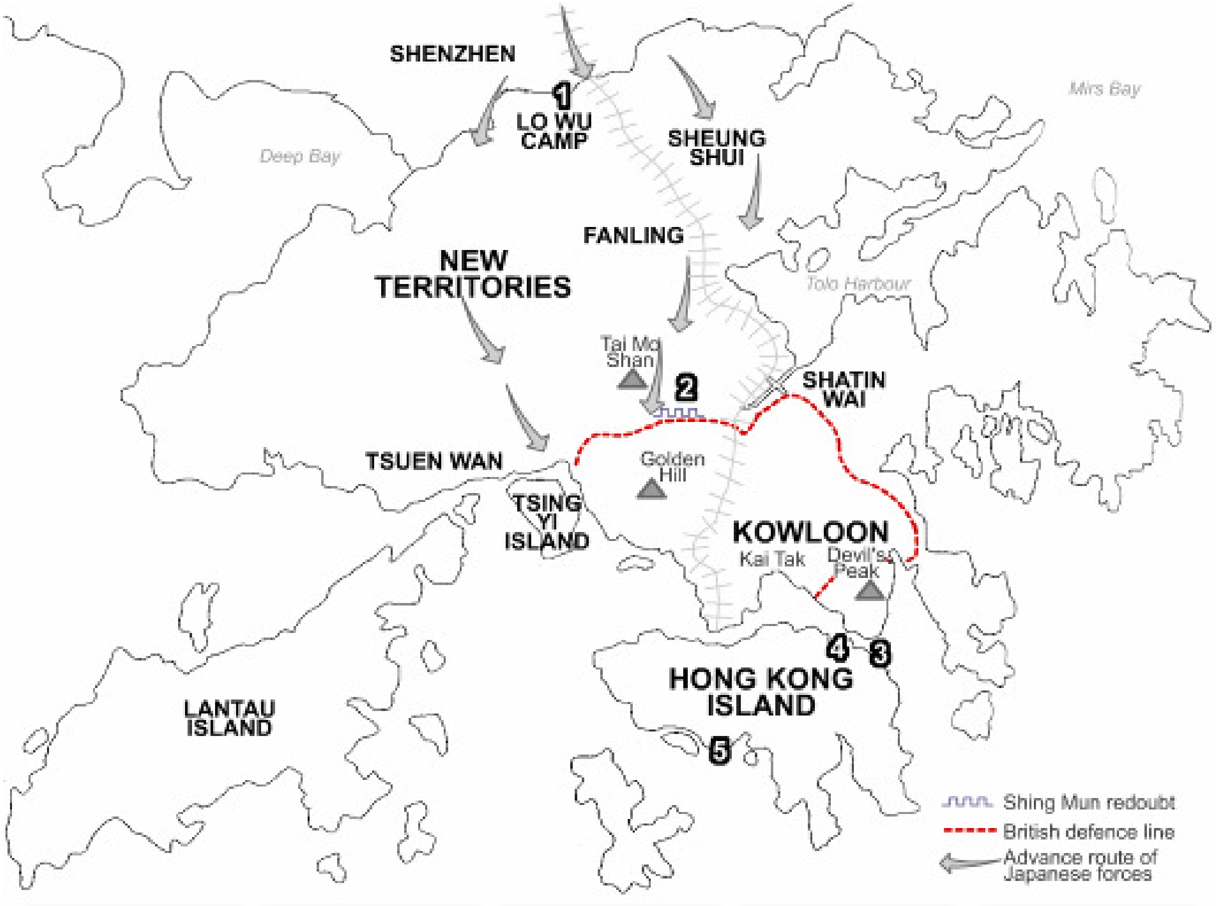

Figure a10 Map of Japanese lines of attack, December 1941

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[23] Snow, Philip. *The Fall of Hong Kong: Britain, China and the Japanese Occupation*. New Haven: Yale University Press, 2003. 64. Print.

Photo a5 British colonial officials headed by the Governor of Hong Kong, Sir Mark Aitchison Young (楊慕琦), surrendered on 25 December 1941 at Japanese military headquarters, The Peninsula Hotel, Tsim Sha Tsui

Diamond Hill under Japanese Occupation

九龍城村民協助當局

建設航空站

農村廿餘民逾二萬集團移住

完成偉大飛行場

居聯會

請恢復會務

潮洲歸鄉團

今晨出發

Figure a11 *Overseas Chinese Daily News*, 20 June 1942

Shortly after the Japanese occupation of Hong Kong in 1941, the Japanese authorities announced plans for an extension of the Kai Tak Airfield and prior to the commencement of construction work a foundation stone laying ceremony was held in September 1942. A newspaper item titled "Kowloon City Villagers Help to Build Airfield", dated 20 June 1942 (see Figure a11), reported that the land of twenty villages in Diamond Hill (including half of Tai Hom Village) were seized for the extension of the airfield, an action affecting about 20,000 people. Most villagers fled to China or to urban areas and some were killed by the Japanese for not co-operating. Other villagers were relocated to Model Village in Kowloon Tsai with 25 huts built for the displaced.

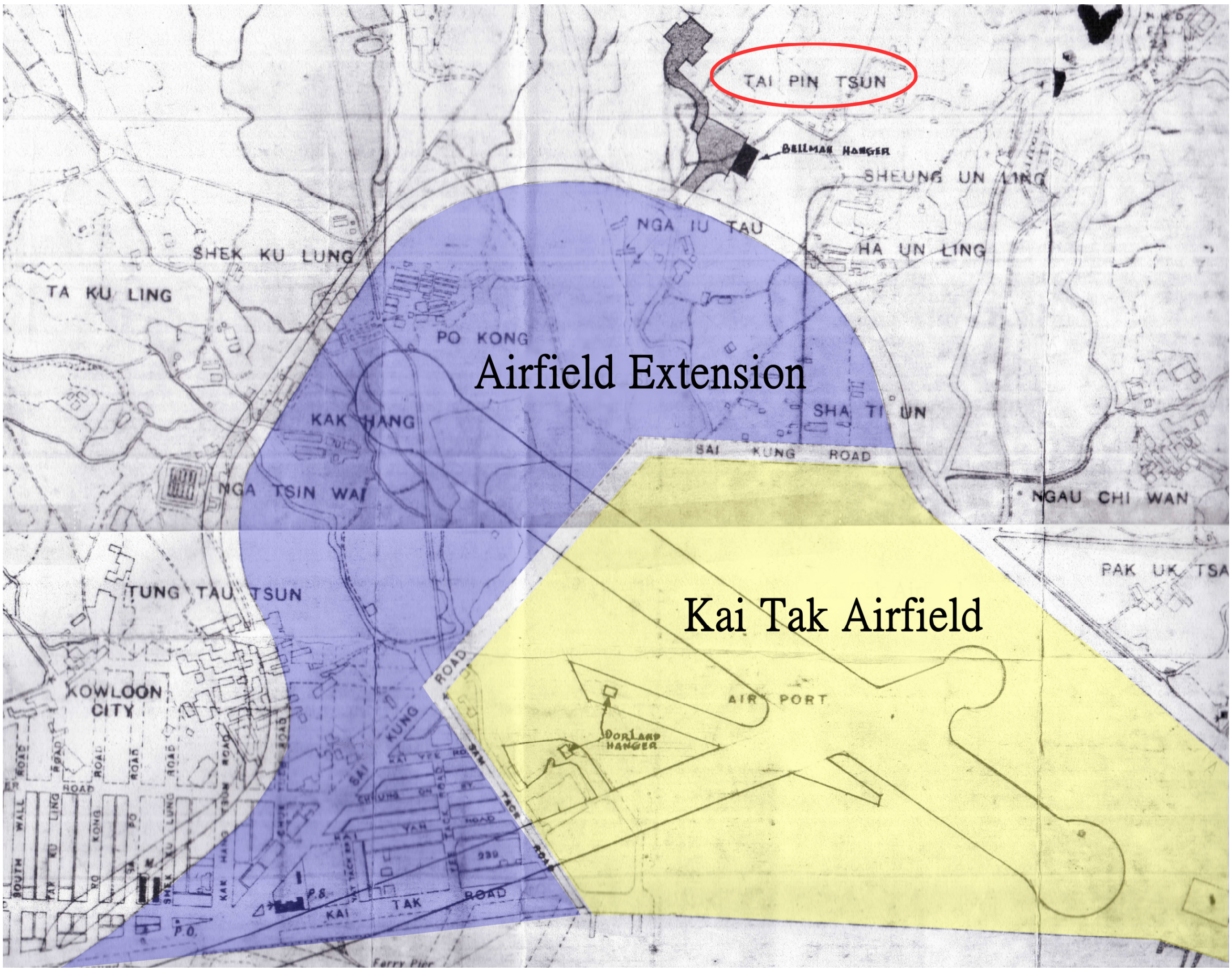

Figure a12 Map showing the scale of expansion of Kai Tak Airfield during Japanese Occupation (map in HKRS156-1-88: Bellman Hangar in Kai Tak Airport-Dispute of ownership, 1947). Tai Pin Tsun, now Tai Hom Village, is circled in red

Construction work commenced on 15 September 1942[24], with Allied prisoners-of-war employed as

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[24] "Inspection visit to Kowloon Tong Model Village rescheduled-airfield extension work commences on the 15th, villagers should take the bypass" *Overseas Chinese Daily News*. 13 September 1942. 4. Print.

forced labourers. Work included diverting all the streams of the area into a single huge stone-lined nullah, building a new road along the inner side of this nullah (Clear Water Bay Road, i.e. today's Choi Hung Road)[25]. Villages and houses within the huge semicircle airfield extension area were then cleared and destroyed in a matter of weeks. The area's Sacred Hill and the wall of Kowloon Walled City were blasted and destroyed for fill for the new reclamation.

The airfield was greatly expanded inland and increased in area from 150 acres to 376 acres (see Figure a12). A barbed-wire fence was erected; and anyone found crossing this fence was executed.

Post-War Period

After the war, the Royal Air Force and Royal Navy used the extended airfield for a few years before an official development plan for Kai Tak Airport was released in 1954. The core idea of this master plan was to upgrade facilities for the rapidly expanding commercial aviation industry.

A new NW/SE 2,542 metre runway extending into Kowloon Bay by land reclamation replaced the previous two inter-crossing runways. The northern section of the former Po Kong Village was released for use and the actual airport was shifted south (see Figure a13).

