

INSPECTION OF THE SUPERSTRUCTURE, VICTORIA PIER, COLWYN BAY



Prepared for:

Design & Engineering Services
Conwy County Borough Council
Library Building
Mostyn Street
Llandudno
LL30 2RP

Prepared by:

Datrys
Consulting Engineers
Yr Aelwyd
3-5 Church Street
Caernarfon
Gwynedd LL55 1SW
Tel 01286 671027

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1.0 INTRODUCTION

In February 2010 Datrys was commissioned by Conwy County Borough Council (CCBC) to carry out a structural inspection and assessment of Victoria Pier, Colwyn Bay and to provide a report on our findings.

This report relates to the structural inspection that was carried out above deck level on the 27th July 2010. The inspection consisted of a visual assessment all of accessible buildings, structures and areas that were deemed safe to enter. This report follows on from our initial report which concerned the supporting steel and cast iron structure below deck level.

The purpose of this inspection was to determine the structural condition of the buildings and elements above deck level in order to complete the inspection of the Pier.

The inspection covered the following items:

- The Pavilion
- The Entrance Buildings
- The Deck
- The Handrails

All surveys were purely of a visual nature. Datrys did not investigate the presence of hazardous materials nor did we assess timbers for signs of infestation or rot.

Whilst any significant defects have been flagged within this report, the absence of comment or the statement “no defects” or similar, does not imply that there is an absence of defects that may be considered to be structurally significant.

The background information regarding the pier was detailed in our previous report so will not be repeated here.

2.0 STRUCTURAL FORM

The structural form for each of the listed items is detailed below.

2.1 The Pavilion

The pavilion is the third structure in this location and was built in the 1930's after the previous two buildings had been destroyed by fire. The pavilion consists of a hipped central building with a plan area of approximately 500m². This building is surrounded by 'lean-to' style mono pitched annexes which, despite their more recent appearance, are considered to be part of the original structure. There are also some smaller, more recently added timber frame structures to the eastern side.

The general structural form is well defined and consists of a steel supporting frame with secondary steelwork supporting infill wall panels. The wall panels are a steel lath and render type construction to the outer leaf and have an asbestos fibreboard or thin blockwork inner leaf. The load path for stability under lateral loading is not clearly defined but resistance is most likely to be provided by the walls acting as shear panels.

The main building is generally open, with few internal walls or supporting structures. This is contrary to the annexe buildings.

The steel columns of the main frame generally sit within the walls at the locations of the underlying piles.

The roof to the main building is hipped and appears to consist of asbestos cement sheeting, insulation with a boarded finish to the ceiling. The roof is supported by steel lattice girders spanning onto steel columns. The principal girders span east to west and the columns onto which they are supported span down onto the underlying plate girders.

The roof over each annex is of corrugated sheeting supported on steel beams which span onto steel columns. The roof plane to the south and north edges is cantilevered out from the annex wall.

The general form and construction of the pavilion is likely to have been heavily influenced by the loss of the two previous buildings. The floors are a mixture of tiles and boards over what we understand is asbestos cement underlay. The walls are believed to contain asbestos board and probably asbestos may also be present in the render .

2.2 The Entrance Buildings

There are two linked buildings at the Pier Entrance running from the Promenade. Both buildings have nominally flat roof planes; the building nearer the road has a plain appearance whereas the adjacent building has pyramid shaped fibreglass vaults around the roof edges and down its central axis.

The roof to the roadside building is of wood-wool panels and Metsec lattice beams which span between steel universal beams which are in turn supported by steel SHS columns. The roof with the pyramid vaults is of a lightweight galvanised steel space frame supported at its corners and mid-length by steel SHS columns. The internal space is open with no supporting structure. The space frame cantilevers over the adjoining flat roof of the roadside building.

No vertical bracing was noted and stability under lateral load is thought to be provided by the roofs acting as braced planes to transfer the loads to walls that act as shear panels. Alternatively the columns may act as vertical cantilevers the capacity of which would be reduced by any problems with the Pier sub-structure.

The steel columns are supported by steel beams onto the underlying girders. The floor appears to span in a north to south direction between these steel beams.

