



Structural RIBA Stage 3 Report
for
Scarborough West Pier Regeneration Scheme
Foreshore Road
Scarborough
YO11 1PD

Commissioned by WBS Ltd.

Report 21037-H-RP-001-R0
27th April 2023



Mason Clark Associates

Project		WBS – Scarborough West Pier Regeneration		Job No		21037-H					
Section				Introduction				Sheet		i	
Calc. By	Date	Chk'd By	Date	Rev	Date						
DM	Apr 23	MWG	Apr 23								

Project Title:	WBS – Scarborough West Pier Regeneration
Job Ref:	21037-H
Client	William Birch & Sons
Date	April 2023


CONTENTS

Sheet	Item
i	Contents
i	Revision
i	Design Data
A1-2	MCA Site Observations
B1-7	Summary and Recommendations
Appendix A	Preliminary Ground Investigaiton Information
Appendix B	Steelwork Corrosion Survey
Appendix C	Concrete Core Results
Appendix D	MCA Site Photographs
Appendix E	MCA Ferroscons
Appendix F	Building 1 Historic Archive Drawings

REVISION HISTORY

Rev	Date	Description	Checked By
0	27.04.23	Initial Issue	MWG
1	04.07.23	Second Issue	MWG

PROJECT DESIGN DATA	
DESCRIPTION	This document records observations completed by MCA in February 2023. The second part explains the current structural strategy for the project based on these observations and completed surveys.
INTENDED USE	Public
INFORMATION RECEIVED	Borehole records and trial pit sketches from Solmek 31.03.2023 Corrosion Survey by Proteq AM-23.186 VT March 2023. Concrete Core Results – TESTCRETE March 2023. Building 1 Archive Drawings – North Yorkshire County Council Records.

 Mason Clark Associates 44 Newland Park Hull HU5 2DW	Project				Job Ref.	
	WBS – Scarborough West Pier Regeneration				21037H	
	Section				Sheet no./rev.	
MCA Site Observations				A 1		
Calc. by	Date	Chk'd by	Date	App'd by	Date	
DM	Apr 23					

1. **MCA SITE OBSERVATIONS**

1.1. **BUILDING 1**

- 1.1.1 Timber discolouration identified in portions of the length of the timber purlins, ridge, rafters and hip / valley members. Photograph - B1 (1)
- 1.1.2 Damaged internal brick walls identified at their apex. Photograph - B1 (4)
- 1.1.3 Water tank with supporting steelwork identified in the roof void, located at the north end of the building. Photograph - B1 (3)
- 1.1.4 Bowing timber limited sections supporting first floor ceiling.
- 1.1.5 Existing steel down-stand beams identified for most beams over ground floor level of this Building. Other down-stands were probed and determined as concrete lintels. B1 (2)
- 1.1.6 Archive drawings show extension constructed from brick spread and concrete foundation.
- 1.1.7 Chimney Support steelwork identified to follow line of brickwork forming fireplace openings and divider wall from original design.
- 1.1.8 180-190mm Ground Slab thickness and reinforcement present 8mm diameter, 180mm down. Photograph - B1 (5)
- 1.1.9 Ferro scan of top of ground floor slab, does not show reinforcement within top 150mm layer.

1.2. **BUILDING 2**

- 1.2.1 Timber discolouration identified in portions of the length of the timber purlins, ridge, rafters and hip / valley members. Photograph – B2 (2)
- 1.2.2 Scaffolding now present along west elevation of Building 2, which appears to prop and support the balcony of the building.
- 1.2.3 Raised original ceiling present in roof void. Photograph – B2 (1)
- 1.2.4 Existing steelwork in roof void present in southern end of the building. Photograph – B2 (1)
- 1.2.5 Ground slab thickness 160mm with no reinforcement provision. Photograph – B2 (3)
- 1.2.6 Ferro scan of top of ground floor slab, does not show reinforcement within top 150mm layer.




Mason Clark Associates
44 Newland Park
Hull
HU5 2DW

Project				Job Ref.	
WBS – Scarborough West Pier Regeneration				21037H	
Section				Sheet no./rev.	
MCA Site Observations				A 2	
Calc. by	Date	Chk'd by	Date	App'd by	Date
DM	Apr 23				

1.3. **BUILDING 3**

- 1.3.1 Primary structural columns, beams and roof bracing is steelwork. Photograph – B3 (3) with close up B3 (7).
- 1.3.2 First floor down stands are steel beams supporting beam and block floors. The beam and block floor has a screed above. Photograph – B3 (5) and B3 (6).
- 1.3.3 Ground slab thickness is 240-250mm, with 12mm diameter bars at 135mm depth. Photograph – B3 (4)
- 1.3.4 Roof is prefabricated timber trusses, Photograph – B3 (8)
- 1.3.5 Ferro scan of Building 3 first floor screed shows 8mm diameter reinforcement bars at approximately 200mm spacing located 50mm below top of slab level.
- 1.3.6 Ferro scan of Building 3 first floor screed shows 8mm diameter reinforcement bars at approximately 200mm spacing located 50mm below top of slab level.
- 1.3.7 Ferro scan of Building 3 ground floor concrete slab shows either 8mm or 20mm bars at 200mm centres, 100 below top of slab level.
- 1.3.8 In roof void, cavity measured as 140 internal block work, 140mm cavity, 100mm brickwork.


