ZCR Centre for Research into Rare Disease in Children
at Great Ormond Street Hospital

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Planning condition 17
To be read in conjunction with 464_27_500, 464_27_501, 464_SK_1903, 539.F.03, 539.F.04 and 539.F.08.

Fourth Floor Brown/Biodiverse Roof

Buildup:

- Proprietary hot melt liquid applied roofing system in inverted roof configurations including waterproof membrane to zero falls, thermal insulation, cover / protection board including to upstands, filter / drainage membrane and various finishes; all as recommended by the manufacturer for the particular location and finishes.
    - Preparation:
    - Substrate to be clean, dry and free from contaminants detrimental to the adhesion of the hot applied rubberised bitumen system.
    - Laitance: Remove to provide a surface to comply with roofing manufacturers and levelling screed manufacturer's requirements as applicable.
    - Carry out adhesion tests as recommended by the manufacturer.
    - Remove sharp protrusions and fill all voids with cement sand mortar.
    - Apply fully bonded levelling screed to mitigate deflections or backfalls.
- Primer applied as recommended by the roofing manufacturer brought up at all perimeters / abutments.
- Minor cracks in substrate, 1.5mm – 3mm: Polyester fabric reinforcement bedded in a 3mm thick preliminary application of the roof waterproofing in a strip 100mm each side of the crack.
- Cracks 3mm – 12mm: Reinforcement bedded in a 3mm thick preliminary application of the roof waterproofing in a strip 100mm each side of the crack.
- Preliminary local reinforcement: 150mm wide reinforcement strip to all junctions at abutment upstands, penetrations and outlets, joints and fixings in discontinuous substrates and bedded in a preliminary application of the hot melt roof waterproofing.
- Waterproof roof coating: As described, in two 3mm thick coats, with reinforcement incorporated in the first coat.
- Protection sheet: 5mm thick, polyester based root resistant elastomeric bitumen slate mineral surfaced access / protection sheet fully bonded to the second coat of roof waterproofing.
- Thermal insulation: To achieve an overall U-value of 0.15 W / sq m K.
    - Field: 240mm thick (in two layers, 140mm and 100mm) extruded polystyrene; loose laid with staggered joints.
    - Vertical: extruded polystyrene in combination with 90mm (80mm + 10mm) cementitious topped extruded polystyrene; restrained by field sheet and top edge retained by a securely fixed metal flashing.
- Filter layer: High performance non-woven polythene membrane.
- Penetrations: Sleeves to suit the pipe / duct / service and finished with preformed collars fully bonded to the membrane and clamped to the sleeve.
- Rainwater outlets: Thermally insulated with clamping detail to capture the membrane, with membrane fully sealed to the outlets; as recommended by the roofing manufacturer.
- Upper protection layer (loose laid): Root protection membrane, loose laid and lapped at all edges.
- Drainage / water storage layer loose laid on protection layer.
    - Install with one cup profile interlock on all sides and staggered.
    - Carefully cut to fit closely around penetrations and outlets.
- UV resistant filter fleece on drainage / water storage
- Seed mix to be confirmed on 70 – 200mm rubble / crushed local substrate / recycled building materials, screened for sharps / deleterious materials.
- Rubble spread to achieve varied profile including mounds; apply blinding layer of site sourced 5-20mm sub / top soil.
- 300mm wide vegetation breaks with 20 – 40mm rounded pebble infill at roof perimeters, penetrations and erosion susceptible areas.
- Integral gutters: Formed within depth of insulation; edges reinforced with manufacturer's galvanized steel corner protection over main membrane and covered with additional layer of membrane.

Planting details:
The seed mix has a coverage rate of 1Kg to 10m² of roof area. The seeds will only be sown in fair weather, as strong winds will disperse the seeds before they reach the substrate. Even coverage is gained by sowing 50% of the mix longitudinally down the roof, and then over-sown at 90° with the remainder of the seed mix.

