



CPD Seminar Handout:

Roof Refurbishment: Choosing the Best Solution



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Roof Refurbishment: Choosing the Best Solution

CPD handout: November 2017

This document contains the key resources from SIG Design & Technology's RIBA Certified CPD Seminar, Roof Refurbishment: Choosing the Best Solution, in an easy to use format.

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Roof refurbishment – 3 stages

Roof refurbishment – 3 stages



1. Roof survey
2. Design considerations
3. Finding the solution



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There are 3 stages in the refurbishment process; what should be included in the roof survey, how the condition of the roof will influence the design and finding the right solution for your roof.

Roof refurbishment – Stage 1

The slide features the SIG Design Technology logo in the top left corner. The main title "Stage 1: Roof survey" is centered at the top. Below the title, the text "To include:" is followed by a bulleted list: "General overview", "Specific overview", "Diagnostic testing", and "Recommendations". To the right of the text are two photographs: the top one shows a close-up of a roof surface with gravel and a small puddle; the bottom one shows a large white rectangular object, possibly a roof panel or insulation, floating in water.

If you have a failing roof the first step is to get a roof survey done by a professional. The roof survey should a full detailed report on all issues internally and externally

Stage 1: General overview



Project: Action High School
Client: Middleborough Council
Project Reference: 0010

SECTION 1 - CONDITION SURVEY

2.1 General Brief View

Ashlan White Primary - Red Areas

Project: Action High School
Client: Middleborough Council
Project Reference: 0010

Roof identifying highlighting

Roof Area (sq m) 1 + 400m², 16x19 = 318, 2 + 211

Roof Type Flat

Building Height 10m

Roof Pitch (max %) 5%

Falls (if any) <90°

Exposure East

Existing Waterproofing System Bitumen Membrane

Insulation Formed in Insulation

Roof Control Structural Deck

Roofing Material Shingle

Structural Deck Wood Slab

Gutter & Downpipe Timber and PVC Windows

Perimeter Details Change in Level Upward Parapets

Handrail Handrail areas Vertical GRP Rooflights and Built-in Vents

Service Units N/A

Flue Vents Self Vent, Hot Flues, Cold Flues

Air Conditioning Units Yes

Created 11 August 2015

HOT WORKS are NOT permitted under ANY circumstances

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Project: Action High School
Client: Middleborough Council
Project Reference: 0010

1.2 Risk Assessment

Client: Middleborough Council Address: Ashlan White School

On arrival you must report to the client

Address: report check Yes - photograph to be taken No - explain reason why below

Access & agree to the roof Yes Undequate Good Poor

External ladder Yes No Undequate

External staircase Yes No Undequate

Service ladder Yes No Undequate

Internal staircase Yes No Undequate

Budget for equipment Yes No Undequate

Other, please state Yes No Undequate

Risk level Low Medium High

Risk level prioritised? Yes No Undequate

Is the work in a safe area? Yes No Undequate

Risk split? Front or whole Front Whole Undequate

Fragile roof? If Yes contact the office Yes No Undequate

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The general overview in the roof survey should include; risk assessment, roof area, existing waterproofing and detailing on the roof. The building owner should also be made aware that they have responsibility for the person on the roof.

Stage 1: Specific overview

SIG DESIGN TECHNOLOGY

Project: Addlestone White School
Date: 11 August 2023
Project Reference: 00330

- Photographic evidence
- Details
 - Outlet details
 - Penetration details
 - Roof light details
 - Upstands
 - Perimeter details

2.2 Details overview

Project Addlestone White School Date: 11 August 2023 Project Reference: 00330

Large barrel lights have been fitted at the front and back of the roof. These have been fitted with several small upstands, which will cause water to collect around the base of the upstands and potentially give a cold spot on the roof.

Some lights have been installed on the roof, the electric supply appears to be wrapped in a black bag.

All outlets are fitted with a inclusion of a lack of general maintenance, there is a large amount of debris on the roof, photo has been taken.

Old soot house is rotten and failing down, this should be removed at the same time as removing gutters.

