

工程指示 / 要求簡箋(E.I.)

工程指示編號：EI / 6629 / 23

修改版次：-

工程編號：J - 858

工程名稱：將軍澳日出康城 11

工程項目：幕牆 配件 更換玻璃用 結構膠 DS 795 黑色 10 支 地盤用

收件人：林哥

發件人：Paul Wong

日期：14/08/2023

內容：

請提供 DS795 黑色 10 支 供地盤使用作更換玻璃之用。

附上更換方案 MC42167

請在 2023.08.30 前完成上列要求。

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 () 小羅 & 清 □ 連附件
 () 質檢部 □ 連附件 () 會計部 □ 連附件 () 報關組 □ 連附件 () 其他 _____ □ 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 積哥 □ 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 / 23

發件人簽署：

項目經理簽署：



美特鋁質有限公司
MIDI ALUMINIUM FABRICATOR LTD.

Our ref. MC/42167/858

7th Aug 2023

Gammon Construction Ltd
22/F Tower 1, The Quayside,
77 Hoi Bun Road,
Kwun Tong, Kowloon.

By Email & Hand

Attn.: Mr. Matthew Wong

Dear Sir,

**Re : Design, Supply & Installation of Curtain Wall, Glass Wall, Aluminium Window,
Aluminum Cladding & Louvers at T.K.O.T.L 70 RP, Phase 11, LOHAS Park,
Tseung Kwan O, N.T.
2nd Submission for Method Statement for Glass Replacement of Curtain Wall
(TS100)**

Regarding the captioned project, we would like to submit Method statement of
Replacement of Curtain Wall glass for you review and comment.

Thank you for your kind attention.

Yours faithfully,

MIDI ALUMINIUM FABRICATOR LTD.

Marco Tam
Executive Director

Encl

cc. Gammon	- Mr. Billy Kan / Mr. Rick Chung	(w/e)
Sino	- Mr. Terry Wan / Mr. Andy Chan / Mr. Kenneth Leung	(w/e) (Email Only)
RLP	- Ms. Marina Tong / Ms. Ginny Chau	(w/e) (Email Only)
Aecom	- Mr. Ryan Ko / Mr. Dennis Chiu / Ms. Crystal Wong	(w/e) (Email Only)

FM / MT / JL / AY / PW / jc



更換幕牆玻璃施工方案

METHOD STATEMENT

FOR REPLACEMENT OF CURTAIN WALL GLASS

工程項目: Design, Supply and Installation of Curtain Wall, Glass Wall, Alum. Window, Alum. Cladding and Alum. Louvers for Proposed Residential Development at TKOTL 70RP, Phase 11, LOHAS Park, Tseung Kwan O, Hong Kong

由: MIDI Aluminum Fabricator Ltd.

日期: 2023 年 07 月 20 日

版本: 1

內容

1. 簡介
2. 物料
3. 更換幕牆玻璃施工方案
4. 附件
 - 電動玻璃吸盤說明書 (7 頁)
 - ASTM C1036-06 (8 頁)

1. 簡介

美特鋁質有限公司(下稱 "美特")負責設計與安裝大樓鋁質工程和玻璃幕牆工程。◦金門建築有限公司 (Gammon Engineering & Construction Co. Ltd.) 下稱 "金門 / GECCL / 大判" 管理之

所有有關此地盤內之監管、施工、運輸物流及安全事項, 美特員工包括管工及其工友, 均需依據則師已經批准之圖紙、工程力學之設計數據, 大判發出的指示及此施工方案確切執行。

所有有關此工程之加工廠及物料供應商, 包括玻璃, 鋁質型材及鋁板, 均需依據則師已經批准之圖紙, 商號及工程力學之數據設計的需要確切執行。

當地盤安裝期完結, 玻璃拆除保護和清潔後, 按 ASTM C1036-06 驗收標準進行玻璃驗收, 不合乎 ASTM C1036-06 驗收標準之玻璃, 需要更換

2. 物料

- 玻璃
- Dow Corning 795 結構膠
- Dim. 0.5mm 高強鋼線

3. 更換幕牆玻璃施工方案

3.1) 更換幕牆玻璃

- 以更換幕牆項目最大的玻璃為例子說明.
- 幕牆項目最大之玻璃位於 T2A 67/F Flat F M.B.R. & T3A 67/F Flat F, M.B.R.
- 玻璃呎吋: 2150mm X 2533mm (10+12A+12 IGU)
- 玻璃重量: 311.5 KG

