

Acceptance & Reception Procedure

| DEE - Departamento de Estruturas e Edifícios | |
|--|----------------------------------|
| Aluminum Window | Document No.: ARP/DEE/007 |
| | Rev. No.: C |
| | Date: 2016/06/06 |
| | Page No.: 1 of 5 |

1 Reference Standard

Air Permeability

GB/T 7106-2008: Graduations and test methods of air permeability watertightness wind load resistance performance for building external windows and doors

GB 50176-1993: Thermal Design Code for Civil Building

GB/T 8478-2008: Aluminum alloy window and door

JGJ 214-2010: Technical code for aluminum alloy window and door engineering

Materials for Aluminium Alloy Windows

Reference standard: BS 4873:2004

Aluminium profiles: BS EN 755-9:2001 or equivalent;

Aluminium ancillary components: BS EN 485-2:1995 or equivalent;

Anodized oxidation coating on aluminium: BS 1615, BS 3987 or equivalent;

Liquid organic coating on aluminium: BS 4842 or equivalent;

Powder organic coating on aluminium: BS 6496 or equivalent;

PVDF coating on aluminium: GB/T 5237.5-2000 or equivalent;

Other materials being used shall conform to the standard BS 4873:2004.

Flat Tempered Glass

ASTM C 1048 -2004 Standard Specification for Heat- Treated Flat Glass- Kind HS, Kind FT Coated and

Uncoated Glass

EN 12150-1 – 2000 Glass in Building – thermally Toughened Soda Lime Silicate Safety Glass- Part 1 :

Definition and Description

GB 15763.2-2005 Safety Glazing Materials in Building – Part 2: Tempered Glass

Flat Tempered glass (2)

GB 9962-1999 Laminated glass

GB 15763.2-2005 Safety glazing materials in building—Part 2: Tempered glass

Acceptance & Reception Procedure

| DEE - Departamento de Estruturas e Edifícios | |
|--|----------------------------------|
| Aluminum Window | Document No.: ARP/DEE/007 |
| | Rev. No.: C |
| | Date: 2016/06/06 |
| | Page No.: 2 of 5 |

Field check for water-tightness properties

The Reference standards are American Architectural Manufacturers Association Specification AAMA 501.2-09.

2 Approval Procedure

2.1 Documents

The following documents shall be submitted for approval:

| Documents | | Requirements |
|-----------|---|---|
| a) | Design documents | <ul style="list-style-type: none"> ● Specification ● Material requirement ● Design Calculation (included shop drawing, mechanical properties calculation, etc.) ● Design wind load (included all the factors) |
| b) | Manufacturer catalogue | <ul style="list-style-type: none"> ● The catalogue shall include type of material, specification |
| c) | Recent Manufacturer Auto Control Test Reports | <ul style="list-style-type: none"> ● Test reports shall be the latest within 1 year |

Remark: Factory visit(s) may be required depends on the actual situation. In case of doubt, LECM has right to collect sample(s) from the factory for testing(s).

2.2 Mock-up test

Sample of aluminum window shall be submitted for mock-up test. The test should be carried out according to GB/T 7106-2008 for the air permeability, water-tightness and wind load resistance properties of the aluminum window. Number of specimens shall be according to the designer or owner requirement. If the number of specimens is not specified, it is recommended to take 3 specimens of each typical type of aluminum window for the test. When the contractor could provide a mock-up test report of the aluminum window from a third party, and the window stated in the report is the same manufacturer, same model or a typical model that can represent the model used in the project, mock-up test could be exempted

Acceptance & Reception Procedure

| DEE - Departamento de Estruturas e Edifícios | |
|--|----------------------------------|
| Aluminum Window | Document No.: ARP/DEE/007 |
| | Rev. No.: C |
| | Date: 2016/06/06 |
| | Page No.: 3 of 5 |

Table 2.1 – Test Items

| Testing Item | Test Standards | Direction |
|--|----------------|--|
| Air permeability | GB/T 7106-2008 | Test for the quantity of air permeability of the aluminum window at 10Pa pressure difference |
| Water-tightness (Dynamic Pressure Method) | GB/T 7106-2008 | Test for water-tightness of the aluminum window at specified pressure |
| Wind load resistance | GB/T 7106-2008 | Test for deformation or workability of the aluminum window at specified pressure |

3 Reception Procedure

3.1 Materials for Aluminum Alloy Windows

Materials for aluminum alloy windows should be according to ARP/DMC/11 for reception..

3.2 Glass

Glass should be according to ARP/DEE/008 and ARP/DMC/13 for reception.

