

MATERIAL SUBMITTAL FORM

Part A: Project & Record Information:

Project Name	ADFSP Phase7 Package6 Construction of Shaib Al Askhar	MS.Ref.No	55830/00-SIT/ZZ/DIP/ARC/MAT/0070/00
Client	Department of Education and Knowledge	Rev.No	0
Employer	Abudhabi General Services Company(Musanada)	Darwing Ref.	
PMC		BOQ Ref: if any	
Engineer	Al Suweidi Engineering Consultants	Approx. Qty	
Contractor	Dhafra International Projects Group	Submission Date	13-08-20

Part B: Material Submittal Discipline:

Related Discipline	<input type="checkbox"/> Civil Material	<input checked="" type="checkbox"/> Architectural Material	<input type="checkbox"/> Electrical Material
	<input type="checkbox"/> Mechanical Material	<input type="checkbox"/> Others (Specify):	

Part C: Material Details- Mirrors

Spec's. Ref.		Attachment Checklist			
section: 08 83 13		1	Compliance checklist		
Specified Material	Mirrors	2	Copy of the related specs <input checked="" type="checkbox"/>		
		3	Copy of the related drawings		
Proposed Material	6mm thick mirror	4	Copy of the related BOQ		
		5	Copy of the related Standards		
Manufacturer's	Name	M/s. AGC Glass	6	Material Technical Data Sheet <input checked="" type="checkbox"/>	
	Address	Europe	7	Previous test results	
Supplier's	Name	Al Firdous Aluminium & Glass Cont.Co	8	Warranty	
	Address	UAE	9	Musanada Previous Approvals	
Estidama Approval	This material not applicable to Estidama code E		10	Other Relevant Approvals	
Justification of Alternative Material			11	License/s of Manufacturer	
Part C: Contractors Review			12	ISO 9001 Certificate	
	QA/QC	HSE Engineer	Const. manager	13	Sample with Sample Tag <input checked="" type="checkbox"/>
Name	R.Vasudevyan	Darwin	Devendran V	14	Estidama Compliance Approval <input checked="" type="checkbox"/>
Signature				15	Others <input checked="" type="checkbox"/>
Date	13-08-20	13-08-20	13-08-20		

We do certify that the material submitted herewith has been reviewed in details and in accordance with the Contract Documents except as otherwise stated here above.

Part D: Engineers Review / Approval

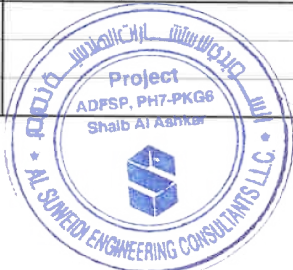
Approved, subject Client Approval



Employer/ Engineer Approval	<input type="checkbox"/> A - Approved	<input type="checkbox"/> C - Revised and resubmit
	<input checked="" type="checkbox"/> B - Approved with comments	<input type="checkbox"/> D - Rejected

Note(1): Employer's/ Engineer's approval is for conformance with information given and design concept expressed in Contract Documents. Approval does not authorize changes to Contract Documents. Employer's/ Engineer's approval does not relieve the Contractor from his contractual obligation to ensure conformance to all Contract Documents. Any deviations, to the Contract Documents found subsequent to Employer's/ Engineer's approval are to be corrected by the Contractor at no extra Cost/Time to the Employer.

	Engineer's ME / SE	Engineer's RE	For Musanda
Name		Eng.Rafi Abdallah	Eng.Isameldin AbdulWahab
Signature			
Date		15/08/2020	



SAMPLE TAG FORM

Ref. 55830/00-SIT/ZZ/DIP/ARC/MAT/0070/00 Rev. (00)

Form Issue Date: 13-8-20

Client : Department of Education & Knowledge

Engineer : Al Suweidi Engineering Consultants

Employer: Musanada, Abu Dhabi General Services

Contractor : Al Dhafra International Projects Group

Project Name & Location: Abu Dhabi Future Schools Program Phase 7, Package 6 / School at Shaib Al Askhar

Material: Mirror

Date of Submission: 13/08/2020

Item Description: 6mm thick Mirror

Specs.Ref. Section: 08 83 13

BOQ. Ref.

Drwg. Ref.

Block No. :

Level:

Element:

Discipline:

- Civil
 Architectural
 Mechanical
 Electrical
 Other (state)



Material Submittal No.: 55830/00-SIT/ZZ/DIP/ARC/MAT/0070/00

Method Statement No.: _____ ITP No.: _____ Checklist No.: _____

Sketch attached to show the location(s) Yes No

Attached Test Certificates Yes No

Contractor Statement

We certify that the material submitted herewith is a specimen of the material which to be used in the areas described above, and in compliance with the contractor drawings and specification except as otherwise stated on the related Material Submittal Form. We undertake full responsibility to ensure that the material delivered at site is same as the approved sample

Received by Engineer on:

Date:

Time:

Signed by:

Engineer's Inspectors Comments:

Witnessed Site Test Results (if any):

Passed

Failed

N/A

Ref: Report No:

Testing Lab Representative Signature:

Engineer's Final Comments & Decision: The Work is:

- A - Approved
 B - Approved with Comment
 C - Revise and Resubmit
 D - Rejected
 E - Approved with Comment/Resubmit

Remarks: **Approved, subject to comments approval**



Engineer : **RAFI ABDALLAH**

Signature:

Date: **15/08/2020**

Contractor:

Signature:

Date:

Note: AAAA: Contractor's Abbreviation, B: Discipline (C for Civil, E for Electrical & M for Mechanical), NNN: Form Serial Number, XX: Revision Number, dd/mm/yyyy: day/month/year

MBS TMT - Sample tag form -STF Rev.1





SOZO Consultants
Tel: +971 2 666 9600
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www.sozo.ae



Transmittal Ref No. : ADFSP/DIP/DT/CIV/241

Date: 12/08/2020

DOCUMENT TRANSMITTAL FORM

Project Name :	Abu Dhabi Future Schools Program Phase 7, Package 6/ School at Shaib Al Ashkar	Contract No. :		Company Name:	Dhafra International Project Group
Type of Document :	<input checked="" type="checkbox"/> Material Submittal <input type="checkbox"/> Method of Statement	<input type="checkbox"/> Reports <input type="checkbox"/> Shop Drawings	<input type="checkbox"/> Other	Discipline :	<input checked="" type="checkbox"/> Architecture <input type="checkbox"/> Civil
					MEP Other

Subcontractor : Al Firdous Aluminium & Glass Cont.Co Manufacturer : M/s. AGC Supplier: Al Firdous Aluminium & Glass Cont.Co

Document Title: Arch Material Submittal Document Ref. No.: ADFSP/DIP/DT/CIV/241 Rev. : 0

Document Description: Mirror

Specification Ref.: BOQ Ref.: Drawing Ref.: Standard Ref.:

*Provide the list of documents attached to the transmittal.

