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# PASSIVHAUS PERFORMANCE LEVELS IN CONTEXT

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# Focus

- New build housing, esp. social/affordable
- Cost
- Scalability
- Real world performance
- Energy efficiency (vs. carbon)

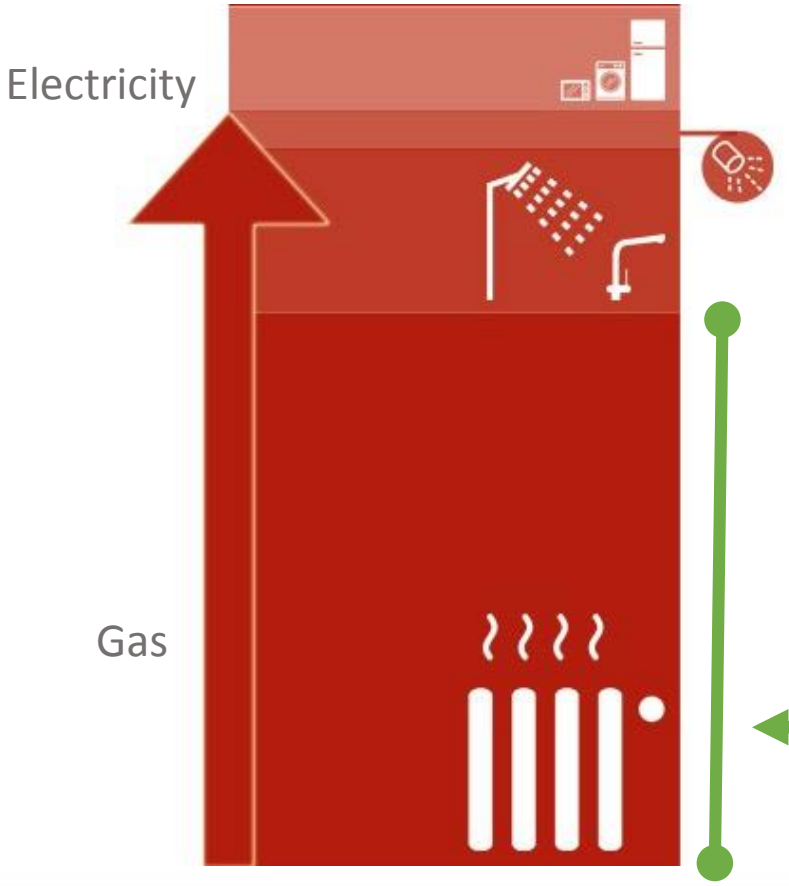
# Why PassivHaus?

- Energy efficiency first
- A robust foundation for zero-carbon & NZEB
- Proven performance
- PHPP as a design tool
- Attention to detail
- Healthy internal environment

# Levels

| | Space Heat | Heating Load | Air Test | PE | PER |
|---|---|---|---|---|---|
| Premium | 15 kWh/(m² a) | 10 | 0.6 | N/A | 30 |
| Plus | 15 kWh/(m² a) | 10 | 0.6 | N/A | 45 |
| Classic | 15 kWh/(m² a) | 10 | 0.6 | 120 kWh/(m² a) | 60 |
| PHLEB | 30 kWh/(m² a) | N/A | 1.0 | 120 kWh/(m² a) | 75 |

# The Performance Gap




- Well understood problem
- Circa 40% higher than advertised using SAP / Part L
  - 60% Space Heating

~~= 54 kWh/m2.a~~

**= 86 kWh/m2.a vs. 30/15**

# The Performance Gap

- Why?
  - Lack of attention to detail, from design through to construction
  - Wrong target / focus (Co2), TFEE Low
  - Construction quality (air tightness proxy)
  - Lack of quality assurance / vetting
  - Poor model (SAP)
    - ‘SAP is not a design tool’, etc

