# GBE Code H21 Timber Cladding + Guide

# Outline of timber constructions in readiness for an expert system and specifications

## Read it in Word’s ‘Outline’ View not normal, page, draft, full screen reading, web layout, or print layout views

# First task undertaken H21 and offshoots

# Extracting the essence from TRADA publications by Patrick Hislop

# Legend

## Green: Consider for GBE

### E.g. of approach:

### FSC only

### Preservative treatment:

#### In H21 Cladding: is avoidable so we will

#### In Q55 Decking: is difficult to avoid so will detail a better solution

## Blue: for TRADA but not GBE

### FSC and PEFC

### Treated softwood

### Painted softwood

## Violet: Avoid not for GBE

### Treated softwood

### Nails make demountability less successful

## Red: Pending information by me or clarification from Patrick Hislop

# Timber Applications

## External Wall & Roof cladding

### B12 Conservatories

#### May learn something from TRADA Window Book

#### Purchased

### H11 Curtain walling

#### May learn something from TRADA Window book

#### Purchased

### [H20 Rigid sheet cladding](#_H20_RIGID_SHEET)

### [H21 Timber Weatherboarding](#_H21_TIMBER_WEATHERBOARDING)

#### Weatherboarding

#### Rainscreen cladding

#### Batten cladding

### [H64 Timber shingling](#_H64_TIMBER_SHINGLING)

#### Wall Shakes

#### Wall Shingles

#### Roof Shakes

#### Roof Shingles

### H69 Timber board roofing

#### Board on board roofing

### [H92 Rainscreen Cladding/overcladding](#_H92_RAINSCREEN_CLADDING/OVERCLADDIN)

#### Rainscreen cladding

### [K42 External Suspended Soffits](#_K42_EXTERNAL_SUSPENDED)

#### Soffit cladding

### L10 Windows/Rooflights/Screens/Louvres

#### Windows

##### TRADA book on windows

##### AECB paper on thermal bridging

##### AECB paper on thermal comfort

##### AECB paper on construction and materials

#### Rooflights

#### Internal Screens

#### External Screens

#### External Solar Shading See L15

#### Louvres See L19

#### Conservatories See B12

#### Curtain walling See H11

### [L15 External Solar Shading](#_L15__EXTERNAL)

#### Brise Soleil

##### Vertical array

##### Sloping array

##### Horizontal array

### [L19 Ventilation Louvres](#_L19__VENTILATION)

#### Timber Ventilation Louvres

### L20 Doors/Shutters/hatches

#### May learn something from TRADA Window book

### L30 Stairs/Walkways/Balustrades

## Internal Wall floor and ceiling linings

### K11 Rigid sheet flooring/sheathing/decking/sarkings/linings/casings

#### Rigid sheet materials

#### Floating floors

#### Flooring

#### Wall sheathing

#### Roof decking

#### Sarking

#### Wall linings

#### Ceiling linings

#### Casings

#### Underlayments

### [K13 Rigid sheet fine linings/panelling](#_K13_FINE_PANEL)

#### Internal wall fine linings

#### Internal ceiling fine linings

### K20 Timber board flooring/decking/sarking/linings/casings

#### Less visible timber

#### Rigid sheet materials

#### Floating floors

#### Flooring

#### Wall sheathing

#### Roof decking

#### Sarking

#### Wall and ceiling linings

#### Casings

#### Underlayment

### K21 Timber strip/board fine flooring/linings

#### 2 TRADA books on floor sealers and their application

#### High quality timber board flooring

#### Internal Floor Finishes

#### High quality timber board wall linings

#### High quality timber board ceiling linings

### K50 Internal Enclosures

### M42 Wood block/composition block/Parquet flooring

#### 2 TRADA books on floor sealers and their application

#### Parquet flooring

## External works

### Q40 Fencing

#### Screens

#### Fencing & Gates

### Q50 Street Furniture

#### Gates

#### Furniture

#### Planters

### Q55 Decking

#### TRADA Book on decking

#### Decking

#### Supports

#### Canopies

##### Solar shading see

#### Screens

## Structural timber

### B14 Panelled Construction

#### SIPS Structural insulated panel system

##### Tekhus

#### ISPS Insulated structural panel system

##### TRADIS

##### Solid panel framed rendered hemp-lime

#### G22 Load-bearing laminated solid panel construction

##### Eurban

##### KLH

##### Merk

### B15 Framed construction

#### Timber Post and Beam Construction

##### TRADA book purchased

#### Species

##### Oak framed

##### Sweet chestnut framed

#### Hufhaus

#### RuralZED

### D30 Timber Piling

#### See Civil Engineering applications

### D41 Crib walls/Gabions/Reinforced earth

#### Crib walling

#### Gabions: Log infill

### E20 Formwork

### G20 Carpentry/Timber framing/First fixing

#### Roof trusses

#### Trussed rafters

##### TRADA Books Purchased

##### LVL Laminated Veneer Lumber

#### LL Laminated Lumber

#### Composite I Beams

#### Glued Laminated Timber frames

#### Timber frame construction

##### TRADA Book Purchased

#### Loose timbers

##### TRADA book purchased

##### External wall Studs

##### Internal Partition Studs

##### Floor Joists

##### Beams

##### Flat roof joists

##### Rafters

##### Purlins

#### Framing for insitu hemp-lime

##### Draft of NNFCC report have, obtain draft book

##### Formwork

##### Back wall

##### Stud Framing

##### Soffit

##### Framing for roof

#### Log Cabin Construction

#### Timber Post and Beam Construction

##### TRADA book purchased

### G21 Load-bearing Timber Blockwork

#### Steko

### G22 Load-bearing laminated solid panel construction

#### Eurban

#### KLH

#### Merk

### G23 Timber Post and Beam Construction

#### TRADA book purchased

### G31 Prefabricated timber unit decking

#### Eurban

#### KLH

#### Merk

## Furniture Fittings Fixtures

### N10 General Fixtures/Furniture/Equipment

### N11 Domestic Kitchen fittings

### N12 Catering equipment

### N13 Sanitary Appliances/fittings

#### Vanity units

### N15 Signage/notices

## Reference Sections

### [M60 Painting/clear finishes](#_Finished)

### P20 Unframed Isolated trims/skirting/sundry items

### Z10 Purpose made joinery

### Z11 Purpose made metalwork

### [Z12 Preservative /fire retardant treatment for timber](#_Treatment)

### [Z20 Fixings/Adhesives](#_Fixing_&_Fastenings)

### Z22 Sealants

# H21 TIMBER WEATHERBOARDING

# OUTLINE:

# Performance requirements

## Resist wind load and uplift

## Resist defection and creep

## Weatherboarding

### Exclude wind driven rain

### Ventilation through space behind weatherboarding

### Drainage through space behind weatherboarding

## Rainscreen

### Permit limited rain passage but drain out at base

### Pressure equalisation though open joints

### Ventilation tough space behind rainscreen

## Not generate wind noise or rattling

## Fire performance

### Fire resistance at site boundaries

### Low spread of flame in escape routes

### Combustibility

## Design life & Durability

### Meet design life

### 30 years treated softwood

### 40 years durable hardwood

## Maintain good appearance

### Fade to grey/silver

### Avoid corrosion staining

### Avoid rainwater splash staining/fading

### Require redecoration at intervals

## Maintenance

### None

### Frequent and predictable

### Replacement after design life

### Damage at low level

### Rain splash discolouration

### Trapped contact water damage

### Persistent gutter overspill?

## Security

### Prevent removal of screen

### Prevent entry into building

## Flora and Fauna exclusion or inclusion

# Exposure Conditions & Fire characteristics

## Hazard Class:

### Hazard class 3: Above ground, not covered

#### Timber of durability class 1 2 or 3

##### suitable without treatment

##### sapwood removed

#### Timber of durability class 4 & 5 not suitable

##### Preservative treated timber including sapwood is suitable

##### Heat treated timber suitable

## Internal

### Fire

#### No requirements

#### Escape route

##### Surface spread of flame BS 476:Part 7: Class 1

##### Building Regulations Approved Document B: Class 0

### Splinter free passage or touching

#### Sawn, planed and arises removed

#### Sawn, planed arises removed and sanded

#### Sawn planed arises removed and sand blasted

## External

### Weather

#### Undercover

#### Not covered

#### Sheltered

#### Severe

### Wind driven rain index

### Humidity

### Precipitation

### Fire

#### No requirement

#### Boundary proximity condition (fire)

##### Surface spread of flame BS 476:Part 7: Class 1

##### Building Regulations Approved Document B: Class 0

## Shading (Differential fading)

### Avoid projecting eaves

#### Shading to top of cladding and soffits below fascias

### Avoid projecting verges

#### Shading to cladding and soffit below barge board

### Consider pre-fading boards

### Consider coloured decorative coating

#### Long term maintenance

## Proximity to horizontal splash surface

### Contact (avoid always)

#### Window sills

#### Door thresholds

#### Cladding sills/flashing/drips

#### Handrails

#### Copings

### Close (Avoid if possible)

#### Cladding sills/flashing/drips

##### Minimum 15 mm. gap and sloping down and out

##### Clearance sufficient for ventilation of batten zone

##### Insect mesh at base and top of batten zone

### 200 splash height

#### Ground level

##### Consider planting or gravel mulch to disturb splash

#### Balconies

##### Consider open grille decking against building

#### Access walkways

##### Consider open grille decking against building

#### Flat roofs

##### Consider loose gravel solar shading

### 200-250 mm. (avoid textured surfaces (sawn): risk of capillary attraction, provide drip profile)

### 450 mm. (suitable for most choices of surface finish)

### Framing:

#### Generally

##### Metal: Not in contact

##### Timber:

###### Not in contact

###### Joinery framed (in contact)

#### Mild steel frames

##### Hot dip galvanized

###### Sacrificial Zinc rich coating

#### Stainless steel frames

##### Grade: 316 Marine grade

#### Timber

##### Same species, treatments, Surface, Finish, MC,

##### Different species, treatments, surface, finish, same MC

### Flashings:

#### Material compatible with adjacent roofing/cladding

#### Material compatible with acidic tannin

#### Coated metal:

##### Leave protective films in place

###### (not exceeding manufacturer recommendation)

##### Aluminium (high % recycled content)

###### Polyester Powder coated

###### Anodized

###### PVF2 coated

##### Steel

###### Hot dip galvanized

###### Hot dip galvanized and sacrificial zinc rich coating

###### Hot dip galvanized and Polyester powder coating

###### Hot dip galvanized and painted

## Alternative splash zone materials (recessed)

### Overhang cladding beyond wall

#### Concrete plinth shown

#### Concrete plinth/DPM/Protection

#### Slates placed against plinth, dry joint, soil retained

#### Paving slab turned up forming skirting, dry joint, soil retained

#### Reconstructed stone plinth units, lime mortar

#### Brick in lime mortar

#### Plastics wood substitutes

# Durability

## Natural durability BS EN 350 Parts 1 & 2

### Class 1 Very Durable

#### Remove sapwood

##### European Oak (exceptional)

#### Achievable using acetylation treatment

### Class 2 Durable

#### Remove sapwood

##### European Oak (normal)

### Class 3 Moderately Durable

#### Remove sapwood

### Class 4 Slightly Durable

#### Remove sapwood

##### European Redwood (Pinus sylvestris)

##### Scots Pine (Pinus sylvestris)

#### Requires preservative in cladding applications

### Class 5 Not Durable

#### Remove sapwood

#### Requires preservative in cladding applications

## Life Expectancy

### Treated Softwood: 30 years

### Durable Hardwood: 40 years

### Maintenance Regimes (desired frequency and complexity)

#### None

##### No decoration, fade to silver (external exposed)

#### Intensive

##### Regular sanding/stripping and over coating

##### Regular staining/oiling/waxing

## Guarantee Requirements

### Certification

#### NHBC

##### 10 years normally

#### Zurich

##### 15 years normally

#### Other

#### BLP

### Supplier/Installer back to back?

### Timber sourcing certification

### Treatment Certification

### Strength ad suitability certification

### PII covered engineer with reclaimed timber

# Moisture movement

## General:

### not all timbers fit these groups neatly

### frequent uptake and loss of moisture in unfinished wood can lead to surface checking (small cracks)

## Small movement timbers: 1% for 5% change in MC

## Medium movement timbers: 1% for 4% change in MC

### Home grown Oak

#### Will develop small surface cracks but will not affect durability

### European Redwood (Pinus sylvesris)

#### Heat or chemical treatment without preservatives

## Large movement timbers: 1% for 3% change in MC

### Avoid in cladding

# Sustainable Certification

## FSC

### FSC Certified

### FSC Chain of Custody

### FSC Project Chain of custody

### FSC Recycled content (applicable to panel products)

### FSC Reclaimed (not yet formally established)

### Non-FSC Local source, sustainable forestry

## PEFC

### PEFC Certified

### PEFC Chain of Custody

### PEFC Project Chain of custody

### PEFC Recycled content (applicable to panel products)

### Non-PEFC Local source

# Timber Quality

## Sapwood General

### Treated sapwood is acceptable

### Exclude sapwood if untreated

### Durable hardwoods

## Knots BS 1186 Part 3

### Classes dictate size and frequency of knots

### Class CSH

#### maximum 6 mm. diameter knots

#### Intended for small sections

#### Not appropriate for cladding

### Class 1

#### For planed and unfinished boards

#### For prestigious buildings

#### Easily available

##### Douglas Fir

##### Western Red Cedar

##### Tropical hardwoods

#### More difficult to obtain

##### May prove expensive in otherwise low cost species

##### European redwood

##### European whitewood

##### European Larch

##### European Oak

### Class 2

#### Increasingly accepted for cladding

#### Unfinished and transparent finishes

#### Temperate hardwoods

##### European oak

### Class 3

#### Traditionally acceptable for cladding

## BS EN 15146

### Addresses knots

### Also addresses:

#### Acceptability of end splits

#### Shakes and checks

#### Presence of resin pockets

### Relates to each species and defines two grade

#### Grade A

#### Grade B

### Profiles: Take care:

#### many profiles not commercially available

#### not necessarily represent good practice in design or purpose made profiles

## BS EN 14915

### Characteristics, evaluation of conformity and marking

### Reaction to fire

### Formaldehyde content

### Pentachlorophenol content

### Water permeability

#### Largely irrelevant to claddings with ventilated cavity

### Thermal conductivity

#### Largely irrelevant to claddings with ventilated cavity

### Preservative treatment

### Manufacturing controls

### Good practice in construction

# Species

## Species Applicable

### Softwood

#### Local

##### Native

###### European Larch (Larix deciduas)

care with Sustainable Certification

Class 3 moderately durable

Small movement

Less dense, strong and knot-free

Also suitable for shingles and shakes

###### Spruce (European whitewood) (Picea abies)

Class \_ durability

\_\_\_\_ movement

###### Scots Pine (European redwood) (Pinus sylvestris)

Class 4 Slightly durable

Heat or chemical treatment not preservative

Medium movement

##### Non-native

###### Western Red Cedar (Thuja plicata)

(UK grown less durable than North American class 2) (Remove sapwood)

