



工程指示 / 要求簡箋(E.I.)

工程指示編號：EI / 0866 / 19                      修改版次：-  
 工程編號           ：J - 837                              工程名稱       ：觀塘裕民坊  
 工程項目           ：幕牆/Glass cladding 玻璃色差儀 2 部 (質檢用)  
 收件人             ：Maggie / 王良 / 生統      發件人       ：Ant Yeung                      日期       ：23/07/2019

要求提供 /  確認 事項：

- |                                    |                                     |                               |
|------------------------------------|-------------------------------------|-------------------------------|
| <input type="checkbox"/> 初步鋁料 B.M. | <input type="checkbox"/> 加工拆圖，然後生產  | <input type="checkbox"/> 尺寸表  |
| <input type="checkbox"/> 正式鋁料 B.M. | <input type="checkbox"/> 技術上資料 / 指示 | <input type="checkbox"/> 報價   |
| <input type="checkbox"/> 配件 B.M.   | <input type="checkbox"/> 樣辦或貨品說明書   | <input type="checkbox"/> 分判合約 |
| <input type="checkbox"/> 其他：_____  |                                     |                               |

內容：

因應本工程的新、舊藍片原片涉及色差問題。以及長遠計，可確保玻璃收貨標準。  
 請訂購玻璃用色差儀 2 部供質檢用。  
 牌子和型號的資料，由三鑫玻璃廠提供。  
 牌子：KONICA MINOLTA 型號:CR-400  
 王良：請安排 1 部於本廠用， 1 部於駐玻璃廠 QC 用。  
 謝謝！

請在 2019 / 07 / 30 前完成上列要求。

附：3 頁相片及報告，ASTM C-1376 標準  $\Delta E_{*ab} < 4.5 =$  合格。  
 4 頁 SPEC

以上項目為：

- 原合約工程包                       原合約工程加 / 減賬                       新工程報價

原因：-

分發東莞各部門：

- 生產技術總監  連附件     技術部     連附件     生產部     連附件     機械設計部  連附件  
 採購部     連附件     生產統籌部  連附件 *楊*  
 質檢部     連附件     會計部     連附件     報關組     連附件     其他 楊榮輝  連附件

分發香港各部門：

- 行政部  連附件     會計部  連附件     統籌部  連附件     工程部地盤科文  連附件  
 採購部  連附件     QS 部  連附件     維修部  連附件     其他 \_\_\_\_\_  連附件

傳遞編號：

HK 1682 / 19

發件人簽署：  
*Ant Yeung*

項目經理簽署：  
*[Signature]*



CHROMA METER CR-400  
AC ADAPTER: 5V USE AC-A305  
BATTERIES: 1.5Vx4, D, 2A  
KONICA MINOLTA  
SENSING, INC B 8206095  
MADE IN JAPAN

720866 HK 1682

CHROMA METER CR-400

AC ADAPTER: 5V  $\overline{\text{A}}$  2A USE AC-A305

BATTERIES: 1.5Vx4, 0.2A

KONICA MINOLTA  
SENSING, INC.

MADE IN JAPAN

B 8206095



KONICA MINOLTA

0012 S I S W O  
样品0077 MENU  
[No Name]  
SCI 10° / D65 10° /  
L\* 30.26 ---  
a\* -2.21 ---  
b\* -1.19 ---  
ΔL\* 0.11 ---  
Δa\* -0.01 ---  
Δb\* 0.79 ---  
ΔE\*ab 0.80 ---  
07/19/2019 16:08:46  
0012 S/I  
样品 列表 标准色

測定 標準色

保存 選択

校正 MENU

OPTION

READY



# 中航三鑫股份有限公司

AVIC SANXIN CO., LTD.