Item No.	Document Type	Rev.	Description	Notes
1	Material Submittal	0	Mirror	

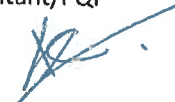



Submitted By Person's Name: R. Vasudevan Designation: QA/QC Engineer. Date: 12-8-20 Signature & Company Stamp:

SOZO CONSULTANTS REVIEW & COMMENTS

Code E: Not applicable to Estidama

Reviewed By SOZO Consultants: Reviewed by Sustainability Consultant/PQP
Kareem Selim

Status Code: A B C D **E**

A- Approved B- Approved with Comments C- Revise and Resubmit D- Rejected **E- Not Related to Estidama**

By signing above the Contractor/Subcontractor/Supplier represents that it has exercised practices, methods of working and standards which are generally exercised and adhered to all contractual obligations such as; works in reviewing all drawings, designs and specifications set out in or referred to in the Submittal above. It is the Contractor responsibility to ensure all contractual requirements are coordinated performed on site as per the contract and standards. Our review and comments does not relieve the employer from his obligations.



SECTION 08 83 13

MIRRORS

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- 1.2.1 Comply with all of the contract documents.
- 1.2.2 The Contractor shall provide all mirrors indicated on drawings or specified herein, including all labor, materials, equipment, and services necessary to complete the the following including, supply, installation, maintain and replace as detailed.
- 1.2.2.1 Frameless mirrors in toilets.
- 1.2.2.2 Frameless mirror units and barre system in Multipurpose hall.

1.3 RELATED SECTIONS

- 1.3.1.1 Section 05 50 00 - Metal Fabrications.
- 1.3.1.2 Section 06 10 00 - Rough Carpentry.

1.4 PERFORMANCE REQUIREMENTS

- 1.4.1 Provide mirrors that will not fail under normal usage. Failure includes glass breakage and deterioration attributable to defective manufacture, fabrication, and installation.

1.5 QUALIFICATIONS

- 1.5.1 Submit manufacturer's certified identification, showing strength, grade, thickness, type and quality for mirrors used. Mark mirrored glass with permanent identification labels.
- 1.5.2 The Contractor shall assume undivided responsibility for the mirrors and coordination with the components of related work. This firm must demonstrate not less than 5 years successful experience at work similar to the work of this project. Provide at least one person who shall be thoroughly trained and experienced in the skills required, who shall be completely familiar with the referenced standards and the requirements of this work, and who shall personally direct all installation performed under this Section of these specifications.

1.6 DEFINITIONS

- 1.6.1 Deterioration of Mirrors: Defects developed from normal uses that are attributable to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning mirrors contrary to mirror manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1.7 CODES AND REFERENCES

- 1.7.1 All reference to standards, regulations and requirements of statutory bodies shall mean the latest published editions at the time of contract. Product manufacture, testing and installation shall comply with the following references unless otherwise stated in the specification or otherwise approved.
- 1.6.1.1 ASTM C 1048 Specification for Heat-Treated Flat Glass - Kind FT Coated Glass
- 1.6.1.2 ASTM C 1503 Specification for Silvered Flat Glass Mirror.
- 1.6.1.3 CFR 1201 Code of Federal Regulations: Safety Standard for Architectural Glazing Materials.
- 1.6.1.4 GANA Glass Association of North America Glazing Manual.

1.8 SUBMITTALS

- 1.8.1 Product Data: For the following:
- 1.8.1.1 Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
- 1.8.1.2 Mirror mastic.
- 1.8.1.3 Mirror hardware.
- 1.8.1.4 Mirror and barre system.
- 1.8.2 Shop Drawings: Include mirror elevations with sand blasting details as required, edge details, mirror hardware, and attachments to other work.

- 1.8.3 Samples: For each type of mirror product required, in the form indicated below:
- 1.8.3.1 Mirrors, 300 mm square, including edge treatment on 2 adjoining edges.
 - 1.8.3.2 Mirror clips.
 - 1.8.3.3 Mirror trim, 300 mm long.
 - 1.8.3.4 Barre, 300mm long.
 - 1.8.3.5 Barre brackets and hardware.
- 1.8.4 Product Certificates: For each type of mirror and mirror mastic, signed by product manufacturer.
- 1.8.5 Qualification Data: For Installer.
- 1.8.6 Mirror Mastic Compatibility Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing and substrates on which mirrors are installed.
- 1.9 QUALITY ASSURANCE**
- 1.9.1 Installer Qualifications: An experienced installer who has completed mirror glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in mirror installations with a record of successful in-service performance.
- 1.9.2 Source Limitations for Mirrors: Obtain mirrors from one source for each type of mirror indicated.
- 1.9.3 Source Limitations for Mirror Glazing Accessories: Obtain mirror glazing accessories from one source for each type of accessory indicated.
- 1.9.4 Glazing Publications: Comply with the following published recommendations:
- 1.9.4.1 GANA's "Glazing Manual" unless more stringent requirements are indicated.
 - 1.9.4.2 Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
 - 1.9.4.3 GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
 - 1.9.4.4 Professional on the Care and Handling of Mirrors."
- 1.9.5 Safety Glazing Products: For tempered mirrors, provide products complying with testing requirements in 16 CFR 1201 for Category II materials.
- 1.9.6 Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing and substrates on which mirrors are installed.
- 1.10 DELIVERY, STORAGE, AND HANDLING**
- 1.10.1 Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from condensation, temperature changes, direct exposure to sun, or other causes.
- 1.10.2 Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors, protected from moisture including condensation.
- 1.11 PROJECT CONDITIONS**
- 1.11.1 Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.
- 1.12 WARRANTY**
- 1.12.1 Special Warranty: Manufacturer's standard form, made out to Employer and signed by mirror manufacturer agreeing to replace mirrors that deteriorate as defined in "Definitions" Article, within specified warranty period indicated below:
- 1.12.1.1 Warranty Period: 10 years from date of Taking Over Certificate.

