

4211FA FLETCHER ALUMINIUM CURTAIN WALLING

Masterspec sections must be customised to suit the project being specified, by removing irrelevant information and adding project-specific information and selections.

1. GENERAL

This section relates to the design, development, manufacture, supply and glazing of Oakley® aluminium framed curtain walls.

Modify or extend the above description to suit the project being specified.

This section is generally in a performance form and involves some manufacturer design, whether or not an off-the-shelf system is chosen. Modify performance requirements to suit project.

1.1 RELATED WORK

Refer to GLAZING for glazing.

Include cross references to other sections where these contain related work.

1.2 ABBREVIATIONS

The following abbreviations are used throughout this part of the specification:

DWP	Design Wind Pressure
SLS	Serviceability limit state
ULS	Ultimate limit state
WANZ	Windows Association of New Zealand

Refer general section INTERPRETATION & DEFINITIONS for abbreviations used throughout the specification.

Documents

1.3 DOCUMENTS REFERRED TO

Documents referred to in this section are:

NZBC C/AS1	Fire safety
NZS 1170.5	Structural design actions - Earthquake actions - New Zealand
AS/NZS 1170.1	Structural design actions - Permanent, imposed and other actions
AS/NZS 1170.2	Structural design actions - Wind loads
AS 1449	Wrought alloy steels - Stainless and heat resisting steel plate, sheet and strip
AS 1734	Wrought aluminium and aluminium alloy flat sheet, coiled sheet and plate for general engineering purposes
AS/NZS 1866	Aluminium and aluminium alloys - Extruded rod, bar, solid and hollow shapes
AS 2848.1	Aluminium and aluminium alloys - Compositions and designations - Wrought products
NZS 3109	Concrete construction
NZS 3504	Aluminium windows
AS 3715	Metal finishing - Thermoset powder coatings for architectural applications
NZS 4211	Performance of windows
NZS 4223.1	Glazing in buildings - Glass selection and glazing
NZS 4223.3	Glazing in buildings - Human impact safety requirements
NZS 4223.4	Glazing in buildings - Wind, dead, snow and live action
AS/NZS 4284	Testing of building facades
AS/NZS 4680	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
AS/NZS ISO 9001	Quality management systems - requirements
BS 3900	Methods of test for paints Part C5: Determination of film thickness
AAMA CW13	Structural sealant glazing systems
AAMA 610	Cleaning and maintenance of painted aluminium extrusions and curtain wall panels
AAMA 800	(Full series) Voluntary specifications and test methods for sealants
AAMA 2604	Performance requirements and test procedures for high performance organic coatings on aluminium extrusions and panels
AAMA 2605	Performance requirements and test procedures for superior performance organic coatings on aluminium extrusions and panels

ASTM C1087	Standard test method for determining compatibility of liquid-applied sealants with accessories used in structural glazing systems
US Federal Specification:	TT-S-001543A: Sealing compound, silicone rubber base (for caulking, sealing and glazing in buildings and other structures) TT-S-00230C: Sealing compound, elastomeric type, single component (for caulking, sealing and glazing in buildings and other structures)
WANZ	Anodic oxide coatings on wrought aluminium for external architectural applications (WANZ SFA 3503-03:2005)
WANZ	Powder Coating Quality Assurance System
BRANZ Study Report SR39:	The behaviour of external glazing systems under seismic in-plane racking

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

Delete from the DOCUMENTS clause any document not cited. List any additional cited documents.

RELATED DOCUMENTS

Refer to the following related documents when preparing this section:

NZBC B1/VM1	Structure
NZBC B1/AS1	Structure
NZBC B2/AS1	Durability
NZBC E2/AS1	External moisture
NZBC E3	Internal moisture
NZBC F2/AS1	Hazardous Building Materials
Window Association of New Zealand:	Aluminium Window Handbook
BRANZ BU 349	Finishes for aluminium
BRANZ BU 362	Finishes on architectural hardware
BRANZ BU 471	Insulating glass units
BRANZ BU 422	Maintenance and refurbishment of aluminium joinery
BRANZ BU 450	Solar-control glass selection and installation
BRANZ publication	Selecting wall claddings
Health and Safety in Employment Act	1992

1.4 MANUFACTURER'S DOCUMENTS

Manufacturer's and supplier's documents relating to work in this section are:

Fletcher Aluminium High Performance Architectural Solutions for Windows and Doors - Oakley high performance systems

Copies of the above literature are available at:

Web: www.oakley.co.nz

Telephone: 0800 Oakley

It is important to ensure that all personnel on site have access to accurate, up to date technical information on the many products, materials and equipment used on a project. In most cases individual products are not used in isolation, but form part of a building process. Also a particular manufacturer's and/or supplier's requirements for handling, storage, preparation, installation, finishing and protection of their product can vary from what might be considered the norm. Access to technical information can help overcome this potential problem.

Warranties

1.5 WARRANTY

Warrant this work against all failures, including but not limited to a warranty that all work will be weathertight, structurally sound and free from distortion and deformation under load, that materials and finishes will not crack, peel, blister, delaminate or otherwise deteriorate or corrode, that glass will not break due to thermal shock and temperature differential due to inherent glass faults, that glazing tapes, gaskets and sealants will be free from deterioration due to sunlight, ozone, weather and oxidation and will be free from permanent deformation under glass load.

The warranty to include a separate warranty from the manufacturer of the structural glazing sealant, confirming the performance of the structural silicone used in both cohesion and adhesion.

The warranty to apply to the entire curtain wall installation including discrete windows and doors, all frames, panels, glass, glazing, surface finishes, sealants, gaskets, fixings, fastenings, related materials, fabrications and installation.

The warranty to provide for the repair of any defects resulting from faulty design, faulty execution or defective materials and include for the repair of damage to buildings or structures, in which the curtain wall work has been performed or located, caused by any such defect.

The warranty to further provide that the rights contained in this warranty may be assigned to any subsequent owner before the expiry of the period stated.

Warranty period: 5 years

Refer to the general section for the required form of WARRANTY AGREEMENT and details of when completed warranty must be submitted.

Some of the above terms may be able to be omitted or modified where similar provisions are included in the warranty form itself.

Check general section WARRANTIES for the date of commencement of warranties; which is normally practical completion of the contract. Refer to the chosen conditions of contract as it may also contain information on guarantees.

Fill in the number of years. Normally available warranty period is 5 years with up to 10 years for large projects and 2 years only for small simple projects. NZS 3504 requires that manufacturers of windows marked to claim compliance with NZS 4211 must warrant their windows will comply for a period of at least two years. This period may not be adequate for a curtain wall installation, but any increase in time will have cost implications. Note also that a special guarantee form will be needed, encompassing the special terms and conditions applying to a curtain wall installation.

1.6 FORM OF WARRANTY

Complete the accompanying warranty agreement as part of the contract documents to be signed.

