Bats, Pads & ZEDs

Brian Murphy,
Green Building Encyclopaedia
SHU Sharc CPD 20/11/2024

1

Bats & Birds, Roosts & Nests Low to Zero Energy Developments

Design, Construction & Guidance Publication

5

Workshop

6

Invitation

- Habitat Regs. & Code for Sustainable Homes
- Complimentary and conflicting requirements
- Architects, development control & constructors
- Need definitive guidance to safe solutions

7

Working together

- bat world and construction industry
- Working together to find common ground,
- to do some future gazing
- into methods of construction
- that will survive next few decades
- find ways to accommodate bats and birds
- without compromising performance of future buildings too much if at all

8

Future Guide

- *"Biodiversity for Low and Zero Carbon Buildings"*
- will do just that
- for bat and bird species for which buildings are important
- swifts, swallows, house martins, house sparrow, starlings, barn owls and peregrine falcons.

9

Behind the scenes

- analysis of existing information
- critique of available products
- review of materials
- appropriate format for potential readers.

10

Scope

- Analysis
  - Communication
  - Dimensions
  - Products
- Future Gazing
  - Construction Types
  - Bat & Bird accommodation

11

Analysis

12

Communications

- Architects can't read
  - They think with pencil and paper in hand
  - Cannot read more then a paragraph at a time
  - Without a cartoon or drawing to get to the next paragraph
  - So guide must be illustrated
  - A picture per paragraph a paragraph per picture
  - No need to read anything
  - Flow diagrams, Charts, tables

 13

13

Communications

- Batties v Architects
  - You know what your talking about
  - We know what we are talking about
  - But risk we don't get a word of each others
  - We read enough to learn new jargon
  - We talk Jargon all the time
  - To make ourselves sound intelligent or important but alienate and confuse
  - Jargon Busters needed in both directions

 14

14

Communications

- Batties v Architects
  - They know what they are talking about
  - We know what we are talking about
  - But risk we don't get a word of each others
  - We read enough to learn new jargon
  - We talk Jargon all the time
  - To make ourselves sound intelligent or important but alienate and confuse
  - Jargon Busters needed in both directions

 15

15

GBC Green Building Calculator https://GreenBuildingCalculator.uk
GBE https://GreenBuildingEncyclopaedia.uk
GRC Green Retrofit Calculator https://GreenBuildingCalculator.uk

Jargon Buster

- To introduce terminology used by each party to create a level playing field
- Written by each side for each other
  - future building methods
  - simplified building physics & performance
  - Wildlife, habitat, birds, bats, roosts
- 10 A4 pages

 16

16

GCT PUBLICATION JARGON BUSTER

AIR BARRIER
An air barrier comprises materials and/or components, which are air impervious or virtually so, separating conditioned spaces (heated, cooled or humidity controlled, usually inside), from unconditioned spaces (unheated, un-cooled, humidity uncontrolled, usually outside).
based on SEDA Scottish Environmental Design Association definition)

AIR EXFILTRATION
The uncontrolled outward leakage of indoor air through cracks, discontinuities and other unintentional openings in the building envelope.
SEDA Scottish Environmental Design Association)
In winter the air is likely to be heated and heated air exfiltration will result in uncontrolled heat loss and potential interstitial condensation risk.
GreenSpec '09 & EBS '09)

AIR INFILTRATION
The uncontrolled inward leakage of outdoor air through cracks, discontinuities and other unintentional openings in the building envelope.
SEDA Scottish Environmental Design Association)
In winter the air is likely to be cold and cold air infiltration will result in uncontrolled draughts, leading to thermal discomfort and condensation risk.
GreenSpec '09 & EBS '09)

AIR LEAKAGE PATH
A route by which air enters or leaves a building or flows through a component.
based on SEDA Airtightness Guide definition)
The air leakage path may not pass directly through an element but can also pass long its length or across its area. Gaps in the external envelop can manifest themselves in more than one location and in any junction of external or internal construction.
Plasterboard is an example of an air-leaky construction where air moves between walls and plasterboard and leaks out of electrical switches and sockets, around skirting, etc.
Holes through the building fabric through which air can pass, that can destroy the integrity of the fabric's acoustic, fire, thermal, wind, weather, water and air tightness performance.

 17

17

College knowledge

- Architect know what they know
- They leaned it 10, 20 , 30, 40 years ago
- Architects have a lot to learn about changes in low energy building design
- This guide and the jargon buster gives us an opportunity to update them

 18

18

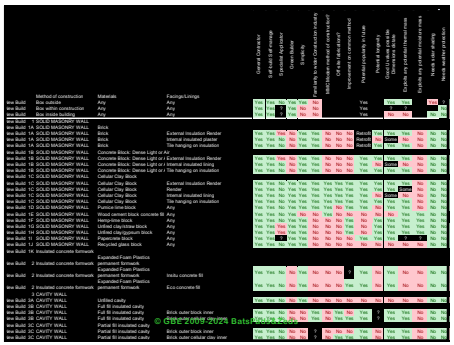
GBC Green Building Calculator https://GreenBuildingCalculator.uk
GBE https://GreenBuildingEncyclopaedia.uk
GRC Green Retrofit Calculator https://GreenBuildingCalculator.uk

Future Gazing

- 1600 construction methods listed by BRE
- 900 more listed by GreenSpec in MyGreenSpec
- Select types of construction likely to succeed into the Low to Zero Carbon building age
- 10 methods of construction selected
- 70 materials, cladding & finish permutations
- That can also accommodate bats & birds
- Decide where in the construction they go
- And make it competent construction