## 联系函

To	美特铝质工程有限公司	Date	2019.7.15
Attn		From	中航三鑫 品质部
Subject	观塘裕民坊蓝玻色差事宜	Tel	0752-5199503
Page	1 页	Fax	0752-5195078

非常感谢贵司一直以来对我司工作的支持。

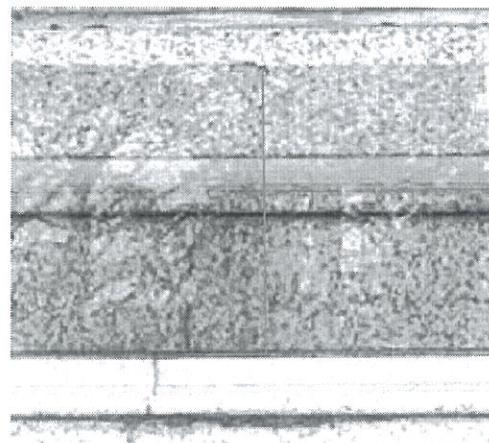
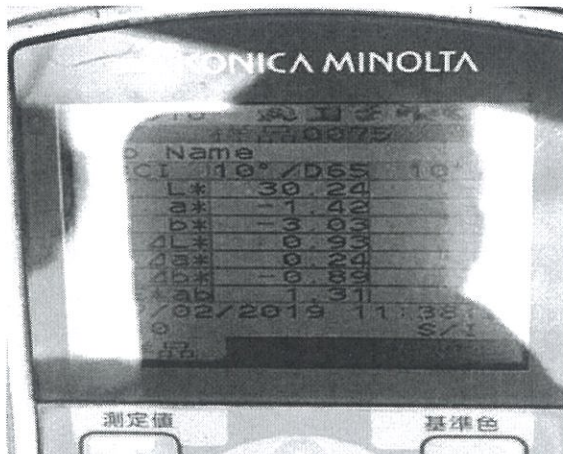
关于观塘裕民坊项目所使用的蓝玻存在片与片之间色差一事,我司进行了相关调查:

1、浮法原片(包括白玻,色玻,LOWE等玻璃)普遍客观存在批间次的色差,特别是色玻及LOWE由于工艺更加复杂,其色差差值比普通白玻的差值要大,因此相关区域标准对玻璃间色差做出了约定。

2、色玻在建筑市场的使用量较少,与采矿时砂矿石材质的稳定性及市场需求有关,因此国内生产色玻的原片厂家也极少,相对应的各个厚度的色玻原片生产轮换周期也延长,即前后批次的同厚度玻璃,可能间隔半年甚至更长时间以上。这都会造成色玻不同批次间的色差更加难以控制。

3、裕民坊项目前期样板层及部分玻璃于2018年开始生产,使用了去年年度的蓝玻原片。今年原片厂家熔炉改造,技术更新,原蓝玻已经停产,但过渡的蓝玻颜色与旧款原片颜色差异较大,且试用期间,该过渡原片质量不稳定,存在很高的自爆率,明显不符合香港市场的质量要求,当然,不排除不同砂矿石的采集影响到了新旧玻璃之间的颜色差异。经过协调厂家,折中生产了颜色很接近、同时产品质量有所保证的现款蓝玻供于我司加工。

4、我司收到新原片后,检验了新旧原片间的色差差异,相关图片及数据如下图:

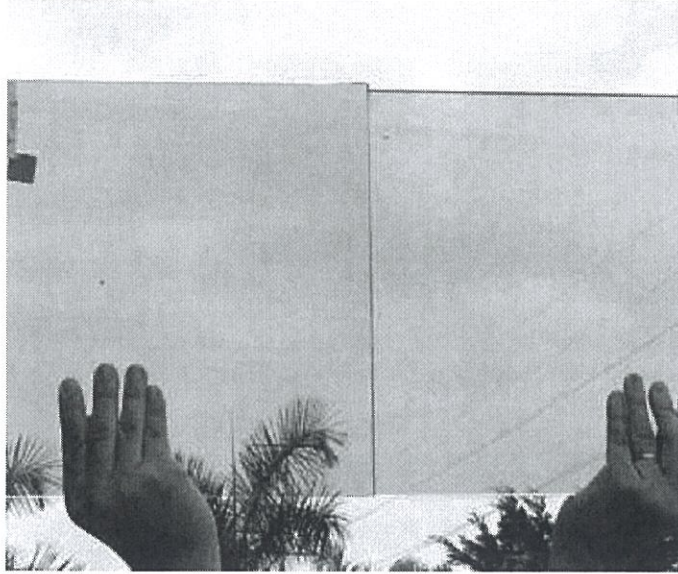




# 中航三鑫股份有限公司

AVIC SANXIN CO., LTD.

