BLP TIS (UK) Ltd framework for delivery of the 60 year BOPAS durability and maintenance assessment

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The BLP TIS durability assessment process

This document sets out information requirements and our approach to the BOPAS durability and maintenance assessment.

To assess durability we confirm that the design measures and construction address the most likely causes of premature failure such that the building should achieve an expected design life of 60 years. Additional checks will be required for design life of 75 or 100 years.

The report is set out in following sections:

1) The BOPAS submission checklist for the 60 year durability and maintenance assessment
2) Key durability issues associated with buildings
3) Interface details between major building elements
4) Indicative list of drawings required to communicate the building design, construction and details of junctions

The nature of these assessments is that they are iterative and rely on exchange of information as the assessment develops.

1 BOPAS submission checklist

1. Declaration of system boundaries in terms of dimensions, number of storeys, occupation/use categories, intended geographical location, exposure limitations (e.g. wind, driving rain) and identification of secondary elements within scope (e.g. stairs, roofs, claddings, windows, doors, direct glazing, chimneys/flues, integrated services, finishes)
2. Portfolio of completed structures – for long term performance verification (if available)
3. Comprehensive specification for each component of the system with specific reference to dimensions, physical properties and durability characteristics; manufacturers' data sheets and third party certification in the case of components sourced from other manufacturers; test data in the case of bespoke components
4. Documentation to demonstrate that system components are compliant with the declared specifications (e.g. lab testing of treated timber samples, cube tests of concrete samples)
5. Factory fabrication: specification, quality and process controls; permitted tolerances
6. Design philosophy statement for structure and weather tightness
7. Details (1:5) of all junctions and intersections of structural elements
8. Details (1:5) of step and stagger configurations and common abutments
9. Details (1:5) around window and door openings
10. Where relevant, supporting structural tests where values have been derived from testing (e.g. racking, fastener pull out, deflection etc.)
11. Sample structural calculations for a typical structure to relevant Eurocode(s) – ideally to demonstrate the structural boundaries of the system
12. Robustness analysis (progressive collapse), if applicable
13. Sample drawings and specification for a typical structure
14. Services installation methodology statement; provision for future access
15. Rules for notching and holing structural members for services penetrations
16. Thermal transmission calculations; U values
17. Management of cold bridges, linear thermal transmittance; Psi values
18. Condensation risk calculations/assessment
19. Moisture accumulation assessment by reference to:

    a) Hygrothermal testing appropriate to the materials used;
    b) ETAG 004 assessment, in the case of insulated external render systems; or
    c) Dynamic modelling, e.g. WUFI hygrothermal modelling (including 1% moisture penetration stress) – in the absence of a secondary moisture control construction e.g. a drained cavity.

20. Fire tests, or supporting documentation if relying on established values
21. Air tightness tests
22. Acoustic tests
23. Erection manual; including fixing schedules, permitted tolerances – and should also include instructions on fixing of cavity barriers and fire stopping
24. Training manual for approved installers if this is how the system is to be constructed

2 Key durability issues

Table 1 provides an outline of typical causes of failure and suggests approaches for managing durability risks. Some issues may not be applicable and would be ignored.

The assessment considers durability over a 60 year period.