 19

19



 20

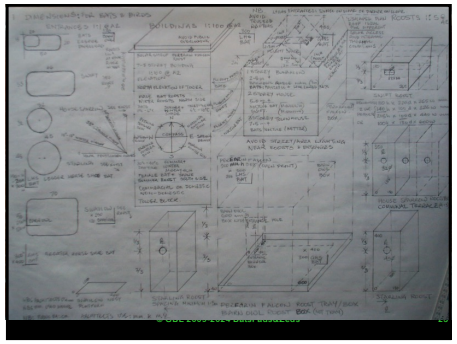
Dimensions: Bats & Birds

- Entrances
- Entrance: locations, heights
- Flight spaces in and out
- Roost locations
- Roost/box sizes
- Roost arrangement

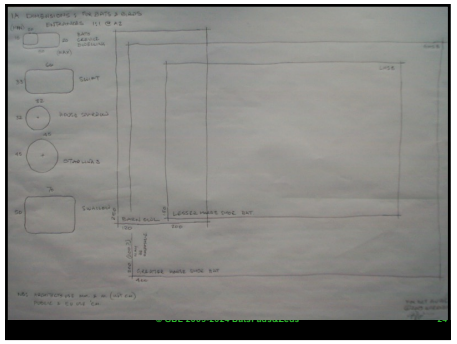
 21

21

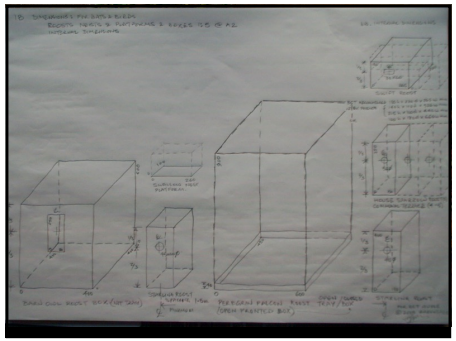
22



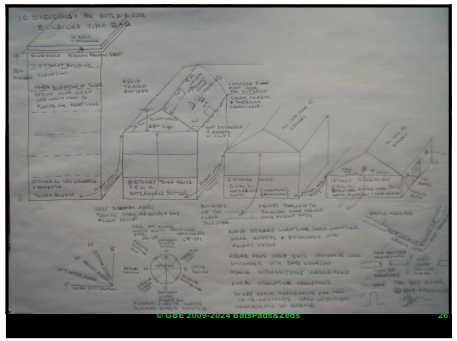
23



24



25



26

Interconnectivity

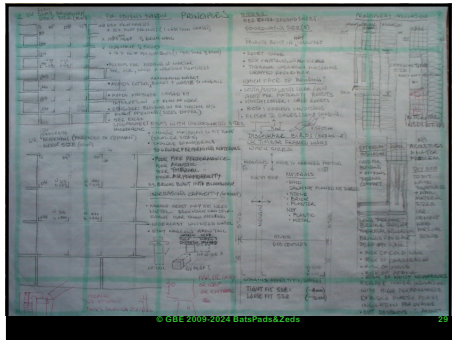
- Eaves Triangles
- Ridge Triangles
- Connecting tunnels
- Ability to move from warm to cooler places
- Parent s move from maternity roost
- and go into tauper

27

Dimensions: Construction

- Construction types:
  - Standard dimensions, work sizes, departures
- Principles
  - Avoid disruption of work flow
  - Use standard sizes, co-ordinating sizes
  - Risks with un co-ordinated sizes
  - Sizes for: Build-in or into built openings
- Increasing roost/nest capacity
- Orientation and elevation
- Solar access and shading
- Position relative to thermal/acoustic insulation

28



29

Tables

- Tables of masonry
  - Was on (www.scribd.com/brianspeeman), no longer
  - Bricks: UK metric, UK modular, UK Imperial
  - Blocks: UK metric, Thin Joint block
  - Blocks: German coursing & 1 mm. joint
  - Build–in size:
    - Brick/block with 2 joints openings
  - Into built opening
    - With variable tolerances
  - Build-in with insulation wrap around
    - Any thickness
- Timber frame, trimming and noggins

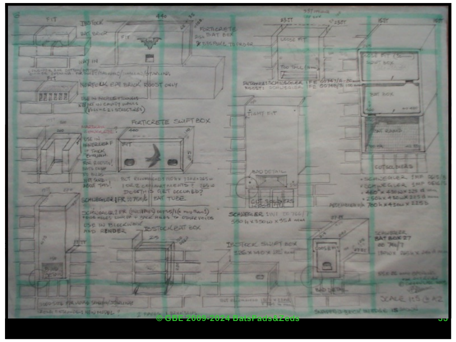
30

31

Dimensions: Bat & Bird Boxes

- Manufactured products for building in
  - Ignoring surface mounted (not normally a problem)
    - Except Architects get precious about their details
  - Entrances
  - Bat boxes for building in
  - Bat ramps
  - Swift boxes for building in
  - Roosts
  - Bat tubes
- Sizes in relation to construction
  - Important to Architect
- Sizes in relation to occupants
  - Important to occupant
  - Post Occupancy Evaluation Of Bat/Bird Boxes?