## 联系函



从测量仪器上的数值可知，去年与今年蓝玻的色差差值在 $\Delta E=1.3$ 左右，符合美标玻璃色差值不超过 $\Delta E=4.5$ 的要求。我司多年购买各种玻璃原材料，理解批间次玻璃会客观存在一定的色差差异，鉴于来料检验数据结果显示符合我司与原片厂家签订的色差质量标准要求，亦满足贵我两司签订的美标要求，我司按合格品签收原片厂家的蓝玻原片，正常用于玻璃的后续加工。

以上关于裕民坊项目蓝玻的色差分析，望贵司理解，并正常使用符合标准要求的玻璃，后续订单将继续使用今年的蓝玻原片加工。我司将全程跟踪并配合贵司的相关工作，如有问题请立即联系我司。

顺祝！

商祺！

中航三鑫股份有限公司

品质部

2019年7月15日

N.K.I.L. 6514 Kwun Tong Town Centre (Development Areas 2 & 3)  
 Specification for the Tower Curtain Wall, Alum. Window, Alum. Cladding and  
 Balustrade Nominated Sub-Contract

合約

Tender

	Cycle)
- ASTM C743	Standard Test Method for Continuity of Porcelain Enamel
- ASTM C774	Standard Test Method for Yield Strength of Enameling Steels After Straining and Firing
- ASTM C792	Effects of Heat Aging on Weight Loss, Cracking, and Chalking of Elastomeric Sealant
- ASTM C794	Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants
- ASTM C864	Specifications for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers
- ASTM C920	Standard Specification for Elastomeric Joint Sealants
- ASTM C1036	Standard Specification for Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass
- ASTM C1087	Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems
- ASTM C1172	Standard Specification for Laminated Architectural Glass
- ASTM C1184	Standard Specification for Structural Silicone Sealants
- ASTM C1199	Standard Test Method for Measuring the Steady-State Thermal Transmittance of Fenestration Systems Using Hot Box Methods
- ASTM C1253	Standard Test Method for Determining the Outgassing Potential of Sealant Backing
- ASTM C1363	Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by means of a Hot Box Apparatus
- ASTM C1376	Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass
- ASTM C1401	Standard Guide for Structural Sealant Glazing
- ASTM D412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
- ASTM D790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- ASTM D2200	Pictorial Surface Preparation Standard for Painting Steel Surface.
- ASTM D2244	Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
- ASTM D2247	Standard Practice for Testing Water Resistance Coating in 100% Relative Humidity
- ASTM D2583	Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impresser
- ASTM D2584	Test Method for Ignition Loss of Cured Reinforced Resins
- ASTM D2563	Classifying Visual Defects in Glass Reinforced Plastic Laminate Parts
- ASTM D2794	Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
- ASTM D3039/3039M	Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials
- ASTM D3363	Standard Test Method for Film Hardness by Pencil Test
- ASTM D3359	Standard Test Methods for Measuring Adhesion by Tape Test
- ASTM D3330/D3330M	Standard Test Method for Peel Adhesion of Pressure-Sensitive Tape
- ASTM D3363	Standard Test Method for Film Hardness by Pencil Test
- ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials
- ASTM E119	Standard test Methods for Fire Tests of Building Construction and Materials
- ASTM E136	Standard Test Method for Behaviour of Materials in a Vertical Tube Furnace at 750°C
- ASTM E283	Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
- ASTM E330/E330M	Structural Performances of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
- ASTM E331	Standard Test Method for Water Penetration of Exterior



ASTM C1376

## Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass<sup>1</sup>

This standard is issued under the fixed designation C 1376; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This specification covers the optical and aesthetic quality requirements for coatings applied to glass for use in building glazing.

1.2 The coatings covered are applied to the glass using either pyrolytic or vacuum (sputtering) deposition methods and are typically applied to control solar heat gain, energy performance, comfort level, and condensation and enhance the aesthetic of the building.

1.3 This specification addresses blemishes related to the coating only. It does not address glass blemishes, applied ceramic frits, and organic films.