PART 2 - PRODUCTS

2.4 APPROVED MANUFACTURERS

- 2.4.1 Subject to compliance with requirements, provide products by the approved manufacturer.

2.5 SILVERED FLAT GLASS MIRROR MATERIALS

- 2.5.1 Clear Glass Mirrors: ASTM C 1503, Mirror Quality – Q1.
- 2.5.1.1 Nominal Thickness: 6.0 mm unless otherwise indicated on drawings.
- 2.5.2 Tempered Glass Mirrors (frameless): Comply with ASTM C 1503, Mirror Glazing Quality, for blemish requirements in annealed float glass before silver coating is applied, for coating requirements, and with other

requirements not affected by tempering process; and comply with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied.

2.5.2.1 Thickness: 6mm unless otherwise indicated on the drawings.

2.5.3 Details as indicated on drawings.

2.6 FRAMELESS MIRROR UNITS AND BARRE SYSTEM IN MULTIPURPOSE HALL

2.6.1 Details as indicated on drawings.

2.6.2 Mirror units shall have prefinished holes for fixation of the barre.

2.6.3 Provide the highest reflection and distortion-free imaging at all times.

2.6.4 Barre made from wood; species and finish as indicated on drawings. Prefinished brackets and mounting hardware as per recommendations of the manufacturer.

2.7 MISCELLANEOUS MATERIALS

2.7.1 Setting Blocks: Elastomeric material with a Type A Shore durometer hardness of 85, plus or minus 5.

2.7.2 Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

2.7.3 Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

2.7.4 Anchor and Inserts: Provide devices as required for concealed mirror installation.

2.8 FABRICATION

2.8.1 Mirror Sizes: To suit Project conditions, and before tempering, cut mirrors to final sizes and shapes.

2.8.2 Cutouts: Fabricate cutouts before tempering for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

2.8.3 Mirror Edge Treatment: As indicated on the drawings.

2.8.3.1 Seal edges of mirrors after edge treatment to prevent chemical or atmospheric penetration of glass coating.

2.8.3.2 Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

2.8.4 Mirrors shall not crack or deform as a result of fastening methods or incompatibility with background materials and construction.

PART 3 - EXECUTION

3.1 EXAMINATION

3.1.1 Examine substrates, areas and conditions affecting performance of Work under this Section. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

3.2.1 Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating surfaces with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

3.3.1 General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

3.3.2 Provide a minimum air space of 3 mm between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

3.3.3 For wall-mounted mirrors, install mirrors with mastic and concealed hardware.

3.3.3.1 Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.

3.3.3.2 Install mastic as follows:

1. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.

2. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.

3. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 3 mm between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

- 3.4.1 Protect mirrors from breakage and contaminating substances resulting from construction operations.
- 3.4.2 Do not permit edges of mirrors to be exposed to standing water.
- 3.4.3 Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

END OF SECTION

PROJECT NAME : **ADFSP Phase 7 Package 6 Shaib Al Watah Al Ain**

CLIENT : **Musanada**

CONSULTANT : **Dorsch Gruppe DC Abu Dhabi**

ENGINEER : **Al Suweidi Engineering Consultants**

CONTRACTOR : **Dhafra International Projects Group.**

ALUM. CONTRACTOR : **Al Firdous Aluminium & Glass Cont. Co.**

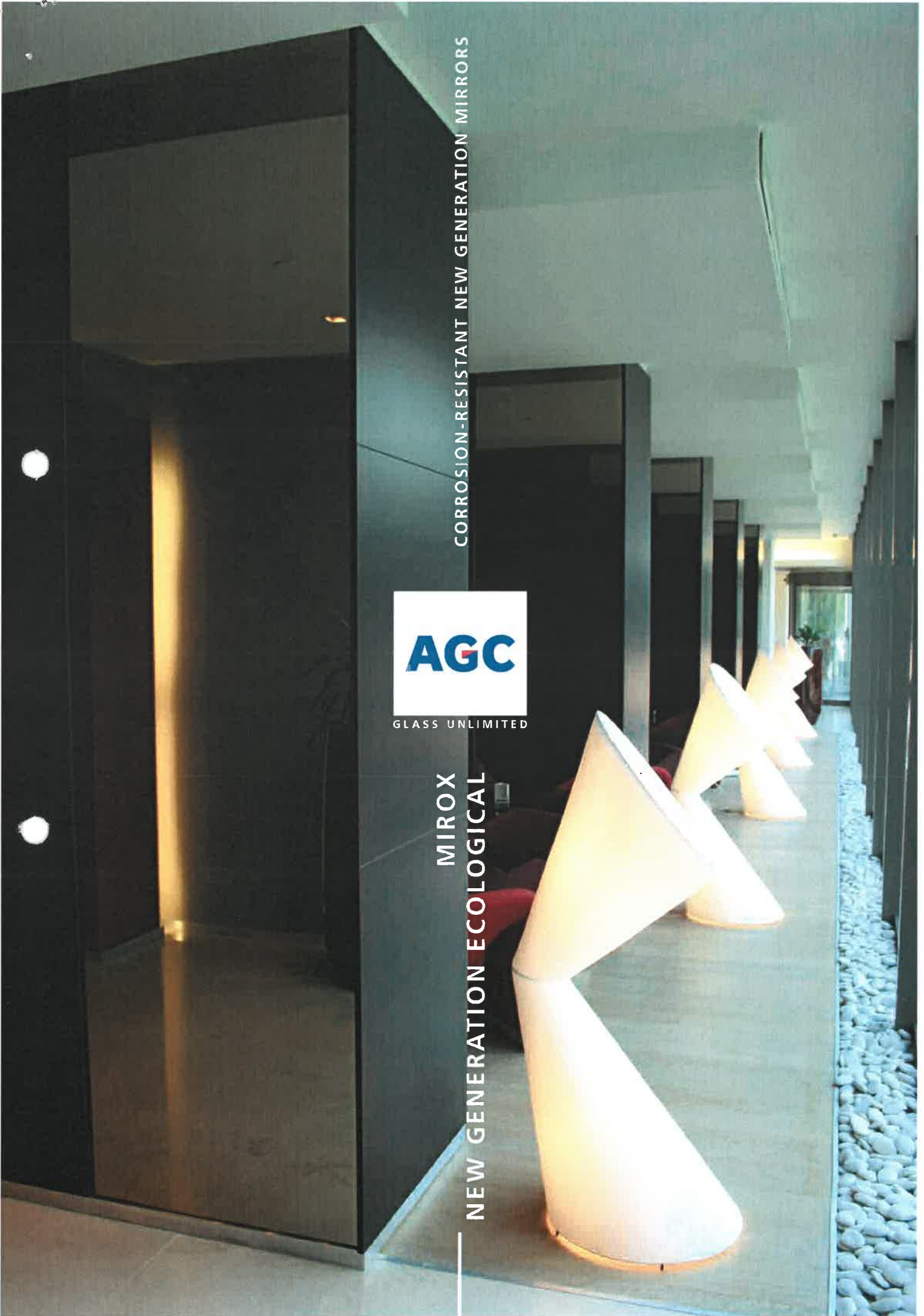
TECHNICAL SUBMITTAL FOR MIRROR

CORROSION-RESISTANT NEW GENERATION MIRRORS



GLASS UNLIMITED

MIROX
NEW GENERATION ECOLOGICAL



Manufacturing process

Mirox New Generation Ecological (MNGE) – superior quality plus environmental protection