The interior of both buildings has been sub divided into a number of rooms using non-load bearing stud partition walls.

2.3 The Deck

The deck is made up of closely positioned timber boards which span parallel to the length of the pier. The decking is supported by timber joists which are irregularly spaced but are generally between 400 & 600mm centres. The timber joists span directly onto the top boom of the steel girders giving a maximum span of approximately 5.5m. The joists are generally held in position on the steel girders with steel brackets.

The layout of the decking is shown in the appended photographs and Datrys drawing 09205/0002.

2.4 The Handrails

The handrails provide a safety barrier around all exposed edges of the deck. The railings are decorative cast iron infill panels which span between cast iron posts. The posts have an inverted 'u' shaped baseplate which is fixed through a timber kerb with a single bolt.

3.0 OBSERVATIONS

The significant observations recorded for each of the items are summarised below. The photographs referred to are appended.

3.1 The Pavilion

- A substantial proportion of the rendered outer wall leafs are cracked and are collapsing (photo's 12-14, 21-25, 28-29, 58-60).
- Some of the secondary steelwork supporting the fabric walls is corroding (photo's 30, 52, and 60).
- The roof of the toilet block to the north west of the main building is leaking. The floor is wet and seems to be rotten (photo's 35, 36).
- The principal structural members appeared to be in a good condition with little signs of corrosion and no signs of defects.

3.2 The Entrance Buildings

- There was some minor corrosion of the galvanized space frame. The roof showed signs of leaking in areas, especially to the south end of the roadside building.
- There were no significant structural defects observed.

3.3 The Deck

- A considerable number of boards are missing, rotten or loose. A few failed during the survey when trafficked.
- The condition of the decking is poor over the whole area of the Pier but deteriorates significantly toward the seaward end.
- The timber joists generally appear adequate although a number showed signs of decay. The timbers were observed through the planks such that close at hand inspection was not possible.

3.4 The Handrails

- Substantial lengths of the handrails are missing; especially toward the seaward end.
- The timber kerb is a water trap and has decayed around most of the perimeter. A number of the handrail connections are loose.
- The railings have rotated out of plane at the south east corner of the pier where the circular deck area has failed.

4.0 DISCUSSION

4.1 The Pavilion

Most of the external wall panels have failed due to cracking and buckling; in areas they have become detached. This failure pattern is probably due to corrosion of the unrendered inner face of the steel laths as a result of condensation. The expansion of the corroding steel would cause the render to crack allowing exposure to the aggressive external environment. This in turn would lead to accelerated corrosion and expansion resulting in the buckling of the wall panel and its becoming detached from the supporting structure.

In view of the fate of the previous two pavilions it is likely that the current building has been fire proofed using asbestos based products. We believe that the walls, roofs and floor all contain such material making the overall quantity significant. Any works being carried out would disturb such material which would need to be contained and carried out in a careful manner for controlled disposal.

It is clear that there have been problems with the roofs leaking in the past which may be why the majority of the sheeting has been replaced on the lower annexes. The roof to the toilet area continues to leak which will be causing corrosion of the supporting steelwork.

The principal steel frame (columns, roof girders, beams etc) are in an acceptable condition but will require blast cleaning and repainting with some minor repair works. However with the failing of the outer wall panels which act as shear walls the condition of the principal frame will deteriorate and its resistance to lateral load will be jeopardized.

Most of the primary columns for the pavilion rest on the underlying plate girders. These, as detailed in our previous report, were found to be in a reasonable condition. The repair and refurbishment of the Pavilion and its

supporting structure could therefore be carried out in-situ rather than by dismantling and re-erection but at an increased cost.

4.2 The Entrance Buildings

The buildings are of a much more recent construction than the Pavilion and have been subject to recent, ongoing maintenance and refurbishment. They are therefore in better condition.

There were no significant structural defects observed. The roof had leaked at some point in the past and may need to be repaired. The space frame will need to be treated to prevent ongoing corrosion. Whilst the buildings are structurally adequate, they are unlikely to comply with the current Building Regulations.

The supporting steel girders (inspected and detailed in our previous report) were found to be unsuitable and need to be replaced which would directly affect the buildings above them.