This form of direct warranty is designed to provide direct recourse to the curtain wall manufacturer. Also include a requirement for appropriate professional indemnity insurance cover to cover negligent design.

1.7 CONTRACT PERFORMANCE, DEFECTS LIABILITY BOND

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Refer to the standard Window Association of New Zealand bond document and decide if this is adequate for the project in question.

Requirements

Select one or a combination of the following SAMPLES clauses, depending on circumstances.

1.8 NO SUBSTITUTIONS

Substitutions are not permitted to any specified Fletcher Aluminium system, or associated components and products.

1.9 SUBMIT SECTION SAMPLES

Submit for assessment samples of full-size sections, or half-size drawings and details of all profiles offered.

Where appropriate, confirm when samples are required. If samples are to be submitted with a tender then this requirement should be recorded somewhere in the tender conditions.

1.10 SUBMIT ASSEMBLY SAMPLES

Submit for assessment before fabrication, a complete assembly of members and components of the curtain wall system, at the mullion/transom junction and at the lowest sill.

Modify or expand this clause to better describe the assembly required for the project.

- 1.11 **SUBMIT HARDWARE SAMPLES**
Submit for assessment, actual samples or catalogue cuts and data sheets of all hardware, operating and security systems offered, including examples of the proposed or specified hardware surface finishes.

Where appropriate, confirm when samples are required. If samples are to be submitted with a tender then this requirement should be recorded somewhere in the tender conditions.

- 1.12 **SUBMIT FINISH SAMPLES**
Submit for assessment 3 samples of the specified finish to all exposed curtain walling system sections, in the selected colour, including statements of the film thickness actually achieved on the samples. These samples will be used as quality control samples.

Expand this and the preceding SAMPLES clauses as appropriate to include any details of timing, distribution or approval procedures.

- 1.13 **PROTOTYPES AND TESTING**
Allow to fabricate in the factory a curtain wall prototype from the reviewed shop drawings. Disassemble, then reassemble the prototype and test to confirm that the curtain wall offered complies with the documents. Do not commence factory production of the curtain wall before a satisfactory test result has occurred.

Prototype to consist of a fully glazed and panelled assembly, three modules wide and not less than 7.5 metres high; to include two full vision panels and one infill panel and three spandrel panels, full fixing to structure, mullion joints and horizontal and vertical expansion joints. Use the specified project glass or an agreed equivalent in the assembly.

Ensure the nominated management, assembly and fixing staff for the project are involved at all stages of prototype fabrication and assembly for testing. Maintain the prototype in assembled condition as a control sample.

Paragraph 2 is an example of a typical prototype assembly. Modify to suit project requirements.

The building of prototypes is expensive and should only be used where a new system is being developed, or where standard components are being used in a new way. For more familiar systems, samples may be satisfactory, but each project must be judged on its merits. It is necessary to be quite specific about the size and form of the prototype, where it will be made and where it will be tested.

The full process of assembling, disassembling and re-assembling of the prototype may not be justified in some cases and could be replaced by the monitoring of the initial disassembly process to check any concealed factors such as sealant use.

Clarify where the prototype should be stored after testing as it will no doubt need to be removed from the testing area.

Consider the following as an alternative to constructing and testing a prototype:

TESTED SYSTEMS

Submit for assessment proprietary curtain walling systems that have been successfully tested to performance criteria equal to or more severe than those specified.

- 1.14 **RESEARCH AND DEVELOPMENT**
Make available on request evidence of research and development undertaken in support of the design and performance of the system proposed. Provide instances of use elsewhere by means of drawings, photographs and test certificates.

- 1.15 **MANAGEMENT CAPABILITY**
Submit a statement as to the management capability of the curtain walls organisation, including that of the certifying engineer and all associated suppliers and installers.

Nominate the management staff who will control all stages of the contract and undertake to maintain attendance on site full-time throughout the period of installation on site, to oversee the quality control programme required and to ensure all aspects of the development and installation are achieved in accordance with the documents.

1.16 SHOP DRAWINGS AND INSTALLATION DETAILS

Shop drawings to show, but not be limited to:

- Design calculations
 - Fully dimensioned elevations of all elements (minimum scale 1:20)
 - Complete details of construction, connections and all support systems (scale A1 to 1:1 and A3 to 1:2)
 - Dimensions of all typical elements and of any special sizes and shapes
 - Pressure equalisation ventilation provisions and provision for the exclusion and/or drainage of moisture
 - Jointing details and method of fixing between individual elements and between this installation and adjacent work
 - Provision for adjustment of fixings to ensure the true alignment of curtain walling
 - Sealant types and full size sections of all sealants and backing rods
 - Provision for thermal movement
 - Provision for seismic movement and movement under wind loads
 - Sequence of installation
 - Co-ordination requirements with other work
 - Full size details of glazing gaskets and glazing wedges
 - Glass manufacturer's thermal stress analysis for spandrel panels and tinted, reflective, or other solar control vision glass
 - A full schedule of materials, finishes, componentry, hardware and fittings.
- Add further detail on the precise form and extent of shop drawings where appropriate.*

Refer to the general section SHOP DRAWINGS for the requirements for submission and review and the provision of final shop drawings.

Add further detail on the form and extent of shop drawings where appropriate. Modify this clause to conform with the appropriate timing for the project. In some cases, preliminary details may need to be supplied at the pricing stage, with final shop drawings by the successful supplier/fabricator only.

1.17 MAINTENANCE PROGRAMMES

Propose for approval, and allow to carry out, a comprehensive maintenance programme devised in accordance with AAMA 610 throughout the duration of the curtain wall fabrication and installation. Also provide a maintenance programme in written and graphic form upon completion of the curtain wall installation.

Provide further details of these requirements as appropriate.

1.18 MAINTENANCE PROGRAMMES, STAINLESS STEEL

Provide maintenance programmes for all stainless steel exposed externally.

Performance - standards

1.19 CERTIFYING ENGINEER

Nominate the names of the chartered professional engineer responsible for the structural and performance calculations and the chartered professional engineer who will review, check and certify all curtain wall design work.

1.20 LOADINGS CODE REQUIREMENTS

To AS/NZS 1170, and NZS 1170.

1.21 DEAD LOAD

Accommodate deflection of any member in a direction parallel to the plane of the wall when carrying its full dead load, limited to an amount which will not reduce the glass bite below 75% of the design dimension.

Alternatively state a deflection limit of say 3mm.

Provide 3mm minimum clearance between the member and the top of the fixed panel, glass or other fixed part below.

Shallow transom members with heavy glass may require glass support points (setting blocks) to be moved nearer to each edge (to within 150mm or 0.125 of span, whichever is the greater). If this condition is likely to apply, check deflection/spanning characteristics of the mullions and verify glass for new edge stress.

