To Independant assessor

THE GILBRAITHE PARTNERSHIP
Consulting Civil and Structural Engineers

# STOCKTON HEATH PRIMARY SCHOOL

**Report on**
**Proposed Refurbishment and Extension**
**Of Existing School Building**

**On Behalf Of**
**Warrington Borough Council**

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**2839**

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# STOCKTON HEATH PRIMARY SCHOOL
# PROPOSED REFURBISHMENT AND EXTENSION OF EXISTING SCHOOL BUILDING

## 1. INTRODUCTION

The Environment and Regeneration Department of Warrington Borough Council are currently reviewing the options for redevelopment at Stockton Heath Primary School.

This preliminary report details the findings of a visual inspection of accessible elements of structure, comprising the existing school building.

Elements of structure which were hidden, unexposed or inaccessible were not inspected. This report cannot therefore comment on such parts of the building, and it is possible that additional repair may become necessary once elements of existing construction have been fully opened up during the course of any refurbishment works.

A visual inspection was carried out on 13th May 2005 and 18th May 2005.

Certain record drawings were made available, and these have been reviewed as part of the structural assessment.

This report should be read in conjunction with reports prepared by the Architect on the general fabric of the building, comprising roof finishes, rainwater goods, window frames, doors, plasterwork and general finishes. The Architect's report should also address spatial suitability, thermal performance and access, which is outside the scope of our brief.

It should also be read in conjunction with reports prepared by a Timber and Damp Proof Specialist and reports prepared by Services Consultants.

## 2. FORM OF CONSTRUCTION

The inspection and record drawings suggest that the form of construction may be summarised as follows:

1. Roof –Traditional partly exposed timber roof trusses supporting timber purlins and timber rafters and timber ceiling joists. Slate finishes. Lath and plaster ceiling below roof void.

   A complex roof on plan, featuring numerous valleys, hips and exposed rafter feet to eaves.

2. First Floor – Record drawings indicate wood block flooring and reinforced concrete first floor construction. This appears to span either directly to load bearing masonry walls or to intermediate steel support beams.

3. Ground Floor Construction – Record drawings indicate wood block flooring on concrete on filling. The thickness of the concrete suggests that the floor slabs have been constructed 'on solid'.

   The construction of the ground floor over the part basement was determined to be concrete with brick and breeze aggregate. Steel filler joists were noted at approximately 600mm centres.

   A small pipework duct was noted to extend from the basement area down the length of the school with branches off to either side. Although this ductwork was not investigated fully due to the limited access, it was noted that the duct floor was of concrete, the floor construction over was of brick aggregate and breeze concrete with steel filler joists, and the duct walls were of brickwork with corbelled brickwork towards the duct floor. Headroom was limited to that of a crawl space.

4. Stairflights to First – apparently of cast concrete (single treads).

5. External and Internal Walls - The external walls were noted to feature header bricks, and one of the detail cross sections indicates 14inch brickwork. It would therefore appear that the external walls are of solid masonry construction. Measurements on site in a number of locations confirmed this general overall dimension, with thickening out to piers between windows, door reveals. A feature string course was also noted as was the ornate treatment, particularly around entrance doorways.

   Internally, the walls were noted to be of varying thicknesses, at least 225mm overall, and the majority were determined to be load bearing. However, a number of stud partitions were noted in the area of the first floor office and in the first floor IT suite

6. Foundations - Record drawings suggest foundations traditionally formed in corbelled masonry, or possibly corbelled masonry on concrete strip footings formed relatively shallowly - at depths of approximately 700mm. It should be appreciated that these drawings may not reflect the construction as built.

   Within the basement area, the foundations appear to extend down to approximately 2.8m below external ground level, and are again indicated as corbelled brickwork. The basement retaining walls are indicated as solid brickwork.

## 3. PRESENT USE / FUTURE USE

The building was opened in 1910 as a school, which is its present use. It is understood that its future use will be essentially as existing.

## 4. INSPECTION AND APPRAISAL

### 4.1 Foundations

A visual inspection of the building did not evidence any significant distress that could be associated with foundation inadequacies or general settlement. There was no evidence of differential movement between the basemented wing of the building and the remainder of the school.

A bore hole investigation ** has been previously carried out on the site in the area of the playground pavilion to the North East corner of the playground as part of another scheme. This recorded tarmac, brick and ash fill to a depth of approximately 1.5m. Thereafter a loose, becoming medium dense, light brown sand was encountered extending down to firm brown clay and weathered red sandstone at approximately 3.4m below playground level.

It should be noted that because of the natural fall of the land, the playground levels appear to have been made up in the area of that investigation, and therefore it is surmised that the main school building is formed with foundations in the medium dense light brown sand. This should be further proved by investigation.

A preliminary desk study did not suggest any contamination on site, although some contamination was noted to have been recorded during the course of development of the nearby shopping centre.