Small knots common in UK grown

Small movement

BS 8417: 60 year service life

Resistant to preservative treatment

High tannin content corrosive: protect porous and steel or iron materials below

Soft and brittle: Avoid applications prone to mechanical damage: low level

Avoid unfinished where high levels of pollution present (traffic and industrial processes)

Also suitable for shingles and shakes

###### Douglas Fir (Pseudotsuga menziesii)

(UK grown less durable Class 3-4 moderately to slightly durable than North American Class 3)

Moisture movement: \_

Resistant to treatment

Can be left unfinished to fade

Requires preservative treatment

###### European Larch (Larix deciduas)

care with Sustainable Certification

Class 3 moderately durable

Small movement

Also suitable for shingles and shakes

#### Scandinavia,

##### Native

###### European redwood (Pinus sylvestrius)

Class 4 Slightly durable

Heat or chemical treatment not preservative

Medium movement

###### European whitewood (Pinus abies)

Class 4 Slightly durable

Heat or chemical treatment not preservative

Medium movement

###### European Larch (Larix deciduas)

care with Sustainable Certification

Class 3 moderately durable

Small movement

Also suitable for shingles and shakes

#### Russia, Latvia

##### Native

###### European redwood (Pinus sylvestrius)

Class 4 Slightly durable

Heat or chemical treatment not preservative

Medium movement

###### European whitewood (Pinus abies)

Class 4 Slightly durable

Heat or chemical treatment not preservative

Medium movement

#### Siberia

##### Native

###### European Larch (Larix deciduas)

care with Sustainable Certification

Class 3 moderately durable

Small movement

Very slow grown

Dense, straight grained and less knotty

Also suitable for shingles and shakes

#### Alpine

##### Native

###### European Larch (Larix deciduas)

care with Sustainable Certification

Class 3 moderately durable

Small movement

Very slow grown

Dense, straight grained and less knotty

Also suitable for shingles and shakes

#### North American

##### Native

###### Californian Redwood

Class 2 durable

infrequent use in UK

Also suitable for shingles and shakes

###### Douglas Fir (Pseudotsuga menziesii)

Aka Oregon Pine, British Columbian Pine

Acidic with high tannin content

Small movement

Class 3 Moderately durable

Straight grained, robust wood

Can be untreated and unfinished

###### Western Red Cedar (Thuja plicata)

Durability Class 2) (Remove sapwood)

Straight grained, largely free of knots

Small movement

BS 8417: 60 year service life

Resistant to preservative treatment

High tannin content corrosive: protect porous and steel or iron materials below

Soft and brittle: Avoid applications prone to mechanical damage: low level

Avoid unfinished where high levels of pollution present (traffic and industrial processes)

Expensive

Also suitable for shingles and shakes

#### Asia/Pacific

##### Native

###### Radiata Pine

Class 4 slightly durable

requires treatment

#### Don’t know

##### Western Hemlock

###### Class 4 slightly durable,

###### requires treatment

###### Temperate

##### Southern Yellow Pine

###### Class 4 slightly durable,

###### requires treatment

### Temperate Hardwood

#### Local

##### Native

###### English Oak (Quercus robur)

Shorter lengths than European

2.4 m long normally

150 mm. maximum width

Durability Class 1 Very Durable (Remove sapwood)

Medium movement

Can be used green (un-dried)

Soft and workable whilst green

Once dry becomes extremely hard and resistant to mechanical damage

High tannin content corrosive: protect porous and steel or iron materials below

Resistant to coatings

Can be left unfinished to fade to grey

**FSC and PEFC**

Also suitable for shingles and shakes

###### Welsh Oak (Quercus robur)

Source: Coed Cwmry, Small section?

As English Oak

###### Sweet Chestnut (Castanea sativa)

2.4 m long normally

150 mm. maximum width

Durability Class 1 Very Durable (Remove sapwood)

Small movement

Can be used green (un-dried)

Soft and workable whilst green

Once dry becomes extremely hard and resistant to mechanical damage

High tannin content corrosive: protect porous and steel or iron materials below

Resistant to coatings

Can be left unfinished to fade to grey

**FSC by the forestry commission**

Available in relatively small quantities

Also suitable for

shingles and shakes,

post and beam construction

###### Elm

In short supply

classed as 5 non durable

but performs better than that

Used in waney edge boarding

##### European

###### Oak (Quercus robur)

France, Germany, Eastern European

Longer lengths than UK Home grown

\_\_\_ m long normally

150 mm. maximum width

Durability Class 1 Very Durable (Remove sapwood)

Medium movement

Can be used green (un-dried)

Soft and workable whilst green

Once dry becomes extremely hard and resistant to mechanical damage

High tannin content corrosive: protect porous and steel or iron materials below

Resistant to coatings

Can be left unfinished to fade to grey

**FSC and PEFC**

Also suitable for shingles and shakes

#### North American

##### Native

###### American White Oak (Quercus Alba)

Kiln dried suitable for internal use

Can lead to problems if used externally

Can lead to extensive shakes

PEFC

### Tropical Hardwood

#### General Issues

##### Take particular care with Certification

##### Durability Class 1 Very durable or 2 durable

##### Dense or very dense

##### Small or medium movement

##### Some will darken upon exposure initially

##### avoid treatment: probably unnecessary

##### Suitable for use undecorated

##### Will bleach to grey after exposure for long period

#### African

##### Small amounts of certified wood

#### Far East

##### Illegal Logging rife

##### Primary species

###### Iroko

Endangered species

Plantation grown with certification available

###### Teak

take care with sourcing and certification

#### Central & Southern America

##### FSC Certified available

##### Seek detailed performance characteristics of subspecies

##### Seek availability information

##### Seek length and sizes information

##### Secondary species (less well known)

###### Angelim

###### Cumaru

###### Louro

###### Itauba

###### Jatoba

###### Kauri

###### Massaranduba

###### Purpleheart

###### Tatajuba

## Options and Alternatives

### Designer Preference

### Species to avoid

#### Alternatives

#### Greenpeace and FoE have lists

## Performance Specification of timber (avoiding species specification)

# Treatment

## General issues

### Service life BS 8417

#### Durable species or treatment

#### Up to 60 years (normal building design life)

## Untreated

### Durability to match or exceed exposure class

## Preservative pre-treated (BS 8417)

### Chemical

#### CCA (Copper Chrome Arsenic)

##### no longer permitted

##### (in domestic applications)

##### Where children present

##### Where food growing may occur

##### No longer made?

#### Water-borne Copper-Organic

##### Up to 60 years

#### Organic-Solvent

##### Up to 60 years

#### Water-borne micro emulsions

##### Up to 60 years

### Mineral

#### Boron Salts

##### Up to 30 year life

### WPA Manual

### Methods:

#### Immersion in liquid

#### Pressure and vacuum in liquid in vessel

#### Pressure and double vacuum in liquid in vessel

#### Low pressure spraying

##### Unacceptable except:

##### Local application to previously treated timber

##### after cutting planning and drilling

##### end grain sealer

### Applicability:

#### If timber to be left unfinished:

##### Water-borne copper-organic

###### Affect moisture content of the wood

###### Greenish tinge to wood

###### Will fade over time

###### Must be fully dried before handled or used

#### If the timber to be coated or stained

##### Light organic solvent

###### Do not increase moisture content of the wood

Less risk of distortion of profile

###### Must be fully dried before handled or used

##### Water-borne micro-emulsions

###### Do not increase moisture content of the wood

Less risk of distortion of profile

###### Must be fully dried before handled or used

##### Boron salts

###### 30 year life

###### Water soluble and susceptible to leaching

## Fire Treatment

# Modified timber

## Generally:

### Allows cheaper and readily available timber of lesser durability to be used without preservatives

### Modification is throughout the section

### Reduces moisture absorption and moisture movement

### Process tends to darken the wood

### Preservative treatment only penetrates to a limited depth

## Chemically Modified timber

### Process

#### Impregnate wood

#### Chemical reaction with wood

### Effect

#### Render the wood more durable

#### Improves moisture resistance

#### Improves dimensional stability

#### Improves coating performance

#### Extends coating maintenance frequency

#### Raises timber durability

##### European redwood

##### European whitewood

### Acetylation

#### Pressure impregnate wood with acetic anhydride

#### derivative of acetic acid (Vinegar)

#### Raises pine to Durability Class 1

### Proprietary

#### Product Reference: Accoya

#### Manufacturer: BSW timber

## Heat treated timber

### Process:

#### Dries the wood

#### Heats the wood

#### Reduces the natural nutritional content of wood

#### Discourages fungi and insects

### Effect

#### Timbers suitable for hazard category 3

#### (above ground, not covered)

#### Suitable for cladding

#### 30 year life

### Advantages

#### Throughout whole section

#### Halves the moisture movement of timber

### Disadvantages

#### Darkens appearance

##### This should fade due to sun bleaching if unfinished

#### Makes the timber softer and more brittle

##### Similar to Western Red Cedar

##### Use adequate number of fixings

#### Loss of fastener pull out strength

### Proprietary

#### Finland

##### Product Reference: Thermowood

##### Manufacturer: Finnforest UK Ltd.

#### Holland

##### Product Reference: \_\_\_

##### Manufacturer: \_\_\_\_

### Additional opportunities

#### Similarly modified softwood battens are available

#### But they are softer and more brittle than unmodified

#### Consider unmodified softwood

# Fire Protection

## Fire treatment

### Requirements

#### Limit “Unprotected cladding”

##### Within 1 m from site boundary:

##### Of greater height than \_\_ m.

##### Building Regulations Approved Document B Class 0

##### European Class B

##### Or better

### Applications

#### Vacuum/Pressure treatment

### Type:

#### External exposure

##### Leach resistant

##### Humidity resistant and maintained protective coating

#### Internal exposure

### Effectiveness

#### Natural permeability of wood

#### Sapwood easily treated

#### Heartwood can be resistant to treatment

#### Softwoods

##### European Larch quite resistant

#### Hardwoods mostly resistant to treatment

#### Manufacturers know the species and thicknesses that can be treated to Class 0/Class B

#### WPA Manual: Industrial Flame retardant for solid timber and panel products

### Treated

### Treated and kiln dried

## Cavity barriers

### Requirements

#### Building Regulations Approved Document B

#### Different in each country?

#### Smoke and flame

#### Counterproductive for ventilation and drainage cavities

#### Stop and start the cavity above and below

#### Provide drips etc. at each floor

### Locations

#### Party walls

##### Solid 50 x 50 mm. batten can be used at party walls

#### Party floors

##### Intumescent honeycomb

##### Intumescent strip or tape

##### Intumescent paint

#### Around window openings

# Boundaries

## Edges at change of materials

### Breather membranes

#### At re-entrant

#### In line

#### No need for vertical DPC

#### Turn breather membrane to close wall

#### Hold in place with batten

### Damp proof course from cavity wall closing

#### In-line or behind a vertical DPC

#### Extend the DPC to cover joint between any framing or sheathing of the wall

### Pre-compressed foam sealing strip

#### Instead of gunned sealant or mastic

#### Maintain good contact over uneven surfaces

#### Will continue to expand to fill any gaps

#### Even if there is shrinkage or movement at interface of wall and timber

### Metal flashings

#### Malleable metal flashings

##### Lead

###### Avoid below Acidic timber

###### Avoid below WRC

###### Avoid below mosses and algea

##### Dressed over solid base

##### Below windows

###### Dressed back behind base of timber boarding

##### Capping

###### Not suitable as a capping or it will block ventilation of cavity

###### May be used with open joint boarding

##### Finishes

###### Patination oil on face

###### Bitumen coating on rear face against alkali materials

#### Pressed metal

##### General

###### Profiled to self support and span

###### Project from base and background

##### Materials and finishes

###### Aluminium

Powder coated

Anodized

###### Copper

Unfinished

Pre-patinated

Avoid below acidic timber

Avoid below WRC

###### Zinc

Unfinished

###### Recycled aluminium

Powder coated

Protective temporary peel off strip

Anodized

Protective temporary peel off strip

###### Mild steel

Unfinished not suitable below acidic species

Galvanized

Galvanized and powder coated

Pre-drill before protection

Protective temporary peel off strip

Bitumen coating

##### Bimetallic and electrolytic corrosion

###### Avoid

Copper below green acidic timber

Lead below green acidic timber WRC & Oak

Zinc below western red cedar (acidic)

Zinc below green oak (tannin)