3.2) 施工方案

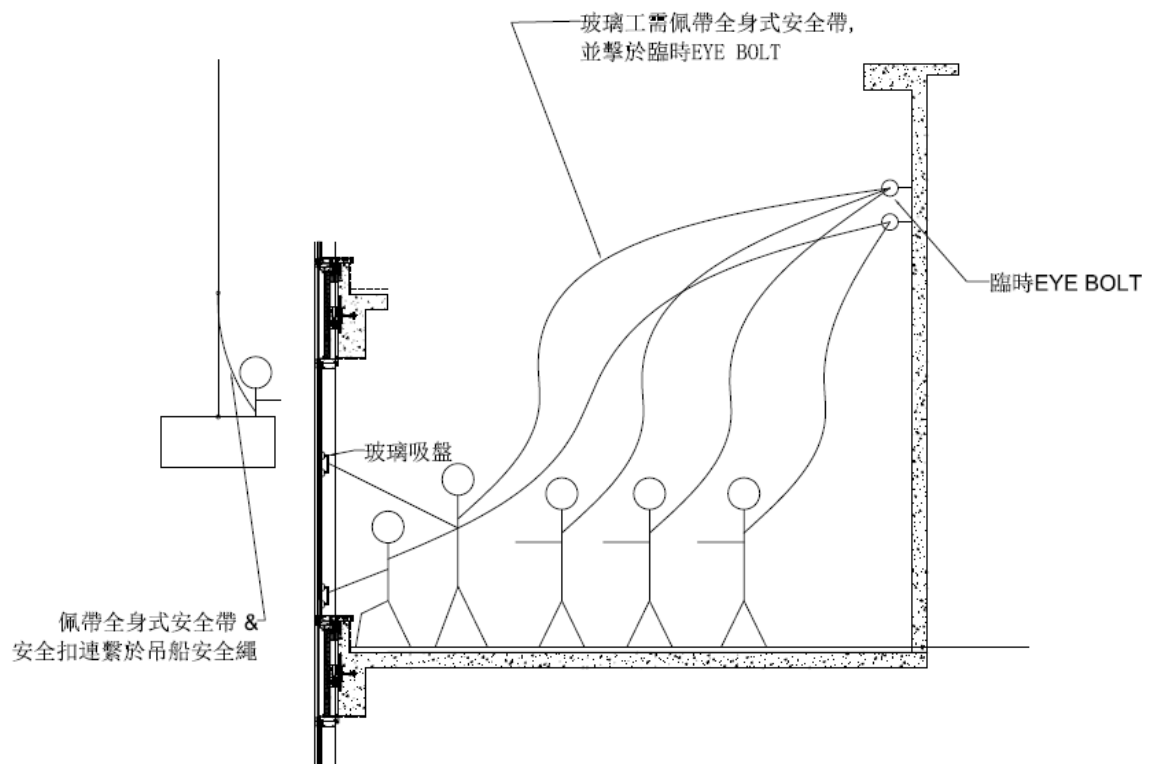
- 更換幕牆玻璃需使用永久吊船 (BMU) / 臨時船
- 施工人員: 7 人

如 IGU 外層玻璃破爛, 先將玻璃碎片清除, 將玻璃吸盤放置室內

如 IGU 內層玻璃破爛, 先將玻璃碎片清除, 將玻璃吸盤放置室外

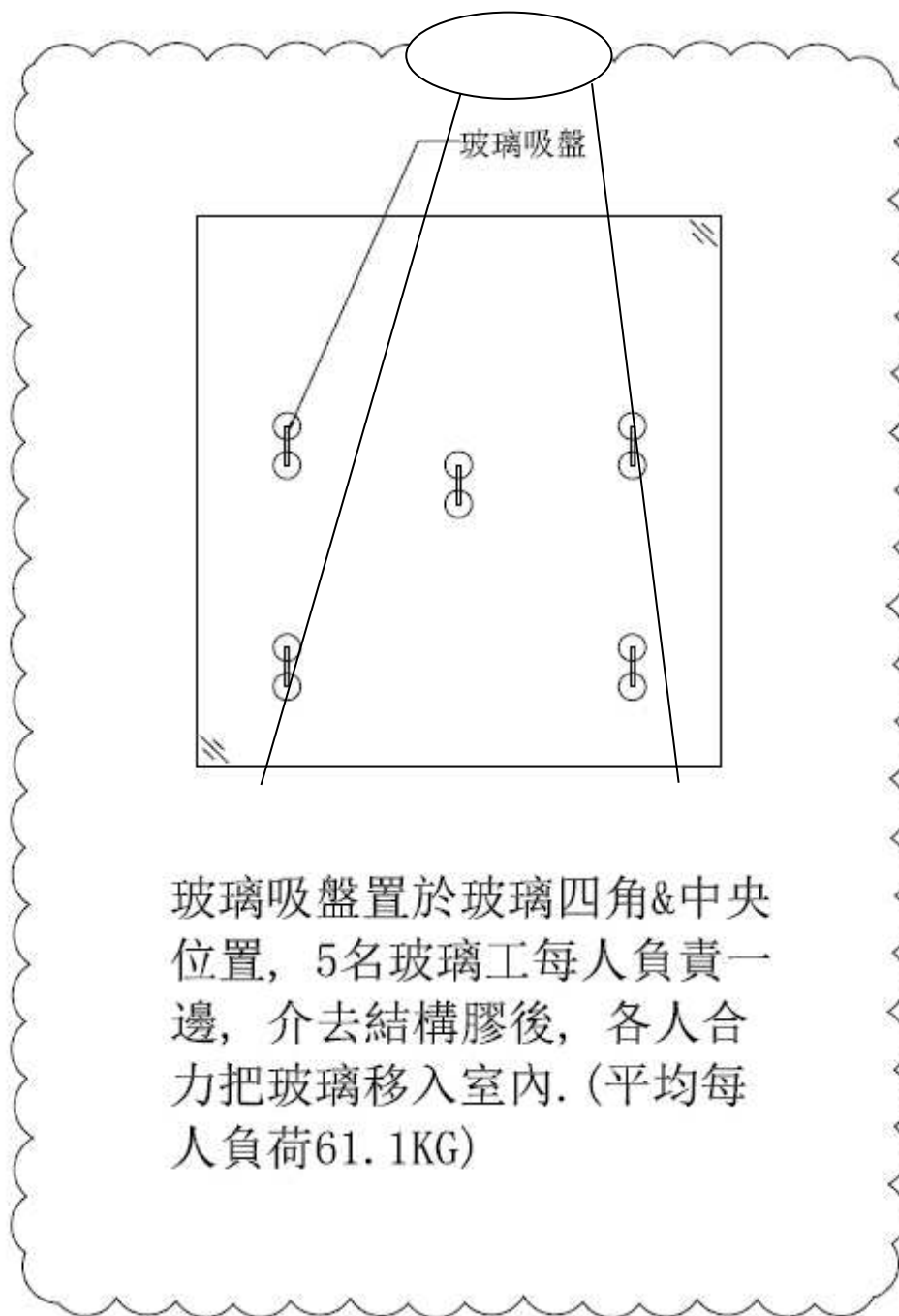
1. 室外 2 人, 操作吊船至更換玻璃之對應位置, 拆除&安裝玻璃.

2. 室內 5 人, 各人使用玻璃吸盤, 附於玻璃 4 角和中央位置, 當玻璃拆出時, 5 人合力把玻璃移入室內.