In the meantime, north of the airport where the old villages once stood, a wave of refugees from China brought another great change to the area: a solid mass of squatter housing interspersed with small patches of vegetable fields. The Chu family, the dominant ancestral owners of Tai Hom, came back from China belatedly in 1948, only to find that their land was occupied by illegal housing. Some of those who had encroached on Chu land were willing to pay rent, while the remaining majority were non-paying resident squatters[26].

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[25] Hase, P.H.,. "Beside the Yamen: Nga Tsin Wai Village". *Journal of the Royal Asiatic Society Hong Kong Branch*. 39. (1999): 55. Print

[26] Smart, Alan. *Making Room: Squatter Clearance in Hong Kong*. Hong Kong: Centre of Asian Studies, University of Hong Kong, 1992. 76. Print.

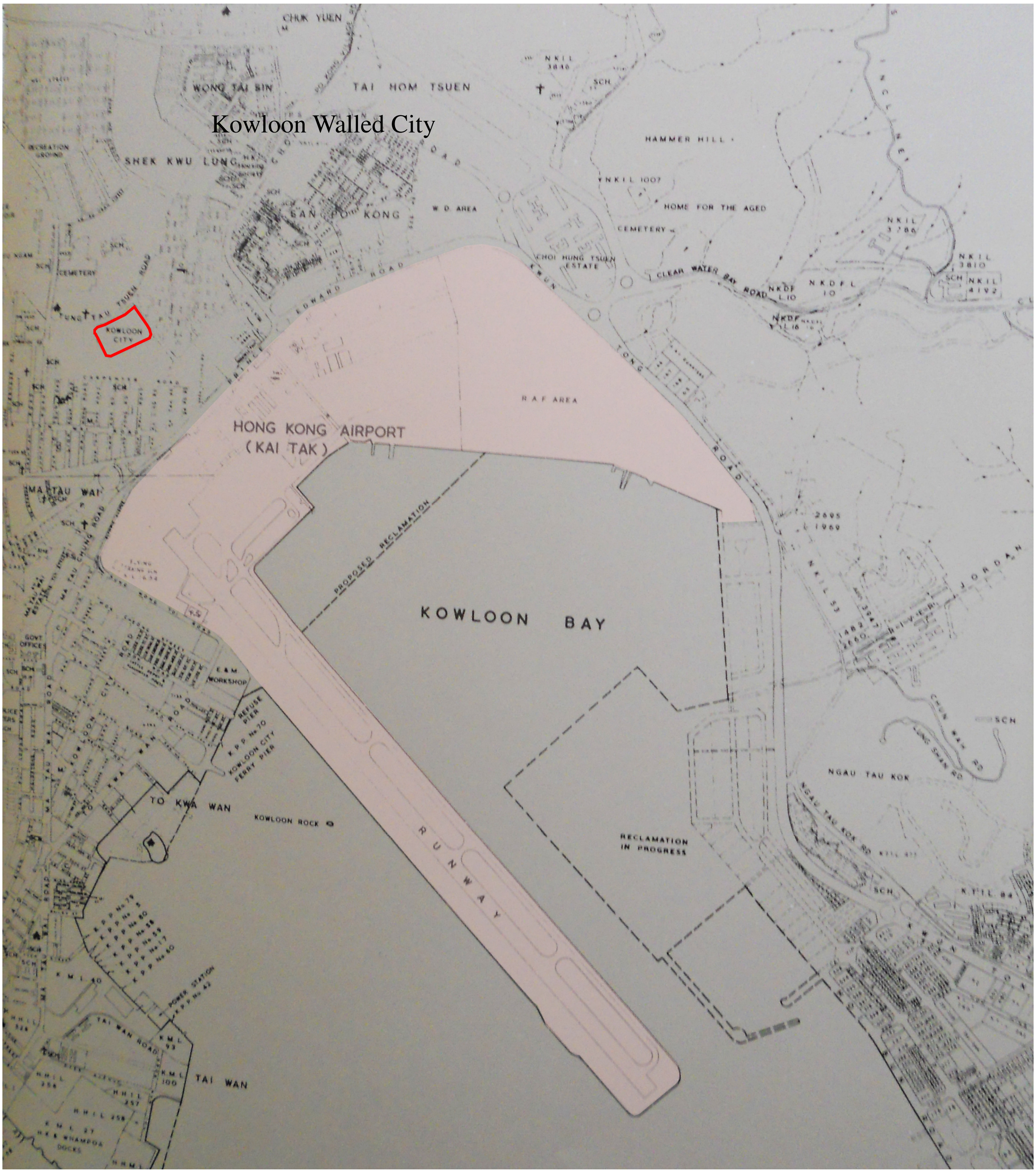

Figure a13 Map of East Kowloon (1967). The northern area was released and a new runway (with a new flight path orientation) was built between 1956 and 1960 on newly reclaimed land that extended into Kowloon Bay.

Hong Kong's first film industry studios began moving into Diamond Hill from the late 1930s The earliest to relocate was Zhao Shushen's (趙樹燊) Grandview Motion Pictures (大觀聲片廠), moving its studio from Pak Tai Street in To Kwa Wan to Diamond Hill, converting the former European-style residence of Leung Yan Po (梁仁甫) into a film studio[27]. Film production was interrupted by WWII, however, later, it again thrived in Tai Hom Village once Japanese occupation ended. Grandview Motion Pictures changed ownership several times, with name changes, including Diamond Film Studio (鑽石片場) in the 1950s to Jiancheng Film Studio (堅城片場) in the 1970s. Television Broadcasting Limited (TVB) also rented the studio for the shooting of drama programmes in its early days[28].

Photo a6 Demolition and dismantling of Jiancheng Film Studio in the 1980s

The area's film studios attracted movie celebrities and the wealthy to move to the Diamond Hill area to live, including: Cantonese Opera singer Hong Xian-nu (紅線女), actor Pau Fong (鮑方), film director Moon Kwan (關文清). They each built a house in Tai Hom Village to be near their work. Actress Nancy Sit (薛家燕), singer Andy Lau (劉德華) and the Hui Brothers (許氏兄弟) also lived in the Tai Hom squatter area when they were young. The film industry also stimulated the growth of other industries; including shops for theatre props, shoe-making, dyeing factories and restaurants, of which Wing Lai-yuen (詠藜園) became famous for its Sichuan noodles.

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[27] Wong, Mary. *50 Years of the Hong Kong Film Production and Distribution Industries: An Exhibition (1947-97).* Hong Kong: Hong Kong Film Archive, 1997. 24. Print.

[28] Lam, Man Wai. Personal interview. 27 March 2011.

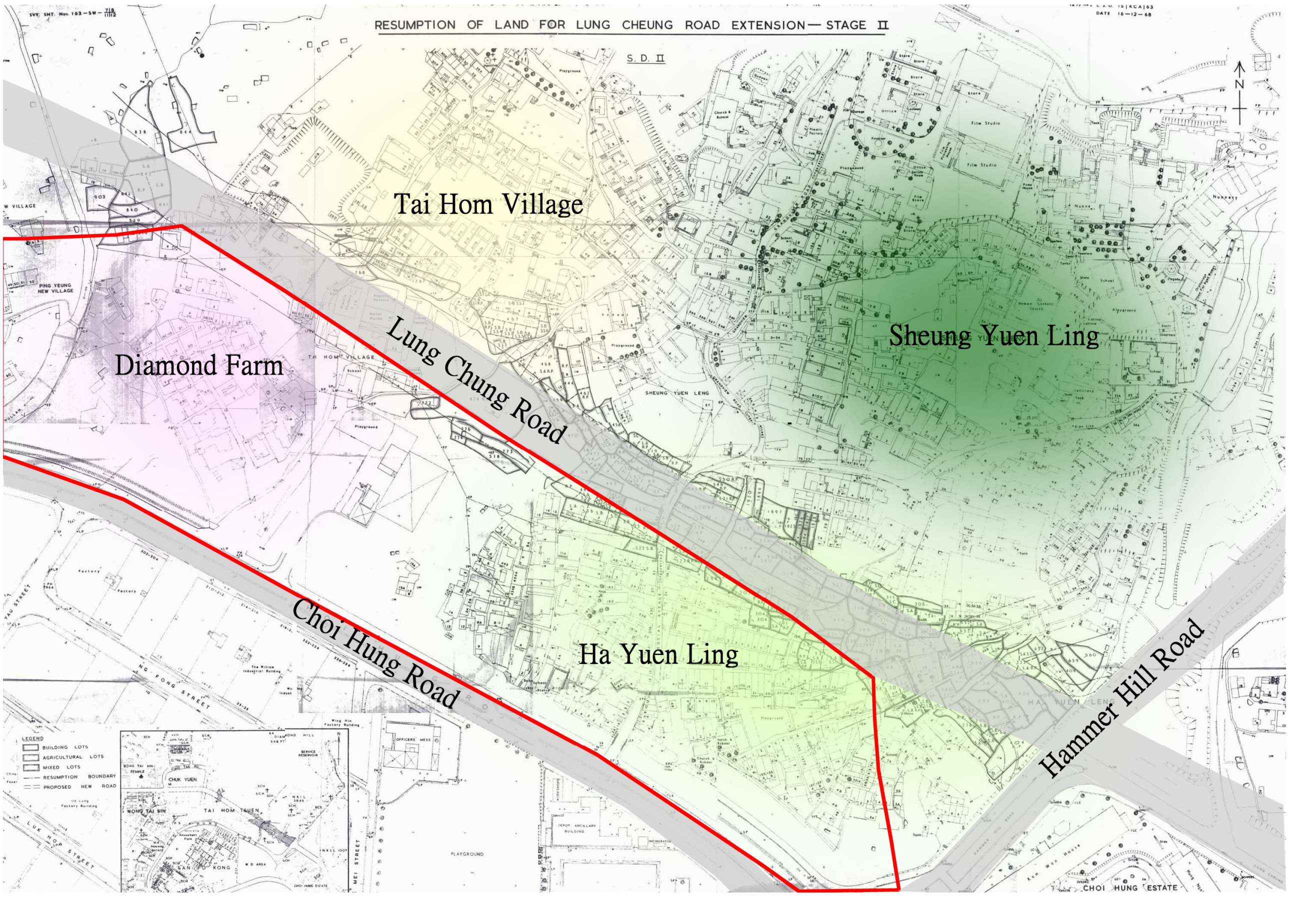


Figure a14 A conceptual map (circa mid-1960s) illustrating the area's later road networks and villages within the entire Diamond Hill squatter area (circa late-1970s). The red-lined area is the now vacant site known as the "Former Tai Hom Village" (despite the "original" Tai Hom Village's correct location as shown in this map)

In 1969, the government proposed to build a new road (Lung Cheung Road, 龍翔道) to ease traffic congestion on Choi Hung Road (彩虹道). The proposed freeway cut through the squatter area (see Figure a14 and Photo a7), dividing Tai Hom Village into North and South villages. Sections of land in Tai Hom Village and Sheung Yuen Ling Village were seized, and the construction of Lung Cheung Road commenced in 1973. For many years, the combined Diamond Hill squatter villages constituted one of Hong Kong's largest squatter sites, which at its peak comprised six squatter villages of 12,000 structures and 34,000 residents.