Chemical tests on borehole samples recorded near neutral pH conditions within the soil and negligible soluble sulphate concentrations. Chemical tests for organic matter also obtained negative results.

For the purposes of refurbishment and extension of the existing school, it is therefore recommended that one borehole be carried out in the area of the proposed extension, together with trial pit investigation of the existing foundations in four locations. A formal desk study for contamination should also be undertaken.

Summary: The existing building foundations appear to be performing satisfactorily. Further investigation by borehole and trial pit is however recommended, particularly in the area of the extension. A formal desk study on possible contamination should be carried out as part of the development of the Health and Safety plan.

4.2 Ground Floor Construction

Where exposed, the ground floor appeared to be of wood block finishes on concrete generally constructed 'on solid'. This appeared to be performing reasonably satisfactorily and there was no evidence of significant distress.

Within the basement area, the ground floor construction over was determined to be concrete with steel filler joists at approximately 600mm centres. The aggregate in the concrete was predominantly brick, although with some breeze.

Construction with breeze aggregate was common at the turn of the Century but soon fell into disrepute because of the problems associated with concrete made with breeze aggregate. Because the aggregate at Stockton Heath Primary School appears to have a smaller percentage of breeze clinker aggregate, the floor has performed reasonably satisfactorily to-date, but now shows signs of deterioration. Whilst there was no evidence of significant expansion and movement in the concrete (which is generally more likely in wholly breeze aggregate concrete) it is known that clinker aggregate can accelerate the effect of corrosion of steel. Indeed, breeze aggregate concrete in contact with steel is banned in new construction.

** RTD Site Investigation Report Ref:83/04, October/November 2004

At Stockton Heath Primary School, the steel filler joists in the ground floor construction over the basement and over the crawlway ducts exhibit corrosion, in some areas with sufficient expansion and exfoliation of corrosion to cause spalling of the concrete soffit and slight displacement at bearings. For a projected lifespan of 60 years, it is recommended that these areas of suspended ground floor construction be replaced by new reinforced concrete (see photo).

Summary: Structural performance of ground floor generally satisfactory. Areas of ground floor over basement and crawlway ducts should be replaced by new.

Further consideration should also be given to thermal insulation, dampness penetration, ventilation, provision of services.

## 4.3 Loadbearing Masonry Walls

The inspection did not note any evidence of significant out of plumbness or active movement or displacement in the principal loadbearing masonry walls.

The condition of timber backing lintels to windows should be assessed, particularly in the light of dampness penetration noted in a number of locations. In such locations, the internal arch head formed in plasterwork evidenced significant cracking, and may become displaced in time.

Internally, a number of arch headed doorways and corridors were noted. In one location a beam appeared to bear on to one of these arch heads and although there was no evidence of structural distress, this is considered to be an unusual detail which may require further assessment. Whilst the external elevations to the loadbearing walls were performing reasonably satisfactorily, it is considered that the string course and the ornate porch head details may prove problematic in terms of maintenance in future years. In a number of locations, the arch head brickwork over windows had displaced slightly, but in no area was the degree of displacement of immediate structural concern. It was noted that some vegetation was growing from perpends in a number of locations. The chimney stacks appeared generally to be satisfactory, and the chimney pots align vertically. However over a 60 year period further maintenance on these items may be expected.

Summary: Performing structurally reasonably satisfactorily. Enhanced maintenance may be expected because of the ornate details to external masonry. The condition of built in backing timber work and further plaster deterioration in certain areas may be expected due to local dampness penetration.

## 4.4 First Floor Construction

The inspection did not evidence any undue distress in the first floor construction. Slight movement was apparent within the wood block flooring to the first floor hall, which is utilised for gymnasium activities. The degree of movement in the wood block to some extent reflects the spans of the concrete floor between beams, but the degree of displacement is not of structural concern. It is recommended that the condition of floor beams be assessed by exposure where bearing into external walls, and that plaster be locally removed to allow assessment of reinforcement/filler joist details.

The condition of ceiling plaster and plasterwork finishes generally should be reviewed and a decision taken as to whether to replace by new, as the existing plaster may tend to de-bond over a projected extended life span of 60 years.

Summary: The first floor construction appears to be performing satisfactorily for its age and present loading conditions.

Further assessment of steelwork and floors built into external walls should, however, be carried out by local exposure, particularly at areas where dampness penetration is prevalent.

## 4.5 Roof Structure

The record drawings indicate a wholly traditional roof construction featuring timber rafters, timber purlins and timber trusses. Trusses feature exposed steel jointing plates. The ceiling construction is generally indicated as being of timber joists spanning to binders.

The timber rafters are exposed at the eaves soffits.