Mirox New Generation Ecological mirrors reflect AGC's ongoing quest for innovation and the constant improvement of our range.

These products, available exclusively from AGC, stand out for:

- their copper-free metal coating;
- the very low lead paints;
- their ability to resist chemical damage.

AGC manufactures its New Generation Ecological mirrors at most of its production sites, guaranteeing the same optimum levels of quality and service.

Elimination of toxic products

The elimination of the amounts cited below¹ shows just how environmentally-friendly Mirox New Generation Ecological mirrors really are.

- Cu** Copper (7 tonnes/year)
- NH** Ammonia (84 tonnes/year)
- Pb** Lead (248 tonnes/year)

Furthermore, AGC puts great effort in developing products that preserve our indoor air quality. MNGE products show close to zero indoor emissions of Volatile Organic Compounds (A+, according to French Décret No. 2011-321), including very low levels of formaldehyde. Since 2012, Mirox New Generation Ecological mirrors are Cradle to Cradle Certified^{CM} Silver.



Mirox New Generation Ecological – product identification

As a hallmark certifying MNGE's high quality standards, AGC paints the back of each mirror stock sheet green and prints it with the "ECOLOGICAL" logo.

The green paint used is itself environment-friendly and does not affect the MNGE quality in any way. Moreover, its higher hardness index makes the product easier to shape.

The advantages of Mirox New Generation Ecological

- Unrivalled anti-corrosion properties and protection against ageing and aggressive agents such as the ammonia and acetic acid found in certain cleaning products;
- Compatible with a wide range of adhesives for ease of handling by the customer or installer;
- No pitting or clouding with age;
- Unbeatable value for money.

¹ estimate based on an output of 20,000,000 m²/year



Old Generation mirror	Mirox New Generation Ecological (MNGE)
Polishing	Polishing
Sensitization	Sensitization
	*Activation
Silvering	Silvering
	*Passivation
Coppering	
	Paint adhesion treatment
Annealing of metal coatings	Annealing of metal coatings
First coat of paint applied (chemical protection)	First coat of very low lead paint applied (chemical protection)
First coat baked	First coat of very low lead paint baked
Second coat of paint applied (physical protection)	Second coat of no-added lead paint applied (physical protection)
Second coat baked	Second coat of no-added lead paint baked

*Activation: treatment to affix the silver coating to the glass

*Passivation: protects the silver coating against oxidation

To ensure greater respect of the environment, AGC only manufactures ecological mirrors that are 100% copper-free and with very low lead (0,16% or 1.600ppm).



Performance of Mirox New Generation Ecological

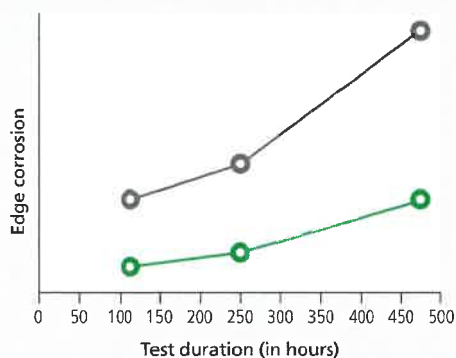
BEHAVIOUR IN STANDARD ACCELERATED AGEING TESTS

Property or test	European Standard EN 1036	Mirror – old generation	Mirox New Generation Ecological
Maximum corrosion (μm) of edges after Cass Test EN ISO 9227	1500	500	250
Pitting after Cass Test (number / dm^2) EN ISO 9227	2 of 0,2 mm < diameter \leq 3 mm accepted provided < 0,2 mm	1 of 0,2 mm < diameter \leq 3 mm accepted provided < 0,2 mm	1 of 0,2 mm < diameter \leq 3 mm accepted provided < 0,2 mm
Maximum corrosion (μm) of edges after the neutral salt spray test EN ISO 9227	1000	200	50
Pitting after the neutral salt spray test (number / dm^2) EN ISO 9227	2 of 0,2 mm < diameter \leq 3 mm accepted provided < 0,2 mm	1 of 0,2 mm < diameter \leq 3 mm accepted provided < 0,2 mm	1 of 0,2 mm < diameter \leq 3 mm accepted provided < 0,2 mm
Maximum corrosion (μm) of edges after the condensation water test acc EN 1036 (Normative annex A)	200	50	50
Pitting after the condensation water test (number / dm^2) acc EN 1036 (Normative annex A)	1 of diameter \leq 0,3 mm	1 of diameter \leq 0,3 mm	1 of diameter \leq 0,3 mm

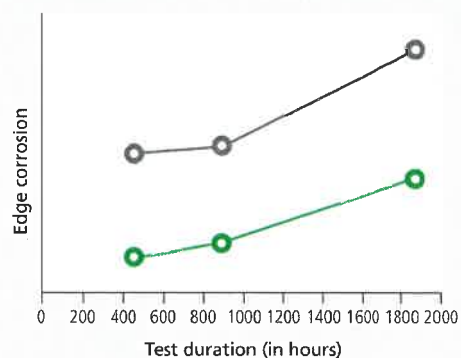
BEHAVIOUR IN EXTENDED ACCELERATED AGEING TESTS

Extended ageing in the Cass Test (standard duration: 120 hours)

Extended ageing in Salt Spray (standard duration: 4800 hours)



● Mirror - old generation
● Mirox New Generation Ecological



RESISTANCE TO AGGRESSIVE AGENTS

	Cleaning products	
Ammonia resistant	Mirror – old generation	Mirox New Generation Ecological
	1 day	<7days
	Adhesives* for mounting	
Compatibility with oxime- or alkoxy-based silicones	Mirror – old generation	Mirox New Generation Ecological
	NO	YES

Please consult the processing and installation guidelines available from our subsidiaries and agents for advice on storage, mounting, positioning, cutting and shaping.