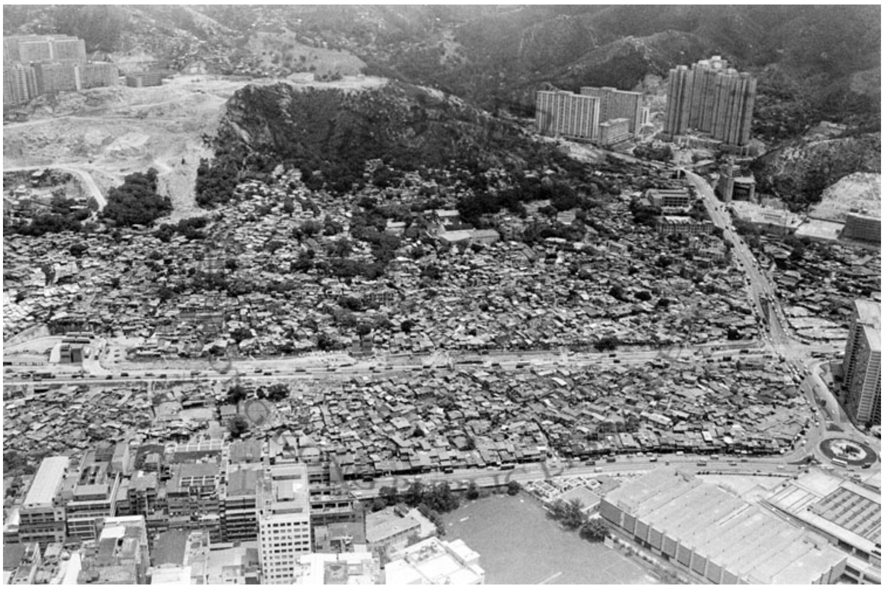


Photo a7 Diamond Hill Squatter Area in 1982.

In 1982, the Housing Department started to carry out surveys to count the number and prevalence of squatter areas around Hong Kong. A squatter occupancy survey was conducted in 1984, with only residents registered at that time eligible for re-housing when affected by later government clearance schemes.

After 1987, development plans, including the Tate’s Cairn Tunnel (大老山隧道) and the residential project near Fung Tak Road (鳳德道), led to another wave of land seizures and the re-housing of 26,000 Diamond Hill squatter residents.

The clearance of Sheung Yuen Ling Village (上元嶺) was completed in early 1997 and the final Diamond Hill squatter settlements were concentrated in the two villages of Tai Hom and Ha Yuen Ling (下元嶺), both eventually cleared in 2001. During the time of demolition, the pillbox was discovered in Tai Hom Village. Covered with illegal structures, it had previously been used as a squatter home.

Before the demolition of Tai Hom Village, local film director Fruit Chan (陳果) used the village for the setting of *Hollywood-Hong Kong* (香港有個荷李活), capturing the last glimpses of Tai Hom Village.

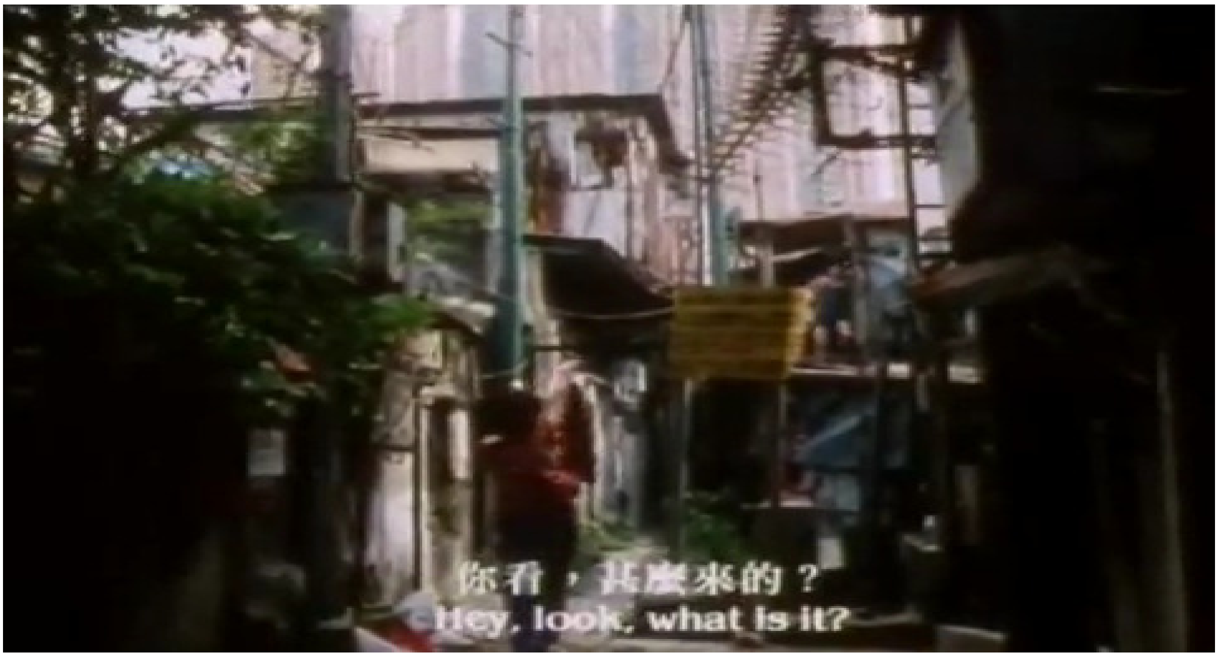


Photo a8 Image retrieved from the Fruit Chan movie *Hollywood-Hong Kong*, 2001.

Appendix II

Other Military Structures in Hong Kong

Other military structures in Hong Kong

Declared Monuments

1. Fan Lau Fort (分流炮台)

Fan Lau, Lantau Island

Fan Lau Fort is located at the south-western tip of Lantau, overlooking a sea passage leading into the Pearl River Estuary. According to the Macau Gazetteer, the fort can be dated reliably to the 7th year of Yongzheng (1729), when it was recorded that two forts were constructed on Lantau. Fan Lau Fort was apparently one of them. Rectangular in shape, the fort measures 46m by 21m and its walls are built of semi-dressed stone and green bricks. It was believed that the fort was once occupied by pirates. However, after the surrender of pirates to the Qing government in 1810, the fort would have been retaken by government troops. It was probably abandoned around 1898 after the lease of the New Territories to Britain.

Initial restoration work was undertaken in early 1985. This was followed by a large scale restoration and repair project in 1990 which also provided for the clearance of the surrounding area.

2. Tung Chung Fort (東涌炮台)

Tung Chung, Lantau Island

Tung Chung Fort, referred to in the Qing Dynasty as the Tung Chung Suocheng (Tung Chung Battalion), was the naval headquarters of the Right Battalion of Dapeng. The carved granite slab above the entrance gives the date of the Fort as 1832. In 1898 when the New Territories was leased to Britain, the Fort was evacuated by the Qing authorities, then occupied, first as a police station, and then by Wa Ying College, the Rural Committee Office and the Public Primary School of Tung Chung.

3. Tung Chung Battery (東涌小炮台)

Tung Chung, Lantau Island

According to the Guangdong Annals, two military forts were built in the 22nd year of Jiaqing reign (1817) at the foot of the 'Rocky Lion Hill' at Tung Chung, Lantau Island. In 1980, the remains of a battery were discovered on a hill slope facing the sea near Tung Chung Pier. After clearing the dense undergrowth, an L-shaped wall with a platform at the corner, probably for gun emplacements, was revealed. There is little doubt that this ruin is one of the two forts built in 1817 as mentioned in the Guangdong Annals. Although some restoration has been carried out, the battery remains to be studied in greater detail.

4. Tung Lung Fort 東龍洲炮台

Tung Lung Chau, Sai Kung

Located at the north eastern tip of Tung Lung Chau, Tung Lung Fort was built in the reign of Kangxi (1662-1722) to guard against pirates according to the Xinan Gazetteer. Another historical document describes it as being built by order of Yang Lin, Viceroy of Guangdong and Guangxi from 1719 to 1724.

Measured 33.5m by 22.5m, the rectangular fort was enclosed by wall of 3m high with its main entrance at north wall. It consisted of fifteen guardhouses and was armed with eight cannons. A small detachment was stationed at the fort until the beginning of the 19th century, when it proved difficult to cope with a marked increase in piracy. Because of the difficulty in keeping this remote fort supplied, it was replaced by Kowloon Fort in 1810.

Repairs and partial restoration were then carried out to the fort between 1979 and 1982. While the restoration work was in progress, a systematic archaeological excavation of the interior of the fort was conducted by the Antiquities and Monuments Office with the assistance of volunteers. A large quantity of artefacts was unearthed.

5. Fortified Structure at no.55 Ha Pak Nai

No. 55 Ha Pak Nai

Built around 1910, the fortified structure at No. 55 Ha Pak Nai, Yuen Long is the only remaining building in Hong Kong with solid evidence of having direct connection with the revolutionary movement under the leadership of Dr. Sun Yat-sen (1866-1925) and his compatriots.

