



Specialist Height Services, Steeplejacks and Industrial Abseiling

HQ. The Pinnacle Works, Station Road, Epworth, Doncaster DN9 1JU

Industrial Rope Access · Steeplejacks · Chimney Maintenance · Flare Stack Maintenance
Guy Rope Tensioning · Structural Inspection · Insulation and Cladding · Glazing Maintenance and Repair
Non-Destructive Testing · Industrial Painting · Structural Steelwork · Mastic Jointing · Drone Inspection

Scarborough West Pier



Corrosion and General Investigatory works
Scarborough West Pier Buildings 1, 2 and 3
March 2023
Proteq Northern Limited



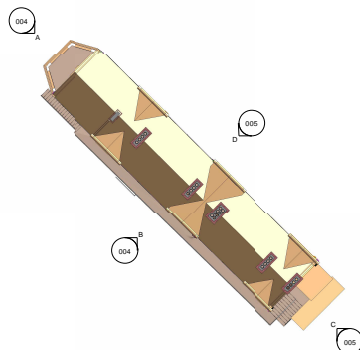
The inspection at Scarborough West Pier was performed to establish the condition of various steel members across 3No. Buildings using mainly visual inspection techniques supplemented with ultrasonic thickness measurements in areas of concern. A cover meter survey was also performed in certain locations as per the client's request to establish the depth and layout of any found re-enforcing bar within the concrete slabs. The inspection works were performed alongside the main contractors, who opened up the areas marked on the supplied drawings to enable inspection.

In general, the steelwork in the areas exposed during the inspection works within buildings 1, 2 & 3 remains in good condition with only minor surface corrosion exhibited with the exception of the I Beam lintel and upstands on the rear elevation of Building No.2. This I beam has suffered from severe corrosion attack. In some areas, the beam has suffered from a 100% loss of section, with perforations clearly visible throughout. Our onsite engineers expect that this could be over-plated to reinstate the structural integrity of the beam. However, calculations would have to be performed by a structural engineer to determine the level of over-plating required, along with the material used and the weld procedure. Once this information is produced along with a suitable specification for a protective coating, it may be possible to indicate a residual design life; however, at this point, it is not possible to provide a residual design life.

To the rear of Building No.3, the arch lintel former has suffered from corrosion attack. This has caused the expansion of the lintel, which has taken the weight from the lower pillar, causing some minor vertical cracking within the brickwork.

The handrails on the external face of building No1 and No2 are heavily corroded and have been repainted without any evidence of repairs taking place. The engineer's concern was based on the connection point to the concrete substrate, which is spalling and showing signs of cracking and de-lamination.

The inspection works, whilst in-depth, are limited to the areas uncovered by the main contractor. While the beam conditions in these areas can provide an indicative condition, this report is limited by this factor. Potential heavy corrosion and/or damage could be present in areas not visible during the inspection.



1 004 - Key Plan
Scale: 1:200



A 004 - End Elevation
Scale: 1:50



B 004 - Front Elevation
Scale: 1:50

Notes

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6. Mason Clark Associates are not responsible for determining the appropriate fire period, fire boundary conditions or the associated design of the protection or inherent fire resistance to any elements of structure, including all frames, props, beams, joists, roof members and secondary structure elements such as trusses. Refer to the Architect or Project Manager for this information.

Survey Notes

1. All 3D models are based on Faro Focus 30X Scan Data, in a 5cm mean scan point volume.
2. No intrusive techniques were employed during this survey, all information provided is visually measured data only obtained where access was provided, possible on the arranged the survey was carried out.
3. Due to modelling limitations within the Revit software environment each 3D component is modelled to a maximum 3mm deviation from the scan data. Any components which can not be modelled with this tolerance will be identified.
4. This model to be read in conjunction with all available scan data and photogrammetry provided.
5. Do not scale off this drawing. All dimensions to be derived from site measurement and agreed with contractors and sub-contractors before proceeding to manufacture. Figured dimensions are for reference only. Any discrepancy between figured dimensions and actual dimensions are to be reported immediately to the Architect and confirmation sought before proceeding.
6. Due to lagging, rust, paint and other surface contaminants all pipe sizes, steel sections and other features are modelled indicative only and should be checked on site by contractor prior to any works commencing.
7. All data shown is representative of form and location, not function. Function to be determined on site by the contractor prior to any works commencing.
8. Material composition is not reflected in the 3D model components other than surface finish which can be identified visually such as floor finishes.
9. Only hard fix items are included within this model from the survey data, no 'soft' fix items such as loose cables and movable items have been included.
10. The main fabric of the building (walls, columns, beams & floors) have been modelled inclusive of any finishes unless the true thickness of finishes can be determined visually on the survey scan information.

P1	Preliminary - First Issue	08	01/10/2023
P2	Preliminary - Client Issue	08	05/09/2023
Rev	Details	01	11/09/2023



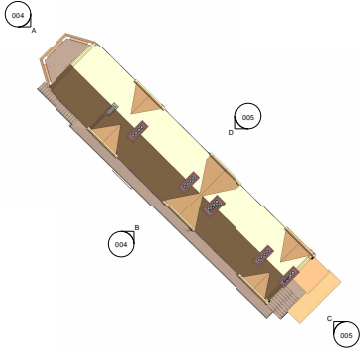
Mason Clark Associates Ltd
Architects, Engineers and Surveyors

