

 (**Replace logo)**

 BUILDING NAME, LOCATION

 \*COMPLETED BY / role / company

 MAT05- DESIGN FOR DURABILITY AND RESILIENCE

 VULNERABLE AND EXPOSED ELEMENTS RISK ASSESSMENT

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 BASED UPON BREEAM NEW CONSTRUCTION V6 (SD5079)

 \*Items highlighted in red text, to be completed by Designer/Design Team Member.

INTRODUCTION

The following document has been produced in response to meeting the requirements of MAT05 – Designing for durability and resilience of the BREEAM New Construction Version 6 criteria in accordance with the information from relevant bodies and resources. The report has been submitted for the development of [Insert: Development name] to demonstrate the measures undertaken by the design team to reduce the need to repair and replace materials resulting from damage to exposed elements of the building and landscape.

The report is a result of the following project team:

|  |  |  |
| --- | --- | --- |
| Name | Company | Role |
| Shauna Buckley | Carbon.Climate.Certified | BREEAM Assessor |
| [Insert name] | [Insert company name] | Architect |
| [Insert name] | [Insert company name] | M&E |
| [Insert name] | [Insert company name] | Civil/ Structural Engineer |

The report includes the project teams recommendations for measures that will be incorporated into the design to accommodate future adaptation of the building.

BREEAM NEW CONSTRUCTION VERSION 6 – MAT05

The following information shows the BREEAM criteria required for compliance of MAT05 Designing for Durability and Resilience. The report follows and will demonstrate how the project sets out to comply with the following criteria.

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| Materials05 | Designing for durability and resilience  | Credits Available |
| To reduce the need to repair and replace materials resulting from damage to exposed elements of the building and landscape.  | 1 |

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|  |  |
| Protecting vulnerable parts of the building from damage | 1. Protection measures are incorporated into the building's design and construction to reduce damage to the building’s fabric or materials in case of accidental or malicious damage occurring. These measures must provide protection against:1. Negative impacts of high user numbers in relevant areas of the building (e.g. corridors, lifts, stairs, doors etc.).
2. Damage from any vehicle or trolley movements within 1m of the internal building fabric in storage, delivery, corridor and kitchen areas.
3. External building fabric damage by a vehicle. Protection where parking or manoeuvring areas are within 1 metre of the building façade and where delivery areas or routes are within 2 metres of the façade, i.e. specifying bollards or protection rails.
4. Potential malicious damage to building materials and finishes, in public and common areas where appropriate.
 | Architect / MEP / Civils |
| Protecting exposed parts of the building from material degradation | 2. Key exposed building elements have been designed and specified to limit long and short term degradation due to environmental factors. This can be demonstrated through one of the following:1. The element or product achieving an appropriate quality or durability standard or design guide. If none are available, use BS 7543:2015as the default appropriate standard

OR1. A detailed assessment of the element's resilience when exposed to the applicable material degradation and environmental factors.

3. Include convenient access to the roof and façade for cost-effective cleaning, replacement and repair in the building's design.1. Design the roof and façade to prevent water damage, ingress and detrimental ponding.
 | Architect / MEP / Civils |

DESIGN NOTE – KEY TERMS

Applicable building’s fabric and materials

1. Foundation/substructure/lowest floor/retaining walls
2. External walls
3. Roof/balconies
4. Glazing: windows, skylight
5. External doors
6. Railings/balusters (where exposed to external environment)
7. Cladding (where exposed to external environment)
8. Staircase/ramps (where exposed to external environment)
9. Hard landscaping

Environmental factors

1. Environmental agents, including:
	1. Solar radiation
	2. Temperature variation
	3. Moisture
	4. Wind
	5. Precipitation, e.g. rain and snow
	6. Extreme weather conditions: high wind speeds, flooding, driving rain, snow
2. Biological agents, including:
	1. Vegetation
	2. Pests, insects
3. Pollutants, including:
	1. Air contaminants
	2. Ground contaminants

Material degradation effects (includes, but not necessarily limited to the following)

1. Corrosion
2. Dimensional change, e.g. swelling or shrinkage
3. Fading/discolouration
4. Rotting / Leaching / Blistering / Melting
5. Salt crystallisation
6. Abrasion

Malicious damage

For BREEAM purposes this is a damage occurring due to intentional or irresponsible actions by users of the building or the public, e.g. damage to doors / windows due to physical force.

DESIGN NOTE – METHODOLOGY

Part 1 - Protecting vulnerable parts of the building from damage

Protection measures, which will be incorporated into the building’s design and construction to reduce damage to the building’s fabric and materials, are provided within the Table 1. These measures will provide the protection against the damage factors defined under criteria 1a, 1b, 1c and 1d.

Preventative measures, which will be incorporated to limit material degradation of the exposed parts of the building in order to reduce frequent replacements, repairs and maintenance through life cycle of the building, are provided within the Table 1. These measures will provide the protection against damage factors defined under criteria 3 and 4.