*AGC advises to use only recommended or compatible brands of silicone as set out in its installation guidelines that can be found on www.yourglass.com

No "cloud"

The defect known as "cloud", which appears on most conventional mirrors, results from the oxidation of the copper or silver coating brought on by reagents passing through the paint (especially polymerization agents in the adhesives used to fix the mirrors in place). Once the copper or silver coating is completely oxidized, brownish or greyish stains appear.

This defect, known as "cloud", is simply not possible with our Mirox New Generation Ecological mirrors, if compatible adhesives are used.

Environmental protection

- Generally speaking, mirror production results in a high concentration of ammonia in the effluent from the silvering line. Some 90% of this ammonia comes from the coppering process.
- Copper-free mirrors help processors to respect the environment too, since the effluent from shaping operations is totally free of copper.

- Given the increased stringency of both national and international environmental standards, Mirox New Generation Ecological mirrors are definitely a safe investment.

A product rewarded for its excellence

The ecological excellence of Mirox New Generation Ecological has been rewarded with a number of awards bestowed by glass production experts and industrial troubleshooters. These awards reflect the efforts that AGC has made to help protect the environment. They include:

- The "British Industry Award" for environmental initiative: an award given by Glassex (the UK specialist glass fair).
- The "Prix de l'Environnement" awarded by the FEB (the Federation of Belgian Companies).
- The special commendation made in the "Eco-design" category at the European Better Environment Awards for Industry (sponsored by the European Commission).

THE MIROX NEW GENERATION ECOLOGICAL RANGE

	Thicknesses (mm)					Max sizes (cm) ¹	Available in Mirox Safe/ Safe+ safety version ²	Available on request with white paint ³	Installation, bonding
	3	4	5	6	8				
Clear	x	x	x	x	x	600 x 321	x	x	alkoxy- or oxime-based silicones
Bronze	x	x	x	x		600 x 321	x	x	
Grey	x	x	x	x		600 x 321	x	x	
Green		x		x		225 x 321	x	x	
Clearvision	x	x	x	x		600 x 321	x	x	
Black Mirox				x		225 x 321	x	x	
PrivaBlue				x		225 x 321	x	x	
Mirold Morena		x		x		225 x 321	x	x	

¹ Other sizes: please refer to the Product Catalogue available on www.yourglass.com;

² Maximum size: 255 x 321 cm;

³ White paint advised in applications where the back of the mirror is visible (e.g. bathroom cabins).

Applications

Mirox New Generation Ecological mirrors are a source of inspiration for furniture professionals, interior architects, decorators and designers. The possibilities are endless, but a few examples are given below.

GLAZING USED AS A COVERING*

Mirox New Generation Ecological	Partitions, walls, colonnades, pillars	Sliding doors (for cupboards, wardrobes, contemporary furniture)	Contemporary furniture	Display case stands
Clear, Bronze, Grey, Green, Black, Clearvision, Priva- Blue, Mirold Morena	x	x	x	x

*Always consult the safety and security standards for the market in which the application will be used.

In addition to Mirox New Generation Ecological mirrors, AGC offers a full range of decorative glass products. For further information, contact your local AGC representative or consult www.yourglass.com.





**Technical Data Sheet
Mirox (SAFE+)**

11/2019

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1 INTRODUCTION

This Technical Datasheet provides information on the Mirox range of mirror glass, both with and without a SAFE+ safety film. The Mirox substrate is a float glass as per standard EN 572-2.

2 STANDARDS

Mirox products comply with:

- EN 1036-1 – Glass in building – Mirrors from silver-coated float glass for internal use – Part 1: Definitions, requirements and test methods
- EN 1036-2 - Glass in building – Mirrors from silver-coated float glass for internal use – Part 2: Evaluation of conformity/Product standard

All Mirox products are CE-marked as per EN 1036-2. CE marking declarations are available from www.agc-yourglass.com/CE.

All Mirox products are produced in ISO 9001-certified plants.

3 COMPOSITION AND PROPERTIES

The base glass used for Mirox is float glass that complies with EN 572-1 & 2.

Standard EN 572-1 defines the magnitude of the proportions by mass of the principal constituents of float glass as follows:

SiO ₂	69 to 74%
Na ₂ O	10 to 16%
CaO	5 to 14%
MgO	0 to 6%
Al ₂ O ₃	0 to 3%
Others	0 to 5%

- Density: 2.5

4 DURABILITY OF MIROX

Mirox products are tested using the durability method described in EN 1036-1 that implies cutting 100x100mm samples into big size sheets to perform ageing tests.

Wherever measured (Punctual), Mirox products complies with requirements of EN1036-1 while if taking several samples and making the average of results (Average), Mirox products outperform the requirements of EN 1036-1.

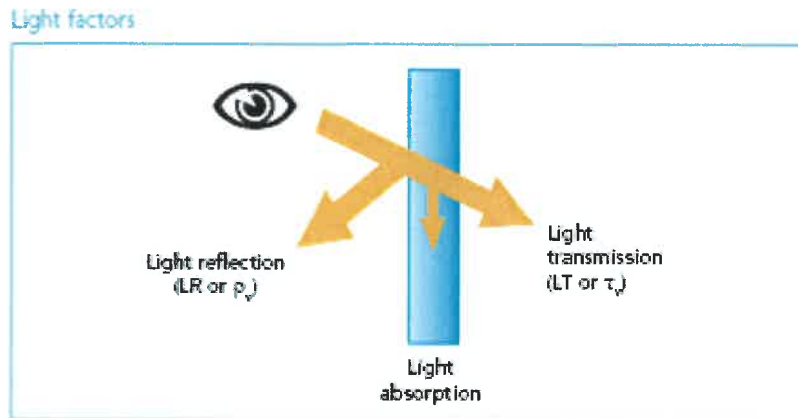
	EN 1036-1 criteria	Performance of Mirox MNGE and Mirox 4Green
Neutral salt spray test: - Maximum corrosion around the edge	1.0 mm	Punctual: 1.0 mm Average: 0.05mm
Copper accelerated acetic acid salt spray test: - Maximum corrosion around the edge - Maximum number of spots (diameter between 0.2 and 3 mm, below size accepted)	1.5 mm 2	Punctual: 1.5 mm Average: 0.25 mm 1
Condensation water test - Maximum corrosion around the edge - Maximum number of spots (diameter \geq 0.3 mm, below size accepted)	0.2 mm 1	Punctual: 0.2 mm Average: 0.05 mm 0

5 LIGHT PROPERTIES

Light properties are calculated using spectral measurement in compliance with standard EN 410.