Scarborough Council

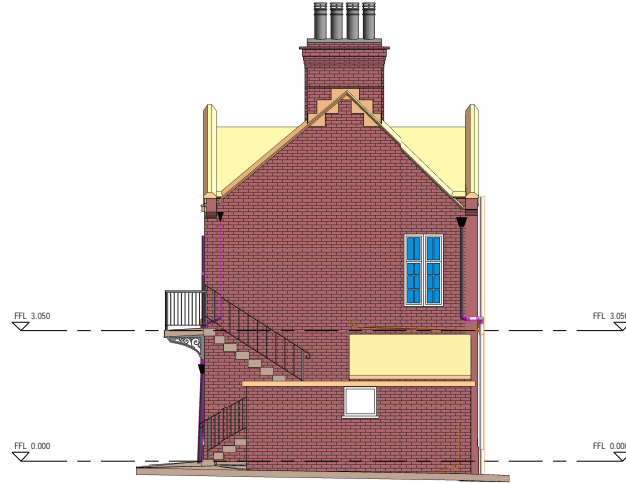
Project 1
Scarborough Harbour West Pier

Site
Existing Survey
Building 1 Elevations Sheet 1

Drawn	DB	Checked	DB	Date	Sept 2023
Scale	A1	Authorised			
Drawing No	19866-4-DR-004	Sheet	P2		



1 005 - Key Plan
Scale: 1:200



C 005 - End Elevation
Scale: 1:50




D 005 - Rear Elevation
Scale: 1:50

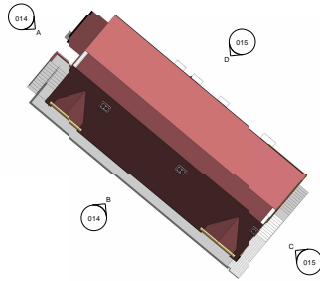
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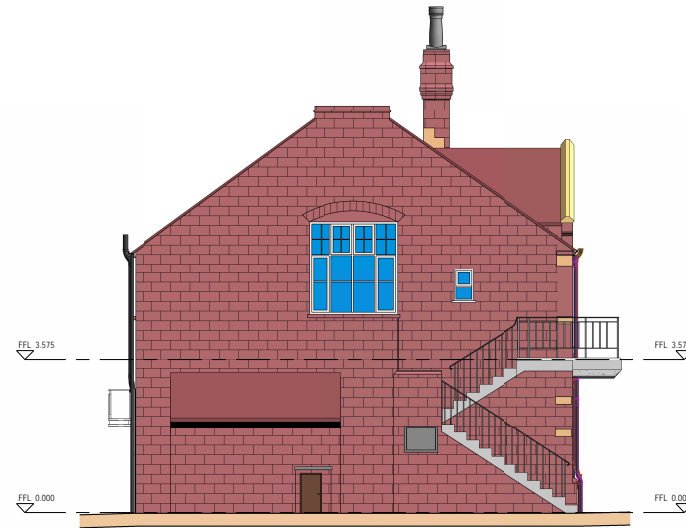
Survey Notes

1. All modelling is based on Pabi Point 3D X Scan Data, with a 5mm mean scan point lesion.
2. No intrusive techniques were employed during this survey. All information provided is visually measured data only obtained where access was provided. Where possible on the arranged the survey was carried out.
3. Due to modelling limitations within the Revit software environment each 3D component is modelled to a maximum 10mm deviation from the scan data. Any components which can not be modelled with this tolerance will be identified.
4. This model to be read in conjunction with all available scan data and photogrammetry provided.
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8. Material composition is not reflected in the 3D model components, other than surface finish which can be identified visually such as floor finishes.
9. Only hard fix items are included within this model. From the survey data, no soft fix items such as loose cables and mobile items have been included.
10. The main fabric of the building (walls, columns, beams & floors) have been modelled inclusive of any finishes unless the true thickness of finishes can be determined visually on the survey scan information.

P2 Preliminary Final Issue 08/10/2021 08/10/2021 08/10/2021	08/10/2021 08/10/2021 08/10/2021
 Scarborough Council Scarborough Harbour West Pier	
Existing Survey Building 1 Elevations Sheet 2	
Drawn: DRB Scale: A1 Drawing No: 19666-HDR-005	Checked: [] As Indicated Date: Sept 2021 Rev: P-2



1 014 - Key Plan
Scale: 1:200



A 014 - End Elevation
Scale: 1:50



B 014 - Front Elevation
Scale: 1:50

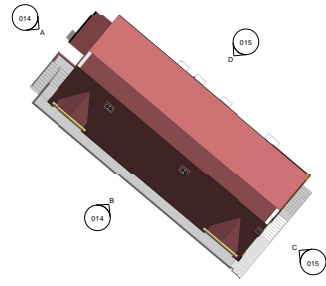
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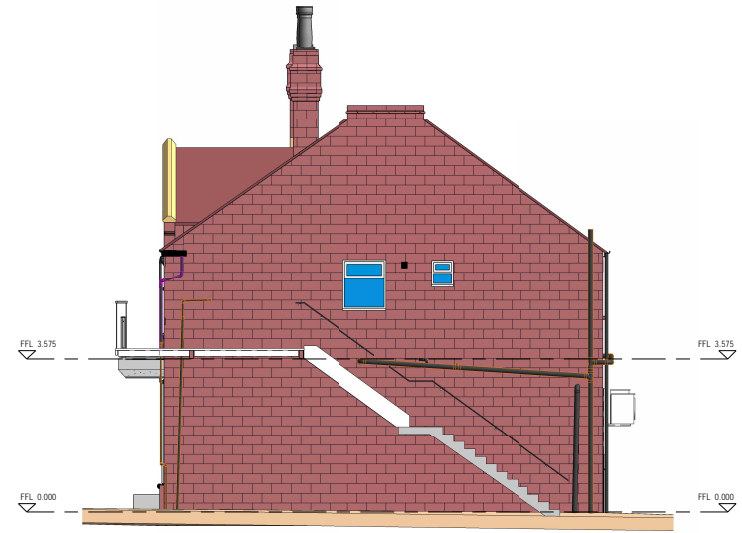
Survey Notes