32



33

Product Specifications

- Extracted notes from
  - Literature
  - Websites
- Rewritten as specifications
- No longer available from www.greenspec.co.uk
- Wish to create product pages on GBE
- https://GreenBuildingEncyclopaedia.uk
- Wish to add to Green Building Calculator carbon calculator and eventually a specification assembly tool

© GBE 2009-2024 BatsPads&Zeds 34

34

N80 BIODIVERSITY ENHANCEMENT/MITIGATION SYSTEMS
To be read with Preliminaries/General Conditions A10-A55

F30 ACCESSORIES TO BRICK/BLOCK/STONE WALLING.
To be read with Preliminaries/General Conditions A10-A55

____ CONCRETE EAVES/VERGE SYSTEM
Reference Drawing(s): ______
Location: _____
Roof configuration:
Mono ridge
Pitched roof with gables: Eaves and verges
Pitched roof with eaves: Eaves only
Pitched roofs with hips: Eaves only
Background:
Cavity wall construction
Solid wall construction
Cavity:
Total cavity: ___ mm.
Insulation thickness: ___ mm.
Residual cavity: ____ mm.
At eaves/verges: cavity reduced by 100 mm. by projecting eaves/verge blocks into cavity
Blocks: To BS 6073-1
Type:
Solid
Hollow with bird aperture in face
Hollow with bat aperture in base
Manufacturer: RoofBLOCK Limited, 6 Almoner's Field, Cullum Road, Bury St Edmunds IP33 2TS, UK
T/F 028 9181 8285
Manufacturer: RoofBLOCK Limited, 5 Bramble Wood, Newtownards BT23 8WZ, IRELAND
T/F 048 9181 8285
E sales@roofblock.co.uk W www.roofblock.co.uk
Product Reference:
RoofBLOCK masonry roof overhang system
RoofBLOCK masonry roof overhang system with bird box adaption

35

Product Critique

- Compare the product with:
  - Bat requirements
  - Building/Builder requirements
  - Energy requirements
    - Condensation risks, fire, thermal performance
  - Acoustic requirements
    - Noisy neighbours: high risk of failure
- Usually a shortfall in some respect
  - Some in many respects

© GBE 2009-2024 BatsPads&Zeds 36

36

BAT & BIRD BOX PRODUCT CRITIQUE

GENERALLY:

DIMENSIONS:
If made in the UK it may fit with UK standard size construction products (not always)
If made in Germany it may fit with German standard size construction products (or be face fixed)
If made in Germany and imported to the UK it is unlikely to work with UK standard size construction products.
And on the whole they don't.

Despite EU and ISO standards UK and Germany have different standards sizes
The Metric brick size was introduced in the 1970's
We got bored with them by the 1980's

If made by a brick manufacturer most likely to fit brick sizes
If made by a stone or reconstructed stone manufacturer most likely to fit stone/block sizes
If made by a bat enthusiast likely to fit bats.
Norfolk Bat Brick is the exception: it fits bats and bricks

Width out of co-ordination: increase widths of purpend joint in brickwork either side, and/or above and below to fit.
Height out of co-ordination: turn bricks on edge underneath or on end and cut soldier course to length.
Depth out of co-ordination: Likely to cause thermal bridges through U value envelop
Width and height: out of co-ordination do not use brickwork use blockwork and render it to hide the mess.
Width, height and depth out of co-ordination: consider a different method of construction or a different bat box

Most bat boxes will accommodate many bats in a colony
Do bats come in standard size colonies?
Does the size of a bat box put an artificial barrier on colony sizes?
To modify the box size will just modify the number of bats the box can accommodate
Modifying box size lets it co-ordinate with construction

PRODUCT CRITIQUE

Product 1

37

Material Critique

- Compare the materials with:
  - Bat requirements
    - Climbing and hanging
    - Thermal mass
    - Non-toxic
  - Building requirements
    - Durability & preservative avoidance
  - Energy requirements
    - Thermal mass & Thermal insulation
  - Acoustic requirements
- Suggest a new material

© GBE 2009-2024 BatsPads&Zeds 38

38

BAT & BIRD BOX MATERIAL CRITIQUE

MATERIALS:

Clay facing brick:
Good points:
Frost resistant
Strong
Thermal mass
Bad points
absorbent so will smell of urine in time
High embodied energy

Cement based concrete:
Good points
cement is impervious to moisture,
strong,
durable
thermal mass
Bad points
High embodied energy
High embodied carbon
Alkali do not use aluminium fasteners

Cement and wood chip fibre concrete
Manufacturer's recipe
Copyright? Schwegler Wood-Concrete
Make in UK under licence?
Good points
thermal mass
Added moisture mass
Medium carbon sequestration
Vapour permeable
Easy to mould to any shape

39

Biodiversity:Bats Workshop/Round table Discussions

100% Design

24th September 2010

 41

41

Construction Solutions

 42

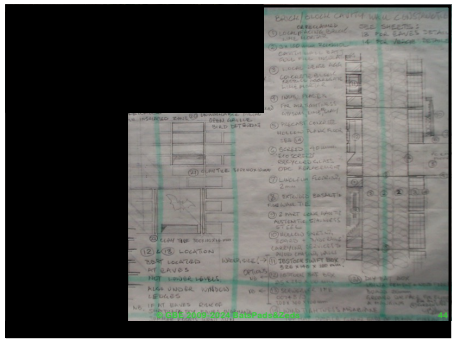
42

Cavity wall construction

- Brick and block leaves
- NHBC still insisting on cavities
- We will persist and we will make them work some how despite carbon targets
- 300 mm. full fill cavity insulation
- Long ties or 2 part ties
- Bat boxes built into brick outer leaf

43

43



44

Solid masonry wall

- Blockwork inner wall
- Many block materials
- External insulation & render/cladding
- Cantilevered solar shelf
- Thermal break avoiding thermal bridges
- Base for Peregrine Falcon tray/nest

