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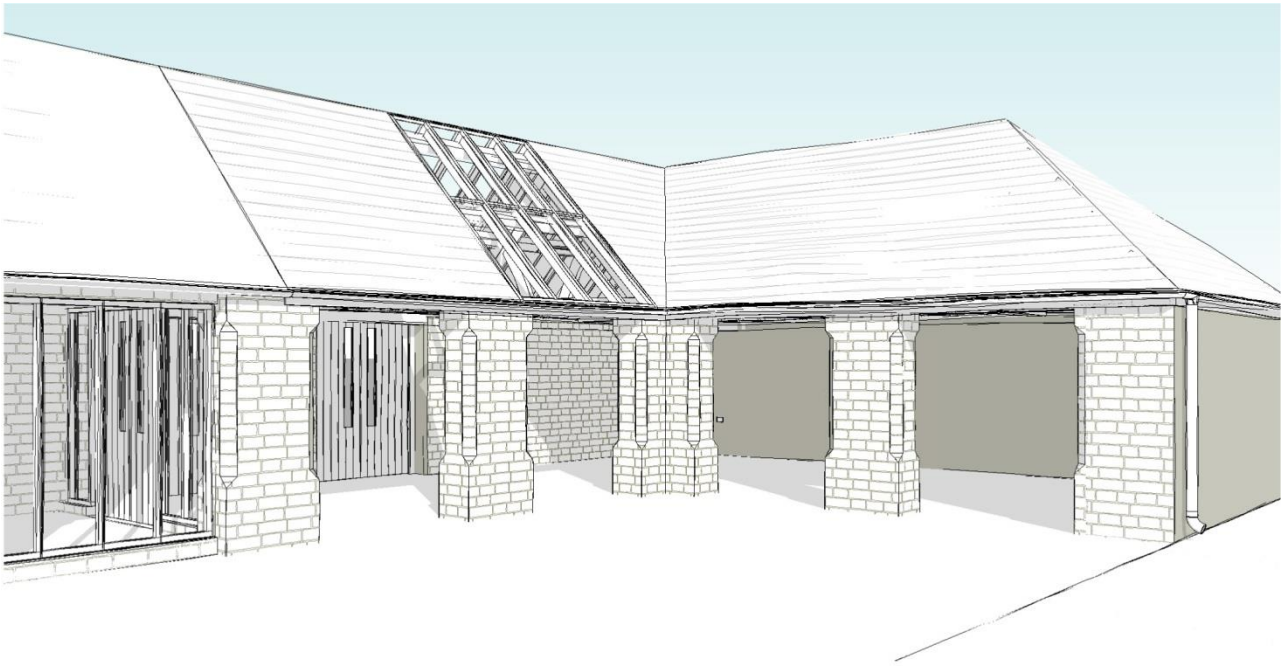
The Demonstration Building

Architectural Specification of Works

1807
11 October 2018



at

WESTONBIRT
The National Arboretum
Tetbury
Gloucestershire
GL8 8QS

Issue	Date	Purpose	Issued by
T1	11.10.18	Tender WIP	DS
A	24.10.18	Tender	DS
B	4.12.18	Tender – client changes + updates	DS

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A PRELIMINARIES

A10 PROJECT PARTICULARS

110 NAME & LOCATION:
Westonbirt,
The National Arboretum,
The Wood Center, formerly Plant Center,
Tetbury, Gloucestershire,
GL8 8QS
NATURE OF WORKS:
New open air building on existing piers and walls to house demonstration.
LENGTH OF CONTRACT:
To be confirmed.

120 EMPLOYER, CONTRACT ADMINISTRATOR:
The Forestry Commission, Westonbirt, The National Arboretum, The Wood Center, Tetbury, Gloucestershire, GL8 8QS
Contact
Chloe Gilbert T: 0300 0674 269
E: chloe.gilbert@forestryengland.uk

130 PRINCIPAL CONTRACTOR:
TBC

140/150 ARCHITECT, PRINCIPAL DESIGNER:
Batterham Smith Architects
1 Tollbridge Studios, Tollbridge Road, Bath, BA1 7DE
T: 01225 851 122
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200 STRUCTURAL ENGINEER:
James Birdwood
BTA Structural Design Ltd
Street Farmhouse, Shipton Moyne, Tetbury, GL8 8PN
T: 01666 880532
E: james@bta.co.uk

A11 TENDER & CONTRACT DOCUMENTS

110 The tender documents comprise the following:
Architectural drawings 1807-**001**, 1807-**006** + 1807-**007**,
Specification,
Structural drawings,
The contract drawings to be the same as the tender drawings.

A12 THE SITE / EXISTING BUILDINGS

110 The Site:
The new building is located on the East end of the wood shop within the Wood Centre yard area at Westonbirt Arboretum, GL8 8QS.