4.3 The Deck

The timber decking was found to be in various stages of decay and are not considered to be serviceable. There is no apparent danger below from collapse but if the pier were to reopen then allowance should be made to replace all the decking.

The timber joists appeared to be in a reasonable condition. The beams were inspected on a visual, sample through the decking and therefore with limited access. It is a realistic risk that decay will be present in a significant proportion of the joists. The treatment of the steel girders will also require their removal. Given the above it is advisable to allow for the total replacement of the decking and supporting joists.

The deck also acts as the in-plane bracing to transfer the lateral wind loads to the braced gridlines. The ability of the decking to transfer lateral loads to the

column heads without bending of the girders is a significant concern with respect to the long-term survival of the Pier.

4.4 The Handrails

The panels and posts that remain appeared to be in a serviceable condition. The decay of the timber kerb into which they are connected has lead to the rails becoming unstable. The advanced decay is likely to be the cause of the more exposed sections toward the seaward end becoming detached.

In order to re-open the pier all rails would need to be removed, blast cleaned and repainted. An analysis of their performance under the current regulations would also be required which may require the base connection detail to be revised.

5.0 CONCLUSIONS & RECOMMENDATIONS

The following items may be concluded from the structural inspections.

1. The fabric of the Pavilion is not serviceable and should be replaced in its entirety. It probably contains a large quantity of asbestos and will need to be carefully removed and subject to controlled disposal.
2. The structural frame of the Pavilion appears to be in reasonable condition and would require stripping back to be blast cleaned, and repainted. Local repairs especially to connections will probably be required.
3. The timber decking and supporting joists to the deck show decay and have been lost in areas. Allowance should be made for replacing all timber elements.
4. The connection detail for the handrail posts is poor and will lead to water entrapment and encourage decay. All handrails will need to be removed, refurbished and re-attached to a new adequately designed base connection. The kerb detail should be replaced with a durable alternative.
5. It may be possible to refurbish the Pavilion structure and its substructure in-situ but at a higher cost than dismantling and re-erection.
6. The Entrance Buildings will need to be upgraded to comply with the requirements of the current Building Regulations.
7. The Entrance Buildings do not exhibit any significant structural defects although how lateral stability is achieved is unclear and may be dependant on the rigidity of the Pier sub-structure. This in turn is in need of strengthening and might require the propping of the buildings above. The value of these buildings should be considered in relation to the cost of the repair work.