Unprotected mild steel below green acidic timber

mixing metals on one building

different metals in contact

###### Consider

Temporary protection during tannin release

More base metals towards the top

More nobel metals towards bottom

##### Copings

###### Project over top edge of boarding

###### Particularly exposed ends of vertical boarding

###### Drip profile downstand

10 mm. clearance minimum

Any further will not ensure clearance of the cladding below

Shed water away from top edge

###### Overshadowing will prevent the boarding below bleaching (if desired)

##### Window opening top flashing

###### Requires careful detailing

###### Vertical boarding

###### Flashing to extend into adjoining boards

###### Boarding to be cut back to accommodate

###### Flush boarding difficult

###### Board on board okay

##### Base of claddings

###### Sloping top surface to drain out and down

###### Projection beyond wall below

###### Steep enough that any rain splash misses bottom of boarding

###### Maintain 15 mm. gap

###### Between bottom of board and top of flashing

###### For drainage and ventilation

###### Important with vertical boarding end grain absorption

###### Prevent excessive wetting and discolouration

###### Flashing to extend back full depth of cavity

###### Dressed or pressed up, drilled and screwed to backing wall

###### Breather membrane to overlap upstand onto flashing

### Gap between ends of boarding and other material

#### 8-10 mm. gap for ventilation

#### End grain of horizontal boarding

#### Do not fill with any sealant

## Changes of direction, plain or angle

### external corners

#### Strong visual impact

#### Consider detailing at openings when detailing corners

#### Horizontal boarding

##### Solid timber set flush

###### Create re-entrant corner with vertical battens

###### Stop boards 8-10 mm. short of batten face

###### Requires high quality workmanship

###### Fix solid timber to battens

###### 8-10 mm. shadow gap between boards and solid timber

###### No sealant

##### Covered corner

###### Create corner with vertical batten

###### Stop boards 8-10 mm. short of batten corner

###### Cover ends of boards with corner piece

###### Form L shaped corner piece

###### tongued and grooved together

###### 8-10 mm. anti capillary groove on two hidden faces

###### No sealant

##### Solid capped set flush

###### Create re-entrant corner with vertical battens

###### Fix solid timber corner batten to vertical battens

###### Stop boards 8-10 mm. short of vertical batten face

###### Requires high quality workmanship

###### Form L shaped corner piece

###### tongued and grooved together

###### 8-10 mm. anti capillary groove on two hidden faces

###### Cover corner batten with corner piece

###### 8-10 mm. shadow gap between boards and corner piece

###### No sealant

##### Re-entrant corner

###### Create re-entrant corner with vertical battens

###### Stop boards 8-10 mm. short of vertical batten face

###### Requires high quality workmanship

###### Cover re-entrant corner battens with two boards of different dimension,

###### First board widest

###### Second board narrower by first board width

###### one to each face

###### 8-10 mm. shadow gap between corner boards and horizontal boarding

###### No sealant

##### Mitred corners

###### Mitreing is not recommended

###### Shrinkage will leave gap for moisture retention

###### Moisture will lead to selling and moving apart

#### Open joint Rainscreen horizontal boarding

##### Mitred open joint corner

###### Maintain normal vertical joint width at corner

###### Accommodate tolerance and any variation

###### Visible fasteners will be set back from corner

#### Diagonal boarding

##### Treat similarly to horizontal boards

##### Exposing ends of boards needs accurate cutting

##### High water run off

##### 12 mm. gaps recommended

##### Seal space behind vertical gap to prevent water entry

#### Vertical boarding

##### Board on board

###### Cladding to corner

###### Outer board at corner of one elevation

###### Inner board (cut) at end of one elevation

### internal corners

## At openings

### Dimensional coordination is essential for appearance sake

#### Work with board/lap/joint width

#### Position openings to coordinate with boarding

#### Avoid notches and split boards (poor appearance)

#### Consistency is important

#### Varying board widths or laps can solve dimensions but appearance may suffer

#### Ribbon windows may simplify detailing

#### Minimise cutting to minimise labour intensity (costly)

#### Minimise cutting to minimise waste (costly)

#### 3D consideration of flashings, DPC and sills essential

#### Maintain integrity of defence against water entry

#### Maintain pattern of visible fasteners around openings

## Eaves

### General

#### The greater the overhang the more pronounced the shading and likelihood of differential bleaching of unfinished surfaces

### Projecting eaves

### Horizontal soffit

### Sloping soffit

### Fascia

## Verges

### Bargeboards

### Fascia

### Soffit

## Parapet

### General

#### No overhang avoids shading and ensures consistent weathering

#### Capping with lead will seal ventilation zone

#### Capping with self supporting metal maintains ventilation

### See

# Moisture Content

## Green

## Seasoned

## Kiln dried

# Surface Texture

## Sawn

### risks of splinters

### Capillary attraction of splash water up surface

### More surface coating required for coverage

### Better protection with more coating

## Fine sawn

### Suitable for stains

## Sawn Planed

## Sawn Planed Arises eased

### Removes risk of splinters during handling

## Sawn Planed Sanded

## Sawn Planed Sand blasted

# Decoration

## Types

### General

#### No decoration will lead to:

##### timbers bleaching to grey/silver

##### some friability of the surface

##### particularly with softwood

#### Decoration should be applied as early as possible

##### Maximise the performance of the coating

#### Uncoloured decoration is poor UV protection

##### generally not suitable externally

##### pigments are necessary

#### Opaque coatings

##### Offer best protection

#### Translucency

##### Can permit the figure, texture, grain and colour show through

#### Colours:

##### Can simulate natural colours

##### Can contrast with manmade colours

##### Dark colours offer greatest UV protection

##### Dark colours raise the temperature

##### Raised temperature will drive out moisture

##### Drying timber may suffer cracking or checking

##### Raised temperature can lead to resin exudation

#### Permeability

##### Can enhance the ability of the timber to dry out through stains and low build finishes

##### Can protect from moisture uptake

#### Film forming coatings

##### Paints and varnishes

###### Can resist moisture uptake

###### Are too brittle upon aging

###### Will crack as moisture movement occurs

###### Lets moisture in

###### Can trap moisture under surface in the wood

###### Possible degradation of the wood

###### Possible blistering, flaking and peeling of the finish

###### Should ideally be extensible:

To cope with moisture movement of timber

##### Micro-porous coatings

###### Are flexible enough to follow moisture movement

###### Are permeable to permit loss of moisture from under the surface

###### Apply to fine sawn surfaces for longer life than planed

###### More coating needed for sawn surfaces

#### Can help the wood retain its colour

### Application

#### UK worst practice

##### prime timber before building in

##### Absorbent surface against permeable construction

#### Scandinavian best practice

##### full coating system on all faces

#### Compromise

##### Minimum one full topcoat on all faces

##### Consistent moisture uptake and loss possible

##### Shrinkage will not reveal uncoated surfaces

#### Location

##### Factory

###### Controlled moisture content (if timber)

###### Controlled humidity (in factory)

###### No Precipitation

###### Controlled wind movement

###### Controlled sun (exposure of wood)

###### Machine applied

###### Controlled application rates

###### Controlled drying

##### On-site

###### Uncontrolled moisture, humidity, wind, sun exposure, precipitation,

###### Unpredictable on site labour skills

###### Timber exposed to ultra violet light degraded

###### Risk of inconsistent factory undercoat and site top coats

###### Diminished life expectancy

##### On-site maintenance

###### Do not let bare timber to be exposed before maintenance

###### Poor UV affected surface will lead to poor adhesion

###### Hardwoods more difficult to gain penetration or adhesion

###### Sand down or strip all film forming coatings

### Unfinished

#### Weather and bleach naturally in UV sunlight

##### General

###### No further maintenance

###### Long life possible

###### Sun (UV light) bleaching to grey or silver colour

###### Some will go to brown

###### Bleaching will not affect the durability of the timber

###### High levels of UV light do not reduce life expectancy

###### More movement in the surface

due to fluctuating moisture content

Some surface checking (small cracks) may occur which will open and close

###### Pollution and dirt accumulations higher on un-finished

Can lead to blackening of the surface

###### Low moisture movement species best

###### Partial bleaching

Affected by shading

Eaves, verges, balconies, solar shading, rainwater goods, lights, signs, sills and drips

Can be high contrast, unexpected and unacceptable

It is a design failure rather than a materials failure

Consider pre-bleached timbers

Consider different detail in sheltered no-bleach zone

Orientation affects rate of bleaching

Slow: north east, north, north west

Fast: south east, south, south west

Shading by other buildings can affect rate

Brake dust containing metal dust can react with tannin resulting in iron staining

###### Blackening

A number of causes

Cladding in the vicinity of trees or heavy vegetation or where there is unusually high run off of moisture

Exhaust fume pollution

Brake dust from cars and trains containing metals can react with tannin resulting in iron staining

Cement dust from local construction work

Mild steel fasteners in acidic timbers reaction blackens fastener and timber

Avoid all such risks

Cleaning fluids are available but remove the source of the problem first

###### Moisture content affecting colour or appearance

Shading can maintain moisture content higher that that warmed by the sun

Contact surfaces at base of cladding and other penetrations

Maintain timber in wet condition

Splash zones can keep moisture content high

Splash 200 mm. and capillary attraction up sawn surfaces a further 250 mm.

Eaves abutment with gables, blocked gutter overflow zone

Consider different fastening regime to permit easy replacement

###### Tannin

High tannin content acidic timbers

Run-off during bleaching process

Porous materials below cladding

Stone, brick, concrete, precast stone, renders

Staining potential

Avoid by design or temporary protection

##### Softwoods

###### Western Red Cedar

###### Douglas Fir

##### Hardwoods

###### European Oak

### Finished

#### Vapour tight

##### Lacquered

##### Painted

#### Micro porous vapour permeable

##### Low build stain high solids

##### high build stain

##### Stained

##### Stain and wax (dangerous on decking)

##### Oiled

##### Waxed (dangerous on decking)

##### Limed (traditionally on oak)

## Health issues

### Plant based

#### Plant based solvent

#### Water based solvent

### Mineral based

### Synthetic

#### High VOC

#### Low VOC (more chemicals)

# Installation appearance

## Co-ordinated design

### Corners

### Changes of level

### Parapets

### Openings

### Soffits

### Junctions with other materials

## Board layout

### Orthogonal shapes

### Non-orthogonal shapes

#### Curved on plan

##### Lends itself to vertical boarding

##### Board on board works well

##### T&G difficult

#### Tight radii

##### Lends itself to narrow boards

##### Battens

###### Can be made up in thin layers capable of negotiating curve

###### Successive layers can be fixed together

Nails

Screws

###### Joints must not coincide

#### Curved on section

##### Lends itself to horizontal boarding

##### Overlap and shiplap work well

##### T&G difficult

##### Shallow angles can permit capillary attraction leading to water entry

##### Tight curves open up joints to water entry into joint

##### Sustained moisture content will lead to failure

#### Curved on elevation

#### Angled facades

##### May accept vertical horizontal or sloping boarding

##### Shallow angled façade or gable

###### Cut end of vertical boards

###### Avoid tapering horizontal boards

##### Horizontal boards

###### Additional batten to support tapered ends of boards

###### Use of diagonal boards can sometimes simplify junction

### Combinations of the above

### Geometry may dictate board layout

#### Vertical horizontal or diagonal board layouts

#### Combination of the above

## Surface coverage

### Random length and joint locations

### Controlled length and joint locations

### Random width(s) and joint spacing

### Controlled width(s) and joint spacing

## Framed panels

## Unframed panels

## Off-site panelised prefabrication

## Boarded

### Vertical

### Diagonal

### Horizontal

### Mixed

## Battened

## Louvres

## Solar shading

## Rainscreen

## Tiled

### Shingles

### Shakes

### Tiles (appear like ashlar stonework)

## Boundaries

## Profiles, overlapping, gaps, butting T&G or TG&V

## Profiles

### Spaced battens

#### Weathered top edge

#### Drip profile

### Rain-screen open joint profiled edge boards

#### Anti-capillary profiles

## Joint layout

### Board length limitations

#### Softwood

##### Species

###### European redwood

###### European Whitewood

###### European larch

###### Douglas fir

##### Lengths

###### Up to 4.8 m.

#### Temperate Hardwood

##### Species

###### Sweet chestnut

2.0 – 4.0 m.

Maximum: 5.0 m.

###### European Oak

2.4 m. generally

2.0 – 4.0 m.

Maximum: 5.0 m.

#### Tropical hardwoods

##### Species

###### Varies

2.1 – 4.2 m.

Maximum: 4.8 m.

