Project:
809 **Kidderpore Avenue**

Work Section: **RFS: Roof Systems**

To be read in conjunction with the Project General Requirements Section of this specification.

Specification Status: Stage E (Technical Design)

Issue number:	Date:	Reviewed by:	Checked by:
T1 Tender Review	08.08.14	NR	JC

Terms: **Specification Types**

Prescriptive Specification:
Where items are to be consultant designed, the specification is in prescriptive form. All paragraphs are prescribed requirements.

Descriptive Specification:
The contractor shall complete the design complying with the Functional, Visual and Performance Requirements recorded in this specification and the contract documents. Where a particular material, product or supplier is referenced, this shall be deemed to be indicatively representing the design intent only. The contractor remains fully responsible for the detailed design whether or not indicative products within the specification are incorporated into the detailed design.

Tag Ref.	Roof Systems – Scope Summary	Spec. Type
RFS-100	Cold ventilated clay tile roofing over new roof structures	Descriptive
RFS-101	Cold ventilated clay tile roofing over existing roof structures	Descriptive
RFS-102	Vertical clay tiling	Descriptive
RFS-110	Inverted flat roofing to Block C Extension	Descriptive
RFS-120	'Heritage' batten cap zinc sheet roof coverings	Descriptive
RFS-130	Rolled lead sheet roof coverings	Descriptive
RFS-140	Lead flashing/coverings to misc string courses/window heads	Descriptive
RFS-150	Rigid insulation above sloped ceilings to habitable spaces at roof level	Descriptive
RFS-151	Flexible insulation above horizontal ceilings and suspended timber floors in roof voids to habitable spaces at roof level	Descriptive
RFS-152	Rigid insulation to vertical wall linings to habitable spaces at roof level	Descriptive
RFS-153	Rigid insulation and lining/sheathings to dormer cheeks	Descriptive
RFS-154	Rigid insulation to dormer/bay roof areas	Descriptive
RFS-180	Rainwater goods and systems	Descriptive
RFS-200	Liquid applied inverted flat roofing system with natural granite stone paver finish	Descriptive
RFS-201	Liquid applied cold flat roofing system with natural granite stone paver finish	Descriptive
RFS-202	Liquid applied cold podium deck type system with paver finish	Descriptive
RFS-203	Liquid applied inverted flat roofing system with concrete paver and stone ballast finish	Descriptive
RFS-204	Liquid applied inverted flat roofing system to lift shaft and service risers	Descriptive
RFS-260	Liquid applied inverted flat roofing system with sedum finish	Descriptive
RFS-261	Liquid applied cold flat roofing system with sedum finish	Descriptive
RFS-280	Liquid applied cold flat roofing system with composite timber deck finish to external balcony areas	Descriptive
RFS-400	Un-insulated single ply membrane flat roof system	Descriptive
RFS-401	Un-insulated podium deck roofing system	Descriptive
RFS-420	Standing seam zinc sheet warm roof coverings	Descriptive
RFS-421	Standing seam zinc sheet warm roof coverings to dormers	Descriptive
RFS-460	Liquid applied inverted flat roofing with biodiverse green roof finish	Descriptive
RFS-461	Liquid applied inverted flat roofing system with paver finish	Descriptive
RFS-480	Insulated liquid applied roofing system with composite timber deck finish	Descriptive
RFS-481	Un-insulated liquid applied roofing system with composite timber deck finish	Descriptive

RFS ROOF SYSTEMS: SYSTEM GENERAL REQUIREMENTS

REQUIREMENTS FOR PERFORMANCE

Roof Generally:

- Systems shall be secure, free draining and completely weather-tight. The works shall be designed and installed such that cavity drainage, weathering and water shedding shall not cause unsightly stains on visible elements.
- Systems shall not fracture, peel, delaminate, corrode, rattle, deform, vibrate or generate noise in end use occupation (i.e. from Design Load application).
- Roof finishes shall not significantly change colour, tone, gloss level or pattern under anticipated environmental conditions during the design life of the works. This excludes non pre- patinated metals such as natural zinc and copper alloys. Refer to System Specific functional and visual requirements.
- The system and/or components within the system shall comply with the European Product Regulations in respect of testing, declaration and marking products applicable to the regulations.
- Unless stated otherwise in the Project General Requirements section of this specification, the service temperatures assumed shall be as listed in CWCT Standard for Systemised Building Envelopes.

Definitions:

- Roof definition:
    - For fire considerations, the term roof includes roof surfaces pitched at an angle equal or less than 70° from the horizontal, in accordance with Building Regulations Approved Document B. Approval of the building control body shall be sought to confirm if vertical elements of a roof, such as dormers, shall be treated as a wall or a roof for fire considerations. - For reference to CWCT, the term roof refers to an element for which the mean slope of the envelope is within 75° of the horizontal.
- Flat roofs are defined in accordance with BS 6229 as having a pitch not greater than 10° to the horizontal.
- Zero falls or completely flat roofs are defined as those roofs with finished fall between 0 and1:80.
- Warm roof systems are defined as those where the thermal insulation is placed above the principal roof structure and below the weatherproof layer.
- Inverted roof systems are defined as those where the thermal insulation is placed above the weatherproof layer and the principal roof structure.
- Cold roof systems are defined as those where the thermal insulation is placed below the weatherproof layer and below or within the thickness of the principal roof structure.
- Limited access roofs are defined as those roofs subjected only to pedestrian traffic for maintenance of the roof covering and cleaning of gutters, parapets, copings etc.
- Pedestrian access roofs are defined as those subjected to pedestrian traffic and gathering of people greater than that required for maintenance.
- Green roofs:
    - Extensive are defined as those green roofs with low- growing plants, with no access other than for occasional maintenance and typically no artificial irrigation, other than during establishment.
    - Biodiverse are defined as those green roofs similar in composition to an extensive roof, but designed specifically to create a habitat that will attract a particular flora and fauna. This category includes brown roofs.
    - Intensive, also referred to as roof gardens, are defined as those green roofs with greater depth of growing medium, supporting a wider range of planting compared to extensive roofs. These roofs are accessible to people and require regular maintenance and artificial irrigation systems.
    - Semi- intensive are defined as green roofs that can include characteristics of both extensive and intensive roofs. Typically these roofs support a wider range of plants compared to extensive roofs and may only be occasionally accessible Irrigation and maintenance requirements are dependent upon the plant species selection.

Roofs Generally Blocks A to C inc:
Roofs for blocks A-C include the following dormer types:
A: 1 sided dormer: roof panel only
B: 2 sided dormer: roof and one cheek
C: 3 sided dormer: roof and two cheeks

Architectural, visual description of Block A-C eaves types: To be read alongside intent drawings.

Type A:
Eave with bargeboard, no soffit board and jack rafters visible in elevation.
Tongue and groove boarding over jack rafters is visible from underneath.
Jack rafters protrude nominal 40mm from bottom end of bargeboard.
Bargeboard depth to be between 165mm / 175mm.
Jack rafter centres: 350
Eave ventilation at top of wall.

Type B:
Eave with bargeboard and continuous moulded soffit panel.
Bargeboard depth 170mm.
Eave ventilation: vent system under last tile courses.

Type C:
Eave with bargeboard only against brickwork.
Bargeboard depth: 170mm
Eave ventilation: vent system under last tile courses.

Type D:
Eave with bargeboard over vertical timber battens against brickwork.
Bargeboard depth: 170mm
Batten spacing: Refer System Specific Requirements
Eave ventilation: at top of wall

Contractor Responsibility:
- For CDP works the contractor shall provide detailed design information and drawings and all necessary calculations, test data, data sheets and material specifications for the works to be undertaken to demonstrate compliance with this performance specification.
- The contractor shall assure themselves of the suitability of the design, its fit to the building, its compliance with the architectural requirements and this specification before commencement of procurement, manufacture and installation.
- Refer to Project General Requirements

Completion of the Detail Design:
- Where required the contractor shall complete the detailed design of the roofing system including insulation and surface build-up and finish requirements over.
- The contractor's detail design shall ensure the completed installation meets all of the stated Functional, Visual and Performance Requirements, that contractor designed fixings shall be appropriate for the type and thickness of substrate and that all accessories shall achieve the stated requirements for finishing, alignment and durability.

Inspection and Quality Control:
- The contractor will have in place a quality control system that ensures all materials delivered to site are of a fit quality and in accordance with the project specifications and that all installations are carried out in a proper and correct manner that will achieve the performance requirements of this specification.
- Documentary evidence of the QA/QC system shall be submitted prior to the commencement of manufacture and installation of the works.

Design Life, Durability and Certification:
- Design Life of Building: 60 years

- Roofing systems to be consistent with: BS ISO 15686-1 Table B.1: Major replaceable components.
- Where required, roof systems shall perform whilst accommodating foot traffic and designed plant loads for the Design Life of the system.
- Waterproofing membrane to hold BBA certification and durability equal to the Total Design Life of the structure.
- Flat roof insulation systems shall have BBA roof installations to zero falls certification.
- Provide manufacturer's Warranty covering materials and workmanship for 20 years.

Service Life and Warranties

- Atmospheric conditions in accordance with BS EN ISO 12944, BS EN ISO 14713 and BS EN 10169:
External (Outdoor): C3, Medium (urban industrial, coastal low salinity)
Internal (Indoor): C1, Very Low (internal heated or C2, internal unheated)
- Building Service Life: See Project General Requirements.
- System design life as defined in BS EN ISO 15686-1
- Warranties shall be from date of practical completion and design life of system components as the following table:

System component	**Service life**	**Warranty (min period)**
Secondary structural steelwork	60 years	12 years
Powder coating gloss retention and colour fastness	60 years	25 years (or less if including consequential loss clauses)
Powder coating adhesion	60 years	12 years
Paint coatings (except timber)	60 years	5 years
Anodising	60 years	12 years
Wet seals accessible for maintenance *	25 years	12 years
Insulation and fire stopping excluding inverted roof construction	60 years	12 years
Inverted roof construction insulation	25 years	12 years
AVCL/ VCL membranes, in accordance with BS 5250 requirements	60 years	12 years
Zinc panels/sheet materials	60 years	12 years
Cement particle board	30years	12 years
Plywood boarding	60 years	12 years
Weather/breather membranes excluding warm roof construction	60 years	12 years
TPE/TPO polymeric single ply waterproofing membrane	25 years	20 years
Hot melt inverted roof waterproofing	60 years	35 years
Cold liquid applied exposed roof waterproofing	60 years	20 years
Cold liquid applied inverted roof waterproofing	60 years	20 years
* For generic life expectancy of sealants refer to Table 2.2 of CIRIA, Sealant joints in the external envelope of buildings: a guide on design, specification and construction and Table 1 of CWCT TN19		

Durability and Degredation:

- The system and all parts thereof shall be serviceable for the design life required above. No parts shall suffer significant degradation or failure during the service life required above.
- The works shall be designed and installed to weather effectively. Water running off the system shall be managed and directed in such a way that waterborne pollutants are not leached out onto either adjacent cladding or surrounding structure in a manner likely to cause staining, long term dampness or algae growth.
- The completed works shall resist abrasion from normal cleaning methods and maintenance systems without any discernible change in appearance.
- Where material or system performance reduces or erodes during the course of its service life, such as in the case of vacuum insulated products, the predicted performance at the end of the service life shall be used as the basis for the design.