# Closing the Gap

QA

| LEVEL | Space Heat (Efficiency) | Air Test | Components | QA | PHPP |
|---|---|---|---|---|---|
| PHI Low Energy Building | ✓ | 1.0 | Certified / QA | ✓ | ✓ |
| PH Classic | ✓ | 0.6 | | ✓ | ✓ |
| PH+/Premium | ✓ | 0.6 | | ✓ | ✓ |
| Part L 2013 (SAP2012) | ✗ | ~5 (10) | Mix | ✗ | ✗ |
| Part L 2020 (SAP10.2) | ~ | 3.0 | | ~ | ✗ |
| Part L 2025 'FutureHomes' | ? | 3.0? | | ? | ✗ |

# Closing the Gap

- PHPP Model
  - Proven to reflect real world performance of dwellings
  - Model re-created by Certifier & checked by PHI
- Design & Construction
  - All thermal bridges quantified and input
  - Design + details reviewed by Certifier

    *All design decisions have (modeled) consequences*
  - Constructed junctions/details documented
  - Air test – Pressurisation + De-pressurisation average
  - Material proof of purchase/installation (receipts/photography)

# Closing the Gap

- PassivHaus gets closest
  - Co-heating tests within a few %
- Problem… schemes close to PH targets often fall away
  - Faux PassivHaus claims ‘PassivHaus levels of insulation’, etc
- …the Performance Gap becomes a cliff edge

# Broader Context

MACRO

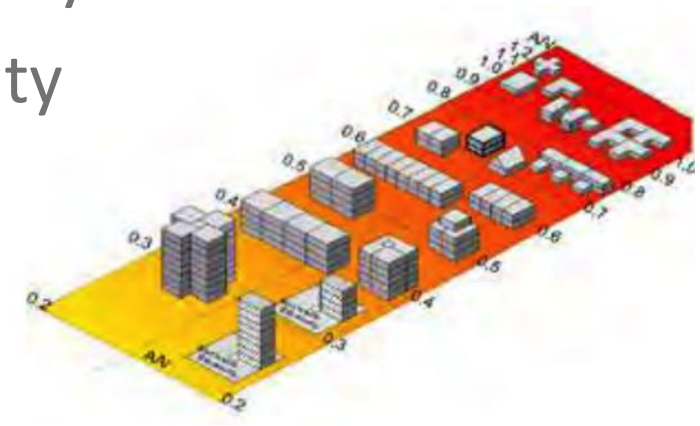
- Fuel poverty
- Housing crisis
- Affordability
- Productivity

MICRO

- Planning
- Local environment
- Local community
- Social value

# The Ideal

- Maximise space/form factor
- Optimise fenestration
- Ideal orientation
- Minimise complexity
- Design for longevity
  - Adaptable
  - Contextual
  - Robust



# Vs. Real World Constraints (Context)

- Planning - parking adjacent each home (crime)
- Opposition to terraces
- Resistance to density
- Vernacular
  - Materials, detailing

- Constrained brownfield site
- Problematic orientation
- Need for surveillance
- Push to maximise dwellings

- **…Grants / Budget**

# Case Study – Stoney Gate Walk

- 21 New Homes in Openshaw, east Manchester
- 3b/4p 84m2
- Targeting PassivHaus Classic and PHLEB
- Client – One Manchester
- Brownfield, contaminated, infill Site

# Stoney Gate Walk

- Constraints
  - Tight cul-de sac location with school adjacent
  - Site required remediation & Phase 2 SI found brick cellars
  - Surrounded on three sides with mature trees
  - Development density maximised
    - reduced opportunity for solar orientation