 Mason Clark Associates 44 Newland Park Hull HU5 2DW	Project				Job Ref.	
	WBS – Scarborough West Pier Regeneration				21037-H	
	Section				Sheet no./rev.	
MCA Summary and Recommendations				B 1		
Calc. by	Date	Chk'd by	Date	App'd by	Date	
DM	Apr 23					

1. RIBA STAGE 3 INVESTIGATION SUMMARY AND RECOMMENDATIONS

1.1. Below are section which describe additional recommendations for buildings 1 to 3. These are in addition to those described in the structural engineer section of the RIBA Stage 2 report.

1.2. BUILDING 1

- 1.2.1 Due to timber defects identified in the roof void of this building, a timber survey is recommended to check and survey any wet rot or other defect types which might be present.
- 1.2.2 Brickwork internally need local patch repairs, to repair damage brickwork identified in the roof voids.
- 1.2.3 The assumed water tank and associated supporting steelwork located at the north end of the building must be removed prior to construction starting.
- 1.2.4 It is advised to remove and replace the bowing timber sections present at first floor ceiling level, with new timber joists spanning between the transverse walls. The timber joists of the building are not described as of significant heritage value in the Heritage Statement, and therefore, MCA have advised they be replaced.
- 1.2.5 Existing steel down-stand beams and lintels are in fair condition, and can be utilised if openings remain the same width. However, due to the current proposals most of these down-stand beams do not provide the required opening and should be removed. Steel box frames will provide vertical and lateral stability and openings as required by the proposals, with appropriate temporary works constructed before to allow their installation.
- 1.2.6 Although archive drawings show the extension constructed with brick spreader and concrete strip foundations, TP05 sketch by Solmek, shows only the brick spreader foundation. This in tandem with CBRs showing very weak made ground, requires the proposed foundations supporting the glazed external space and internal steel box frames to be piled. It is noted that Solmek could not complete a trial pit on the main building, which will likely differ in it's foundation geometry and type compared with the extension. This needs to be determined as a priority before construction begins to give MCA a sufficient window to validate or redesign the foundations. It is requested that Solmek, in their final report advise on the safe bearing pressure (SBP), internally, allowing the above to be validated. MCA have designed new foundations to have compressible material / movement joints under proposed foundations to prevent damage to the existing building foundations.
- 1.2.7 Chimney support steelwork identified which follows the line of the brickwork forming the fireplace openings and divider walls from the original design, are in fair condition and can be reutilised if fixing back to steel box frame construction possible.
- 1.2.8 First floor existing timber floor joists likely adequate, pending final design check, and can be retained if in fair condition when exposed in all locations, and if it is possible to fix back to the proposed steel box frames.

 Mason Clark Associates 44 Newland Park Hull HU5 2DW	Project				Job Ref.	
	WBS – Scarborough West Pier Regeneration				21037-H	
	Section				Sheet no./rev.	
MCA Summary and Recommendations				B 2		
Calc. by	Date	Chk'd by	Date	App'd by	Date	
DM	Apr 23					

1.2.9 The corrosion survey by Proteq describes the balcony steelwork of Building 1 as in poor condition. The steelwork needs to be removed off site, grit blasted, inspected, and recoated. The bases of these members and their fixings will need local repair or complete replacement following the inspection. In some areas, it is possible to complete the work in-situ which is of advantage, as there is lower risk of damaging the handrails.

1.3. **BUILDING 2**

1.3.1 Due to timber defects identified in the roof void of this building, a timber survey is recommended to check and survey any wet rot or other timber defects which might be present.

1.3.2 The concrete portion of the balcony is spalling and revealing corroded steelwork underneath. It is recommended that further investigation is taken to determine the scale of corrosion and whether holding repairs of spalled concrete with local recoating is sufficient alone or if the provision of a cathodic protection system is also required to provide the required residual service life of the balcony. As a first action, carbonation and chloride ion investigation will be required on the concrete infill and encasement areas to determine if the concrete is no longer providing protection of the steelwork internally. This will be in tandem with an inspection of an area which has spalled to determine the extent of steel corrosion.