140 Existing Utilities and Services:
Electrical requirements for lights and power sockets to be supplied from existing ring main within the shop.

170 Site Investigation:
Structural engineer to have made visit to site to assess the structural stability and bearing capacity of existing piers and walls. Structural Engineer can be contacted for further information.

180 Health and Safety Hazards:
Westonbirt is a visitor attraction and members of the public will be in the grounds of the Arboretum during the works. Any vehicle movements outside of the contractor designated area should therefore take consideration of this.

	A bridle path runs adjacent to the yard. The contractor is to be mindful of this and to notify the client of any operations, vehicle or otherwise that may affect its use. Flood risk – Zone 3.
A12.05	Contractor's Compound: Allow for sufficient secure Heras fencing to isolate the Yard from the Wood Centre during the works.
A13	DESCRIPTION OF THE WORK
120	The Works: To erect a new green oak framed roof with reconstituted Cotswold stone tiles over existing masonry piers and walls to provide a covered demonstration area. Supply and install electrical requirements. **All timber to be supplied by client.**
121	It is a requirement of this project that the timber work associated with the frame will be carried out in public view onsite within the Yard, in order to align with Westonbirt and the Forestry Commission's ethos of sustainability and the promotion of timber working.
A20	CONTRACT
	JCT Minor Works Building Contract (MW) 2016 Edition • Requirement: Allow for the obligations, liabilities and services described.
	CONTRACT PARTICULARS
Clause 2.8	LIQUIDATED DAMAGES At the rate of *TBC* per week or part thereof.
Clause 2.10	RECTIFICATION PERIOD Period: 12 months from the date of practical completion.
Clause 4.3	INTERIM PAYMENTS Interim Valuation Dates: The first Interim Valuation Date is: *TBC*. Thereafter at intervals of: one month. Payments due prior to practical completion: Percentage of total value of the work etc.: 95%. Payments becoming due on or after practical completion: Percentage of the total amount to be paid: 97.5%.
A30	TENDERING/ SUBLETTING/ SUPPLY
	MAIN CONTRACT TENDERING
145	TENDERING PROCEDURE: Main contractors will be expected to comply with the timescales and requirements set out in this documentation, and accompanying invitation to tender letter.
160	EXCLUSIONS / QUALIFICATIONS: Inform the client if any parts of the work as defined in the tender documents cannot be tendered or need to be qualified.
170	ACCPETANCE OF TENDER: No guarantee is offered that any tender will be recommended for acceptance or be accepted. And no payment will be made to reimburse costs incurred during the tendering process.
190	PERIOD OF VALIDITY: After submission, keep tender open for consideration for not less than 3 months.
	PRICING / SUBMISSION OF DOCUMENTS
250	PRICED DOCUMENTS: Where measurements are not stated ascertain from the drawings. Costs relating to items, which are not priced, will be deemed to have been included elsewhere in the tender.
310	TENDER: Tenders must include for all work shown or described in the tender documents as a whole or clearly apparent as being necessary for the complete and proper execution of the Works. Initially submit a completed form of tender.

530	SUBSTITUTE PRODUCTS: If an alternative product to that specified is proposed, obtain approval before ordering the product.
550	HEALTH AND SAFETY INFORMATION: Include a copy of the contractor's health and safety policy document.
A32	**MANAGEMENT OF THE WORKS**
110	SUPERVISION: Accept responsibility for coordination, supervision and administration of the Works.
120	INSURANCE: Before starting work on site submit details, and/ or policies and receipts for the insurances required by the Conditions of Contract. This will include professional and public liability and professional indemnity insurances.
	PROGRAMME / PROGRESS
210	PROGRAMME: When requested and before starting work on site, submit a master programme for the Works.
A33	**QUALITY STANDARDS / CONTROL**
	STANDARDS OF PRODUCTS AND EXECUTIONS
110	INCOMPLETE DOCUMENTATION: General: Where and to the extent that products or work are not fully documented, they are to be: • Of a kind and standard appropriate to the nature and character of that part of the Works where they will be used. • Suitable for the purposes stated or reasonably to be inferred from the project documents.
	ACCURACY / SETTING OUT GENERALLY
330	APPEARANCE AND FIT: Tolerances and dimensions: If likely to be critical to execution or difficult to achieve, as early as possible either submit proposals; or arrange for inspection. General tolerances (maximum): To BS 5606, tables 1 and 2.
	SUPERVISION / INSPECTION / DEFECTIVE WORK
510	SUPERVISION: In addition to the constant management and supervision of the Works provided by the Contractor's person in charge, all significant types of work must be under the close control of competent trade supervisors to ensure maintenance of satisfactory quality and progress.
620	MEASURES TO ESTABLISH ACCEPTABILITY General: Wherever inspection or testing shows that the work, materials or goods are not in accordance with the contract such rectification measures: Will be at the expense of the Contractor. Will not be considered as grounds for revision of the completion date.
	WORK AT OR AFTER COMPLETION
730	MAKING GOOD DEFECTS: Remedial work: Arrange access with the employer. Rectification: Give reasonable notice for access to the various parts of the Works. Completion: Notify when remedial works have been completed.
A34	**SECURITY/ SAFETY/ PROTECTION**
	SECURITY, HEALTH AND SAFETY
140	CONSTRUCTION PHASE HEALTH AND SAFETY PLAN Submission: Present a simple construction phase health and safety plan to the Employer/ Client prior to commencing onsite.
	PROTECT AGAINST THE FOLLOWING
330	NOISE AND VIBRATION Standard: Comply with the recommendations of BS 5228-1, in particular clause 7.3, to