- 1.22 **LIVE LOAD**
Accommodate the stated deflection at mid point between columns caused by uniform and concentrated live loads on floors or horizontal structure to which the curtain wall is anchored. Refer to SELECTIONS. Allow up to 10mm to permit normal building structure compression and creep.
- 1.23 **SEISMIC, EARTHQUAKE LOADS**
Design the system and its anchorages to resist the earthquake loads of the seismic zone in accordance with NZS 1170. Refer to SELECTIONS for requirements.
- 1.24 **INTER-STOREY SEISMIC MOVEMENT**
Accommodate in-plane inter-storey seismic movement per floor. Refer to SELECTIONS for requirements.
- 1.25 **VERTICAL MOVEMENT**
Accommodate beam/floor deflection, column shortening and creep. Refer to SELECTIONS for requirements.
- 1.26 **DESIGN WIND PRESSURES, BY CALCULATION**
Design in accordance with AS/NZS 1170.2, using scheduled calculated design wind pressures. Refer to SELECTIONS for requirements.
- 1.27 **DESIGN WIND PRESSURES**
(Boundary layer wind tunnel tests)
Design in accordance with AS/NZS 1170.2, using the design wind pressure zones shown on the wind load map elevations supplied.
- These wind maps have been derived from diagrams in the report entitled ~.
Copies of the full report are available for inspection at the offices of ~.
Select from one of the above two clauses.
- Ensure drawings carry a clear statement of the various positive or negative design wind pressures on the curtain wall facades. Wind tunnel testing carries a cost, but more precise results provide an opportunity for economies as a result of more precise design of extrusions and glass thicknesses. The more recording points the greater the precision. Unexpected results can occur by comparison with calculated values. Design on the basis of wind tunnel testing will always result in an alternative solution to NZBC B1.*
- 1.28 **DEFLECTIONS**
Maximum deflection due to bending of any structural member, measured relative to the end of the member at the serviceability wind pressure (SWP) to not exceed 1/250 of the span as per AS/NZS 4284.
In any case deflection limited to 1/360 must be used for plastered, tiled or thin masonry clad dry wall spandrels, while 1/1000 may need to apply to curtain walls where the infill material is thin dimension stone (e.g. granite).
- 1.29 **GLASS BITE**
No reduction of glass bite by more than 25% of design size or edge clearance below 25% or 3mm (whichever is greater) due to deflection.
Lower deflections will often require the use of heavier cross section or reinforcement of frames and thicker glass. This will influence the economy of the installation. Deflections up to 1/60 are permitted for thin metal panels which do not frame glass. Provided retention is satisfactory there will be no back-support show-through and no sealant failure should result. Structural sealants may require a lower deflection ratio than 1/180 and sealant manufacturers should be consulted.
- 1.30 **FRAMING MEMBER DEFLECTION**
Limit the deflection of a framing member over-hanging an anchor point to $2L/180$ where L is the length of the cantilevered member.
- 1.31 **FRAMING MEMBER DEFLECTION**
Limit the deflection of a framing member over-hanging an anchor point and adjoining a fixed building element to no more than one half the sealant joint depth between the framing member and the fixed building element.
Select from one of the preceding two alternative clauses. The first should be used where no sealant joint is involved, the second where there is one. It is essential that sealed joints be

designed to accommodate the deflection likely to occur and so deflection must be held within the capacity of the sealant.

- 1.32 HUMAN IMPACT REQUIREMENT
Select glass for the type and thickness in accordance with NZS 4223.3 for risk level and required impact strength. Refer to SELECTIONS for requirements.
Depending on wind area, location of glass in relation to floor level, the glazing configuration and whether physical barriers exist, impact strength should govern the selection and thickness of glass type in high rise buildings. In high wind areas glass chosen for the design wind pressure will usually also meet impact strength requirements. In low wind areas impact strength will probably govern selection.
- 1.33 WATER TIGHTNESS REQUIREMENT
No significant leakage in terms of NZS 4211.
- 1.34 AIR LEAKAGE REQUIREMENT
Air leakage level 2 in terms of NZS 4211.
The preceding two clauses are in terms of NZS 4211. Revise if other test methods are chosen.
- 1.35 AIR CONDITIONING REQUIREMENTS
Provide a gas tight junction against all adjacent horizontal and vertical structure.
- 1.36 THERMAL MOVEMENT REQUIREMENT
Design for thermal movement to occur without causing deformation, stress on glass, failure of joint seals, undue stress on structural elements and reduction of specified standards of performance over the following surface temperature range:
Annual range of surface temperature: - 6°C to 140°C
Modify temperature range to suit site.
- 1.37 THERMAL PERFORMANCE REQUIREMENT
Provide minimum thermal transmittance U values for the scheduled locations. Refer to SELECTIONS for requirements.
Select which locations apply and obtain figures from the project mechanical engineer for inclusion. The type of vision and spandrel glasses and insulated opaque panels will come from these requirements.
- 1.38 BUILDING MAINTENANCE UNIT LOAD REQUIREMENT
Allow for loads imposed by the building maintenance unit. Provide securing eyes as shown on drawings.
Describe the type of building maintenance unit likely to be used on the face of the curtain wall. Where framing members, in particular mullions, serve as continuous tie-in guides, supply information on the design loads likely and the permissible maximum deflection. Intermittent stabilisation using building anchors is an alternative method. Consult OSH.
- 1.39 FIRE CODE REQUIREMENT
The indicative details show a stated fire resistance rating between floors and at brackets in compliance with NZBC acceptable solution C3/AS1: Spread of fire, to be carried out. Curtain wall installers to liaise with and attend on other trades so that they can carry out their work at the most appropriate time in relation to the curtain wall programme.
- 1.40 ACOUSTIC REQUIREMENTS, INTER-FLOOR
The indicative details show the inter-floor requirements for acoustic privacy between floors, relative to the curtain wall installation, to be carried out. Curtain wall installers to liaise with and attend on other trades so that they can carry out their work at the most appropriate time in relation to the curtain wall programme.
State the design inter-floor acoustic rating which must be maintained between the face of the structure and the back of glass or spandrel panel and show the intention on indicative drawings. Specify elsewhere unless part of the curtain wall work.
- 1.41 ACOUSTIC REQUIREMENTS, SOUND TRANSMISSION
Average sound transmission loss (STL) through the curtain wall system over the standard frequency range of 125-4000Hz:
Average sound transmission loss: ~ dB(A) (minimum)

- 1.42 ACOUSTIC REQUIREMENTS, SOUND TRANSMISSION
Average sound transmission loss through the curtain wall system for the stated frequency range:
Average sound transmission loss: ~ dB(A) (minimum)
Frequency range: ~ Hz
Choose from the two preceding clauses, both of which cover noise issues related to the curtain wall itself. However if the building is near an airport, motorway or some other major noise source, the second clause, which requires on-site measurements, should be used.