APPENDICES

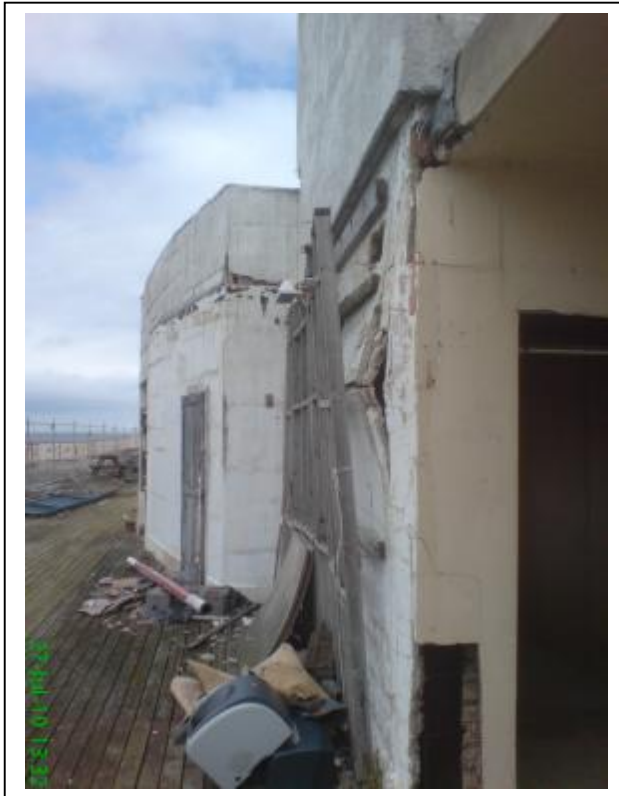
PHOTOGRAPHS



Photo 11: Corner column detail



Photo 12; Lath & plaster boarding to the pavilion



Lath & plaster boarding to the pavilion



Photo 14: South west corner of pavilion



Photo 21: Damaged plaster wall to the south west pavilion corner



Photo 23: West elevation damage to plaster



Photo 24: Cracked plaster to the curved structure



Photo 22; Damaged plaster wall to south east corner of pavilion



Photo 27; Annex cantilever, north west corner



Photo 28: Annex cantilever
roof and wall construction

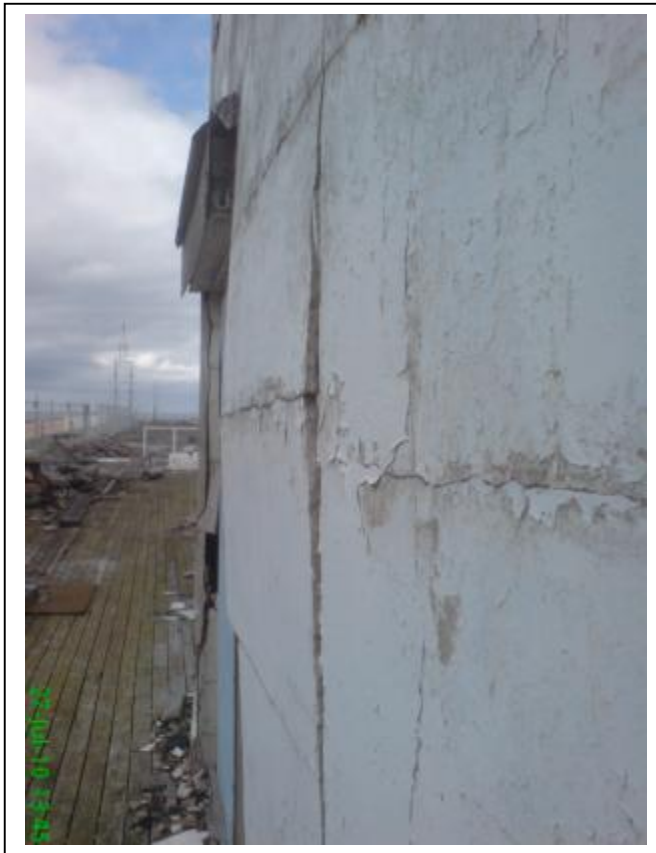


Photo 25: Cracked plaster to the curved structure



Photo 26: Repaired damage to the curved structure, north end



Photo 29; The wall composition



Photo 30: Cracking of internal
blockwork leaf



Photo 59: Cracking within the outer leaf plaster of the pavilion



