whitbybird

CUBE CINEMA
KING SQUARE, BRISTOL

Structural Inspection & Appraisal

for

Cube Cinema Ltd.

March 2006

project no. **3863**

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CONTENTS

Revision History

Rev	Date	Purpose/Status	Document Ref.	Comments
1	31/03/06	Issue	Structural Appraisal March 2006 Rev 1	

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Peter Cunningham Associate	**David Burns** Director	**David Burns** Director

1 EXECUTIVE SUMMARY

Whitbybird Ltd. were commissioned by the Cube Cinema Ltd. to undertake a structural inspection and appraisal of the structure for the current occupants.

Whitbybird Ltd. did a visual inspection of accessible elements without opening up or intrusive testing.

The structure displays serious structural defects which should be attended to ensure the safety of its users and provide an economic future life for the building.

2 BRIEF

The Cube Cinema Ltd. have requested whitbybird Ltd. to undertake a structural appraisal of the Cube Cinema and this was confirmed in their letter of 24 May 2005.

The purpose of the appraisal is to provide information on the current condition of the building structure and to assist the current management and their architect in the development of options for future upgrading of the property.

The appraisal consists of a visual inspection of the auditorium, stage, fly tower, bar, offices, stores and public areas.

The extent of the appraisal is delineated by the spaces in current use by the cinema. These are located both under and over adjacent properties. Where defects are noted in these adjoining properties they are recorded when considered as being of relevance to the Cube Cinema's structural integrity.

Whitbybird have been given copies of Keith Day Architect drawing number 2107 / 04 showing the plans and elevations.

This structural appraisal is concerned only with the main structural elements of the property and does not include inspections of non structural items e.g. finishes, fittings, services, etc. However, where such items were observed to have significant defects these have been noted for information only.

Excluded from the inspection are the above and below drainage system, paths, landscaping, etc. The inspection was of reasonably visible elements and did not undertake any opening up works, removal of finishes or boarding.

This report is for the exclusive use of Cube Cinema Ltd. And its contents shall not be used in whole or in part by an third parties without the express permission of whitbybird in writing.

This report shall not be relied upon exclusively by the Client for decision making purposes and may require reading with other material or reports.

3 DESCRIPTION

The Cube Cinema is a public building used for film showings and live music performances.

The original building on the site was probably an outbuilding associated with the large town houses fronting on to Kings Square and was probably constructed in the 1700's.

Over time it is believed to have had a number of uses including industrial activities.

The current form of the building is understood to date from 1964 when the fly tower, stage and auditorium were created by forming the new reinforced concrete and masonry tower and scenery store on top of the original brickwork walls.

No structural information elating to this modern construction is available.

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4 SURVEY WORK

The visual inspection took place on 23 June 2005.

The work consisted of a visual inspection of the external and internal elements of the structure where they could be reasonably accessed.

See plans in Appendix 2 for element references. For the purposes of this report the elevation onto Princess Row is considered to be south west facing.

Photographs are contained in Appendix 1 and referenced by *Ph. 1,2*, etc.

5. INSPECTION OBSERVATIONS

South West Elevation onto Princess Row

This elevation comprises original brickwork with the modern exposed concrete ring beam with new brickwork above. *Ph. 1 & 2.*

Both old and new masonry appear to be in reasonably good condition for their age with no apparent bulges, out of plumb areas or deteriorating bricks or mortar.

The external ring beam shows poor compaction, *Ph 3,* and at the left hand end of this beam concrete ring beam some tying reinforcing wire is projecting suggesting low cover to the reinforcement.

Some cement mortar patch repairs have been carried out at mid height. *Ph 2.* These may be to correct a defect caused by embedment of steel in the wall.

The projection room comprises a flat roof on brickwork walls supported on an in situ reinforced concrete structure. *Ph 5.* The concrete beams over the garage doors below have spalled concrete which has exposed the reinforcement. *Ph 4.*

The owner of the garage below allowed entry for inspection of the slab forming the projection room floor which showed no obvious defects.

