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Mirrors

that meet the standard

New consensus standard defines mirror quality requirements

By C. Gregory Carney

north American mirror manufacturers recently took a major step to ensure the continued high quality of today's silvered flat glass mirror with the development of an industry consensus standard.

For a number of years, mirror product standards were governed by federal specification DD-M-411 C, followed by the General Services Administration—commercial item description (CID A-A 3002 (June 4, 1996) mirrors, glass. In 1998, members of the former North American Association of Mirror Manufacturers (now the Mirror Division of the Glass Association of North America) began drafting what would ultimately be published by the American Society for Testing and Materials (ASTM International) as the industry consensus document C 1503-01 Standard Specification for Silvered Flat Glass Mirror.

“People at all levels of the mirror industry felt the need for an industry consensus document in lieu of the federal specifications,” explains Lee

Harrison, president of Walker Glass Co., Ltd. “In order to ensure participation of producers, distributors, and users in the development and acceptance of the standard, the original industry task group turned to ASTM.

“One of ASTM International’s primary objectives is to provide the forum for the development, publication, and distribution of voluntary consensus standard specifications,” explains Harrison. “We felt development of a standard within the ASTM structure would provide the needed acceptance and recognition for the document.”

A task group was formed under ASTM Committee C 14 on glass and glass products and subcommittee C 14.08 on flat glass; Harrison, past president of NAAMM and past chairman of the GANA Mirror Division volunteered to serve as chairman. With a broad base of members, the task group began the development of a standard within the well defined procedures and regulations of

Thickness		Intended use	
Designation	(Traditional designation)	Maximum recommended surface area per cut size piece	Recommended application
2.5 mm	(single (5 sq.ft.))	Up to .5 sq. m.	Utility mirrors where distortion and blemishes are not a major concern
3.0 mm ½ in.)	(double or (7.5 sq.ft.))	Up to .75 sq. m.	Mirror components and other general use applications
4.0 mm	(⅝ in.) (10 sq.ft.)	Up to 1 sq. m.	Mirror components and other general use applications
5.0 mm	(⅞ in.) (32 sq. ft.)	Up to 3 sq. m.	Architectural use and other applications where optical quality is a major concern
6.0 mm	(1 in.) (32 sq. ft.)	Up to 3 sq. m.	Architectural use and other applications where optical quality is a major concern

Fig. 1

TABLE 2 Allowable Point Blemish Size and Distribution for Mirror Cut Size and Mirror Stock Sheet Grades of Mirrors

Blemish Size ^A	Mirror Cut Size ^B		Mirror Stock Sheet			
	Mirror Select Quality (usually available in 6 mm (¼ in.) clear mirror only)		Mirror Glazing Quality		Mirror Select Quality (usually available in 6 mm (¼ in.) clear mirror only)	Mirror Glazing Quality
	Central ^C	Outer ^C	Central ^C	Outer ^C		
< 0.30 mm (< .012 in.)	Allowed with a minimum separation of 300 mm (12 in.)	Allowed with a minimum separation of 300 mm (12 in.)	Allowed ^D	Allowed ^D	Allowed ^D	Allowed ^D
≥ 0.30 mm < 0.50 mm (≥ .012 in. < 0.02 in.)	Allowed with a minimum separation of 600 mm (24 in.)	Allowed with a minimum separation of 300 mm (12 in.)	Allowed with a minimum separation of 300 mm (12 in.)	Allowed with a minimum separation of 300 mm (12 in.)	Allowed with a minimum separation of 1200 mm (48 in.)	Allowed D
≥ 0.50mm < 0.80 mm (≥ .02 in. < 0.032 in.)	None Allowed	Allowed with a minimum separation of 900 mm (36 in.)	None Allowed	Allowed with a minimum separation of 300 mm (12 in.)	None Allowed	Allowed with a minimum separation of 600 mm (24 in.)
≥ 0.80 mm < 1.20 mm (≥ .032 in. < 0.047 in.)	None Allowed	None Allowed	None Allowed	Allowed with a minimum separation of 1500 mm (60 in.)	None Allowed	Allowed with a minimum separation of 1200 mm (48 in.)
≥ 1.20 mm < 1.50 mm (≥ .047 in. < 0.059 in.)	None Allowed	None Allowed	None Allowed	None Allowed	None Allowed	Allowed with a minimum separation of 1500 mm (60 in.)
≥ 1.50 mm (≥ .059 in.)	None Allowed	None Allowed	None Allowed	None Allowed	None Allowed	None Allowed

^A See 7.4.1 for detection, 7.4.1.1 for measurement and 7.4.3 for distribution of point blemishes.

^B See 4.4 for maximum recommended surface area per cut size piece.

^C The central area is considered to form a square or rectangle defined by the center 80 % of the length and 80 % of the width dimensions centered on a lite of mirror. The remaining area is considered the outer area.

^D Provided that clusters are not formed.