### Width limitations

#### European Oak

##### 150 mm.

### Spacing and size and patterns

### Surface profiles

## Joint patterns & batten spacing

### Random or standardised lengths

### Random colour mixing

### Fixing appearance and spacing

## Joints

### Horizontal boarding

#### Vertical end-joints

##### Coincident with battens

##### Standard batten widths insufficient for end joints

##### Insufficient width batten

###### Insufficient edge distance on batten

###### Insufficient end distance on board

##### Consistent length boards and all occur on same batten

##### Use two battens side by side

##### Spaced to match joint between board ends

##### Timber frame background

###### Use wide batten fixed in centreline of stud

#### Panelised boarding

##### On structural grid lines

##### Lends itself to prefabrication

##### Requires coordination of openings

##### Labour intensive

##### Requires accuracy for good visual effect

##### Invites rejection by designers

##### Wasteful of timber cutting to length

#### Invisible joints

##### Random location

##### Coincident with battens

##### Length of batten nailed to side of main batten

###### To support ends of two boards

###### Length 3 x board width

##### Butt joint positions randomly staggered

##### 5 mm. gap for ventilation and drainage of end grain

### Vertical boarding

#### Horizontal end-joints

##### Increasingly visible over time

##### Wetting and swelling of lower board end grain

##### Run-off from upper board

##### Chamfer ends of boards outwards

##### Seal top of lower board

##### Gap: 5 - 8 mm.

##### Coincident with battens

##### Standard batten widths insufficient for end joints

##### Insufficient width batten

###### Insufficient edge distance on batten

###### Insufficient end distance on board

##### Consistent length boards and all occur on same batten

##### Use two battens side by side

##### Spaced to match joint between board ends

#### Panelised boarding

##### Storey heights

##### Most species can be accommodated

##### Lends itself to prefabrication

##### Floor level joints can accommodate shrinkage, deflection, creep and structural settlement

##### May accommodate cavity barriers between floors

##### Requires coordination of openings

##### Offcuts can be used under window openings

##### Labour intensive

##### Requires accuracy for good visual effect

##### Invites rejection by designers

##### Wasteful of timber cutting to length

#### Jointing

##### Finger jointing and end dowelling

##### Will become economic

##### Will become more commonplace

##### Longer lengths overcome need for butt joints

##### Reduce off-cut waste

#### Invisible joints

##### Random location

##### Coincident with battens

##### Length of batten nailed to side of main batten

###### To support ends of two boards

###### Length 3 x board width

##### Butt joint positions randomly staggered

##### 5 - 8 mm. gap for ventilation and drainage of end grain

##### Chamfered outward and downward

## It may be difficult to exclude all sapwood:

### Permissible relaxations:

#### No sapwood should be visible in exposed board face

#### No sapwood should be present in board edges, lapping or jointing profile

#### No sapwood should be present in end grain

#### Sapwood which occupies less than 5 mm. width of the hidden face may be of unlimited length

#### Sapwood which occupies more than 5 mm. width of the hidden face should be less than 500 mm. long

### Check the class specification and modify if required

#### may be difficult to identify sapwood

# Board Orientation & Profile

## Horizontal

### General issues

#### Most common

#### Profiles: simple overlap, feather or square, rebated feather, shiplap

### Square edge

#### thickness: 16-19 mm.

#### overlap 25 mm.

#### Heart side outwards

### Feather edge

#### thickness: minimum 8 mm. to 16-19 mm.

#### overlap 25 mm.

#### thin edge at top

#### Heart side outwards

### Rebated feather edge

#### Thickness: minimum 8 mm. to 19 mm. low edge: 10 mm.

#### Overlap 15 mm.

#### Gap: 2 mm.

#### Heart side outwards

### Ship lap

#### Thickness: minimum 16 – 19 mm.

#### Overlap 15 mm.

#### Gap: 2 mm.

#### Heart side outwards

### Horizontal T&G Jointed

#### tongue uppermost

#### Heart side outwards

#### Thickness: 19-22 mm.

#### Recommended board face width: 100 mm.

#### Maximum board face width: 125 mm.

#### T&G overlap 10 mm.

#### Gap: 2 mm.

#### Not V joint (used internally or vertically)

#### Better with a rebated profile

### Open joint

#### 30 degree sloping top and bottom edges

#### Heart side outwards

#### Widening gap towards back is better

#### gap 8-15 mm.

#### thickness 16-19 mm.

#### Insect mesh behind

#### Suitable for green timber, shrinkage less obvious

#### strong shadow line

#### UV light penetration effect on breather membranes to be taken into account

#### Reduced spacing battens to reduce shrinkage movement

### Butted boards

#### risky for capillary attraction

#### end grain water penetration

## Diagonal (take care with profiles)

### General issues

#### Longer span between H or V battens

#### Diagonal battens?

#### Reduce V or H batten spacing

#### Thicker board (How thick?)

#### Avoid V pattern abutments

#### Consider A pattern abutments

#### Avoid simple overlapping boards

#### Avoid open butt joints in lengths

#### Avoid butt joints use longer boards

#### Heart side outwards

### Ship lap

#### Thickness: minimum 16 – 19 mm.

#### Overlap 15 mm.

#### Gap: 2 mm.

#### Heart side outwards

### Diagonal T&G Jointed

#### tongue uppermost

#### Thickness: 19-22 mm.

#### Recommended board face width: 100 mm.

#### Maximum board face width: 125 mm.

#### T&G overlap 10 mm.

#### Gap: 2 mm.

#### Not V jointed (used internally or vertically)

#### Heart side outwards

### Overlapping

## Vertical

### General Issues

#### Consider lengths available and horizontal joints

#### Avoid top of board below joints absorbing water

#### Consider stopping and starting at floor levels

#### Consider fire barriers at floor levels

#### Allow for creep, deflection and settlement of the structure

#### Consider a weather drip between storeys or panels

#### Consider prefabrication of panels

### Vertical T&G Jointed

#### Recommended width: 100 mm.

#### Maximum width: 125 mm.

#### Thickness: 22 mm.

#### Shrinkage risks disengagement of T&G

#### T&G overlap 10 mm.

#### Gap: 2 mm.

#### Can use V jointed

#### Alternative: Rebated overlapping

#### Heart side outwards

### Rebated overlapping boards

#### Maximum width: 150 x 19 mm.

#### Heart side outwards

### Board on Board

#### Minimum 20 mm. overlap

#### With or without Capillary grooves near the outer edges of both board touching faces

#### Suited to curvilinear plan walls

#### Tolerant of dimensional variation

#### Gap created provides ventilation and drainage

#### Gap created avoids need for counter-battens

#### Wide boards on wide board

##### 150 and 150 x 16 mm.

#### Wide boards on narrow board

##### 100 on 75 x 16 mm.

#### Narrow boards on wide board

##### 75 on 100 x 16 mm.

#### Variety of board widths permits surface modelling

#### Outer board: Heart side outwards

#### Inner board: Heart side inner

### Open joint board

#### Widening gap towards back is better

#### gap 8-15 mm.

#### thickness 16-19 mm.

#### Insect mesh behind

#### Heart side outwards

#### Suitable for green timber, shrinkage less obvious

#### strong shadow line

#### UV light penetration effect on breather membranes to be taken into account

#### Use of breathing sheathing board appropriate

#### Reduced spacing battens to reduce shrinkage movement

### Open joint battens

#### Widening gap towards back is better

#### gap 8-15 mm.

#### Size: minimum ex 50 x 50 mm.

#### Insect mesh behind

#### Suitable for green timber, shrinkage less obvious

#### strong shadow line

#### UV light penetration effect on breather membranes to be taken into account

#### Use of breathing sheathing board appropriate

#### Reduced spacing battens to reduce shrinkage movement

## Sloping

### Board on Board

#### Minimum 20 mm. overlap

#### With capillary grooves near the outer edges of both board touching faces

#### Wide boards on wide board

##### 150 and 150 x 16 mm.

#### Wide boards on narrow board

##### 100 on 75 x 16 mm.

#### Narrow boards on wide board

##### 75 on 100 x 16 mm.

#### Outer board: Heart side outwards

#### Inner board: Heart side inner

#### Reduced spacing battens to reduce shrinkage movement

#### Reduced batten spacing or sloping battens

# Fixing & Fastenings

## Choices

### Hardwood

#### Screws (normal practice)

##### At or close to 16% MC

###### Allow for seasonal variation in MC

###### Oversize drill holes

###### Small movement timbers: 2 mm.

###### Medium movement species: 2 mm.

###### Clearance around shank

###### Use countersunk screws

###### Use oversize screws with bigger heads

###### Maximum 150 mm. board width

###### Locate screws ¼ board width in from edges

##### Green timber

###### Allow for considerable initial shrinkage

###### Oversize drill holes

###### Green timber: 4 mm.

###### Washer needed

Slotted hole washers

Not easy to obtain

Require alignment to permit movement

Require positioning to maximise possible movement

###### Recessed holes in timber face

###### Oversized to permit movement of washer over timber in recess

###### screw heads for use with washer

Round head or pan head

Sheeting screws with built in washers

###### Rear face fixing

Hardwood open joint boards

Panelise boards with battens

Screws through clearance holes

###### Front face fixing

Hardwood boards

Panelise boards with battens

Screw through front face and pellet or plug holes

#### To treated softwood battens (normal practice)

#### To same hardwood battens

#### Expressed

##### Demountability

###### Single lap with exposed Phillips head screw

Square edge board, horizontal boarding

Feather edge board, horizontal boarding

###### Socket in timber oversized hole, washer and screw

open joint boarding

###### Flat head nails at surface

board on board

#### Hidden

##### Limited demountability

###### Hidden J profile stainless steel fixing clips

###### Fixed to vertical batten

###### Horizontal shiplap or Open joint boarding

###### With added slot in underside

###### J profile hooks into slot

###### Screw top of boards to battens through shoulder

###### Similar principle to T&G

###### Can allow for considerable shrinkage in board width

###### Easy to engage in Joint

###### Less liable to damage tongue

###### Board can be held and aligned with wide clip

###### Requires careful design for each application

Taking in to account:

Species, shrinkage, thickness, other characteristics

### Softwood

#### Nails (normal practice)

#### To treated softwood battens (normal practice)

#### Non-demountable

##### Lost head nails

###### Horizontal boarding

Open joint

Square edge

Feather edge

Rebated feather edge

Shiplap

T&G

###### Diagonal

###### Vertical

##### Secret fix nails

###### Not recommended in T&G Joint

Risk of tongue splitting

###### Recommended in rebated T&G Joint

Nail through shoulder

## Metals

### Acidic species e.g. Oak, WRC, Sweet chestnut

#### Austenitic stainless steel

##### Marine Environment: (tidal estuary and sea) Grade 316

##### Otherwise Grade 304

##### Weathers down to matt grey

#### (Quercus Fencing fastenings)

#### Galvanized steel

##### Prone to damage when driving

#### Mild steel

##### Will stain timber and fastener purple-black

##### Stain not removable

### Non acidic species

#### Avoid ferrous if uncoated softwood boarding

#### Galvanized steel

##### Prone to damage when driving

##### Protect by coating timber

#### (Quercus Fencing fastenings)

#### Brass

### Un finished hardwood

#### Austenitic stainless steel

##### Marine Environment: (tidal estuary and sea) Grade 316

##### Otherwise grade 304

##### Weathers down to matt grey

##### Clips or washers same metal and grade

### Coated hardwood

#### Austenitic stainless steel

##### Marine Environment: (tidal estuary and sea) Grade 316

##### Otherwise Grade 304

##### Weathers down to matt grey

#### (Quercus Fencing fastenings)

#### Galvanized steel

##### Prone to damage when driving

## Fastener sizes: Dictated by board thickness

### Nails

#### Nails normally driven just below the surface

##### allow for timber shrinkage

##### avoiding nail becoming proud of surface

#### Nails 20 mm. from end of board

#### Nails 15 mm. from edge of board

#### Spacing: batten spacing dictates.

#### Small head or siding nails can pull through soft WRC

#### Larger heads recommended for WRC

### Standard round wire nails:

#### 2.5 x thickness of board

#### T&G: 19-22 mm. = 48-55 mm.

#### Other: 16-19 mm. = 40-48 mm.

### Annular ring-shank nails

#### Improved holding power

#### 2 x thickness of board

#### T&G: 19-22 mm. = 38-44 mm.

#### Other: 16-19 mm. = 32-38 mm.

### Pneumatically driven nails

#### D shaped heads may not be visually acceptable

#### Virtually headless pins are not recommended

### Screws:

#### 2 x thickness of board

#### T&G: 19-22 mm. = 38-44 mm.

#### Other: 16-19 mm. = 32-38 mm.

## Batten size, spacing and direction

### Batten Size:

#### Minimum 2 x board thickness

#### T&G: 19-22 mm. = 38-44 mm.

#### Other: 16-19 mm. = 32-38 mm.

#### Minimum: 38 x 38 mm.

### Batten profile:

#### Horizontal boarding vertical batten

##### Square

#### Vertical boarding horizontal batten fixed to counter-batten

##### 15 degree sloping top face to throw off water into ventilation cavity

#### Vertical board on board horizontal batten

##### 15 degree sloping top face to throw water away from sheathing and breather face

## Metal framing and fasteners

### Avoid different metals in direct contact if possible

#### Introduce timber battens between boards and metal framing

##### Fix boards with stainless screws to battens

##### Fix galvanised framing with galvanized or plated screws to battens

#### If unavoidable:

##### Galvanized framing and stainless steel fasteners

#### Never:

##### Stainless framing and galvanized steel fasteners

### Avoid self drilling, self tapping, self countersinking fasteners

#### Unprotected mild steel swarf will corrode

#### Iron staining of timber and stainless steel

#### Electrolytic action between different metals

## See Background and counter-battens

# Insect mesh

## Cavity behind boards can be warm and dry home to insects

## Insects: wasps, woodlice, flies

## Risk factors:

### Urban v rural

### Proximity of trees

### Height above ground

### Etc.

## Guidance:

### TRADA do not advise on need

### Precautionary principle could apply (do it anyway)

## Mesh over openings:

### Bottom and top of cavity

### Close jointed horizontal boarding

#### Fix mesh vertically to back wall of cavity

#### Fold up and attach to underside of vertical battens

#### Spanning between battens

### Close jointed vertical boarding

#### Fix mesh vertically to back wall of cavity behind counter-battens

#### Fold up and attach to underside of horizontal battens

### Board on board vertical cladding

#### Fix mesh to horizontal bottom battens

#### Extend out to run continuously across the inner boards

#### Sealing gaps behind the outer boards

### Horizontal overlapping boards

#### Square and feather edge boards

#### Triangular gaps at ends of boards

#### Alternate solutions:

##### Compressible foam tape

###### Between last vertical batten and boards

##### Fabric mesh

###### Stapled to whole facade battens before boarding

### Open jointed boarding

#### Fabric mesh

##### Excludes insects

##### Stapled to whole facade battens before boarding

##### Reduces rain penetration

##### Shades cavity from UV light

##### Restricts visibility into cavity

## Products

### Perforated metal sheet

#### If metal cladding is also used,

#### Obtain from installer

#### Metal

##### Acidic timber

###### Stainless steel

###### Terne coated stainless steel

##### Zinc

##### Copper

#### Perforation size: \_\_ mm. maximum

#### Free air area: \_\_ %

#### Fastener:

##### Screw if adequate access room

###### Same metal as perforated sheet

##### Staple if limited access

###### Same metal as perforated sheet

### Metal mesh

#### Mesh spacing: \_\_\_\_

#### Hole size: \_\_\_\_

#### Metal

##### Acidic timber

###### Stainless steel

##### Non-acidic timber

###### Zinc coated mild steel

###### Galvanized chicken wire (small mesh)???

###### Non-ferrous metal

#### Fastener:

##### Screw with large washer if adequate access room

###### Same metal as perforated sheet

##### Staples if limited access

###### Same metal as perforated sheet

### Fabric mesh

#### Mesh spacing: \_\_\_\_

#### Hole size: \_\_\_\_

#### Material:

##### UV Resistant plastic mesh

###### Nylon

###### \_\_\_\_\_

#### Fastener:

##### Staples:

###### Acidic timber

Stainless steel

###### Non-acidic timber not coated

Stainless steel

###### Non-acidic timber coated

Zinc coated steel

# Supporting Biodiversity:

## Occupation v Infestation

### What is the consequential risk of occupation?

### Can we encourage without risk?

## Bats?

### Bat droppings and urine on outer face of insulation

#### Suits hygroscopic insulation

#### Dense cellulose fibre

### Bat droppings and urine on outer face of breather membrane

#### Used with open surface hydrophobic insulation

#### Moisture resistant vapour permeable membrane

#### Paper may not be suitable

#### Polymeric may be acceptable

#### Tyvek are working with BCT

### Bat droppings and urine on outer face of breathing sheathing boards

#### Suits hygroscopic boards

#### Dense cellulose fibre and wood fibre boards

### Entry slots

#### Higher level (base of upper floors) may be ideal

### Roots

#### Trapped warm air is ideal for maternity roots

##### Sunny elevations

#### Ventilated spaces are ideal for winter hibernation roosts

##### Shaded elevations

### Or should we hang bat boxes on outer face?

## Bees and other pollinators?

### Lone bees

#### Drill holes in perimeter battens and horizontal board ends

#### Various diameters

#### Probably not be deep enough

#### Build in bee and insect nest box in panels

### Swarms

#### Probably discourage

#### Avoid honeycomb building inside construction

#### Encourage separate weather-boarded hive construction (mobile)

#### Or build hives on apex of roofs (not collecting honey)

## Spiders?

### Insect mesh will exclude some and permit others

### But excluding insects will deny them food

## Birds?

### Permitted behind cladding by poor detailing or unfinished work

### House martins

#### Fix manufactured nests to cladding below eaves

### Other bird boxes

#### Fix to cladding out of reach of cats

# Background

## Solid

### Counter battens to provide ventilation zone

### Battens to accommodate tolerances

### Rainscreen Insulation & DPM

### Insulation and breather membrane or board

### Breathing Sheathing Board

### Airtightness layer

## Spaced

### External walls

#### Studs and insulation

##### Avoid if possible creates cold bridge through insulation

##### Decrement in timber: impact on infrared survey?

##### Cold bridge analysis: Psi values

###### 400 mm. thick walls

###### 400 mm. timber stud and 400 mm. insulation

###### psi negligible

###### (but metal stud would remain a big problem)

#### Studs, insulation and sheathing board

##### Sheathing board with insulating properties will reduce cold bridge effect

##### External insulation covering the studs wraps up the cold bridges

###### Dense cellulose fibre boards

#### 2 layer studs and cross battens with insulation in both layers

##### Cold bridge minimisation

##### 400 mm. thick over all

##### Psi value minimised further

#### Breather membrane

##### Essential to prevent warm air being drawn out of insulation into ventilation space and blown away

#### Breathing sheathing board

##### Essential to prevent warm air being drawn out of insulation into ventilation space and blown away

##### May be essential to hold the insulation in place

##### Can have racking strength to add to wall stability

##### Can provide additional or substantial thermal insulation for the wall

#### Breathing wall construction

##### Internal lining

##### airtightness layers

##### Studs

##### Thermal insulation: Hygroscopic with decrement property

###### Dense cellulose fibre

##### Breathing sheathing board

##### Battens

##### Weatherboarding

### Pitched roof

#### Rafters, eaves & verge framing

#### Rafters and boarding (Scottish practice)

##### Counter-battens and battens essential

#### BRE confirmed that breathing roof construction is also possible

#### Rafters and insulation between

##### Avoid if possible creates cold bridge through insulation

##### Decrement in timber: impact on infrared survey?

##### Cold bridge analysis: Psi values

###### 400 mm. thick roof

###### 400 mm. timber rafters and 400 mm. insulation

###### psi negligible

###### (but metal rafter would remain a big problem)

### Internal ceiling

#### Ceiling joists with thermal insulation

#### Ceiling Joist, thermal insulation and board

#### Ideally a breather membrane is used over

#### Ceiling to flat roof

##### Decrement insulation important

##### Thermal mass important

#### Ceiling to pitched roof with attic space

##### Decrement insulation important

##### Thermal mass important

#### Ceiling to pitched roof with sloping ceiling

##### Decrement insulation important

##### Thermal mass important

#### Ceiling to room in a roof

##### At eaves (beyond room)

###### Insulated

###### Decrement insulation important

###### Thermal mass

##### Below room

###### Insulated

###### Decrement less important

###### Thermal mass less important

### Floor

#### Suspended ground floor

#### Suspended upper floor

#### Suspended floor over external passage/carport/garage

#### Floor joists

#### Floor joists and soffit boards

## Rainscreen framing

### See Metal flashings for corrosion issues

### See batten, metal framing and fastenings for corrosion issues

## Access panels and doors

### To service risers

### Water, Gas, Electricity, Telephone, Broadband, Satellite

### RWP, RWHP, SW&VP

### Meters: Electric, Gas, Water

#### Gas ventilation issue and Gas Regs.

### Water stop valves, drain cock, outdoor taps,

### Gulley below (low risk of sewer gas)

## Easy replacement areas

### Eaves abutting gable

#### Rainwater gutter persistent overflow risk area

### Splash zone

# Detail Design

## General

### Meet service life with minimal maintenance

### 1st line of defence: Design to reduce risk

### 2nd line of defence: Durable – sapwood or + preservatives

## Control of moisture

### Generally

#### Always assume rain-screen principle

#### Cladding largely protects membrane from wind, rain, daylight and sunlight

#### Amount of rain penetration depends upon design of cladding

##### Open jointing more rain penetration

##### Overlapping less rain penetration

#### Open cavity should always be provided

##### Drain any moisture penetration

##### Ventilate to dissipate any internally generated vapour

##### Maintain equal moisture content in both faces of boarding

###### Avoid distortions

##### Minimum 19 mm. wide

##### Usually dictated by the batten size (minimum 38 x 38 mm.)

##### Minimum 15 mm. at flashings

#### Maintain moisture content (MC) below 22%

##### No risk of Fungal attack (UK)

##### Little risk of Insect attack (UK)

##### Risk of Termite attack (Not UK)

##### Wetting to higher than 22% will not instigate decay

##### Sustained exposure above 22% increases risk of attack

##### UK typical ambient humidity and direct exposure to rain unprotected externally

###### Not raise MC above 20%

###### BS 1186:Part 3 suggests 19%

###### Climate change increase?

#### Principles

##### Avoid contact with porous surfaces

##### Avoid contact with wetted non-porous surfaces

##### Prevent wood from absorbing moisture

###### Particularly the absorbent end grain

##### Waterproof membranes or air gaps required

##### Protect top edges of vertical boards

##### Ventilate bottom edges of vertical boards: 15 mm.

##### Ventilate side edges of horizontal boards: 8 – 10 mm.

##### Ventilate bottom ends of diagonal boards: 12 mm.

##### Sloping flashings to splash away from board ends

##### Avoid sealants

### Backgrounds

#### Masonry background

##### Waterproof membrane not needed

#### Other backgrounds

##### Waterproof membrane behind battening

### Bases

#### 15 mm. clearance above flashings

### Abutments

#### 8 – 10 mm. clearance

#### 12 mm. clearance from diagonal boarding

##### Ensure water runoff cannot enter behind this joint

### Overhangs

#### Generally

##### Largely protect walls from direct wetting

##### Wind driven rain gets everywhere

##### Extend the life of surface finishes

##### Not affect the durability of the wood

#### Unfinished

##### Will slow or prevent natural weathering and bleaching

##### Result in uneven colouring between shaded and unshaded

### Horizontal surfaces

#### Ground, pavement, flat roofs, decking, etc.

##### Smooth surface splash higher

###### Irregular large gravels disperse splashes

##### Water can sit on surface

###### Consider permeable surface

#### Indirect wetting from splashing

#### Greater wetting of lower boards

#### Deterioration of surface finishes

#### Possible algal growth

#### 200-250 mm. clearance advisable

## Allowing for moisture movement (MM)

### General

#### Organic material: Moisture Content (MC) varies with environmental conditions

#### MC varies:

##### Maximum 22% North face winter

##### Minimum 10% South face summer

##### Higher and lower % are occasionally recorded

##### Seasonal variation on one face varies: 6-8%

##### Change in moisture content won’t affect strength or durability

##### Avoid restraining fixings or tight jointing

##### Risk of splitting cupping or bowing

##### Excessive moisture movement: T&G can disengage

##### May compromise the fixing to the building

### Design to accommodate MM Moisture Movement

#### Design in allowances for MM Moisture Movement

#### Match MC in use to MC at construction

#### UK normal MC range: 12% - 20%

#### BS 1186:Part 3 suggests: 13% - 19%

#### Aim to obtain timber of 16% mean MC

#### Aim to fix timber at \_\_% mean MC

#### Design joints to accommodate shrinkage and swelling

#### Generally

##### Limit board widths to 150 mm. to limit variation in size

###### Especially if used Green

#### Overlapping

##### Overlapping more tolerant and remain watertight

#### Open joint

##### Open joints more tolerant remain watertight

#### Rebated

##### Rebated less tolerant and may not remain watertight

#### T&G Tongue and Groove boarding

##### Limit board widths to preferably 100 mm. maximum 125 mm.

##### Tongue uppermost

##### T&G less tolerant and may not remain watertight

##### Movement in T&G boards can make assembly difficult

##### T&G boards movement can lead to tongue splitting off

##### Only kiln dried to recommended MC should be used

### Fixing and fasteners to accommodate moisture movement

#### Board Widths

##### Below 100 mm. single fixed

##### Reduce batten spacing

##### Up to 100 mm. single fixed

##### Shrinkage either side of fastener

##### Over 100 mm. double fixing to help them stay flat

##### Stresses between fasteners

#### Changes in shape

##### Moisture content variations

##### Natural tendency

##### Predictable

##### Turn to advantage

##### Section cut from tree

###### side nearest the heart of the tree expands relatively (heart side)

###### side furthest from the heart side shrinks relatively

###### edges cup away from the heart side

##### Arrange for joints between board to tighten against each other

##### Most boards:

###### Heart side to face outward when section installed

##### Board on board

###### Inner board

Heart side inwards to face building

###### Outer board

Heart side outwards to face away

##### Quarter sawn boards have least risk of changing shape

###### Uneconomical to use quarter sawn throughout

#### Cladding support: battens and counter-battens

##### Battens to which boards are fixed

###### Battens usually dictate the ventilation zone depth

(minimum 19 mm.)

###### Vertical cladding, Horizontal Battens Size:

Dictated by board fastener and board thickness

Nails

Nails normally driven just below the surface

allow for timber shrinkage

avoiding nail becoming proud of surface

Nails 20 mm. from end of board

Nails 15 mm. from edge of board

Spacing: batten spacing dictates.

Small head or siding nails can pull through soft WRC

Larger heads recommended for WRC

Standard Round wire nails:

2.5 x thickness of board

T&G: 19-22 mm. = 48-55 mm.

Other: 16-19 mm. = 40-48 mm.

Annular ring-shank nails

Improved holding power

2 x thickness of board

T&G: 19-22 mm. = 38-44 mm.

Other: 16-19 mm. = 32-38 mm.

Pneumatically driven nails

D shaped heads may not be visually acceptable

Virtually headless pins are not recommended

Screws:

Minimum 2 x thickness of board

T&G: 19-22 mm. = 38-44 mm.

Other: 16-19 mm. = 32-38 mm.

Batten Size:

Minimum 2 x board thickness

T&G: 19-22 mm. = 38-44 mm.

Other: 16-19 mm. = 32-38 mm.

Minimum: 38 x 38 mm.

Batten profile:

Horizontal boarding vertical batten

Square

Vertical boarding horizontal batten fixed to counter-batten

15 degree sloping top face to throw off water into ventilation cavity

Vertical board on board horizontal batten

15 degree sloping top face to throw water away from sheathing and breather face

###### Counter-battens, studs, joists or rafters

Spacing of nails or screws dictated by this spacing

Usually fixed vertically or running down slope

Reduced centres

Helps reduce tendency for boards to twist, bow or cup

Green timber cladding

Centres reduced to 400 mm. (maximum 500 mm.)

Narrow boards (less than 100 mm.)

Centres reduced to 400 mm.

Vertical or horizontal boards

Not greater than 600 mm. centres

Diagonal boards

Vertical or horizontal battens

Not greater than 400 mm.

Diagonal battens

Not greater than 600 mm.

###### Counter-batten size:

To maintain 19 mm. ventilation zone

Vertical boarding:

Counter-batten size: 16 x \_\_ mm.

###### Perimeter battens

Omit or reduce thickness of any perimeter battens (top and bottom of horizontal boarding)