Achillea millefolium
Anthemis tinctoria
Campanula rotundifolia
Dianthus carthusianorum
Dianthus deltoides
Fragaria vesca
Geranium sanguineum
Hieracium pilosella
Leucanthemum vulgare
Linum perenne
Muscari comosum
Origanum vulgare
Papaver rhoeas
Petrorhagia saxifraga
Potentilla argentea
Salvia pratensis
Sedum acre
Sedum album
Sedum ellacombianum/
(selskianum hort.)
Sedum hispanicum
Sedum montanum
Sedum sexangulare
Sedum spurium
Teucrium chamaedrys
Thymus pulegioides
Verbascum nigrum
Veronica spicata

Establishment
Due to the components incorporated within the seed mix there is no requirement for establishment maintenance. It is advisable to ensure that the roof surface is not trafficked other than for essential roof maintenance for the first 12 months after sowing. Bare patches can been over-sown if considered necessary, but will develop vegetative cover over time in any case. The anticipated period of establishment to provide a good vegetated cover is at least two years.

Maintenance Plan:
Maintenance will be carried out annually, during springtime and additionally in late autum. The following procedures shall be carried out in order to ensure the roof is maintained in good condition and to protect the validity of the waterproofing system. In general, the biodiversity areas shall be disturbed as little as possible during maintenance so as not to upset any micro-habitats that may have colonised.

- Safe access will be gained to the roof and relevant Health and Safety procedures will be followed when working at roof level.
- In order to avoid a build-up of bio-mass on the roof all dead vegetation will be removed with a strimmer and provision made for the debris to be safely lowered to the ground and disposed of.
- Remove unwanted leaf litter that has fallen onto the roof surface from overhanging trees both in the spring and autumn, to ensure that this does not smother the vegetation beneath.
- Open the lids of all Inspection chambers, to inspect and ensure that all rainwater outlets and downpipes are free from any blockages and that water can flow away freely.
- Ensure that any protective metal flashings and termination bars remain securely fixed in place. Advise the client of the need to repair or renew as necessary.
- Examine all mastic sealant and mortar pointing for signs of degradation. Advise the building owner of the need to repair or renew as necessary.

- Check that all promenade tiles and paving slabs are securely fixed to the roof surface and in good condition.
- Ensure that any new items of plant/equipment on the roof are mounted on suitable isolated slabs and that any fixings used to secure the plant/equipment in place do not penetrate the waterproofing.
- Plant encroachment: Any vegetation which has encroached into drainage outlets, Inspection chambers, walkways and the vegetation barriers (pebbles) should be removed. If movement/settlement of the pebble vegetation barrier has occurred, additional washed stone pebbles similar to the existing are to be added.
- Plant maintenance: In the absence of specific instructions from the building owner or their designated consultant, advice should be sought from both the project landscape designer and the plant supplier and any maintenance carried out according to their specific recommendations.
- Weeding: With the exception of saplings, which should always be removed, weeds in a biodiverse green roof should be considered as a problem only of aesthetics, unless they are particularly invasive. If considered undesirable, they can be removed.
- Fertiliser: Slow release fertilizer will be applied at a rate of 80g/m² in the early spring.
- Irrigation: The provision of watering points at roof level will allow for occasional watering in periods of prolonged drought.

Second Floor Raised Planter/ Green roof

Buildup:

- Proprietary hot melt liquid applied roofing system in inverted roof configurations including waterproof membrane to zero falls, thermal insulation, cover / protection board including to upstands, filter / drainage membrane and various finishes; all as recommended by the manufacturer for the particular location and finishes.
    - Preparation:
    - Substrate to be clean, dry and free from contaminants detrimental to the adhesion of the hot applied rubberised bitumen system.
    - Laitance: Remove to provide a surface to comply with roofing manufacturers and levelling screed manufacturer's requirements as applicable.
    - Carry out adhesion tests as recommended by the manufacturer.
    - Remove sharp protrusions and fill all voids with cement sand mortar.
    - Apply fully bonded levelling screed to mitigate deflections or backfalls.
- Primer applied as recommended by the roofing manufacturer brought up at all perimeters / abutments.
- Minor cracks in substrate, 1.5mm – 3mm: Polyester fabric reinforcement bedded in a 3mm thick preliminary application of the roof waterproofing in a strip 100mm each side of the crack.
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- Waterproof roof coating: As described, in two 3mm thick coats, with reinforcement incorporated in the first coat.
- Protection sheet: 5mm thick, polyester based root resistant elastomeric bitumen slate mineral surfaced access / protection sheet fully bonded to the second coat of roof waterproofing.
- Thermal insulation: To achieve an overall U-value of 0.15 W / sq m K.
    - Field: 240mm thick (in two layers, 140mm and 100mm) extruded polystyrene; loose laid with staggered joints.
    - Vertical: extruded polystyrene in combination with 90mm (80mm + 10mm) cementitious topped extruded polystyrene; restrained by field sheet and top edge retained by a securely fixed metal flashing.
- Filter layer: High performance non-woven polythene membrane.
- Penetrations: Sleeves to suit the pipe / duct / service and finished with preformed collars fully bonded to the membrane and clamped to the sleeve.
- Rainwater outlets: Thermally insulated with clamping detail to capture the membrane, with membrane fully sealed to the outlets; as recommended by the roofing manufacturer.
- Light Weight soil

    - Product reference: Specialist light weight soil suitable for tree planting in conjunction with a green roof system. Contractor to coordinate with green roof system manufacturer and submit proposals .
- Compost
    - Compost, if recommended by soil laboratory shall be worked into top 200mm of topsoil during final cultivation at a rate of 1 cu. m. of material per 20sq m.
    - Timing: Apply prior to cultivation.
- Ameliorants - General Fertiliser : All areas
    - Application rate: apply evenly over all planting areas at manufacturers recommended rates for amenity planting.
    - Timing: Immediately prior to cultivation
- Peat
    - Peat or products containing peat: Do not use.
- Contamination
    - General: Do not use topsoil contaminated with subsoil, rubbish or other materials that are:
    - Corrosive, explosive or flammable.
    - Hazardous to human or animal life.
    - Detrimental to healthy plant growth.
    - Subsoil: In areas to receive topsoil, do not use subsoil contaminated with the above materials.
    - Give notice: If any evidence or symptoms of soil contamination are discovered on the site, or in topsoil to be imported.
    - Dispose of any contaminated soil as instructed by CA.
- Weed Contamination
    - All soils stockpiled or spread shall be free of weeds prior to cultivation.
    - Apply Glyphosate at appropriate time to ensure its activity. Re-apply if required.
- Mulching Planting Beds - Composted Fine Bark Mulch
    - Material: Melcourt Pine Mini Mulch, or similar approved - with nominal particule size Range 3-18mm.
    - Purity: Free of pests, disease, fungus and weeds.
    - Preparation: Clear all weeds. Water soil thoroughly.
    - Coverage: 50mm layer to be spread over all planting areas..
    - Finished level of mulch: max. 30 mm below adjacent paved areas or planter edge.
    - No plants shall be buried beneath mulch. All topgrowth and/or perennial crowns shall be freed from mulch layer.

For Planting details refer to drawings 539.F.03, 539.F.04 and 539.F.08.