Light reflection (LR - ρ_v), measured in accordance with EN 410, must be at least:

- 86% for mirrors made from clear float with a thickness between 2 mm and 6 mm
- 83% for mirrors made from clear float with a thickness between 8 mm.



6 DIMENSIONAL TOLERANCES

6.1 THICKNESS

The actual thickness will be the average of four measurements, rounded to the nearest 0.01 mm, taken at the centre of each side (PLF or DLF).

The actual thickness, rounded to the nearest 0.1 mm, must not vary from the nominal thickness by more than the tolerances given in the table.

	Minimum (mm)	Maximum (mm)
2	1.85	1.95
3	2.8	3.0
4	3.8	4.2
5	4.8	5.2
6	5.8	6.2
8	7.7	8.3

6.2 LENGTH AND WIDTH

As in EN572-2, the tolerances for length and width are ± 3 mm and ± 2 mm respectively.

The limit of squareness is described as the difference between diagonals. The difference may not exceed 5 mm.

7 QUALITY REQUIREMENTS

7.1 INTRODUCTION

Mirror quality can be affected by faults that distort the appearance of the image of reflected objects. Such alteration of the image can result from optical faults, faults in the glass and faults in the reflective coating.

7.2 DEFINITIONS OF FAULTS

The following definitions apply:

- Optical faults: faults directly associated with the distortion of the reflected image.
- Glass appearance faults: faults which alter the visual quality of the mirror on silver-coated float glass. They can be spot and/or linear and/or enlarged area faults.
- Spot faults: solid or gaseous inclusions, deposits, crush marks etc. In some cases, spot faults are accompanied by a type of distortion called 'halo'. The nucleus of the spot fault is measurable.
- Linear faults: scratches, extended spot faults, etc.
- Brush marks: very fine, barely visible circular scratches that are associated with glass cleaning techniques.
- Scratches: any kind of scratches that are not brush marks.
- Reflective silver coating faults: faults in the reflective silver layer that alter the appearance of the silvered glass. They consist of scratches, stain, colour spots and edge deterioration.
- Stain: alteration of the reflective coating characterised by a more or less brownish, yellowish or greyish coloration of zones which can sometimes cover the entire reflective surface.
- Colour spots: alteration of the reflective coating taking the form of small, generally coloured spots.
- Edge deterioration: discoloration of the reflective silver at the edge of the silvered glass.
- Protective coating(s) faults: faults where the metallic layer is exposed. These can be scratches or loss of adhesion of the protective coating(s).
- Edge faults: faults that affect the as-cut edge of the silvered glass. These can include entrant/emergent faults, shelling, corners on/off and vents.

7.3 GLASS FAULTS

7.3.1 INSPECTION METHOD

The silvered mirror must be observed in a vertical position, with the naked eye and under normal diffused lighting conditions (natural daylight or simulated daylight, between 300 lux and 600 lux at the silvered mirror), at a distance of at least 1 metre. The direction of observation is normal, i.e. at right angles, to the silvered mirror. The use of an additional lighting source, e.g. spotlight, is not allowed.

The dimension and number of brush marks, scratches and spot faults which distort vision must be noted.

7.3.2 ACCEPTANCE LEVELS

The tables below show the acceptance levels for glass faults for standard sizes.

Acceptance level for linear faults in standard sizes

	Mirrors with clear and tinted glass substrate	
	Jumbo size (defects/ sheets of 6 m x 3.21 m)	Other sizes (defects/m ²)
Brush marks (≤ 50 mm)	8	0.375
Scratches (≤ 50 mm)	3	0.139

Acceptance level for spot faults^a in standard sizes

	Mirrors with clear glass substrate			
	Jumbo size (defects/ sheets of 6 m x 3.21 m)		Other sizes (defects/m ²)	
	Max/sheet	Average/sheet	Max/sheet	Average/sheet ^b
≤ 0.2 mm	Accepted ^c	Accepted ^c	Accepted ^c	Accepted ^c
> 0.2 mm and ≤ 0.5 mm	26	18	1.35	0.93
> 0.5 mm	3	2	0.16	0.11
	Mirrors with tinted glass substrate			
	Jumbo size (defects/ sheets of 6 m x 3.21 m)		Other sizes (defects/m ²)	
	Max/sheet	Average/sheet	Max/sheet	Average/sheet ^b
≤ 0.2 mm	Accepted ^c	Accepted ^c	Accepted ^c	Accepted ^c
> 0.2 mm and ≤ 0.5 mm	30	29	1.55	1.50
> 0.5 mm	4	3	0.21	0.16

^a The dimensions stated are without the halo effect and relate to the largest of the fault dimensions.

^b The average must be calculated taking into account the total individual pack area (m²).

^c Accepted, providing they do not form a cluster.

7.4 REFLECTIVE SILVER COATING FAULTS

7.4.1 INSPECTION METHOD

Same as section 7.3.1.

7.4.2 ACCEPTANCE LEVELS

The reflective silver coating faults are not allowed if they are visible under the condition set out in section 7.3.1.

7.5 PROTECTIVE COATING FAULTS

7.5.1 INSPECTION METHOD

Same as section 7.3.1.

7.5.2 ACCEPTANCE LEVELS

Using the method described in section 7.3.1, the presence of pinholes, burst bubbles, flaking of the protective coating along the edges or other faults in the protective coating(s) is not allowed.