Table 1: Typical durability issues for confirmation

Cause of failure	Confirmation of durability
Structural inadequacy	Basis of structural calculations (e.g. Euro codes, British Standards, Institutional guidance, e.g. Steel Construction Institute, and test data). Structural calculations.
Moisture damage	Exclusion of moisture from steel frame and timber based components confirmed by detailed design relating to for example: weatherproofing envelope, vapour control layers, breather membranes, damp proof courses and provision of ventilation and drainage to reduce the risk of moisture based failure. Moisture risks include: hydrostatic, capillary, hydrothermal, interstitial and surface condensation (also related to thermal bridging), Typical moisture sources: are ground, atmospheric, in-use and construction moisture
Corrosion	Resistance to corrosion of metals - confirmed by protective coatings or corrosion resistant materials for expected corrosivity levels; measures to manage bimetallic corrosion if it is a risk.
Decay	If wood based components are used - minimising the risk by controlling moisture content to less than 20% or appropriate preservative treatment or naturally durable timbers for the exposure class and desired service life.
Weathering (agents of deterioration)	Resistance to agents of deterioration such as frost, hailstones, pollutants and solar radiation etc. also related to moisture damage. Agents of deterioration may be natural or man-made.
Movement	Typically management of thermal and moisture movement
Process and construction defects	Issues relating to off-site production quality control, design, transport and installation. Management and co-ordination of information, protocols for design and installation at interfaces with other trades, sub-contractors and works packages.
In use damage or lack of maintenance	Maintenance requirements and information. Accessibility of shorter life components to carry out repairs, replacement and alterations.

3 Interface details

Key interface details and junctions:

- Site preparation and foundations
- Ground floor external wall foundation interface
- Roof upper module interface
- Separating wall - floor interfaces with each other and external wall, and partition interfaces
- External cladding and openings to external wall interfaces
- Provision for services
- Provision for module lifting

4 Drawing requirements

Drawings to describe the building and at a scale to make explicit key detailing issues.

The actual set of drawings required will depend on the type and extent of offsite modularisation. All distinct cases of floor/wall/roof/penetration/opening junctions should be included.

For a complete building drawings would include some or all of the following or others as applicable:

4.1 External walls

1. Vertical cross section of the walls with all layers
2. Horizontal cross section of the walls with all layers
3. Typical view of structural frame with positions of studs, plates, lintels, including openings
4. Horizontal racking resistance system
5. System for wall ties and uplift anchors
6. Horizontal cross section of junctions between prefabricated elements, including corners
7. Vertical cross section of junction between external wall and foundation/ground floor
8. Vertical cross section of junction between external wall and suspended floors
9. Vertical cross section of junction between external wall and roof, both at gables and façades
10. Design of junctions between external wall and windows and external doors
11. Fire stops

4.2 Internal walls

1. Horizontal cross section of the walls with all layers
2. Typical view of structural frame with positions of studs, plates, lintels, including openings
3. Horizontal racking resistance system
4. Vertical cross section of junction between wall and foundation/ground floor
5. Vertical cross section of junction between wall and suspended floors

4.3 Separating and compartment walls

1. Horizontal cross section of the walls with all layers
2. Typical view of the structural frame with positions of studs and plates
3. Horizontal racking resistance system
4. Horizontal cross section of junctions between prefabricated elements
5. Vertical cross section of junction between wall and foundation/ground floor

6. Vertical cross section of junctions between wall and suspended floors
7. Vertical cross section of junctions between wall and roof structure
8. Position of fire barriers
9. Detailing of sound insulation measures

4.4 Floors - upper and ground

1. Vertical cross section of the floors with all layers
2. Horizontal plan of structural system with positions of joists, blocking, etc.
3. Structural system for floor openings
4. Detail of possible structural joist splices
5. Vertical cross section of element junctions
6. Vertical cross section of support details on foundations and walls

4.5 Separating and compartment floors

1. As above for floors, and
2. Detailing of fire barriers
3. Detailing of sound insulation measures

4.6 Roofs

1. Vertical cross section of complete roof structure with all layers
2. Plan of structural system with positions of rafters and possible intermediate supports
3. Structural system for openings to attics
4. Basic design of joints around ducts, pipes, chimneys, etc penetrating the roof
5. Vertical cross section of support details at exterior walls and intermediate supports
6. Vertical cross section of element junction
7. Basic design of joints between roof and roof windows
8. Details of roof features e.g. dormers
9. Detailing of fire protection measures

4.7 Miscellaneous

Details and sections to assess the construction of the following:

1. Core zones, lift shafts, stairwells etc.
2. Balconies, terraces, walkways, cantilevered elements etc.
3. Basements and ramps
4. Other features or constructions which form part of the building