1.4 Dimensional values are stated in inch pound units and are to be regarded as the standard units for this specification. The metric units given in parentheses are for information only.

### 2. Referenced Documents

2.1 Reference to these documents shall be the latest issue unless otherwise specified by the authority applying this specification.

#### 2.2 ASTM Standards:

C 162 Terminology of Glass and Glass Products<sup>2</sup>

C 1036 Specification for Flat Glass<sup>2</sup>

C 1048 Specification for Heat-Treated Flat Glass—Kind HS, Kind FT Coated and Uncoated Glass<sup>2</sup>

D 2244 Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates<sup>3</sup>

### 3. Terminology

3.1 *Definitions*—Refer to Terminology C 162, Specification C 1036 or Specification C 1048 as appropriate:

3.1.1 *blemishes in flat glass*—refer to Specifications C 1036 or C 1048, as appropriate.

NOTE 1—These definitions do not apply to in-service damage.

3.2 *Definitions of Terms Specific to This Standard:*

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee C14 on Glass and Glass Products and is the direct responsibility of Subcommittee C14.08 on Flat Glass.

Current edition approved April 10, 2003. Published May 2003. Originally approved in 1997. Last previous edition approved in 1997 as C1376-97.

<sup>2</sup> *Annual Book of ASTM Standards*, Vol 15.02.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 06.01.

3.2.1 *coated overhead glass*—glass used in an installation in which the lower edge of the glass is more than 6 ft (1.8 m) above (the viewer's) floor level or cannot be approached within 10 ft (3.0 m); the glass can usually but not always be viewed in both transmission and reflection; the glass is usually sloping in from the vertical plane, however, may also be vertical or sloping out from the vertical plane.

NOTE 2—The following terms are designed to guide the user to the appropriate inspection charts and requirements.

3.2.2 *coated spandrel glass*—glass used in an installation in which the glass is only viewed in reflection from the building's exterior. The glass is usually installed vertically, however, may be at a slope to the vertical plane.

3.2.3 *coated vision glass*—glass used in an installation in which the lower edge of the glass is a maximum of 6 ft (1.8 m) above (the viewer's) floor level; the glass can be viewed in transmission or reflection; the glass is usually vertical, however, may also be sloping in or out from the vertical plane; and the glass can be approached within 10 ft (3.0 m) or less. (If the distance is greater than 10 ft (3.0 m), see coated overhead glass.)

3.2.4 *coating rub*—a surface abrasion of appreciable width that has partial, or complete, removal of the coating producing a hazy appearance.

3.2.5 *coating scratch*—partial, or complete, removal of the coating along a thin straight or curved line.

3.2.6 *corrosion*—change in the color or level of reflected or transmitted light over all or part of the glass surface as a result of degradation of the coating from external sources.

3.2.7 *crazing*—a random conglomeration of fine lines or cracks in the coating.

3.2.8 *cut size*—flat glass sheets cut to specific dimensions.

3.2.9 *mark/contaminant*—a deposit of foreign material on the glass surface.

3.2.10 *nonuniformity*—obvious variation in reflected color of the coating within a lite of glass or between two lites of coated glass in the same building or both.

3.2.10.1 *banding*—wide or narrow areas of nonuniformity with demarcation that appears as a linear line and may occur anywhere on a lite.

3.2.10.2 *edge to edge*—gradient nonuniformity within a lite of glass.



3.2.10.3 *lite to lite*—nonuniformity between individual lites.

3.2.10.4 *mottling*—spotty or patchy nonuniformity (not to be confused with strain pattern inherent to heat-treated glass or in-service staining, or both, or damage of glass).

3.2.10.5 *picture framing*—perimeter nonuniformity.

3.2.11 *pinhole*—small area in which the coating is entirely or partially absent.

3.2.12 *pyrolytic*—term used to describe a method of manufacture of a coating. Process applies the coating to hot glass, usually at the time of flat glass manufacturing.

3.2.13 *spot*—a small, opaque blemish in the coating.

3.2.14 *stock size*—flat glass sheets cut to standard dimensions that will be cut to smaller sizes in future use.

3.2.15 *vacuum deposition*—term used to describe a method of manufacture of a coating. The process applies the coating in a vacuum chamber to flat glass.

