TECHNICAL DESIGN NOTE

Hydrock

Project name	Heyford Park - Proposed new primary school		
Design note title	Structural condition survey of existing hangers		
Document reference	04583-HYD-SCH-ZZ-RP-S-0001		
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1. INTRODUCTION

Hydrock were instructed to undertake visual inspections of four identical portal frame hangers at Heyford Park disused airfield.

The survey was purely visual only on the visible steel superstructure, with no requirement for any intrusive surveying, opening up, testing or sampling. No desk top information was made available for review.

A MEWP was made available for the surveys to allow close-up access to roof structure within eaves and ridge. However, the plant was only able to access within the hangers as the surrounding ground was soft and uneven.

The survey was undertaken on 3rd August 2021. The weather was dry and sunny.

2. PROJECT PROPOSALS

The former airfield site is being redeveloped for housing, to include a new primary school to serve the new housing.

The primary school development is to entail imaginative re-use of the hangers for incorporation into the new school's learning resource. An indicative proposed site layout is shown below. The four existing hangers are shown as four grey rectangles arranged around the central hard and soft games courts. A new proposed classroom building is in the south east corner.

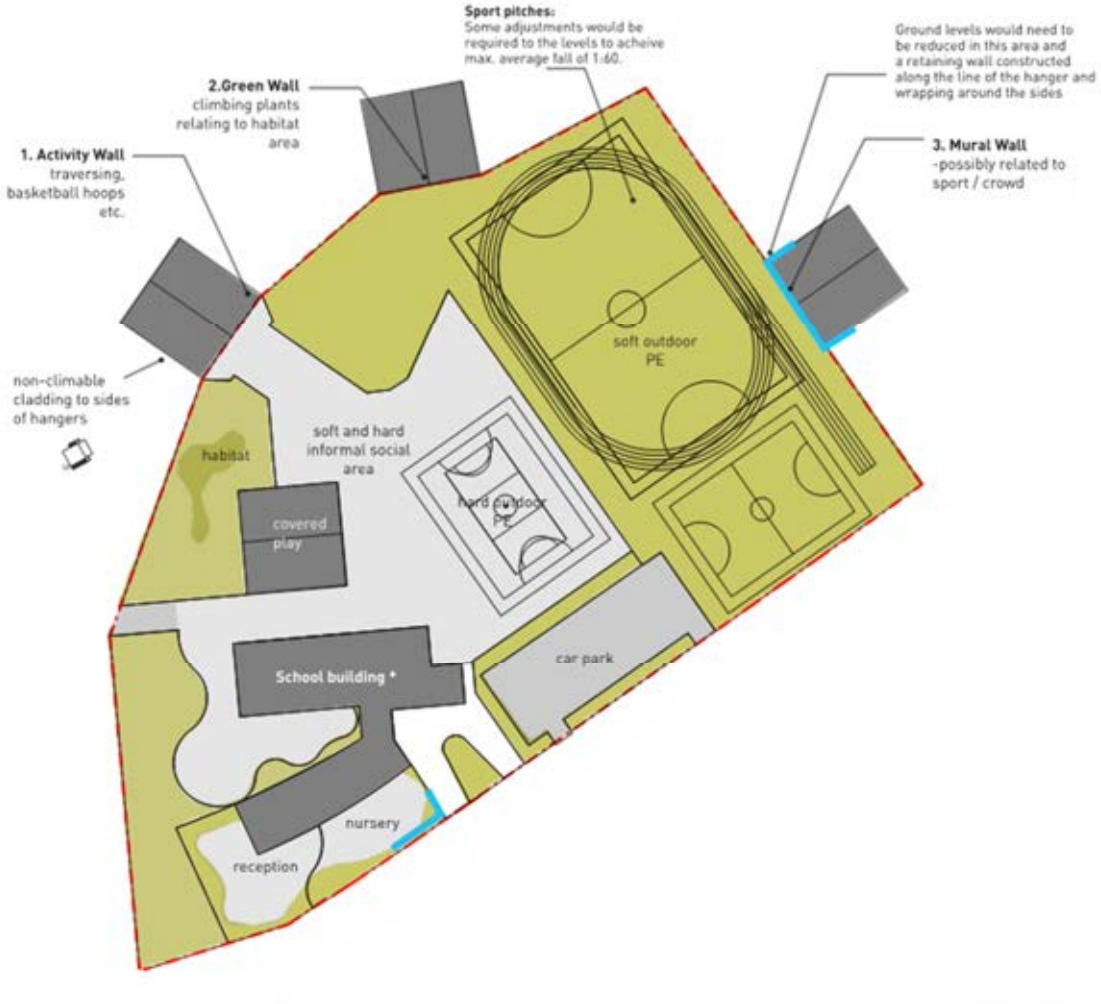
The architect's "Design Update Revision C" report has been made available, from which the plan below is an excerpt.