- The contractor shall ensure that electrolytic corrosion between dissimilar metals does not occur under the environmental conditions expected to prevail during the life of the building. This shall include prevention of electrolytic corrosion due to the following:
    - direct contact of dissimilar metals
    - water runoff from electrolytically dissimilar metals
- The works shall be designed to prevent the occurrence of crevice corrosion by avoiding details and interfaces where water may be trapped over long periods of time. Narrow openings between metal components in contact with other metal or non metal components in locations prone to wetting shall be avoided. Particular attention shall be given to fasteners where crevices may be formed under bolt, screw or rivet heads or within the thread. Appropriate sealing shall be carried to avoid crevice corrosion.
- Corrosion resistance of items that have a structural or load bearing function, whether accessible or inaccessible for inspection and repair, shall have a life to first maintenance equal that the entire system service life stated in the Service Life and Durability section of this specification above.
- The Life to First Maintenance of ferrous metal items shall be Very High (VH) as defined in Table 2 of BS EN ISO 14713-1 Zinc coatings – Guidelines and recommendations for the protection against corrosion of iron and steel in structures, Part 1: General principles.
- All externally visible ferrous metal surfaces shall have corrosion resistance of equal performance to hot dipped galvanised steel with a minimum average coating thickness of 85 um to ISO 1461 or stainless steel grade 1.4401 or, where not visible, develop natural patination to meet service life of the components, equal to steel grade 304.
- Where fixings connect dissimilar metals, the fixings shall be made of a material which is at least as noble of the noblest material fixing being fixed. I.e. an aluminium to mild steel bracket should be fixed with stainless steel screws.
- The works shall be designed to prevent the risk of corrosion or staining by direct contact of metal components with timber.
- Water runoff: The works shall be designed to prevent the risk of corrosion by water run-off from timber onto electrolytically dissimilar metal surfaces.
- Water runoff: The works shall be designed to prevent the risk of acidic corrosion by water run-off from bitumen onto metal surfaces such as copper and zinc.
- Water runoff: The completed works shall ensure that water runoff from metals, such as copper, bronze, brass etc, shall not result in staining of porous materials below.
- Water runoff from concrete, stone or other materials containing lime shall not affect the performance or degrade the appearance of adjacent materials, such as metals particularly anodised aluminium, stone and glass surfaces/assemblies or finishes to components.
- Where wood preservatives are used, the contractor shall eliminate the risk of any adverse reaction with metals, polymers and other materials.
- Sealant systems shall not bleed, discolour or cause staining of any facing materials which they are likely to come into contact.

Timber:

- The contractor shall ensure that adequate provision is made to ensure water run-off from timber elements does not affect the performance of non-visible metal surfaces/ assemblies or finishes to components/ assemblies.
- The contractor shall confirm in writing that water run-off from timber elements will not affect the warranty or predicted service life of visible metal components or finishes.

- Underlay timber boards:
    - Timber durability for out-of-ground contact use shall satisfy Use class 3 to BS EN 335.
    - Timber components shall be suitable for use in exterior conditions that correspond to Service Class 3 to BS EN 1995-1-1
    - General durability requirements: timber underlay and any supporting, trimming or associated timber components shall be durable, not degradable by moisture or water vapour, and not show signs of degradation including disfiguring and destroying fungal and insect attack for the service life of the element. Fungal resistance requirements of timber panel products shall be in accordance with BS 1982.
- Durability of sealants:
    -Sealants selected to seal a joint shall be able to maintain their performance while accommodating variations in joint sizes due to manufacturing and erection deviations, and repeated building movements induced by mechanical and environmental stresses. They shall withstand climatic conditions and any specific environmental conditions to which they are subjected.
- Durability of metal composite panel cladding/ covering:

- Composite panels shall not delaminate or corrode during the service life of the system.

- Alkali damage:
  - The contactor shall ensure that all aluminium components shall not suffer alkali corrosion or staining from cement based materials.
  - The contactor shall ensure that all glass components shall not suffer visual or performance degradation arising from waterborne alkalis from components above.
- UV and IR resistance:
  - All materials that are sensitive to UV/IR shall maintain their integrity, visual appearance and performance over the service life of the element of the works in which they are incorporated.
- Sulphate reaction:
  - Masonry and cement based components either near or in contact with ground shall not suffer degradation by sulphate attack.

Maintainability:

- The design of the works shall take account of the requirements for maintenance after completion of the works. Components which require cyclical maintenance shall be accessible, either directly or indirectly following removal of associated components.

Environmental Conditions:

- Refer Internal/External Temperatures/Relative Humidity/Service Temperature Range whole building values noted in the Project General Requirements.

Thermal:

- U-value: Refer System Specific Requirement sections
U-value calculations to allow for Moisture Corrected Values.
- Specified system to have EMS certification to meet project environmental assessment criteria.
- Thermal calculations shall be submitted by the contractor, which are to include (but not limited to) calculations for all insulating roofing and cladding types to demonstrate compliance of the specified U-values and the Building Authorities. The Contractor shall take account of 1, 2 and 3 dimensional heat flow, including thermal bridges through the construction in accordance with BS EN ISO 6946, BR443, BS EN ISO 10211-1, BRE IP 1/06 and BR497.
- The thermal analysis techniques utilized by the contractor shall be in accordance with the current version of the BRE document BR 443 and all standards referred to therein and to the Services Engineers thermal performance information.
- Green roofs: Thermal calculations shall ignore the insulating effect of the growing medium, vegetation etc in accordance with BR 443.

Condensation:

- The contractor is to ensure that surface condensation does not form on the works when used under temperature and humidity conditions referred to the Services Engineer's Report or the Project General Requirements of the architectural specification.
- No interstitial condensation shall form in warm roof construction under the same environmental conditions as above.
- Interstitial condensation shall not build-up in ventilated cold roof construction under the same environmental conditions as above. Short term accumulations of interstitial condensation shall not cause staining, rotting, corrosion or any detriment to performance or aesthetics of the works, as determined by BS EN ISO 13788.
- Inverted roof construction: Interstitial condensation shall not form on or within the adjacent works internal to the waterproofing membrane under the same environmental conditions as above.
- Metal sheet roofing: The design of the works shall eliminate the risk of underside condensation of metal coverings, such as zinc and lead.
- The contractor shall evaluate the risk of interstitial and surface condensation forming on the works by using acceptable risk analysis calculation methods stipulated under 'Post Contract Submittals 'in this specification.
- Special consideration shall be given to thermal bridges in the construction, in order to predict the risk of surface or interstitial condensation (see Thermal clauses herein). The contractor shall ensure that thermal bridging is eliminated, or where this is not possible thermal bridging shall be limited to ensure no degradation to performance or risk of condensation forming within or on the surface of the works.
- Particular consideration shall be given to avoidance of areas with reduced thermal resistance, such as roof gutters, when assessing surface or interstitial condensation risk. The contractor shall ensure that

areas with reduced thermal resistance are eliminated, or where this is not possible such areas shall be limited to ensure no degradation to performance or risk of condensation forming within or on the surface of the works.
- The risk of interstitial condensation in roof construction shall be assessed in accordance with BS 5250, Annex D and the guidance provided in *'Thermal Insulation: avoiding Risks'* (3rd edition) published by the BRE 2002.
- Control of condensation in warm and inverted flat roofs should conform to the recommendations of BS 6229 and BS 5250.

Integrity of Metal Sheet Roofing/ Flashings/ Trimmings/ Copings:
- Requirement: Design coverings/ flashings and methods of attachment to prevent loss of weather-tightness and permanent deformation due to heat, snow, wind pressure, action or suction and other climate stresses.
- Refer CP 143 relevant parts and BS 6229 as necessary.

Water Penetration:
- Under site exposure conditions, moisture shall not penetrate onto internal surfaces, or into cavities not designed to be wetted.
- For metal lined roof constructions, adequate provisions shall be made to ensure that thermal pumping is prevented at joints, i.e. no water shall be drawn through the joints/ laps of the metal coverings.
- Particular attention shall be given to eliminate the risk of capillary action and cavity bridging.
- Movement and other fixed joints shall remain sound and accommodate all thermal, building structure or other movements and any applicable loads without compromising water-tightness.
- The weather-tightness of the roof systems shall not be adversely affected by deflections defined by the Structural Engineer and thermal movements of roofing and roof structure components.

Protection Against Snow:
- Snow shall not penetrate onto internal surfaces, or into roof cavities.

Ventilation
- Voids above insulated layers in cold roof systems shall be adequately ventilated to the outside air, in accordance with BS 5250 ventilation requirements.
- Insect and vermin mesh to ventilated roof systems: mesh size to be sufficient to exclude infestation from nest building insects without compromising the minimum required free ventilation area.

Drainage:
- The design of the roof shall ensure adequate drainage of rainwater.
- The design of the works shall be in accordance with the following:
- BS EN 12056-1: Gravity drainage systems inside buildings - Part 1: General and performance requirements
- BS EN 12056-3: Gravity drainage systems inside buildings - Part 3: Roof drainage, layout and calculation
- BS EN 12056-5: Gravity drainage systems inside buildings - Part 5: Installation and testing, instructions for operation, maintenance and use
- Where outlets drain via internal pipework, the above requirements shall be met whilst discounting one outlet (this is to prevent a risk of water ingress into the building in the event of outlet blockage).
- An additional outlet, emergency outlets or overflows shall be provided on flat roofs with parapets and in non-eaves gutters in accordance with paragraph 7.4 of BS EN 12056-3 and Appendix 7.1-D of NHBC Standards. Emergency outlets are classified as additional outlets with no less hydraulic capacity than the primary outlets, but set at a level above the normal drainage layer in order to prevent excessive water build-up on the roof. Emergency overflows are classified as lateral sloping drain chutes with no less hydraulic capacity than the primary outlets, but set at a level above the normal drainage layer in order to prevent excessive water build-up on the roof.
- Warning pipes or slots shall be provided in eaves gutters to indicate outlet or downpipe blockage. Warning pipes or slots are classified as 20mm diameter pipes or slots, set above the outlet level and discharging in a visible position to act as a warning in the event of blockage.
- Bounded roofs with thresholds to interior spaces shall incorporate additional outlets or emergency overflows in order to prevent the risk of over-spilling of rainwater into the building or structural overloading. The level of the lower lip of the overflow shall be lower than the lip of the threshold.
- Drainage points shall be located at the lowest points of the roof to facilitate effective rainwater

removal.
- Inverted roofs: Where the thermal insulation layer is of thickness so at to compromise the required freeboard at roof perimeter and thresholds to interior spaces, the thickness of the insulation may be locally reduced to form drainage canals around the perimeter and to the outlets in order to meet the requirements for minimum freeboard. Where this measure is taken:
    - The average area weighted thermal transmittance shall meet the required U value
    - The minimum local thermal transmission shall not give rise to surface and interstitial condensation.
    - Pedestrian roof surfaces shall have equal stability, aesthetics and functionality whether above upper and lower levels of insulation.
- Balconies with upstands on all sides: the design of the drainage systems shall ensure that if an outlet or downpipe becomes blocked, there will be no water ingress into the building. This can be achieved by providing one outlet and an emergency overflow or two outlets connected to independent downpipes, in accordance with the guidance in Appendix 7.1-D of NHBC Standards.
- Inverted roofs (excluding podium systems): Dual level roof drainage systems shall be designed in accordance with BS 6229 and BS EN 12056-3 to drain water off at the level of the filter/ water-reducing layer and at the level of the waterproofing layer.
- Inverted Podium Roof Decks:
    - Roof drainage systems shall be designed in accordance with BS 6229 and BS EN 12056-3 to drain water off at three levels:
        - hard podium surfacing layer
        - drainage layer
        - waterproofing layer
    - The subsurface roof layers shall be efficiently drained to prevent the podium paving bedding layer from becoming saturated and eliminate the risks of subsurface ice growth and frost heave, i.e. there shall be no upward swelling/ cracking of the hard podium surfacing during freezing conditions.
- Rainfall Calculations:
    - Eaves gutters and flat roofs shall utilise a return period T = ## requirement to be stated at later work stage ## years to BS EN 12056-3
    - Valley and parapet gutters shall utilise a return period T = ## requirement to be stated at later work stage ## years to BS EN 12056-3
- Green Roofs:
    - Water levels within the green roof build-up shall be managed to ensure excess water is drained away effectively, preventing water logging of the growing medium.
    - Drainage outlets shall be kept clear of vegetation to prevent the risk of blockages.