Performance - system design

- 1.43 SYSTEM DESIGN
The aluminium curtain wall work to include:
- metal frames and support structure
 - spandrel and infill panels
 - glass and glazing
 - thermal insulation
 - all internal casings, trims, beads, linings
 - cast in inserts and anchors
 - lugs, brackets, frames, packings, fixings, fastenings
 - sealants and gaskets
 - flashings
 - hardware, operating and security mechanisms
 - other accessories and all related items needed to complete the work shown in, or that can be inferred from, the documents supplied.
- Then select from the following, amplifying as necessary.*

There is a contractual requirement to carry out a maintenance programme during the contract.

A drained joint pressure equalised system is required, preferably with cover trims which can be placed after the risk of construction damage has passed.

Not all systems are drained joint. Some are face-sealed without clear drainage paths to the outside. Take great care by examining mullion/transom joint details supplied for proper pressure equalisation drainage holes in the mullion and transom.

Glaze panels from the inside/outside.
State which applies.

- 1.44 SYSTEM OPTIONS
- In the interest of performance and economy, offer alternatives to the indicative details shown, which comply with the intent of the drawings and specifications.
 - The indicative details for a system show the design intent as to proportion and size but do not purport to show the actual extrusion or method of assembly.
 - Note that infill panels are thin dimension stone and the design of the whole system must take this into account.
 - Where four sided structural silicone work is required or offered it shall be done in factory conditions and not on site.
- The system design must be devised for each project. The paragraphs offered above should be selected or rejected or augmented to suit the project. Even when an off-the-shelf curtain wall is appropriate, some special design is usually needed. When a custom-made curtain wall is anticipated, special design work is inevitable.*

Where design development is part of the contract work it is necessary to clarify appropriate responsibilities for this design. A design warranty, linking owner, project designer and window designer may be necessary. This should be listed here and cross referenced in the GENERAL section.

It is the intention of this approach to specifying that everything necessary to make the curtain walling "work" is included in the package that is first priced and then fabricated/installed/maintained by the window company concerned. Indicative details must therefore be clear as to the limits of the work and should always encompass the weathertight installation against surrounding planes, materials and elements. To this end the specification should call up "items needed to complete the work shown in, or that can be inferred from the drawings and specifications".

Performance - prototype testing

- 1.45 LABORATORY TESTING
Carry out laboratory tests required in a laboratory accredited by International Accreditation of New Zealand.
Modify if an off-shore laboratory is being used.
- 1.46 FIELD TESTING
Carry out field performance tests required with the accredited laboratory staff.
- 1.47 TESTING PERSONNEL
Carry out tests using accredited laboratory personnel. Provide test results witnessed and certified by a chartered professional engineer.
- 1.48 LABORATORY TESTING
Conduct laboratory testing of agreed prototype to meet specified standards of performance. Order of tests to be agreed.
Structural performance in accordance with AS/NZS 4284.
Allowable loaded deflection: $L/250$
- Water penetration (dynamic) to be in accordance with AS/NZS 4284 - no leaks.
Air infiltration in accordance with AS/NZS 4284: ~ litres/m²/sec.
Seismic inter-storey movement in accordance with the procedure set out in BRANZ Study Report SR39.
- | | |
|--------------------------------|--------------------------|
| Proof load test: | 1.5 design wind pressure |
| Preload pressure: | 50% design wind pressure |
| Relaxation time: | 5 minutes maximum |
| Time at pressure: | 10 sec minimum |
| Allowable residual deflection: | $1/1000$ |
- Provide notice of the test dates and study the installation at the rig before the test.
NZS 4211 is the New Zealand test method for windows. AS/NZS 4284 is more appropriate for curtain walls and can be tested here, as facilities are available in laboratories accredited by International Accreditation of New Zealand.

Performance - general testing

- 1.49 TESTING STRUCTURAL GLAZING
Deglaze 5% of the first 100 units and 2% thereafter of finished joints as tests of proper adhesion in accordance with the sealant manufacturer's specifications as work proceeds and keep proper records of results. Carry out the first deglaze under the supervision of the sealant manufacturer. Provide reports of the tests.
- 1.50 FIELD TESTING
Conduct field testing to meet the specified standards of performance.
Field testing is not commonly required, except on large installations and for new designs. If used, state the test to be used in subsequent clauses.
- Water leakage at design wind pressure (static pressure) in accordance with AS/NZS 4284
Areas to be field tested should be shown on the drawings. Note that early testing ensures the discovery of errors at a time when correction is possible at minimum cost. The process involves applying a pressure box to the outside or inside of the building.
- Water spray test (without pressure difference) in accordance with AS/NZS 4284.
Air leakage (static pressure) in accordance with AS/NZS 4284.
- 1.51 ALTERNATIVES TO TESTING
Provide test reports, including full structural calculations prepared by recognised testing laboratories, or certified by independent chartered professional engineers, showing that a similar/identical curtain wall assembly has previously met all the performance requirements of this specification.

Delete this clause if testing is necessary. The submission of test reports and certificates means a judgement must be made on their validity. This clause may be most appropriate when a branded system is chosen.

1.52 PROVIDE EVIDENCE

Provide preliminary evidence of certification by a laboratory accredited by International Accreditation of New Zealand that the curtain wall offered will comply with the requirements of this specification.

If this clause is used the specifier may omit the LABORATORY TESTING clause on the basis that the standards of performance are clearly stated by existing documentation.

Performance - sealants

1.53 MANUFACTURER'S SPECIFICATION

Submit the name of the manufacturer and their specification for the nominated or selected joint sealant system for evaluation before commencing work.

Select timing.

1.54 TEST SEALANT SUBSTRATES

Before commencing manufacture and installation obtain and submit a certificate from the sealant manufacturer which states that all adjoining substrates and materials have been examined to ASTM C1087 and are compatible with the silicone sealant to be used. Use sealants and substrates only in combinations for which favourable adhesion and compatibility results have been obtained.

1.55 MANUFACTURER'S TECHNICAL SERVICES

Use the research and development and technical information inputs of the sealant manufacturer's technical services section throughout the design development, prototype testing and installation stages.

1.56 QUALITY CONTROL

Maintain an approved quality control programme in accordance with AS/NZS ISO 9001 including testing procedures at all stages of design, prototype testing and installation in conjunction with the sealant manufacturer to ensure the quality of the installation is maintained in accordance with the requirements of the sealant manufacturer. Make available test reports prepared in connection with the quality control programme.

Performance - generally

1.57 CERTIFICATES

Provide certificates from the approved laboratory and certified by a chartered professional engineer that the curtain wall assembly as tested complies with the documents. Do not commence manufacture until the certificates have been accepted in writing.

The proper sequence of events is:

- *Design system*
- *Preliminary shop drawings*
- *Construct prototype*
- *Test to compliance*
- *Obtain approval of certificate*
- *Final shop drawings*

1.58 SUPPLY DESIGN CALCULATIONS

Supply design calculations from a chartered professional engineer before fabrication, supporting the structural integrity of the system in accordance with the specified standards of performance, for approval.