1.3.3 From the corrosion survey by Proteq, the first-floor filler joist steel joist beams and internal primary steelwork has minor surface corrosion. It is recommended that this is grit blasted, if the building can be closed and a new protective coating applied, if not then removal of corrosion by hand tools is recommended.

1.3.4 Carbonation and chloride ion investigation will be required on the internal filler joists floor to determine if the concrete is no longer providing protection of the steel joists beams internally. Depending on the results, the provision of a cathodic protection system may be required to provide the required residual service life of the steelwork.

1.3.5 The corrosion survey describes the external first floor steel beam and column arrangement present on the east elevation of the building as having heavy corrosion which has caused complete section loss in extreme cases. It is recommended to grit blast all the external steel work surfaces, and over plating is required for reinforcing the existing steelwork.

1.3.6 Any raised ceiling, or steelwork in the roof void should be removed, and the lower suspended ceiling and batten support replaced, with structural timber joists spanning between the transverse walls. The raised ceiling, steelwork, and suspended ceiling of the building are not described as of significant heritage value in the Heritage Statement, and therefore, MCA have advised they be replaced.

1.3.7 The initial trial pit 04 sketch from Solmek has shown that the existing walls extend at least 1.2m from existing ground level (EGL). No foundation was discovered at the base of the trial pit. This is a good indication the walls are



Mason Clark Associates
44 Newland Park
Hull
HU5 2DW

Project WBS – Scarborough West Pier Regeneration				Job Ref. 21037-H	
Section MCA Summary and Recommendations				Sheet no./rev. B 3	
Calc. by DM	Date Apr 23	Chk'd by	Date	App'd by	Date

found on stronger made ground, which is evident from the preliminary borehole records. However, to determine the exact capacity of the foundations, the bottom of wall and any associated foundation is required to be uncovered, along with local plate bearing tests conducted.

- 1.3.8 Due to site restrictions, a trial pit located adjacent to an existing steel column was not practical at the time. To determine the exact capacity of the foundations, the pad foundation's underside, and protrusion away from the column is required to be uncovered, along with local CBR testing.
- 1.3.9 At this stage load comparisons have been completed on the foundations from additional loading, and deemed satisfactory as within allowable limits of the foundation's safe bearing pressure.
- 1.3.10 The corrosion survey by Proteq describes the balcony steelwork of Building 2 as in poor condition. The steelwork needs to be grit blasted, inspected, and recoated. The bases of these members and their fixings will need local repair or complete replacement following the inspection.
- 1.3.11 Scaffolding has now been erected to support the balcony of Building 2. It is recommended that an investigation to why this has occurred is completed, to determine if further deterioration has occurred since it was surveyed by MCA in 2021.

Table 1 - Building 2 Steelwork Residual Service Life

Area	Current service life (y)	Possible Remediation	Improved Service Life (y)
Balcony Handrails	5	Replace fixings which are corroded or failed with galvanised equivalents. Remove off site, grit blast, inspect structure. Repair local areas and connections, and apply protection coating to steelwork	20
Primary steelwork externally exposed	0	Grit blast or wire brush structure. Apply protective coating to steelwork. Complete over plating works.	20
Primary steelwork internal	15	Grit blast or wire brush structure. Apply protective coating to steelwork.	30
Primary steelwork concrete encased	N/A	Requires further investigation to advise	N/A

NB: Balcony steelwork assumed to have minimum thickness of 5mm and galvanised coating no longer providing protection.


NB: Allowable loss of internal steelwork section is 10% from measured.

NB: Primary steelwork internal assumed to have minimum thickness of 11mm.

Project WBS – Scarborough West Pier Regeneration				Job Ref. 21037-H	
Section MCA Summary and Recommendations				Sheet no./rev. B 4	
Calc. by DM	Date Apr 23	Chk'd by	Date	App'd by	Date