- All modelling is based on Faro Focus 30X Scan Data, with a 5cm in-plan top-point tolerance.
- No intrusive techniques were employed during this survey, all information provided is visually measured data only, distance where access was provided possible on the arranged the survey was carried out.
- Due to modelling limitations within the Revit software environment each 3D component is modelled to a maximum 30mm deviation from the scan data. Any components which can not be modelled with this tolerance will be identified.
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Rev	Description	Date
P1	Preliminary Final Issue	08/10/2021
P2	Preliminary Final Issue	08/10/2021
Rev	Description	Date
01	Issue	08/10/2021
02	Issue	08/10/2021
03	Issue	08/10/2021
04	Issue	08/10/2021
05	Issue	08/10/2021
06	Issue	08/10/2021
07	Issue	08/10/2021
08	Issue	08/10/2021
09	Issue	08/10/2021
10	Issue	08/10/2021
11	Issue	08/10/2021
12	Issue	08/10/2021
13	Issue	08/10/2021
14	Issue	08/10/2021
15	Issue	08/10/2021
16	Issue	08/10/2021
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42	Issue	08/10/2021
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97	Issue	08/10/2021
98	Issue	08/10/2021
99	Issue	08/10/2021
100	Issue	08/10/2021



1 015 - Key Plan
Scale: 1:200



C 015 - End Elevation
Scale: 1:150



D 015 - Rear Elevation
Scale: 1:150

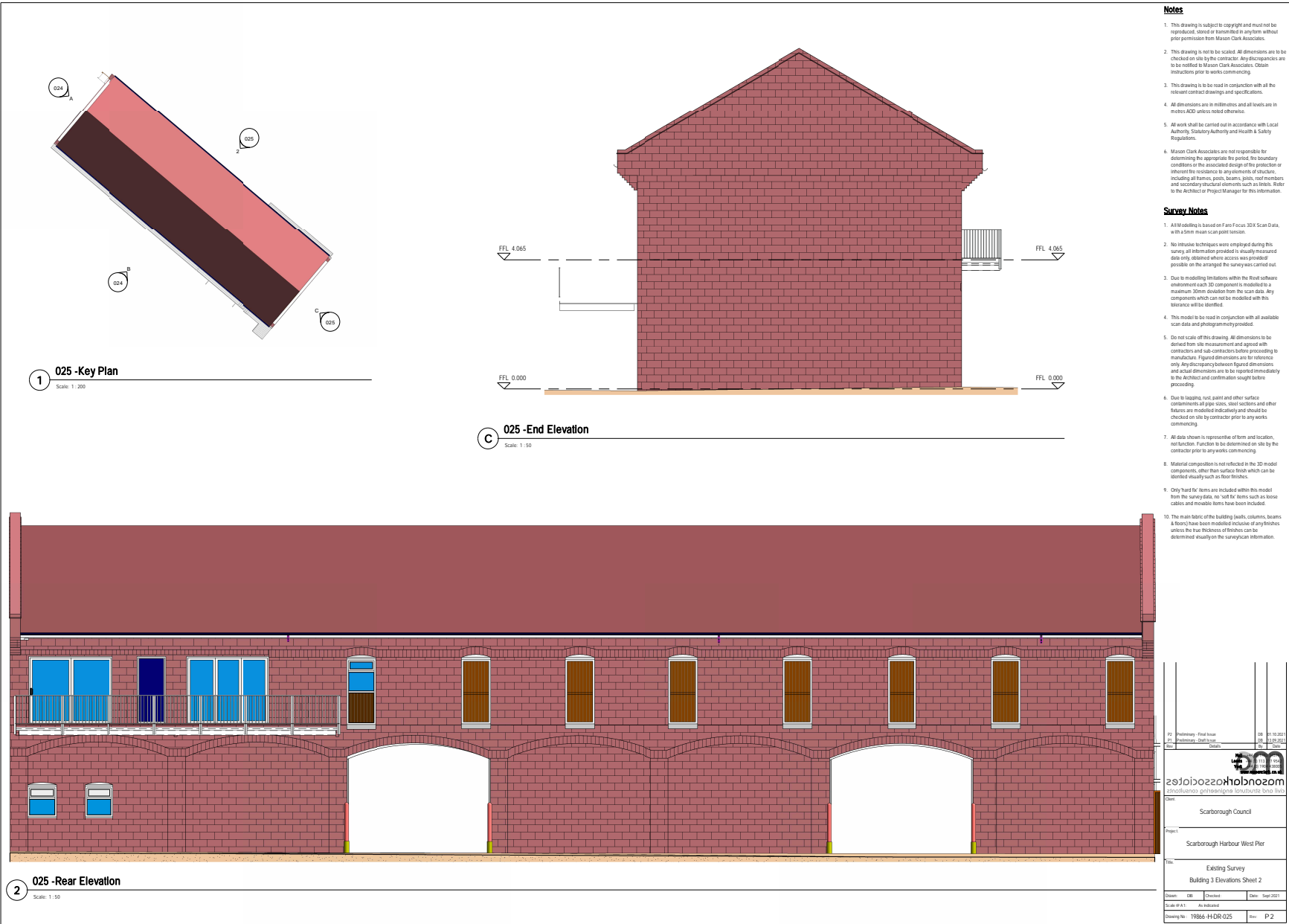
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Survey Notes