Part 2 - Protecting exposed parts of the building from material degradation

Key exposed building elements will be designed and specified to limit long and short-term degradation due to environmental factors. This will be demonstrated via one of the following:

* The element or product will achieve an appropriate quality or durability standard or design guide (see Table). If none are available, BS 7543:20151 will be used as the default appropriate standard.

OR

* A detailed assessment of the element's resilience when exposed to the applicable material degradation and environmental factors will be provided with the evidence.

Examples of Suitable durability measures

Suitable durability and protection measures to vulnerable parts of the building can include:

1. Bollards/barriers/raised kerbs to delivery and vehicle drop-off areas
2. Robust external wall construction, up to 2m high
3. Corridor walls specified to Severe Duty (SD) as per BS 5234-21 and, for healthcare buildings, Health Technical Memorandum 56 - Partitions.
4. Protection rails to walls of corridors
5. Kick plates/impact protection (from trolleys etc) on doors
6. Hard-wearing and easily washable floor finishes in heavily used circulation areas (i.e.  main entrance, [[1]](#footnote-1)corridors, public areas etc)
7. Designing out the risk without the need for additional materials specification to  protect vulnerable areas.

Any vehicle impact protection measures specified should be positioned at an adequate distance from the building to protect the fabric from impact from any vehicle with a measurable overhang of the body from the wheel track, in particular for any goods delivery areas.

In vehicle movement areas only; where the specification of external robust wall construction is specified to comply with the credit, additional protection will be provided to ensure against potential damage to the robust façade from vehicle movement, i.e. specifying bollards or protection rails.

COMPLIANCE OVERVIEW

Part 1: Protecting vulnerable parts of the building from damage

Table 1. Protecting building from damage / material degradation.

The table below provides a summary of some of the damages that can reasonably be expected to occur and require to be designed out. It does not provide for a complete overview of all risks possible. It is responsibility of the relevant consultant (Civil Engineer/Structural Engineer/Architect) to identify and mitigate the risks associated with the project with respect to adequately protecting of exposed elements of the building and landscape.

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| Criteria | Accidental and / or malicious damage | Measures to provide protection against accidental and / or malicious damage | Evidence of Implementation (to be read alongside this report) |
| Protecting vulnerable parts of the building from damage | 1a. Negative impacts of high user numbers in relevant areas of the building (e.g. corridors, lifts, stairs, doors etc.) |   |   |
| 1b. Damage from any vehicle or trolley movements within 1m of the internal building fabric in storage, delivery, corridor and kitchen areas |   |   |
| 1c. External building fabric damage by a vehicle (protection where parking or manoeuvring areas are within 1 metre of the building façade and where delivery areas or routes are within 2 metres of the façade, i.e. specifying bollards or protection rails) |   |   |
| 1d. Potential malicious damage to building materials and finishes, in public and common areas where appropriate |   |   |
| Protecting exposed parts of the building from material degradation | 3. Poor convenient access to the roof and façade for cost-effective cleaning, replacement and repair in the building's design |   |   |
| 4. Water damage to the roof and façade due to the following: |   |   |
| 4a. Staining |   |   |
| 4b. Detrimental oxidation |   |   |
| 4c. Ponding |   |   |
| 4d. Rot |   |   |
| 4e. Ingress |   |   |
| 4f. Penetration |   |   |
| 4g. Other deleterious effects |   |   |

Part 2: Protecting exposed parts of the building from material degradation

Below is provided a summary of two routes. One route should be chosen to demonstrate that key exposed building elements have been designed and specified to limit long and short term degradation due to environmental factors.

ROUTE 1: The element or product achieves an appropriate quality or durability standard or design guide from Table 2. If none are available, use BS 7543:20151 as the default appropriate standard

**OR**

ROUTE 2: A detailed assessment of the element's resilience when exposed to the applicable material degradation and environmental factors.

ROUTE 1

Identify which of the following quality or durability standards or design guides are applicable. If none are available, use BS 7543:2015 as the default appropriate standard.

Table 2. Relevant industry durability or quality standards and design guides.