With its advantageous location overlooking Deep Bay and Shenzhen, No. 55 Ha Pak Nai was an operational base of the revolutionary movement. A place of refuge for the revolutionaries under the cover of a rice mill and sugar refinery was set up around 1910 at the site after the Mutiny of the New Army in Guangzhou. A fortified structure was also built at the site to keep watch on the area across Deep Bay, which was then under the administration of the Qing authority. The fortified structure was built by Mr. Tang Yam-nam (1846-1923), who was a core member of Hsing Chung Hui (Xing Zhong Hui, 興中會). The site was mainly owned by Mr. Li Ki-tong (1873-1943) who joined Hsing Chung Hui in 1900 and was a son of the wealthy businessman Mr. Li Sing (1830-1900).

Architecturally, the fortified structure in Ha Pak Nai is essentially a functional structure for surveillance. It is a two-storey rectangular structure built of grey bricks, with a mezzanine floor between the first floor and the roof. A staircase bulkhead is found on the flat roof. Gun loops at various levels on the elevations can still be found. Internally, the plain rooms have screeded floors. To serve defence purposes, tapered and recessed window openings allowed a greater viewing angle from the inside of the building.

The Antiquities and Monuments Office will provide display facilities at the site in the second half of 2011.

Proposed Grade I (by 23 Nov 2011, grading not yet confirmed)

Ngog Shuen Chau Barracks, Old Prison Area, Block 318 Stonecutters Island, Sham Shui Po, KLN	**Ngong Shuen Chau Barracks, Old Prison Area, Block 319** Stonecutters Island, Sham Shui Po, KLN
	
Ngong Shuen Chau Barracks, Old Prison Area, Block A Stonecutters Island, Sham Shui Po, KLN	**Ngong Shuen Chau Barracks, Old Prison Area, Block H** Stonecutters Island, Sham Shui, KLN
	

Ngong Shuen Chau Barracks, South Shore Battery, Block 47A-B Stonecutters Island, Sham Shui Po, KLN	**Ngong Shuen Chau Barracks, Stonecutters West Battery, Ruin of Generator House** Stonecutters Islandm Sham Shui Po, KLN
	
Ngong Shuen Chau Barracks, Stonecutters West Battery, Block 37 Stonecutters Island, Sham Shui Po, KLN	**Ngong Shuen Chau Barracks, Stonecutters West Battery, Block 41** Stonecutters Island, Sham Shui Po, KLN
	

Ngong Shuen Chau Barracks, Stone cutters West Battery, Block 24A-D Stonecutters Island, Sham Shui Po, KLN	**Ngong Shuen Chau Barrack, Stonecutters East Battery, Defensive Loopholed Wall** Stonecutters Island, Sham Shui Po, KLN
	
Former Whitfield Barracks, KLN West II Battery KLN Park, Tsim Sha Tsui, KLN	
	

Proposed Grade II (by 23 Nov 2011, grading not yet confirmed)

Ngong Shuen Chau Barracks, Stonecutters West Battery, Block 29 Stonecutters Island, Sham Shui Po, KLN	**Ngong Shuen Chau Barracks, Old Prison Area, Block 322** Stonecutters Island, Sham Shui Oi, KLN
	
Ngong Shuen Chau Barrack, Stonecutters East Battery, Block Stonecutters Island, Sham Shui Po, KLN	**Ngong Shuen Chau Barracks, Stonecutters East Battery, Block 331** Stonecutters Island, Sham Shui Po, KLN
	

Ngong Shuen Chau Barracks, Stonecutters East Battery, Block 332 Stonecutters Island, Sham Shui Po, KLN	**Ngong Shuen Chau Barracks, Stonecutters East Battery, Block 333 A&B** Stonecutters Island, Sham Shui Po, KLN
	
Ngong Shuen Chau Barracks, Stonecutters East Battery, Block 334 Stonecutters Island, Sham Shui Po KLN	Ngong Shuen Chau Barracks, Ammunition Sub Depot Area, Block 01 Stonecutters Island, Sham Shui Po, KLN
	

Ngong Shuen Chau Barracks, Stonecutters West Battery, Block 36 Stonecutters Island, Sham Shui Po, KLN	**Ngong Shuen Chau Barracks, Stonecutters Central Battery, Gun Emplacement associated with underground magazines** Stonecutters Island, Sham Shui Po, KLN
	
Ngong Shuen Chau Barracks, Stonecutters West Battery, Ruins of West Battery Stonecutters Island, Sham Shui Po, KLN	**Ngong Shuen Chau Barracks, South Shore Battery Centre Gun Emplacement** Stonecutters Island, Sham Shui Po, KLN
	

Ngong Shuen Chau Barracks, Stonecutters West Battery, Block 43

Stonecutters Island, Sham Shui Po, KLN

Proposed Grade III (by 23 Nov 2011, grading not yet confirmed)

Military facility within Stonecutters Island, Sham Shui Po, KLN	**Military facility within Stonecutters Island,** Sham Shui Po, KLN
No picture	No picture
Military facility within Stanley Peninsula, H.K.	
No Picture	

Some of the Nil Grade Military Structures

Wong Nai Chung Gap

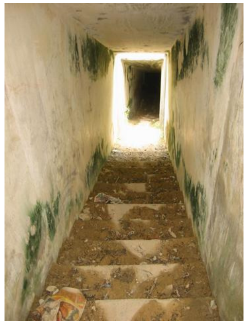




Lei Yue Mun Fort (Now Hong Kong Museum of Coastal Defence)




Shing Mun Redoubt



Pinewood Battery

Fortress on the Devil Peak

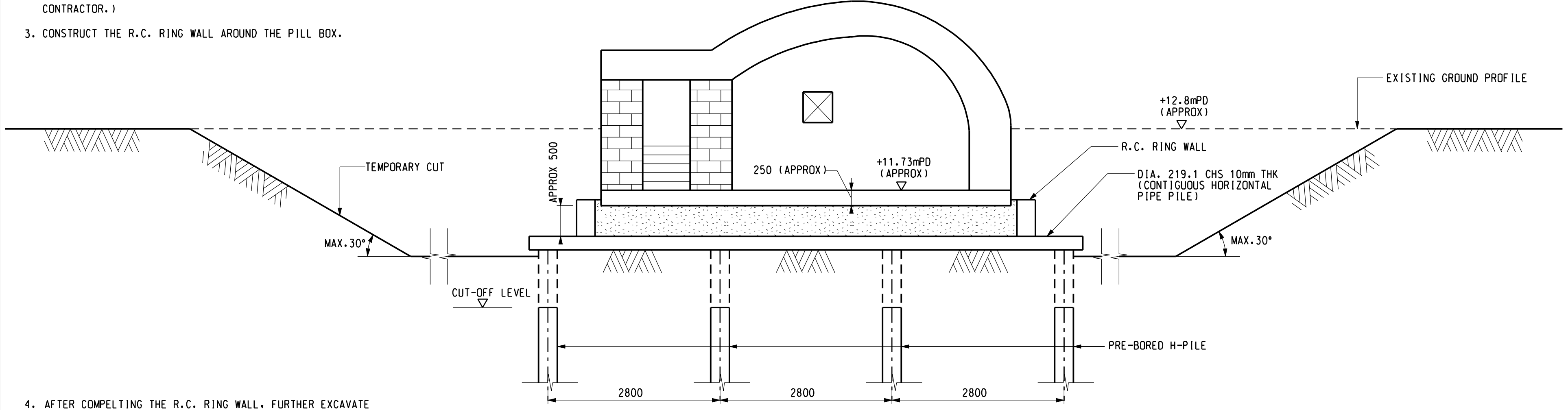

Wartime bunker and shelters near Tai Tam Gap
Artillery Observation Posts at Mt. Parker
Artillery Observation Posts at Stanley Mound
Artillery Observation Posts at the end of Harlech Road (High West)
Artillery Observation Posts at the summit of Jardine's Lookout
Artillery Observation Posts on Pottinger Peak
Artillery Observation Posts, Middle Spur
British Military Structure, Middle
Jubilee Battery
Mount Davis Battery

Appendix III

Relocation Plan

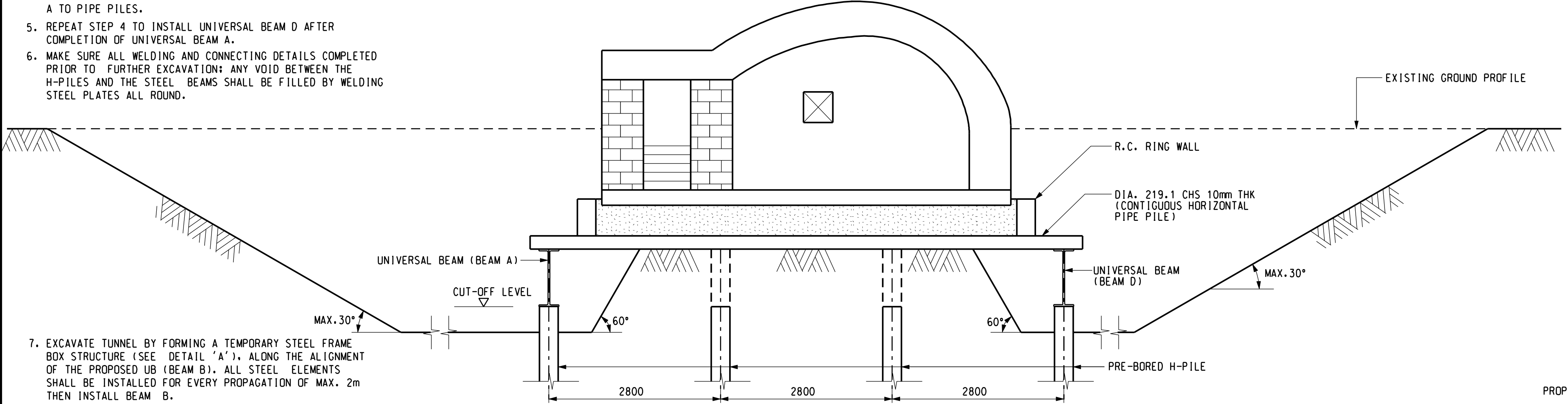
CONSTRUCTION SEQUENCE FOR UNDERPINNING WORKS

1. EXCAVATE DOWN AROUND THE PILLBOX BY FORMING TEMPORARY CUT OF MAX 30° TO PROVIDE ACCESS AND WORKING AREA FOR HORIZONTAL PIPE PILING.
2. INSTALL HORIZONTAL PIPE PILES AND H-PILES(PRE- BORED). TOLERANCE ON HORIZONALITY OF STEEL PIPE PILES SHALL NOT EXCEED 1 IN 100. THE TENTATIVE FOUNDING LEVEL OF H-PILES ARE -30mPD (FOR REFERENCE ONLY, ACTUAL FOUNDATION TYPE & FOUNDING LEVEL TO BE DESIGNED BY THE CONTRACTOR.)
3. CONSTRUCT THE R.C. RING WALL AROUND THE PILL BOX.