North West Elevation over Garage

The single storey stretcher bond brickwork wall appeared in reasonably good structural condition. However, staining down the wall below the extract duct was visible. *Ph 7*

The flat roof over the projection room was not opened up for inspection. The fascia board was rotting which suggests deterioration of the end bearing of the timber rafters. *Ph 7.*

The northwest corner of the first floor concrete edge beam adjacent to the refuse bins has been damaged, possibly by vehicle impact. *Phs 6,8 & 9.* This appears to have had a patch repair which has continued to spall but should be stripped off to reveal the full extent and depth of the original damage and an appropriate repair applied.

North East Elevation to Courtyard

The upper section of this elevation is probably part of the original outbuildings, possibly stables. *Phs 10 & 11.*

This wall has old bricks in many places with differing styles of brickwork with some surface deterioration around the circular window.

A large crack at the northern end has been re-mortared with poor quality cementations repairs. *Ph 10.* The high level wall bulges outwards over door opening. *Ph 8*. The parapet appears to have been rebuilt / re-mortared and there are remaining gaps in parapet coping stones.
Overall this wall is in poor condition and requires extensive repair and rebuilding to ensure its continued usefulness.

Scenery Store - North West Elevation

The lower area is older original red coloured brick with a modern concrete capping beam over with yellow coloured modern brick above with doors for scenery dock & steel access platform attached. *Ph 12.*

Adjacent to the patio seating area the old brickwork wall at low level has extensive mould growth on the surface. The mortar has come loose probably due to dampness which may manifest itself on the inside. Poor quality mortar repair has been done.
The concrete edge ring beam has poorly compacted concrete with links exposed with some slight reinforcement staining on the face.

A tree root is embedded above a poor quality mortar fillet and has resulted in cracking of the parapet wall & coping stone above. *Ph 14.* This has resulted in moisture ingress internally. *Ph 25.*

The lower area of the wall has vegetation growing. The scenery dock access platform is severely corroded allowing water penetration through hole in the steel floor plates. *Phs 13 & 21.* This element is thought to be unsafe and access should be prevented.
The balustrade attached to the roof edge outside the high level escape door is not properly fixed to the roof edge and is unsafe.

Likewise at the top end of the access ladder to scenery store the bolts into the brickwork have corroded causing cracking of brickwork and lifting of bed joints. *Ph 22.* This has rendered the ladder unsafe.

Courtyard

The brickwork retaining wall to the car park is approximately 1.8m high and is heavily covered by ivy with the roots well attached to the wall. This could present problems should the roots expand to force apart the bricks. There was no apparent lean to this wall but it was not possible to inspect closely due to the it being completely covered by vegetation.

The steel escape stair appear generally in good condition with some light corrosion on the underside. The top durbar plate shows some corrosion as well. The stair generally needs touching up with an appropriate protection paint system. One infill rod is broken and presents a possible hazard should someone bend it.

Roof over Male Toilets

The flat roof covering appears to be relatively new and in good condition. The tiles on sloping roof are in old & poor condition, their surfaces crumbling and spalling and some having been dislodged and with vegetation growing on them. *Ph 15.*

The old lead guttering has debris in it which may lead to leakage problems. *Ph 17.*

The hidden valley gutter has debris in it . It was not clear where this gutter drained to but it should be established to inspect its adequacy. The parapets appear in reasonable condition.

Scenery Store - North East Elevation

The external face of the lower concrete beam has poor concrete compaction. *Phs 15 & 16.* Reinforcement staining is visible. There is a small ledge on top of this beam where water can rest and thus may cause ingress problems.

Fly Tower - North East Elevation

This area is inspected from the flat roof over the scenery store. The upper wall comprises concrete perimeter columns and beams with brickwork infill panels. The beam at mid height which also forms the lintel over the escape door appears in reasonable condition. *Ph 18.*

The brickwork below this beam also appears good but with some steel tie bars with plates and nuts, *Ph 18,* which are believed to have been used for suspending items over the stage, *Ph 39,* and not be structural elements. This exposed steel may corrode and disrupt the brickwork locally.