Maintenance:

Principal Operations

- The principal operations required are:
- Regular inspection of Trees
- Minor tree works
- Weeding and cultivation of planted areas
- Regular monitoring of automated irrigation system (specified by others) and additional hand watering if required
- General litter collection from soft landscape areas
- Leaf litter removal
- Sweeping of paths and hard surfaces and gravel
- Path maintenance
- Other works as specified below

Other operations of a less general nature will be required according to the dictates of normal good horticultural practice and the requirements of the site. These may include hand weeding, pest and disease control and the like. All such operations shall form part of the normal contract works and the Contractor shall be deemed to have allowed for such items in the tender

Watering

- Quantity: Trees to be manually irrigated through watering pipes, equipped with slow difussion reservoirs. Ensure that the trees are watered thoroughly and that the water filled all tanks.
- Application: Do not damage or loosen plants.
- Compacted soil: Loosen or scoop out, to direct water to rootzone.
- Frequency: As necessary for the good establishment and continued thriving of all planting.
- Special consideration must be given to early autumn watering for planted trees. Regular monitoring of water content in planters and and tree pots to ensure adequate moisture level. Contractor to take a

soil sample before watering from immediate tree surrounding/ rootball and assess moinsture level before watering.

Herbicide And Pesticide Application

- Notification: As properties on the site will be in occupation during the maintenance period. The landscape contractor will inform the SM a minimum of 48 hours and a maximum of 7 days prior to each intended application of herbicide and detail the locations to be treated.
- All applications of herbicide shall be undertaken in strict accordance with the Control of Substances Hazardous to Health (COSHH) Regulations and the Control of Pesticides Regulations 1986 by licensed operators.
- All handling, storage and application of herbicides and pesticides to be in accordance with Soft Landscape Preamble of general matters

Shrubs/Perennials

- To be maintained by skilled operators only.
- All works shall be carried out in accordance with good horticultural practice in accordance with the requirements of the species
- Soil and mulch levels shall be as specified at all times.
- All arisings are to be removed from site and beds left in a neat raked condition.
- Gaps in planting: Refill by replanting.
- Watering:
    - New plants: Before and after planting out.
    - Ongoing: As necessary for the continued thriving of all planting.
- Regularly monitor for signs of pests and disease, if found - report to CA and LA with recommendations for appropriate treatment
- Note: Lavender and similar plants to be cut back immediately after flowering (approx. early August) to allow for re-growth before dormancy period.

Shrubs/Trees/Hedges

Establishment Of New Planting

- Duration: from time of planting to Final Completion handover.
- Weed control:
    - Method: Keep planting beds clear of weeds by hand weeding or chemical methods as appropriate.
    - Area: Maintain a weed free area around each tree and shrub, minimum diameter the larger of 1 m or the surface of the original planting pit.
- Soil condition: Fork over beds to keep soil loose, with gentle cambers and no hollows. Do not reduce depth or effect of mulch.
- Trees: When in leaf, spray crowns during warm weather after dusk.
- Watering: As required to ensure healthy establishment of all plants..

Fertilizer

- Time of year: March or April.
- Type: Slow release.
- Spreading: Spread evenly. Carefully lift and replace any mulch materials.
- Application rate: As manufacturer's recommendations.

Refirming Of Trees And Shrubs

- Timing: After strong winds, frost heave and other disturbances.
- Refirming: Tread around the base until firmly bedded.
- Collars in soil at base of tree stems, created by tree movement: Break up by fork, avoiding damage to roots. Backfill with topsoil and refirm.

Pruning Operations Generally

- Pruning: In accordance with good horticultural and arboricultural practice.
- Removing branches: Do not damage or tear the stem or bark.
- Wounds: Keep as small as possible and cut cleanly back to sound wood.
- Cutting: Make cuts above and sloping away from an outward facing healthy bud, angled so that water will not collect on cut area.
- Larger branches: Prune neither flush nor leaving a stub, but using the branch bark ridge or branch collar as a pruning guide.
- Appearance: Thin, trim and shape each specimen appropriately to species, location, season, and stage of growth, leaving a well balanced natural appearance.
- Use clean sharp secateurs, hand saws or other approved tools. Trim off ragged edges of bark or wood with a sharp knife.
- Disease or infection: Give notice if detected.

