

CPD Seminar Handout:

A Structured Approach to Roof Specification and Design



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A Structured Approach to Roof Specification and Design

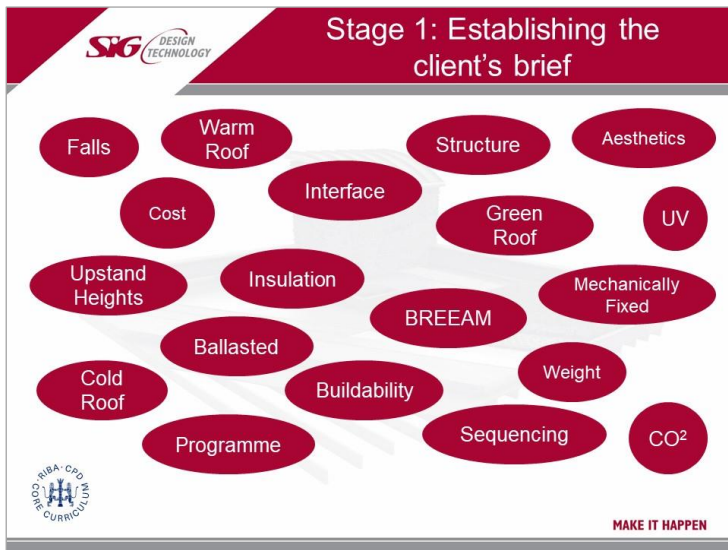
CPD handout: February 2019

This document contains the key resources from SIG Design & Technology's RIBA Certified CPD Seminar, A Structured Approach to Roof Specification and Design, in an easy to use format.

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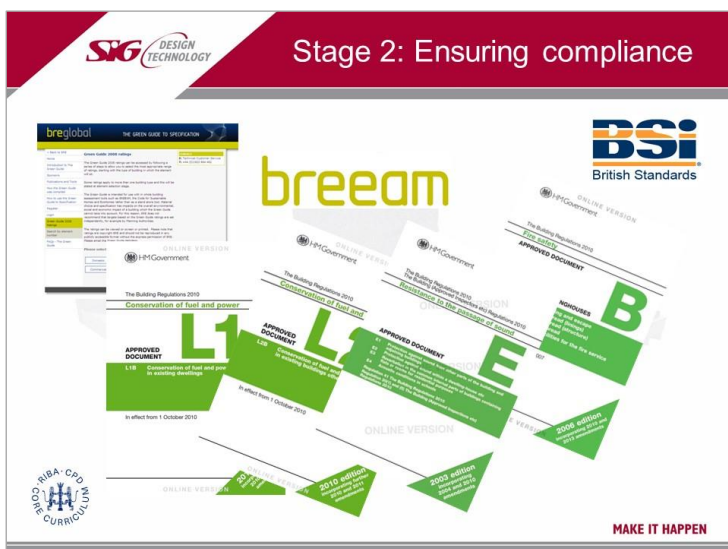
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CPD Slides

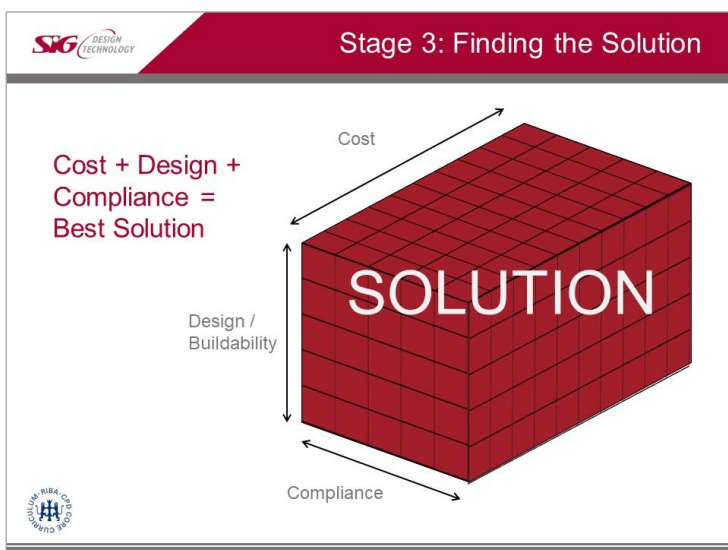
**Design considerations****Stage 1: Establishing the client's brief**

What do you think are some of the design considerations you need to make when specifying a roof?

So first of all – what does the client need this specific roof to do? Its design and construction must meet a matrix of complex and strategic variables.

**Stage 2: Ensuring Compliance**

We're all familiar with these types of documents, they are vital to correct design and due diligence, but how do we ensure compliance when there are so many different standards for any one building element?