Air-tightness:
- Refer to the Project General Requirements of the architectural specification for the whole building air tightness target and means of achieving it. The works are to be designed, fabricated and installed so as to contribute to the achievement of this target.
- Systems and interfaces with adjacent systems are to form continuous barrier against uncontrolled air leakage.
- Roof and balcony systems where required to provide barrier to air leakage shall not degrade the whole building air-tightness performance requirement of 5$m^3/hr.m^2$@50Pa.

Structural and Mechanical:
- The completed works shall accommodate loading requirements in accordance with the relevant European and national code requirements.
- The works shall be capable of accommodating movement and tolerances associated with any element and adjacent elements without degradation of performance, tolerance limits, operability or aesthetics to either. Movements may include: Elastic deformation induced by dead/live loads and/or excessive temporary loads, axial shortening, ground movement/differential settlement, shrinkage, moisture movement, creep, thermal movement, movement due to chemical action and movement due to the expansion of absorbed or retained moisture caused by freezing. Movement in this context includes both reversible and irreversible movement. The design and detailing of the works including fixings shall prevent degradation due to locked-in stresses.
- The contractor shall take full account of all the anticipated building movements including those arising with the supporting structure to the works as described in the Building Movement and Tolerances report, prepared by the Structural Engineer. The works shall perform without adverse effects under

such movements.
- Fixing assembly calculations shall take into consideration the worst combination of the structural frame tolerances as described in the Structural Engineer's 'Building Movement and Tolerances Report' and shall be in accordance with the relevant British Standards for the material being used.

Dead and Live Loads:
- The completed works shall be capable of accommodating the following loads without reduction in performance:
- The live load applied by maintenance access and service equipment.
- The applied loads from plant replacement.
- Parapet barrier loads (where applicable).The contractor shall assess the use class of the building as defined in BS EN 1991-1-1, and design the elements and guardings in compliance with the loading and structural requirements in BS EN 1991-1-1, guidance in PD 6688-1-1 and BS 6180.
- Imposed loads on the roof surfaces shall be as defined in BS EN 1991-1-1 and BS EN 1991-1-3
- Imposed vertical loads due to building occupants: Internal ledges and framing members shall be designed to accommodate a vertical concentrated load of 1KN or a uniformly distributed load of 0.6kN/m, whichever is most onerous, as defined in PD 6688 without permanent deformation occurring.
- Thermal induced loads: The works shall be designed to accommodate loads generated in components or assemblies subject to temperature variations.
- Wind loads:
    - The roof system shall withstand without peeling, deforming or uplifting, positive and negative wind pressure forces and friction.
    - Wind loads shall be calculated to BS EN 1991 (relevant parts) and respective UK National Annexes appropriate to location, exposure, height, building shape and size, roof pitch, orientation taking account of existing and known future adjacent structures.
    - Particular attention shall be paid to areas subject to increased wind velocities and pressures arising from localised eddies and vortices such as at eaves, verges, ridge, external corners, fins, shelves, signage, photovoltaic (PV) systems and other projections to ensure stability, freedom from vibration and security of fixture.
    - Loose laid external insulation: The design of the works shall prevent uplift of loose laid external insulation in flat roof constructions. Where the insulation is secured in place by utilising ballast, the minimum ballast size and depth required to provide stability against wind induced uplift and resistance to wind scour shall be determined by calculation in accordance with BS EN 1991-1-4 and its UK National Annex, BRE Digest 295 and BRE Digest 311
    - Inverted green roofs: The design shall incorporate the necessary measures to ensure the green roof layers shall resist wind uplift, wind shear and erosion due to wind suction.
    - Shear and slide forces in pitched roofs:
    - Inverted pitched green roofs: The works shall resist shear and slide forces and the risk of growing medium 'slippage' shall be eliminated.

Wind Uplift:
- The roof system shall not peel or uplift under wind loadings.
- Wind Loads: Calculate to BS EN 1991 (relevant parts) appropriate to location, exposure, height, building shape and size, taking account of existing and known future adjacent structures.
- Ballast: requirement to be calculated in accordance with BRE Digest 295 and for stability of ballast BRE Digest 311.

Building Movement, Deflections and Tolerances:
- Refer Specification Project General Requirements and Structural Engineers Building Movement and Tolerance Report.

Robustness and Impact:
- The works shall be designed to resist applied or transferred impacts that occur during normal use and maintenance of the system, this shall include external impact from cleaning equipment likely to be used in locations close to the external cladding and roofing. Impacts shall not cause permanent deformation, breakage or any other detrimental effect.

Fire:

- Roof finish systems shall be deemed to meet BS 476-3: designation Class AA, AB or AC (national class to BS 476-3) or B roof(t4) (European class to BS EN 13501-5)
- Insulation to comply with fire classification in accordance with BS 476-7or BS EN 13501-1.
- Fire resistance of roofs forming part of a means of escape or/and performing the function of a floor shall meet the requirements for load bearing capacity, integrity and insulation of Approved Document B of the Building Regulations.
- Fire and smoke stopping: To BS 476-22.
- Refer to Fire Strategy Report by Fire Engineer.
- Cavity barriers shall achieve minimum 30 minutes integrity and 30 minutes insulation, when exposed to fire from each side separately, and be installed at no greater intervals than the ones stipulated in Table 13 of Approved Document B, unless the system complies with paragraph 9.10. Cavity barriers shall also be installed at compartment interfaces with the roof as required in the Approved Document B. The final strategy shall meet the approval of the building control body.
- Cavity barriers in cold roof construction shall not inhibit ventilation of the roof system.
- Fire stopping shall be installed around penetrations through any roof that has a fire rating and shall be of equal performance to wall through which they are penetrating.
- Fire stopping and cavity barriers at compartment lines shall equal the resistance of the compartment separation as defined on the fire strategy drawings or report.
- Fire and smoke stops shall be positively supported. All fire and smoke stopping shall be capable of accommodating all structural, settlement, drying shrinkage, creep, thermal, and moisture movements of the building frame and/or the façade without dislodging.
- Green Roofs:
    - Green roofs shall be designed to provide the necessary resistance to external spread of fire to meet the approval of the building control body.
    - Particular attention shall be paid to the design of non artificially irrigated green roofs, such as extensive roofs, where specific roof build-up (including plant selection, soil depth and organic matter content) and fire breaks requirements apply in accordance with the guidance in section 3.5 of 'GRO Green Roof Code, Green Roof Code of Best Practice for the UK 2011', published by GRO.
    - Fire breaks in green roofs are classified as non vegetated strips, comprising pebbles or concrete paving. Fire breaks shall be installed as a minimum at the roof perimeter around all roof penetrations and at maximum 40m intervals across the roof, in accordance with the GRO Green Roof Code.
    - When green roofs are installed adjacent to vertical facades, then a non vegetated strip shall be installed 2m minimum between the vegetated area and the wall to limit damage of the building in the event of fire.
    - Reference should also be made to 'Fire Performance of Green Roofs and Walls' published by the Department for Communities and Local Government August 2013
- Refer Fire Engineers information

Earth Bonding and Lightning Protection:
- All exposed metal components shall be earth bonded to meet or exceed the requirements of BS EN 62305, BS 7430, BS 7671/latest IEE Regulations.
- Earth bonding points shall be located as unobtrusively as possible and wherever possible completely concealed. If they are visible or partially visible the location and the appearance must be agreed with the Lead Designer in advance.
- Refer to Mechanical Services information

Infestation:
- The system shall be so constructed as to prevent insect infestation arising in inaccessible cavities using guidance contained in BRE Digest 415.

Slip:
- Surfaces designed to be walked on shall not represent a slip hazard when wet.
- Where not stated otherwise in the System Specific Requirement sections the Pendulum Test Value (SRV) shall be 40 minimum when tested wet in accordance with BS EN 13036-4.

Acoustic:
- External sound reduction: refer to acoustic specification.
- Horizontal flanking transmission: refer to acoustic specification.

- Vertical flanking transmission: refer to acoustic specification.
- Rainfall noise: The completed works are to incorporate damping on horizontal or sloping light metal surfaces. Where the performance target or prescriptive means of achieving rainfall reduction is not stated in the acoustic report, assume performance equal to resilient plasto-elastic material of 6kg/m^2 bonded to underside of any outer lightweight roof covering. Where the interior space is intended as a room for study, performance or sleeping, target to be equal to resilient plasto-elastic material of 10kg/m^2. Note resilient material and bond to be heat and freeze resistant with design life equal to that of the components to which it is attached.
- Noise arising from thermal movement of roof components shall not be detectable from the interior.
- Where tightly stretched membranes and sheet metal roof systems are specified, the contractor shall carry out a risk assessment for likelihood of wind, rain and hail generated noise and vibration, and mitigate risks of drumming, rattling, humming and whistling within the completed works.
- Particular attention shall be given to mitigate the risks of wind-induced whistling through ventilation slots at roof eaves or within ventilators placed on ventilated pitched roof systems.
- Where thin linear components are required on the roof systems, the contractor shall carry out a risk assessment for likelihood of wind generated noise and mitigate risks of drumming, humming and whistling within the completed works. Particular attention shall be paid to open ended tubes and hollow components.

Health and Safety:
- In completing the design, the contractor shall assess hazards associated with the construction, maintenance and demolition of the works and risk of such shall be eliminated, or where not possible minimised and communicated to the designated contact.
- The contractor shall ensure performance of the system whilst discharging designer's duties under the CDM Regulations 2007.
- In addition, the contractor shall assess the hazards to building users and the public arising from the works throughout the service life of the building and risk of such shall be eliminated, or where not possible minimised and communicated to the designated contact.

Environmental

Responsible Sourcing Generally:
- Materials forming roofing systems shall be responsibly sourced and independently third party accredited (such as BES 6001) from manufacturers holding BS EN ISO 14001 or BS 8555 phase one to four audit certification (for small companies as defined by the Companies Act 2006) as a minimum to meet the Project Environmental Assessment Method requirements. Refer the Project General Requirements.
- Specified systems to have EMS certification to meet project environmental assessment criteria.

- For Hot Melt Bitumous Roofing Systems:
Accreditations must cover product manufacture, bitumen production and aggregate extraction and production.
- For Single Ply and Polyester Resin Membrane Roofing Systems:
Accreditations must cover both product manufacturing plant and main polymer production.
- For clay tiles:
Accreditations must cover both product manufacturing plant and clay extraction process
- Metal Pressed or Formed Systems:
Accreditations must cover metal section production and the material ingot production plant.
- For timber and timber-based products/components:
Refer Project General Requirements

Responsible Sourcing of Insulation:
- Insulation products are to be A or A+ rated by the BRE Green Guide to Specification or a manufacturer's independently certified Environmental Product Declaration and be sourced from manufacturers holding ISO 14001 or BS 8555 phase one to four audit certification (for small companies as defined by the Companies Act 2006) for both the insulation manufacturing plant and the raw material suppliers to the manufacturing plant.
- Insulation blowing agents shall have zero Ozone Depletion Potential (ODP), be CFC and HFC free and have a Global Warming Potential (GWP) of <5.

- All insulation products shall be 100% recyclable and manufacturers should be operating or participating in a recognized off-cut collection and/or recycling scheme.

Recycled Content:
To BS EN ISO 14021

Volatile Organic Compounds (VOCs):
Wood and wood-based panels shall be compliant with BS EN 13986 Annex B for formaldehyde E1 and the manufacturer must verify that regulated wood preservatives are absent as defined.

Additional Requirements for Performance: Carpentry/Timber Framing Components

Carpentry/ Timber Framing:
- Refer to Structural Engineer's specification.
- The structural design of the timber framing shall be in accordance with BS EN 1995: Eurocode 5, relevant parts.
- In completing the design the contractor should follow the guidance in Trada publication*' Timber frame construction: Designing for high performance'*.