- All modelling is based on Faro Focus 3DX Scan Data, with 5mm mean cloud-point resolution.
- No intrusive techniques were employed during this survey, all information provided is visually measured data only obtained where access was provided possible on the arranged the survey was carried out.
- Due to modelling limitations within the Revit software environment each 3D component is modelled to a maximum 30mm deviation from the scan data. Any components which can not be modelled with this tolerance will be identified.
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P2	Primary	Final Issue	09	01/10/2021
02	Primary	Issue	02	02/10/2021
01	Issue	Details	01	02/10/2021
Mason Clark Associates CONSULTANTS ARCHITECTS ENGINEERS SURVEYORS				
Client				
Scarborough Council				
Project				
Scarborough Harbour West Pier				
Title				
Existing Survey				
Building 2 Elevations Sheet 2				
Drawn	CR	Checked	Date: Sept 2021	
Scale	W A 1	As Indicated		
Drawing No:	1966-HDR-015	Rev:	P 2	




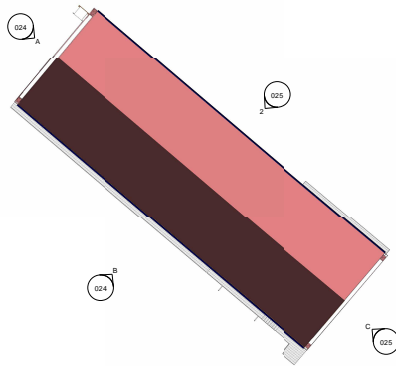
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Survey Notes

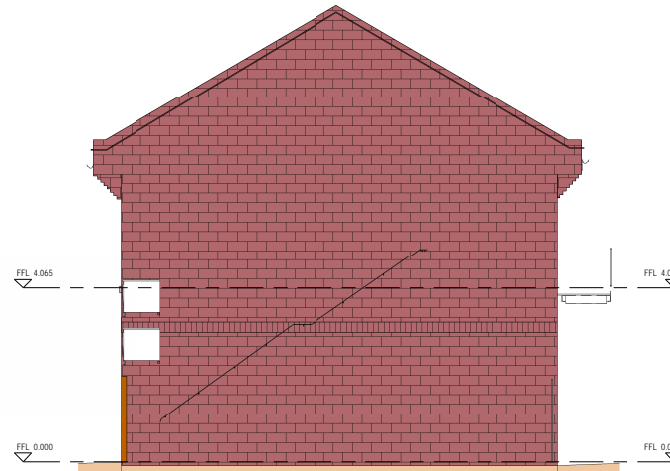
1. All modelling is based on Faro Focus 30X Scan Data, with a 5cm mesh scan point location.
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Pr	Preliminary Final Issue	08	10/2021
At	Preliminary Draft Issue	08	10/2021
Rev	Details	05	09/2021
			
Client: Scarborough Council			
Project: Scarborough Harbour West Pier			
Title: Existing Survey Building 3 Elevations Sheet 2			
Drawn:	CR	Checked:	CR
Date:	09/2021	Date:	09/2021
Scale:	A1	As Indicated	
Drawing No:	1986-HDR-025	Rev:	P.2



1 024 - Key Plan

Scale: 1:200



A 024 - End Elevation

Scale: 1:50



B 024 - Front Elevation

Scale: 1:50

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PS	Preliminary Final Issue	08	01/10/2021
CS	Client Review	08	11/02/2021
CS	Client	08	03/03/2021
Scarborough Council			
Project: Scarborough Harbour West Pier			
Title: Existing Survey Building 3 Elevations Sheet 1			
Drawn	DSB	Checked	Date: Sep 2021
Scale	M 1:1	As Indicated	
Drawing No:	19866-HDR-024	Rev:	P 2



VISUAL INSPECTION REPORT

Customer: Proteq Ltd.	Date of test: 6 th & 7 th March 2023	Report Number: AM-23.186
Site Address: West Pier, Scarborough	Component: Structural steel elements	Drawing Number: 21037-H-SK-R0-002
	Identification: N/A	Serial / Pattern Number: N/A
	Material: Mild Steel	Surface condition: Galvanised / Painted / Bare
Order Number: Verbal T Mariner	Heat Treatment: N/A	Process: N/A
Calibration procedure No(s): N/A	Dimensions: N/A	Thickness: N/A
Specification: BS EN ISO 17637	Procedure: AMPR-VT-001 ISS 2	Acceptance Standard: Report all in service defects
Equipment Details: N/A	Illumination Equipment: Handheld torch & headlamp	
Magnification Level: N/A	Illumination Level: >500 Lx	
Description of items and test results:		
A Visual Inspection has been carried out on		
Test Results:		
Test Restrictions: None		
Inspection Operator: A Mitchell / J Bateman 	Operator Approval/Level/Number: A Mitchell PCN LEVEL 2: 208243	
		
Customer Authorising Stamp:	Inspection Authority Stamp:	
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Form No 009 Rev 0		