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This section of the roof survey includes detailed descriptions and photographic evidence of any issues both internally and externally.

Stage 1: Diagnostic testing

SIG DESIGN TECHNOLOGY

- Core sample
- Moisture mapping
- Thermographic imaging

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Diagnostic testing is essential to help understand the existing condition of the roof.

Core sampling a roof involves physically removing a portion of the membrane and insulation layers to ascertain condition of roofing system components.

Moisture mapping uses meters to provide photographs or drawings of moisture areas beneath the roof.

Thermographic imaging uses an infrared camera to locate cold spots on a roof caused by wet insulation.

Roof refurbishment – Stage 2

Stage 2: Design considerations

SIG DESIGN TECHNOLOGY

Falls Ability to overlay roof Work required Upstand Heights

Other limiting factors Existing system Weight Structure

Cold Roof Roof finish Previous repairs Saturated waterproofing system

Cost Warm Roof Existing build

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So what factors of the roof do we need to consider before proceeding with the design? Its design and construction must meet a matrix of complex and strategic variables.



Stage 2: Suitability of deck

- Is it classed as a fragile roof?
- Condition of existing deck
- New imposed weight loads
- Suitability of the system for the deck



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Stage 2: System recommendations

To strip or not to strip?

- Saturated system
- Incorrect build up
- Fragile deck
- Deflection on existing roof
- Excessive ponding water
- Client requirement
- Suitability of existing system
- Complete roof fail
- Height restrictions

Solution: strip the roof



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The results from the survey will determine whether you should strip or not strip a roof. If the roof includes any of these points you should strip the roof.



Stage 2: System recommendations

To strip or not to strip?

- Ponding water
- Suitability of existing system
- Not saturated
- Free from water damage
- Deck
- Budget

Solution: overlay system



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If the roof includes any of the following you can overlay the system.

Stage 2: Detailing



Upstand heights



Weep holes / cavity trays



Rooflight



Penetrations



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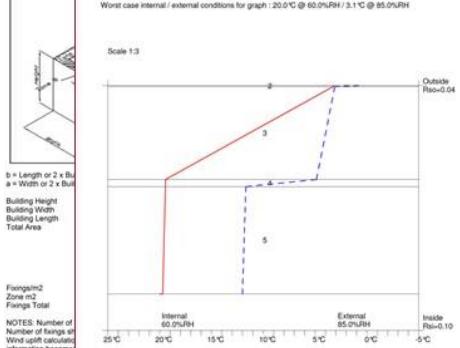
RIBA CPD Curriculum logo

Stage 2: Performance requirements



Project: Paddo
Client:
Wind Load Calc
The calculation code of practice
Site wind speed
 $V_s = V_b \times S_r \times S_t$
 V_b is the basic site speed
 S_r is the direct site exposure
 S_t is the terrain factor
Effective wind
 $V_e = V_s \times S_e$
 S_e is the terrain site in course
Dynamic Press
 $\phi_d = 0.613 \times V_e$
Wind Loads
Flat Roof
External Surface
 $P_e = \phi_d \times C_p \times C_w \times C_a$
 C_p is the size of
 C_w is the size of
 C_a is the size of
Internal Surface
 $P_i = \phi_d \times C_p \times C_w \times C_a$
 C_p is the size of
Total Pressure
 $P = P_e + P_i$
Fixing Requirements
Design load per
Wind Load Calculate
Actual number of fixings centres mm
Wind load per square meter
Lines of fixings m
Minimum number of fixings per
Number of fixings per
Condensation Risk Analysis (no account taken of thermal bridges)
3 - Dwellings with low occupancy
Jan (Jan) **Feb** **Mar** **Apr** **May** **Jun** **Jul** **Aug** **Sep** **Oct** **Nov** **Dec** **Jan** **Feb**
3.0 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8%
3.1 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8%
3.2 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8%
3.3 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8% 30.8%
4 Polythene, 1000 gauge (0.12mm) 19.4 3.2 3.1 0.65 0.77 0 In Jan No
(0.02mm) 19.4 3.2 3.1 0.76 0.77 0 In Jan No
5 Concrete, dense (BS5250) 19.4 11.7 1.37 2.26 0 No
6 Inside surface resistance 19.7 12.0 1.40 2.29 0 No
Worst case internal / external conditions for graph : 20.0°C @ 60.0%RH / 3.1°C @ 85.0%RH

Scale 1:3



NOTES: Number of fixings required to prevent water infiltration into the building. Fixing details must be included in the design to inform calculation to inform calculation.