minimize noise levels during the execution of the Works.

430	WASTE Includes: Rubbish, debris, spoil, surplus material, containers and packaging. General: ***Minimize production. Prevent accumulations. Keep the site and Works clean and tidy.*** Handling: Collect and store in suitable containers. Remove frequently and dispose off site in a safe and competent manner: Non-hazardous material: In a manner approved by the Waste Regulation Authority. Hazardous material: As directed by the Waste Regulation Authority and in accordance with relevant regulations. Recyclable material: Sort and dispose at a Materials Recycling Facility approved by the Waste Regulation Authority. Voids and cavities in the construction: Remove rubbish, dirt and residues before closing in. Waste transfer documentation: Retain on site. Note: Timber: Contact Wiltshire Wood Recycling for paid collection of all timber waste The Milking Parlour, East Combe Farm, Castle Combe, Wiltshire, SN14 7EY Tel: 01249 783499 / Mobile: 07436 535209 Email: info@wiltshirewoodrecycling.org.uk
	PROTECT THE FOLLOWING
520	ROADS AND FOOTPATHS Duty: Maintain roads and footpaths within and adjacent to the site and keep clear of mud and debris. Damage caused by site traffic or otherwise consequent upon the Works: Make good to the satisfaction of the Employer, Local Authority or other owner.
560	EXISTING FEATURES Protection: Prevent damage to existing fences, gates, walls, roads, and other site features, which are to remain in position during execution of the Works. Rectify any damages caused.
A35	SPECIFIC LIMITATIONS ON METHOD/ SEQUENCE/ TIMING
140	SCAFFOLDING Scaffolding: Allow for means of erecting and cladding the timber frame including suitable scaffolding, mobile or otherwise as deemed necessary.
170	WORKING HOURS Specific limitations: 8am – 5pm, Monday to Friday unless prior agreement has been sought with the client.
A36	FACILITIES/ TEMPORARY WORK/ SERVICES
220	SITE ACCOMMODATION Facilities: Contractor to provide a provisional sum cost for providing suitable temporary accommodation including sanitary accommodation for contractor's use as required to meet HSE requirements.
	TEMPORARY WORKS
340	NAME BOARDS/ ADVERTISEMENTS General: Contractor to provide board for Consultants and contractors name boards. The use of sign boards and their positioning needs to be agreed with the client before erection.
	SERVICES AND FACILITIES
420	LIGHTING AND POWER Supply: Contractor to connect to supply provided by client.

B CONTINGENCY

B.01	CONTINGENCY : Allow for 10% contingency allowance.

C DEMOLITION / ALTERATION / RENOVATION

C20	DEMOLITION
C20.01	Remove tops of walls + piers to accommodate new timber members. Refer to sections on sheets **1807-006** and **1807-007**.
C20.02	Remove planter in north east corner and make good tarmac beneath.
C20.03	Test existing cables on top of north wall to determine if they are live and if so their purpose.
C41	REPAIRING/RENOVATING/CONSERVING MASONRY
C41.01	Refer to structural specification for restorative works to the masonry walls and piers

D GROUNDWORK

NOTE : Below ground works to be carried out under a separate contract.

D20	EXCAVATING AND FILLING
D20.01	No ground works are foreseen.

E CONCRETE

NOTE : Below ground works to be carried out under a separate contract.

E 05	IN SITU CONCRETE CONSTRUCTION
E 05.01	See Structural Engineers information

G STRUCTURAL

GREEN OAK FRAME

SCOPE:

It is anticipated that all timber will be provided by Westonbirt, it has been seasoned and stacked and brought to site ready for the frame to be constructed.