1.4. **BUILDING 3**

- 1.4.1 Investigations have recorded the construction of Building 3, and it has now been possible to produce a representative structural model and lateral and vertical stability checked for the proposed refurbishment works. It has been assessed to be acceptable without the need to strengthen the primary structure. This is strictly based on the new loading regime being maintained.
- 1.4.2 Although it is not possible to determine the exact capacity of the beam and block flooring without knowing the manufacturer, a load comparison has determined that the flooring is within acceptable limits for the new proposed usage without strengthening works. The actual shape of the lintel needs to be determined, and in the temporarily supported where the structure is failing, before replacement completed.
- 1.4.3 The corrosion survey by Protec has determined most arch lintels are distorted or delaminated, and due to the difficulty in local repairing of specific locations, they have recommended that all steelwork supporting the external arches are replaced.
- 1.4.4 The corrosion survey has identified minor surface corrosion present on the primary steelwork of Building 3. Due to the volume of façade which would be required to be temporarily replaced to grit blast and recoat the steelwork, a more practical solution would be a cathodic protection system be introduced such as the placing of anode wire through mortar joints. Primary steelwork in voids, if waterproof, have a low rate of corrosion compared to encased steelwork (CPA, Technical Note 20: 2018). From table 2 below, it can be seen an estimated residual service life without remediation is 25 years. An inspection every 5 years for primary steelwork is recommended to monitor corrosion rates for these areas. For concrete encased steelwork, rates are higher, and application of an Impressed Current Cathodic System (ICCP) will provide a residual service life similar to the other steelwork.
- 1.4.5 Building 3 balcony is in good condition. The galvanic coating is still effective in most areas, although likely close to end of design life, due to the age of the building. The steelwork needs to be grit blasted, inspected, and recoated. A representative sample of the fixings will need pull tested to check integrity and replacing if failed and where corroded.
- 1.4.6 The initial trial pit 03 sketch from Solmek has shown that the existing concrete foundation is 0.82m from EGL. This has allowed design checks of changes to load directly above walls possible.
- 1.4.7 Due to site restrictions, a trial pit located adjacent to an existing steel column was not practical at the time. To determine the exact capacity of the foundations, the pad foundation's underside, and projection away from the column is required to be uncovered, along with local plate bearing tests conducted.
- 1.4.8 At this stage load comparisons have been completed on the foundations from additional loading, and deemed satisfactory as within allowable limits of the foundation's safe bearing pressure.

 Mason Clark Associates 44 Newland Park Hull HU5 2DW	Project				Job Ref.	
	WBS – Scarborough West Pier Regeneration				21037-H	
	Section				Sheet no./rev.	
MCA Summary and Recommendations				B 5		
Calc. by	Date	Chk'd by	Date	App'd by	Date	
DM	Apr 23					

1.4.9 No defects were observed in the timber trusses seen within the roof void, and no further action is advised.

Table 2 Building 3 Steelwork Residual Service Life

Area	Current service life (y)	Possible Remediation	Improved Service Life (y)
Balcony	10	Replace fixings which are corroded or failed with galvanised equivalents. Remove off site, grit blast, inspect structure. Repair local areas and connections, and apply protection coating to steelwork	25
Primary steelwork in masonry voids	25	Inspection every 5 years and reassessment of service life. Or grout fill voids and install ICCP between masonry joints	50 (ICCP option)
Primary steelwork concrete encased	10	Apply ICCP protection along primary steelwork	35
Steel arch lintels	0	Replace all external arches lintel with galvanised equivalents	20

NB: Allowable loss of steelwork section is 10% from measured.

NB: Steelwork in voids assumed to have waterproof protection from masonry and not intact with it.

NB: Primary steelwork in masonry voids assumed to have minimum thickness of 6mm

NB: Primary steelwork concrete encased assumed to have a minimum thickness of 10mm.

NB: Balcony steelwork assumed to have minimum thickness of 5mm and galvanised coating no longer providing protection.

NB: Impressed current cathodic protection (ICCP) assumed to last 25 years. Manufacturer must confirm this.

1.5. **OTHER CONSIDERATIONS**

1.5.1 The substation adjacent to the toilet block will likely have piled foundations. The foundation design produced by MCA need to be provided to the SBC maintenance engineer to check they are satisfied the proposals do not destabilise the harbour wall.

1.5.2 The Bait Shed building will have piled foundations. The foundation design produced by MCA need to be provided to the SBC maintenance engineer to check they are satisfied the proposals do not destabilise the harbour wall.

1.5.3 The trial pit TP 02 sketch was not completed at the junction between Building 3 and 4. This will need to be uncovered and recorded to first demolish Building 4 without causing instability to Building 3, and secondly allow the validation of MCA's foundation layout.

Project WBS – Scarborough West Pier Regeneration				Job Ref. 21037-H	
Section MCA Summary and Recommendations				Sheet no./rev. B 6	
Calc. by DM	Date Apr 23	Chk'd by	Date	App'd by	Date