Ref: 16515IMP 07.04

RIBA CPD Curriculum logo

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© JPA Technical Literature Jan 2014

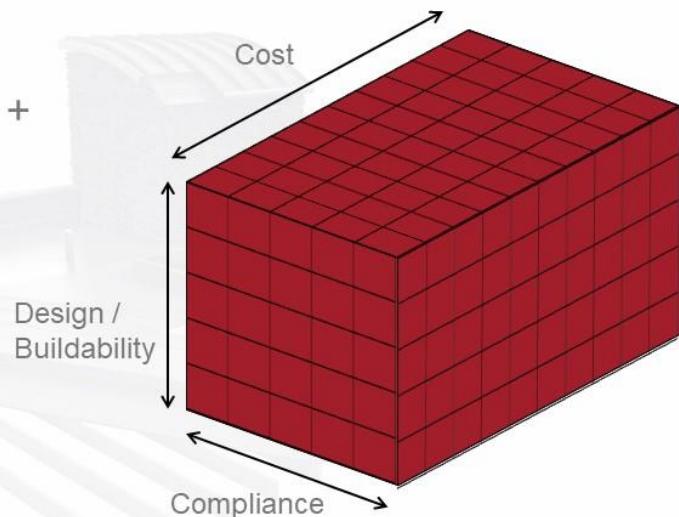
Notes: Thermal calculations and condensation risk predictions are true and accurate to the best of our belief and knowledge. All liability for errors or omissions is excluded. This document is for general information only. Details, warranties and guarantees shall be provided by the manufacturer and supplier for the required purpose of use. Should you have any queries, please contact the technical department on: (01205) 446555.

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Stage 3: Finding the solution

**Cost + Design +
Compliance =
Best Solution**



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Stage 3: Why specify bitumen

- Over 100 years of experience and development
- Robust product
- Access to roof
- Non-slip hazard
- High durable, long-lasting performance
- Environmentally friendly
- High resistance to mechanical damage and puncturing



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Stage 3: Why specify single ply?

- Over 50 years track record
- Low capital cost and cost in use
- Safe, rapid, clean installation
- High durable, long-lasting performance
- Design flexibility – wave form, cupolas, colours etc
- Easy repair, modification and refurbishment
- Ideal surface for subsequent photovoltaic systems
- Environmentally friendly & good reflectivity



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Stage 3: Why specify liquid coating?

- A wet-on-wet, cold applied liquid waterproofing product
- Fully reinforced with a polyester fabric
- Free of solvents and isocyanates
- Very low in VOCs, fume free, virtually odourless
- Seamless waterproofing system, ideal for complex detailing
- Can apply in cold temperatures above 0°C
- Water repellent on application



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Case Study – St John’s School

The image contains two side-by-side photographs of a school building. The left photograph shows a long, low-profile swimming pool building with a grey metal roof. The right photograph shows a larger building, likely the gym and changing rooms, featuring a grey metal roof and a dark, flat roof section. Both buildings are set against a backdrop of green fields and a clear sky.

We will now look at the results of a roof survey determined the roof choices at St John's School

Built some 50+ years ago, the school's original roof system had come to the end of its useful working life and persistent water ingress was a significant problem.

Complex in parts the three separate roof areas comprised of a mix of complementary interfacing products comprising bituminous roofing system, single-ply PVC membrane and composite panels.