REPORT CONTINUATION

Customer: Proteq Ltd.	Date of test: 6 th & 7 th March 2023	Report Number: AM-23.186
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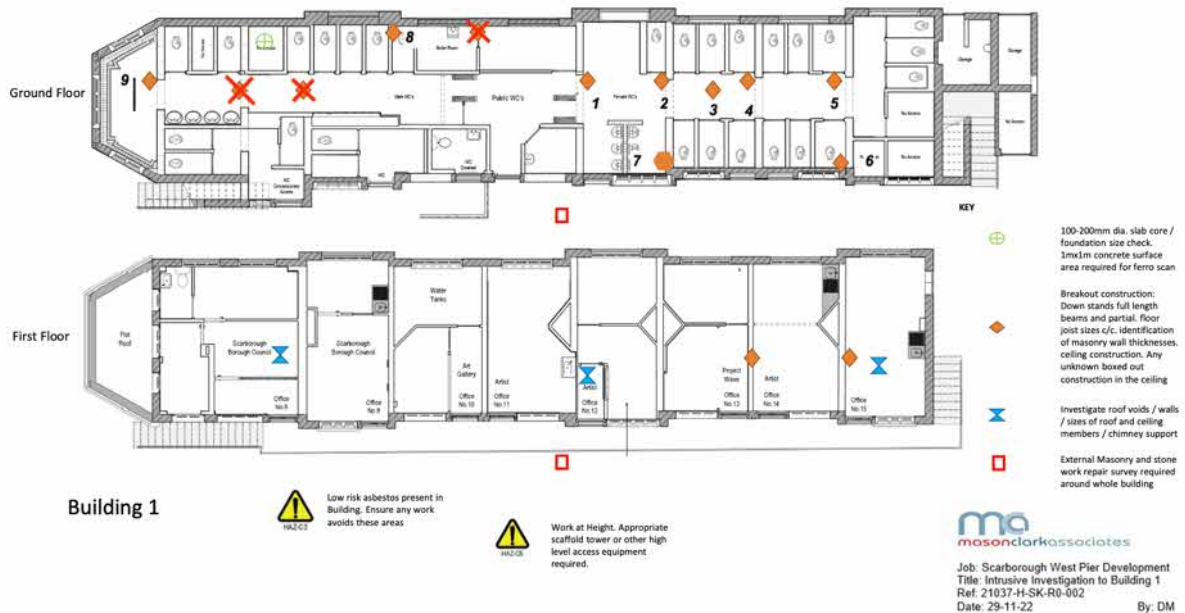


Figure
Building 1
First & Ground floor plan

Areas of the ground floor toilet ceiling were exposed to visually inspect the integrity of the supporting structural members. Please see below for images and detail.

Access to the first-floor loft space was via the loft hatches. No steelwork present, standard boarding, timber and brick roof support structure.

The balcony handrail is corroded and has been repainted without performing any repairs. The corrosion it not currently affecting the structure of the handrail, however in some areas the thinning has made the handrail sharp to the touch. The main concern with the balcony handrail however is the substrate connection, as the concrete appears to be in poor condition and is currently supported by scaffolding.

REPORT CONTINUATION

Customer:
Proteq Ltd.

Date of test:
6th & 7th March 2023

Report Number:
AM-23.186



Figure
Women's toilet Location 1



Figure
Women's toilet location 1

All Steelwork in good condition

I Beam:

Flange = 200mm

Web = 180mm

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Form No 010 Rev 0

REPORT CONTINUATION

Customer: Proteq Ltd.	Date of test: 6 th & 7 th March 2023	Report Number: AM-23.186
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Figure
Women's toilet location 2



Figure
Women's toilet location 2

All Steelwork in good condition

I Beam:

Flange = 180mm

Web = No measurement possible

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Form No 010 Rev 0

REPORT CONTINUATION

Customer: Proteq Ltd.	Date of test: 6 th & 7 th March 2023	Report Number: AM-23.186
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Figure
Women's toilet location 3



Figure
Women's toilet location 3

No Steelwork. Floor joists sit on steel frame with steels encased in the beams.

REPORT CONTINUATION

Customer: Proteq Ltd.	Date of test: 6 th & 7 th March 2023	Report Number: AM-23.186
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Figure
Women's toilet location 4



Figure
Women's toilet location 4

All Steelwork in good condition. Minor surface corrosion.

I Beam:

Flange = 200mm

Web = 180mm

REPORT CONTINUATION

Customer: Proteq Ltd.	Date of test: 6 th & 7 th March 2023	Report Number: AM-23.186
--------------------------	---	-----------------------------



Figure
Women's toilet location 5



Figure
Women's toilet location 5

All Steelwork in good condition, encased in render.

I Beam:

Flange = 100mm

Web = 180mm

REPORT CONTINUATION

Customer: Proteq Ltd.	Date of test: 6 th & 7 th March 2023	Report Number: AM-23.186
--------------------------	---	-----------------------------



Figure
Women's toilet location 6



Figure
Women's toilet location 6

All Steelwork in good condition, encased in render.

I Beam:

Flange = 100mm

Web = 180mm

REPORT CONTINUATION

Customer: Proteq Ltd.	Date of test: 6 th & 7 th March 2023	Report Number: AM-23.186
--------------------------	---	-----------------------------



Figure
Women's toilet location 7



Figure
Women's toilet location 7

All Steelwork in good condition, encased in render and sits on brickwork of outer wall.

I Beam:

Flange = 100mm

Web = 180mm

REPORT CONTINUATION

Customer: Proteq Ltd.	Date of test: 6 th & 7 th March 2023	Report Number: AM-23.186
--------------------------	---	-----------------------------



Figure
Men's toilet location 8



Figure
Men's toilet location 8

All structural elements seem in good condition, timber framework above. Access doesn't allow for measurements.

REPORT CONTINUATION

Customer: Proteq Ltd.	Date of test: 6 th & 7 th March 2023	Report Number: AM-23.186
--------------------------	---	-----------------------------



Figure
Men's toilet location 9



Figure
Men's toilet location 9

All structural elements seem in good condition, timber framework above.
Access doesn't allow for measurements.

REPORT CONTINUATION

Customer: Proteq Ltd.	Date of test: 6 th & 7 th March 2023	Report Number: AM-23.186
--------------------------	---	-----------------------------

Building 2:

Building 2 is a large 2 storey building used downstairs by a small business called (Jacks Place) where the operators store lobsters and prepare them for sale, they also have a small shop located next door which is open Thursdays and Fridays. Upstairs the building is used as offices and general storage areas.