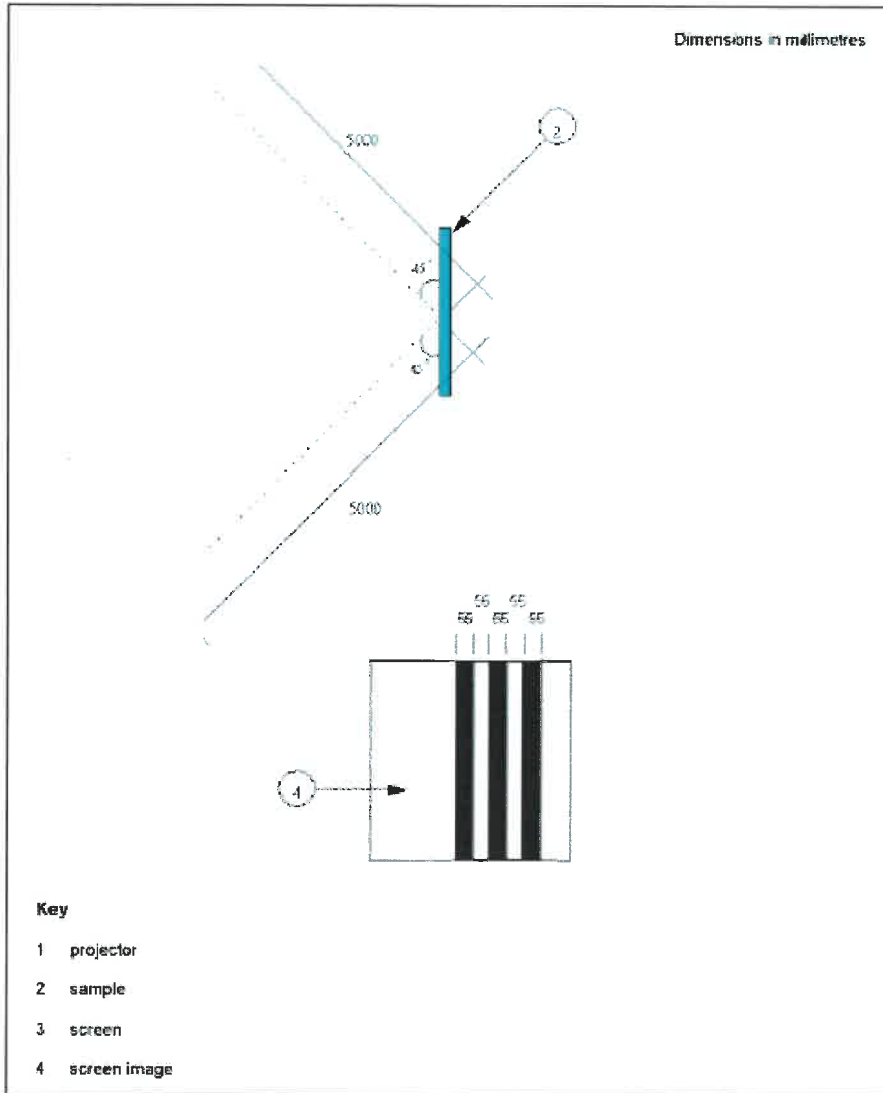
7.6 OPTICAL QUALITY

7.6.1 QUALITATIVE VISUAL INSPECTION METHOD

A silvered mirror must be examined in 500 mm × 500 mm areas at a time. The observer must be located at a distance of 2 m in front of and perpendicular to the area being examined. There must be an irregular background behind the observer. The reflected image must not be optically distorted, e.g. by another reflective surface or window. The observed distortions can be quantified using the method described in section 7.6.2.

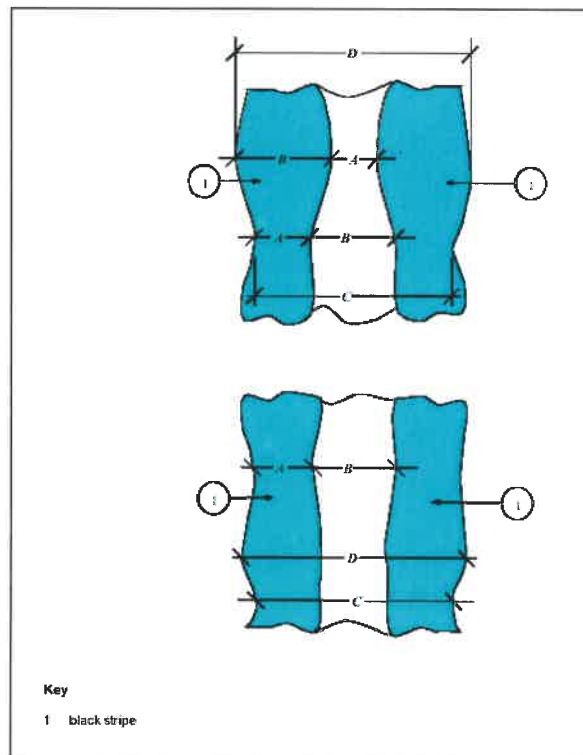
7.6.2 OPTIONAL QUANTITATIVE TEST METHOD

A projector with a focal length between 80 mm and 100 mm and an aperture of 8 mm must be positioned at a distance of 5 m from the specimen being examined, at a 45° angle to the specimen, which is positioned vertically. A screen must be located 5,000 mm from the centre of the mirror at right angles to the reflected beam.



A grid pattern slide, when projected onto the screen must give dark and clear stripes measuring 55 mm wide. Stripe width is calibrated using a non-distorted front surfaced mirror in place of the specimen.

The difference in width of each projected stripe, or of three neighbouring stripes must be measured.



7.6.3 ACCEPTANCE LEVELS

The mirror meets the requirements if it does not exhibit any distorting optical variation of the image following the visual inspection described in section 7.6.1.

In case of doubt, the method described in section 7.6.2 can be used. The measured deviations must remain within the following limits (see figure above):

- $A = 55 \text{ mm} - a$
- $B = 55 \text{ mm} + a$
- $C = 165 \text{ mm} - b$
- $D = 165 \text{ mm} + b$

where $a = 10 \text{ mm}$ and $b = 15 \text{ mm}$.

If the pane includes an original edge of the basic glass production width B , the following values for a and b apply in the corresponding 165 mm wide border band:

- Nominal glass thickness $< 4 \text{ mm}$:
 - $a = 30 \text{ mm}$
 - $b = 40 \text{ mm}$
- Nominal glass thickness $\geq 4 \text{ mm}$:
 - $a = 20 \text{ mm}$
 - $b = 30$

7.7 APPEARANCE OF THE SAFE+ VERSION

Mirox can be delivered with the SAFE+ safety backing film on the painted side. The appearance of this film is not perfect and some bubbles can appear. Visual imperfections in the SAFE+ safety backing film do not have a negative impact on soft body impact resistance as per EN 12600.