2. **LIMITATIONS**

- 2.1.1 Our inspection and report are concerned with the structural aspects of the building such as foundations, walls and floors. We have not concerned ourselves with the condition of items such as doors, windows, and other fittings; or items such as timber infestation / decay, dampness, and testing of services to the property, unless specified in the report.
- 2.1.2 Sampling and testing of materials is beyond the scope of this report.
- 2.1.3 We have not inspected woodwork or other parts of the structure which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the property is free from defect.
- 2.1.4 This report is applicable to the condition and state of the building at the time of inspection. The building may be subject to deterioration in the future and the opinions expressed in this report may need to be revised accordingly.
- 2.1.5 This report is limited to the property under consideration. It does not consider the effects that adjoining properties may have, unless with prior agreement, a detailed inspection of all adjoining properties can be made.
- 2.1.6 The above recommendations do not constitute a full list of works to be carried out, but refer to the main areas of work associated with structural aspects of the building, based on a visual inspection only and under the limitations of our inspection.
- 2.1.7 All building and construction works are covered by the requirements of the CDM regulations. Owners/Clients have legal responsibilities to engage persons and companies with appropriate level of skills knowledge and experience to ensure that the requirements of the CDM regulations are met. The works required will be covered by the CDM regulations 2015 and you should understand your obligations and act accordingly.
- 2.1.8 Unless specifically mentioned no comment is made in the report as to the presence of new or old mine workings or tunneling, heavy metals, chemical, biological, electromagnetic or radioactive contamination or pollution, or radon methane or other gases, underground services or structures, springs and water courses, sink holes or the like, noise or vibratory pollution, mould, asbestos and asbestos products.
- 2.1.9 The report has been prepared for the client alone and no third party should rely on it. For the avoidance of doubt, the Contracts (Rights of Third Parties) Act 1999 shall not apply to this contract.
- 2.1.10 The inspection and report will not include any liability in respect of Advice/Design in fire safety to the structure and/or any liability whatsoever in respect of any losses (whether direct or indirect) arising from combustibility of cladding in delivery of our Services. We shall not be liable for that part of any claim which relates to loss of profits, loss of use, loss of production, loss of contract, liquidated damages or for any cost of decamping or rehousing.
- 2.1.11 Possible deleterious materials have been noted during the survey. Any prospective purchaser should acquire specialist advice on the appropriate actions for dealing with these materials. In addition, we would highlight that, for



Mason Clark Associates
44 Newland Park
Hull
HU5 2DW

Project		WBS – Scarborough West Pier Regeneration		Job Ref.		21037-H					
Section				MCA Summary and Recommendations				Sheet no./rev.		B 7	
Calc. by		Date		Chk'd by		Date		App'd by		Date	
DM		Apr 23									

all non-domestic properties and communal areas, any materials containing asbestos must be managed and or removed in accordance with the current Asbestos Regulations. We recommend that a specialist report be undertaken to clearly identify these materials and management/removal requirements.

2.1.12 This report is limited to structural matters. The client should obtain their own advice on any specialist surveys that need to be undertaken.

2.1.13 Short of the whole structure involved being dismantled, an appraisal can only ever be based on the areas investigated, in the belief they are representative.

Appendix A



12-16 Yarm Road, Stockton on Tees, TS18 3NA
 Tel: 01642 607083 Email: info@solmek.com

Figure Title

Exploratory Hole Location Plan

Project Number

S230227

Project Name

Scarborough West Pier

Client

William Birch and Sons

Date

March 2023





DRG Number


Figure 2


Scale

1:1500 @ A4 [DO NOT SCALE]

Legend Key

-  Locations By Type - Empty
-  Locations By Type - BH
-  Locations By Type - TP
-  Project Bounds - Project Bounds

Back II / Installation	Legend
	

Back II / Installation	Legend
	

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend
	Depth	Type	Results			
				0.25		
				0.60		
				0.80		
				1.20		

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend
	Depth	Type	Results			
				0.22		
				0.52		
				0.90		