The structural engineer has provided calculations to ensure that the frame is appropriately sized and braced. However it is the responsibility of the framer to ensure that all timber chosen is suitable for its intended use and joints meet the structural requirements. Appropriate fabrication drawings are to be included within the tender cost.

OAK SPECIFCATION:

A number of different 'standards' exist, and many companies operate to different standards. The specifications to be used on this project are based on Carpenter Oak's specification:
'British' Specification: A spec that blends the highest grade possible at reasonable cost and ease of sourcing.
'European' Specification: A spec that is lower than the 'British' spec, but still roughly equates to the European standard of QPA (the highest European standard). Note: QP1, is a considerably lower grade and this will not be accepted.

The timber selection policy is designed to provide the highest standard of framing, while minimising waste through the careful usage of timbers where 'defects' exist, but are not important to the performance of the frame. As such, it does not slavishly adhere to any one specification, but looks to take the best from each, in a way that provides the optimal balance of structure/aesthetics and cost. If this system is not used then an equal equivalent way of grading the timber should be used.

The stages of the grading process are as follows:

Each Project will be allocated either:
British Specification (BS), or
European Spec (ES),

TRADA recommend the use of C ('General Framing') for most members, with the use of B ('Special Framing') for 'highly stressed and spanning members'.

Timber is to be visually inspected and graded according to the above specifications. Timbers failing to meet the minimum standards of TRADA's respective C and B grades, depending on their function in the building will be rejected.

Where the timber passes the TRADA spec, but falls short of the designated BS or ES specification for the project, Timber Graders, in conjunction with the Carpentry Teams will examine each individual timber and its function in the building to see if its use is appropriate.
If so, the timber will be accepted, and carefully oriented in the frame.
If not, it too will be rejected.

FIXINGS - TAPERED PEGSs:
Cleft from straight grained oak; free of shake, brown stain, and distortion
10 inches/250mm to 13 ½ inches/ 335mm long, drawn into octagonal section. The peg target diameter is measured at the half way point to ensure tight fit after driving.
The upper half is shaved to the square of the target diameter – 0/ + 3mm. The corners are then chamfered to octagonal and the lower half tapered. The tip is chamfered to aid driving the offset.
Pegs should be between 16 - 20% moisture content to avoid brittleness or over flexibility.
There are also square pegs with no taper, and die driven dowels. Dowels are standard for tie collars and arch braces /tension joints where both sides of the mortice must be working fully.

OTHER FIXINGS:
As per B.S. 5268

TIMBER HANDLING:
Timber is to be provided by Westonbirt. Framer to establish grading and suitability for use and ensure sufficient quantity for use.

Moisture content to be measured with a meter by driving the prongs into the timber away from the end grain.
Moisture content should be to specification, but as a guide:
Green timber 24% and over
Air Dry 15-19%
Kiln dry 10-15%
If the moisture content is a critical part of the design for structural or any other reason then the timber should be ordered over length to allow a piece to be cut off, and the core moisture content checked, away from the end grain.

Timber to be stored clear of the ground on minimum 75mm bearers. Support adequately to avoid any undue bow. Use shading mesh in summer to slow checking.

Timber stored for over two months should be under cover if discoloration is undesirable.

Stainless Steel covers for forklifts, non-ferrous banding to be used.

CUTTING JOINTS AND ORIENTING TIMBER:
Defects:
Knots, wane, shakes and other defects should be avoided at joints or stressed areas. Where possible place knots in compression. Any defects that are discovered upon cutting a joint would require re-grading and following assessment of its impact dealt accordingly.

If wane and sapwood is specified it must be orientated away from exterior faces – "heart out". Timber in exposed exterior locations should be orientated to drain downwards i.e. upended.

Appearances.

Select and place timbers with thought and reasoning to use the grain direction and any figure. Match or mix curves and shapes etc. Tapers to be placed consistently. Any taper should be narrow "top up" unless noted.

All corners to be "arrised" with a plane to 2 - 3mm.

Any damage to arrises or lost sap may be faired in if appropriate. This must be considered in relation to the edge use e.g. for a glazed edge this would be unacceptable.

No break out to peg-holes or torn edges. Softwood and Air Dry timbers to be drilled from both sides.

Frame to be cut as per drawing. No mis-cut or blocked mortices acceptable, unless the patch a) has not structural implications, and b) is not visible.