The balcony at the front of this building appears to be constructed from wrought iron and has suffered from corrosion attack. The suspected cause of this is saltwater exposure and a lack of maintenance. The handrails appear to have been recently painted using a thick black paint however, it is evident that no preparation has been performed prior to painting as laminations are still present within the paintwork. The West hand staircase has stanchions which are no longer attached to the concrete, this is due not only to the corrosion of the handrail but also due to the concrete failing. The balcony is supported by steel beams encased in concrete, these currently have scaffold supports underneath them, based on the support. Our engineers, expect these beams to be in a poor condition however at the time of the inspection no access was available to any of these areas.

Internally the beams were visually inspected in Jacks Place. A hands-on inspection was performed at the rear elevation of the building whereby our engineers were able to visually look into the ceiling void and see the beam conditions. 1No. beam appears to have been replaced within Jacks Place as it is of a more modern construction style than the others. The main beams have been painted with red oxide paint which is beginning to fail, these beams are hot riveted in construction. 1No. beam appears to have been painted in epoxy-based silver paint, this beam also has bolted connections indicating this may have been replaced. In the ceiling void it is possible to see through the main structural steel within 'Jacks Tank Room' the beam appears to be in good condition visually and shows no signs of corrosion; however, access to this area is not possible without causing significant disruption to the business within. Sizes of beams within Jack's, the older beams painted with what appears to be red oxide - Web 280mm & Flange 155mm, the newer beam painted in silver - Web 250mm & Flange 155mm. We would recommend preparing and re-painting of the internal steelwork to extend the design life. The tables of 'standard systems for steelwork given in BS EN ISO 12944-2 and BS EN ISO 9223 classify the area as C5M. These areas are classed as very high in the corrosion category as it's an area with high salination.

Standard systems for C5 – Very high risk environment category

System number	E-C5-A	E-C5-B	E-C5-C
Coating life	15	20	15
Nearest equivalent BS EN ISO 12944-5 ^[3]	TSM5.01	C5.08	G5.04
Surface preparation to BS EN ISO 8501-1 ^[4]	Blast clean to Sa 3	Blast clean to Sa 2½	-
Factory applied coatings	i) Sprayed aluminium to BS EN ISO 2063 ^{[8][9]} 150µm (note 9) ii) Zinc phosphate epoxy sealer coat 50µm iii) High build epoxy MIO 100µm (note 4)	i) Zinc rich epoxy primer 40µm (note 6) ii) High build epoxy MIO 200µm total (one or two coats) (note 4)	i) Hot-dip galvanize to BS EN ISO 1461 ^[5] (note 1) ii) Mordant wash iii) Etch primer 40µm iv) High build epoxy MIO 100µm (note 4)
Site applied coatings	Recoatable polyurethane finish 60µm	High solid aliphatic polyurethane finish 60µm	Recoatable polyurethane finish 60µm

Our Engineers would recommend going with the specification E-C5-B as it gives the longest coating life with a more achievable blast cleaning specification, however blasting to SA2.5 may not be achievable due to the location and access to the structural steelwork. An alternative specification would be E-C5-C

On the harbour side of the building, the horizontal and vertical I beam are exposed directly not only to the saltwater environment of the harbour but also have crab and lobster pots stacked against them causing prolonged exposure to saltwater which our engineer believes has significantly impacted the corrosion present. The Flange of the beam is 80mm the Web of the beam is 250mm. The beams are 4.5(m) long and are jointed using fish plates.

The horizontal I beam Lintel at the rear of the building supports the upper floor; it was inspected at 5 No. Locations along its length at each of these locations the corrosion was hand cleaned from the beam to establish its extent. At each one of these sections, the beam had suffered a 100% loss of section the remainder of the beam tests at between 11mm and 14mm. This beam will have a corrosion allowance within the original design of the building. A 100% loss of section will certainly exceed this corrosion allowance; therefore, this beam should be considered life-expired and be repaired or replaced as soon as possible.

It may be possible to over plate this beam to restore it to the original design standard. However, the type of plate, thickness and weld procedure would have to be agreed upon with a structural engineer, a specialist paint system should also be sought to protect against further corrosion attack. These factors will also stipulate the future design life of the repaired beam. It is therefore impossible for us to state the expected design life post-repair.

The vertical beams to the harbour side of the building have also suffered from severe corrosion attack and have suffered 100% loss of section. These beams could be repaired using a similar method to above,

however further brickwork may need to be removed to establish whether the corrosion has extended from the web of the I beam to the flange. These areas were not accessible during the inspection.

The surface of the I beam in both locations is heavily corroded making ultrasonic thickness reading difficult to obtain and not an accurate record of the overall thickness / integrity of the beams.