- Contractors shall only use suitable pruning equipment. All dead wood shall be cut out cleanly, suckers removed and the plants pruned, trimmed, thinned out shaped and tied in at the appropriate time as necessary according to kind, species and variety in order to achieve the above objectives. Pruning shall not be carried out in such a manner that tops are sheared off.

Pruning Of Excessive Overhang

- Timing: as necessary.
- Operations: Remove growth encroaching onto grassed areas, paths, roads, signs, sightlines and road lighting luminaires.

Pruning Of Excessive Height

- Timing: as necessary.
- Operations: Remove excessive height to avoid obstructions to sight lines and obstructions to light at windows. Shrubs beneath windows shall not be allowed to grow above cill level at any time

Pruning Trees And Shrubs

- Standard: To BS 7370-4.
- Special requirements: All tree works shall be carried out by an arboricultural specialist who is a current member of the Arboricultural Association.

Formative Pruning Of Young Trees

- Standard: Type and timing of pruning operations to suit the plant species.
- Time of year: Do not prune during the late winter/ early spring sap flow period.
- Young trees up to 4 m high: Crown prune by removing dead branches and reducing selected side branches by one third to preserve a well balanced head and ensure the development of a single strong leader.
- Remove duplicated branches and potentially weak or tight forks. In each case cut back to live wood.
- Whips or feathered trees: Do not prune.
- Operatives: Member of the Arboricultural Association only.

Pruning Ornamental Shrubs

- General: Prune to encourage healthy and bushy growth and desirable ornamental features, e.g. flowers, fruit, autumn colour, stem colour.
- Suckers: Remove by cutting back level with the source stem or root.

Pruning Flowering Species Of Shrubs And Roses

- Time of year:
- Winter flowering shrubs: Spring.
- Shrubs flowering between March and July: Immediately after the flowering period.
- Shrubs flowering between July and October: Back to old wood in winter.
- Rose bushes: Early spring to encourage basal growths and a balanced, compact habit.

Removal Of Dead Plant Material

- Operations: At the end of the growing season, check all shrubs and remove all dead
- foliage, dead wood, and broken or damaged branches and stems.

Dead And Diseased Plants

- Removal: Following notification to CA and LA in monthly report (see Clause 108 above.
- Replacement: In the next scheduled round of replacement planting.
- WEED CONTROL GENERALLY
- Weed tolerance: At all times, weed cover less than 5% and no weed to exceed 100 mm
- high.
- Adjacent plants, trees and grass: Do not damage.

Hand Weeding

- General: Remove weeds entirely, including roots.
- Disturbance: Remove the minimum quantity of soil, and disturb plants, bulbs and mulched
- surfaces as little as possible.
- Completion: Rake area to a neat, clean condition.
- Mulch: Reinstate to original depth.

Herbicide To Kill Regrowth

- Type: Suitable foliar acting herbicide to kill regrowth.
- Timing: Allow recommended period for herbicide to take effect before clearing dead weeds.

Weed Control With Winter Herbicide

- Type: Suitable residual soil acting herbicide.
- Time of year: Unless otherwise agreed, complete before end of March.
- Timing: Allow recommended period for herbicide to take effect before clearing dead weeds.

Weed Control With Summer Herbicide

- Type: Suitable foliar acting herbicide.
- Timing: Allow recommended period for herbicide to take effect before clearing dead weeds.

Digging Over

- General: Dig over beds. Do not damage existing plants, bulbs and roots.

- Depth of dig (minimum): 100 mm.

Soil Aeration

- Compacted soil surfaces:
- Prick up: To aerate the soil of root areas and break surface crust.
- Size of lumps: Reduce to crumb and level off.
- Damage: Do not damage plants and their roots.

Soil Level Adjustment

- Level of soil/mulch at edges of beds: Reduce to 50 mm below adjacent grass or hard
- surface.
- Arisings (if any): Spread evenly over the bed.