 45

45

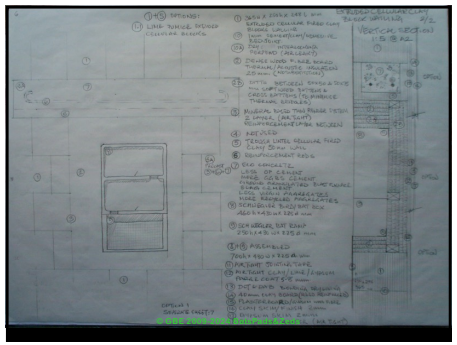
46

Cellular clay block solid wall

- German technology
- German dimensions
  - Avoid interface clashes
  - Bat boxes not made to these dimensions
- German bat and swift boxes installed into formed opening
- 'U' value maintained and insulation wrapped around the boxes

 47

47



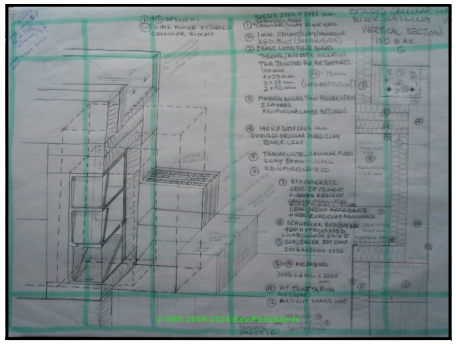
48

Cellular clay block and rendered external insulation

- As previous with added insulation to outside face of wall
- Insulation wrapped around Bat/bird box

 49

49

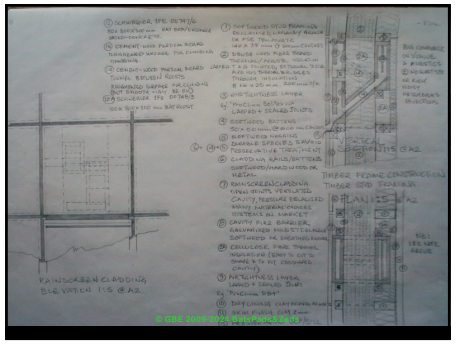


50

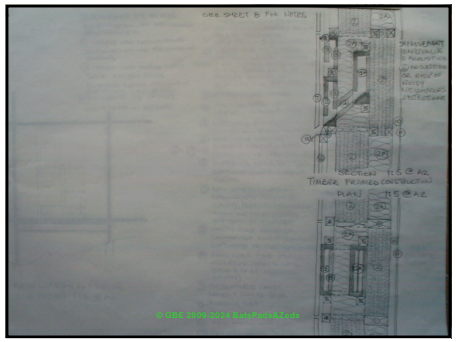
Timber stud frame with external insulation & rainscreen cladding

- Normal stud framing (thermal bridge)
- 'Tea cosy' insulation outside of frame
- Dense wood fibre insulation
- Decrement delay to solar radiation
- Bat boxes in cladding zone
- Rainscreen cladding
- Multi-storey labyrinth bat boxes

51



52

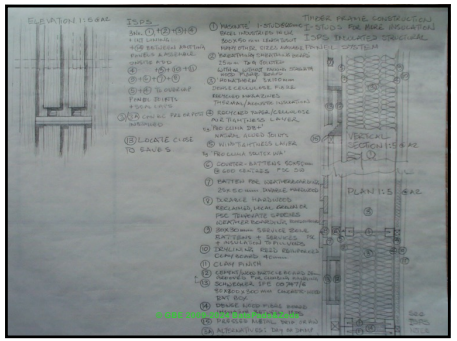


53

I-Stud timber frame & ISPs

- I-studs accommodate insulation
- Bat boxes in cladding zone
- Weatherboarding: Board on board
- ISPS Insulated Structural Panel system

© GBE 2009-2024 BatsPads&Zeds 54



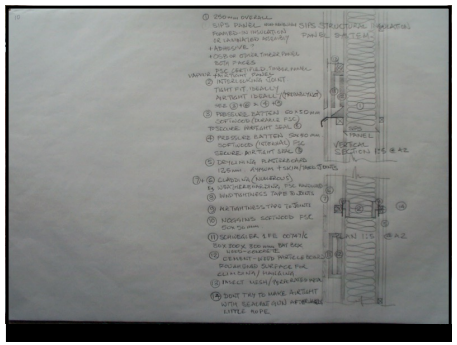
55

SIPS Structural Insulated Panel System

- High performance plastic insulation
  - Good in winter, not good in summer
- No cutting: Integrity maintained
- Allegedly airtight:
  - recent experience suggests otherwise
- Wind tight and air tight taped joints
- Pressure battened joints
- Bat box in cladding zone

© GBE 2009-2024 BatsPads&Zeds 56

56



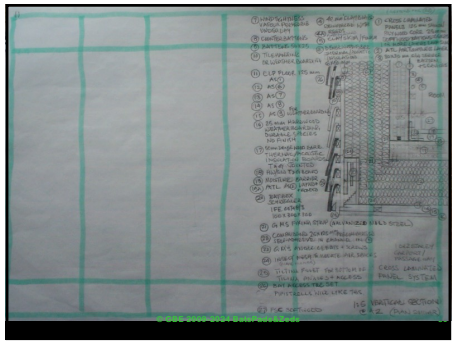
57

Cross laminated panels & external insulation

- Structural loadbearing solid wood panels
- Plantation thinnings
- Airtight panels
- External insulation
- Bat boxes in cladding zone
- Plain tile hanging
- Bat Access-tile sets
- Bats in tile batten zone