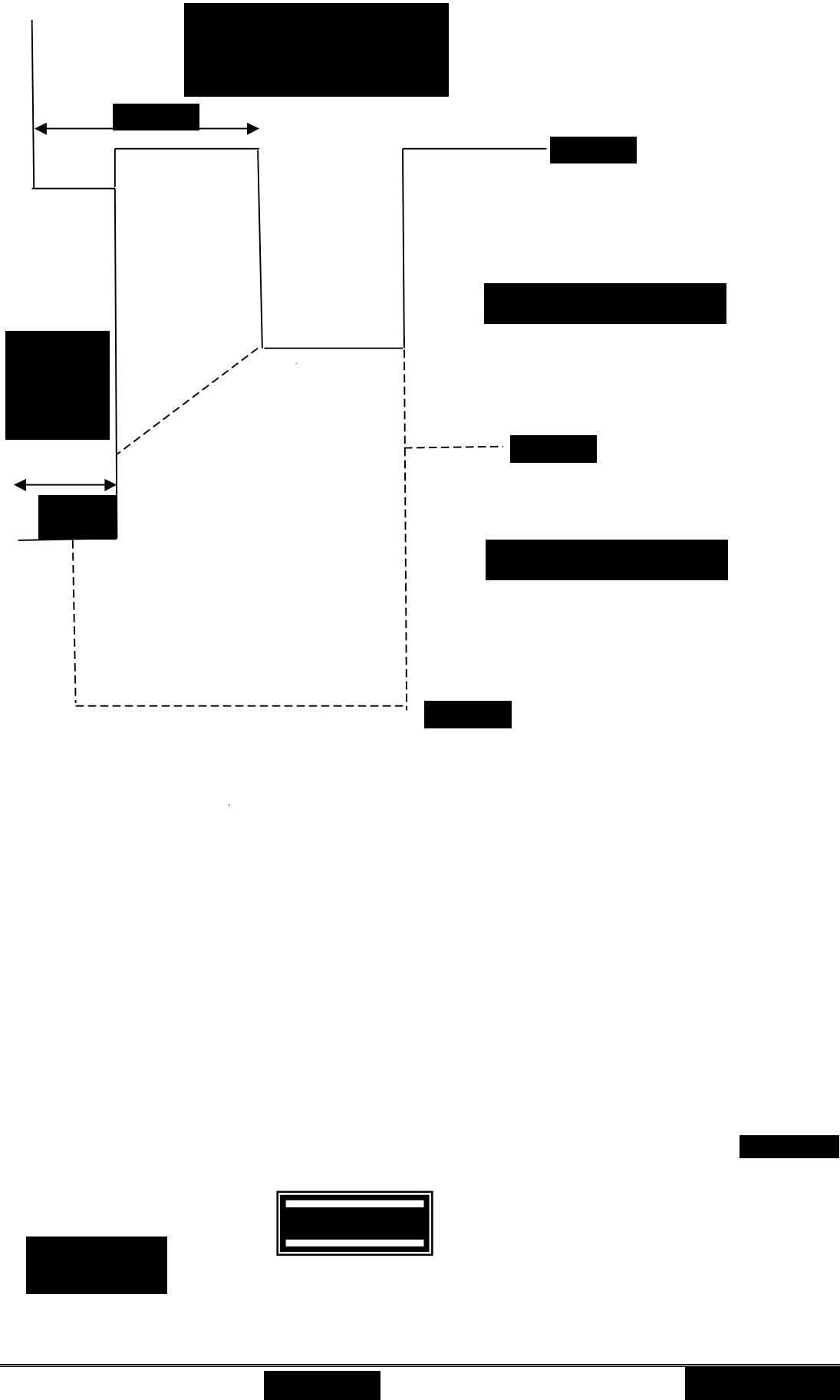
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend
	Depth	Type	Results			
				0.22		
				0.54		
				0.75		
				0.84		

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend
	Depth	Type	Results			
▼				0.20		
				0.57		
				1.20		

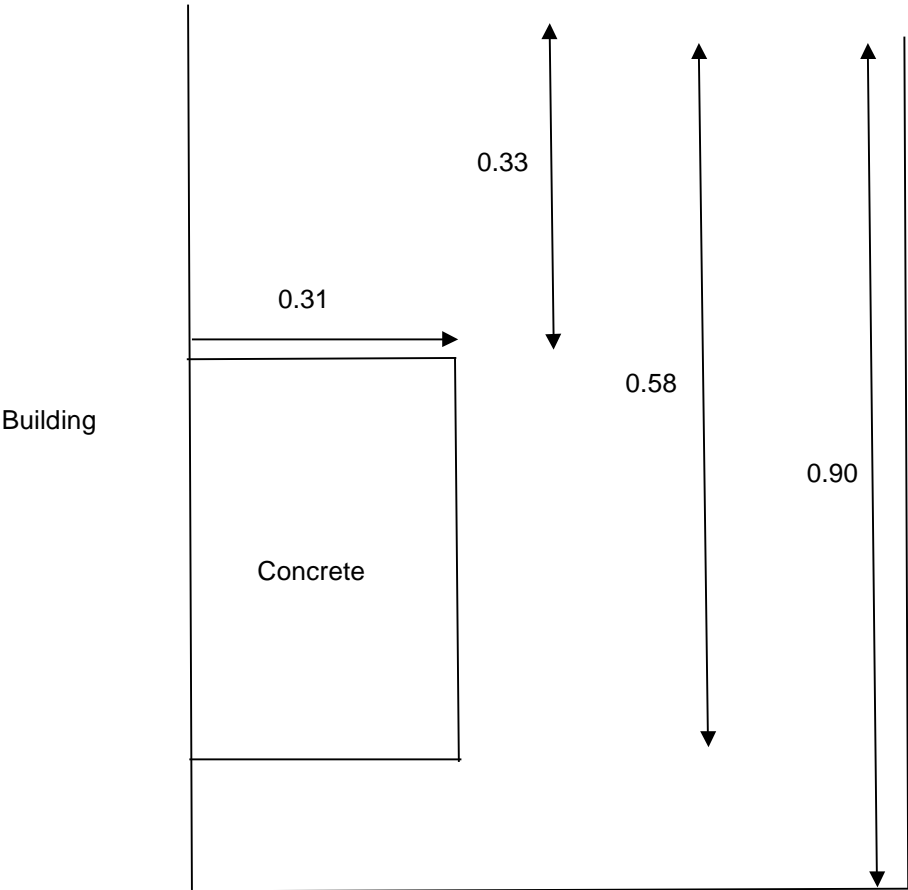
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend
	Depth	Type	Results			
				0.05		
				0.10		
				0.30		
				0.40		
				0.63		