3.3 Field check for water-tightness properties

After installation work of the aluminum window was finished, field check for water-tightness properties of aluminum window should be carried according to ARP/DEE/006 for reception.

4 Acceptance criteria

4.1 Mock-up test

| Testing item | Test standards | Minimum requirement |
|------------------|----------------|---|
| Air permeability | GB/T 7106-2008 | <ol style="list-style-type: none"> 1. Calculate for the quantity of air permeability at 10Pa pressure difference whether it can satisfy the design requirement 2. When there is no design requirement, the air permeability should not be lower than that stated at |

Acceptance & Reception Procedure

| DEE - Departamento de Estruturas e Edifícios | | | | | | | | | |
|--|---|---------------|-------------|-----------|---|-------|------------|-----------|--------|
| Aluminum Window | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Document No.:</td> <td style="padding: 2px;">ARP/DEE/007</td> </tr> <tr> <td style="padding: 2px;">Rev. No.:</td> <td style="padding: 2px;">C</td> </tr> <tr> <td style="padding: 2px;">Date:</td> <td style="padding: 2px;">2016/06/06</td> </tr> <tr> <td style="padding: 2px;">Page No.:</td> <td style="padding: 2px;">4 of 5</td> </tr> </table> | Document No.: | ARP/DEE/007 | Rev. No.: | C | Date: | 2016/06/06 | Page No.: | 4 of 5 |
| Document No.: | ARP/DEE/007 | | | | | | | | |
| Rev. No.: | C | | | | | | | | |
| Date: | 2016/06/06 | | | | | | | | |
| Page No.: | 4 of 5 | | | | | | | | |

| | | |
|--|----------------|--|
| | | <p>GB/T 7106-2008 table 1:</p> <p>Class 4 (for buildings of 6 or less than 6 storeys)</p> <p>Class 6 (for buildings of more than 6 storeys)</p> |
| Water-tightness (Dynamic Pressure Method) | GB/T 7106-2008 | <ol style="list-style-type: none"> 1. No leakage observed at the specific test pressure (if there is no design requirement, the test pressure should not be less than 0.2 design wind load W_k) 2. For the classification test, gradually increase the test pressure until leakage occurred, the pressure level before leakage occurred is the classification pressure. |
| Wind load resistance | GB/T 7106-2008 | <p>Engineering test(Design wind load W_k is provided):</p> <ol style="list-style-type: none"> 1. Distortion test: obtain P_1 at the largest frontal deflection, P_1 should be not less than $0.4W_k$, the largest frontal deflection is shown in table 4.1 2. Repeated Pressure test: Test at $P_2 = 1.5 P_1$ or $0.6W_k$ design wind load (whatever which is smaller), the specimen should not be damaged or malfunction. 3. Test at $P_3 = 2.5 P_1$ (Test pressure should not be lower than the design wind load W_k, if test pressure P_3 is greater than W_k, test pressure $P_3=W_k$ is considerable), the specimen should not be damaged or malfunction. <p>Grade test(Design wind load W_k is not provided):</p> <ol style="list-style-type: none"> 1. Distortion test: obtain P_1 at the largest frontal deflection, the largest frontal deflection is shown in table 4.1 2. Repeated Pressure test: Test at $P_2 = 1.5 P_1$, the specimen should not be damaged or malfunction. 3. Test at $P_3 = 2.5 P_1$, the specimen should not be damaged or malfunction. |

Acceptance & Reception Procedure

| DEE - Departamento de Estruturas e Edifícios | |
|--|----------------------------------|
| Aluminum Window | Document No.: ARP/DEE/007 |
| | Rev. No.: C |
| | Date: 2016/06/06 |
| | Page No.: 5 of 5 |

Table 4.1 The largest frontal deflection of the distortion test

| Aluminum window Specimen type | Main frame allowable deflection | Distortion test largest frontal deflection |
|---------------------------------|---------------------------------|--|
| Single glass or Laminated glass | $\pm 1/120$ | $\pm 1/300$ |
| Hollow glass | $\pm 1/180$ | $\pm 1/450$ |
| Fixed glass | $\pm 1/60$ | $\pm 1/150$ |
| Single Hinged opening | 20mm | 10mm |

All the tests listed on the above table should be complied with the minimum requirements. If three specimens pass the test, the aluminum window can be accepted. If one of three specimens fails, 3 additional specimens will be selected to retest. The aluminum window will be accepted only when these three additional samples passed. If more than one specimen fails, the aluminum window cannot be accepted. The contractor is responsible to find out the reason of failure and repair the failure part. Retest of the aluminum window should be carried out.

4.2 Other test

For the tests of acceptance procedure, the acceptance criteria should be referred to the corresponding Approval & Reception Procedure.