Moisture Content of Timber Components:
Moisture content of wood and wood based products at time of installation: Not more than:
Covered in generally unheated spaces: 22%.
Covered in generally heated spaces: 20%.
Internal in continuously heated spaces: 20%

Warping of Timber:
The amount of bow, spring, twist and cup in a piece of timber of specified grade must not exceed the limits set down in BS 4978

Additional Requirements for Performance: Cold Applied Polymer Inverted Roofing Systems

- The design of inverted roofing systems shall comply with the requirements and guidance provided in:
    - BS 6229: Code of practice for flat roofs with continuously supported coverings
    - NHBC Standards, Part 7, Chapter 7.1
    - ETAG 005, relevant parts published by European Organisation for Technical Approvals (EOTA).
    - 'Code of practice for the specification and use of liquid waterproofing systems', published by the Liquid Roofing and Waterproofing Association (LRWA)
    - Guidance notes by the Liquid Roofing and Waterproofing Association (LRWA)
    - BBA certification
    - system component manufacturers' written instructions
- All cold applied liquid inverted roof systems shall have a valid BBA certification.
- The liquid applied waterproofing shall remain firmly adhered to the roof deck and resist the passage of moisture into the building during the service life of the system, whilst resisting the effects of wind loads, mechanical damage in use, movement, surface temperatures and ageing media (including heat and water).
- The contractor shall demonstrate by calculation and where required test data that the installed system has sufficient mechanical resistance and stability against wind loads to avoid detachment of system components.
- The contractor shall assess the waterproofing components resistance to dead and live loading to ensure the performance requirements are met.
- The contractor shall verify that the proposed cold applied liquid waterproofing system can accommodate the declared structural movement of the roof substrate, without degradation to performance.
- The design of the works shall eliminate the risk of displacement by flotation of the insulation boards.
- Resistance to traffic:
    - Pedestrian access roofs: The completed works when finished with suitable podium paving,

shall withstand, without degradation to performance, the foot traffic and light concentrated loads associated with pedestrian access roofs, as defined under 'Definitions' of this specification.

- Resistance to surface temperature: The assembled roof system shall resist without degradation to performance the anticipated surface temperatures occurring in service conditions.
- The roof build-up above the thermal insulation layer shall allow the diffusion of water vapour.
- Washed down fines and other debris shall be prevented from passing into and below the insulation joints and becoming trapped between the insulation and the weatherproof layers.
- Water percolation between the joints of the thermal insulation boards, shall be limited to ensure no degradation to thermal performance or risk of condensation forming within or on the surface of the works.

Additional Requirements for Performance: Hot Applied Monolithic Inverted Roofing Systems - Insulated Podium

- The design of inverted podium roofing systems shall comply with the requirements and guidance provided in:
  - BS 6229: Code of practice for flat roofs with continuously supported coverings
  - NHBC Standards, Part 7, Chapter 7.1
  - ETAG 005, relevant parts published by European Organisation for Technical Approvals (EOTA).
  - 'Hot melt rubberised bitumen waterproofing systems. Code of practice', published by the Flat Roof Alliance (FRA)
  - 'Code of practice for the specification and use of liquid waterproofing systems', published by the Liquid Roofing and Waterproofing Association (LRWA)
  - Guidance notes by the Liquid Roofing and Waterproofing Association (LRWA)
  - BBA certification
  - system component manufacturers' written instructions
- All hot applied monolithic inverted podium roof systems shall have a valid BBA certification.
- The liquid applied waterproofing shall remain firmly adhered to the roof deck and resist the passage of moisture into the building during the service life of the system, whilst resisting the effects of wind loads, mechanical damage in use, movement, surface temperatures and ageing media (including heat and water).
- The contractor shall demonstrate by calculation and where required test data that the installed system has sufficient mechanical resistance and stability against wind loads to avoid detachment of system components.
- The contractor shall assess the waterproofing components resistance to dead and live loading to ensure the performance requirements are met.
- The design of the works shall eliminate the risk of displacement by flotation of the insulation boards.- Resistance to traffic:
  - Pedestrian access roofs: The completed works when finished with suitable podium paving, shall withstand, without degradation to performance, the foot traffic and light concentrated loads associated with pedestrian access roofs, as defined under 'Definitions' of this specification.
- Resistance to surface temperature: The assembled roof system shall resist without degradation to performance the anticipated surface temperatures occurring in service conditions.
- The roof build-up above the thermal insulation layer shall allow the diffusion of water vapour.
- Washed down fines and other debris shall be prevented from passing into and below the insulation joints and becoming trapped between the insulation and the weatherproof layers.
- Water percolation between the joints of the thermal insulation boards, shall be limited to ensure no degradation to thermal performance or risk of condensation forming within or on the surface of the works.
- The design of the works shall eliminate the risks of subsurface ice growth and frost heave, i.e. there shall be no upward swelling/ cracking of the hard podium surfacing during freezing conditions.
- Falls: The specified podium roof falls shall be achieved either by sloping the structural deck or tapering/ stepping the thermal insulation. Where the former measure is taken:
  - The average area weighted thermal transmittance shall meet the required U value
  - The minimum local thermal transmission shall not give rise to surface and interstitial condensation.

- Hard podium surfacing:
    - Hard paving slabs, setts etc shall be laid to appropriate drainage falls on suitable rigid bedding.
    - Adequate provisions shall be made to ensure that the bedding is prevented from becoming saturated.

Additional Requirements for Performance: Hot Applied Monolithic Inverted Roofing Systems (Excluding Podium)

- The design of inverted roofing systems shall comply with the requirements and guidance provided in:
- BS 6229: Code of practice for flat roofs with continuously supported coverings
    - NHBC Standards, Part 7, Chapter 7.1
    - ETAG 005, relevant parts published by European Organisation for Technical Approvals (EOTA).
    - 'Hot melt rubberised bitumen waterproofing systems. Code of practice', published by the Flat Roof Alliance (FRA)
    - 'Code of practice for the specification and use of liquid waterproofing systems', published by the Liquid Roofing and Waterproofing Association (LRWA)
    - Guidance notes by the Liquid Roofing and Waterproofing Association (LRWA)
    - BBA certification
    - system component manufacturers' written instructions
- All hot applied monolithic inverted roof systems shall have a valid BBA certification.
- The liquid applied waterproofing shall remain firmly adhered to the roof deck and resist the passage of moisture during the service life of the system, whilst resisting the effects of wind loads, mechanical damage in use, movement, surface temperatures and ageing media (including heat and water).
- The contractor shall demonstrate by calculation and where required test data that the installed system has sufficient mechanical resistance and stability against wind loads to avoid detachment of system components.
- The design of the works shall eliminate the risk of displacement by flotation of the insulation boards.
- Resistance to traffic:
    - Pedestrian access roofs: The completed works when finished with a suitable paving/ decking protection, shall withstand, without degradation to performance, the foot traffic and light concentrated loads associated with pedestrian access roofs, as defined under 'Definitions' of this specification.
    - Limited access roofs: The completed works shall withstand, without degradation to performance, the foot traffic and light concentrated loads associated with limited access roofs, as defined under 'Definitions' of this specification.
- Resistance to surface temperature: The assembled roof system shall resist without degradation to performance the anticipated surface temperatures occurring in service conditions.
- The roof build-up above the thermal insulation layer shall allow the diffusion of water vapour.
- Washed down fines and other debris shall be prevented from passing into and below the insulation joints and becoming trapped between the insulation and the weatherproof layers.
- Water percolation between the joints of the thermal insulation boards, shall be limited to ensure no degradation to thermal performance or risk of condensation forming within or on the surface of the works.
- Roof finishes:
    - The roof assembly shall not deform and there shall be no degradation of performance under the loading of the roof finishes, such as ballast, paving and decking.
    - Stone/ Paving ballast: The ballast layer shall be adequate to prevent wind uplift, floatation and provide complete protection to the insulation and filter/ water -reducing layer against UV degradation
    - Timber terrace decking: The decking shall be adequately secured against displacement due to wind loads. Deck sections shall be removable to allow inspection and cleaning of the roof void underneath the decking. A stone ballast layer below the timber decking shall be provided at all times.

Additional Requirements for Performance: Zinc Sheet Roofing Systems

Zinc Roof Coverings Generally:

- The design of the zinc sheet roofing shall be in accordance with the system's BBA party certification requirements, the system manufacturer's recommendations and CP 143-5: Code of Practice, Sheet roof and wall coverings: Zinc.
- Completed works: There shall be no loss of weather-tightness or permanent deformation due to heat, snow, wind pressure, action or suction and other climate stresses.
- The design of the works shall:
    - ensure the completed works shall resist wind uplift without distortion, stress or reduction in specified performance
    - accommodate the thermal movement of their components without distortion, buckling, stress or reduction in specified performance
    - eliminate the risk of underside condensation of metal coverings
- The contractor shall assess the exposure conditions of the roof to determine project specific maximum permissible spacing of zinc covering widths and joints and verify these with the zinc manufacturer to ensure the performance requirements are met.
- Zinc panel gauges and widths shall be selected to eliminate the risk of 'oil canning' (more commonly known as elastic buckling or deformation) of zinc sheet coverings.
- The fixings shall be designed on a project specific basis taking into consideration the connection resistance between the roofing panels and the fixing clips and the pull-out resistance from the substrate
- The design of seams, welts and clips shall allow the appropriate degree of movement of zinc coverings.
- Proprietary fixings shall accommodate longitudinal and lateral thermal expansion/ contraction. Clips securing the zinc covering to the roof deck shall be austenitic grade 304 stainless steel. Where appropriate, sliding clips shall be utilised in conjunction with fixed clips in accordance with the manufacturer's recommendations.
- All fixing bolts, anchors, screws, rivets, nuts and any other associated fastening component utilised in the construction of the covering support system shall be manufactured from austenitic stainless steel grade A2
- Standing seams shall resist loading of maintenance access wire-ways and PV panel installations with proprietary reinforcement to zinc roofing manufacturer's recommendations.
- The roof decking shall be continuous and have adequate strength to carry all designed and imposed loads.
- Thermal movement details shall be designed to ensure appropriate allowance for movement, without impairment of security at full expansion or contraction.

Warm non ventilated construction:

- All warm non ventilated systems shall have a valid BBA or UKAS accredited equivalent third party certification, certifying that there is no risk of surface/ interstitial and underside condensation forming within the completed works under normal service conditions.
- The insulated roof deck shall act as a continuous vapour barrier.

Cold roof/ ventilated construction:

- The design of the works shall ensure that an unobstructed, cross ventilated air space is maintained above the insulation.
- The design of the works shall ensure there are no stagnant air pockets above the insulation zone to ensure no degradation to performance.

Gutter Design:

- To BS EN 12056-3: Gravity drainage systems inside buildings Roof drainage, layout and calculation
- The zinc lined gutters shall accommodate the thermal movement of their components without distortion, stress or reduction in specified performance.