ACCURACY IN FABRICATION

Joints to be cut within a 1.5-mm tolerance. (Mortices to be over deep to allow avoid tenons grounding 10-15% of tenon length).
Frame dimensions to be within -5 to +0mm at overall and principal datum points.
Openings to be within these tolerances i.e. – 0 to +5 mm. (Note that this does not apply to members that can reasonably be pulled in whilst fixing following materials e.g. if a bowed joist or rafter at its centre stands proud of the adjacent joists, but once floored or battened, lays flat.)
As guide peg-holes to be offset by 3mm to draw the shoulders tight. Off set to be positioned to maximise the direction of draw: e.g. at right angles to shoulder for a stud, and plumb from the apex for a principal rafter bridle, or bias to the outer corner shoulder of a brace mortice.
All work to be checked by the Team Leader or Assistant following workshop assembly prior to dismantling. Any deviation to be remedied. Sign off by Team Leader noted and dated in file.
All other accuracies as below.
As-built frame should comply with drawings.

ERECTION ON SITE:

Brace the frame thoroughly until self-stable. Select an appropriate temporary fixing at method statement stage.
Drive pegs so that the face-side peg hole is fully closed, and the inner mortise wall fully engaged for a min of 25mm. Cut pegs approx. 10mm from face; 10mm from rear where in areas of rub or traffic or leave long to taste elsewhere (an aesthetic consideration).
Remove all off-cuts as work proceeds.

Nailing

Spacing, edge and end distances as per BS 8000-5:1990. For visible oak work use rose head nails, pre-drilled.
Pilot the fixed timber to the greater shank dimension, and orientate the wedge into/with the grain.

Screwing

As per BS 8000-5:1990

Pelleting

As per BS 8000-5:1990
Counter sinks to allow for a minimum pellet depth of 6mm.

Bolting

As per BS 8000-5:1990
Drill holes to be max 2mm greater than bolt
Washers to be placed under head and nut.
Tighten so that washers just begin to bite the timber
Bolts to project from the nut a minimum of one full thread. Visible bolts to project a maximum of three threads and be burred off.
It may be a job specific requirement of the structural engineer that bolts need re-tightening as the timber dries out (building design must accommodate this). Tightness checks should occur on completion by the team leader, and then by the client as specified following enclosure/completion of the structure. Any pelleting should be designed with access in mind.

Gluing

As per BS 8000-5:1990

Follow glue manufacturer's recommendations
Glazed surfaces to be sanded first.
"Site gluing of any type should be undertaken only in exceptional circumstances"
Connectors
As per BS 8000-5:1990
Finish
Band sawn left as is.
Note: the accuracy is assumed when frame is green and not when any seasoning has occurred.

SITE ACCURACY	
Accuracy Criteria – all measured on/to face or from centre as per frame drawing dimensioning.	(All work will be to this class unless specified otherwise)
AC1. Overall frame, principle members, and "up to opening" plan dimensions including square.	±5mm
AC2. Joints.	a) All principal load bearing joints within 1.5mm tolerance. b) Secondary members within 1.5mm tolerance for mortice and tenons, and same for 50% of shoulders. Max tolerance deviation 2.5% of length of the longest face or 5mm which ever is less.
AC3. Spacing of frame members	± 5mm
AC4. Level of horizontal members length end to end	up to 3m: 5mm up to 6m: 7mm max over 6m: max 10mm
AC5. Flatness variation across frames. Measured by the bay 90 degrees to members.	2mm between adjacent joists, studs or rafters Across 3m: 4mm/m Across over 3m: 12mm max
AC6. Verticality of frames measured at top and bottom	Up to 3m: 20mm over 3m: max 20mm
AC7. Verticality of roof components measured from wall plate to apex	1m - 10mm 2m - 15mm 3m - 20mm 4m - 25mm max

SAND BLASTING TO FRAME:
The frame is to be left untreated and therefore care should be taken not to unnecessarily stain the frame before or during erection. Any unsightly footprints or mud should be carefully cleaned off the oak, however a certain amount of water or ferrous staining is to be expected.

G20 CARPENTRY/ TIMBER FRAMING/ FIRST FIXING

G20.01 FIXING TO GREEN OAK

The primary frame is made of green oak. It is easy to cut and fabricate when green but will move and shrink when it dries. The majority of this movement takes places within the first 18 months. The oak frame tends to shrink about its centre axis about 5-7% If this is not allowed for unacceptable movement can be transferred to adjacent structures or cladding.

H CLADDING/ ROOFING

H10 PATENT GLAZING

H10.01 PATENT GLAZING

Location : glazed roof over the entry
- Drawing reference(s): 1807-006, 1807-007
- Supporting structure: continuous timber rafters (minimum 50mm wide) positioned under