1.59 SUPPLY STRUCTURAL GLAZING DESIGN CALCULATIONS

Supply calculations before manufacture, supporting the structural integrity of the system from the sealant manufacturer in accordance with the specified standards of performance.

Use only with structural silicone applications.

- 1.60 PROVIDE
Provide glazing details and specifications. Also provide glass manufacturer's thermal stress analysis.
- 1.61 ACCEPT RESPONSIBILITY
Accept responsibility for the structural and weathertight performance of the glazing work and all spandrel and infill panel work.
- 1.62 CERTIFY COATINGS
Certify on request compliance with this specification and support with control and sampling records. If required, test for film thickness to BS 3900, part C5, method No.4, using method (b) for certifying thickness and method (b) where any dispute arises as to the thickness provided.
The coating should be applied by an applicator who can certify that the coating has been applied in accordance with the specification.
- 1.63 QUALITY ASSURANCE REQUIREMENTS
Plan, establish and maintain a quality system for the project and its component parts in accordance with AS/NZS ISO 9001. Provide access to the curtain wall company's quality system to enable monitoring and quality auditing. Quality systems to be used as an aid to achieving compliance with the documents and to record such compliance.
- 2. PRODUCTS**
- Materials**
- 2.1 CURTAIN WALL SYSTEM
Refer to SELECTIONS.
Where a "stock" system can be selected state it here. Make consequential amendments to the performance requirements.
- 2.2 EXTRUSIONS
Complying with AS/NZS 1866. Alloy designation AA6060-T5 (designated to AS 2848.1). Extruded for anodising or powder coating.
State alloy designation if different. State temper.
- 2.3 FLAT SHEET, COILED SHEET AND PLATE
Complying with AS 1734 of suitable thickness. Rolled for anodising or powder coating. Alloy designation: 5005 or 5251 depending on strength requirements. All folding and forming to take place before powder coating or anodising.
- 2.4 STAINLESS STEEL PLATE SHEET AND STRIP
Grade 316 austenitic steel complying with AS 1449 of suitable thickness.
Finish: 2B (satin lustre)
Polish and passivate welds after fabrication of stainless steel brackets.
Grade 316 stainless steel is commonly available in 2B (satin lustre). Type 304 is available in BA (bright annealed) finish. Do not use brushed finishes externally as they hold dirt and stain too readily.
- Materials - glazing**
It is necessary for guarantee purposes for the curtain wall fabricator/installer to be responsible for the total installation, including glazing. NZS 4223 specifies that glass thickness shall be selected for the design wind pressure, but also note human impact requirements which may govern selection. Glass and panel types would be drawn and detailed elsewhere and listed in this section.
- 2.5 PANELS (SPANDREL AND/OR INFILL) SCHEDULE
Refer to SELECTIONS
- Thickness to suit design wind pressure on the face.
- Insulation to be bonded to the back of panels to provide a U value of 0.6 W/m²K, or to be placed in the cavity as detailed.
State acceptable methods of insulation and installation.
- 2.6 GLASS (VISION AND SPANDREL) SCHEDULE
Refer to SELECTIONS

- Apply coating layer so that varying glass thicknesses to suit standards of performance do not affect an even external appearance.
- Glass thickness calculated to the requirement of the LOADINGS CODE REQUIREMENTS clause and selected in accordance with NZS 4223.
- Provide details of a thermal stress evaluation appropriate to the use of glass on this project before approval of shop drawings and the ordering of glass.

Components

2.7 GLAZING GASKETS

Compatible with the sealant. Where gaskets are used on four sides of glass or aluminium, mitre cut and heat weld at corners to form continuous elements.

Hardness: 70 ± 5 Shore A

It can be difficult to obtain heat welded corners to gaskets. Where this is not possible, add the following:

"Do not stretch glazing gaskets during installation. Measure and cut glazing gaskets 1% over-length before installation to avoid stretching."

It is necessary to specify the material for the gaskets, as there are considerable cost differences. If gaskets are used in conjunction with silicone structural glazing, the material must be compatible. The most frequently used types are Santoprene, neoprene and silicone.

2.8 GLASS SETTING BLOCKS

Neoprene or approved equal.

Width: Glazing unit thickness

Length: 150mm minimum

Hardness: 80-90 Shore A

Thickness: 12mm

Always specify setting blocks. Adjust the above requirements as appropriate.

2.9 GLASS EDGE BLOCKS

Neoprene or approved equal.

Length: 100mm minimum

Hardness: 60-70 Shore A

Provide 3mm clearance between glass and block.

Edge blocks prevent the glass "walking" within the frame.

2.10 GLAZING TAPES

To AAMA 804.1, 806.1, 807.1.

2.11 EXPANDED CELLULAR GLAZING TAPES

To AAMA 810.1.

2.12 HARDWARE, OPERATING AND SECURITY MECHANISMS

~

List any special hardware or operating requirements here, to enable the curtain wall manufacturer to nominate selections from their standard range, or to include for your special selections.

Components - fixings

2.13 FIXINGS AND FASTENINGS GENERALLY

Fixings and fastenings to comply with the structural performance stated in the LOADINGS CODE REQUIREMENTS clause.

2.14 FIXINGS AND FASTENINGS EXPOSED TO THE WEATHER

Aluminium or grade 316 stainless steel to suit structural duty. Finish to match the aluminium finish specified.

2.15 FIXING AND FASTENINGS NOT EXPOSED TO THE WEATHER

Hot-dipped galvanized mild steel with a minimum coating weight of 600g/m² complying with AS/NZS 4680, or gold passivated zinc coated mild steel, or mill finish extruded aluminium.

Select appropriate fixings and fastenings, but check against the LOADINGS CODE REQUIREMENTS clause.

- 2.16 CAST-IN INSERTS
Design in accordance with the FIXINGS AND FASTENINGS GENERALLY clause. Hot-dipped galvanized mild steel with a minimum coating weight of 600g/m² to AS/NZS 4680.
- 2.17 SCREWS
Grade 316L stainless steel with countersunk Philips or Allen heads finished to match surrounding surfaces. Use concealed screws wherever practicable.
- 2.18 RIVETS
Blind rivets of the same composition as the materials being joined.
- 2.19 COMPONENT COMPATIBILITY
Ensure all elements and accessories are compatible on the electrochemical scale of metals so that no sacrificial corrosion can occur.
Some installations in severe environments may require special consideration of compatibility.