The upper level of this wall is in poor condition. *Phs 19, 20, 23.* The upper concrete perimeter beam has very poor quality concrete work. It has been inadequately compacted thus probably leading to deterioration of the reinforcement at this upper level severely exposed location.

The column on north east corner is in extremely poor condition. *Phs 20 and 23. A*pproximately one metre from the top are large voids above a large vertical crack probably due to reinforcement corrosion within.

The brickwork has poor quality and inadequate mortar pointing with some dislodged bricks. *Ph 19.*

Fly Tower & Scenery Store - South East Elevation to Adjoining Garden

This elevation can only be seen from the private garden of the adjoining property which was not available for access. Therefore, no comments can be made on this section.

Fly Tower - North West Elevation

This area was not accessible for a close inspection due to no access being available onto adjoining roof. However, the concrete column at high level on the north west corner displays poor quality concrete work.

Fly tower walls are blockwork internally with brickwork stretcher bond on the outer leaf.

Entrance corridor some damp water ingress at high level underneath the sloping roof.

Auditorium Seating Undercroft

Access to this undercroft is by a hatch from the bar seating area and is used as a store.
The seating support comprises radial timber frames supporting circumferential timber beams which support the flooring for the seating over. *Ph 26.*

The soffit is partially covered with 12 mm of plaster board but of the much timber is exposed therefore there is no effective fire protection to the audience area above. The posts themselves sit on timber railway sleeper type spreaders sitting on the floor boards which form part of a suspended timber floor. *Ph 27.*

The undercroft felt quite dry with little apparent sign of dampness except in the northern west corner. *Phs 28, 29 & 30.* No ventilation was noted. (However, the inspection was undertaken in the summer after a dry period.)

The timbers were built into the external walls and whilst no obvious signs of decay were noted a full inspection should be carried out.

Some cracking was noted in the north west corner. *Ph 28.*

Bar Seating Area

The external wall to this area has a 215 mm brickwork dwarf wall approximately one meter high with timber stud above. The sloping roof displays no obvious defects but the rafters could not be inspected. It is understood to have been re-roofed within the recent past. The floor to this lounge is concrete with tiles with steps connecting it to the bar beyond and concrete steps up to the auditorium seating.

Projection Room

The projection room walls has stretcher bond brickwork walls on three sides with no apparent defects to these walls. The flat roof over is not accessible for inspection.
There are possible asbestos panels in this room. Projection room concrete floor has a lino type covering and is slightly uneven. The soffit of this slab was inspected from below (see above.)

Scenery Store

The flat roof over is a deep profiled galvanised steel decking, *Ph 49,* with felting on top that is understood to have been renewed in the recent past. A central steel beam spans from south east to north west wall and supports the decking at mid span. This beam is slightly rusted and appears to have no corrosion protection. Its size was not measured. It is built into the brick wall at both ends and sits directly on the brickwork with no padstone.

The perimeter edge beam at 1.4 metres above floor level displays poorly compacted concrete with many links and some main reinforcement visible. The concrete is highly honeycombed with obvious lack of cover to the reinforcement obvious frequently being visibly measured as 15mm. *Phs 29, 30 & 32.* No spalling was noted.

The beam separating the scenery store from main stage area beam at very high level is a steel beam encased in concrete. The beam is built into the masonry wall and is probably unprotected and corroded. *Ph 31*.

Fly Tower

The fly tower structure comprises reinforced concrete ring beams built on top of the older historic brickwork out building. Brickwork piers 330mm thick rise on the corners and middle of each elevation whilst between these are blockwork infill panels with a masonry outer leaf which are probably 250mm overall thickness.

The access ladder is loose at mid height and should be properly secured to the wall.

The fly tower has a flat roof with timber rafters. Ph 39 & 40. These are built into the external masonry walls and are probably decayed. These should be closely inspected.