each glazing bar. Additional timber rails also required (minimum 50mm wide) at the top and bottom positions of the structure. All timber work measured elsewhere
- Patent Glazing system: To BS 5516, with performance criteria as specified in this section.
- Manufacturer and reference: The Standard Patent Glazing Company Ltd, Flagship House, Forge Lane, Dewsbury, West Yorkshire, WF12 9EL. Tel :01924 461213. www.patent-glazing.com
- Type: two-edged supported system
- Glazing bar: 'RAFTERLINE' type non-structural glazing bar with PC1 screw on & PC2 snap on caps.
- Material: Grade 6063 temper T6 aluminium alloy, conforming to BS EN 755-2.
- Finish: All sections to be polyester powder coated to BS 6496 and as section Z31.
- Colour/texture: a non-metallic RAL matt colour from the standard range, to be chosen by the client on site. Contractor to advise client of lead times so that the choice of colour does not adversely affect the programme.
- Minimum film thickness: 40 micrometres
- Glazing Bar Spacing: 600mm
- Slope: to suit location
- Bottom overhang/lap: 75mm
- Pane/infilling material(s): Single Glazed with panes of 6mm Clear (Heat Soaked) Toughened glass
- Flashings/Weatherings: dress only others code 4 lead flashings to perimeter positions (Lead flashings measured elsewhere)
- Incorporated components:

H10.02 DESIGN

- Complete detailed design of the patent glazing in accordance with BS 5516 and the requirements of this specification.
- Coordinate detailed design with that for all related works.
- Submit detailed design to the CA before commencement of patent glazing work.

H10.03 DESIGN/PERFORMANCE REQUIREMENTS

GENERALLY: Performance requirements specified in this section apply to the entire patent glazing assembly, including flashings and junctions with adjacent parts of the building. Full allowance must be made for deflections and other movements.
INTERGRITY: Calculate size(s) and spacing(s) of glazing bars, thickness of glazing/infilling, types and locations of fixings and other structural requirements in accordance with BS 5516 and BS 6399: Part 2 (making due allowance for any internal pressure) to ensure that the patent glazing will resist all dead loads and design live loads, and accommodate all deflections and thermal movements without damage.
- Basic wind speed (Vb): ……..m/s.
- Altitude factor (Sa): ……
- Directional factor (Sd): Determine from BS 6399:part 2, Table 3.
- Seasonal factor (Ss): 1.
- Probability factor (Sp): 1.
- Terrain and building factor (Sb): Determine from BS 6399: Part 2, Table 4.
- Size effect factor: Determine from BS 6399:Part 2, Figure 4.
- Snow load: Determine from BS 6399:Part 3.
- Permanent imposed loads: ……..

WATER PENETRATION onto internal surfaces or into cavities not designed to be wetted must not occur when the patent glazing is tested in accordance with Centre for Window and Cladding Technology, Test methods for curtain walling, section 5 to a peak positive pressure of …… Pascal's.

THERMAL SAFETY: Glazing units must have adequate resistance to thermal stress generated by orientation, shading, solar control and construction.

H10.04 FABRICATION AND INSTALLATION

WORKMANSHIP GENERALLY:
- To BS 5516.
- All fixings must be concealed unless indicated on detailed drawings.
- Machine cut and drill all components in the workshop wherever possible.
- Site drill or cut into structure only in approved locations.

GLASS:
- To BS 952 generally, free from bubbles, cracks, rippling, dimples and other defects. Panes to be accurately sized with clean, undisfigured and undamaged edges and surfaces.
- Insulating glass units to BS 5713, hermetically sealed and Kitemark certified.

INFILLING must be:
- Accurately sized with undisfigured and undamaged edges and surfaces.
- Adequately rigid to comply with all design/performance requirements.

SUITABILITY OF STRUCTURE: Not less than two weeks before commencement of patent glazing installation, survey the supporting building structure, checking line, level and fixing points. Report immediately to the CA if the structure is unsuitable to received the patent glazing.

PROTECTION AND FINAL CLEANING:
- Remove any cement and plaster based spillage whilst wet.
- Prevent staining, scratching and other disfigurement of the patent glazing during installation and by following trades.
- At Practical Completion or when otherwise agreed with the CA, remove any protective coverings and thoroughly clean external and internal surfaces with mild detergent solutions approved by the patent glazing manufacturer.

H61.00 FIBRE CEMENT SLATING

H61.01 Roof laid with Cardinal Slates reproduction stone tiles in diminishing courses to manufacturer's specification

H61.02 Rafter/truss centres at 600mm: use 25 x 50mm batten
Rafter/truss centres at 400mm: use 25 x 38mm batten
In all cases, use 25 x 38mm batten on edge for J and K courses. This allows sufficient space for the nib and slightly raises these tiles to prevent rocking.
Batten should conform to the standard in the most recent version of BS5534.

H61.03 It is important that the tops of the rafters are sufficiently close together at the roof apex for the top batten (usually for a K course) to be placed at the highest point of the roof. This is sometimes a problem where there is a wide ridge board / beam or the counterbattening stops short of the apex. If this is not done, the ridge unit may not provide enough cover to the top course of tiles.