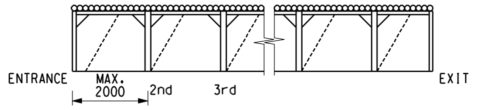
VIEW 1

4. AFTER COMPELTING THE R.C. RING WALL, FURTHER EXCAVATE DOWN UNDERNEATH ALONG THE EDGE OF THE PILL BOX AND EXCAVATE MAX. 1000 INWARD. INSTALL THE REQUIRED UNIVERSAL BEAM (BEAM A) UNDERNEATH AND AT DIRECTION PERPENDICULAR TO THE PIPE PILES, WELD UNIVERSAL BEAM A TO PIPE PILES.
5. REPEAT STEP 4 TO INSTALL UNIVERSAL BEAM D AFTER COMPLETION OF UNIVERSAL BEAM A.
6. MAKE SURE ALL WELDING AND CONNECTING DETAILS COMPLETED PRIOR TO FURTHER EXCAVATION; ANY VOID BETWEEN THE H-PILES AND THE STEEL BEAMS SHALL BE FILLED BY WELDING STEEL PLATES ALL ROUND.



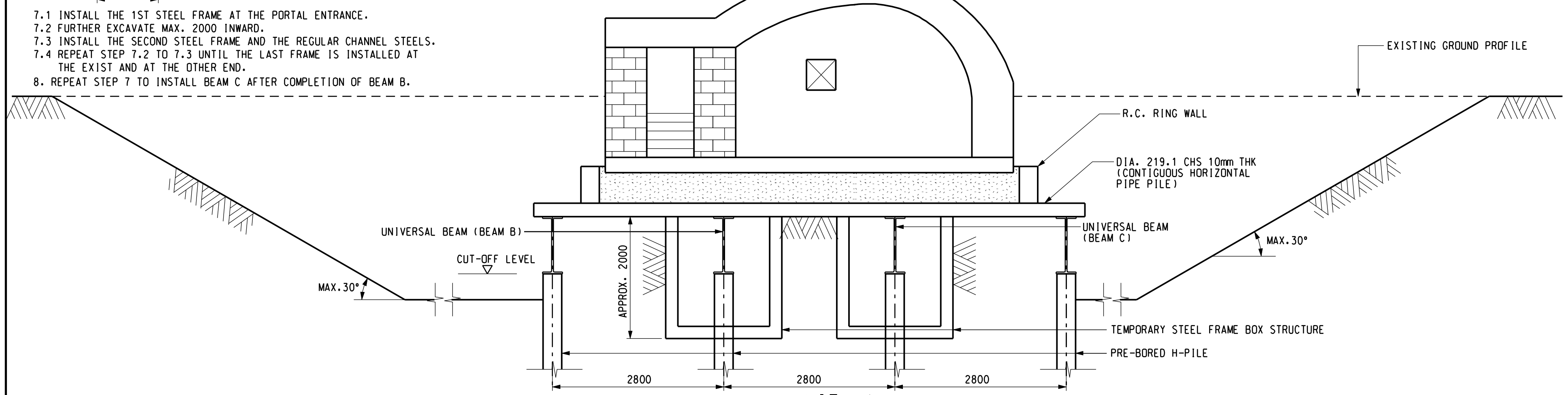
VIEW 1

7. EXCAVATE TUNNEL BY FORMING A TEMPORARY STEEL FRAME BOX STRUCTURE (SEE DETAIL 'A'), ALONG THE ALIGNMENT OF THE PROPOSED UB (BEAM B). ALL STEEL ELEMENTS SHALL BE INSTALLED FOR EVERY PROPAGATION OF MAX. 2m THEN INSTALL BEAM B.



7.1 INSTALL THE 1ST STEEL FRAME AT THE PORTAL ENTRANCE.
7.2 FURTHER EXCAVATE MAX. 2000 INWARD.
7.3 INSTALL THE SECOND STEEL FRAME AND THE REGULAR CHANNEL STEELS.
7.4 REPEAT STEP 7.2 TO 7.3 UNTIL THE LAST FRAME IS INSTALLED AT THE EXIST AND AT THE OTHER END.

8. REPEAT STEP 7 TO INSTALL BEAM C AFTER COMPLETION OF BEAM B.



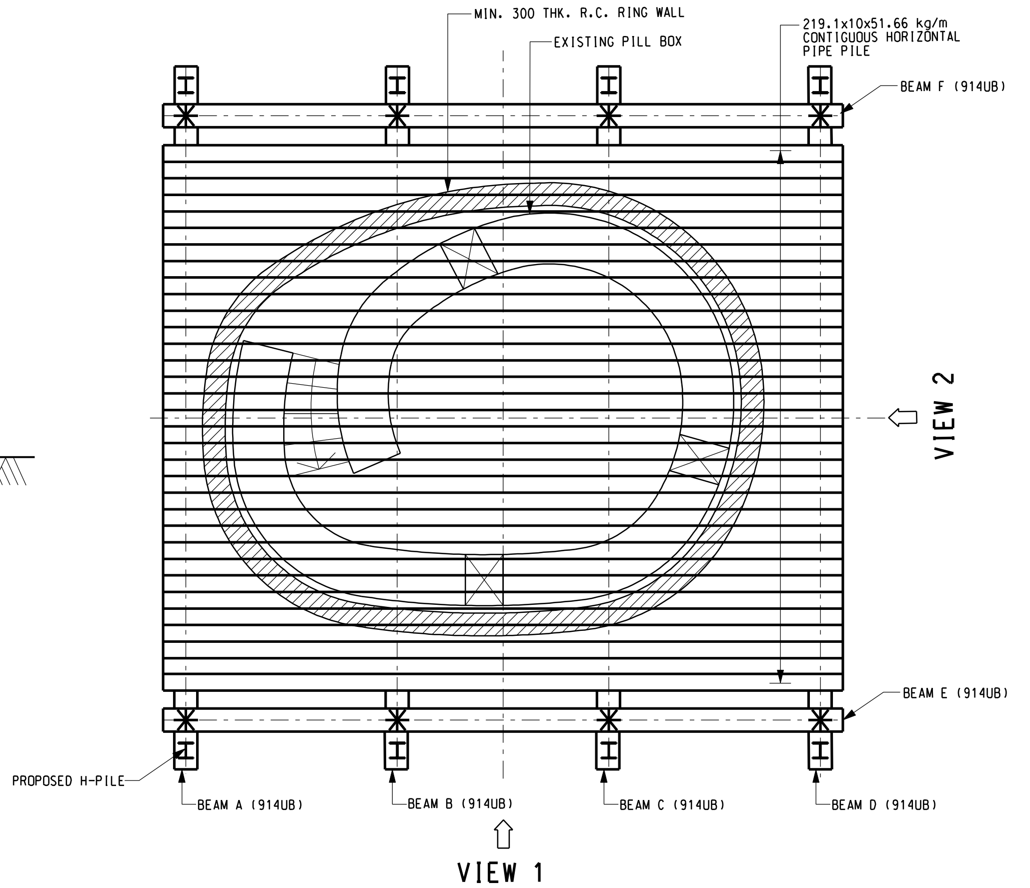
VIEW 1

NOTES:

1. ALL DIMENSION ARE IN MILLIMETER OR OTHERWISE SPECIFIED.
2. ALL LEVELS SHALL REFER TO METERS ABOVE PRINCIPLE DATUM OF HONG KONG.
3. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH DRAWING NO. 1106/W/301/ACM/C21/502 & 503.
4. ALL DIMENSIONS AND LEVELS OF THE EXISTING PILLBOX ARE INDICATIVE ONLY AND SHOULD BE VERIFIED BY THE CONTRACTOR ON SITE.
5. THE PILE PRE-BORING EXERCISE SHALL NOT CAUSE SETTLEMENT TO THE PILLBOX STRUCTURE.
6. DRAWING NOS. 1106/W/301/ACM/C21/501, 502 & 503 SHOW THE SCHEMATIC UNDERPINNING WORKS. ALL MEMBER SIZES, LENGTH AND LEVELS OF THE PROPOSED UNDERPINNING WORKS ARE INDICATIVE AND FOR REFERENCE ONLY. THE DETAILED DESIGN OF UNDERPINNING WORKS SHOULD BE DONE BY THE CONTRACTOR.

LEGEND:

✳ ENVISAGED LIFTING POINT FOR TRANSPORTING THE PILLBOX (INDICATIVE ONLY)



PLAN OF STEEL FRAME AND UNDERPINNING WORKS

FOR INFORMATION ONLY

REV	DESCRIPTION	BY	DATE	APPROVED
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DRAWN	BCHF
DESIGNED	TCC
CHECKED	AKLN
APPROVED	IMW
DATE	17/DEC/2012

DO NOT SCALE DRAWINGS. ALL DIMENSIONS SHALL BE VERIFIED ON SITE.

MTR

SHATIN TO CENTRAL LINK

ORIGINATOR

AECOM in association with Aedas, MVA and DLS

CADD REF. 1106_W_301_ACM_C21_501A.DGN

TITLE
CONTRACT 1106
DIAMOND HILL STATION
HERITAGE - PILLBOX RELOCATION
UNDERPINNING
(SHEET 1 OF 3)

SCALE N.T.S.