The objective of this report is to record the structural condition of only the superstructure of the hangers, report on their condition characterisation and make initial comment on their suitability for re-use.

Note the following caveats and exclusions:

- No inspections have been made of the foundations has been made as part of this exercise. However Hydrock Geo have undertaken trial pits to expose some of the foundations as part of an intrusive Phase 2 site investigation.

- No design assessments have been undertaken on the structure, either in the existing condition nor the proposed.
- No intrusive testing, investigation or sampling has been undertaken.
- Although MEWP access was provided for the survey there were many cars parked in some of the sheds which prevented access to some areas.
- No access was possible around the outside perimeter of the hangers due to soft uneven ground. Also, there was often much undergrowth against the buildings which prevented even walking up close.



3. SITE DESCRIPTION

The site is located in rural Oxfordshire about 6 miles north west of Bicester. The Heyford Park development is approximately 450ha, as shown on Google image below, with approximate site plan marked and enlarged below.

The area of proposed primary school development is about 3Ha.

4. EXISTING STRUCTURAL DESCRIPTION

All four hangers are identical in design, described as follows:

- 5No primary hot rolled steel portal frames x approximately 25m span at approximately 6m centres (= overall footprint 25 x 24m);

- Hot rolled steel angles, and occasionally UB's, eaves tie members;
- Small angle cross-bracing in roof plane in one bay;
- Small angle vertical-cross bracing in one wall bay;
- Eaves and ridge haunches to portal frames;
- Hangers open at each end, vertical cladding only to side walls;
- RC plinths to 2-bolt baseplate details to frames, and edge upstand to base of cladding;
- Hot rolled steel RSJ purlins at approximately 1.5m c/c;
- Hot rolled steel channels (RSC's) cladding rails at approximately 1.5m c/c;
- All steel is painted, and possibly also galvanised underneath;
- Single skin profiled cement-bound asbestos cladding sheeting to walls and roof fixed with U-through bolts;
- Jointed ground bearing slab floor finish, untied to foundations. Joints appear in reasonable condition;
- There is a lighting column in a foundation pad at front left corner of each hanger.

General arrangement pictures of the hangers given below.

5. CONDITION CHARACTERISATION

The following typical defects were noted. All defects apply commonly to all hangers with general condition fairly similar in all of them.

Hairline cracking to the concrete upstand at base of cladding. Happens regularly and seems to correlate with slab jointing.

Suspect the upstand is bridging the slab joints.

Not considered to be structurally significant in the context of proposed re-use as an external shelter. However, it will lead to on-going risk of water ingress and reinforcement corrosion. Concrete patch repairs may be recommended in places, but sometimes an elastomeric paint may be sufficient.

In a few areas the upstand cracking is much more significant and could be mechanical damage or a focus of cumulative movement.

Clearly concrete repairs will be required at areas such as this, with possibly new movement joints cut into the upstand to reflect the slab joints.

Bent brace. Note this only occurs in one location at south west corner of hanger 1.

Appears to be impact damage.

Brace to be replaced.

Light surface rust everywhere.

Original protection systems appear soundly specified; however, maintenance regime has probably been slack.

All steelwork will require cleaning and repainting.

Bolts are generally in good condition, but some are showing excessive rust.

An allowance for replacing say 20% of bolts should be made.

Occasionally the cladding rail channels are distorted torsionally. It is suspected that they may not be justifiable for spanning vertically supporting the weight of cladding.

It is suggested that any new cladding is designed to be supported vertically on the upstand, or cladding rails may need anti-sag measures (rods) to take out the vertical load.

The portal frame bases could be described as being “frugally connected” with only 2No M20 HD bolts being cast into the RC plinth where we would expect minimum of 4. They do not seem to be exhibiting any adverse structural effects so no structural enhancement is considered necessary.

However, if there are to be any general structural upgrades to the hangers associated with the conversion (e.g. adding cladding which would increase wind forces and dead loads on the structure) then these connections may need more closely checking and may need to be upgraded.

Holding down bolts appear generally in good condition as noted above. However, in hanger 4 they seem to be more badly corroded than the others.

They will need to be replaced with four new drilled expanding

There is often much undergrowth growing around the outside of the building preventing close access.

This will require to be completely removed.