H61.04 INSTALLATION GUIDANCE

Battening

The batten schedule should always be checked against the actual roof length before starting battening, to make certain that it is appropriate for that roof. It is very important to adhere to the coursing specified. Failure to follow the schedule will result in the wrong quantities of tiles. If it is necessary to make any changes to the batten schedules provided, we should be notified immediately to enable us to adjust the quantities before delivery (assuming it is not too late!). It is best to make any minor adjustments in the F, G or H courses.

The batten schedule provided will give the correct head lap for each length of tile. All gauge measurements are taken from the top of the battens. A cumulative total is provided for checking progress up the roof. It is a good idea to check the cumulative length two or three times on the average roof.

The battens for J and K courses are very close together so it is important to nail the battens on edge to allow the nib to be inserted. Due to the narrower profile it is essential to take extra care when nailing these courses so as not to split the batten.

Laying the tiles

Cardinal tiles can be cut in the same way as other concrete tiles, except that manual tile cutters are not suitable due to the irregular texture of the back of the tiles.

<u>Side lap</u>

The minimum side lap will vary according to the length of the tile. In the main body of the roof there should be a minimum side lap of 50mm. For the S to C courses, aim for 75mm, and for verge courses aim for 50-75mm side lap to get the bond started.

<u>Using narrow and medium width tiles</u>

It is important that the medium and smaller width tiles are worked into the main body of

the roof. There will be a lot more of these smaller tiles supplied than is the case with most other manufacturers of imitation stone tiles. Wide tiles should mainly be used for cutting valleys, hips, verges etc, with narrower width ones used to establish a regular bond in the main body of the roof.

Mixing colours

There should be a mix of darker and lighter colour shades provided, which need to be distributed to avoid banding.

An excess of tiles will be provided – these remain the property of Cardinal Slates if not used on the site they were delivered to, and should be left in the crates to be returned. The delivery note will indicate the excess amount delivered.

Fixing the tiles

Eave, undereave, valley, hip, abutment, and verge tiles should be nailed, as well as every fifth course in the main body of the roof. The nails should be clout headed nails to BS1202 (aluminium or copper), long enough to be driven 15-20mm into the batten while allowing for a small amount of movement by the tile. Generally, a 40mm nail will be suitable but a longer one may be required for lower courses with thicker tiles. The tiles have integral nibs which are used to simply hang the other courses over the batten.

Steeper or exposed roof pitches

Where the roof pitch is over 50 degrees every third course should be nailed, and where it is over 60 degrees or vertical every course should be nailed. If the roof is in a very exposed area or subject to unusual stresses then please consult us.

Eaves

The length of S and Q tiles can vary slightly and the eaves tilt can also change. It is best to use an undereave and eave tile on site to determine exactly where to place the eave and undereave batten.

Verges

No verges

Hips

Hips using hip tiles: fix 6mm galvanised hip irons at the base of each hip using 12 gauge galvanised screws or nails. The tiles should be cut to fit closely together, and the hip ridge should follow a straight line up the roof edge and be bedded in as the tiles are laid. The end of the bottom hip tile should be trimmed to align it with the eaves tiles, and filled with mortar.

Exposed hip: mitre tiles closely together and use code 4 lead soakers above each course extending 100mm each side of the hip to create a weathertight junction. The line of the mitre should follow a straight path up the hip. Once this is created, a mortar cap or roll can be applied to cover the mitred hip if a different traditional appearance is desired.

Valleys

Close mitred valley: use an additional underlay strip 1m wide, underneath the main underlay, and use code 4 lead soakers above each course. The tiles should be cut cleanly so the mitre is in a straight line and the soakers will be correctly supported. At a lower roof pitch or with long roof lengths (more than 4m) close mitred valleys may not be able to cope with very intense rainfall.

Valleys should be laid dry. A comb filler should be used where there are substantial gaps between the tiles and the rafter, in order to prevent animal access.

Notes when using lead

All exposed lead should be treated with patination oil after installation is complete.

H61.05 Ridge tiles to be black clay to match existing, fully bedded in fibre reinforced mortar.

H61.06 Lay breather membrane over common rafters, with enough slack to allow water to run under battens. Ensure laps are minimum 150mm.