Accessories

- 2.20 POINTING SEALANT
Building silicone or approved equivalent with not less than a $\pm 40\%$ movement factor to US Federal Specification TT-S-001543A.
This clause is specifically for structural sealant work. Two part sealants require factory application.
Do not use silicone sealants with stone panels as bleeding can occur.
- 2.21 STRUCTURAL SEALANT
Cross section of structural silicone and bite dimension in accordance with the LOADINGS CODE REQUIREMENTS clause, as calculated by manufacturer. Use in conjunction with compatible silicone rubber spacers and gaskets or double-sided expanded cellular glazing tapes.
- 2.22 WEATHERING SEALANT
Building silicone used in accordance with manufacturer's instructions for weather sealing glass to glass joints complying with US Federal Specification TT-S-0011534A, or a one-part polyurethane medium modulus ($\pm 25\%$ movement) to US Federal Specification TT-S-00230C.
It is not advisable to mix sealants in the one installation. For example polystyrene and silicone are incompatible, preventing cure.
Use polyurethane sealant next to thin dimension stone panels supported on curtain walling. Silicone sealants can bleed into natural stonework causing coloured stains, Water run-off from silicone sealant can also cause streaking on glass which is difficult if not impossible to clean off.
- 2.23 NARROW JOINT SEAM SEALANT
To AAMA 803.3.
- 2.24 PRIMERS
Use the type specified by the manufacturer of the sealant for the particular application.
- 2.25 BREAKER TAPE
Pressure sensitive self adhesive polyethylene tape.
- 2.26 BACKING MATERIAL
Extruded closed cell polyethylene rod or open cell polyurethane foam compatible with the selected sealant, of suitable diameter to achieve 3mm compression in joints up to 16mm wide and 6mm compression thereafter. Replace damaged rods.
Damaged rods may cause harmful interactions with sealant. Check with the manufacturer.
- 2.27 MASKING TAPE
Pressure sensitive self adhesive paper tape.

A separate glazing sealant guarantee can be justified in some circumstances, as a greater assurance of quality.

Finishes

- 2.28 **APPLICATORS**
Use only Window Association of New Zealand approved applicators.
Applicator lists are available.
- 2.29 **PROVIDE**
Provide three extrusion samples, each 500mm long of each approved finish before manufacture commences.
- 2.30 **ANODISED ALUMINIUM**
To WANZ SFA 3503-03:2005.
Thickness grade: 20 - 25 microns
In high quality work there may be a need to specify some form of temporary covering (i.e. lacquers or a strippable coating material).
- 2.31 **EXTERNAL ORGANIC POWDER COATED ALUMINIUM**
Polyester powder organic coating in accordance with the Window Association of New Zealand: Specification for powder organic coatings on architectural aluminium products and AS 3715.
Thickness: 50 microns minimum
Thickness will depend on the particular circumstances, with a minimum of 50 microns.
- 2.32 **EXTERNAL ORGANIC COATED ALUMINIUM, WET**
Fluoropolymer wet coating (PVF2) in accordance with AAMA 2604 and 2605.
Thickness: 30-50 microns
Thickness will depend on the number of coats. 10 year durability guarantee available, but liability is pro-rated to life expended, from 100% to 30%.
- 2.33 **EXTERNAL ORGANIC COATED ALUMINIUM, POWDER**
Fluoropolymer powder coating (PVF2) in accordance with AAMA 2604 and 2605.
- 2.34 **INTERNAL ORGANIC COATED ALUMINIUM**
Polyester powder organic coating in accordance with the Window Association of New Zealand Specification for powder organic coatings on architectural aluminium products and AS 3715.
When it is intended there will be interior trims fitted independently of the main curtain wall frames, economies are possible by using a lesser specification.

3. EXECUTION

Conditions - generally

- 3.1 **QUALITY CONTROL**
Before commencing manufacture submit a project quality plan in accordance with AS/NZS ISO 9001, to cover all stages of fabrication, installation, sign off and completion. Manufacturing to not commence until written approval is obtained.
- 3.2 **KEEP PAPER**
Keep paper and cardboard wrappings on aluminium elements dry.
- 3.3 **DO NOT DELIVER**
Do not deliver to site any elements which cannot be immediately unloaded into suitable conditions of storage which are permanent. Once in storage do not move again unless for installation purposes.
- 3.4 **UNLOAD**
Unload, handle and store elements in accordance with the curtain wall manufacturer's requirements.

3.5 PROTECTION
Provide packaging for and avoid distortion of elements during transit, handling, storage and hoisting. Prevent pre-finished surfaces from rubbing together. Prevent contact with water, mud, plaster and cement, and dissimilar metals.

3.6 PROTECTION
Retain protective coverings and coatings in place during fixing. Remove protection on completion unless designed to remain in place.
Modify if retention of protective coatings/coverings is inappropriate. For example on aluminium faced panels where dirt can stick to the protective film adhesive. Consult the manufacturers.

3.7 FACTORY VISITS
Afford full facilities for the inspection of elements, assemblies and prototype during fabrication and installation, in order to establish conformity with the documents.

Conditions - glazing

3.8 STRUCTURAL GLAZING
Carry out all work in strict accordance with AAMA CW13 and the recommendations of the manufacturer of the panel being glazed, the sealant manufacturer's instructions and structural calculations, on properly cleaned substrates using compatible silicone rubber spacers.

3.9 GLAZE
Glaze in accordance with details shown.

Assembly

3.10 FABRICATE GENERALLY
Fabricate extruded, rolled or pressed aluminium members for the curtain wall system free of distortion and blemish, true to shape and size, of sufficient strength to meet the performance specified.

3.11 SECTION
Section thicknesses in accordance with NZS 3504, AS/NZS 1170, and NZS 1170.

3.12 CUT AND ASSEMBLE
Cut and assemble members to develop full design strength in all joints so that operating stresses are adequately distributed and transmitted to the appropriate structural members and anchor points without distortion and glass fractures. Carefully match all exposed joints to produce continuity of the line and plane, accurately fitted and rigidly secured.

3.13 AVOID JOINTS
Avoid joints that detract from the appearance of the finished surfaces. Match all butting surfaces true and even to produce hairline joints with secretly fixed screws and brackets or snap fit extrusions together with narrow joint seam sealants.

3.14 FABRICATE FINISHED ASSEMBLIES
Fabricate finished assemblies true to size and shape, free of wind, sag, bow and other distortions under operating conditions in accordance with NZS 4211.

3.15 CUT AND ASSEMBLE
Cut and assemble members to develop full design strength in all joints so that operating stresses are adequately distributed and transmitted to the appropriate structural members and anchor points without distortion and glass fractures.

3.16 INSTALL HARDWARE
Install all selected hardware, operating and security mechanisms where these are added to opening elements off site.