A visual inspection in one area of the roof void did not note any evidence of undue distress. Slight opening of joints in trusses was noted. The untidy ceiling within the roof void was also noted, with nominal mineral wool insulation. The ceiling to first was noted to be lath and plaster. Over a 60 year period this may be prone to cracking and debonding.

The roof appears to have been refelted some time ago. Redundant water tanks recorded.

Dampness penetration was apparent to some areas, and it should be noted that the roof geometry is complex, featuring hips and valleys and a number of valley gutters. These latter items would appear to have been problematic, as the building features a number of spitters set above the original valley outlets, suggesting problems with blockages and consequent dampness penetration within the building.

In view of this noted dampness penetration, it is considered that an allowance should be made for possible replacement of rafters local to these valleys, possible up to the first purlin level, and that valley timber work and built in truss ends may require replacement or strengthening. The extent of the work can only be proved by exposure of salient details.

In any refurbishment programme, the valley gutter details should be carefully reviewed and amended to allow proper discharge of all rainwater to obviate future maintenance problems.

A number of slates were noted to be tabbed, and several were noted to be displaced. However, the general condition of roof finishes appeared satisfactory. Because of the geometry of the roof, and for a 60 year extended life span, we would recommend re-slating and re-flashing and improvement of valley gutter details to obviate any further dampness penetration problems. It is also suggested that the exposed rafters at eaves detail be reviewed, to obviate maintenance and further deterioration at this level. All rainwater goods should also be replaced.

Summary: Extensive overhaul to roof finishes, felt, insulation recommended. Further exposure of built-in timberwork also recommended. An allowance should be made for repair to rafters and truss ends and eaves where built-in to external masonry.

## 5.0 STRUCTURAL MODIFICATIONS

A number of structural modifications are proposed, to facilitate the revised plan layout. These may be summarised as follows:

1. Extension to classrooms U5, U2, CG and Staffroom by removing external masonry walls at both ground and first. This will necessitate new beams at eaves level and first floor level, the construction of new piers to support same, and new pad foundations. Further assessment of overall stability required.

2. Removal of certain division walls between classrooms at first floor level. These walls support feature downstanding trusses and rafter feet and valley gutters over. The height of the new beams will necessarily reflect the downstanding level of the trusses to be supported. Alternatively, the trusses might be modified to facilitate a higher opening through between adjacent classrooms.

3. Removal of internal ground floor walls between classrooms G3 and G2 at ground floor level. These walls currently support both the existing roof construction and first floor support beams, and masonry at first floor level. It is considered that substantial beams will be required, with the introduction of new pad bases under rebuilt reveals. Providing the extent of masonry removal is not excessive, then overall stability of the building will not be affected.

4. Removal of an existing division wall in the single storey east wing and existing classroom G1. Removal of this wall will necessitate the introduction of new structure to support the existing roof construction over and support of an existing beam which carries a chimney stack at its remote end. Stability will be affected, but may be reinstated by the introduction of a new wall off new foundations to reflect the Architect's proposed plan.

5. Removal of 225 brickwork to WC in North East corner of building. A new steel beam will be required over.

6. Demolition of the South West Wing - Replacement under. This should not prove problematic as the stairwell wall forms a natural break between the wing to be demolished and the retained elements of construction. However, it should be noted that the basement under this wing houses the heating boiler and oil tank.

## 6.0 FURTHER INVESTIGATION / ASSESSMENT

It is assumed that other members of the Design Team will review the condition of the existing building in terms of thermal insulation, windows, mechanical and electrical services, ventilation, and other elements of construction such as rainwater goods, drainage, etc which comprise the fabric of the building. The following further investigations are also recommended:

1. Site Investigation.
2. Timber and Damp Survey.
3. Review of all Services.
4. Condition of Backing Lintels to Windows
5. Condition of First Floor Beams and Floors where Built into External Walls, particularly where Dampness Penetration Present.
6. Asbestos Audit.
7. Review of Thermal Performance, Ventilation.

Assessment of whether any likely changes over a 60 year period are likely to be necessary and the impact these might have on the building, given that the internal walls are generally loadbearing and the supported structure is relatively heavy.

## 7.0 SUMMARY

In structural terms the building is performing reasonably satisfactorily for its age and form and construction. Only the suspended concrete floor over the basement and pipework ductwork, dampness penetration, and the condition of backing timberwork and floors and beams where built into external walls may be of structural concern in the medium term.

Virtually all of the internal walls are of loadbearing masonry, and this would affect the ease with which any refurbished building could be further adapted.

Careful consideration should be given to remedial work to the weather proof envelope. The complex roof and wall detailing will necessitate enhanced levels of maintenance over the extended lifespan of the building.

This report should be read in conjunction with reports by other specialists in respect of their areas of expertise.

Further investigations have been recommended as detailed in Section 6.0

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Corrosion of Downstand Beam and Steel Filler Joist