Photo 60: Collapse of outer leaf plaster to the pavilion



Photo 57: General deterioration of the annex cantilevered roof

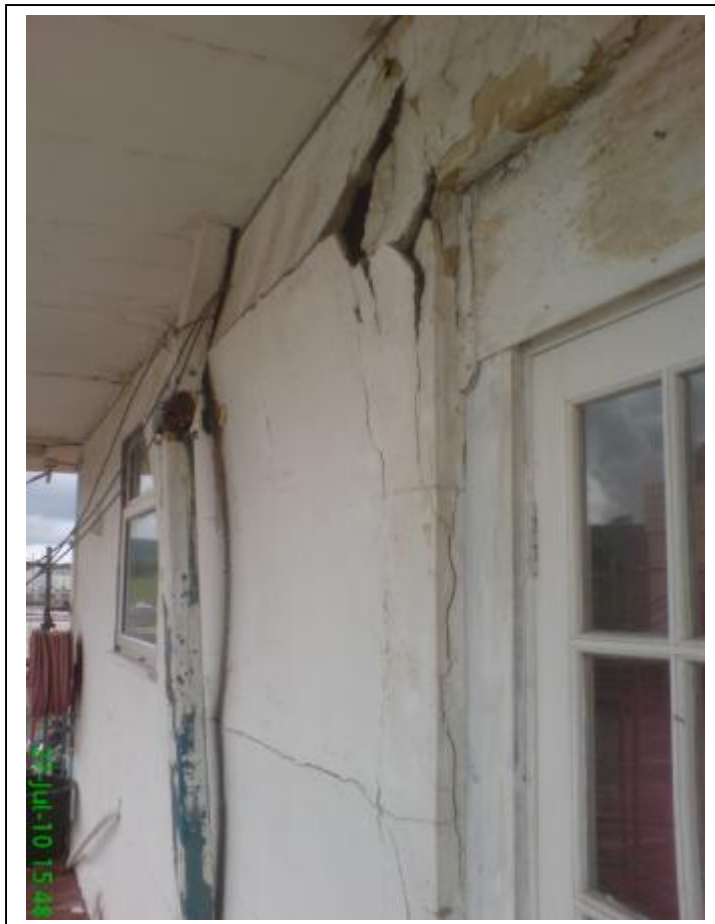


Photo 58: Cracking of the outer leaf plaster to the pavilion



Photo 55: Fire protection to a typical steel column



Photo 16: Damaged ceiling under south cantilever of pavilion



Photo 34: North elevation of pavilion



Photo 31: View from the north west corner
showing the toilets



Photo 35: Interior of toilet, north west corner



Photo 36: Inside of toilet area, north west of pavilion



Photo 37: Cracked inner blockwork leaf



Photo 52: Close up of insulation board to internal wall leaf of pavilion



Photo 53: Close up of insulation board to internal leaf of pavilion



Photo 56: The ceiling within the north annex to the pavilion



Photo 19: Cantilevered roof to the eastern edge of the pavilion



Photo 6: A roof beam in the north bar annex