- KEY
- ⊕ 100-200mm dia. slab core / filler joist floor / foundation size check / 1m²m concrete surface area required for ferro scan
 - ◆ Breakout construction: identification of masonry wall thicknesses, ceiling construction
 - ✕ Investigate roof voids / walls – sizes of roof and ceiling members / chimney support
 - Measure / corrosion survey / Material testing of all existing internal and external steelwork. Includes balcony

Building 2

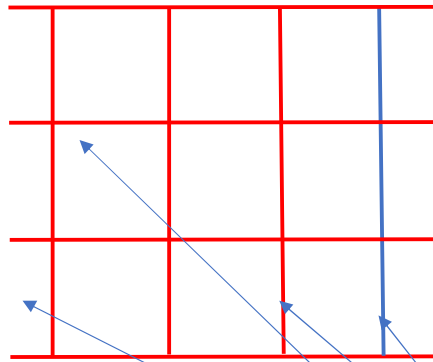
- Possible risk of ACM present in upper floors. Needs completion of Building Asbestos surveys.
- Work at Height. Appropriate scaffold tower or other high level access equipment required.

ma
masonclarkassociates

Job: Scarborough West Pier Development
Title: Intrusive Investigation to Building 2
Ref: 21037-H-SK-R0-003
Date: 29-11-22 By: DM



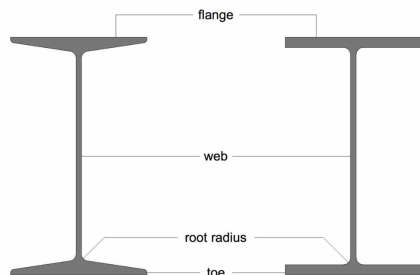
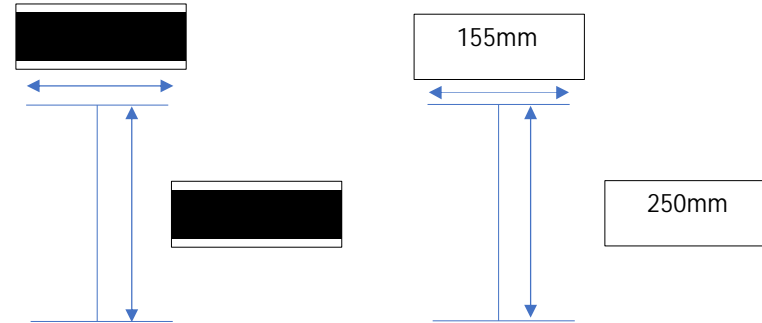
Plan View of Open Area



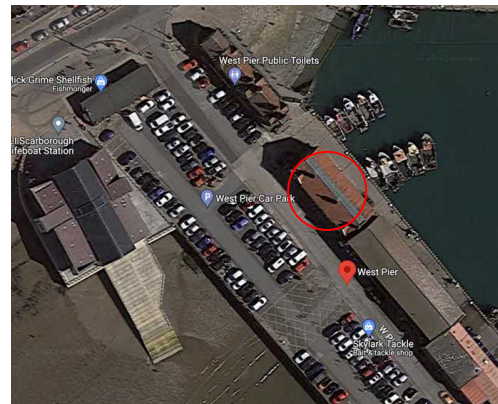
- Newer Silver Painted Beam
- Old Style Red Oxide Beam
- Tank Room False Wall
- Freezer Room


Original Beam Painted with Red Oxide

Newer Beam Painted in Silver



Location Key




 THE PINNACLE WORKS,
 STATION ROAD, EPWORTH,
 DONCASTER, DN9 1JU
 T: 01427 872572
 E: INFO@PROTEQ.CO.UK
Specialist Height Services

Client: Mason & Clarke

Site: Scarborough West Pier

Title: Building No.2

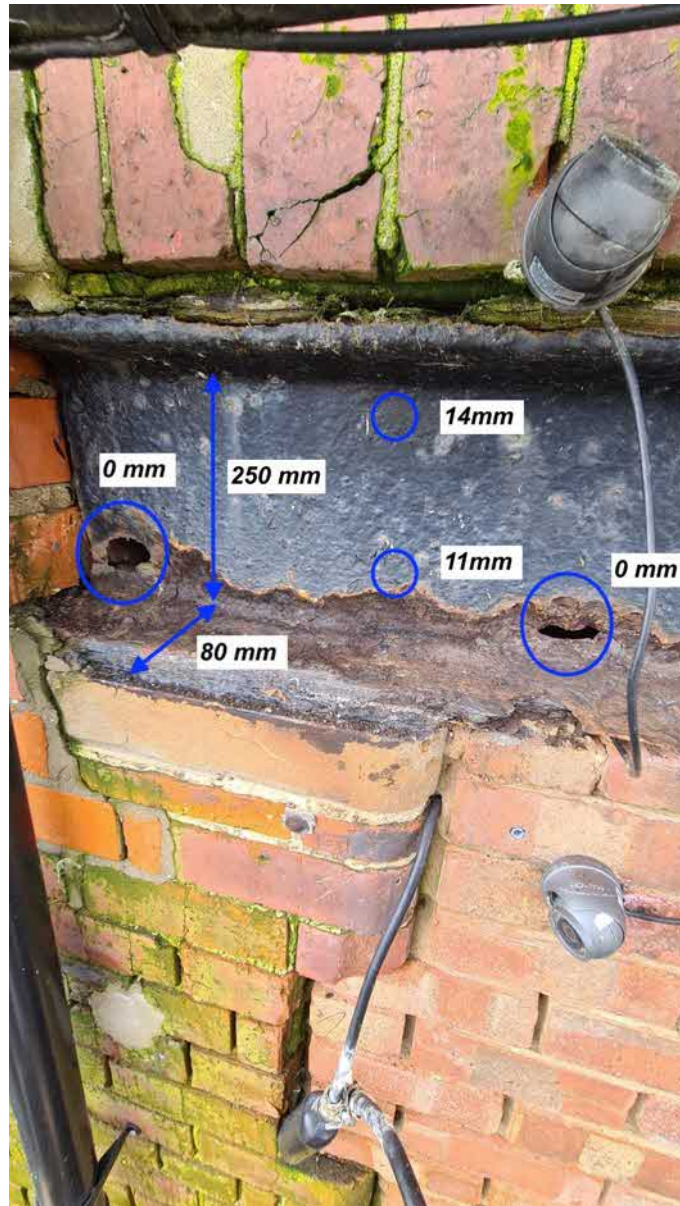
Date: 5th April 2023

Drawn By: J. Bateman

Scale: Not to Scale	Drawing No. PRO.SWPB2
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Building No. 2 Rear Horizontal Beam Size and Corrosion, the vertical beam shown below is the same size but in a different orientation.