Supro

- Manufacturer: DuPont Tyvek
  Web: www.construction.tyvek.co.uk
  Email: tyvek.construction@dupont.com
  Tel: +44 (0)844 4068722
  Address: BBSP1, Bristol & Bath Science Park, , Dirac Crescent, Emersons Green,, Bristol, Avon BS16 7FR
- Product reference: Tyvek® Supro
- Roll size: 1 x 50 m /1.5 x 50 m /Contractor's choice
- Accessories: Tyvek 2060B Tape /Tyvek® Double Sided Acrylic Tape /Tyvek® Butyl Tape

K LININGS/ SHEATHING/ DRY PARTITIONING

K11 RIGID SHEET FLOORING/ SHEATHING/ DECKING/SARKING/ LININGS/ CASINGS

K11.11 Fix 11mm OSB3 to underside of common rafters using min 25mm screws.
SterlingOSB Zero
- •Manufacturer: Norbord Europe Ltd.
  - Web: www.norbord.co.uk.
  - Tel: +44 (0)1786 812921.
  - Product reference: SterlingOSB Zero.
- • Thickness: 11 mm
- • Board size: 1220 x 2440 mm - Square edge (9–18 mm).
- • Edge profile: Manufacturer's standard
- • Finish: Unsanded. - Suitable for GRP/ fibreglass.

P BUILDING FABRIC SUNDRIES

P10 SUNDRY INSULATION/ PROOFING WORK/ FIRE STOPS

P10.01 Insulation to be installed between common rafters, flush with bottom of rafter so as not to push breather membrane against battens above.
Thermapitch® TP10
- •Manufacturer: Kingspan Insulation.
  - Web: www.kingspaninsulation.co.uk.
  - Tel: +44 (0)1544 388601.
  - Product reference: Thermapitch® TP10.
- • Insulation thickness: 75mm

R DRAINAGE

R10 RAINWATER PIPEWORK/ GUTTERS

R10.01 INSTALLATION GENERALLY
Discharge of rainwater: Complete, and without leakage or noise nuisance: Obtain components from same manufacturer for each type of pipework and guttering. Discharge rainwater to ground locally at downpipe.

R10.02 GUTTERS AND DOWNPIPES:
Supply and fit Lindab Rainline galvanised steel rainwater gutter and downpipe system. The gutters, pipes and fittings all to be supplied with a natural galvanised finish, and to be fitted all to the manufacturers recommendations. Installation is relatively simple, using push together fittings.
The gutters to be 125mm wide, supported on rafter brackets fixed to lower roof timber. Max distance between brackets 800mm, max 100mm for ea. end, Brackets to be secured using galvanised tek screws. Downpipes to be 75mm in diameter with discharge shoe. All to positions shown on the drawings. Rainwater to discharge to ground.
Allow for all guttering, joints, brackets, stop ends, outlets, downpipes, bends and pipe holders.
All downpipes to be installed perfectly vertically, with brackets at max 1.5m centres.
Gutters to be laid to a slight fall of no less than 1:360.
Lindab
0121 585 2780

V ELECTRICAL

V90 GENERAL LIGHTING AND POWER

V90.01	GENERALLY: All work is to be carried out strictly in accordance with Regulations for Electrical Installations (17th Edition with amendments) issued by the Institution of Electrical Engineers. All materials shall comply with IEE Regulations and relevant British Standards. Note: As the demonstration building is open fronted therefore all fittings require to comply with external IP66 rating. Galvanised trunking to be used.
V90.02	Existing cables on top of north wall need to be tested. Allow for removal if inactive or for rerouting / protection if still in use.
V90.03	ELECTRICAL ENGINEER: The Electrical Engineer shall be responsible for the design of the Electrical system. The Electrical Engineer shall be responsible for designing the electrical loading for each circuit and planning the routing of the cables and conduits within the building.
V90.04	INSTALLATION GENERALLY Installation, testing and commissioning: To BS 7671, to provide a safe, well insulated, earth protected system capable of supplying anticipated maximum demand. Accessories: Types recommended by relevant equipment manufacturer, including fasteners, bushes, glands, terminals, connectors, clips, clamps, etc. Fasteners: Avoid contact between dissimilar metals. Use corrosion resistant fasteners in locations where moisture may occur.
V90.05	FACE PLATES AND BACK BOXES: The electrical fittings generally shall be IP66 external grade sockets MK Masterseal face fixed to the masonry wall min 600mm above ground level.
V90.06	LIGHTING: Allow for supply and fitting of the following soffit fixed LED fittings with MK Masterseal Switches. Wirefield COM65 LED CPB625K.
V90.07	EARTHING: The system is to be earthed to current IEE Regulations and to the supply authority's regulations. Allow for earth rod.
V90.08	CIRCUIT LIST: Provide a comprehensive circuit list inside the door to the consumer unit to be typewritten on self adhesive labels.
V90.09	INSPECTION AND TESTING: Check all fittings etc., and ensure that everything is clean, in new condition and functioning correctly. Test the entire installation and arrange for tests by the supply authority. Provide everything necessary and pay all costs. Provide a completion certificate in accordance with IEE Regulations, and ensure that a copy is either emailed or posted to the client. All to the standards called for in BS 7671-7.