Photo 51: Roof support column & beam to entrance building



Photo 43: The east elevation of the entrance building



Photo 15: View along south elevation of the pavilion



Photo 17: View from the south of the pavilion



Photo 18: View from the south east corner of the pavilion

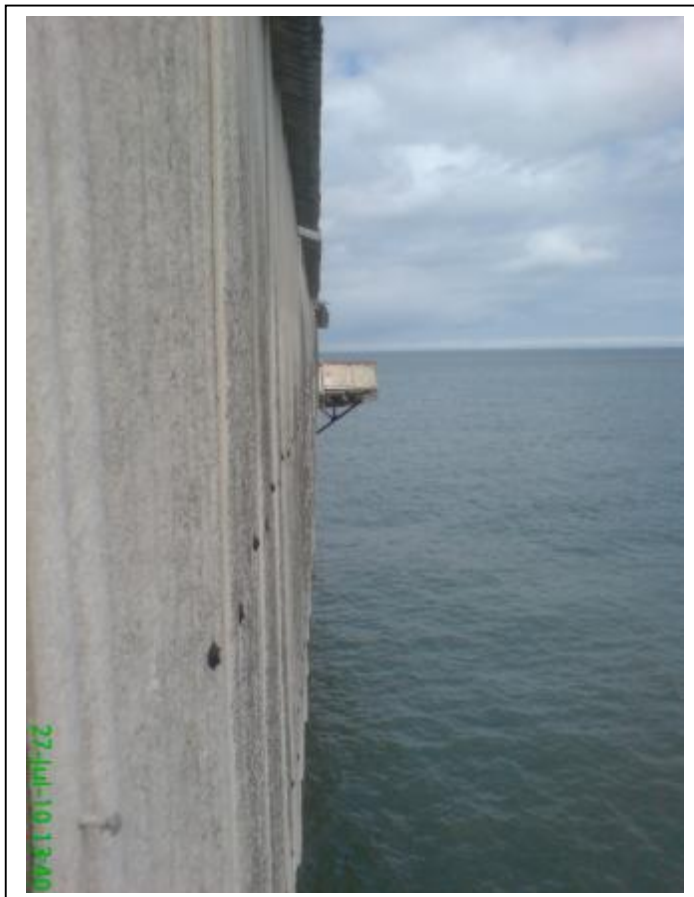


Photo 20: View along the east side lean to of the pavilion



Photo 32: View the pavilion from the north east corner



Photo 33: The eastern end of the north elevation of the pavilion



Photo 38: General view from north west corner of pier



Photo 54: View of main pavilion room from the south east corner



Photo 39: Internal view of south east corner of stage



Photo 40: Roof structure above the stage



Photo 1: Inside the main room from the north west corner



Photo 2: Inside the main room from the north west corner



Photo 3: Inside the main room from the north west corner