3.2.16 *vacuum sputtering*—see *vacuum deposition*.

#### 4. Significance and Use

4.1 This specification groups coated glass according to application. These groups are: vision, spandrel/nonvision, and overhead. Similar but unique quality tolerances and inspection guidelines have been outlined for each application. The glass to be coated shall comply with the applicable provisions of Specification C 1036 and Specification C 1048.

4.2 Coating blemishes are an inherent part of the glass-coating process. In addition, coatings can be damaged as a result of improper transportation, storage, handling, fabrication, or installation.

4.3 Individual manufacturers should be contacted for recommended handling, fabrication, installation, and application guidelines.

#### 5. Classification

5.1 *Kinds*—Coated flat glass furnished under this specification shall be of the following kinds, as specified:

5.1.1 *Kind CV*—Flat transparent glass conforming to the applicable requirements of Specification C 1036 or Specification C 1048 or both and having a coating applied to one or more of the glass surfaces which further conforms with the requirements hereinafter specified for coated vision glass.

5.1.2 *Kind CO*—Flat transparent glass conforming to the applicable requirements of Specification of C 1036 or Specification C 1048 or both and having a coating applied to one or more of the glass surfaces which further conforms with requirements hereinafter specified for coated overhead glass.

5.1.3 *Kind CS*—Flat glass conforming to the applicable requirements of Specifications of C 1036 or Specification C 1048 or both and having a coating applied to one or more of the glass surfaces that further conforms with the requirements hereinafter specified for coated spandrel glass.

NOTE 3—Coated spandrel glass may have additional material designed to opacify the glass that is not included in the scope of this specification.

#### 6. Requirements

6.1 *Blemishes for Coated Vision Glass*—The type and number of blemishes shall be no greater than those specified in Table 1.

TABLE 1 Quality Specifications for Cut Size Coated Vision Glass (Kind CV)<sup>A</sup>

Blemish <sup>B,C</sup>	Central Area, in. (mm) <sup>D</sup>	Outer Area, in. (mm) <sup>D</sup>
Pinhole	1/16(1.6) max	3/32(2.4) max
Spot	1/16(1.6) max	3/32(2.4) max
Coating scratch	2 (50) max length	3 (75) max length
Mark/contaminant	2 (50) max length	3 (75) max length
Coating rub	none allowed	length plus width not to exceed 3/4 (19)
Crazing	none allowed	none allowed
Corrosion	none allowed	none allowed

<sup>A</sup>These specifications apply to cut size glass only. For specifications of stock size glass contact the manufacturer.

<sup>B</sup>The glass shall be inspected, in transmission, at a distance of 10 ft (3.0 m) at a viewing angle of 90° to the specimen against a bright uniform background. If a blemish is readily apparent under these viewing conditions, the above criteria applies.

<sup>C</sup>No more than two readily apparent blemishes are allowed in a 3-in. (75-mm) diameter circle, and no more than five readily apparent blemishes are allowed in a 12-in. (300-mm) diameter circle.

<sup>D</sup>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 glass. The remaining area is considered the outer area.

6.2 *Blemishes for Coated Overhead Glass*—The type and number of blemishes shall be no greater than those specified in Table 2.

6.3 *Blemishes for Coated Spandrel Glass*—The type and number of blemishes shall be no greater than those specified in Table 3.

6.4 *Nonuniformity for Coated Glass*—The phenomenon of nonuniformity in coated glass may be visible within an individual lite, or between lites of glass, in a particular building or curtain wall. Consultation with suppliers and viewing full

TABLE 2 Quality Specifications for Cut Size Coated Overhead Glass (Kind CO)<sup>A</sup>

Blemish <sup>B,C</sup>	Central Area, in. (mm) <sup>D</sup>	Outer Area, in. (mm) <sup>D</sup>
Pinhole	3/32(2.4) max	1/8(3.2) max
Spot	3/32(2.4) max	1/8(3.2) max
Coating scratch	3 (75) max length	4 (100) max length
Mark/contaminant	3 (75) max length	4 (100) max length
Coating rub	length plus width not to exceed 3/4 (19)	Length plus width not to exceed 3/4 (19)
Crazing	none allowed	none allowed
Corrosion	none allowed	none allowed

<sup>A</sup>These specifications apply to cut size glass only. For specifications of stock size glass contact the manufacturer.