Maintenance Of Loose Mulch

- Thickness (minimum): 50 mm.
- Top up: prior to Final Coimpletion inspection.
- Mulch spill on adjacent areas: Remove weeds and rubbish and return to planted area.
- Weeding: Remove weeds growing on or in mulch by hand weeding or chemical control as
- appropriate.

Tree Work

Scope Of Operations

- Minor tree works that can be carried out by skilled horticultural labour from the ground or with a long handled pruner only, are.to be included within the scdope of the soft landscape maintenance contract.
- All other arboricultural works shall be carried out by an arboricultural specialist, currently a member of the Arboricultural Association
- All Standard trees shall be inspected at least once per month to ensure that they are stable in the ground and are growing vertically.
- Check base of tree for 'rocking'. Straighten tree, re-stake if required, fill voids with topsoil and firm up, as required.
- Check trees for signs of damage to stem, crown or branches. Cut back broken branches.
- Prune to shape if necessary.

Tree Work Generally

- Identification: Before starting work agree which trees, shrubs and hedges are to be removed or pruned.
- Protection: Avoid damage to neighbouring trees, plants, property etc..
- Standards: To BS 3998 and Health & Safety Executive (HSE) 'Forestry and arboriculture safety leaflets'.
- Removing branches: Cut as Arboricultural Association Leaflet 'Mature tree management'.
- Cut vertical branches similarly, with no more slope on the cut surface than is necessary to shed rainwater.
- Appearance: Leave trees with a well balanced natural appearance.
- Chain saw work: Operatives must hold a Certificate of Competence.
- Tree work: To be carried out by an approved member of the Arboricultural Association.

Additional Work

- Defective, diseased, unsafe or weak parts of trees additional to those scheduled for attention: Give notice if detected.
- Prevention of wound bleeding Standard: To BS 3998, clause 8.
- Prevention of disease transmission Standard: To BS 3998, clause 9 and Appendix B.

Cleaning Out And Deadwooding

Remove:

- Dead, dying, or diseased wood, broken branches and stubs.
- Fungal growths and fruiting bodies.
- Rubbish, wind blown or accumulated in branch forks.
- Wires, clamps, boards and metal objects, if removable without causing further damage and not part of a support structure that is to be retained.
- Other unwanted objects, e.g. tree houses, swings.
- Climbing plants if scheduled.

Cutting And Pruning Generally

- Removing branches: Do not damage or tear the stem.
- Wounds: Keep as small as possible, cut cleanly back to sound wood leaving a smooth surface, and angled so that water will not collect on the cut area.
- Cutting: Cut at a fork or at the main stem to avoid stumps wherever possible.

- Large branches: Remove only with prior approval.
- Remove in small sections and lower to ground with ropes and slings.
    - Dead branches and stubs: When removing, do not cut into live wood.
    - Unsafe branches: Remove epicormic shoots and potentially weak forks that could fail in adverse weather conditions.
    - Disease or fungus: Give notice if detected. Do not apply fungicide or sealant unless instructed.

Special Cutting And Prunning Requirements
Above normal maintenance requirements the following plants will require special care as following:

- Taxus baccata - to be clipped twice a year, in June and and late August/September to maintain the sharp lines and edges of the grid design.
- Hyssopus officinalis - can be left for the first season, but over successive years it will get leggy, so best to trim back mid season.
- Mentha piperita - cut back in June and if necessary again in August to encourage a fresh, dense re-shooting.
- Epimedium x yougiianum 'Niveum' - cut back annually after flowering in May/June.

Bark Damage
Wounds:

- Do not attempt to stop sap bleeding.
- Bark: Remove ragged edges using a sharp knife.
- Wood: Remove splintered wood from deep wounds.
- Size: Keep wounds as small as possible.
- Liquid or flux oozing from apparently healthy bark: Give notice.

Cavities In Trees

- Remove rubbish and rotten wood. Probe the cavity to find the extent of any decay, and give notice.
- Water filled cavities: Do not drain.
- Sound wood inside cavities: Do not remove.
- Cavity openings: obtain further instructions.