REPORT CONTINUATION

Customer:
Proteq Ltd.

Date of test:
6th & 7th March 2023

Report Number:
AM-23.186



Figure
Location 1

I Beam Severe corrosion / delamination



Figure
Location 2

I Beam Severe corrosion / delamination

REPORT CONTINUATION

Customer: Proteq Ltd.	Date of test: 6 th & 7 th March 2023	Report Number: AM-23.186
--------------------------	---	-----------------------------



Figure
Location 3

I Beam Severe corrosion / delamination



Figure
Location 4

I Beam Severe corrosion / delamination

REPORT CONTINUATION

Customer: Proteq Ltd.	Date of test: 6 th & 7 th March 2023	Report Number: AM-23.186
--------------------------	---	-----------------------------



Figure
Location 5

I Beam Severe corrosion / delamination



Figure
Location 6

I Beam Severe corrosion / delamination

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REPORT CONTINUATION

Customer:
Proteq Ltd.

Date of test:
6th & 7th March 2023

Report Number:
AM-23.186



Figure
General Image
I Beam Severe corrosion / delamination



Figure
General Image
I Beam Severe corrosion / delamination

REPORT CONTINUATION

Customer:
Proteq Ltd.

Date of test:
6th & 7th March 2023

Report Number:
AM-23.186



Figure
Location 7

I Beam Severe corrosion / delamination



Figure
Location 7

I Beam Severe corrosion / delamination

REPORT CONTINUATION

Customer:
Proteq Ltd.

Date of test:
6th & 7th March 2023

Report Number:
AM-23.186



Figure
Location 4
I Beam Severe corrosion / delamination



Figure
Location 4
I Beam Severe corrosion / delamination

REPORT CONTINUATION

Customer:
Proteq Ltd.

Date of test:
6th & 7th March 2023

Report Number:
AM-23.186



Figure
General Image Showing the Storage of
Materials/Equipment
I Beam Severe corrosion / delamination



Figure
General Image Showing the Storage of
Materials/Equipment
I Beam Severe corrosion / delamination

REPORT CONTINUATION

Customer:
Proteq Ltd.

Date of test:
6th & 7th March 2023

Report Number:
AM-23.186



Figure
Location 5
I Beam Severe corrosion / delamination



Figure
Location 5
I Beam Severe corrosion / delamination

REPORT CONTINUATION

Customer: Proteq Ltd.	Date of test: 6 th & 7 th March 2023	Report Number: AM-23.186
--------------------------	---	-----------------------------



Figure
Jacks Place Internal
Support structure above holding tanks



Figure
Jacks Place Internal
Support structure above holding tanks

Surface corrosion requires removal and re-protection.

REPORT CONTINUATION

Customer: Proteq Ltd.	Date of test: 6 th & 7 th March 2023	Report Number: AM-23.186
--------------------------	---	-----------------------------



Figure
Balcony Handrail, severe corrosion



Figure
Failed Stanchions
Handrail severe corrosion. Spalling concrete

Building 2 Balcony and steps handrail are in poor condition.

REPORT CONTINUATION

Customer: Proteq Ltd.	Date of test: 6 th & 7 th March 2023	Report Number: AM-23.186
<p>Building 3:</p> <p>Building 3 is used mainly by a café on the first floor. On the ground floor it is used to offload incoming boats and store produce prior to it being loaded and transported for onward sale. The upstairs café has a balcony on the harbour side and a walkway runs throughout the full length of the car park side of the building.</p> <p>The exposed arched steel lintels above the doorways are in varying conditions. It is believed by our engineers that these steel lintels are actually formers used to create the arched brickwork and are not structural. This theory is supported by the fact that the distortion within them has not affected the brickwork arch. These arched lintels are approx. 4590mm long 7.5mm thick and have a back step of 150mm. As shown in the drawing below.</p> <p>The arched lintels appear in places to have been packed with mild steel. These packers have since corroded and are expanding which is causing deformation to the lintels. To the harbour side of the building on Lintel No.1 the expansion has lifted the brickwork and has taken the loading away from the column this can be seen in the form of a vertical step crack within the brickwork emanating from the steel lintel and proceeding down the column. This at present isn't a cause for concern as an air conditioning unit present between building 2 and 3 is preventing any further movement within the brickwork however should this unit be removed care must be taken to ensure that the column remains stable.</p> <p>To the rear of the steel arch former is a concrete lintel, this forms the door opening and supports the upper floor. It is believed that within this lintel is a steel beam which connects to the building uprights at 4.5(m) intervals. A further area was uncovered to see if the connection point could be viewed between the steel upright and the concrete beam. At the opening created it was not possible to see the connection point however our engineers were able to determine that a steel was within the concrete. This was established by the void at the end of the connection point and the steel being present when probed using a drill and drill bit</p> <p>We would recommend that the arch former is replaced like for like. Manufactured and shop coated with a E-C5-B protective coating system to provide an estimated design life of 20 Years with no maintenance. This design life could be further improved with appropriate routine maintenance.</p> <p>In general, the steelwork in these areas remains in good condition showing some signs of light corrosion which was not a cause for concern at the time of inspection the bolts that were accessible during the inspection showed no signs of corrosion or 'necking' and were grade 8.8. The angle of the openings created did not allow for accurate measuring of the beam or bolts.</p>		