SPRA

Single Ply Roofing Association

TECHNICAL GUIDANCE

SINGLE PLY ROOFING GUIDE AND CHECKLIST FOR **WIND LOADING**

ENSURING THAT CLIENTS OBTAIN HIGH QUALITY POLYMER-BASED SINGLE PLY ROOFING, THROUGH A PARTNERSHIP OF QUALITY ASSURED MANUFACTURERS AND CONTRACTORS

S11a/16

WIND LOADING

- A GUIDE TO REDUCED RISK
- A CHECKLIST OF THE PARAMETERS REQUIRED FOR CALCULATION

CONTENTS

1.0 INTRODUCTION

The calculation of design wind loads on a roof is an essential part of the design process. The designer must ensure that the installed roof system is able to resist the wind load induced by a building's geometry and location and that the correct calculation procedures are followed. The correct calculation methodology for UK Building Regulations compliance*, is denoted by BS EN 1991-1-4:2005+A1:2010 when supplemented with the UK National Annex (NA) incorporating National Amendment A1 dated January 2011. Additional guidance on the correct use of the UK National Annex is contained in PD 6688-1-4:2009 which is available from BSI.

* **Note:** For property protection reasons, certain insurance companies of industrial and commercial property can require enhanced wind uplift performance of roofs to that indicated by EN 1991-1-4 alone. It is therefore important that, at an early stage, the roof designer attempts to identify who the insurer of the finished building will be.

This checklist can be used with the **SPRA Protocol for wind load calculation**.

2.0 THE IMPORTANCE OF CORRECT INPUT DATA AND CALCULATION PROCEDURE

The calculated wind load should determine the appropriate method of attachment of the components comprising the roof system; the single ply membrane and any insulation and vapour control layer.

Incorrect calculation of the insulation and membrane restraint requirements can lead to premature failure of the construction. The contractor and designer must have correct input data (building location, height, dimensions and all other required parameters) to ensure that the calculation output relates to the building as constructed and the chosen method of restraint is appropriate.

Personnel who undertake wind uplift calculations must have a thorough knowledge of the calculation procedure, be trained in the use of the appropriate software and be suitably indemnified against error.
See Appendix for a checklist of information required to undertake a wind uplift calculation.

3.0 ESSENTIAL INFORMATION REQUIRED TO UNDERTAKE A CALCULATION

The following notes explain the information required. Headings are cross-referenced to the checklist items.

(1.4 & 4.1) LOCATION

The location can be provided as a grid reference, postcode or address. It is important to establish the exposure of the building taking into account the surrounding terrain, such as open country or a sheltered town position.

(1.5) NEW BUILD OR REFURBISHMENT

State if the project (or each roof, as appropriate) is new build or refurbishment. Provide as much detail about the build-up as possible to assist in the determination of the membrane attachment specification. Should the deck be new build concrete or any type in refurbishment then a pull-out test is required for mechanically attached schemes to establish the appropriate safe working load of the fasteners proposed.

(3.3) ADJACENT STRUCTURES

Provide details of buildings adjacent to the roof being assessed. This should include higher roofs built off the roof being assessed, which could increase loads due to vortices. The person undertaking the calculation will require this detail in order to allow for any shadow zones where increased wind loading may occur. Identify any potential funnelling whereby wind is channelled through narrow openings and thereby will increase wind loading locally on the roof area. A structure protected by adjacent buildings of similar or greater height will affect loading. It may be necessary to consider the effect of likely future development nearby and to design with an additional margin of safety. Satellite imagery may facilitate this assessment.

(3.4) DOMINANT OPENINGS
Does the building itself have dominant openings, for example, loading bays that remain open? This should be identified together with the appropriate elevations as they may affect the air pressure (internal pressure coefficient) within the building when subject to wind load.

(4.0) BUILDING DIMENSIONS
The roof dimensions are required to undertake a calculation. Because wind forces act on a complete building, if the roof is part of a larger structure the dimensions of the complete building footprint and heights of adjacent roofs are required in addition to that of the roof being assessed. The extent of the external perimeter zones may be influenced by the building footprint, particularly if all roofs are on the same or higher levels than the roof being assessed.

(4.1) ROOF TYPE
State if the roof is flat, mono pitched, duo pitched, barrel vaulted etc. The type of roof will affect the load and dimensions of the perimeter zone.

(4.5) BUILDING HEIGHT
The calculated wind load on a flat or low-pitch roof increases with building height. The height measurement should generally be the highest measurement of a single roof for which the calculation is being undertaken. For example on a mono pitched roof, the height taken should be that of the ridge line.