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend
	Depth	Type	Results			
				0.25		
				0.40		
				1.20		

S230227
Scarborough West Pier
TP01 SKETCH



S230227
Scarborough West Pier
TP02



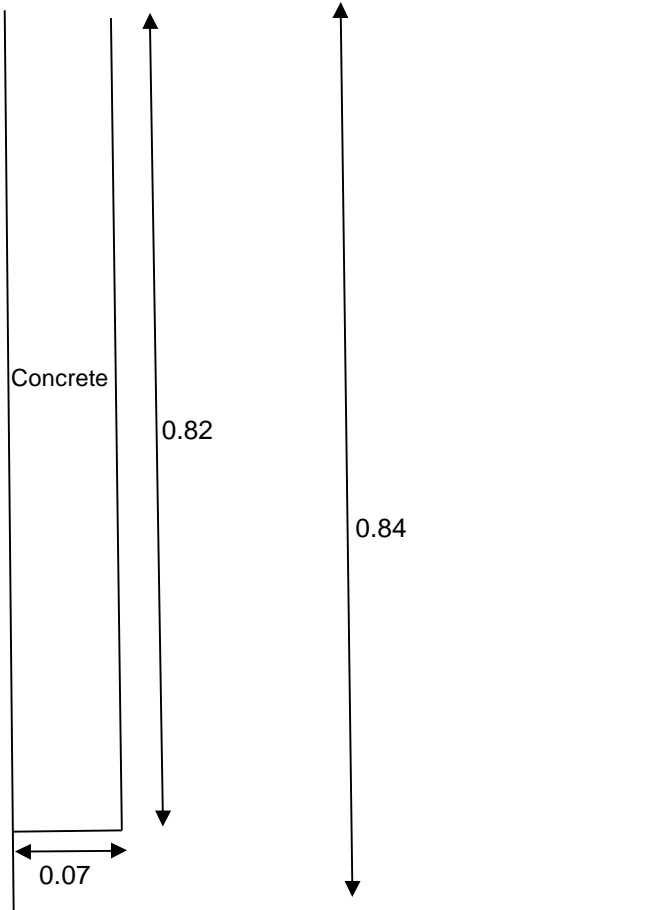
NTS

S230227