<sup>B</sup>The glass shall be inspected, in transmission, at a distance of 15 ft (4.6 m) at a viewing angle of 90° to the specimen against a bright uniform background. If a blemish is readily apparent under these viewing conditions, the above criteria applies.

<sup>C</sup>No more than two readily apparent blemishes are allowed in a 3-in. (75-mm) diameter circle, and no more than five readily apparent blemishes are allowed in a 12-in. (300-mm) diameter circle.

<sup>D</sup>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 glass. The remaining area is considered the outer area.



**TABLE 3 Quality Specifications for Cut Size Coated Spandrel Glass (Kind CS)<sup>A</sup>**

Blemish <sup>B,C</sup>	Range Number 1, in. (mm) <sup>D</sup>	Range Number 2, in. (mm) <sup>D</sup>
Pinhole	1/8(3.2) max	5/32(4.0) max
Spot	1/8(3.2) max	5/32(4.0) max
Coating scratch	3 (75) max length	6 (150) max length
Mark/contaminant	3 (75) max length	6 (150) max length
Coating rub	none allowed	length plus width not to exceed 3/4(19)
Crazing	none allowed	none allowed
Corrosion	none allowed	none allowed

<sup>A</sup>These specifications apply to cut size glass only. For specifications of stock size glass contact the manufacturer.

<sup>B</sup>The glass shall be inspected, in reflection, at a distance equal to or greater than 15 ft (4.6 m) at a viewing angle of 90° to the specimen under uniform lighting conditions. If a blemish is readily apparent under these viewing conditions, the above criteria applies.

<sup>C</sup>No more than two readily apparent blemishes are allowed in a 3 in. (75-mm) diameter circle and no more than five readily apparent blemishes are allowed in a 12 in. (300-mm) diameter circle.

<sup>D</sup>The specifications separates glass by the distance that it will be viewed when installed. Range No. 1 is for all glass within a viewing distance of 15 ft (4.6 m) or less, and Range No. 2 is all glass viewed from a distance greater than 15 ft (4.6 m).

size mock-ups under typical site conditions and surrounding landscape is highly recommended before construction.

6.4.1 The scientific nature of controlling gas flow, electrical charges, and coating layer densities require production tolerances for light transmittance, reflectance, and color of coated glass products. Glass within allowable production tolerances may yield differences in reflected color or intensity of light

transmittance or reflectance or both. Perceivable differences are not immediate cause for rejection.

6.4.2 Glass should be viewed as installed and from the exterior of the building for uniformity comparison. Coating nonuniformity may occur from lite to lite in a building. It may also occur within a lite in the form of edge-to-edge gradation, banding, mottling, or picture framing.

6.4.3 Nonuniformity is defined using a  $\Delta E^*_{ab}$  as defined in Test Method D 2244 for CIE 1976 L\*A\*B\*, Illuminant D65 and 10° Observer. Using a reference target established by the manufacturer, or the average color readings as defined below, no color readings should exceed a  $\Delta E^*_{ab}$  of 4.5. To calculate  $\Delta E^*_{ab}$ , the following procedure should be used: Using a mobile/handheld spectrophotometer, color readings will be taken and documented from a predetermined number of units that have been installed on a building. A minimum of ten readings should be taken and should include any glass that is in question. The readings taken should then be averaged and that average will be used as a target for calculating the  $\Delta E^*_{ab}$ . **Using the average color reading as a target, no color readings should exceed a  $\Delta E^*_{ab}$  of 4.5.**

NOTE 4—Design professionals and building owners should be aware that certain coated glass products will yield color differences when used in adjacent vision and spandrel area conditions and when used in laminated glass constructions or on different glass thickness.

NOTE 5—Refer to manufacturer for blemishes not listed in this specification.

## 7. Keywords

7.1 coated glass; flat glass; glazing; nonuniformity; overhead glass; pyrolytic coating; spandrel glass; sputtered coatings; vacuum deposition coating; vision glass

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