Photo 4: Central roof within the main pavilion



Photo 5: View within the north bar annex



Photo 7: The north annex looking through to the main room



Photo 8: The curved roof structure from the south



Photo 9: Column to beam connection south west corner of main room



Photo 10: Principal corner column, south west of pavilion



Photo 41: North elevation of the building



Photo 42: Looking along the east elevation of the entrance building



Photo 43: The east elevation of the entrance building



Photo 45: Internal room of the entrance building

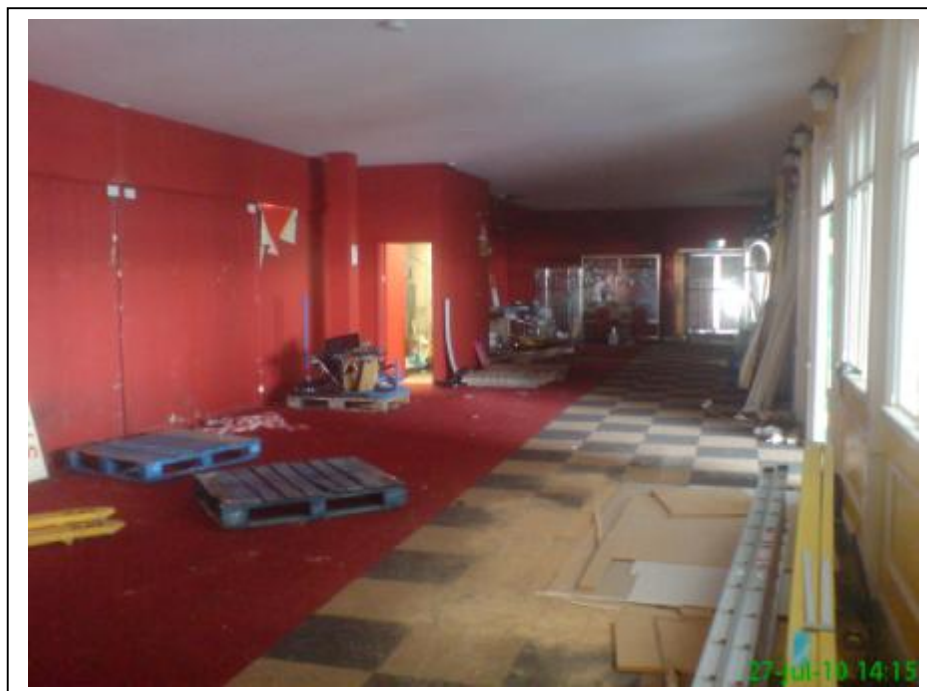


Photo 46: Internal room of the entrance building



Photo 47: Kitchen area within the entrance building



Photo 48: Roof over the entrance building

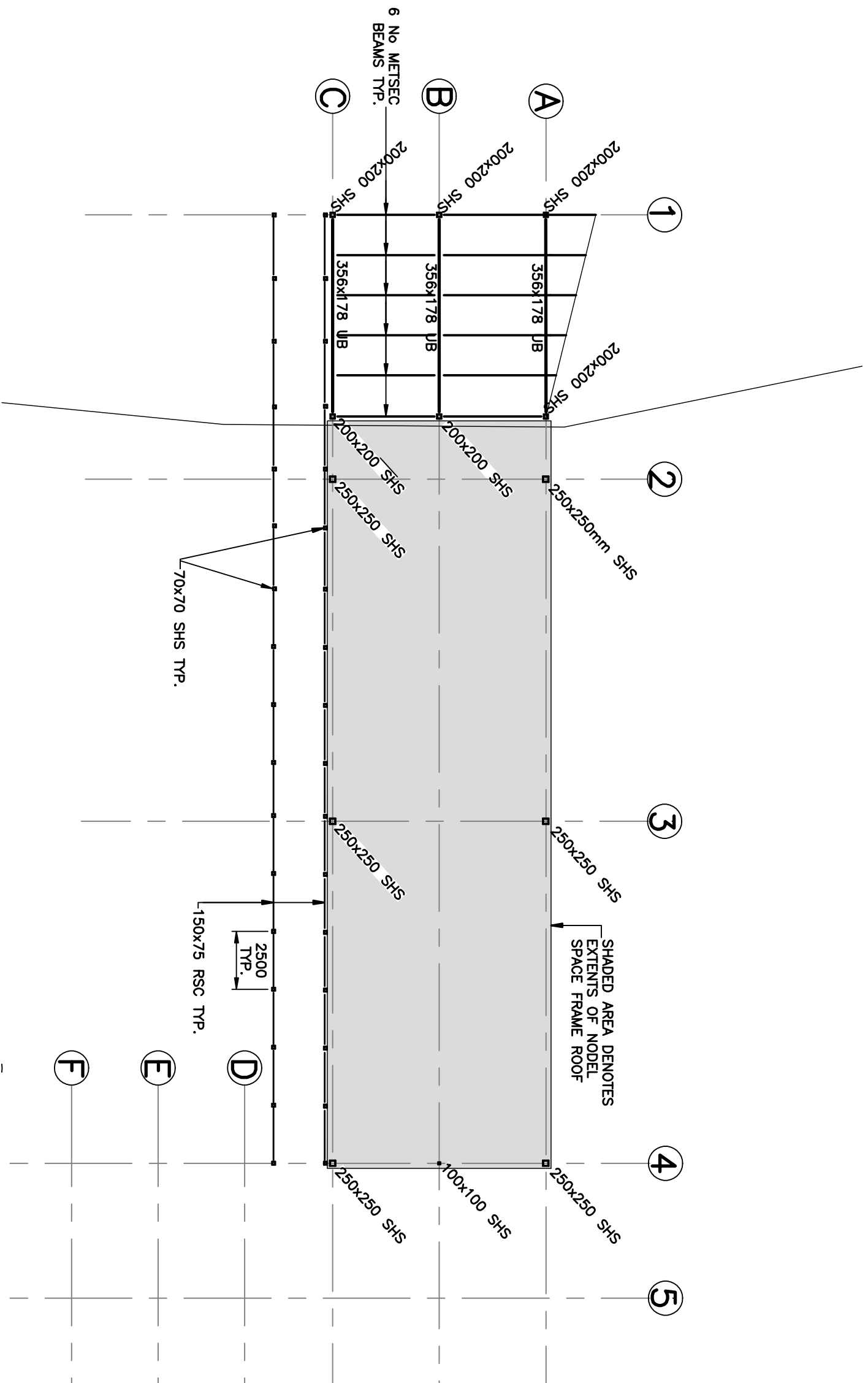


Photo 49: Roof over the south room of the entrance building



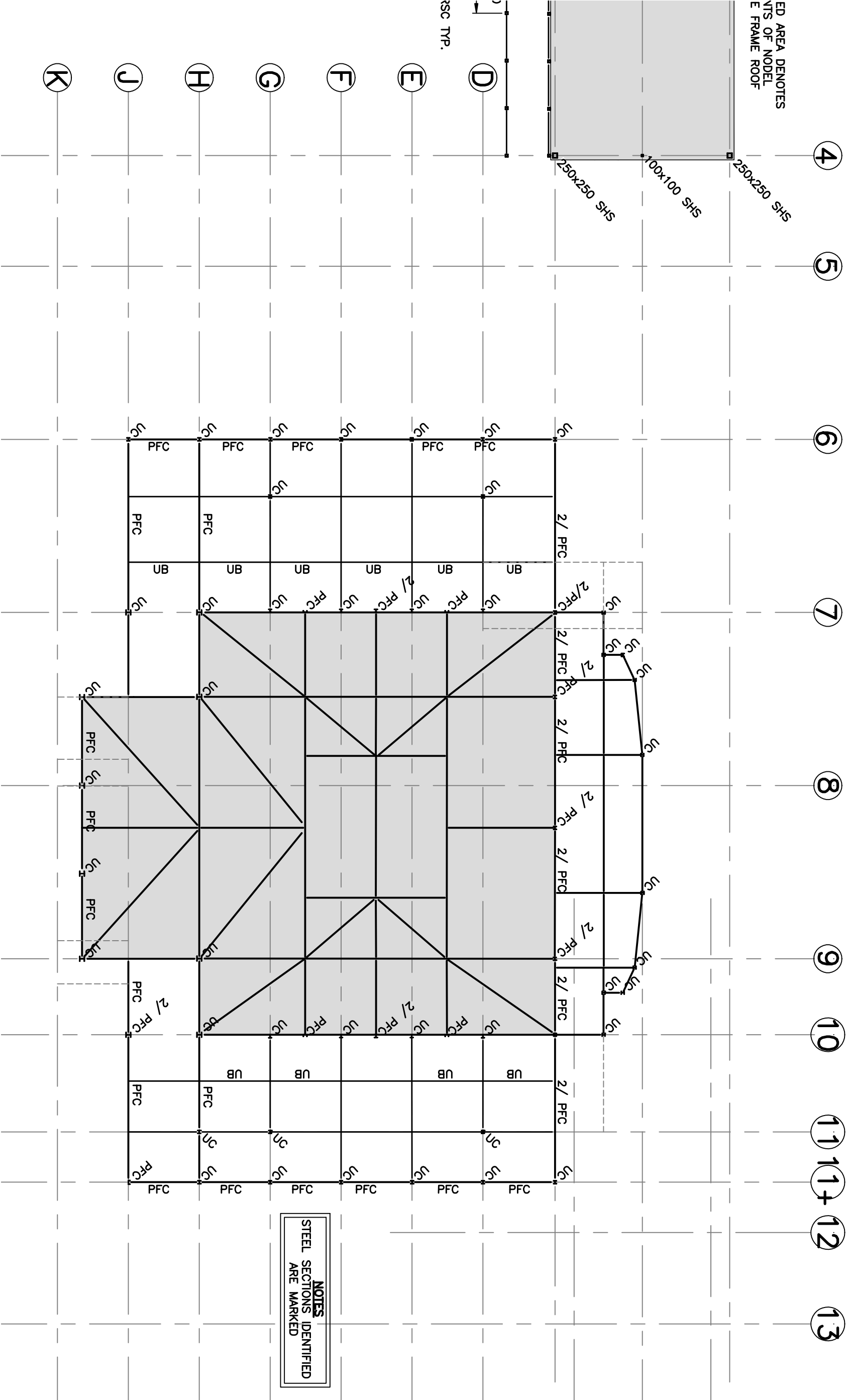
Photo 50: Roof over the south room of the entrance building