Scarborough West Pier

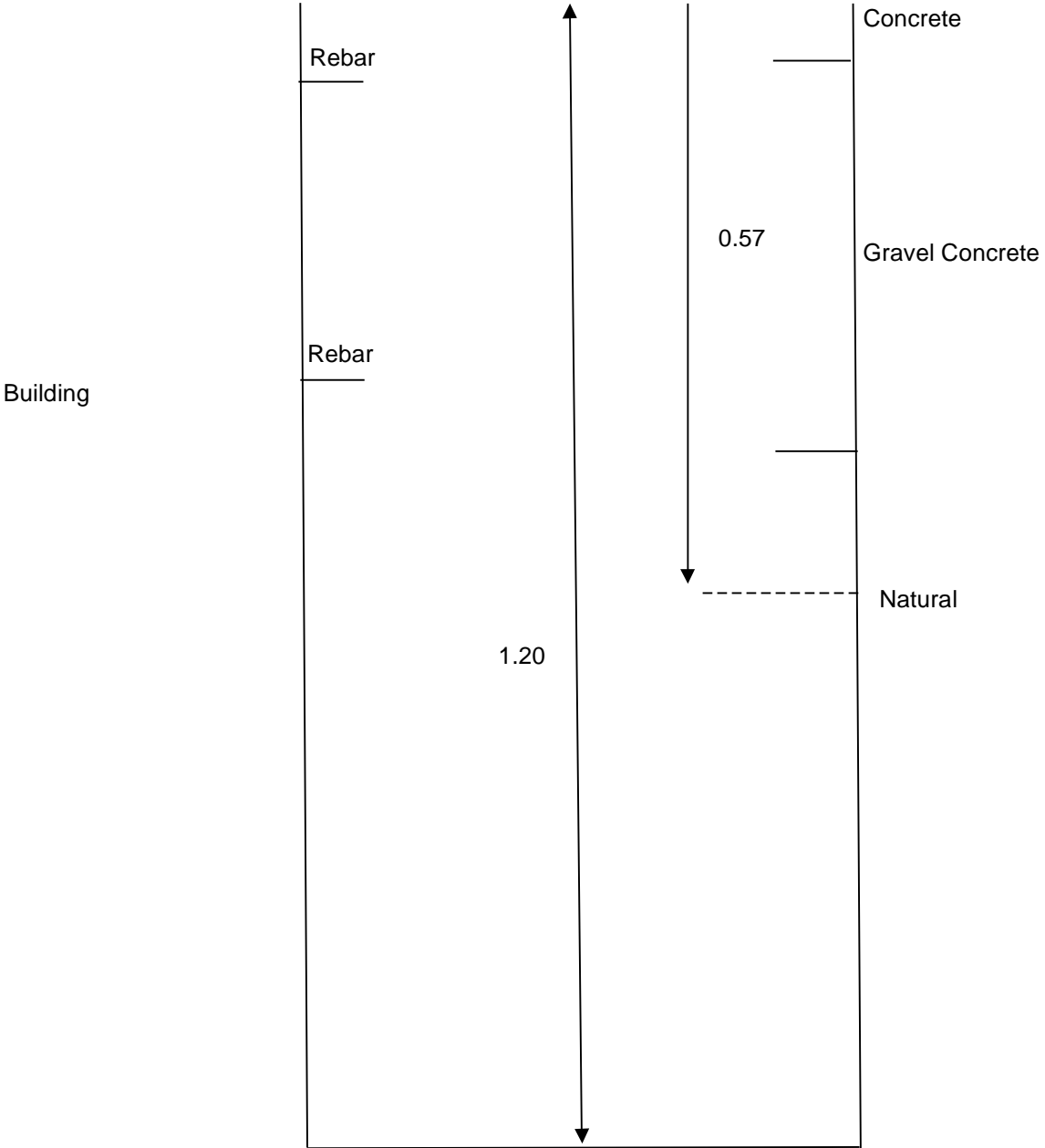
TP03

Building



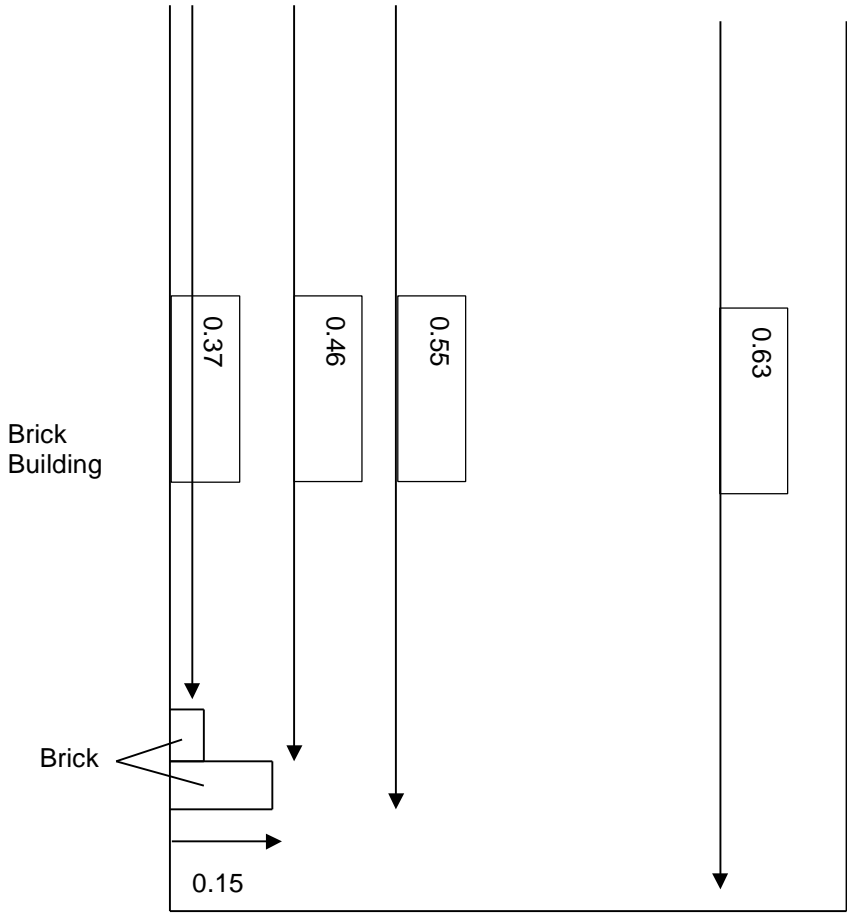
NTS

S230227
Scarborough West Pier
TP04



NTS

S230227
Scarborough West Pier
TP05



S230227
Scarborough West Pier
TP07 SKETCH



Appendix B