# Stoney Gate Walk

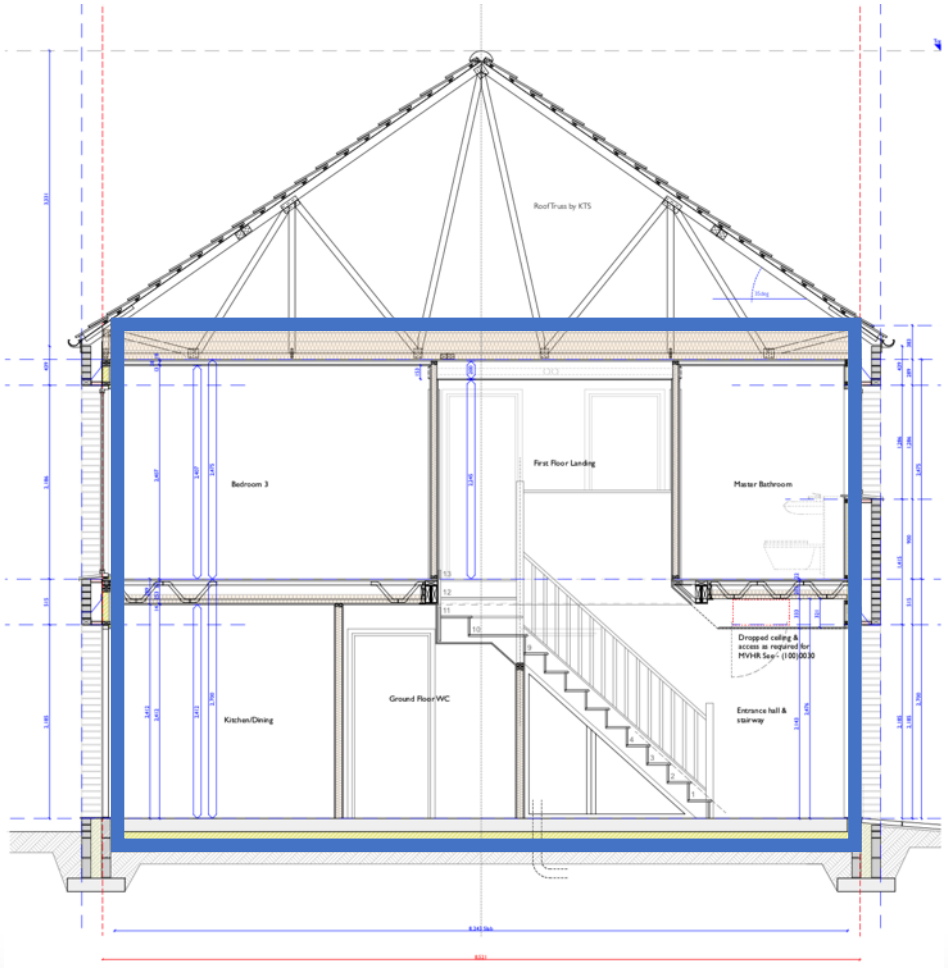
- Design Strategy
  - Contextual design focus
  - Design for pre-fabrication
  - Maximise economies of scale (repetition)
  - Minimise complexity
    - ‘Thermal Box’
  - Take advantage of BIM
  - Window type (size) balanced using PHPP for each dwelling

# Stoney Gate Walk

- Scheme aspirational but cost limited
- Sensible, pragmatic approach taken to achieving PassivHaus (Classic) on one plot (3 dwellings)
- Pushed for PHLEB on remaining 18 dwellings to keep performance/quality up
- Specification
  - Wall & construction form kept constant, roof & slab insulation reduced to get scheme in budget
  - All windows/doors PH Certified uPVC triple glazed
  - Same certified MVHR maintained throughout
  - Low modulation gas boiler for DHW / space heating, common to all