The slide features the SIG Design Technology logo at the top left. The main title 'Case study: St John's School' is centered above two photographs of a roof. The top photograph shows a white circular vent on a dark, textured roof surface. The bottom photograph shows a side view of a building with a brick wall and a dark roof, with a green construction fence visible in the background.

The roof survey identified a number of problems

SIG DESIGN TECHNOLOGY

Case study: St John's School

Solution 1: gym roof

- Used existing system as VCL
- New CTF insulations to U-value 0.18
- Overlay with bituminous membrane
- Perimeter mansard detail completed with composite metal sheet details
- Composite panels replaced

Before

After

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The roof deck to the gym hall used the existing system as a VCL and was overlaid with bituminous torch-on system comprising vapour control layer (VCL), Cut-To-Falls insulation together, underlay and cap sheet. Perimeter mansard details were completed with composite metal sheet details.

SIG DESIGN TECHNOLOGY

Case study: St John's School

Solution 2: changing room roof

- HSE registered fragile deck
- Raised weep holes and cavity trays to allow insulation heights
- Self-adhesive VCL
- New timber decking installed
- New CTF insulation and bituminous membranes
- Vertical cladding finished with composite panels





Before

After

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The roof to the changing rooms was an HSE registered fragile deck and contained asbestos. It was completely refurbished with new timber deck, self-adhesive vapour control layer (VCL), new Cut-To-Falls insulation together and the bituminous torch-on system. Composite panels were used as cladding on the roof and careful detailing was required where they interfaced with the BUR.

SIG DESIGN TECHNOLOGY

Case study: St John's School

Solution 3: swimming pool roof

- Stripped existing roof coverings
- Insulation to achieve U-value 0.18
- Self-adhesive VCL
- Aluminium metal deck to front elevation
- PVC single ply with standing seams
- Composite panels suitable for swimming pool





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The swimming pool was stripped of its original concrete tiles and an aluminium structural deck installed to receive the 390m² single ply system with standing seam.

Careful thought needed to be given to the method of attaching the membrane to guard against potential wind uplift factors. The structural deck couldn't be penetrated as it was essential to prevent chlorine and humidity contaminating the system. So, SIG Design & Technology developed a project-specific detail to provide mechanical restraint.

What is interstitial condensation?

SIG DESIGN TECHNOLOGY

What is interstitial condensation?

What is interstitial condensation?

- Difficult to detect without investigation
- Occurs within the fabric of the building
- Not obvious fault
- Lead to failure of roof deck
- Cause of internal leaks to building
- Unnecessary refurbishment
- Thermal performance



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Interstitial condensation occurs within the fabric of a building, at the point (known as the dew point), where the atmospheric temperature of a given concentration of water vapour drops to a point when water droplets begin to condense and dew can form.

Interstitial condensation is different from surface condensation such as that caused by cold bridging, and its occurrence within the roof or wall structure of a building is difficult to detect without investigation.

Case Study – John Paul School

SIG DESIGN TECHNOLOGY

Case study: John Paul School

Interstitial condensation issues

- Misdiagnosed for over 16 years
- Overlays applied without success
- No VCL
- No weep holes for water ingress
- Waterproofing in excellent condition

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The school has been leaking for well over 16 years. The costs of misdiagnosis are high, several overlays of new membranes have been applied, ceiling tiles replaced and a suspected leaking gutter replaced.

Core samples indicated that there was no VCL (vapour control layer) in the construction. and discovered no butyl mastic seal to the laps either. If there is no control to water vapour travelling through the roof, then it is at risk of interstitial condensation.

For 5/6 years the 1600m² deck has gradually rotted and now 90% of the timber deck has completely failed. If the problem had been identified earlier the deck would have been saved, but now the entire roof will have to be replaced.

What to expect from suppliers

Technical support:

You should receive comprehensive technical support from a manufacturer or supplier and this should comply to all relevant standards.

Technical information should include standard details, NBS Specifications, Cut To Falls insulation design, wind load and thermal calculations and third party accreditation.

SIG Design & Technology now has several products as BIM objects available in the NBS National BIM Library.