Stage Area

The stage is formed with timber but was not able to be inspected due to plaster coverings. However, above the corridor the cross beam was noted to be not continuous and may not provide sufficient support to above. *Ph 24.*

Lantern over Auditorium Seating

The structure here comprises queen post timber trusses spanning from the proscenium arch to the rear wall of the seating area.

These original trusses have been significantly altered by removal of sections of the bottom boom and insertion of three number 305mm deep by 175mm wide steel beams inserted on a slope to provide a sloping ceiling above the seating space below. *Phs 36, 37, 38 & 47.*

Angle cleats connect the remaining timber to the top flange of the steel beams. *Ph 36.*
The edge distances of bolts into timber are inadequate on the lower end connections. It was not possible to inspect all connections in this area.

Generally the timber work in the roof lantern appears to be in reasonable condition. The very high level pitched roof has been recently renewed with the ceiling joists being retained whilst the posts and louvres have been made replaced. The purlins and hip members appear to be sound but we were unable to get to base of hip members to inspect the end bearing and condition.

The modern steel beams inserted to support the timber lantern were viewed where possible. The beam closest to Dove Street appeared to sit on an inadequate padstone with the wall below in poor condition. The central beam sits on a rather narrow pier of old stonework. The beam on the courtyard side was not visible. It was not possible to inspect the steel beam ends in detail for bearing or corrosion.

Access was gained through a hatch above the fire escape to Dove Street to inspect the hip member which sits on a triangular piece of timber which appeared in reasonable condition. On the other side at the public entrance into the auditorium the timbers at high level appeared OK.

6. APPRAISAL & RECOMMENDATIONS

The building structure comprises original construction of variable quality which displays defects consistent with its age and modern construction which is of evident poor quality.

The foundations were not able to be inspected but there did not appear to be any significant lean, distortion, significant settlement or differential deflections which would be evidence of undue foundation movement. The current structure has stood there for 40 years and there is little suggestion that the foundations are defective.

The original lower elements of the building of brickwork are in an advanced age and show typical signs of ageing e.g. poor mortar pointing, cracking, distortion, surface delamination, etc. These elements require considerable repair with repointing, rebuilding of distorted walls, replacement of failing brickwork, installation of dpc's, replacement of debonded renders, new copings, ventilation of enclosed spaces.

The modern flytower structure gives cause for concern due to the poor quality of construction. The principle defects may be summarised as :-

1. Inadequate compaction of concrete.
2. Inadequate cover to reinforcement.
3. Spalling and cracking of concrete to expose reinforcement.
4. Deterioration of steelwork platforms and ladders.

Many elements of this modern structure display severely inadequate construction and/or deterioration as to render them unsafe and possible pose a danger to the building users and general public.

All items noted in the observation section should be investigated further to establish the extent and severity of their implications. The principle issues are as follows :-

1. A rigorous investigation of the modern reinforced concrete elements to include :-
   - Cover to reinforcement survey
   - Identification of voids and inadequate compaction
   - Quality of concrete and mix constituents
   - Condition of reinforcement including depth of carbonation
   - Chlorides, sulphates, high alumina cement.

   These should be undertaken to establish in detail the condition of the concrete elements, to direct appropriate repairs and to estimate the residual life of the concrete structure.

2. A full condition and plumb survey of all walls to establish their integrity and stability and propose any required repair and stabilising measures.

3. A thorough review of the fire resisting capabilities of critical structural elements particularly those relating to the publicly accessed areas.

4. A full inspection of all timbers for decay and infestation.

5. A detailed structural review of the steel beams / lantern support over the auditorium.

6. It was not possible to inspect all elements of the structure but in the knowledge of the condition of those able to be inspected these should be made accessible and opened up to allow further more detailed inspection and appraisal.

An extensive structural repair programme can then be formulated and undertaken to provide structural safety and confidence in the building's future.

APPENDIX 1

PHOTOGRAPHS

APPENDIX 2

REFERENCE PLANS