Maintain 19 mm. ventilation zone

# Resource Efficiency

## Reduce waste in design

### Obtain knowledge of what is available: width and length

### Design with available width and length in mind

### Choose species according to preferred design width and length

## Design for Demountability

### Fasteners

#### Screws

##### Accessible heads

##### Corrosion resistant to enable unscrewing later

#### Nails: Avoid

### Metal

#### Future reuse as screw essential

#### Corrosion resistant

##### Austenitic stainless steel

##### Grade: 304 or 316 (marine grade)

#### Corrosion resistant finish

##### Susceptible to damage when driving

## Reclaim for reuse

### Care with fixings avoid damaging boards

### Use screwdriver in reverse to remove screws

### Assemble multiple pallets to support lengths

### Strapping to secure, timber strips to protect

## Waste issues

### Hazardous waste (treated or coated)

### Active Virgin timber

#### Compostable waste (perishable species)

### Mixed waste (treated or coated)

# Samples & Mock-ups

## Samples

### Require sufficient samples prior to purchase

### Purpose

#### Agree visual quality of profile

#### Check size of section

#### Agree visual quality of timber

##### Knots

##### Sapwood

##### Colour range

#### Agree finish: surface texture, transparency, colours, gloss level

### Timing

#### In advance of purchase deadline to meet programme

##### Programme may include mock-up construction and approval process

## Mock-ups

### Position:

#### as if in real building

##### Height, distance and viewing angles

##### for accurate judgement

#### in the real building

##### if acceptable, as part of the final works

### Large enough to include:

#### Long lengths of timber, butt joints

#### Background build-up, framing,

#### boundaries, edges

#### Internal and external changes of direction,

#### Openings,

#### Changes in design

### Purpose

#### Check interfaces with other trades

#### Ensure required quality can be achieved

#### Agree acceptable quality if different

### Timing

#### In advance of purchase deadline to meet programme

# Drawings

## Standard Details

### Show the proposed construction details (fixed)

## Principle Details

### Show the ideal details (fixed)

### but offer designers some choices about:

### size, profile, species, finishes (unfixed)

# Materials handling and storage

## Materials can be spoiled and repairs may be impossible or unacceptable

## Wasting materials is unacceptable practice

## Risks

### Exposure to excessive wetting

### Exposure to mud splashes

### Exposure to cement slurry splashes

### Damage by foot traffic boot marks

### Damage by impact

## Protection

### Protection is essential in transportation, storage and once installed

## Storage

### Avoid over tight banding

#### Protect edges of boards from damage

#### T&G vulnerable

### On solid flat (shallow slope to self drain) surface

#### Dry concrete suitable

#### Lime stabilised soil suitable

#### Avoid soil base (mud splashes)

#### Away from traffic flows (mud splashes)

### On battens or pallets to prevent contact with soil and ground water

#### Batten spacing to prevent deflection of stack or individual boards

### Undercover and ventilate

#### Exclude moisture but encourage moisture egress

### Green timber

#### Consider stacking with sticks between layers

#### Ventilation to reduce moisture content

#### Sticks must be clean and dry to avoid stick marking

### Unfinished installation boards

#### Special care to keep clean and dry and free from soil and cement splashes and damage

#### Sawn finishes impossible to sand to remove marks

#### Natural weathering of any marks: long slow process

### Prefinished boards or panels

#### Avoid damage of finish

#### Avoid touching up as it is difficult to do well

##### Colour matching

##### Gloss level matching

##### Blending in

##### Loss of durability compared with factory applied

# Installation

## Moisture content

### At time of installation is important

### As specified

### Check and record immediately before installation

### It may be different to when delivered

### Condemn timber for use on the project if MC drops by \_ %

## Heartside arrangement

### Normal boarding

#### Symmetrically profiled boards

#### If growth rings are visible in cross section of boards

#### Ensure heartside is on outer face

### Board on board

#### Inner board heartside to face inwards to wall

#### Outer board heartside to face outward

### Care with kiln dried and sawn timber this may reverse requirements

## Allow for moisture movement: Expansion

### 2 mm. gap for up to 150 mm. wide T&G

### What gap for larger?

## Allow for moisture movement: Shrinkage

### Green timber will shrink on drying

### Provide less gap

### T&G not suitable for Green Timber

### Open joint setting out should make joints narrower so they are correct once dry

### X mm. per xxx mm.

### Determined by calculation

## Butt jointing boards

### Unfinished timber: 5 mm. gap

### Coated timber: 8 mm. gap

### Always occur on doubled battens

#### Random length: add additional batten, length: ≥ 3 x board width

#### Expressed joint in panels: add second batten

### Thicker or narrow hardwood boards

#### Form lap joint by rebating ends and overlap

#### Labour intensive and requires good workmanship

## Nominal and finished sizes

### Allow nominally 6 mm. reduction in section size (3 mm. from each face)

### If cladding is based on nominal size and coordinated with openings

#### increase joint sizes to compensate

## Unfinished boards and fasteners

### Drive nail or screw heads flush after initial drying has taken place

## Coated boards

### Arrises

#### Removal of sharp square arises will prolong the life of the coating

#### Planning chamfers or sanding

#### Coating cannot negotiate sharp corners

#### Surface tension in liquid coating pulls them back from corners

#### Benefits horizontal boards in particular

### fasteners

#### Drive nail or screw heads slightly below the surface for slight paint build up

### Application on site

#### Minimum of first coat to be applied before installing

#### Apply thickly to exposed end grain

#### Pre-coating on all faces will even out moisture absorption

#### help even out distortion across the section

#### Avoid uncoated material showing when shrinkage occurs

#### Open joint boarding

##### Coat battens as well

# Maintenance

## Unfinished boards

## Unfinished shingles and shakes

### Little or no maintenance

### Surface cleaning from pollution or foliage

## Surface cleaning

### Cleaning agents

#### For removal of surface staining or soiling

#### For removal of beached surface

#### For removal of iron staining in acidic timber

### Stubborn stains may require a clear coating

#### Clear coating have low UV resistance

#### Will need recoating frequently

##### 2-3 years or less

### Wetting stains may benefit from clear coating

#### To reduce water uptake

#### Only apply after drying out

#### Clear coating have low UV resistance

#### Will need recoating frequently

##### 2-3 years of less

#### Test small patch to check appearance

## Life expectancy

### Depends on many factors:

#### Level of exposure

#### Initial application method

##### Factory applied will outlast site applied

##### Factors include:

###### Tightly controlled process

###### Controlled moisture content

###### Limiting exposure to UV light before application

###### Cleanliness of environment

###### Standards of workmanship

### Long life coating may require special preparation for maintenance

#### Consult manufacturer of coating and component

### Always check for compatibility of all layers

#### Check O&M manuals (Operation and maintenance manuals)

### Do not overcoat micro porous coating with film forming coatings

### If reapplying same coating check preparation rules

#### Patchy clear stain will need to be stripped back to bare wood

#### Minimise preparation time by maintaining before deterioration sets in

### Hardwoods coating for first time after being left unfinished

#### Hardwood vary considerably

#### Some are not suitable for coating

### Need for decoration depends on exposure

#### The most exposed will require more frequent redecoration

#### Less exposed need not be coated at same frequently as exposed

#### Survey and determine needs

### Update O&M manuals

# H21 TIMBER WEATHERBOARDING

# BACKGROUND INFORMATION

## Environmental Issues

### Forest as Resource

#### Support for people

##### Home for people

##### Medical resource

##### Food resource

###### Shade grown coffee

#### Support Biodiversity

##### Home for nature

##### Food source for nature

##### Food for nature when dead

#### Timber

##### Biomass Fuel

##### Building material Carpentry and Joinery

##### Furniture and Cabinet making

#### Carbon sink (Carbon Sequestration) when growing

##### Consumes Carbon dioxide

##### Produces Oxygen

##### Mature trees reduce efficiency

##### Harvesting of plantation is good if replanting

### Occupants

#### Occupation by indigenous tribes

#### Occupation by wildlife

### Legality

#### Legal ownership of land forest plantation

#### Occupation rights

### Legacy

#### Clear felling destroys most future opportunities

#### Clear felled land rainwater runoff overwhelms rivers

#### Runoff deposits soil in river estuaries

#### Soil in solution in rivers can starve fish of oxygen

#### Soil deposits pollute and kill corals

#### Farming chemicals create dead zones in rivers, estuaries and coastal waters

### Plantations

#### Plantations can restore status quo and avoid many of these issues

#### Plantations likely to be monocultures

##### Limited support for biodiversity

##### Trees may not be indigenous species

##### Coffee, Chocolate, Poppies, Drugs, Soya bean,

##### for animal feed or bio-fuels, soap

##### recreational drugs

### Resource if maintained

#### Medical resource

#### Food resource

#### Shade grown crops in harmony with forest canopy

#### Wildlife habitation/resource

#### Indigenous tribes

#### Carbon sequestration & oxygen generation

### Selective cropping

#### Removal of individual trees can be done

#### Leaving forest to heal in relatively short time

#### Access roads give farmers access

#### Farmers burn and clear fell to make farms for cattle

#### A few years in the soil fertility is gone

#### Soil erosion after cattle disturbance

#### Farmers moves on to repeat process in new location

### Environment Sustainability

#### Rapidly renewable coppicing for biomass fuel

#### Rapidly renewable forest thinning timber

##### for some construction applications

#### Renewable tree growing 40 – 100 year cycle

#### Use of sun, water and minerals from ground

#### Energy for loggers

#### Energy for transportation

#### Energy for milling and craftsmen

#### Energy for shipping and transport

### Factors influencing choice of species

#### Local sourcing

##### Home grown v imported

##### Local employment

##### Local economy

##### Transport minimised

###### Fuel use

###### Pollution

###### Congestion

#### Manufacturing

##### Energy

##### Emissions

#### Simple sawn profiles v profiled

##### Energy used

##### Waste generated

#### Efficient use of resource

##### Reduce

##### Reuse

##### Recycle

##### Recovery: Composting v energy from combustion

##### Reject Waste: Disposal

#### Erection

##### Local labour v imported

#### Finishes

##### None v stained v painted

##### Natural v Synthetic

##### Plant extract v Petrochemical

##### Perfume v VOCs

##### Materials:Waste 1:20

##### Compostable v Hazardous waste

#### Durability

##### Durable v Preservatives

#### Maintenance

##### None v over-coating v stripping and repainting

#### Disposal

##### Composting of untreated unfinished timber

##### Hazardous waste if treated or finished

#### Performance in use

##### Desired performance

##### Service life

##### Appearance

##### Costs

### Zones of influence

#### Sun

##### Sundial

##### Solar shading in summer

##### Solar penetration in winter (deciduous)

#### Light

##### Shading

##### Dappled light

##### Colour from translucency of leaves

##### Reflection on leaves and wet leaves

#### Wind

##### Shelter

##### Wind noise in leaves and through branches

##### Wind shadow

#### Rain

##### Temporary shelter

##### Long term shower

##### Dry spot slowly disappears

#### Lightning

##### Tall trees: lightning magnet

#### Root zone

##### Water harvesting

##### Soil shrinkage

##### Building settlement in extreme droughts

##### Pavement disruption

#### Production

##### Pollen drift

##### Sap

##### Perfume

##### Allergic reactions: Hey fever

##### Seed drop

##### Leaf drop in autumn

#### Biodiversity support

##### Nectar bar

##### Fruit and nuts

##### Home for flora and fauna

## Cost plan

### Treated Softwood: £60-69/m2

### Durable Hardwood: £64-75/m2

## Sustainable Definition?

### England

#### Domestic

##### Code for Sustainable Homes

#### Non-domestic

##### Pending

### Not England

#### Domestic

##### BRE EcoHomes

##### Others?

#### Non-domestic

##### BREEAM, etc.

##### LEAD

##### DREAM

##### CEEQUAL

### BRE Green Guide to Specification

#### (2002 EcoHomes & BREEAM))

##### Treated SW: 2002 A rated

##### Durable HW: 2002 A rated

##### Reclaimed and reused timber: A rated

#### (2008 CfSH Green Guide)

##### Treated SW: 2008 A+ rated

##### Durable HW: 2008 A+ rated

##### Reclaimed and reused timber: A rated

## Timber types

### Coniferous (Softwood)

#### Durable softwood

##### Green Softwood

#### Perishable softwood

##### Treatment

#### Acidic Softwood (tannin staining/corrosion potential)

##### Western Red Cedar

### Deciduous (Hardwood)

#### Durable Hardwood

##### Green Hardwood

#### Perishable Hardwood

#### Acidic Hardwood (tannin staining/corrosion potential)

##### Oak

##### Sweet chestnut

## Timber merchants

### Need to be familiar with numerous issues

### Strength grades (is not enough)

### Quality grades

### Sustainable Forestry Certification

### Chain of custody

### Treatment certification

## H21 Sector

### Manufacturers or suppliers

#### Softwood for batten

#### Treatment for battens

#### Hardwood for battens

##### Softwood for boards

#### Treatment for boards

#### Hardwood for boards

#### Decorative coatings

#### Fasteners

#### Meshes

#### Membranes???

### Installers and applicators

#### Treatment

#### Installation

#### Applications

#### Maintenance

### Contractors

### Designers

# H64 TIMBER SHINGLING

## Shingles and shakes

### General issues

#### Tapered pieces of wood

#### Shingles

##### Sawn on both faces

#### Shakes

##### Split from solid wood

#### Appearance as single lap tiling or slates

#### Durability

##### Some of the oldest timber buildings are clad with shakes or shingles

##### In USA often coated but unnecessary

##### Level to bleach in sunlight

##### May darken to varying shades of brown

#### Application

##### Roofs

##### Walls

#### Adaptable

##### Curves on plan

###### Tight radius can use boiled shingles

##### Corners:

###### Internal or external corner boards

###### Mitred and lacing

##### Curves in section

###### Shorter length shingles and shakes

###### Narrower batten spacing

##### 3 Dimensional surfaces

##### Cladding

##### Roofs

###### Low pitches can reduce life expectancy of shingles

###### Commonly preservative treated imports from USA

#### Rainscreen Ventilation and drainage

##### Essential to maintain ventilation zone under both types

##### Counter-battens

###### preferred if not boarded surface behind/below

###### (English practice)

###### essential if boarded surface behind/below

###### (Scottish practice)

##### Waterproof membrane behind and below essential

#### Sizes: Shingles: Lengths

##### 405 mm.

##### 455 mm.

##### 610 mm.

##### Vertical cladding 40% shown

##### Three layers maximum at overlap

#### Sizes: Shingles: width varies

#### Fixing: span across 3 battens

##### Stainless steel annular ring shank nails

#### Battens and counter-battens

##### Same species as the shingles or shakes

##### Species of same durability class as shingle shakes

##### Species of durability class 1 2 or 3

##### Preservative treated softwood

## Shingles

### Species applicable

#### Softwood

##### Homegrown UK

###### Western red cedar

##### Europe

###### European larch

##### Imported USA

###### Western red cedar

Imported shingles are preservative treated

###### Californian redwood (west USA)

#### Hardwood

##### Home grown UK

###### Oak

###### Sweet chestnut

##### Europe

###### European Oak

## Shakes

### Species applicable

#### Softwood

##### Homegrown UK

###### Western red cedar

##### Europe

###### European larch

##### Imported USA

###### Western red cedar

###### Californian redwood (west USA)

#### Hardwood

##### Home grown UK

###### Oak

###### Sweet chestnut

##### Europe

###### European Oak

# H92 RAINSCREEN CLADDING/OVERCLADDING

## Proprietary panel systems

### Hardwood panels on metal carrier system

#### Rainscreen (visual alternative to terracotta)

#### Open vertical and horizontal joints

#### Ventilated cavity behind

#### Requires dense durable stable hardwood

##### Accommodate moisture movement

#### FSC certification available on all

#### Fixing clips require accurate placement

#### Aluminium carrier system

##### High thermal movement

#### Variant of the historic shingles looking like ashlar

# H20 RIGID SHEET CLADDING (EXTERNAL)

## Materials

### Plywood generally

#### Often used on temporary buildings

#### Requires considerable care in spec and design

#### Vapour resistant sheets

##### Glue lines

##### Increases with thickness

##### Needs ventilation cavity behind

##### Internally generated vapour diffuses away

#### Airtightness

##### Very important for energy performance of building

##### Care needed at joints

##### T&G Joints can maintain integrity of board

##### Sealing or taping joint can make sure

##### Batten the tape to provide mechanical security

#### Rainscreen approach

##### Ventilation and drainage cavity behind

##### Maintain moisture content consistent front and back of sheet

#### Sizes

##### Vertical joints

###### 1200 mm. wide (nominally)

Normal batten spacing 600 mm.

Exposed fixings unless cover-battened

Cover batten on centre of board

###### 600 mm. wide (nominally)

Normal batten spacing 600 mm.