|  |  |  |
| --- | --- | --- |
| Relevant industry durability or quality standards and design guides | Applicable? YES / NO | Evidence (data sheets) |
| Timber |
| BS EN 350:2016. Durability of wood and wood-based products - Testing and classification of the durability to biological agents of wood and wood-based materials, BSI; 2016. |   |   |
| WIS 4-28. Durability by design, TRADA; 2016 |   |   |
| WIS 2/3-60. Specifying timber exposed to weathering, TRADA; 2015 |   |   |
| WIS 1-47. Timber external doors, TRADA; 2015 |   |   |
| BS 8605-1:2014. External timber cladding - Method of specifying, BSI; 2014 |   |   |
| Curtain walling |
| Standard for systemised building envelopes, Centre for Window and Cladding Technology; 2006 |   |   |
| CWCT Curtain Wall Installation Handbook, Centre for Window and Cladding Technology; 2006 |   |   |
| BS EN 13830:2015. Curtain walling - Product standard, BSI; 2015 |   |   |
| Brickwork, blockwork |
| BDA Design Note 7 - Brickwork durability, Brick Development Association; 2011 |   |   |
| Severely Exposed Brickwork, Brick Development Association; 2014 |   |   |
| BS 8297-2017. (Design, manufacture and installation of architectural precast concrete cladding. Code of practice). |   |   |
| The standard refers to EN 13369 (Common Rules for precast concrete products) on durability requirements and requires concrete cover to be in accordance to EN 1992-1-1 and BS 8500. |   |   |
| BS 8500-1:2015 +A1:2016. Concrete – complementary British Standard to BS EN 2016 part 1: Method of specifying and guidance for the specifier  |   |   |
| BS 8500-2:2015 +A1:2016. Concrete – complementary British Standard to BS EN 2016 part 2: Specification for constituent materials and concrete. |   |   |
| Roof elements |
| BR 504. Roofs and roofing: Performance, diagnosis, maintenance, repair and the avoidance of defects (Third Edition), BRE; 2009 |   |   |
| Profiled sheet roofing and cladding. The guide to design and best practice (4th edition), National Federation of Roofing Contractors; 2016 |   |   |
| Guidelines for the Design & Application of Green Roof Systems, CIBSE; 2013 |   |   |
| Single Ply: Design Guide 2016 Edition, Single Ply Roofing Association; 2016 |   |   |
| SPRA: Guidance and standards |   |   |
| LRWA: technical guidance notes |   |   |
| Metal cladding |
| Profiled sheet roofing and cladding. The guide to design and best practice (4th edition) National Federation of Roofing Contractors 2016 |   |   |
| Metal Fabrications: Design, Detailing and Installation Guide, Metal Cladding and Roofing Manufacturers Association; 2006 |   |   |
| Glazing |
| BS EN 12488:2016. Glass in building - Glazing recommendations - Assembly principles for vertical and sloping glazing, BSI; 2016 |   |   |
| Masonry |
| PD 6697:2010. Recommendations for the design of masonry structures to BS EN 1996-1-1 and BS EN 1996-2, BSI; 2010 |   |   |
| BS EN 1996-2:2006. Eurocode 6. Design of masonry structures. Design considerations, selection of materials and execution of masonry, BSI; 2006 |   |   |
| Other useful standards or design guides |
| BR 292. Cracking in buildings (Second edition), BRE; 2016 |   |   |
| BRE Good Practice guidance's |   |   |

ROUTE 2

A detailed assessment of the element’s resilience towards material degradation and environmental factors below provides a summary of some of the risks that can reasonably be expected to occur and require to be designed out. It does not provide for a complete overview of all risks possible. It is responsibility of the relevant consultant (Civil Engineer/Structural Engineer/Architect/MEP) to identify and mitigate the risks associated with the project to assure adequate protection of exposed elements of the building and landscape in order to reduce frequent replacements, repairs and maintenance.

|  |  |  |
| --- | --- | --- |
|  | Material Degradation Effects\* | Durability Measures  |
| Corrosion   | Dimensional change | Fading/ discolouration | Rotting,  Leaching,Blistering,  Melting | Salt Crystallisation | Abrasion  / Wear | Risks Identified |
| Measures to Mitigate the Identified Risk in a way to reduce frequent replacements, repairs and maintenance through the life cycle  | Evidence of Implementation (To be read alongside this report) |
| Building Elements: |
| Foundation/substructure/lowest floor/retaining walls  | Y |  | Y |  |  |  |  |  |
| External Walls  |  |  |  |  |  |  |  |  |
| Roof/balconies  |  |  |  |  |  |  |  |  |
| Glazing: windows, skylight  |  |  |  |  |  |  |  |  |
| External doors  |  |  |  |  |  |  |  |  |
| Railings/balusters (where exposed to external environment)  |  |  |  |  |  |  |  |  |
| Cladding (where exposed to external environment) |  |  |  |  |  |  |  |  |
| Staircase/ramps (where exposed to external environment) |  |  |  |  |  |  |  |  |
| Hard landscaping  |  |  |  |  |  |  |  |  |
| \*Environmental Factors Include: | Solar Radiation, Temperature Variation, Water/Moisture, Wind, Rain/Snow, Extreme Weather Conditions, Biological Agents inc. Pollutants and Contaminants.  |
| Further Comments:  |
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| --- |
| Completed By: |
| Name | Company  | Date  |
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1. ###  BS 7543:2015: Guide to durability of buildings and building elements, products and components.

This standard gives a useful overview of the field of durability and provides a process for predicting a materials service life. It provides useful guidance on the methodology for assessing and measuring durability and identifies common durability failures for typical construction materials. In addition, it lists some example predicted service lives for typical materials. [↑](#footnote-ref-1)