GENERAL SUPERSTRUCTURE ARRANGEMENT DRAWINGS





TITLE		PROJECT		Yr Adwydd 2-4 Church Street Cardiff CF10 1AT 01222 671407 01222 671408 info@colwynbayengineering.com www.colwynbayengineering.com			
<div><div></div><div>DATRY'S</div><div>Not a Statutory Requirement Consulting Engineers</div></div>		Colwyn Bay Pier		Telephone Fax E-mail Internet			
		Job No. 09205		DATE 28.07.10		SCALE 1:200	
		ACAD Ref:09205/1001		CHECKED EPW		PASSED	
		DRAWN OB		DRG No. 1001		REV	

ED AREA DENOTES
NTS OF MODEL
E FRAME ROOF



NOTES
STEEL SECTIONS IDENTIFIED
ARE MARKED

TITLE		PROJECT			
Pier Pavilion Building Roof Plan		Colwyn Bay Pier			
 D A T R Y S Structural Engineering Consulting Engineers		 2-6 Church Street Colwyn Bay Gwynedd LL57 2BQ 01755 671401 info@datarys.co.uk www.datarys.co.uk			
Job No.	09205	DATE	28.07.10	SCALE	1:200
ACAD Ref	09205/1002	CHECKED	EPW	PASSED	
DRAWN	OB	DRG No.	1002	REV	