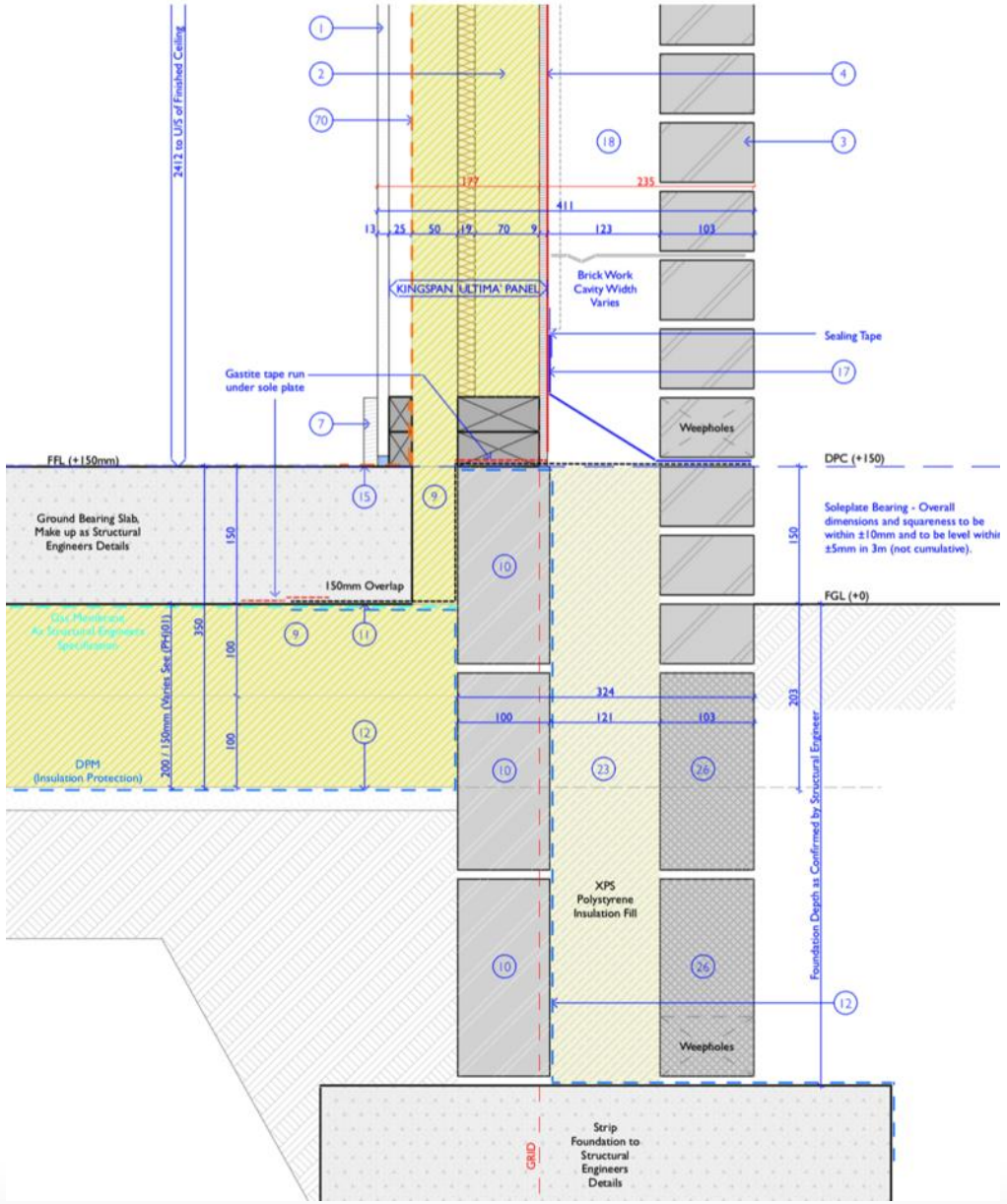
# Stoney Gate Walk

- Plan / section fixed ‘thermal box’
  - Façade articulation provides necessary variation & interest
- Junctions minimised, use of ‘bob-tail’ truss and service void under truss OSB
  - Only penetration through roof is SVP (1 per block) and TV aerials