Additional Requirements for Performance: Inverted Extensive Green Roof Systems

- The design of inverted extensive green roof systems shall comply with the requirements and guidance provided in:
    - BS 6229: Code of practice for flat roofs with continuously supported coverings

- NHBC Standards, Part 7, Chapter 7.1
- ETAG 005, relevant parts published by European Organisation for Technical Approvals (EOTA).
- 'Code of practice for the specification and use of liquid waterproofing systems', published by the Liquid Roofing and Waterproofing Association (LRWA)
- Guidance notes by the Liquid Roofing and Waterproofing Association (LRWA)
- 'Hot melt rubberised bitumen waterproofing systems. Code of practice', published by the Flat Roof Alliance (FRA)
- Guidelines for the design and application of green roof systems, published by CIBSE
- The GRO Green Roof Code, Green Roof Code of Best Practice for the UK 2011, published by GRO
- BBA certification
- system component manufacturers' written instructions

- All inverted extensive green roof systems shall have a valid BBA certification.
- The liquid applied waterproofing shall remain firmly adhered to the roof deck and resist the passage of moisture during the service life of the system, whilst resisting the effects of wind loads, mechanical damage in use, movement, surface temperatures, ageing media (including heat and water) and plant roots.
- The contractor shall demonstrate by calculation and where required test data that the installed system has sufficient mechanical resistance and stability against wind loads to prevent detachment of system components and growing medium 'slippage'.
- The contractor shall assess the waterproofing components resistance to dead and live loading to ensure the performance requirements are met.
- Measures taken to withstand shear forces and prevent growing medium 'slippage' shall be designed to avoid imposing excessive loads on the waterproofing layer.
- Erosion control measures such as erosion protection netting might be required, subject to the calculated project specific wind suction loads,
- The design of the works shall eliminate the risk of displacement by flotation of the insulation boards.
- Resistance to mechanical damage:
    - Traffic: The completed works shall withstand, without degradation to performance, the foot traffic and light concentrated loads associated with extensive green roofs, as defined under 'Definitions' of this specification.
    - Root penetration: Plant roots shall be prevented from penetrating the waterproofing layer and building fabric.
- Resistance to surface temperature: The assembled roof system shall resist without degradation to performance the anticipated surface temperatures occurring in service conditions.
- Appropriate levels of aeration to the plants' root systems shall be provided to protect the roots against the detrimental effects of water logging.
- The roof build-up above the thermal insulation layer shall allow the diffusion of water vapour.
- Washed down growing medium and other debris (such as bird detritus and debris/dust from the covering) shall be prevented from entering and clogging the drainage routes and layers.
- Water percolation between the joints of the thermal insulation boards, shall be limited to ensure no degradation to thermal performance or risk of condensation forming within or on the surface of the works.
- Roof finishes:
    - The roof assembly shall not deform and there shall be no degradation of performance under the loading of the growing medium and planting.
    - For growing medium and planting performance requirements refer to the Specialist Consultants specification
    - Non vegetated zones comprising heavier materials, such as stone ballast or paving slabs shall be installed at all roof perimeters, penetrations, outlets and upstands to:
        - protect against wind uplift at roof areas subject to increased wind velocities.
        - act as fire barriers where required as defined in 'Fire' of this specification.
        - protect building components such as flashings, drainage outlets from plant roots.

Additional Requirements for Performance: Single Ply Polymeric Warm Roofing Systems

- The design of single layer polymeric warm roofing systems shall comply with the requirements and guidance provided in:

- BS 6229: Code of practice for flat roofs with continuously supported coverings
- NHBC Standards, Part 7, Chapter 7.1
- BBA certification
- 'Design guide for single ply roofing', published by the Single Ply Roofing Association (SPRA)
- Technical guidance and quality control documents, published by the Single Ply Roofing Association (SPRA)
- 'Roofing Handbook Information Sheet 16 Single ply roofing', published by the Flat Roof Alliance (FRA)
- 'Flat roofing – design and good practice', published by BFRC/CIRIA
- system component manufacturers' written instructions

- The roof membrane and vapour control layer shall be sufficiently flexible and adequately restrained, by mechanical attachment or adhesive bonding, to resist wind uplift and any flexing of the support deck.
- The system shall resist the passage of moisture whilst accommodating the anticipated structural/ thermal movement of components/ roof deck and fatigue without tearing, cracking or any other damage during the service life of the system.
- The contractor shall demonstrate by calculation and where required test data that the proposed attachment method can securely withstand applied live (including wind uplift forces) and dead loads.
- Where roof areas are subject to high wind velocities, supplementary mechanical restraint may be required to withstand wind uplift forces.
- Material compatibility: The contractor shall verify that the proposed combination of products are approved by the system component manufacturers.
- The design of the roof falls and drainage shall eliminate the risk of long-term water ponding on the waterproof membrane.
- Resistance to foot traffic: The completed works shall withstand, without damage, the foot traffic and light concentrated loads associated with limited access roofs, as defined under 'Definitions' of this specification. Where foot traffic is in excess of the one defined on limited access roofs, the contractor shall provide suitable additional protection to the membrane.
- Support decks shall comply with the relevant requirements of BS 6229, the BBA certificate and, where appropriate, NHBC Standards Part 7, Chapter 7.1.
- Fully adhered systems:
    - The adhesion between the adhered roof components shall be sufficient to resist the effects of wind suction, thermal cycling and structural movements likely to be experienced under normal service conditions.
    - Particular attention shall be paid to eliminate the risk of the roofing membrane peeling due to high wind loads at the roof perimeter, at changes of slope and around details.
- Mechanically attached systems:
    - Mechanical fasteners shall have adequate strength to ensure that the completed works can withstand applied live and dead loads.

Additional Requirements for Performance: Roof Drainage/ Rainwater Systems

Gutter Design:
- To: BS 5427-1: Code of practice for the use of profiled sheet for roof and wall cladding on buildings Design
- BS EN 12056-3: Gravity drainage systems inside buildings Roof drainage, layout and calculation
- The gutter design shall be in accordance with 'The National Federation of Roofing Contractors – Profiled Sheet Roofing and Cladding: A Guide to Good Practice', Third Edition 1999 and shall be in accordance with the manufacturer's recommendations.
- Rainfall calculations:
- Eaves gutters shall utilise a return period T = 50 years to BS EN 12056-3
- Other gutters shall utilise a return period T = 50 years to BS EN 12056-3

REQUIREMENTS FOR SAMPLES, SUBMISSIONS, MOCK-UPS AND TESTING

Submissions Generally:
- Submit for approval in accordance with the protocol detailed in the Project General Requirements.

Product/ Test Data:
- Provide manufacturer's product data for all materials in this specification, including manufacturer's installation instructions, maintenance and test data.
- Provide details of contractor's proposals: Components/ assemblies/ products that meet the requirements of the Design Intent.
- Sufficient samples of the relevant trade literature and technical specifications shall be provided in accordance with the Project General Requirements, together with details/ certificates of systems/ products/ materials that meet the Performance requirements.

Submittals

Contractor's Detailed Design Submittals:
In accordance with the Project General Requirements including (but not limited to) the following:
- Structural calculations:
- A full set of structural calculations shall be provided to demonstrate that the works comply with the requirements of this specification.
- Calculations submitted shall include (but not limited to) calculations for all sections, connections, fixing assemblies, anchors, bolts, fasteners, glazing and panels.
- Wind uplift calculations denoting the safety factor of resistance for normal materials for the complete roof construction used.
- Thermal calculations
- Condensation risk analysis:
    - Zinc and metal sheet warm roof: The risk of surface condensation, mould growth and interstitial condensation shall be assessed in accordance with BS EN ISO 13788 and BS 5250. Reference shall also be made to MCRMA/EPIC publication 'Design guide for Metal Roofing and Cladding to comply with energy requirements of UK Building Regulations'.
    - Cold roof construction: The risk of surface condensation, mould growth and interstitial condensation shall be assessed in accordance with BS 5250.
    - Inverted roof construction: The risk of surface condensation, mould growth and interstitial condensation shall be assessed in accordance with BS 5250.
- Adhered single layer polymeric roof systems:
    - Wind uplift resistance: Appropriate test evidence shall be submitted from the system provider in conjunction with the appropriate adhesive manufacturer. This shall be based upon the test
    method outlined by MOAT 50:1992 'Technical guidelines for the assessment of thermal insulation systems intended for supporting waterproof coverings on flat and sloping roofs'.

Details of Responsible Material Sourcing:
- The contractor is to comply with the requirements in respect of information to be supplied under the project environmental assessment method requirements

Samples:
Provide samples in accordance with the protocol detailed in the Project General Requirements as follows:
- Refer to Samples, Mock-ups, Prototype and Benchmark Requirements Document
- 3no plain roof tiles RFS-1XX
- 1no half-round ridge tile
- 2 x paving slab and support system
- 2 x 300mm length of any visible flashings or trims
- Pebbles
- 300 x 300mm square of membrane
- 3no. decking planks RFS-280, minimum 1500mm long

Additional samples to be confirmed at later work stage.

Quality Benchmarks:
- First 10m² bay in location to be agreed to form the quality benchmark in accordance with the protocol set out in the Project General Requirements.

Testing

Air-tightness:
- The buildings will be subject to whole building air testing in accordance with the Project General Requirements.

Flat Roof Electronic Integrity Test:
- On completion the integrity of the waterproofing shall be tested by means of an electronic detector system to prove that the waterproofing is 100% free from punctures and defects, prior to installation of surfacing.
- Condition of roof prior to testing:
    - Coating: Complete to a stage where integrity can be tested
    - Surface: Clean
    - Waterproof integrity certificate: Attach to warranty application

Adhesion Tests: Requirement:
- Carry out a trial coating to determine priming requirements and/or system suitability.
- Nature of test: Manufacturers recommended bond best method.
- Test results: Proceed with membrane installation if satisfactory.

Site Pullout Test (mechanically fastened flexible roof waterproofing membranes):
- The contractor shall carry out minimum 6 site tests per roof and an additional 6 tests for every additional 1,000m² of roof area: To test method defined in Annex D of ETAG 006, published by European Organisation for Technical Approvals (EOTA).

Hot/Cold Melt Waterproofing Film Thickness Test:
- The contractor shall carry out wet/ dry film thickness tests to monitor the thickness and coverage of all membrane layers.
- Nature of test: Manufacturers recommended thickness best method.

Flat Roof Flood Test:
- The waterproof membrane shall be completed to a stage where integrity can be tested.
- Where flat roofs are flood tested in sections, each sectional test shall overlap by minimum 1m with the previous test area.
- First completed weatherproof area shall be bunded and flooded to assess the integrity and workmanship of the roof. No degree of failure shall be acceptable.
- Upon completion of test, the roof shall be slowly drained so as not to overload the outlets.

Roof Outlet and Gutter Test:
- On completion, the rainwater outlets shall be flood tested to a 100mm head of water for 24 hours. In order to avoid the complete flooding of the roof, the contractor shall prepare a temporary surrounding upstand for each outlet. No leaks shall be observed.

Moisture Content Testing of Timber Components:
- When instructed, timber sections shall be tested with an approved electrical moisture meter.
- Test sample: 5% but not less than 10 lengths of each cross-section shall be tested in the centre of the length.
- Test results: 90% of values obtained shall be within the specified range. The contractor to provide records of all tests.

Testing of Fixings in Concrete and Masonry:
- Off site and site testing of fixings: To BS 5080 Parts 1 and 2, and Construction Fixings Association guidance note 'Procedure for site testing construction fixings'.

Certificates:
- Submit QA/QC evidence
- Submit data recording successful testing outcomes.
- Submit data substantiating manufacturer and installer qualifications.
- Submit certified data attesting fire rated materials comply with specifications.
- Submit certified data attesting relevant materials comply with environmental assessment requirements

Operation and Maintenance Manual:

- At completion, submit printed instructions recommending procedures for maintenance of the roofing and rainwater outlet installations, including full details of recommended inspection, cleaning and repair procedures in accordance with the Project General Requirements.