Application - generally

- 3.17 **ANCHORS**
Curtain wall installers to supply Unistrut anchors or other fixing devices for casting into the structure at locations determined by them. Timing of supply to meet the project programme.
- 3.18 **INSTALL**
Install the full system including hardware, operating and security mechanisms, and glazing in accordance with stated structural performance requirement, reviewed shop drawings, prototype assemblies and installation details.
- 3.19 **CO-ORDINATE INSTALLATION WORK**
Co-ordinate installation work with other trades and arrange for suitable surveyed bench marks and offsets from which the curtain wall may be set out in accordance with the documents.
- 3.20 **PERMISSIBLE DEVIATIONS**
Design to allow for permissible deviations relative to concrete construction which have been specified elsewhere to comply with the tolerances stated in NZS 3109, table 5.2.
Or specify other tolerances in full, which have been stated in other sections of the specification.
- 3.21 **CONFIRM ALL CONSTRUCTION TOLERANCES**
Confirm all construction tolerances and examine all parts of the structure affecting the installation for accuracy. Report all deviations beyond agreed tolerances and/or unsuitable conditions, which would prevent work being in accordance with the documents.
- 3.22 **DO NOT INSTALL THE CURTAIN WALL**
Do not install the curtain wall until errors and unsatisfactory conditions have been corrected or adjusted.
- 3.23 **SET OUT MULLIONS**
Set out curtain wall mullions to the centre lines of stated modules. Set out transoms relative to floor datums.
- 3.24 **CURTAIN WALL TOLERANCES**
Erect the curtain wall in accordance with the following tolerances:
- maximum variation from plane or location: 3mm over any 3.6 metre length, or 12mm in any total length.
- maximum offset from true alignment between two identical members abutting end to end in line: 1mm.
- 3.25 **ON-SITE GLAZING**
Glaze in accordance with the requirements of this specification, on setting blocks together with spacer blocks and edge blocks all used in accordance with specified requirements. Do not apply tapes directly on either face of glass in order to indicate glazing nor for any other reason.
- 3.26 **DAMAGED ELEMENTS**
Discard and replace unless written approval is given to repair.
- Application - sealing joints with pointing sealant**
Be aware that the oil in silicone sealants tends to migrate into adjacent thin dimension stone panels and can create a visible colour difference.
- 3.27 **PREPARE AND INSTALL A SAMPLE JOINT**
Prepare and install a sample joint not less than 3 metres in length, in a selected location for each different type of joint upon submission of certificate and approval of sample materials.
- 3.28 **PROCEED WITH GENERAL INSTALLATION**
Proceed with general installation with the sample joints being the control standard for all subsequent work of this type upon approval of the sample joint.

- 3.29 **PREPARATION**
Ensure that joints are dry and free from laitance and release agents. Remove all loose material, dirt, oil, dust and grease or other matter adversely affecting adhesion of sealant.
- 3.30 **PREPARE JOINTS**
Prepare joints in accordance with the sealant manufacturer's requirements, using recommended solvents and primers where necessary.
- 3.31 **MASK**
Mask adjoining surfaces which would be difficult to clean if smeared with sealant.
- 3.32 **BACKING**
Insert backing material in all joints being pointed with sealant, using a blunt instrument to avoid puncturing. Do not twist rods while installing.
- 3.33 **BACK UP**
When using back up material do not leave gaps and do not reduce the depth of joints for sealant to less than the minimum recommended by the manufacturer of the sealant.
- 3.34 **POINTING**
Fill joint cavities with sealant in accordance with the sealant manufacturer's requirements and the quality control programme. Use a pressure gun with a nozzle cut to fit the joint width. Ensure sealant is deposited in uniform continuous beads without gaps or air pockets.
- 3.35 **TOOL SEALANT**
Tool sealant to form a smooth flat bead within 10 minutes of sealant application.
- 3.36 **TOOL SEALANT**
Tool sealant to form a smooth fillet with a profile and dimensions recommended by the sealant manufacturer within 10 minutes of sealant application.
Select from the above two alternatives.
- 3.37 **MASKING MATERIALS**
Remove immediately after tooling.
- 3.38 **REMOVE EXCESS SEALANT**
Remove excess sealant from adjoining surfaces, using cleaning materials recommended by the sealant manufacturer and leave clean.
- 3.39 **FINISHED WORK**
Leave in a neat and clean condition with no evidence of spill overs on to adjacent surfaces.
- 3.40 **INDICATE**
Indicate the presence of transparent glasses for the remainder of the contract period, with whiting, tape or signs compatible with the glass type. Indicators other than whiting must not be applied to the glass surface.
Modify this clause to suit. Whiting is used to protect internal finishes exposed to the sun. Along with glazing signs and tape, it also acts as a safety device by clearly indicating during the balance of the construction phase that glass has been installed.

This clause does not refer to the NZS 4223 requirement for "manifestations" required for post-construction building use where a glass door or panel could be mistaken for an unimpeded path of travel.
- 3.41 **MANIFESTATIONS**
To comply with NZS 4223.3, 303.1.
Modify this clause to describe project requirements for safety or appearance.

Note that both NZS 4223.3 and NZBC F2 clause F2.3.2 set minimum standards for delineating glass "capable of being mistaken for an unimpeded path of travel". While this issue is best resolved in the basic design of the installation, in some cases applied signs, decals, sandblasting or attached rails are necessary. Consider and specify accordingly.

Completion - cleaning

Note: some mutually exclusive clauses follow. Modify to suit the project's proposed management practices both during and at the completion of the contract works.

- 3.42 REMOVE TRADE DEBRIS
Remove debris by appropriate means on a floor by floor basis as each floor is completed and again before any work is covered up by others. Arrange for general removal.
- 3.43 CLEANING GENERALLY
Clean with soft, clean cloths and clean water. Finish with a clean squeegee. Do not use abrasive or alkaline materials.
- 3.44 TRADE CLEAN
Trade clean curtain wall frames, operable windows and doors, all glass and other related surfaces inside and out at the time of installation to remove marks, dust and dirt, to enable a visual inspection of all surfaces.
Always use this clause. It describes the basic cleaning operation carried out at the time of installation. The expectation is that at that time the installer will leave the site. Note that subsequent damage is a difficult issue on all contracts.
- 3.45 MAINTENANCE PROGRAMME
After the progressive completion of the curtain walling, provide and carry out a comprehensive maintenance programme for the duration of the contract. As a minimum wash and then rinse with copious quantities of clean water, to remove loose debris and dirt at regular intervals not exceeding 8 weeks. Dry off with soft, clean, grit free cloths.
- 3.46 REPORT
Report in writing any stuck-on cement slurry, paint and weld spatter which normal cleaning will not remove. Seek instruction as to removal and receive direction as to appropriate cleaning method.
- 3.47 CLEANING AT COMPLETION
Take off temporary protection and thoroughly clean down both sides of aluminium and glass using the method recommended by the manufacturer.
- 3.48 FINAL CLEAN
Clean down outside and inside surfaces at completion. Externally wash, rinse using copious quantities of clean water to remove loose debris and dirt. Dry off with soft, clean, grit free cloths. Internally render surfaces free of all marks and leave in an "as new" condition.

Completion - generally

Add further instructions here or under the general section CONSTRUCTION if an inspection is to be carried out on completion of the curtain wall work, prior to completion of the main contract work. Further clauses may also be needed where special protective measures are required, perhaps for high quality panels or special glazing. Access for external cleaning is also an issue if scaffolding is used and there is no permanent building maintenance unit.