DRAWING NO. 1106/W/301/ACM/C21/501

REV. A

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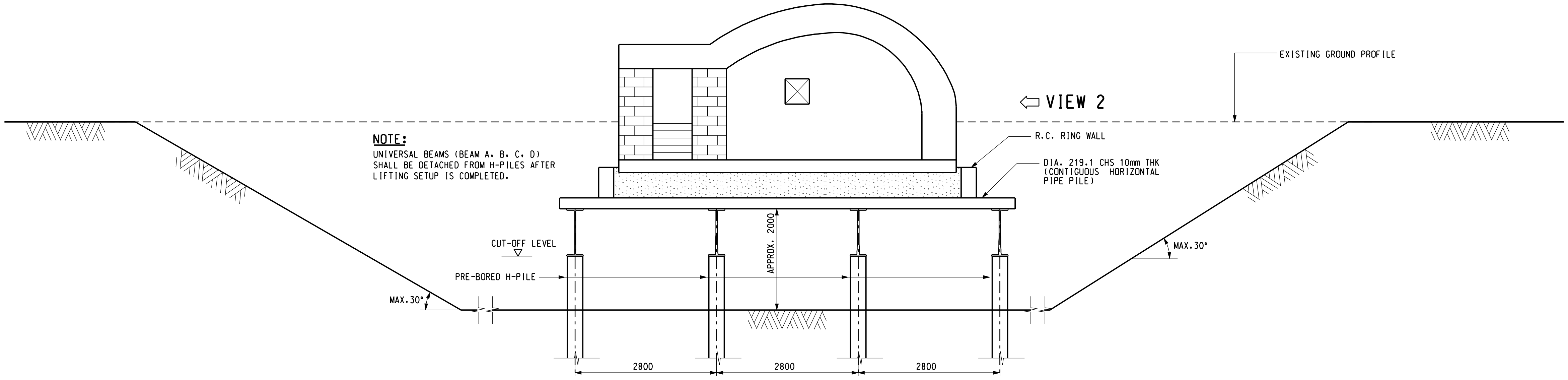
CONSTRUCTION SEQUENCE FOR UNDERPINNING WORKS

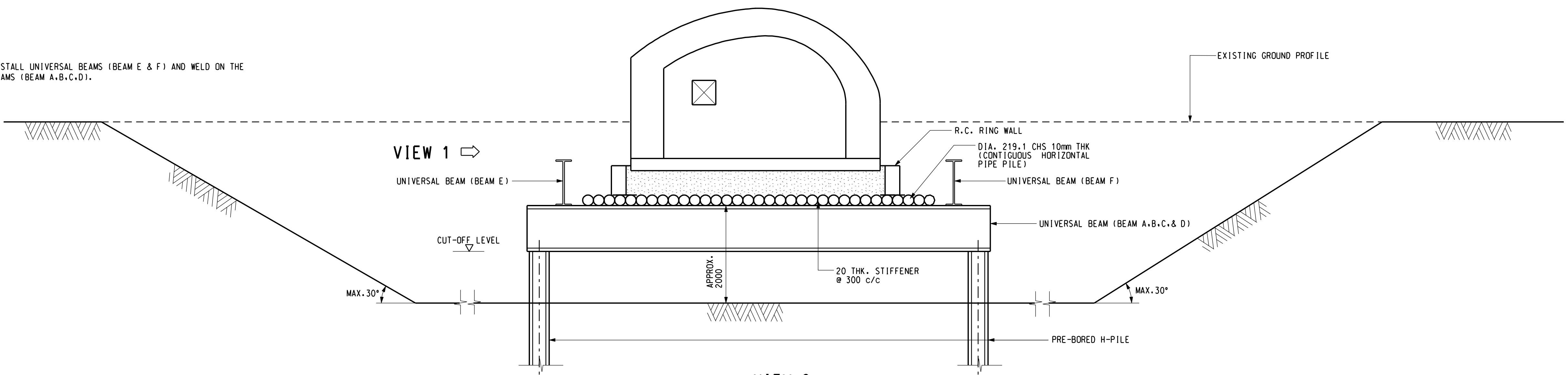
9. EXCAVATE TO THE BOTTOM LEVEL OF THE STEEL FRAME TUNNEL AND REMOVE THE TEMPORARY STEEL FRAME BOX STRUCTURE.
10. FURTHER EXCAVATE DOWN TO APPROX. 2m BELOW PIPE PILE.



NOTE:
UNIVERSAL BEAMS (BEAM A, B, C, D) SHALL BE DETACHED FROM H-PILES AFTER LIFTING SETUP IS COMPLETED.

VIEW 1

11. INSTALL UNIVERSAL BEAMS (BEAM E & F) AND WELD ON THE BEAMS (BEAM A,B,C,D).



VIEW 2

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DRAWN BCHF
DESIGNED TCC
CHECKED AKLN
APPROVED IMW
DATE 17/DEC/2012

MTR

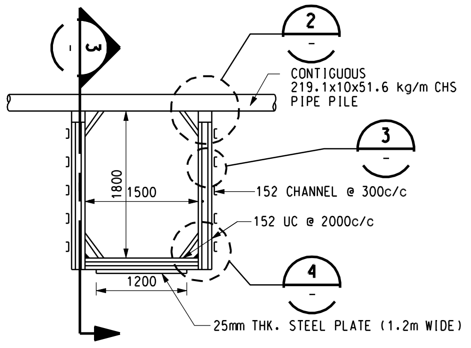
SHATIN TO CENTRAL LINK

ORIGINATOR
AECOM in association with Aedas, MVA and DLS

CADD REF. 1106_W_301_ACM_C21_502A.DGN

TITLE
CONTRACT 1106
DIAMOND HILL STATION
HERITAGE - PILLBOX RELOCATION
UNDERPINNING
(SHEET 2 OF 3)

SCALE N.T.S.
DRAWING NO. 1106/W/301/ACM/C21/502
REV. A



DETAIL A
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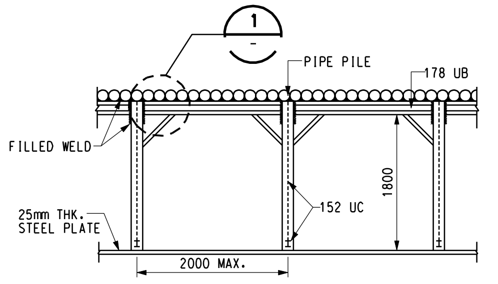
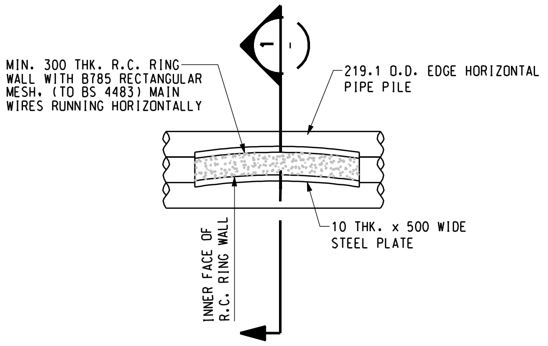


SECTION 3
SCALE N.T.S.

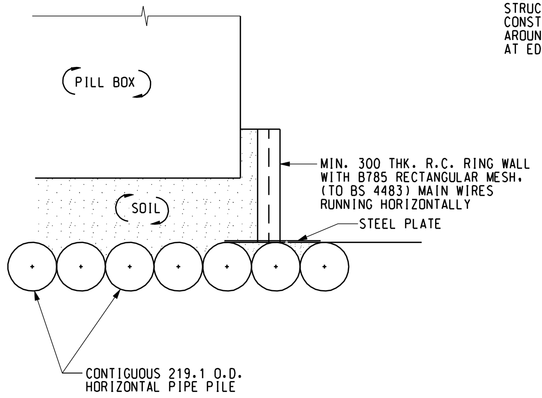
TYPICAL DETAIL FOR THE TEMPRORAY STEEL FRAME BOX STRUCTURE

N.T.S.



PLAN ON HORIZONTAL PIPE PILES

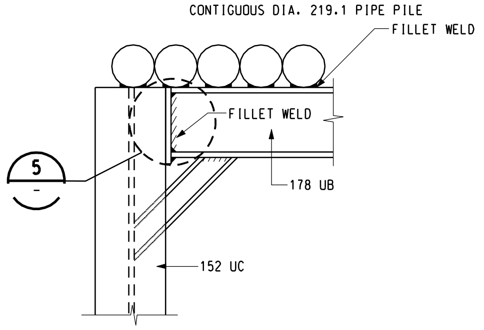
(MIN. LAP LENGH FOR WIRE MESH = 450mm)
N.T.S.



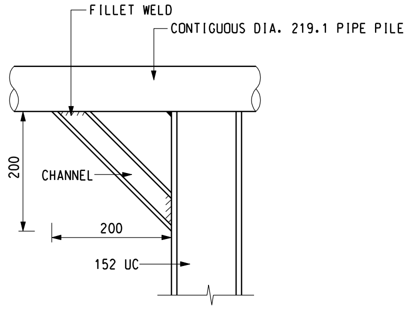
SECTION 1
SCALE N.T.S.

NOTE:

1. THE RING WALL SHALL BE KEPT AWAY FROM THE PILLBOX STRUCTURE SUCH THAT WELDING OF SHEET PLATE FOR THE CONSTRUCTION OF RC RING WALL WILL NOT DISTURB SOIL AROUND PILLBOX BASE AND THEREBY CAUSING SETTLEMENT AT EDGE OF THE STRUCTURE (SECTION 1 AND 2 REFERS).



DETAIL 1
SCALE N.T.S.



DETAIL 2
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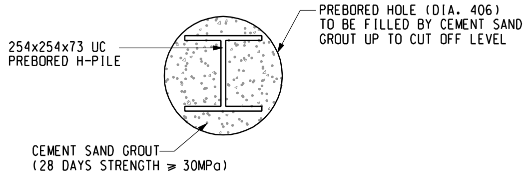
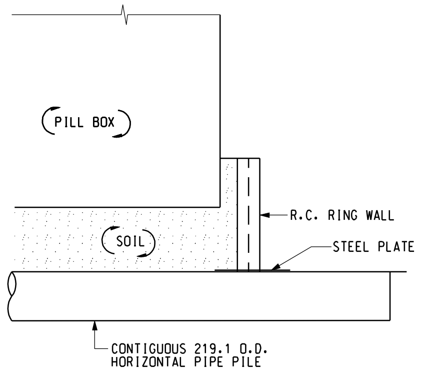


TYPICAL DETAILS OF PREBORED H-PILE INSTALLATION

N.T.S.