REQUIREMENTS FOR WORKMANSHIP AND MATERIALS

Requirements to be stated at later work stage

Appendices:

Purpose Made Joinery:
Refer to Appendix Z10

Purpose Made Metalwork:
Refer to Appendix Z11

Preservatives/ Fire Retardant Treatment:
Refer to Appendix Z12

Methods of Fixing and Adhesives:
Refer Appendix Z20

Mortars:
Refer Appendix Z21

Sealants:
Refer to Appendix Z22

RFS-100 COLD VENTILATED CLAY TILE ROOFING OVER NEW ROOF STRUCTURES: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Proprietary cold ventilated clay tile pitched roofing over new timber roof structures including leadwork flashings in connection

2. Detailed Description:

Build-up:
- Roof tile
- Leadwork flsahings
- Battens/ counter-battens
- Breather membrane/ underlay
- Eaves/verge secondary timberwork
- Roof structures
- Accessories

Roof Tile:
Type: Clay
Product: Rosemary Clay Classic by Monier Redland
Contact: www.monier.co.uk
Colour/Finish: Red 80/ Smooth finish
Size: Nominally 265 x 165mm
Pitch: Not less than 32° in accordance with manufacturers recommendations
Headlap: 65mm min, 88mm max
Hanging Length: Nominally 255mm
Fixing: To Redland FixMaster tile and batten fixing specification

Leadwork Flashings:
Type: To suit application including (but not limited to) cover, verge, apron, raking horizontal and abutment, stepped, chimney, weathering, capping, gutter, cill and head flashings including roof penetrations, sleeves and associated fixings as necessary to complete and fully warrant the roofing installation

Battens/ Counter-battens:
Type: Treated softwood to BS 5534
Grading: Fully factory pre-graded
Preservative Treatment: Refer Appendix Z12
Fixing: To Redland FixMaster tile and batten fixing specification
Batten Size: Nominally 25 x 38mm
Counter-batten Size: Nominally 19 x 38mm

Breather Membrane/ Underlay:
Type: Spirtech 250 Vapour permeable underlay – BBA certificate: 05/4283

Eaves/Verge Secondary Timberwork:
Types:
Open/Closed Eaves/Verges: To include (but not limited to) jack rafters, close boarded underlay, barge/facia boards, decorative/ non-decorative soffit boards, furrings, brackets, noggins etc and as necessary to complete and warrant the works
Grading: As timber roof structures where required. Refer Structural Engineers information
Preservative Treatment: Refer Appendix Z12
Size/Fixing Details: Refer design intent drawings
Finish: Site painted where visible in the completed installation. Refer FIN section of this Specification

Roof Structures:
Refer Structural Engineers information

Accessories:
Half round ridge tile
Arris (clay) hip
Bonnet hip
Plain tile valley
Tile and a half verge tile
Plain tile eaves/top tiles
Baby ridge

Redland Underlay support tray
Redland RedVent 25 Over-fascia Vent
Redland DryVent Ridge System
Stainless steel fixing/fastening straps
Nails, fastenings and other fixings as necessary to complete and fully warrant the installation

3. Performance:
Refer to System General Requirements for Performance, except or in addition:

Clay Roof Tile:
To: BS EN 1304

Breather Membrane/ Underlay:
To: BS EN 13707

Lead Sheet:
To BS EN 12588
Thickness: Suitable for severe exposure, Code 5 minimum

Leadwork Security Marking:
Apply metalwork fused microdot marking by Trace-in-Metal® or similar approved theft deterrent lead marking system to leadwork in vulnerable locations in accordance with the manufacturer's recommendations.

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials, except or in addition:

Spocketed Eaves:
To be re-instated to match existing. Angles vary

RFS-101 COLD VENTILATED CLAY TILE ROOFING OVER EXISTING ROOF STRUCTURES: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Proprietary cold ventilated clay tile pitched roofing over existing timber roof structures

2. Detailed Description:

Refer RFS-100 except:

Roof Structures:
Existing timber. Refer Structural Engineers information

3. Performance:
Refer to System General Requirements for Performance, except or in addition:

Refer RFS-100

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-102 VERTICAL CLAY TILING: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Proprietary vertical clay tiling

2. Detailed Description:

Build-up:
- Roof tile
- Battens / counter-battens
- Breather membrane/ underlay
- Secondary timberwork
- Substrate
- Accessories

Roof Tile:
Type: Clay
Product: As RFS-100
Contact: As RFS-100
Colour/Finish: As RFS-100
Size: As FRS-100
Pitch: 90°
Headlap: 35mm min, 88mm max
Hanging Length: Nominally 255mm
Fixing: To Redland FixMaster tile and batten fixing specification

Battens/ Counter-battens:
Type: Treated softwood to BS 5534
Grading: Fully factory pre-graded
Preservative Treatment: Refer Appendix Z12
Fixing: To Redland FixMaster tile and batten fixing specification
Batten Size: Nominally 25 x 38mm
Counter-batten Size: Nominally 19 x 38mm

Breather Membrane/ Underlay:
Type: As RFS-100, except:
Block A1 front gable breather membrane to be substituted with a bituminous membrane compatible with bat roosting environment. Product to be confirmed at later work stage.

Secondary Timberwork:
As required for secondary roof framing/noggins etc

Grading: As timber roof structures where required. Refer Structural Engineers information
Preservative Treatment: Refer Appendix Z12

Substrate:
Dormer roof structures. Refer Structural Engineers information

Accessories:
As RFS-100 and as required except:
Add: 3no. bat access tiles Block A1 front gable

3. Performance:
Refer to System General Requirements for Performance, except or in addition:

As RFS-100

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-110 INVERTED FLAT ROOFING TO BLOCK C EXTENSION: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Inverted flat roof with ballast to Block C front extension

2. Detailed Description:

Build-up:
- Pebble Ballast
- Separation layer
- Insulation
- Protection and reinforcement layer
- Waterproofing layer
Substrate

Pebble Ballast:
Type: River round
Size: 20 – 40mm variable
Depth: 70mm nominal
Indicative product: Blackdown washed pebble ballast 20/40
Contact: www.blackdown.co.uk

Separation layer:
Non-woven polyethylene geotextile vapour permeable membrane.
Indicative product: Alumasc Polyethylene Separator Sheet, installed in accordance with manufacturer's recommendations.

Insulation:
Alumasc EPS 300 insulation
Thickness: To suit performance requirements nominally 180mm
Upstands and parapets to be insulated using 56mm Alumasc EPS upstand boards with a 6mm thick weather resistant high impact facing board.

Protection and reinforcement layer
Protection sheet: Alumasc Hydrogard 20 MN or alternatively Alumasc Hydrogard 30 MN protection sheet if abnormally heavy site traffic is expected prior to application of topping.
Reinforcement sheets: Flex-Flash F and Flex-Flash UN

Waterproofing Layer:
First Coat: Hydrotech Monolithic Membrane 6125.
Reinforcement: Flex-Flash F or Flex-Flash UN, where appropriate
Second Coat: Hydrotech Monolithic Membrane 6125
Sealant applied between roofing membranes to all common building materials
Indicative product: Alumasc Derbitech Sealstick HD
Colour: Black

Substrate:
Plywood deck – to SE spec.

Accessories:
Requirements to be stated at later work stage.

3. Performance:
Refer to System General Requirements for Performance

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-120 'HERITAGE' BATTEN CAP ZINC SHEET ROOF COVERINGS: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Heritage rounded profile batten cap vented zinc roof coverings on ply decking to gutter-less dormer roofs with back-falls

2. Detailed Description:

Build-up:
- Zinc sheet roof coverings
- Decking
- Battened ventilation zone
- Underlay/VPL
- Secondary timberwork
- Substrate

Zinc Sheet Roof Coverings:
Type: Zinc sheet roofing
Product: VMZINC Standing seam roof for slopes ranging from 3 degrees to 60 degrees
Contact: www.vmzinc.co.uk
Thickness: 0.7mm or 0.8mm
Finish: VMZINC PLUS in QUARTZ-ZINC
Joints/Seams: Nominal 45mm rounded profile batten cap, standing seam
Pitch: Nominally 3°
Fixing: In accordance with metal roofing manufacturer's recommended details

Accessories: Requirements to be stated at later work stage (eg: Continuous eave apron strip)

Decking:
Product: Exterior grade plywood suitable for overlay zinc sheet roofing
Thickness: 18mm nominal
Fixing: To zinc roofing manufacturers recommended details. Nails to be driven into ply so as to avoid abrasive contact with underside of zinc roof coverings over.

Battened Ventilation Zone:
Maintain 50mm minimum air space between plywood and insulation using nominal 50 x 38mm treated softwood battens

Underlay/VPL:
Requirements to be stated at later work stage

Secondary Timberwork:
As required for secondary roof framing/noggins etc
Grading: As timber roof structures where required. Refer Structural Engineers information
Preservative Treatment: Refer Appendix Z12

Substrate:
Dormer roof structures. Refer Structural Engineers information

3. Performance:
Refer to System General Requirements for Performance, except or in addition:

Decking:
Plywood to: BS EN 636, BS EN 314-2 Bonding Class 3

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-130 ROLLED LEAD SHEET ROOF COVERINGS: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Batten roll vented rolled lead sheet roof coverings on ply decking to actively drained dormer roofs with facia gutter drainage

2. Detailed Description:

Build-up:
- Lead sheet roof coverings
- Decking
- Battened ventilation zone
- Underlay/VPL
- Secondary timberwork
- Substrate

Lead Sheet Roof Coverings:
Type: Rolled
Finish: Patinated

Thickness: To suit application and in accordance with 'Rolled Lead Sheet, The Complete Manual' published by The Lead Sheet Association
Joints: Rounded profile batten rolls – nominal 45mm diameter
Pitch: Nominally 3°
Fixing: To installers recommended details and in accordance with 'Rolled Lead Sheet, The Complete Manual' published by The Lead Sheet Association
Accessories:
Requirements to be stated at later work stage

Decking:
Product: Exterior grade plywood suitable for overlay lead sheet roofing
Thickness: 18mm nominal
Fixing: In accordance with 'Rolled Lead Sheet, The Complete Manual' published by The Lead Sheet Association

Battened Ventilation Zone:
Maintain 50mm minimum air space between plywood and insulation using nominal 50 x 38mm treated softwood battens

Underlay/VPL:
Requirements to be stated at later work stage

Secondary Timberwork:
As required for secondary roof framing/noggins etc
Grading: As timber roof structures where required. Refer Structural Engineers information
Preservative Treatment: Refer Appendix Z12

Substrate:
Dormer/bay roof structures. Refer Structural Engineers information

3. Performance:
Refer to System General Requirements for Performance, except or in addition:

Lead Sheet:
To BS EN 12588
Thickness: Suitable for severe exposure, Code 5 minimum

Leadwork Security Marking:
Apply metalwork fused microdot marking by Trace-in-Metal® or similar approved theft deterrent lead marking system to leadwork in vulnerable locations in accordance with the manufacturer's recommendations

Decking:
Plywood to: BS EN 636, BS EN 314-2 Bonding Class 3

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-140 LEAD FLASHING/COVERINGS TO MISC STRING COURSES/ WINDOW HEADS: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Lead flashing to string courses, windows and miscellaneous architectural details

2. Detailed Description:

Build-up:
- Lead
- substrate

Roof finish:
Type: Lead
Product: Class: To application
Finish: Patinated
Thickness: Code 5 minimum
Joints: Requirements to be stated at later work stage
Pitch: To suit application. 3° minimum
Fixing: To substrate in accordance with lead sheet association guidelines

Accessories:
Requirements to be confirmed at a later work stage

Substrate:
Various

3. Performance:
Refer to System General Requirements for Performance, except or in addition:

As RFS-130

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-150 RIGID INSULATION ABOVE SLOPED CEILINGS TO HABITABLE SPACES AT ROOF LEVEL: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Rigid thermal insulation between and below rafters to areas of sloped ceiling in habitable spaces at roof level

2. Detailed Description:

Build-up:
- Ventilated cavity zone
- Insulation
- Restraint netting
- Insulation below rafters

Ventilated Cavity Zone:
Nominal 38 x 25mm full length battens nailed each side of rafter located to maintain 50mm ventilated zone above insulation

Insulation:
Type: Factory made rigid thermoset phenolic insulant
Product: Kooltherm K7 Pitched Roof Board by Kingspan Insulation UK
Contact: www.kingspaninsulation.co.uk
Thickness: 175mm nominal

Restraint Netting:
Requirements to be stated at later work stage

Insulation Below Rafters:
Type: Factory made rigid thermoset phenolic insulant
Product: Kooltherm K15 Rainscreen Board by Kingspan Insulation UK
Contact: As above
Thickness: 25mm nominal

3. Performance:
Refer to System General Requirements for Performance, except or in addition:

Thermal performance Target: U-value for new thermal element: 'Insulation at rafter level': 0.18 $(W/m^2,K)^2$