ASTM. Development of the standard required balloting at task group, subcommittee, and main committee levels and addressing of all negative ballots.*

Standard Scope

The specification covers the quality requirements for annealed, clear, and tinted rectangular cut size, stock sheet, and lehr end mirrors up to ¼ inch thick (6 mm). Specified products are intended to be used

indoors for mirror glazing, for components of decorative applications, or for similar uses.

The specification does not address products that have been further fabricated (such as edge-work) or safety glazing requirements for mirror applications. Building codes and other applicable standards should be consulted for safety glazing applications. Mirrors covered under the standard are not intended for use in environments where

*ASTM procedures require that each standard document be reviewed and re-approved or updated every five years. Manufacturers, fabricators, distributors, and consumers are encouraged to provide suggested revisions or additions to the C 1503-01 standard to the C 14.08 subcommittee on flat glass within ASTM or the GANA Mirror Division. The specification Thickness and Intended Use chart and Tables 2 and 3 were extracted with permission from C 1503-01 – Standard Specification for Silvered Flat Glass Mirror, copyright ASTM International. For additional information or to order a copy of ASTM C 1503-01, contact ASTM International headquarters at 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959; 610/832-9500, fax: 610/832-9555; e-mail service@astm.org, or visit www.astm.org. For additional information on ASTM standards under subcommittee C 14.08 on flat glass, visit the ASTM Web site or the GANA Web site www.ganawebsite.com.

TABLE 3 Allowable Point Blemish Size and Distribution For Mirror Lehr End Grade

Note—Follow the requirements for the appropriate Quality (Mirror Select Quality or Mirror Glazing Quality) for Mirror Stock Sheet in Table 2 with the following additional details for Mirror Lehr End Requirements:

If mirror area < 7 m² (75 SF)—one rejectable defect allowed

If mirror area ≥ 7 m² (75 SF)—two rejectable defects allowed

high humidity or airborne corrosive promoters, or both, are consistently present (such as swimming pool areas, ocean-going vessels, chemical laboratories, and other corrosive environments).

Product Classifications

The specification establishes grades and qualities for mirror products. Product grades are defined as mirror cut size (mirror intended for final use in the size ordered; not intended for recutting), mirror stock sheet (mirror intended for architectural use and where trimming will be required), and mirror Lehr end (mirror intended for recutting by the user into smaller sizes where it is expected that some material may be lost in cutting due to blemishes and edge quality).

Product qualities are defined as mirror select quality (recommended or intended, or both, for use in visually demanding applications requiring minimal distortion and blemishes) and mirror glazing quality (recommended or intended, or both, for general use where limited levels of minor blemishes or distortion, or both, are acceptable).

Section 4.4 of the specification provides information on thickness designations, maximum recommended surface area per cut size piece, and recommended application usage as provided in *Fig. 1*.

Quality Requirements

Tables in the standard provide specific product qualities for mirror-select and mirror-glazing quality. *Table 2* (see page 49) and *Table 3* (above) from the standard provide the allowable point blemish size and distribution for cut size and stock sheet grades of mirrors, and the allowable point blemish size and distribution for mirror Lehr end grade.

Additional product quality tables within the standard include:

- Table 1—Dimensional Tolerances for Mirror Cut Size, Mirror Stock Sheets, and Mirror Lehr End Grades.

- Table 4—Allowable Linear Blemish Size and Distribution for Mirror Cut Size, Mirror Stock Sheet, and Mirror Lehr End Grades of Mirrors.

- Table 5—Allowable Chip Size for Mirror Cut Size, Stock Sheet, and Mirror Lehr End Grades.

- Table 6 – Resistance Criteria for Mirror Coating.

Test Methods

The specification details test methods by referencing other ASTM standards or, as with requirements for appearance of the silver mirror coating, by providing detailed guideline viewing distances and lighting conditions. Product test procedures documented by the standard include:


- Reflectance.
- Appearance of silver coating.
- Coating resistance evaluation.
- Blemish evaluation.
- Blemish detection for point blemishes.
- Point blemish measurement.
- Detection for linear blemishes.
- Blemish distribution.
- Dimensional measurement.
- Squareness measurement.

The standard requires that each package of mirror have a manufacturer's label providing the company name (or trademark), grade and quality of mirror provided, product color, nominal thickness, quantities, dimensions, and place of manufacture.

Use of the Standard

The current issue of the standard gained C 14 committee approval June 10, 2001 and was published in August of 2001.

“This standard is the result of many hours committed by a number of individuals representing mirror manufacturers, flat glass suppliers, coating suppliers, and mirror distributors,” explains Drew Mayberry, president of Lenoir Mirror Co. and current chairman of the GANA Mirror Division. “We believe the task group met the objective of providing the industry with a standard which can be utilized on an industry-wide basis, and the result is a benchmark by which all mirror products can be judged consistently.”

Harrison continues to stress the importance of using the document. “Now that the standard is in place, it will be up to the specifiers, the buyers, the fabricators, and the vendors of mirror to adopt it and utilize it on a daily basis. As more and more companies and individuals use the standard, the end result will be a widespread acceptance of the document and a greater understanding of the product by all involved.” 

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