(4.8) PARAPET WALLS AND EAVES DETAILS
If there are parapet walls at the external perimeters, identify the height of these details. Alternatively describe the profile of the eaves section, for example a simple arris of a curve ('bullnose').

(5.1) DECK TYPE
Identify if the roof deck is steel, concrete or timber panel (plywood, oriented strand board). This will affect the attachment specification of a mechanically attached membrane solution. For steel decks, identify the profile type and if possible, specifically the crown-to-crown measurement.

(7.0) SINGLE PLY MEMBRANE
Identify the membrane type to be used. If a mechanically fastened scheme is required, state the membrane widths available.

(7.5) ATTACHMENT OF SINGLE PLY MEMBRANE
Indicate the preferred attachment type required for the single ply membrane, i.e. mechanically fastened, adhered or ballasted.

(8.0) INSULATION
If possible, indicate the insulation generic type or product to be used, its thickness and board dimensions. Also state the method of attachment. Note that in systems with single ply membrane adhered to mechanically fastened insulation, the mechanical attachment design must meet full calculated wind load, with a given safety factor.

4.0 ESSENTIAL CHECKS DURING INSTALLATION

(4.1) CORRECT INTERPRETATION OF PERIMETER AND CORNER ZONES
Study the completed wind load calculation and clearly follow the attachment guidance for corner, perimeter and field zones identified. In the case of mechanically fastened systems ensure that the number of fasteners per m2 for all zones at least meets the insulation manufacturer's minimum fixing requirements.

(4.2) DECK ATTACHMENT
Will the deck attachment to the structure meet the calculated wind load which will be transferred to it when the roof is subjected to wind uplift? Are there trough stiffeners and what is the crown/trough area ratio?

APPENDIX A - WIND LOAD CALCULATION REQUEST FORM

1.0 PROJECT INFORMATION		
1.1	Project name	
1.2	Street	
1.3	City	
1.4	Postcode	
1.5	New construction	
	Re-roof (strip back to deck)	
	Re-cover (overlay or addition)	

2.0 ROOFING CONTRACTOR DETAILS		
2.1	Company name	
2.2	Contact name	
2.3	Telephone number	
2.4	Email address	

3.0 BUILDING DESIGN AND CONTEXT		
3.1	Grid reference	
3.2	Exposure type *e.g. coastal/country/town*	
3.3	Adjacent structures	
3.4	Open *(building with dominant openings)*	

4.0 BUILDING GEOMETRY - DRAWING ENCLOSED (required in all cases)				
4.1	Roof type (please tick appropriate box) Flat ☐ Mono pitch ☐ Duo-pitch ridge ☐ Duo-pitch valley ☐ Curved/barrel vault roof ☐			
4.2	Curved roofs only: rise height (m):		Curvature radius (m):	
4.3	Length (m)			
4.4	Width (m)			
4.5	Height (m)			
4.6	Roof pitch (^{o})			
4.7	Internal/External gutter			
4.8	Parapet height, if applicable (m)			

5.0 ROOF CONSTRUCTION		
5.1	Deck type (Metal/Concrete/Timber/Other)	
5.2	Detail of total roof system	
5.3	For metal deck substrates only	
5.3.1	Metal deck profile type	
5.3.2	Direction of laying (dwg)	
5.3.3	Crown to crown dimension (mm)	
5.3.4	Deck thickness (mm)	
5.3.5	Steel or aluminium	

6.0 FASTENER DETAILS		
6.1	Manufacturer	
6.2	Type/reference	
6.3	Pull-out tests undertaken? Yes/No	

7.0 MEMBRANE DETAILS		
7.1	Manufacturer	
7.2	Type/reference	
7.3	Preferred width (mm)	
7.4	Thickness (mm)	
7.5	Attachment method	

8.0 INSULATION DETAILS		
8.1	Type/reference	
8.2	Thickness (mm)	
8.3	Board dimensions (m)	
8.4	Attachment method	

9.0 INSURANCE DETAILS		
9.1	Insurance company identified ?	
9.2	Any enhanced wind uplift design requirements over BS EN 1991-1-4 and National Annex?	

10. CERTIFICATION STATEMENT

The information provided above is the best available at the time of application. Should I become aware of change to parameters the checklist will be re-submitted.

Signature of applicant		Date	

11. ADDITIONAL INFORMATION

Drawing of roof / photographs / supporting information

SPRA Single Ply Roofing Association

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