Early involvement in a project by a supplier will make the membrane system choice and technical support process simpler in the long run.

Suppliers can offer advice, not just on which products to use but more importantly when those products are not suitable and an alternative should be sought.

On-site support:

A manufacturer or supplier should offer on-site support to protect the long term integrity of the chosen waterproofing system. This is not just important to ensure the long term performance of the waterproofing system chosen, it's also a requirement of British Standards (BS6229:2003) to maintain a roof and guidance on how this should be done can be demonstrated during a site support visit.

Guarantees

Here's a checklist covering the essential manufacturer support you should receive:

- ✓ Project specific technical support
- ✓ Bespoke design
- ✓ Wind up-lift calculations
- ✓ Cut-To-Falls design
- ✓ Drainage calculation support
- ✓ National Building Specification: J42 waterproofing, Q37 green roofs, H71/92 zinc
- ✓ Registered installer network
- ✓ On-site support & assessment
- ✓ Guarantees/warranties

Detailing, compatibilities & interfaces:

A modern single ply roofing system is more than just a waterproofing membrane and incorporates a number of key system accessories. The key ancillaries that should be considered by the specifier to ensure the integrity of the membrane is not compromised are:

- Vapour control layers
- Geotextile separating fleece
- Adhesives and sealants
- Liquid detailing
- Standing seam profile
- Edge trims and outlets
- Pre-fabricated details & coated metal
- Walkway membrane
- Thermally efficient insulation
- Rooflights

Q37 NBS Proposed Specification

J31 NBS Proposed Specification

Specification

Protection

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These two images show where the integrity of the membrane can compromise the NBS specification by puncturing the membrane, ultimately leading to water ingress

FLL Certificate

Compliance

Standard details

Interfaces

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However, by using the correct materials (in the case of this membrane with a FLL certificate) and standard detailing to avoid puncturing the membrane, these roof membrane systems are not punctured at interfaces and do not risk water ingress.



What not to do!

- Preventable failure: EU €2bn
- Typical failures:
 - Water ingress
 - Wind damage
 - Workmanship
 - Condensation
- Typical reasons:
 - Poor preparation
 - Poor design
 - Poor detailing

Incorrectly Installed



Correctly Installed



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Summary

So hopefully you will go away equipped with three sets of knowledge:

Knowledge

- Defining your client's brief
- Ensuring compliance with UK British Standards and Code of Practice
- Choosing the best roofing system for the job
- When to specify single ply / hot melt / hard metals / liquid coating
- Green roofing options
- Further sources of information / contacts

Modern roof performance

- Waterproofing
- Insulation
- Sustainability
- Energy capture

Manufacturers' responsibilities

- Design bespoke roofing solutions to meet a client's specific brief
- Ensure compliance with UK British Standards and Code of Practice
- Supply, install and guarantee complete roofing solutions
- Ensure performance through effective detailing, compatibility and interfaces

About SIG

SIG Design & Technology is part of SIG Roofing, a leading division of SIG plc, a FTSE 250 listed company and the UK's market leading specialist supplier to professionals in the building and construction industry.

We design and supply flat roofing solutions including green roofing, zinc, copper and stainless steel roofing and cladding and pitched roof coverings including natural slate and clay tiles.

We have put together an 8-step guide to identify the challenges and ensure that a roof's design meets a building's requirements. Called #PerfectRoof, the eight steps follow the process from product selection and design expertise through to full guarantees and planned maintenance. Our know-how is just part of the service that is provided absolutely free to customers.

More information

Website: www.singleply.co.uk

SIG Zinc & Copper website: www.sigzincandcopper.co.uk

Technical blog: www.singleply.co.uk/blog

Technical product downloads: www.singleply.co.uk/resources/downloads/

Find your local advisor: www.singleply.co.uk/about-us/meet-team/



SIG Design Technology
Mannheim House, Gelders Hall Road,
Shepshed, Leicestershire LE12 9NH
Tel: 08445 766 760 Fax: 08445 766 761

www.singleply.co.uk



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