**Stage 3: Finding the solution**

The formula is about Cost + Design + Compliance

Roofing Options



Roofing Options

		
Single ply membranes	Hot melt	Bitumen
		
Hard metals	Liquid coatings	Slate



Single ply



Why Specify Single Ply

- Over 50 years track record
- Low capital cost and cost in use
- High durable, long-lasting performance
- Design flexibility – wave form, cupolas, colours etc
- Well managed and regulated sector (Single Ply Roofing Association - SPRA)



Things to be aware of:

- Not the best application when specifying inverted
- Avoid plant areas with lots of penetrations
- Make sure its adequately protected during construction



Material Characteristics of Single Ply

	PVC	EPDM	TPO	TPE	PIB
Bitumen Compatibility	No	No	Yes	Yes	Yes
Colour Range Options	Wide range	Very limited	Limited	Limited	Limited
Solvent Preparation	Yes	Yes	Yes	No	Yes
Contains Chlorine/Plasticisers	Yes	No	No	No	No
UK Manufactured	Yes	No	No	Yes	No
Polymer Recycling	Partial	No	Partial	100%	100%
Track Record	1960s	1970s	1980s	1990s	1930s
Life Expectancy	30 year BBA	25+ years	35+ years	35+ years	35+ years
Ease of Installation	Simple	Complex Detailing	Sensitive to Site Conditions	Very Simple	Simple
Welding Window (hand)	380°C ± 20°C	Taped	280°C ± 20°C	200°C - 600°C	Self sealing edge




Case Study: The General, Bristol

- Former Bristol General Hospital redeveloped as 205 luxury apartments and houses
- Grade II listed site with distinctive Ogee Dome
- Armourplan PSG single ply membrane replicated the original seamed lead roof
- Replica dome is an uneven structure comprising three sections overall
- Key feature of the dome are eight dormer windows which protrude from the two storeys of the main structure



Hot melt





Why Specify Hot Melt?


- Long life expectancy
- No joints
- Water unable to track under fully bonded system
- Easy to detect leaks if there's a problem

Things to be aware of:

- Involves hot works
- Limited substrates
- Only suitable for inverted roofs








Material Characteristics of Hot Melt

	1 st generation	2 nd generation
Bitumen compatibility	Yes	Yes
UK manufactured	Yes	No
Track record	45 years+	10 years +
Life expectancy	Lifetime of building	25 years
Ease of installation	Simple	Simple
Cold weather application	Down to -18°C	Down to -18°C
Solvent content or VOCs	No	Only in primer
High bond/tensile strength	Yes	Yes
Resistance to impact damage	Yes	Yes
Cure time	None	None
Guarantee	25 years	35 years



Case Study: 5 Broadgate

- New UBS City of London headquarters
- 12 storeys office space over 65,000m² and 7,500m² of concrete-decked roof and terraces
- Waterproofing to perform for minimum of 30 years
- Membrane contributed towards BREEAM Excellent rating
- Speed of application important
- Cost effective option



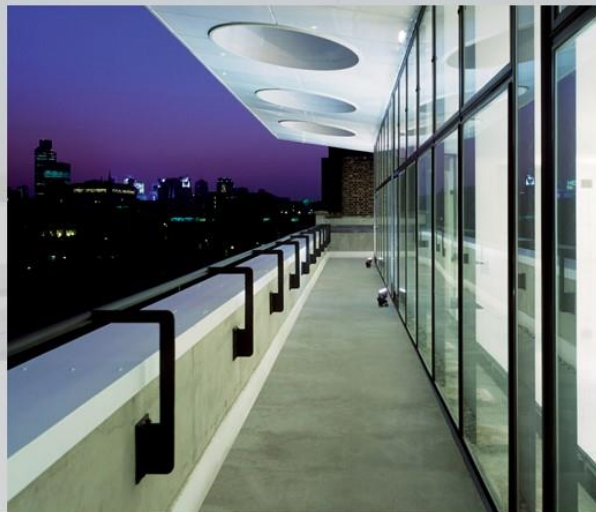
Liquid coating

Why Specify Liquid Coating?

- Cold applied (no hot works)
- Quick cure
- Seamless waterproofing system
- Ideal for complex detailing
- Refurbishment or new build projects

Things to be aware of:

- High capital costs
- Weather dependant
- 3rd party accreditation



- Distinctive obelisk roof with existing copper membrane finish
- New covering requires longer design life to protect fabric of the building
- New roofing to match colour and texture of original copper
- Stripping roof not an option
- Liquid waterproofing adheres to any form and offers highly elastomeric system which lasts for up to 30 years
- Precise pigment ratio achieved and top coat supplied pre-mixed for application



Bituminous membranes

- Robust
- 100 year track record
- Good fire ratings
- High puncture resistance
- Cost effective
- Non-slip

Things to be aware of:

- Hot works
- Limited aesthetics
- Longer installation times



Case Study: St John's School

- SIG D&T secured government's Condition Improvement Funding (CIF) for 1740m² of roof repairs
- School's roof system reached end of working life
- Three roof areas with significant issues
- HSE registered fragile deck
- Persistent water ingress
- Overlay with bituminous membrane completed with composite metal sheet details



Natural slate

Why Specify Natural Slate?