SECTION 2
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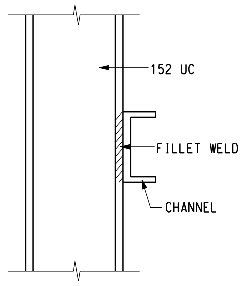

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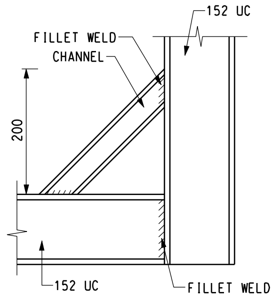

DETAIL 4
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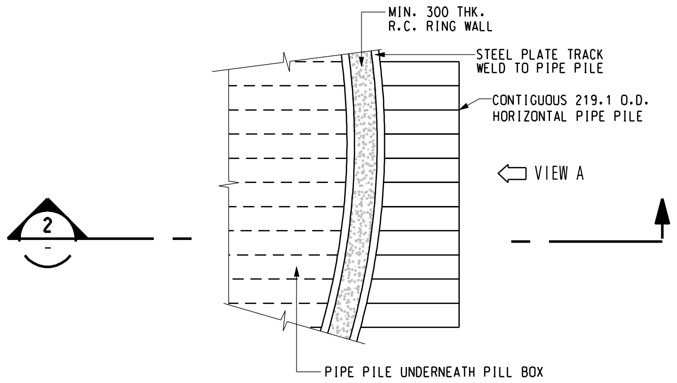
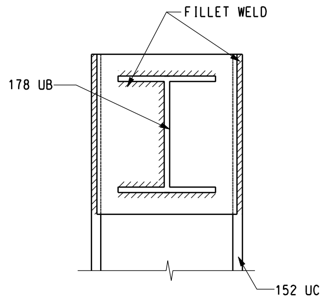
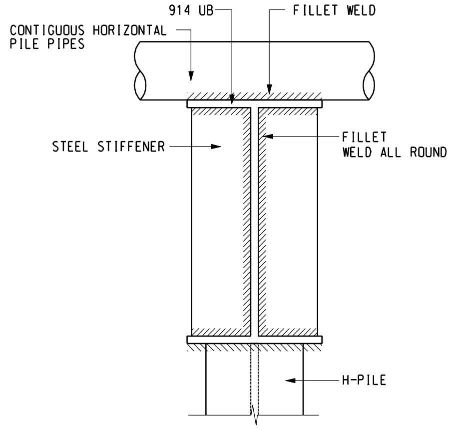


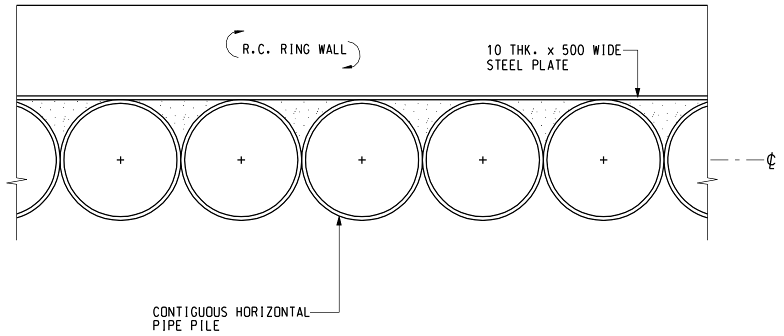


DETAIL 5
SCALE N.T.S.



TYPICAL CONNECTION DETAIL BETWEEN H-PILE AND HORIZONTAL U.B.

N.T.S.



VIEW A
N.T.S.

FOR INFORMATION ONLY

REV	DESCRIPTION	BY	DATE	APPROVED
A	WORKING DRAWING	AKLN	17DEC12	IMW

DRAWN	BCHF
DESIGNED	TCC
CHECKED	AKLN
APPROVED	IMW
DATE	17/DEC/2012

DO NOT SCALE DRAWINGS. ALL DIMENSIONS SHALL BE VERIFIED ON SITE.

MTR

SHATIN TO CENTRAL LINK

ORIGINATOR

AECOM in association with Aedas, MVA and DLS

CADD REF. 1106_W_301_ACM_C21_503A.DGN

TITLE
CONTRACT 1106
DIAMOND HILL STATION
HERITAGE - PILLBOX RELOCATON
UNDERPINNING
(SHEET 3 OF 3)

SCALE N.T.S.
DRAWING NO. 1106/W/301/ACM/C21/503
REV. A

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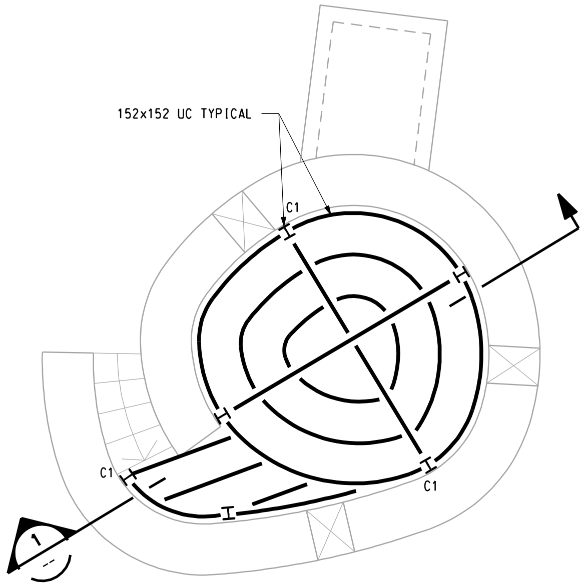
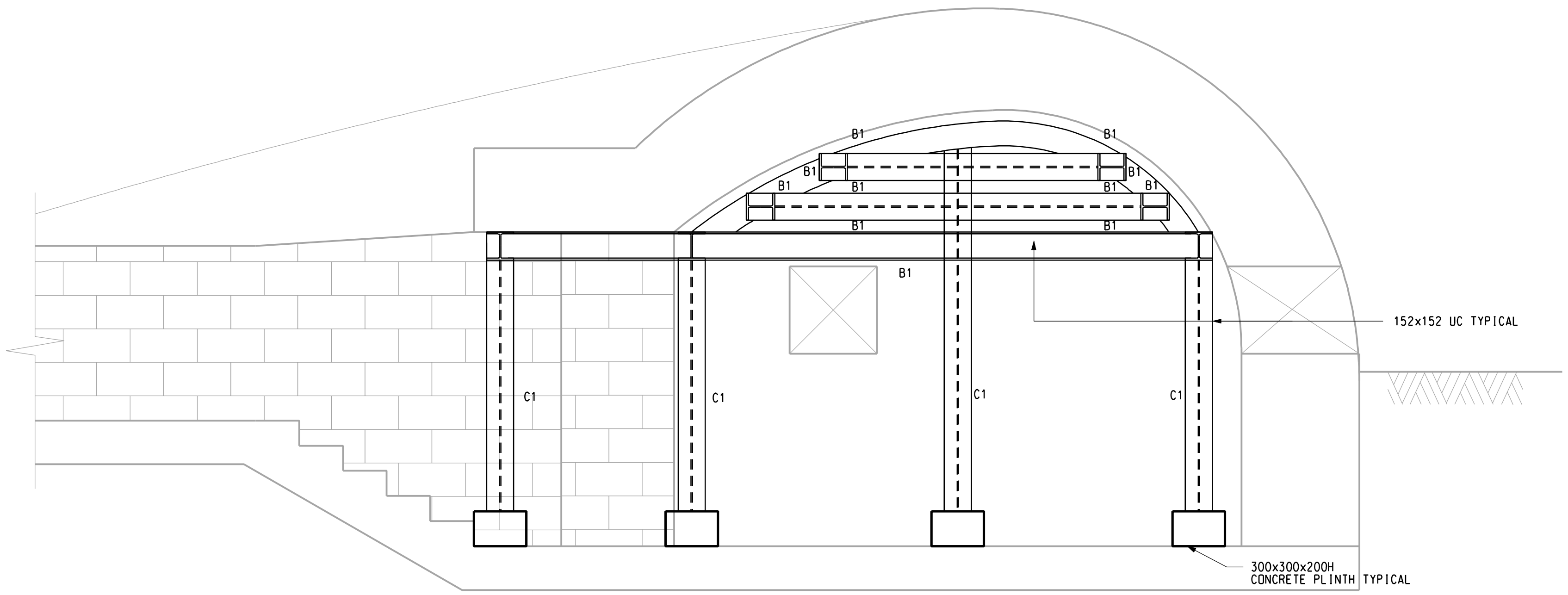


PILLBOX FRAMING PLAN

SCALE 1:50



SECTION 1/--

SCALE 1:20

NOTES:

1. THIS SCHEME INDICATES DESIGN INTENT. THE CONTRACTOR SHOULD DEVELOP HIS OWN DESIGN TO SUIT THE ACTUAL GEOMETRY OF THE PILLBOX AND THE RELOCATION METHOD ADOPTED.
2. GAP BETWEEN PILL BOX AND SPACE FRAME TO BE WEDGED TIGHT.
3. IT IS RECOMMENDED THE PILLBOX STRUCTURE SHALL BE SECURELY PROPPED AND ADEQUATELY SUPPORTED LATERALLY PRIOR TO THE INSTALLATION OF THE TEMPORARY STEEL LIFTING PLATFORM.
4. TIMBER PACKING SHALL BE PLACED TO PREVENT DIRECT CONTACT BETWEEN STEELWORKS AND THE PILLBOX STRUCTURE.
5. LOAD FROM THE STEEL POST SHALL BE SPREAD EVENLY AT THE BASE TO PREVENT EXCESSIVE LOAD ONTO THE EXISTING SLAB.
6. LATERAL LOOP IN STEEL RODS SHALL BE CONSIDERED TO WRAP ROUND THE ROOF DOME TO PREVENT CRACKING OF THE ROOF DUE TO LATERAL MOVEMENT.
7. THE PROPPING AND SUPPORTING WORKS SHALL BE INSPECTED TO ENSURE EFFECTIVENESS PRIOR TO EVERY LIFTING OPERATION.