© GBE 2009-2024 BatsPads&Zeds 58

58



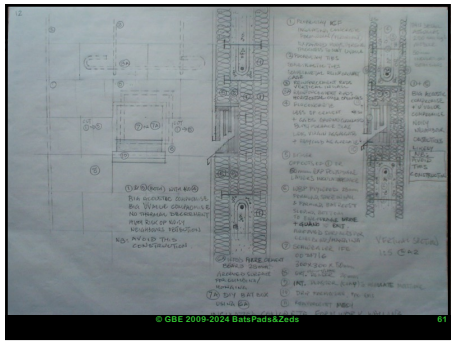
59

ICF Insulated Concrete Formwork

- Expanded polystyrene formwork and concrete infill
- Popular with self-build
- Unpopular with:
  - Eco world
  - low energy world
- Thermal insulating: some, not enough
- Thermal mass: no buried inside wall insulation
- Decrement delay: very short
- Acoustic insulation: some, not enough
- Cast box in?
- Or saw cut polystyrene generating loads of microplastics

 60

60


 61

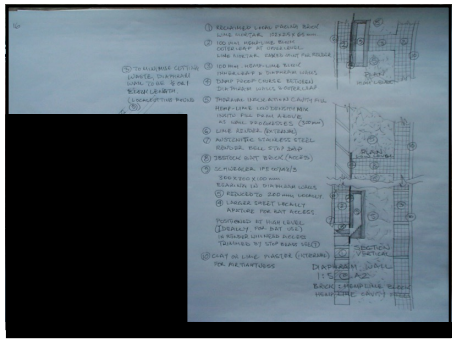
61

Diaphragm Walls

- In past: used brick walls to sports halls
- Hemp lime blocks to beer warehouse
  - So well insulated does not need chilling
- Brick outer leaf at low level
- Insitu hemp-lime insulation in cavity

 62

62



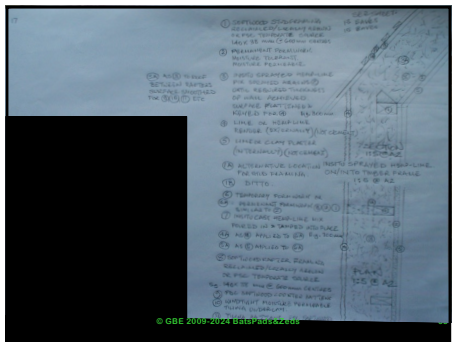
63

Hemp-lime Insitu spray

- Solid wall
- Buried timber frame
- Backing formwork
- Like sprayed concrete
  - lime in place of cement
  - hemp shive in place of aggregate
  - hempcrete
- Average U value, great performance
  - Buried bat box compromise small % of wall

 64

64



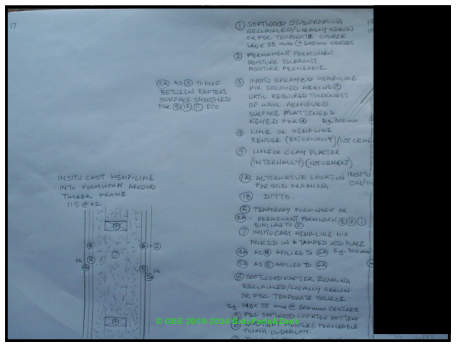
65

Hemp-lime insitu cast

- Temporary or permanent formwork
- Buried timber frame
- Insitu cast hemp-lime hempcrete
- Average U value, great performance
  - Buried bat box compromise small % of wall

 66

66



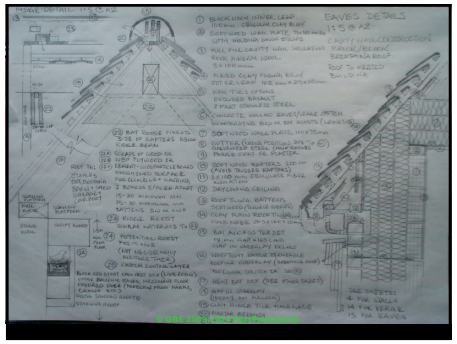
67

Pitched roofs

- Timber roof (not trussed rafter)
- Eaves and verge box system: Concrete
- Pitched roof tile access
  - Eaves triangle
  - Attic triangle
  - Interconnectivity?
- Ridge tile access
  - Ridge triangle
- Roosts in roof timbers and at eaves

68

68



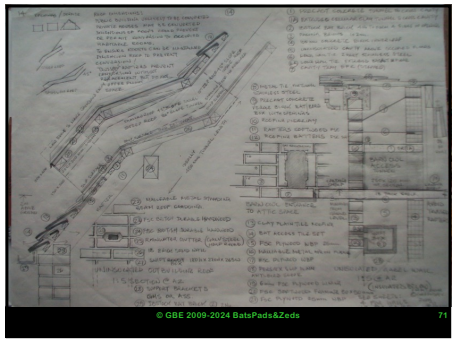
69

Pitched roofs

- Lesser Horse Shoe & Greater Horse Shoes access:
  - Tube through roof slopes
    - Rules complicated to apply
  - Dormer opening option if birds not an issue
- Gable walls
  - Barn Owl landing platform and access to attic
  - Swift access to box in uninsulated cavity