Sometimes the undergrowth outside the building is so rampant that it has ingressed through the cladding. This particular example occurs in hanger 3 but is not typical to all hangers.

Guttering and down pipes are beyond the scope of this investigation but it is clear that they will need to be renewed along with packaging.

Advice of others to be sought.

Slab joints appear to be function adequately. The mastic finish however is past its serviceable life.

Joints to be raked out and refilled as part of the works.

The cladding is assumed to contain asbestos so will present a H&S risk if disturbed.

If removal is required this should be by a licenced removal company and disposed of in line with regulations.

The cladding is fragile and should not be trafficked for fear of falling through.

All external works to be undertaken from cherry pickers.

6. DISCUSSION ON SUITABILITY FOR RE-USE

The general structural condition of the hangers is good, although they are frugally designed.

The defects are characteristic of structures that have not been particularly well-maintained, but it is felt that an originally decent specification has carried them through and as a result there are no serious defects.

The central tenet of creating imaginative re-use of buildings is key to the principals of reducing embodied carbon in buildings and re-using them wherever possible. It is considered that these buildings are perfectly serviceable structures and all options for their re-use should be explored. The architect's outline design proposals for the superstructure have been reviewed and comments made against them as follows.

Re-cladding as they exist

The hangers will need to be re-clad. If this is via a single skin lightweight metal sheeting of similar weight to the existing then the structures will not require any upgrade.

Fully enclosing

If, however, the buildings are to be enclosed then the structure will be subject to increased wind loads and dead weight (since an insulated twin skin system would be required). In this scenario the structure will require a design back-analysis, with the outcome being that structural members will likely have to be strengthened and/or supplemented. Sufficient survey measurements have been collected (though not reproduced herein) to be able to undertake these checks at a later date.

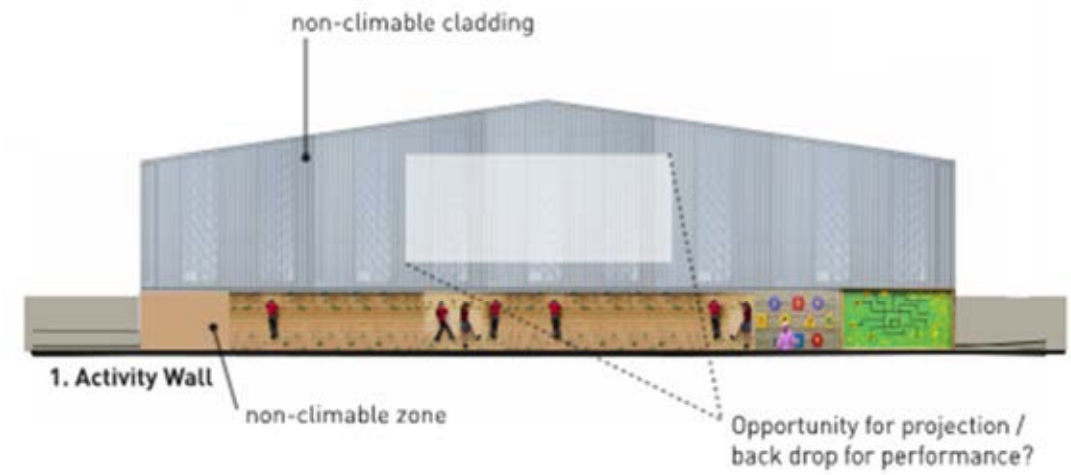
The foundations have not been assessed, although an intrusive geotechnical report has exposed and logged the existing foundations so they can be assessed for suitability under increased wind forces.

Feature walls

It is noted that three of the hangers have closing walls built across one end, as suggested architectural elevations below. This will cause increase in wind forces acting on the structure and increased bracing

will be required to supplement the existing structure to support them. With the back-analysis and careful contrivance of new structure this could be achieved quite efficiently making best use of the original structure.

Again, data on the existing foundations will be available to undertake checks to resist the resulting wind forces on the structure.



Repairs

General structural repairs will be required as noted in defects characterisation as noted above. It is not felt that their extent is beyond the scope of the project and may well be in line with initial expectations.

7. FURTHER WORK AT THE NEXT STAGE

Further investigations required:

- Paint investigation to allow assessment of new steelwork protection specification;
- Concrete repair investigation for due diligence and advice on patch repairs.

Further design work required:

- Coordination of proposed architectural details;
- Design back-check of existing structures to verify working stresses;
- Assessment of new actions on the existing structure, i.e. new dead loads, new enclosing structures etc; and
- Develop designs to support new structures.