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-151 FLEXIBLE INSULATION ABOVE HORIZONTAL CEILINGS AND SUSPENDED TIMBER FLOORS IN ROOF VOIDS TO HABITABLE SPACES AT ROOF LEVEL: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Flexible insulation above horizontal ceilings and suspended timber floors in roof voids to habitable spaces at roof level

2. Detailed Description:

Build-up:
- Ventilated roof void
- Secondary roof structures
- Insulation
- Restraint netting

Ventilated Roof Void:
Refer FLS-100/ 101

Secondary Roof Structures:
As required for secondary roof framing/noggins etc
Grading: As timber roof structures where required. Refer Structural Engineers information
Preservative Treatment: Refer Appendix Z12

Insulation:
Type: Medium density mineral stone wool
Product: ROCKWOOL® Roll

Contact: www.rockwool.co.uk
Thickness: Nominally 200mm o/a laid in 2no. 100mm layers
Installation: To be laid over ceiling system and between secondary roof structures, and over concealed suspended timber floors in roof voids

Restraint Netting:
Refer RFS-150

3. Performance:
Refer to System General Requirements for Performance, except or in addition:

Thermal performance Target: U-value for new thermal element: 'Insulation at ceiling level': 0.16 $(W/m^2,K)^2$

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-152 RIGID INSULATION TO VERTICAL WALL LININGS TO HABITABLE SPACES AT ROOF LEVEL: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Rigid thermal insulation between secondary roof structures to vertical wall linings in habitable spaces at roof level

2. Detailed Description:

Build-up:
- Ventilated roof void
- Restraint netting
- Insulation
- Secondary roof structures

Ventilated Roof Space:
Refer RFS-100/101

Insulation:
Type: Factory made rigid thermoset phenolic insulant
Product: As RFS-150
Contact: As RFS-150
Thickness: 175mm nominal

Restraint Netting:
Requirements to be stated at later work stage

3. Performance:
Refer to System General Requirements for Performance, except or in addition:

Thermal:
Thermal performance Target: U-value for new thermal element: Calculate as 'Insulation at ceiling level': 0.16 $(W/m^2,K)^2$

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-153 RIGID INSULATION AND LINING/SHEATHINGS TO DORMER CHEEKS: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Rigid insulation and plywood linings/sheathings to Dormer cheeks

2. Detailed Description:

Build-up:
- External plywood sheathing
- Secondary roof structures
- Insulation
- Internal plywood lining

External Plywood Sheathing:
Product: Exterior grade plywood suitable for vertical overlay tiling RFS-102
Thickness: 18mm nominal
Fixing: To primary/secondary roof structures. Refer Structural Engineers information

Secondary Roof Structures:
As required for secondary dormer roof framing/noggins etc
Grading: As timber roof structures where required. Refer Structural Engineers information
Preservative Treatment: Refer Appendix Z12

Insulation:
Type: Factory made rigid thermoset phenolic insulant
Product: Kooltherm K7 Pitched Roof Board by Kingspan Insulation UK
Contact: As RFS-150
Thickness: 140mm nominal

Internal Plywood Lining:
Product: Exterior grade plywood
Thickness: 9mm nominal
Fixing: To primary/secondary roof structures

3. Performance:
Refer to System General Requirements for Performance, except or in addition:

Plywood Sheathing/Linings:
Plywood to: BS EN 636, BS EN 314-2 Bonding Class 3

Thermal:
Thermal performance Target: U-value for new thermal element: 'Wall': 0.28 $(W/m^2,K)^2$

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:

Refer to System General Requirements for Workmanship and Materials

RFS-154 RIGID INSULATION TO DORMER / BAY ROOF AREAS: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Rigid thermal insulation between and below rafters to dormer/bay roof areas

2. Detailed Description:

Build-up:
- Insulation between rafters
- Roof structures
- Insulation below rafters

Insulation:
Type: Factory made rigid thermoset phenolic insulant
Product: Kooltherm K7 Pitched Roof Board by Kingspan Insulation UK
Contact: As RFS-150
Thickness: 125mm nominal
Installation: Horizontally between timber roof structures

Roof Structures:
Refer Structural Engineers information

Insulation Below Rafters:
Type: Factory made rigid thermoset phenolic insulant
Product: As above
Contact: As above
Thickness: Requirement to be stated at later work stage

3. Performance:
Refer to System General Requirements for Performance, except or in addition:

Thermal:
Thermal performance Target: U-value for new thermal element: 'Insulation at rafter level': $0.18(W/m^2,K)^2$

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-180 RAINWATER GOODS & SYSTEMS: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Rainwater goods and systems

2. Detailed Description:

Requirements to be stated at later work stage

3. Performance:
Refer to System General Requirements for Performance

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-200 LIQUID APPLIED INVERTED FLAT ROOFING SYSTEM WITH NATURAL GRANITE STONE PAVER FINISH: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Fully adhered, reinforced bitumen liquid applied inverted flat roofing system with natural granite stone paver and ballast finish.

2. Detailed Description:

System:
Hydrotech Liquid applied Monolithic Membrane Waterproofing System MM6125 by Alumasc or acceptable equivalent to meet the functional, visual and performance requirements to Lead Designer acceptance.
Alumasc Roofing System:
www.alumascwaterproofing.co.uk

Build-up:
- Natural stone paver
- Pebble ballast
- Separation layer
- Insulation
- Protection and reinforcement layer
- Waterproofing layer
- Substrate

Natural Stone Paver:
Grey Granite stone flag paving by Marshalls or acceptable equivalent to meet the functional, visual and performance requirements to Lead Designer acceptance, loose laid on Harmer Modulock or acceptable equivalent adjustable pedestal.
Marshalls Paving: www.marshalls.co.uk
Bond/pattern: Requirements to be confirmed at later work stage
Paver Size: Requirements to be confirmed at later work stage
Thickness: Requirements to be confirmed at later work stage
Finish: Flamed
Colour: To be selected from Marshalls Natural Stone range at later work stage

Pebble Ballast:
Type: River round
Size: 20 – 40mm variable
Depth: 70mm nominal
Indicative product: Blackdown washed pebble ballast 20/40
www.blackdown.co.uk

Separation layer:
Non-woven polyethylene geotextile vapour permeable membrane.
Indicative product: Alumasc Polyethylene Separator Sheet, installed in accordance with manufacturer's recommendations.

Insulation:
Alumasc EPS 300 insulation
Thickness: To suit performance requirements nominally 180mm
Upstands and parapets to be insulated using 56mm Alumasc EPS upstand boards with a 6mm thick weather resistant high impact facing board.

Protection and reinforcement layer
Protection sheet: Alumasc Hydrogard 20 MN or alternatively Alumasc Hydrogard 30 MN protection sheet if abnormally heavy site traffic is expected prior to application of topping.
Reinforcement sheets: Flex-Flash F and Flex-Flash UN

Protection/Reinforcement Layer Under Brickwork/Blockwork:
Alumasc Hydrogard 40 MN

Interfaces, Outlets and Overflows:
Alumasc Flex Flash UN uncured neoprene rubber reinforcement fully encapsulated in Monolithic Membrance 6125, installed in accordance with manufacturer's recommendations.

Waterproofing Layer:
First Coat: Hydrotech Monolithic Membrane 6125.
Reinforcement: Flex-Flash F or Flex-Flash UN, where appropriate
Second Coat: Hydrotech Monolithic Membrane 6125
Sealant applied between roofing membranes to all common building materials
Indicative product: Alumasc Derbitech Sealstick HD
Colour: Black

Substrate:
New or existing RC concrete. Refer Structural Engineers information
Primed with Alumasc Bitumen Primer in accordance with manufacturer's written instructions.
Surface to be dry, clean and free from all contaminants including oils, grease, dirt and debris.

Rainwater Outlets
Proprietary aluminium rainwater outlets with domed grates.
Indicative product: Harmer roof drainage
www.harmerdrainage.co.uk/

Accessories:
-Spreader plates for pedestals (where required).
-Membrane pockets for fixing brackets to balustrades AMT (where required).
-Trays/barriers to retain protective sheeting pebble ballast but to allow water penetration.
-Aluminimum coping, metal flashing and insulating flashings
-Stainless steel studs bonded to top of paving slabs to indication roof outlet locations.
-Stainless steel SVP cover with adjustable spigot. Indicative product to be confirmed at later work stage.

3. Performance:
Refer to System General Requirements for Performance

Thermal performance target: 0.18 W/m^2K

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-201 LIQUID APPLIED COLD FLAT ROOFING SYSTEM WITH NATURAL GRANITE STONE PAVER FINISH: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Fully adhered, reinforced bitumen liquid applied cold flat roofing system with natural granite stone paver finish and ballast finish.

2. Detailed Description:

Indicative build-up RFS-200 except:
Omit:
-Insulation
-Separation layer

Protection and reinforcement layer
Protection sheet: Alumasc Hydrogard 30MN protection sheet

3. Performance:
Refer to System General Requirements for Performance

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-202 LIQUID APPLIED COLD PODIUM DECK TYPE SYSTEM WITH PAVER FINISH: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Fully adhered, reinforced bitumen liquid applied cold podium deck type system with paver finish to landscape architects specification.

2. Detailed Description:

Indicative build-up RFS-200 except:
Omit:
- Natural stone pavers
- Pebble ballast
- Insulation
- Separation layer

Add:
- Pavers to match Landscape Architects specification
- Bedding screed laid to fall

Waterproofing Layer:
Integritank high performance tanking and lining system seamless, fully bonded, cold spray liquid applied Structural Waterproofing system by Sterling Lloyd or acceptable equivalent to meet the functional, visual and performance requirements to Lead Designer acceptance.
Sterling lloyd Roofing System: Integritank
Contact: www.stirlinglloyd.com

Outlets:
Proprietary aluminium rainwater drainage channel
Indicative product: Harmer roof Modulock channel drainage
www.harmerdrainage.co.uk/

3. Performance:
Refer to System General Requirements for Performance

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-203 LIQUID APPLIED INVERTED FLAT ROOFING SYSTEM WITH CONCRETE PAVER AND STONE BALLAST FINISH: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Fully adhered, reinforced bitumen liquid applied inverted flat roofing system with concrete paver and stone ballast finish.

2. Detailed Description:

Indicative build-up RFS-200 except:

Concrete Paver:
To roofing manufacturers specification

3. Performance:
Refer to System General Requirements for Performance

As RFS-200

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-204 LIQUID APPLIED INVERTED FLAT ROOFING SYSTEM GRAVEL FINISH TO LIFT SHAFT AND SERVICE RISERS: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Fully adhered, reinforced bitumen liquid applied inverted flat roofing system with gravel ballast to lift shaft and service risers

2. Detailed Description:

Build-up:
As RFS-200 except:
Omit:
Natural stone paver finish

Pebble Ballast:
Type: River round
Size: 40 – 60mm variable
Depth: 100mm nominal spread evenly to flush finish
Indicative product: Blackdown washed pebble ballast 40/60
www.blackdown.co.uk

Thermal Insulation
Alumasc EPS 300 insulation
Thickness: To suit performance requirements nominally 50mm

Accessories:
Stainless steel edge angle to restrain ballast with perforations to allow free drainage
Aluminium angles and flashing to restrain insulation board to upstands

3. Performance:
Refer to System General Requirements for Performance

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-260 LIQUID APPLIED INVERTED FLAT ROOFING SYSTEM WITH SEDUM FINISH: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Fully adhered, reinforced bitumen liquid applied inverted flat roofing system with drainage/moisture retention layer, growing medium and sedum extensive planting incorporating drainage systems.