70

70



71

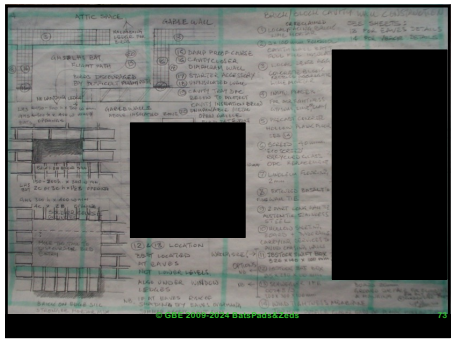
71

Pitched roof Gable Walls

- Lesser Horse Shoe & Greater Horse Shoe access:
  - Chicane to fly through
    - Some Bat species fly like butterflies
      - VTOL Jump jets of the bat world
    - Birds not so agile
  - No landing platform discourages birds

72

72



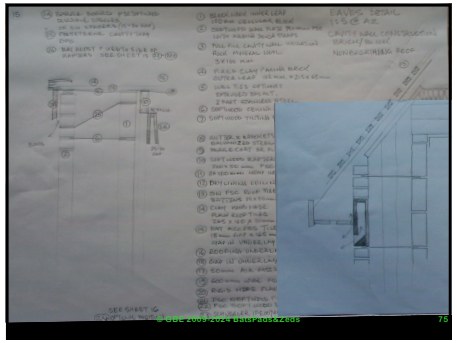
73

Pitched roof eaves/verges

- Timber fascia and soffit
  - Gap for bats at wall
  - Gap for birds in soffit
  - Bat box in eaves triangle
  - Bat box showing below fascia
- Timber barge board with gaps

74

74



75

GBC Green Building Calculator https://GreenBuildingCalculator.uk GBE https://GreenBuildingEncyclopaedia.uk GRC Green Retrofit Calculator https://GreenBuildingCalculator.uk

The next steps

76

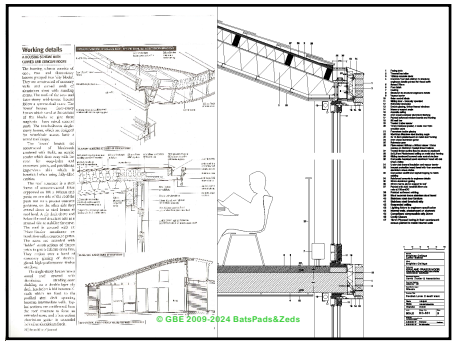
76

Sketches to Perspectives

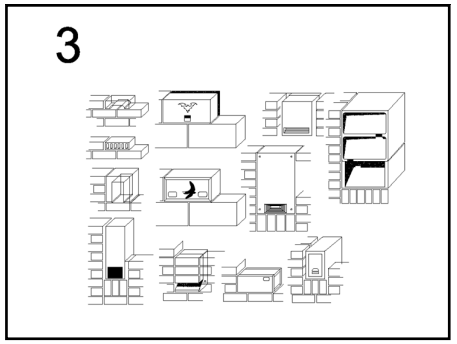
- We met with the Publisher & Architects
- Architectural practice is converting 2D section sketches
- to CAD files and provide Architect friendly drawings
- Just like the AJ and Detail magazines

 77

77



78



80

Text for Architects drawings

DRAWING 1:

1. Reclaimed or local facing brick with lime mortar
2. 3 x 100 mm rock mineral Fibre full fill cavity wall batts
3. Locally manufactured dense recycled aggregate concrete block with lime mortar
4. Insitu plaster for air tightness: clay, lime or gypsum
5. Precast concrete hollow plank floor See (14)
6. 'Eco screed' recycled glass and OP Cement replacement, 40 mm
7. Linoleum sheet flooring, 2 mm
8. 'TeploTie' extruded basalt and fibre long wall tie
9. 2 part long austenitic stainless steel wall tie
10. Hollow skirting board and dado rails carrying services to avoid chasing masonry walls

11 to 13a Options

11. 'Ibstock Swift Box' 326 x 140 x 100 mm.
12. 'Ibstock Bat Box' 215 x 290 x 100 mm.
13. Schwegler 1FE 00748/3, 300 x 300 x 100 mm.

13aDIY Bat Box using cement and wood fibre board, 25 mm. Grooved surface for climbing and hanging

12 & 13 Location: Best located at eaves or under window ledges not at lower levels.

14. Wind tightness membrane: Top hat profile closing ends of plank with hollow core (5).
15. DPC damp proof course
16. Cavity closer

diaphragm wall

17. Wall starter accessory
18. Un-insulated wall
19. See Sheet 13 for Eaves details 81
20. See Sheet 14 for Verge details

81

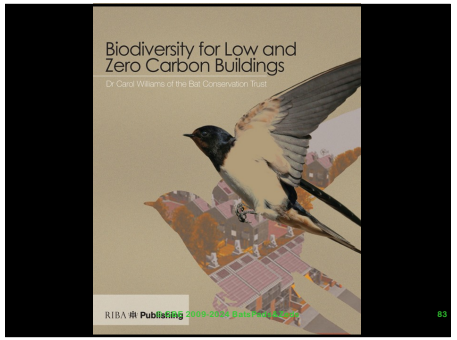
GBC Green Building Calculator https://GreenBuildingCalculator.uk
GBE https://GreenBuildingEncyclopaedia.uk
GRC Green Retrofit Calculator https://GreenBuildingCalculator.uk

Guide

- EcoBuild '10 launched
- I bought £300 worth
  - I gave some as student prizes
  - I gave copies to my Architect Clients
  - 1 to mark up for 3rd edition
- Second edition is sold out
  - Trying to fund 3rd edition
  - Most likely to be a website
  - Spanish translation
  - Belgium Government copied some to website
  - Illegal PDF copy on USA Scribd website