- Aesthetically pleasing
- Long lifespan on quality slate
- Lighter than concrete
- Low carbon footprint
- Higher added-value for property

Things to be aware of:

- Limited range of colours
- Skilled installation required
- Continuity of supply
- Quality issues at budget end of market



Case Study: Duncan Macmillan House

- Headquarters of the Nottinghamshire Healthcare NHS Foundation Trust.
- Grade 2 listed building – built in 1880
- 90% of the roof needed replacement
- Careful restoration to maintain its original visual appearance
- 250,000 slates were used
- Snowdonia National Park approved slate



Hard metals

Why Specify Hard Metals?

- Long life span due to natural patina formation
- Maintenance free
- 100% recyclable
- Excellent BREEAM credentials
- Dramatic visual impact.

Things to be aware of:

- High capital cost
- Compatibility issues
- Limited design standards



Case Study: The Grove Hotel

- Cedar Suite - new events space for The Grove Hotel
- Oval copper-clad structure with delicate detailing
- Real copper unlikely to patinate due to reduced sulphur dioxide levels in the air
- Opted for verdigris copper sheet
- Simple Borromini ellipse forms the oval plan of structure
- Double folded overlaps at sheet interfaces to ensure no billowing of the sheets in high winds



Green Roofing & Blue Roofing

Benefits of a Green Roof

- Optimises structural footprint
- Assists urban drainage
- Thermal and acoustic insulation
- Increases membrane's life expectancy
- Provides green space & aesthetic environment
- Absorbs airborne pollutants
- Countering the heat island effect



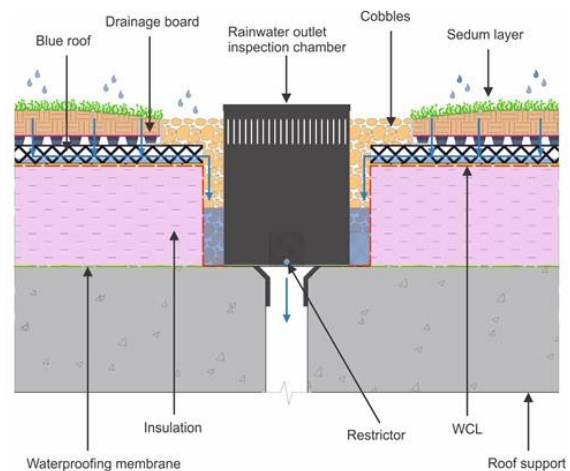
Benefits of a Blue Roof

- SuDs best practice
- Controls attenuation of rainfall during storm events
- Ideal for urban environments where ground space is limited
- Situated above waterproofing membrane (warm roof system) or above water flow-reducing layer (inverted applications).
- Flat roof - rooftop gardens, podiums and amenity areas
- Hybrid green/blue roofs combine benefits of both systems

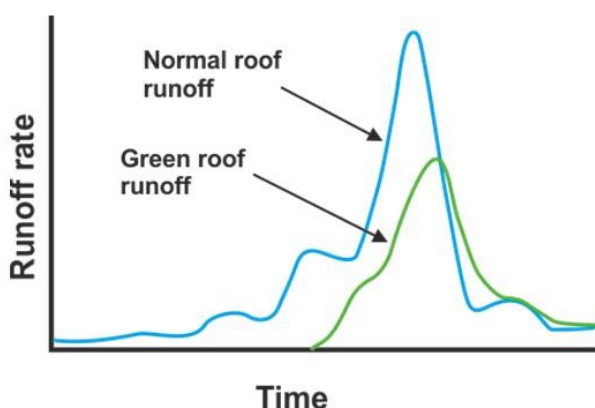


Designing the Blue Roof

- Calculation to assign correct discharge rate to the area
- Loading implications for structure of the building
- Falls taken into account when calculating effective storage void
- Waterproofing layer with BBA certification for blue roofs and zero falls



- SUDS (sustainable urban drainage systems)
- Water attenuation
- Reduce pressure on drains
- Reduce downstream flash flooding
- Slow water runoff from roof



- Substantially increases life expectancy of the roof's waterproofing membrane
- Improves energy efficiency in a warm roof construction
- Improves sound insulation
- Reduces rainwater runoff
- Reduces heat build-up in urban areas
- Provides an additional green space for wildlife
- Improves air quality by absorbing airborne pollutants
- Makes good use of space – optimising the 'structural footprint'
- Aesthetically pleasing



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

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 | • Pre-fabricated details & coated metal |
| • Geotextile separating fleece | • Walkway membrane |
| • Adhesives and sealants | • Thermally efficient insulation |
| • Liquid detailing | • Big Foot systems |
| • Standing seam profile | • Roof-pro |
| • Mechanical fixings & clamping bars | |



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



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

MAKE IT HAPPEN

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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