2. Detailed Description:
Indicative Build-up as RFS-200 except:

Omit:
- Natural stone paver

Add:
- Sedum extensive planting
- Growing medium
- Drainage layer
- Vegetation barrier

Sedum Roof Growing Medium:
To be drought tolerant, low maintenance and self sustainable. Alumasc/Blackdown Green roof vegetation.
Indicative product: NatureMat by Blackdown Horticultural Consultants
Contact: www.blackdown.co.uk

Growing Medium:
Mineral & organic substrate consisting of clean virgin brushed brick, expanded clay, organis matter bark compost & greenwaste.
Indicative product: Blackdown Sedum substrate
Depth: 50mm

Drainage Layer:
Indicative product: Blackdown 25+FS Drainage layer with geotextiles thermally bonded
Depth: 26mm

Vegetation Barrier:
Pebble ballast
Type: River round
Size: 20 – 40mm variable
Depth: 70mm nominal
Width: 300mm to external perimeter edge/500mm to internal junctions and penetrations
Indicative product: Blackdown washed pebble ballast 20/40

Protection and Reinforcement Layer:
Protection sheet: Alumasc Hydrogard 40 MN
Reinforcement sheets: Flex-Flash F and Flex-Flash UN

Substrate:
Two layers of 18mm Plywood on top of steel beams. Refer Structural Engineers information
Primed with Alumasc Bitumen Primer in accordance with manufacturer's written instructions.
Surface to be dry, clean and free from all contaminants including oils, grease, dirt and debris.

Accessories:
As RFS-200 except:
Omit:
-Pedestals
Add:
- Fall Arrest system. Refer MAE section of this Specification
- Aluminium edge angle to restrain growing medium. Vertical, secured using proprietary connectors.
Depth: 100mm
- Inspection chambers
Surround: 300m diameter circle/square of 20-40mm pebble ballast
Indicative product: Harmer GR400/AC Inspection Chamber

3. Performance:
Refer to System General Requirements for Performance

As RFS-200 except:

Roof generally:
To recommendations of 'The GRO Green Roof Code' and the 'Green Roof Guidelines'.
www.greenroofguide.co.uk

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-261 LIQUID APPLIED COLD FLAT ROOFING SYSTEM WITH SEDUM FINISH: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Fully adhered, reinforced bitumen liquid applied cold flat roofing system with drainage/moisture retention layer, growing medium and sedum extensive planting incorporating drainage system.

2. Detailed Description:

As RFS-260 except:

Omit:
-Insulation

3. Performance:
Refer to System General Requirements for Performance

As RFS-260 except:
Thermal: No requirement

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-280 LIQUID APPLIED COLD FLAT ROOFING SYSTEM WITH TIMBER DECK FINISH: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Fully adhered, reinforced bitumen liquid applied cold flat roofing system with timber deck finish to external balcony areas

2. Detailed Description:

Indicative Build-up:
- Timber decking
- Pedestals
- Waterproofing layer
- Rainwater outlets
- Substrate

Timber Decking:
Species: Oak
Type: Seasoned heartwood solid plank
Size: Nominally 25 x 125mm
Lengths: 2m nominal, 600mm minimum with 300mm max support centres
Profile: Pencil round to top corners with saw-cut backs
Joint: Open, 6mm

Support: Treated softwood cross battens on adjustable Harmer Modulock or acceptable equivalent pedestals to suit the bearing capacity of insulation.
Fixing: Countersunk hex head stainless steel screw
Finish: Natural finish

Waterproofing layer
As RFS-202

Membrane to be applied to slab edge/structural support connections
TBC membrane to upstands, cills and flashings.

Rainwater outlets
Proprietary aluminium rainwater outlets
Indicative product: Harmer roof drainage
www.harmerdrainage.co.uk/

Substrate
Steel decking. Refer Structural Engineers information

3. Performance:
Refer to System General Requirements for Performance

Timber Decking
To: BS EN 335 Use Class 3 (UC 3) Sub-class 3.2 (UC 3.2) BS EN 942
Moisture Content:
Moisture content of wood and wood based products at time of installation: To: BS EN 942: Annex B Table B.1, 12 – 19% for external joinery
Slip Resistance:
Minimum Pendulum Test Value (PTV), tested in accordance with BS EN 1341: >40

Timber Decking:
All Timber decking shall be to BS 1186. Timber shall be Oak species.

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-400 UN-INSULATED SINGLE PLY MEMBRANE FLAT ROOF SYSTEM: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Fully adhered single ply roof membrane system to external balcony and canopy areas

2. Detailed Description:

Build-up:
- Single ply membrane
- Substrate

Single Ply Membrane:
Type: Spectraplan SG120 adhered TPE Membrane or acceptable equivalent BBA approved polyester, fleece-backed TPE membrane to meet the Functional, Visual and Performance Requirements

by IKO Group to Lead Designer acceptance.
IKO Group:
www.ikogroup.co.uk
Colour: Dark Grey (RAL 7011)
Thickness: 1.5mm
Falls: Laid to 1:60 falls nominal
- Adhesive: Spectrabond PU Adhesive to membrane manufacturers recommendations

Substrate:
RC concrete slab. Refer Structural Engineers information

3. Performance:
Refer to System General Requirements for Performance

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-401 UN-INSULATED PODIUM DECK ROOFING SYSTEM: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Un-insulated podium deck roofing system over RC concrete slab

2. Detailed Description:

Build-up:
- Paver and support system
- Waterproofing layer
- Accessories
- Substrate

Paver and Support System:
Refer Landscape Architects information

Waterproofing Layer:
First Coat: Hydrotech Monolithic Membrane 6125.
Reinforcement: Flex-Flash F or Flex-Flash UN, where appropriate
Second Coat: Hydrotech Monolithic Membrane 6125
Sealant applied between roofing membranes to all common building materials
Indicative product: Alumasc Derbitech Sealstick HD
Colour: Black

Accessories:
-Membrane pockets for fixing brackets to balustrades AMT (where required).
-Trays/barriers to retain protective sheeting pebble ballast but to allow water penetration.
-Aluminimum coping, metal flashing and insulating flashings
-Stainless steel studs bonded to top of paving slabs to indication roof outlet locations.

Substrate:
RC concrete slab. Refer Structural Engineers information

3. Performance:
Refer to System General Requirements for Performance

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-420 STANDING SEAM ZINC SHEET WARM ROOF COVERINGS: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Pitched, standing seam, zinc sheet warm roof coverings on profiled metal sheeting

2. Detailed Description:

Build-up:
- Zinc sheet roof coverings
- Membrane
- Insulation
-VCL layer
- Substrate

Zinc Sheet Roof Coverings:
Type: Zinc sheet roofing
Product: VMZINC Standing seam for pitched roofing generally
Contact: www.vmzinc.co.uk
Thickness: Nominal 0.8mm
Finish: VMZINC PLUS in QUARTZ-ZINC
Joints/Seams: Standing
Pitch: Nominally 68°
Fixing: In accordance with metal roofing manufacturer's recommended details
Accessories:
Profiled gutter. Refer design intent drawings
Additional requirements to be stated at later work stage

Membrane:
VMZINC Membrane to manufacturers recommendations

Insulation:
Type: Factory made rigid PIR insulation
Product: Thermaroof TR26 LPC/FM insulation by Kingspan Insulation
Contact: www.kingspaninsulation.co.uk
Thickness: 200mm comprising 2no. 100mm layers

VCL Layer:
To sheet roofing manufacturers recommendations

Substrate:
Profiled metal sheeting. Refer Structural Engineers information

3. Performance:
Refer to System General Requirements for Performance, except or in addition:

Thermal:
Thermal performance target: 0.12 W/m^2K

Factory made rigid PIR insulation:
To BS EN 13165
Compressive strength: 150kPa at 10% compression
Thermal conductivity: 0.022 W/m.K minimum

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-421 STANDING SEAM ZINC SHEET WARM ROOF COVERINGS TO DORMERS: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Pitched, standing seam, zinc sheet warm roof coverings on profiled metal sheeting to dormers

2. Detailed Description:

As RFS-420, except:

Zinc Sheet Roof Coverings:
Pitch: Nominally 3° and 90^0 vertical

3. Performance:
Refer to System General Requirements for Performance, except or in addition:

As RFS-420

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-460 LIQUID APPLIED INVERTED FLAT ROOFING SYSTEM WITH BIODIVERSE GREEN ROOF FINISH: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Liquid applied inverted flat roofing system with biodiverse green roof finish

2. Detailed Description:

Build-up:
- Biodiverse green roof
- Growing medium
- Drainage layer
- Insulation

- Waterproofing layer
- Substrate

Biodiverse Green Roof:
Refer Landscape Architects information

Growing Medium:
Refer Landscape Architects information
Depth: Nominally 130mm

Drainage Layer:
Product: 25+FS Drainage layer with thermally bonded geotextiles by Blackdown Hoticultural Consultants
Contact: www.blackdown.co.uk
Depth: 26mm nominal

Protection and Reinforcement Layer
Protection sheet: Alumasc Hydrogard 40 MN
Reinforcement sheets: Flex-Flash F and Flex-Flash UN

Insulation:
Requirement to be stated at later work stage
Thickness: 2no. 130mm layers

Substrate:
RC concrete slab. Refer Structural Engineers information

3. Performance:
Refer to System General Requirements for Performance except or in addition:

Thermal:
Thermal performance target: 0.12 W/m^2K

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-461 LIQUID APPLIED INVERTED WITH PAVER FINISH SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
xvz

2. Detailed Description:

As RFS-200, except:

Insulation:
Alumasc EPS 300 insulation
Thickness: To suit performance requirements nominally 260mm
Upstands and parapets to be insulated using 56mm Alumasc EPS upstand boards with a 6mm thick weather resistant high impact facing board.

3. Performance:
Refer to System General Requirements for Performance, except or in addition:

Thermal:
Thermal performance target: 0.12 W/m^{2}K

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-480 INSULATED LIQUID APPLIED ROOFING SYSTEM WITH COMPOSITE TIMBER DECK FINISH: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Insulated liquid cold applied flat roofing system with composite timber deck finish to balcony areas

2. Detailed Description:

Build-up:
- Composite timber decking
- Separation layer
- Insulation
- Protection and reinforcement layer
- Waterproofing layer
- Substrate

Composite Timber Decking:
As RFS-280

Separation layer:
Non-woven polyethylene geotextile vapour permeable membrane.
Indicative product: Alumasc Polyethylene Separator Sheet, installed in accordance with manufacturer's recommendations.

Insulation:
Alumasc EPS 300 insulation
Thickness: To suit performance requirements nominally 260mm
Upstands and parapets to be insulated using 56mm Alumasc EPS upstand boards with a 6mm thick weather resistant high impact facing board.

Protection and Reinforcement Layer
Protection sheet: Alumasc Hydrogard 20 MN or alternatively Alumasc Hydrogard 30 MN protection sheet if abnormally heavy site traffic is expected prior to application of topping.
Reinforcement sheets: Flex-Flash F and Flex-Flash UN

Interfaces, Outlets and Overflows:
Alumasc Flex Flash UN uncured neoprene rubber reinforcement fully encapsulated in Monolithic Membrance 6125, installed in accordance with manufacturer's recommendations.

Waterproofing Layer:
First Coat: Hydrotech Monolithic Membrane 6125.
Reinforcement: Flex-Flash F or Flex-Flash UN, where appropriate

Second Coat: Hydrotech Monolithic Membrane 6125
Sealant applied between roofing membranes to all common building materials
Indicative product: Alumasc Derbitech Sealstick HD
Colour: Black

Substrate:
New RC concrete. Refer Structural Engineers information

3. Performance:
Refer to System General Requirements for Performance

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials

RFS-481 UN-INSULATED LIQUID APPLIED ROOFING SYSTEM WITH COMPOSITE TIMBER DECK FINISH: SYSTEM SPECIFIC REQUIREMENTS

Type of Specification: Descriptive

1. Functional and Visual Description:
Un-insulated liquid applied roofing system with composite timber deck finish

2. Detailed Description:

As RFS-280, except:

Substrate:
RC concrete slab. Refer Structural Engineers information

3. Performance:
Refer to System General Requirements for Performance

4. Samples, Submissions, Mock-ups and Testing:
Refer to System General Requirements for Samples, Submissions, Mock-ups and Testing

5. Workmanship and Materials:
Refer to System General Requirements for Workmanship and Materials