 82

82



83

GBC Green Building Calculator https://GreenBuildingCalculator.uk
GBE https://GreenBuildingEncyclopaedia.uk
GRC Green Retrofit Calculator https://GreenBuildingCalculator.uk

Plenary Feedback Bat's pads & ZEDs

 87

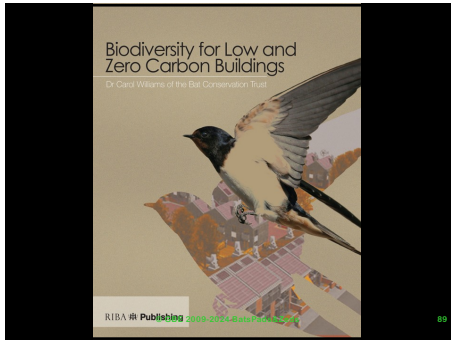
87

Plenary Feedback

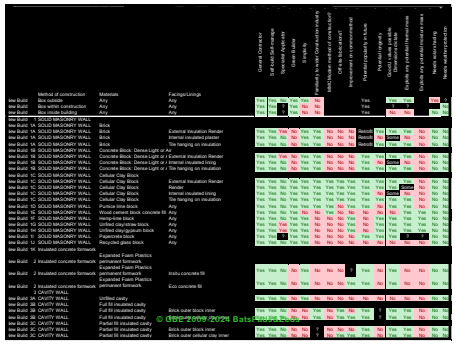
- An authoritative guide to accommodating bats and birds in Zero carbon Buildings is in draft right now
- URL http://www.ribaenterprises_____
- Publication in 2010
- Written by Carol Williams of BCT
- Construction by Brian Murphy GreenSpec
- Guided by Tony Mitchell Jones of Natural England
- Information from Manufacturers
- Many others

 88

88

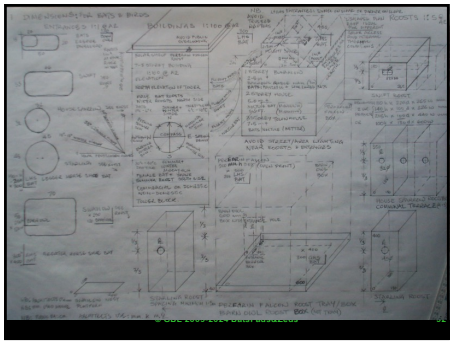


89

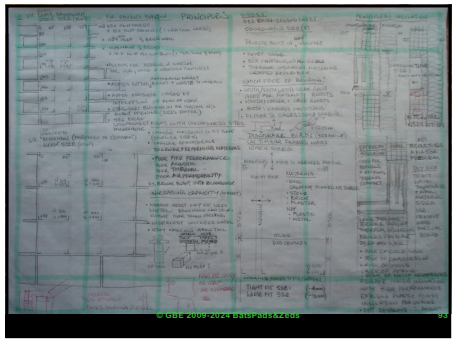


90

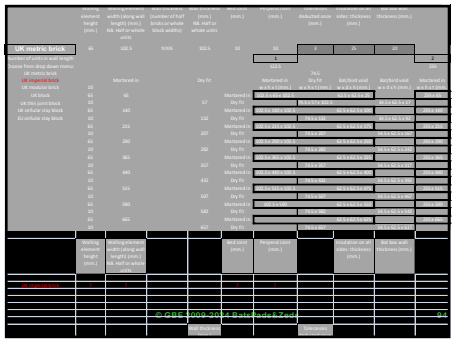
91



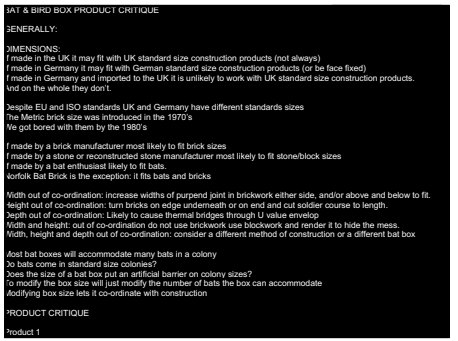
92



93



94



BAT & BIRD BOX PRODUCT CRITIQUE

GENERALLY:

DIMENSIONS:
If made in the UK it may fit with UK standard size construction products (not always)
If made in Germany it may fit with German standard size construction products (or be face fixed)
If made in Germany and imported to the UK it is unlikely to work with UK standard size construction products.
And on the whole they don't.

Despite EU and ISO standards UK and Germany have different standards sizes
The Metric brick size was introduced in the 1970's
We got bored with them by the 1980's

If made by a brick manufacturer most likely to fit brick sizes
If made by a stone or reconstructed stone manufacturer most likely to fit stone/block sizes
If made by a bat enthusiast likely to fit bats.
Norfolk Bat Brick is the exception: it fits bats and bricks

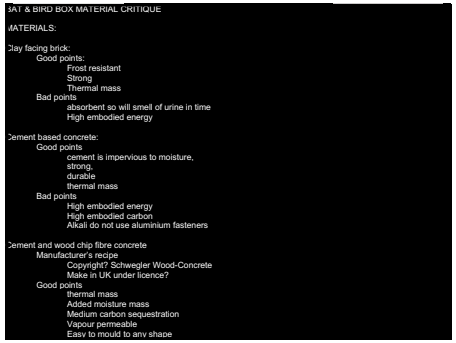
Width out of co-ordination: increase widths of purpend joint in brickwork either side, and/or above and below to fit.
Height out of co-ordination: turn bricks on edge underneath or on end and cut soldier course to length.
Depth out of co-ordination: Likely to cause thermal bridges through U value envelop
Width and height: out of co-ordination do not use brickwork use blockwork and render it to hide the mess.
Width, height and depth out of co-ordination: consider a different method of construction or a different bat box