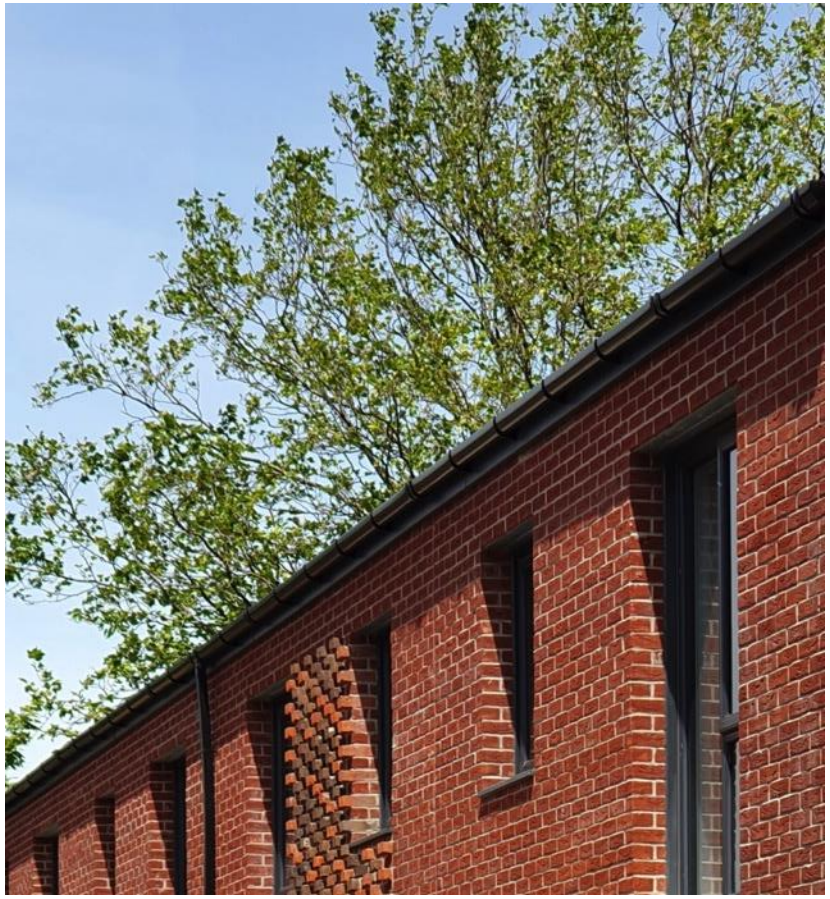
# Stoney Gate Walk

- Prefabrication
  - Pre-insulated panelised timber frame.
- Replicable, (can be) non-proprietary, well understood, sustainable
  - Avoids pitfalls of modular: Too little (lack programme benefits)
  - Too much off site (Volumetric = width/design constraints, over engineering, cost)