7.8 EDGE FAULTS

7.8.1 INSPECTION METHOD

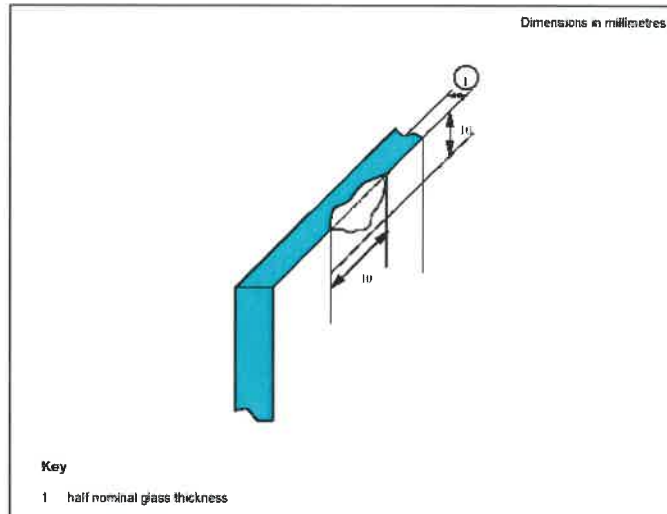
Same as section 7.3.1.

7.8.2 ACCEPTANCE LEVELS

The edge quality of stock size mirrors can be affected by the presence of entrant/emergent faults and shelling. Acceptance criteria are using the method described in section 7.3.1.

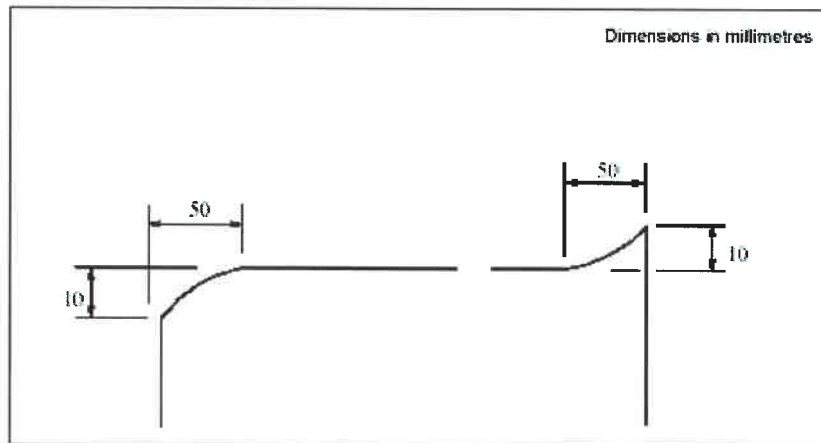
7.8.2.1 CHIPS OR SHELLS

For stock sizes, entrant or emergent chips or shells must be accepted provided they do not exceed a maximum length and depth of 10 mm and half the nominal glass thickness.



7.8.2.2 CORNERS ON/OFF

For stock sizes occasional corners on/off are allowed. No more than 5% of the sheets on a delivery may be affected.



7.8.2.3 VENTED (CRACKED) EDGES

Vented (cracked) edges are not allowed for stock sizes.

8 ENVIRONMENTAL CONSIDERATIONS

Mirox has been developed to be environmentally friendly.

The current Mirox MNGE production , among other things,:

- reduce lead content in the paint to < 0.3% (<3000 ppm) for Mirox MNGE
- reduce ammonia waste by 90%

Mirox 4Green goes one step further:

- lead content in paints reduced to < 0.004% (< 40 ppm*)

* No lead intentionally added, only limited lead contamination from other natural materials used for the manufacture of the paint.

None of the substances identified as substances of very high concern (SVHC) in the REACH Candidate List* is present above 0.1% in Mirox products, including SAFE+ versions (REACH Regulation 1907/2006/EC concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals).

* <http://echa.europa.eu/web/guest/candidate-list-table>

For specific product details, go to www.agc-yourglass.com and visit the “Mirox MNGE or Mirox 4Green product section, or look in the Tools section under Regulatory Documents.

9 SAFETY

9.1 SAFETY IN USE - PENDULUM BODY IMPACT RESISTANCE

Shatter properties (safe breakability) and pendulum body impact resistance are determined and classified in accordance with EN 12600.

Mirox mirrors show a mode of breakage typical of annealed glass (EN 12600, type A).

Mirox SAFE+ includes a polymer film applied to the back of the glass. This safety backing film ensures safety in case of soft body impact.

Mirox SAFE+ shows a mode of breakage typical of laminated glass (EN 12600, type B). Numerous cracks appear under soft body impact, but the fragments hold together and do not separate.

For specific product details, register an account for access to the restricted area on www.agc-yourglass.com, then log in and go to Certificates in the Mirox MNGE or Mirox 4Green product section.

9.2 SAFETY IN CASE OF FIRE - REACTION TO FIRE

Reaction to fire is determined and classified in accordance with EN 13501-1.

Mirrors, manufactured from silvered float glass, are products/materials that are not required to be tested for reaction to fire (e.g. products/materials belonging to Classes A as per Commission Decision 96/603/EC, as amended by 2000/605/EC).

** Contribution to fire growth ranges from class A1 (best, not contributing to fire growth or to the fully developed fire) to class E (worst, quickly leading to a flashover situation). In addition to the main classification for contribution to fire growth, additional classification parameters are assigned to a product for smoke production, and flaming droplets and particles.*

Mirox (SAFE+) shows a reaction to fire behaviour ranging from class A1 to class B, depending on whether or not the safety backing is present and on the type of installation.

For specific product details, register an account for access to the restricted area on www.agc-yourglass.com, then log in and go to Certificates in the Mirox MNGE or Mirox 4Green product section.

CE Marking declarations are available from www.agc-yourglass.com/CE.

10 HEALTH AND HYGIENE CONSIDERATIONS

AGC puts great effort into developing products that preserve our indoor air quality. Mirox products show very little indoor emissions of volatile organic compounds (VOCs), including very low levels of formaldehyde.

Following the publication of French Decree No. 2011-321 of March 23, 2011, as supplemented by the French Decree of 19 April 2011 on the labelling of their emissions of volatile pollutants of construction products, or wall cladding, or floor and paintings and varnish, the Mirox product range (including SAFE+ versions) has achieved A+ level*.

** Information on the emission levels of volatile substances in indoor air, presenting a risk of toxicity by inhalation, on a scale from A+ (very weak emissions) to C (high emissions).*

11 RELATED DOCUMENTS

The following documents are also available from www.agc-yourglass.com:

- Installation Guide
- Processing Guide
- Cleaning and Maintenance Guide for Decorative Glazing
- Glazing Instructions – Traditional Setting
- CE Marking declarations