Most bat boxes will accommodate many bats in a colony
Do bats come in standard size colonies?
Does the size of a bat box put an artificial barrier on colony sizes?
To modify the box size will just modify the number of bats the box can accommodate
Modifying box size lets it co-ordinate with construction

PRODUCT CRITIQUE

Product 1

95



BAT & BIRD BOX MATERIAL CRITIQUE

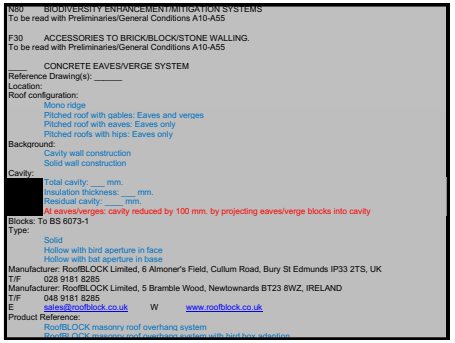
MATERIALS:

Clay facing brick:
- Good points:
  - Frost resistant
  - Strong
  - Thermal mass
- Bad points
  - absorbent so will smell of urine in time
  - High embodied energy

Cement based concrete:
- Good points
  - cement is impervious to moisture,
  - strong,
  - durable
  - thermal mass
- Bad points
  - High embodied energy
  - High embodied carbon
  - Alkali do not use aluminium fasteners

Cement and wood chip fibre concrete
- Manufacturer's recipe
  - Copyright? Schwegler Wood-Concrete
  - Make in UK under licence?
- Good points
  - thermal mass
  - Added moisture mass
  - Medium carbon sequestration
  - Vapour permeable
  - Easy to mould to any shape

96



N80 BIODIVERSITY ENHANCEMENT/MITIGATION SYSTEMS
To be read with Preliminaries/General Conditions A10-A55

F30 ACCESSORIES TO BRICK/BLOCK/STONE WALLING.
To be read with Preliminaries/General Conditions A10-A55

_____ CONCRETE EAVES/VERGE SYSTEM
Reference Drawing(s): _____
Location:
Roof configuration:
- Mono ridge
- Pitched roof with gables: Eaves and verges
- Pitched roof with eaves: Eaves only
- Pitched roofs with hips: Eaves only

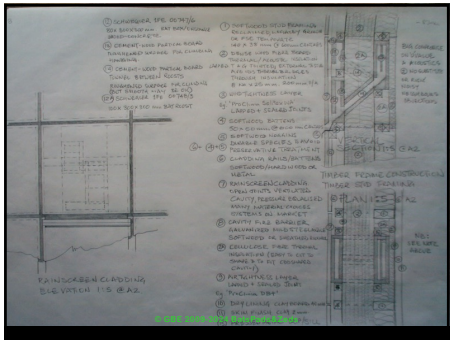
Background:
- Cavity wall construction
- Solid wall construction

Cavity:
- Total cavity: ____ mm.
- Insulation thickness: ____ mm.
- Residual cavity: ____ mm.
- At eaves/verges: cavity reduced by 100 mm. by projecting eaves/verge blocks into cavity

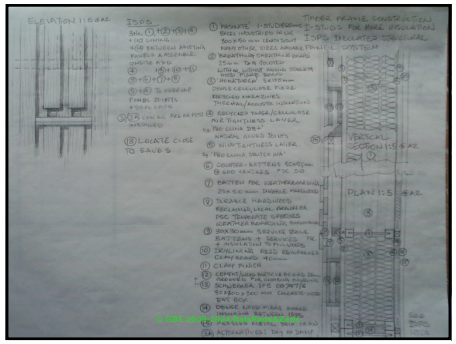
Blocks: To BS 6073-1
Type:
- Solid
- Hollow with bird aperture in face
- Hollow with bat aperture in base

Manufacturer: RoofBLOCK Limited, 6 Almoner's Field, Cullum Road, Bury St Edmunds IP33 2TS, UK
T/F 028 9181 8285
Manufacturer: RoofBLOCK Limited, 5 Bramble Wood, Newtownards BT23 8WZ, IRELAND
T/F 048 9181 8285
E sales@roofblock.co.uk W www.roofblock.co.uk
Product Reference:
- RoofBLOCK masonry roof overhang system
- RoofBLOCK masonry roof overhang system with bird box adaption

97

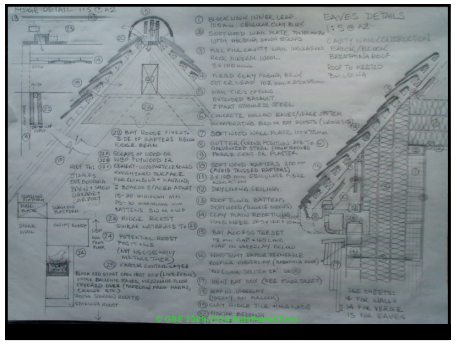


98

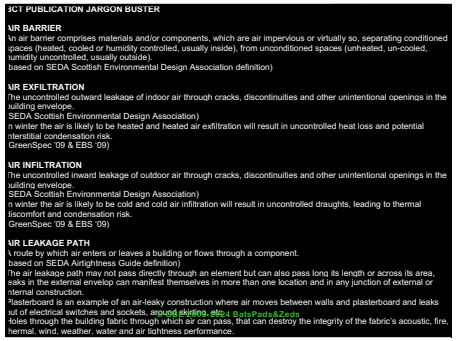


99

100



101



102

107