FOR INFORMATION ONLY

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REV	DESCRIPTION	BY	DATE	APPROVED
B	REPLY AMO'S COMMENT	SPC	26NOV12	IMW
A	ISSUE FOR TENDER ADDENDUM	SPC	24JUL12	IMW

DRAWN	CTJ
DESIGNED	TWF
CHECKED	SPC
APPROVED	IMW
DATE	24/JUL/2012

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MTR

SHATIN TO CENTRAL LINK

ORIGINATOR

AECOM in association with
Aedas, MVA and DLS

CADD REF. 1106_T_301_ACM_C21_504B.dgn

TITLE
CONTRACT 1106
DIAMOND HILL STATION
HERITAGE - PILLBOX
RELOCATION PROPOSED PERMANENT
STRENGTHENING METHOD FOR ENTIRE STRUCTURE

SCALE 1 : 50 @ A1

DRAWING NO. 1106/T/301/ACM/C21/504

REV. B

Appendix IV Responses to Comments

SCL – C1103 Detailed Design for Diamond Hill Station
Conservation Management Plan for the Old Pillbox
(AMO’s letter ref. ( ) in LCSD/CS/AMO 81-5/21 dated 18 January 2013)

AMO’s Comments on Conservation Management Plan for the Old Pillbox	**Response from MTR Corporation**
AMO’s letter ref. ( ) in LCSD/CS/AMO 81-5/21 dated 18 January 2013	
Thank you for your letter dated 27.12.2012. Please see our detailed comments as enclosed. We would like to request you to confirm that MTR will carry out the Management and Maintenance Plan in Section 7.6 of CMP.	
1. Some comments are repetitive and mentioned in our previous comments, please check if all comments are noted, responded and addressed.	Noted. Checked.
2. In Section 1.1, please give elaboration of “on site preservation is not practicable”.	Noted. A statement as cited from the approved EIA Report was added for further elaboration.
3. In Section 1.2, please review if the reinstatement form of the pillbox is not unknown.	Noted. Clarified.
4. In Section 1.6.1, please rectify “Buildings Department” and there is no such “Code of Practices of Building Regulations”.	Noted. Amended in the revised report.
5. In Section 2.4, please provide more information on how the construction year of 1942 was estimated.	Noted. Amended in the revised report.
6. In Section 3.1, please further verify the relationship of the underground chamber and the Pillbox.	Section 3.3.3 is added to review the chamber. However, further investigation will be taken by the contractor.
7. In Chapter 3, please include study and comparison with other pillboxes in HK, if information is available.	A paragraph is added to Section 3.3.1 and please refer to appendix II.
8. Please provide more information for the location of pillbox in Photo 4.1 and 4.2, if available.	Noted. Location provided in the revised report.
9. Please consider if the Pillbox has witnessed the poor living condition of refugees after	Agree. Amended in the revised report.

AMO's Comments on Conservation Management Plan for the Old Pillbox		**Response from MTR Corporation**
	WWII in Section 4.3.	
10.	In Section 5.1, please consider to adopt the definition of CDE in *Standards and Guidelines for the Conservation of Historic Places in Canada* by Parks Canada.	Noted. Definition added in the revised report.
11.	Please review the level of significance of Item 5 – Physical relationship in Table 5.2 as this relationship could not be verified.	The pillbox is located about 40 meters away from the hangar (armored range). The pillbox is located at a higher position than hangar; Pillbox roof is +14.80m above the Principal Datum; hangar roof is +15.70m. These are deliberate site design strategy to achieve the defensive purpose. The level of significance is thus considered as "Medium" which has been amended.
12.	In item 8 of Section 7.1, the significance of the intervention should also be considered.	Noted. Amended in the revised report.
13.	Please review the sentence "Generally, relocation of the pillbox in one piece can <u>reduce any loss</u> to the heritage value…" in Section 7.3.	Noted. Amended in the revised report.
14.	In Section 7.4 as well as other sections, we suggest the storage place be called temporary "building" instead of "shed".	We propose using "temporary storage compound" instead, as it is not proper to call it "building".
15.	In Appendix I Figure a14, the red-lined area is not consistent with the description.	Noted. Amended in the revised report.
16.	We understand that the demolition plan in Appendix III is conceptual only. Detailed demolition plan would be submitted to RDO and circulated for our comments.	In view of the nature of works (i.e., the Pillbox shall be relocated in one piece), Appendix III has been properly amended as Relocation Plan. The contractor has generally agreed to follow the Relocation Plan and a supplementary report with a detailed Relocation Plan will be submitted by the contractor. The contractor's supplementary report shall be properly checked and submitted to RDO and circulated to AMO for comment.

AMO's Comments on Conservation Management Plan for the Old Pillbox	**Response from MTR Corporation**
17. A list of reference should be put at the end of the CMP.	Noted. The list of reference was added in the revised report.

Appendix V

Implementation Programme & Maintenance and Management Schedule

Diamond Hill CDA Site
Conservation Management Plan (CMP) – Implementation Programme

The proposed implementation programme of temporary relocation for the two heritages [being the Former RAF Hangar (the Hangar) and the Old Pillbox (the Pillbox)] is as below:-

Item	Description	Start	Finish	Remark
1	Finalization and obtaining AMO's agreement of the sets of Engineer's CMP reports for the Hangar and the Pillbox	Nov 12	Apr 13	
2	Application of the CMP for EPD's approval as per the EP with EPD's approval granted	Feb 13	Apr 13	
3	Removal of affected trees around the Hangar	Jan 13	Mar 13	
4	Application for EPD's permit and removal of asbestos panels at the Hangar	Jan 13	Mar 13	
5	Finalization and obtaining AMO's agreement of the sets of Contractor's supplementary submissions for the Hangar and the Pillbox	Feb 13	Apr 13	
6	Finalization and submission of the Relocation Plan for the Pillbox and Dismantle Plan for the Hangar to RDO and AMO	Feb 13	Apr 13	
7	Relocation works of the Pillbox to temporary storage compound for storage	May 13	Aug 13	
8	Dismantle of the Hangar to temporary storage compound for storage	May 13	Aug 13	
9	Tentative permanent relocation of the Pillbox and the Hangar in the format as stated in the approved EIA report and the CMP reports subject to approvals and consents of relevant Government Departments.	-	Apr 18	The permanent location for the Hangar and the Pillbox is pending Planning Department's confirmation.

Contract No. 1106 –Diamond Hill Station

Management and Maintenance Schedule for the Old Pillbox

The Old Pillbox

Maintenance arrangement during storage proposal by the Contractor

The management and maintenance schedule should be reviewed every six months by MTRC, SLJV's Heritage Consultant and SLJV.

A. Reference document –

Conservation Management Plan for the Old Pillbox, rev. A, February, 2012.

B. Maintenance arrangement during storage –

1. A temporary storage compound should be provided with appropriate measures to prevent further damage to the heritage structures –

- The temporary storage compound shall be weather-proof, and the condition shall be checked bi-weekly by SLJV's Senior Site Agent.
- The relocated pillbox should be rest on the as-constructed concrete plinths (1000mm width & 950mm height) to avoid flooding.
- The drainage of the temporary storage compound and any sight of water entering into the storage temporary storage compound shall be checked weekly by SLJV's Site Foreman.
- The temporary storage compound shall be checked weekly by SLJV's Site Foreman (Appendix A – Weekly Inspection Checklist refers), or after the first warning by the Observatory that tropical cyclone warning signal no. 3 or above, or amber or red or black rainstorm warning signal is going to be hoisted.
- The temporary storage compound shall be checked by SLJV's Site Foreman after the Observatory lowered all tropical cyclone warning signal and rainstorm warning signals.

2. All elements should be securely protected to avoid any physical damage and the area should be fenced off to prevent trespassing and to secure the structures –

- Record check by SLJV's site security once from 6.00 p.m. to 6.00 a.m. of the subsequent day everyday, and
- The record shall be kept in SLJV's site office for checking by all parties.

3. Regular inspection on the reinforced concrete structure roof structure, floor slab and staircase of the pillbox –

- The reinforced concrete structure roof structure, floor slab and staircase of the pillbox shall be checked once per month by the Heritage Consultant of the Contractor with report prepared for any adverse observation, (e.g. deterioration or damage) and shall be submitted to MTRC for record purposes. MTRC shall notify AMO and relevant Government departments the situations as soon as practicable. Remedial works shall be carried out if necessary after confirmation from MTRC with advices from AMO and relevant Government departments sought, where appropriate.

- The report shall include record photos of the roof structure (4 nos.), floor slab (1 no.), and staircase (1 no.).
- The report with record photo shall be submitted to MTRC for record purpose, and one copy will be kept in SLJV's Site Office for checking by all parties.
- SLJV's Senior Site Agent shall notify to MTRC for any adverse observation in the report.

4. Proper surface drainage should be constructed throughout the temporary storage compounds –

- The drainage of the temporary storage compound shall be checked once per week by SLJV's Site Foreman, and
- The drainage shall be checked by SLJV's Site Foreman after the first warning by the Observatory that tropical cyclone warning signal no. 3 or amber rainstorm warning signal is going to be hoisted.

5. Remedial procedures to handle any non-conforming situations –

- All non-conforming situations shall be handled by SLJV's Senior Site Agent,
- All remedial work to non-conforming work shall be completed within three days after receipt of the report of non-conforming work,
- The remedial report shall be kept by SLJV's Site Office for checking by all parties.

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Annex A - Weekly Inspection Checklist

Annex A – Weekly Inspection Checklist

Contract No. 1106 –Diamond Hill Station

Management and Maintenance Schedule for the Old Pillbox

Weekly Inspection Checklist

Item	Description	yes/no
A.	External envelope of temporary storage compound	
1.	Flooding around the temporary storage compound	
2.	Cracks on the wall surface	
3.	Wall damage, such as crashed into by vehicle	
4.	Broken window glazing	
B.	Ceiling	
1.	Water dripping from ceiling	
2.	Water condensation on ceiling surface	
3.	Water stain marks on ceiling surface	
4.	Cracks on ceiling	
C.	Floor	
1.	Water ponding on floor surface	
2.	Water stain marks on floor surface	
D.	Wall, door and window	
1.	Water seeping in from wall surface	
2.	Water stain marks on wall surface	
3.	Cracks on wall surface	
4.	Window can close properly	
5.	Door can close properly	
6.	Door lock damaged	
E.	Building services installation	
1.	Light fitting can function properly	
2.	Ventilation fan can function properly	
3.	Exit sign light can function properly	
4.	Emergency light fitting can function properly	
F.	Stored items	
1.	Signs of unauthorized search	
2.	Stored items collapsed	
G.	Pest control	
1.	Rats or signs of rats identified	
2.	Termite	
3.	Any other types of insects	

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