- 3.49 IN SITU TOUCH-UP
In situ touch-up of polyester or fluoropolymer coated aluminium is permitted only on written authority. If authority is not granted replace the damaged material.
- 3.50 CHECK HARDWARE
Check that hardware, operating and security mechanisms are complete and operational.
- 3.51 REPLACE
Replace all damaged, cracked or marked elements.
- 3.52 REMOVE
Remove indicators, wipe down all aluminium, panels and glass thoroughly to leave perfectly clean. Remove all debris, unused materials and elements from the site.

4. SELECTIONS

Substitutions are not permitted to the following, unless stated otherwise.

SELECTIONS is for providing details of the actual selections to be included in the contract works including model numbers, colours and other information necessary to ensure that the correct materials are supplied and installed

Performance - standards

4.1 LIVE LOAD

Deflection: ~mm

State the allowable deflection. Obtain the figure from the project's structural engineer.

4.2 SEISMIC, EARTHQUAKE LOADS

Seismic zone: ~

Specify the seismic zone.

4.3 INTER-STOREY SEISMIC MOVEMENT

Movement: ~mm maximum

State the allowable inter-storey seismic movement. Obtain the figure from the project's structural engineer.

4.4 VERTICAL MOVEMENT

Movement: ~mm maximum

State the allowable vertical movement. Obtain the figure from the project's structural engineer. Select one of the following two clauses.

4.5 DESIGN WIND PRESSURES, BY CALCULATION

	<u>SLS</u>	<u>ULS</u>
Face:	~ kPa (positive) ~ kPa (negative)	~ kPa (positive) ~ kPa (negative)

Edge Zones:	~ kPa (positive) ~ kPa (negative)	~ kPa (positive) ~ kPa (negative)
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State by providing face, corner and top edge design wind pressures, both positive and negative for SLS and ULS, on a floor by floor basis. Obtain information from the project structural engineer. Design to AS/NZS 1170.2, as it is an acceptable solution to NZBC B1.

4.6 HUMAN IMPACT REQUIREMENT

Risk level: ~

State the risk level. Depending on wind area, location of glass in relation to floor level, the glazing configuration and whether physical barriers exist, impact strength should govern the selection and thickness of glass type in high rise buildings. In high wind areas glass chosen for the design wind pressure will usually also meet impact strength requirements. In low wind areas impact strength will probably govern selection.

4.7 THERMAL PERFORMANCE REQUIREMENT

Fixed light vision areas: ~ W/m²K

(including glass and metal framing)

Opaque spandrel panels: ~ W/m²K

Opaque other panels: ~ W/m²K

Curtain wall as a whole: ~ W/m²K

Select which locations apply and obtain figures from the project mechanical engineer for inclusion. The type of vision and spandrel glasses and insulated opaque panels will come from these requirements.

4.8 FIRE CODE REQUIREMENT

FRR: ~ hr

State the design inter-floor fire resistance rating which must be maintained between the face of the structure and the back of glass or spandrel panel and show the intention on indicative drawings. Specify elsewhere unless part of the curtain wall work.

4.9 ACOUSTIC REQUIREMENTS, SOUND TRANSMISSION

Frequency range: 125-4000Hz

Average sound transmission loss: ~ dB(A) (minimum)

- 4.10 ACOUSTIC REQUIREMENTS, SOUND TRANSMISSION
 Frequency range: ~ Hz
 Average sound transmission loss: ~ dB(A) (minimum)
Choose from the two preceding clauses, both of which cover noise issues related to the curtain wall itself. However if the building is near an airport, motorway or some other major noise source, the second clause, which requires on-site measurements, should be used.

Performance - prototype testing

- 4.11 LABORATORY TESTING
 Allowable loaded deflection: ~
State deflection ratio (e.g. 1/180, 1/240, 1/360).
 Air infiltration: ~ litres/m²/sec.

Schedules

- 4.12 CURTAIN WALL SYSTEM
 Brand: **Oakley**[®]
 Model: ~
 Manufacturer: ~

- 4.13 ALUMINIUM SHEET AND STRIP
 Thickness: ~mm
State thickness if known for sills, flashings and covers.

- 4.14 PANELS (SPANDREL AND/OR INFILL) SCHEDULE
Schedule panels by material, type or brand. State methods of installation. Specify material in considerable detail.

Panel type	A	B	C
Material	~		
Brand	~		
Type	~		
Finish	~		
Colour	~		
Installation method	~		
Locations	~		

State brand, type, finish, colour. Include any acceptable options if alternatives are acceptable. Finishes are specified in greater detail later. State installation method. State U value. State acceptable methods of insulation and installation.

- 4.15 GLASS (VISION AND SPANDREL) SCHEDULE
Schedule glass by type and methods of installation. Include relevant data if alternatives are acceptable.

Glass type	A	B	C
Brand	~		
Type	~		
Colour	~		
Coating	~		
Shading coefficient	~		
U-value	~ W/m ² K	~ W/m ² K	~ W/m ² K
Locations	~		

State glass brand and/or type, colour coating and other performance data obtained from the mechanical engineer. State installation method. Note that insulation must not touch the back of coloured spandrel glass - leave a 25mm cavity.

- 4.16 GLAZING GASKETS
 Sealant: ~
 Gasket material: ~

- 4.17 POINTING SEALANT
Brand/type: ~
Colour: ~
- 4.18 WEATHERING SEALANT
Brand/type: ~
Colour: ~
- 4.19 ANODISED ALUMINIUM
Colour: ~
Brand: ~
Temporary protection: ~
Select colour from the manufacturer's literature. For a transparent clear finish specify "satin natural". For this finish the surface has been etched to provide the satin finish. State brand name when there is a preference.
- 4.20 EXTERNAL ORGANIC POWDER COATED ALUMINIUM
Location: ~
Brand: ~
Colour: ~
Gloss level: ~ %
State brand, colour, gloss level (60% is satin). Define members and panels to be finished in the various finishes. Non-standard colours require minimum order weights.
- 4.21 EXTERNAL ORGANIC COATED ALUMINIUM, WET
Location: ~
Brand: ~
Colour: ~
Number of coats: ~
Gloss level: ~ %
State brand, colour, number of coats (sometimes determined by colour) and gloss level. Thickness will depend on the number of coats. 10 year durability guarantee available, but liability is pro-rated to life expended, from 100% to 30%.
- 4.22 EXTERNAL ORGANIC COATED ALUMINIUM, POWDER
Location: ~
Brand: ~
Colour: ~
Number of coats: ~
Gloss level: ~ %
Thickness: ~ microns
State brand, colour, number of coats (sometimes determined by colour) and gloss level. Thickness will depend on the number of coats. 10 year durability guarantee available, but liability is pro-rated to life expended, from 100% to 30%.
- 4.23 INTERNAL ORGANIC COATED ALUMINIUM
Location: ~
Brand: ~
Colour: ~
Number of coats: ~
Gloss level: ~ %
Thickness: ~ microns