Hidden fixings under cover-battens

##### Horizontal joints

###### Avoid if edges supported by battens

###### Or Counter-battens to maintain ventilation zone

#### Edge lipping

##### Hardwood

##### Treated softwood

#### Unframed with open joints

##### 6 mm. gaps unfilled

##### Sealed board edges

##### Edge Lipped

##### 12 mm. gap at bottom

##### Top protected from weather

##### Plywood nailed or screwed to battens

##### Fixings exposed

##### Fixings

###### Oversized hole allow for movement

###### Rubber washer

###### Metal washer

###### Screw

#### Cover battened joint boarding

##### 6 mm. gaps unfilled

##### Sealed board edges

##### 12 mm. gap at bottom

##### Top protected from weather

##### Plywood nailed or screwed to battens

##### Cover batten to conceal fixings

###### Substantial Capillary grooves machined on rear face

###### Drainage runs

###### Pressure relief

##### Species

###### Hardwood

###### Softwood

Preservative treated

##### Fixings:

###### Nailed or Screwed

###### through cover batten

###### through gaps between plywood sheets to battens

##### Horizontal joints

###### Flashing to protect sheets below

#### ‘Glazing’ into frames

##### 6 mm. air gap at bottom

##### Drained aluminium bottom bead

#### Exposed outer veneers

##### Part of sheet or additional veneer applied

##### Thinner plywood may require a balancing veneer

##### Hardwoods

###### Durability class 1 2 or 3

###### Birch not suitable

###### Some hardwoods not suitable

###### Durability class 4 & 5 must be preservative treated

##### Visual grade: \_\_\_\_\_

##### Sanded show face

##### Lipping

###### Vulnerable

###### Hardwood lipping first veneer second

###### Veneered first and lipping second

###### Treated softwood

#### Finishes

##### Surface veneer subject to surface checking (small cracks)

##### Film forming high build coatings

###### will show up checking

###### Film liable to break down

##### Low build vapour permeable penetrating stain finishes

###### Will colour the top veneer only

###### Will tolerate checking

###### Checking will not show

###### Moisture build up can escape

##### High solid coating systems

###### Will colour the top veneer only

###### Will tolerate checking

###### Checking will not show

##### Pre-finished resin coated shuttering plywood

###### Limited colour range

###### Many not be UV resistant over long period

###### Standardised design to minimise cutting recommended

###### Cut edge sealing necessary

###### Water penetration risk at the fixings

### External quality plywood

#### Glues: Class 3 to BS EN 314-2

#### Veneers:

##### Class 2 Durable

##### Class 3 Moderately durable

##### Class 4 or 5

###### Preservative treated

#### Edge lipping

##### Hardwood

##### Treated softwood

### Marine Grade Plywood

#### Veneer Durability

##### class 3 Moderately Durable

##### End grain vulnerable to swelling

#### Edge lipping

##### Hardwood

##### Treated softwood

### Softwood sheathing plywood

#### Preservative treated

#### Any cutting or drilling must be retreated

#### Edge sealers

#### Edge lipping

##### Hardwood

##### Treated softwood

### Shuttering plywood

#### Pre-finished resin coated

#### Long life: many formwork applications

#### Any cutting or drilling must be retreated

#### Edge sealers

#### Fixing seals

### Laminated veneer lumber (LVL)

#### Thick softwood or birch veneer

#### Not durable class 1 2 or 3

#### Preservative treatment recommended

#### Thicker panels than plywood

#### One directional material

#### Use vertically little risk of exposed end grain at top and bottom

#### However must protect exposed edges as normal

### GRP encapsulated plywood

#### Any cutting or drilling must be GRP encapsulated

#### Edge sealers

#### Fixing seals

### Moisture resistant MDF

#### Short life application only

### Oil tempered hardboard

#### Short life application only

### OSB

#### Short life application only

## Proprietary panel systems

### Veneered panels

### General issues

#### Veneer applied in manufacture less vulnerable

#### Durable hardwood veneers

#### Factory applied lacquered finish

#### Fixing

##### Screws

###### Exposed screws to battens

###### Allow for moisture movement with oversized holes

###### Make holes watertight with sealing washers or screw caps

##### Carrier system

###### Clips on back of panel

###### Aluminium carrier systems

### Veneered High density wood fibre

#### No end grain or ply vulnerability

#### Veneer applied in manufacture less vulnerable

#### Durable hardwood veneers

#### Factory applied lacquered finish

### Veneered high density cellulose fibre

#### No end grain or ply vulnerability

#### Veneer applied in manufacture less vulnerable

#### Durable hardwood veneers

#### Factory applied lacquered finish

### Bamboo plywood

#### High density bamboo fibre core

##### Little end grain absorption when cut (claimed)

#### Bamboo veneer

#### Protective lacquer

#### Durability class: 5 (not inherently durable)

#### Requires preservative treatment if used externally

#### Use plywood methods of installation

### Veneered Kraft paper layer sheet

### Plastic/Resin and timber fibre extrusions

#### Virgin fibre and virgin binder:

##### poor environmental choice

#### Recycled fibre and recycled binder

##### Better environmental choice

#### Recyclable and recycled by manufacturer

##### Added bonus

# K13 FINE PANEL CLADDING (INTERNAL) requires editing partially complete %%%

## Materials

### Plywood generally

#### Vapour resistant sheets

##### Glue lines

##### Increases with thickness

##### Needs ventilation cavity behind

##### Internally generated vapour diffuses away

#### Airtightness

##### Very important for energy performance of building

##### Care needed at joints

##### T&G Joints can maintain integrity of board

##### Sealing or taping joint can make sure

##### Batten the tape to provide mechanical security

#### Sizes

##### Vertical joints

###### 1200 mm. wide (nominally)

Normal batten spacing 600 mm.

Exposed fixings unless cover-battened

Cover batten on centre of board

###### 600 mm. wide (nominally)

Normal batten spacing 600 mm.

Hidden fixings under cover-battens

##### Horizontal joints

###### Avoid if edges supported by battens

###### Or Counter-battens to maintain ventilation zone

###### Ventilation zone can expose thermal mass

#### Edge lipping

##### Hardwood

##### Softwood in dry conditions

#### Unframed with open joints

##### 6 mm. gaps unfilled

##### Sealed board edges in damp rooms

##### Edge Lipped

##### 12 mm. gap at bottom

##### Plywood nailed or screwed to battens

##### Fixings exposed

##### Fixings

###### Oversized hole allow for movement

###### Rubber washer in damp rooms

###### Metal washer

###### Screw

#### Cover battened joint boarding

##### 6 mm. gaps unfilled

##### Sealed board edges in damp rooms

##### 12 mm. gap at bottom

##### Plywood nailed or screwed to battens

##### Cover batten to conceal fixings

##### Species

###### Hardwood

###### Softwood in dry rooms only

##### Fixings:

###### Nailed or Screwed

###### through cover batten

###### through gaps between plywood sheets to battens

##### Horizontal joints

####  ‘Glazing’ into frames

##### 6 mm. air gap at bottom in damp rooms

##### Drained aluminium bottom bead in wet rooms

#### Exposed inner veneers

##### Part of sheet or additional veneer applied

##### Thinner plywood may require a balancing veneer

##### Hardwoods

###### Durability class 1 2 or 3

##### Damp rooms

###### Birch not suitable

###### Some hardwoods not suitable

###### Durability class 4 & 5 must be preservative treated

##### Visual grade: \_\_\_\_\_

##### Sanded show face

##### Lipping

###### Vulnerable

###### Hardwood lipping first, veneer second

###### Veneered first and lipping second

###### Treated softwood

#### Finishes %%%

##### Surface veneer subject to surface checking (small cracks)

##### Film forming high build coatings

###### will show up checking

###### Film liable to break down

##### Low build vapour permeable penetrating stain finishes

###### Will colour the top veneer only

###### Will tolerate checking

###### Checking will not show

###### Moisture build up can escape

##### High solid coating systems

###### Will colour the top veneer only

###### Will tolerate checking

###### Checking will not show

##### Pre-finished resin coated shuttering plywood

###### Limited colour range

###### Many not be UV resistant over long period

###### Standardised design to minimise cutting recommended

###### Cut edge sealing necessary

###### Water penetration risk at the fixings

### External quality plywood

#### Glues: Class 3 to BS EN 314-2

#### Veneers:

##### Class 2 Durable

##### Class 3 Moderately durable

##### Class 4 or 5

###### Preservative treated

#### Edge lipping

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##### Treated softwood

### Marine Grade Plywood

#### Veneer Durability

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##### End grain vulnerable to swelling

#### Edge lipping

##### Hardwood

##### Treated softwood

### Softwood sheathing plywood

#### Preservative treated

#### Any cutting or drilling must be retreated

#### Edge sealers

#### Edge lipping

##### Hardwood

##### Treated softwood

### Shuttering plywood

#### Pre-finished resin coated

#### Long life: many formwork applications

#### Any cutting or drilling must be retreated

#### Edge sealers

#### Fixing seals

### Laminated veneer lumber (LVL)

#### Thick softwood or birch veneer

#### Not durable class 1 2 or 3

#### Preservative treatment recommended

#### Thicker panels than plywood

#### One directional material

#### Use vertically little risk of exposed end grain at top and bottom

#### However must protect exposed edges as normal

### GRP encapsulated plywood

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###### Clips on back of panel

###### Aluminium carrier systems

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#### Veneer applied in manufacture less vulnerable

#### Durable hardwood veneers

#### Factory applied lacquered finish

### Veneered high density cellulose fibre

#### No end grain or ply vulnerability

#### Veneer applied in manufacture less vulnerable

#### Durable hardwood veneers

#### Factory applied lacquered finish

### Veneered high density desulfurization gypsum panels

#### Internal use only

#### Perforated with acoustic absorbent insulation

### Bamboo plywood

#### High density bamboo fibre core

##### Little end grain absorption when cut (claimed)

#### Bamboo veneer

#### Protective lacquer

#### Durability class: 5 (not inherently durable)

#### Internal applications only

#### Use plywood methods of installation

### Veneered Kraft paper layer sheet

### Plastic/Resin and timber fibre extrusions

#### Virgin fibre and virgin binder:

##### poor environmental choice

#### Recycled fibre and recycled binder

##### Better environmental choice

#### Recyclable and recycled by manufacturer

##### Added bonus

# K42 EXTERNAL SUSPENDED SOFFITS

## Issues

### Risk of condensation remaining on surface

### Introduce profiles to create drip

### Needs non-permeable finish?

# L10 WINDOWS SCREENS LOUVRES ROOFLIGHTS

# Windows

## TRADA book to extract from

## Purchased book

# Internal Screens

# EXTERNAL SCREENS

## Performance requirements

### Wind screening/shelter

### Acoustic baffle

### Rain screening/shelter

### Maximise view/restrict viewing angles

### Control sunlight passage

### Control daylight passage

### Control reflection of daylight from surfaces

### Control reflection of sunlight from surfaces

### Resist wind load and uplift

### Not generate wind noise or rattling

### Resist defection and creep

### Durability

### Control Access

### Control climb ability

### Security screen

## Arrangements

### Vertical

### Horizontal

### Sloping

### Combination(s) of the above

## Design

### Panelised

#### Unframed

#### Framed

##### Hardwood framed

##### Same durability as blades

#### Sub-framed

##### Metal frame

###### Mild Steel

###### Hot dip galvanized

###### Sacrificial coating of zinc rich epoxy paint if acidic timber

## Section orientation

### Vertical

#### In vertical or sloping installation

#### Greatest resistance to deflection and creep

#### Greatest spanning potential

#### Top surface profiled for rainwater runoff

#### Drip profile at base

### Sloping

#### In vertical installation

#### Offers some resistance to deflection and creep

#### Design to overcome deflection and creep

#### Seek to obtain stiffness from supports and fastenings

#### Encourages rainwater runoff, the steeper the better

#### Drip profile at base

### Horizontal

#### Poorest spanning potential

#### Design to overcome deflection and creep

#### Seek to obtain stiffness from supports and fastenings

#### Risk of rainwater standing on top

##### Risk of staining

#### Risk of runoff and condensation on bottom

##### Risk of staining

#### Consider self weight and wind loading

## Blade Size

### Narrow blades/battens/boards

### Wide blades/battens/boards

## Spacing

### Narrow or Wide spacing to exclude the sun

### To encourage consistent bleaching of unfinished timber

## Species

### Generally

#### Strong stiff species for spanning

##### Douglas Fir

###### Preservative treated

##### European Larch

#### Low self weight if horizontal (shallow slope)

##### Western Red Cedar

#### Strength stiffness and low moisture movement

##### For long spans between supports

##### Durable Tropical hardwoods

##### Durability class 1 or 2

##### Sapwood removed

##### Unfinished

##### Durability class 3 4 or 5

##### Preservative treated

### Softwood

#### Local

##### Native

###### European Larch (Larix deciduas)

care with Sustainable Certification

Class 3 moderately durable

Small movement

Less dense, strong and knot-free

Also suitable for shingles and shakes

##### Non-native

###### Western Red Cedar (Thuja plicata)

UK grown less durable than North American class 2

Remove sapwood

Small knots common in UK grown

Small movement

Lightweight

BS 8417: 60 year service life

Resistant to preservative treatment

High tannin content corrosive: protect porous and steel or iron materials below

Soft and brittle:

Avoid applications prone to mechanical damage: low level

Solar shading with single fixings subject to rotation torsion

Avoid unfinished where high levels of pollution present (traffic and industrial processes)

Also suitable for shingles and shakes

###### Douglas Fir (Pseudotsuga menziesii)

(UK grown less durable Class 3-4 moderately to slightly durable than North American Class 3)