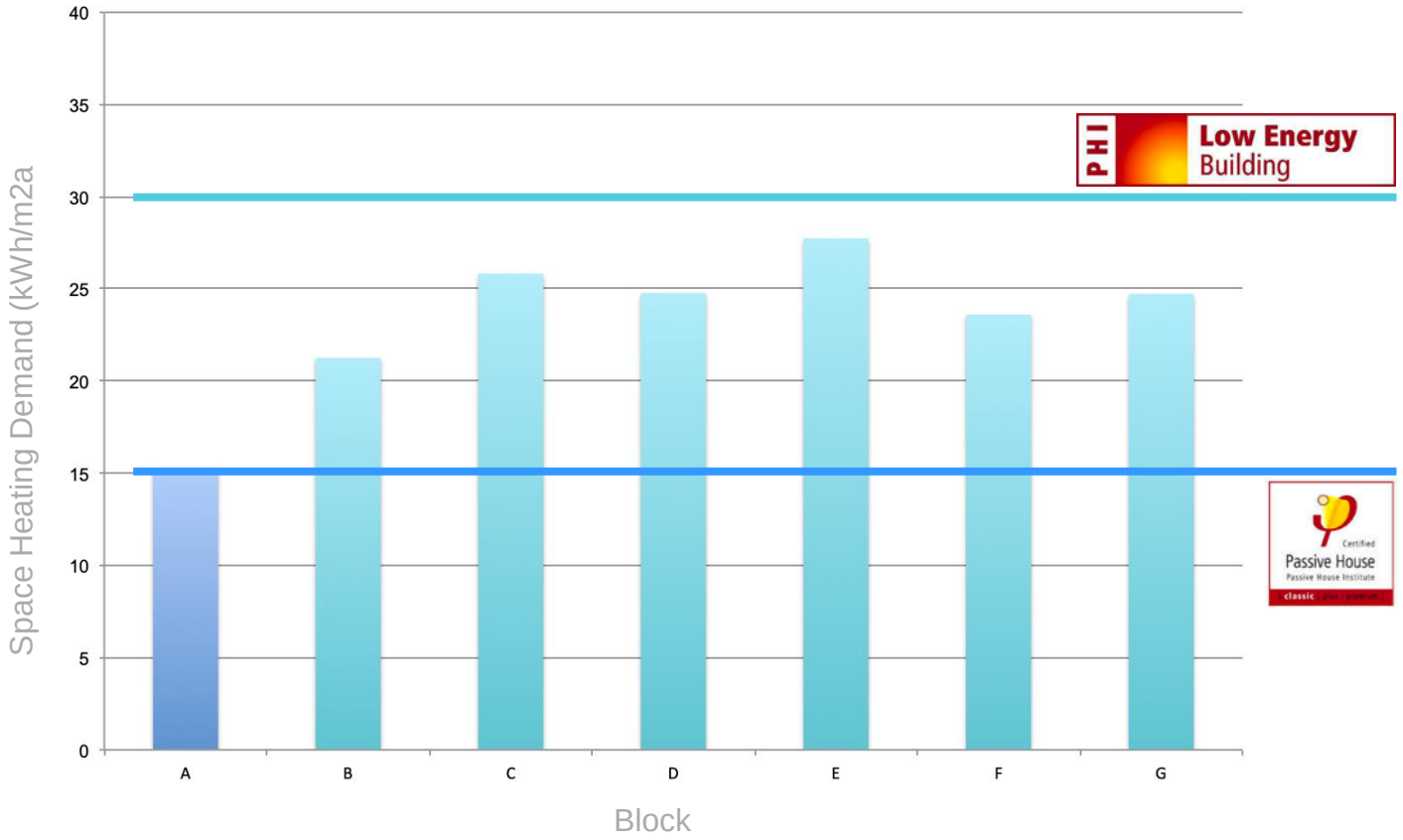
# Stoney Gate Walk

- Full brick reveal provides ‘free’ shade in mid summer
- Masonry façade is contextual, durable and offers (some) thermal mass
- Timber frame with internal VCL
  - Achieving 0.6 hard (first block), =<1.0 (PHLEB) with met with ‘ease’



# Stoney Gate Walk

- Terracing (or lack of) and orientation make a huge difference (largest delta = 30%)
- PHLEB dwellings circa 32% co2 reduction over Part L
- PH Classic circa 40%
- Part L 2020 ‘levels’ proposed are 20 & 31% reduction over 2013



# Stoney Gate Walk

- Cost – Circa £1300m2 (incl. remediation, site/landscape works)
- Model is replicable at scale
  - Design/detailing can be carried forward – ‘pattern book’ approach
- 2020 Part L & Manchester opposition to Gas changes the equation
  - Focus on reducing energy demand more important then ever (comparative cost of electricity)

# Summary

- Target the highest performance contextually possible
  - PassivHaus the foundation for zero carbon & 2028/2038
- Don’t abandon if higher levels aren’t feasible at all times in all paces – ‘Cliff Edge’ performance gap
  - Don’t regress to 0 if 100% not possible
- Future uncertainty (grid/carbon), target energy efficiency (‘Fabric First’)
- Work with communities, stakeholders & local govt’ to increase awareness of what makes sustainability achievable
- Design simply

# ukpassivhaus conference 2019

Thank you…

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