Resistant to treatment

Can be left unfinished to fade

Requires preservative treatment

###### European Larch (Larix deciduas)

care with Sustainable Certification

Class 3 moderately durable

Small movement

Also suitable for shingles and shakes

### Hardwood

#### %%%

## Fixings/Framing

### Acidic timber

#### Acidic timbers need stainless steel fasteners

##### Wood to wood

##### Wood to galvanized

#### Frame often galvanized mild steel

#### Predrill mild steel and hot dip galvanized

#### Austenitic stainless steel and galvanized steel are incompatible

#### but large amounts of galvanized steel can cope with small amounts of stainless steel

#### Do not use self drilling self tapping stainless fasteners into galvanized

#### Isolate metals with grommets, sleeves and washers

#### Remove all metal swarf to avoid tannin corrosion and staining

### Non acidic timbers

#### Non-acidic timbers externally need corrosion resistant fasteners

#### stainless steel fasteners (screws bolts washers)

##### Wood to wood

#### Frame often galvanized mild steel

#### Predrill mild steel and then hot dip galvanized

#### Galvanized steel fasteners (nuts bolts washers)

##### Wood to galvanized

#### Do not use self drilling self tapping fasteners into galvanized

## Fastenings

### Generally

#### Strength needed at supports

#### Minimum 2 fasteners to overcome wind loading twisting rotation stresses

#### Minimum 2 fasteners to overcome moisture movement shrinkage

#### Minimum 2 fasteners to overcome drying distortion in green timbers

### Low density timber

#### Prone to early failure

#### Species:

##### Western Red Cedar

##### Heat treated timbers

### High density timbers

#### Still use two fasteners

#### Overcome tendency to distortion in drying shrinkage

## Panelisation

### Offsite preassembly

### Rigid panels for handling

#### Fix back to structure at larger centres

### Notched members receive notched blades

#### Helps overcome distortion

#### Reduce span of blades

### Fixing

#### Screwed and glued

#### Gluing may help prevent rattling

# External Solar Shading See L15

# Louvres See L19

# Rooflights

# Conservatories See B12 Conservatories

# L15 EXTERNAL SOLAR SHADING

## Performance requirements

### Maximise view/restrict viewing angles

### Minimise sunlight penetration (avoiding glare and overheating internally)

### Maximise daylight penetration (reduce use of artificial lighting)

### Maximise reflection of daylight off surfaces

### Minimise reflection of sunlight from surfaces

### Maximise Ultra violet light absorption upon reflection from surfaces

### Resist wind load and uplift

### Not generate wind noise or rattling

### Resist defection and creep

### Durability

### Security screen

### May for maintenance access walkways

#### Support loadings

## Arrangements

### Flush with wall cladding

#### Vertical integral and flush with cladding in front of window

#### Vertical in front of window

#### Vertical projecting at side of window

#### Vertical spaced from the window

#### Vertical surrounding balconies

### Projecting/Horizontal

#### Horizontal projecting from window head

#### Horizontal projecting from window forming light shelf

#### Horizontal above flat rooflight

#### Horizontal above balconies and roof terraces

### Projecting/Sloping

#### Sloping above sloping rooflight and conservatory roof

#### Sloping projecting from window head

### Combination(s) of the above

## Design

### Integral/flush with /same detailing as wall cladding

#### Rainscreen approach open jointed cladding system

#### Alternate boards/battens continue across window

#### Alternate boards/battens/blades continue along walls

### Independent

### Panelised

#### Unframed

#### Framed

##### Hardwood framed

##### Same durability as blades

#### Sub-framed

##### Metal frame

###### Mild Steel

###### Hot dip galvanized

###### Sacrificial coating of zinc rich epoxy paint if acidic timber

## Blade orientation

### Vertical

#### In vertical or sloping installation

#### Greatest resistance to deflection and creep

#### Greatest spanning potential

#### Top surface profiled for rainwater runoff

#### Drip profile at base

### Sloping (normal to the sun’s rays)

#### In vertical installation

#### Offers some resistance to deflection and creep

#### Design to overcome deflection and creep

#### Seek to obtain stiffness from supports and fastenings

#### Encourages rainwater runoff, the steeper the better

#### Drip profile at base

### Horizontal

#### Poorest spanning potential

#### Design to overcome deflection and creep

#### Seek to obtain stiffness from supports and fastenings

#### Risk of rainwater standing on top

##### Risk of staining

#### Risk of runoff and condensation on bottom

##### Risk of staining

#### Consider self weight and wind loading

## Shading array dimensions

### To exclude sun at 56 degrees above horizontal (UK summer)

### To permit sun at 10 degrees above horizontal (UK winter)

### To exclude/permit sunlight at other angles (to suit brief)

## Blade Size and Spacing

### Narrow blades/battens/boards

#### Closer spacing to exclude sun

### Wide blades/battens/boards

#### Wider spacing to exclude the sun

### Spacing to encourage consistent bleaching of unfinished timber

## Species

### Generally

#### Strong stiff species for spanning

##### Douglas Fir

###### Preservative treated

##### European Larch

#### Low self weight if horizontal (shallow slope)

##### Western Red Cedar

#### Strength stiffness and low moisture movement

##### For long spans between supports

##### Durable Tropical hardwoods

##### Durability class 1 or 2

##### Sapwood removed

##### Unfinished

##### Durability class 3 4 or 5

##### Preservative treated

### Softwood

#### Local

##### Native

###### European Larch (Larix deciduas)

care with Sustainable Certification

Class 3 moderately durable

Small movement

Less dense, strong and knot-free

Also suitable for shingles and shakes

##### Non-native

###### Western Red Cedar (Thuja plicata)

UK grown less durable than North American class 2

Remove sapwood

Small knots common in UK grown

Small movement

Lightweight

BS 8417: 60 year service life

Resistant to preservative treatment

High tannin content corrosive: protect porous and steel or iron materials below

Soft and brittle:

Avoid applications prone to mechanical damage: low level

Solar shading with single fixings subject to rotation torsion

Avoid unfinished where high levels of pollution present (traffic and industrial processes)

Also suitable for shingles and shakes

###### Douglas Fir (Pseudotsuga menziesii)

(UK grown less durable Class 3-4 moderately to slightly durable than North American Class 3)

Resistant to treatment

Can be left unfinished to fade

Requires preservative treatment

###### European Larch (Larix deciduas)

care with Sustainable Certification

Class 3 moderately durable

Small movement

Also suitable for shingles and shakes

### Hardwood

## Fixings/Framing

### Acidic timber

#### Acidic timbers need stainless steel fasteners

##### Wood to wood

##### Wood to galvanized

#### Frame often galvanized mild steel

#### Predrill mild steel and hot dip galvanized

#### Austenitic stainless steel and galvanized steel are incompatible

#### but large amounts of galvanized steel can cope with small amounts of stainless steel

#### Do not use self drilling self tapping stainless fasteners into galvanized

#### Isolate metals with grommets, sleeves and washers

#### Remove all metal swarf to avoid tannin corrosion and staining

### Non acidic timbers

#### Non-acidic timbers externally need corrosion resistant fasteners

#### stainless steel fasteners (screws bolts washers)

##### Wood to wood

#### Frame often galvanized mild steel

#### Predrill mild steel and then hot dip galvanized

#### Galvanized steel fasteners (nuts bolts washers)

##### Wood to galvanized

#### Do not use self drilling self tapping fasteners into galvanized

## Fastenings

### Generally

#### Strength needed at supports

#### Minimum 2 fasteners to overcome wind loading twisting rotation stresses

#### Minimum 2 fasteners to overcome moisture movement shrinkage

#### Minimum 2 fasteners to overcome drying distortion in green timbers

### Low density timber

#### Prone to early failure

#### Species:

##### Western Red Cedar

##### Heat treated timbers

### High density timbers

#### Still use two fasteners

#### Overcome tendency to distortion in drying shrinkage

## Panelisation

### Offsite preassembly

### Rigid panels for handling

#### Fix back to structure at larger centres

### Notched members receive notched blades

#### Helps overcome distortion

#### Reduce span of blades

### Fixing

#### Screwed and glued

#### Gluing may help prevent rattling

# L19 VENTILATION LOUVRES

## Performance requirements

### Resist wind load and uplift

### Maximise air passage (reduce use of artificial ventilation)

### Restrict viewing angles to plant room beyond

### Not generate wind noise or rattling

### Resist deflection and creep

### Durability

### Security screen

## Arrangements

### Vertical

#### Vertical integral and flush with cladding in front of opening

#### Vertical in front of opening

#### Vertical spaced from the opening

#### Free standing screen

### Sloping

#### Sloping above roof plant area

#### Sloping integral and flush with cladding in front of opening

#### Sloping in front of opening

#### Sloping spaced from the opening

### Combination(s) of the above

## Design

### Integral/flush with /same detailing as wall/roof cladding

#### Rainscreen approach open jointed cladding system

#### Alternate boards/battens/blades continue across openings

#### Alternate boards/battens/blades continue along walls/roof

### Independent

### Panelised

#### Unframed

#### Framed

##### Hardwood framed

##### Same durability as blades

#### Sub-framed

##### Metal frame

###### Mild Steel

###### Hot dip galvanized

###### Sacrificial coating of zinc rich epoxy paint if acidic timber

## Blade orientation

### Vertical

#### In sloping installation

#### Greatest resistance to deflection and creep

#### Greatest spanning potential

#### Top surface profiled for rainwater runoff

#### Drip profile at base

### Sloping (normal to the sun’s rays)

#### in vertical installation

#### Offers some resistance to deflection and creep

#### Design to overcome deflection and creep

#### Seek to obtain stiffness from supports and fastenings

#### Encourages rainwater runoff, the steeper the better

#### Drip profile at base

### Horizontal

#### In sloping installation

#### Poorest spanning potential

#### Design to overcome deflection and creep

#### Seek to obtain stiffness from supports and fastenings

#### Risk of rainwater standing on top

##### Risk of staining

#### Risk of runoff and condensation on bottom

##### Risk of staining

#### Consider self weight and wind loading

## Blade Size and Spacing

### Narrow blades

### Wide blades

### Thick blades

#### Wider spacing to permit passage of air

### Spacing to encourage consistent bleaching of unfinished timber

## Species

### Generally

#### Strong stiff species for spanning

##### Douglas Fir

###### Preservative treated

##### European Larch

#### Low self weight if horizontal (shallow slope)

##### Western Red Cedar

#### Strength stiffness and low moisture movement

##### For long spans between supports

##### Durable Tropical hardwoods

###### Durability class 1 or 2

###### Sapwood removed

###### Unfinished

##### Durability class 3 4 or 5

##### Preservative treated

### Softwood

#### Local

##### Native

###### European Larch (Larix deciduas)

care with Sustainable Certification

Class 3 moderately durable

Small movement

Less dense, strong and knot-free

Also suitable for shingles and shakes

##### Non-native

###### Western Red Cedar (Thuja plicata)

UK grown less durable than North American class 2

Remove sapwood

Small knots common in UK grown

Small movement

Lightweight

BS 8417: 60 year service life

Resistant to preservative treatment

High tannin content corrosive: protect porous and steel or iron materials below

Soft and brittle:

Avoid applications prone to mechanical damage: low level

Solar shading with single fixings subject to rotation torsion

Avoid unfinished where high levels of pollution present (traffic and industrial processes)

Also suitable for shingles and shakes

###### Douglas Fir (Pseudotsuga menziesii)

(UK grown less durable Class 3-4 moderately to slightly durable than North American Class 3)

Resistant to treatment

Can be left unfinished to fade

Requires preservative treatment

###### European Larch (Larix deciduas)

care with Sustainable Certification

Class 3 moderately durable

Small movement

Also suitable for shingles and shakes

### Hardwood

## Fixings/Framing

### Acidic timber

#### Acidic timbers need stainless steel fasteners

##### Wood to wood

##### Wood to galvanized

#### Frame often galvanized mild steel

#### Pre-drill mild steel and hot dip galvanized

#### Austenitic stainless steel and galvanized steel are incompatible

#### but large amounts of galvanized steel can cope with small amounts of stainless steel

#### Do not use self drilling self tapping stainless fasteners into galvanized

#### Isolate metals with grommets, sleeves and washers

#### Remove all metal swarf to avoid tannin corrosion and staining

### Non acidic timbers

#### Non-acidic timbers externally need corrosion resistant fasteners

#### stainless steel fasteners (screws bolts washers)

##### Wood to wood

#### Frame often galvanized mild steel

#### Predrill mild steel and then hot dip galvanized

#### Galvanized steel fasteners (nuts bolts washers)

##### Wood to galvanized

#### Do not use self drilling self tapping fasteners into galvanized

## Fastenings

### Generally

#### Strength needed at supports

#### Minimum 2 fasteners to overcome wind loading twisting rotation stresses

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## Panelisation

### Offsite preassembly

### Rigid panels for handling

#### Fix back to structure at larger centres

### Notched members receive notched blades

#### Helps overcome distortion

#### Reduce span of blades

### Fixing

#### Screwed and glued

#### Gluing may help prevent rattling

# M60 PAINTING/CLEAR FINISHES

# P20 UNFRAMED ISOLATED TRIMS/SKIRTING/SUNDRY ITEMS

# Z10 PURPOSE MADE JOINERY

# Z11 PURPOSE MADE METALWORK

# Z12 PRESERVATIVE /FIRE RETARDANT TREATMENT FOR TIMBER

# Z20 FIXINGS/ADHESIVES

# Z22 SEALANTS

# Building Examples

# England

## London

### BedZED

#### Bill Dunster Architects

#### Local Green Oak, untreated unfinished

#### Horizontal Feather edge demountable, exposed screws

## East of England

### Welney Wetland Centre, Fenland, East of England

#### Allies and Morrison

#### Larch

#### Horizontal weatherboarding

### Sutton Hoo Exhibition Building, Suffolk,

#### Van Heyningen and Haward

#### Softwood

#### Stained

#### Horizontal

### Holly Barn, Norfolk

#### Knox Bevan Architects

#### Siberian larch cladding

## South east

### Orchard Building, Bedales School, Hampshire

### Walters and Cohen

### Vertical narrow boards

## South west

### National maritime Museum, Newquay, Cornwall

#### Long and Kentish

#### Green Oak

#### Horizontal

#### Vertical battened

## East Midlands

## West Midlands

## Do not know

### National Memorial Arboratum

#### Architype

# Wales

## Tourist Information Centre St David Pembrokeshire

### Smith Roberts

# Scotland

## Scottish Seabird Centre, North Berwick, Scotland

### Simpson and Brown

### Vertical boarding

## David Douglas pavilion, Pitlochry, Sotland

### Gaia Architects

### Douglas Fir

### Vertical Boarding

# NI & Ireland

## Lewis Glucksman gallery, University College, Cork

### O’Donnell + Tuomey

### Horizontal

### Rounded corners

# Europe

# International

## Wood Research Centre, Honduras

### TRADA

### Diagonal Boarding

# © 2008 GBE

REV REVISIONS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Revision No. | Description | Author | Date | Checked by: |
| A00 | Created issued to SP to start process rolling | BRM | 02/05/2008 |  |
| A01 | Revised refinement and development using TRADA Cladding guide 2nd edition (incomplete) | BRM | 06/05/2008-17/05/2008 |  |
| A02 | Revised refinement and development using TRADA Cladding guide 2nd edition ~~(complete)~~Reorganised content list, H21 and Added K42 | BRM | 26/05/2008 |  |
| A03 | Continue to add to scope and to H21 (complete) | BRM | 12/06/2008-19/06/2008 |  |
| A04 | K13 (internal) copied to H20 (external) newK13 similar to H20 pending editingSpecification clauses now in a separate fileMinor refinementsIssue to Sandy | BRM | 26/06/2008-03/07/2008&31/10/2008 |  |
| A05 | Rename GBE H21 Outline from TRADA Book.docx | BRM | 26/02/2016 |  |
| A05 | Replace GreenSpec with GBE | BRM | 26/02/2016 |  |