3. 設置臨時 EYE BOLT 作為穩固點, 室內工人必須把安全繩擊穩於臨時 EYE BOLT.

第二重吊運



玻璃吸盤置於玻璃四角&中央位置，5名玻璃工每人負責一邊，介去結構膠後，各人合力把玻璃移入室內。(平均每
人負荷61.1KG)

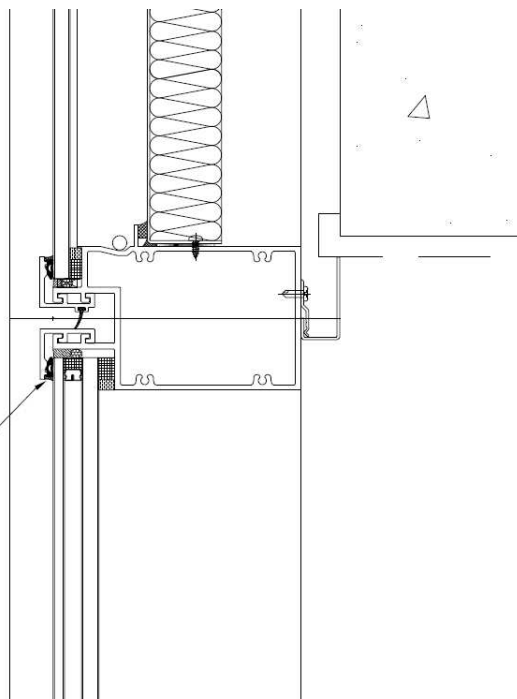
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1

- 拆除幕牆玻璃 (步驟 1~步驟 7)

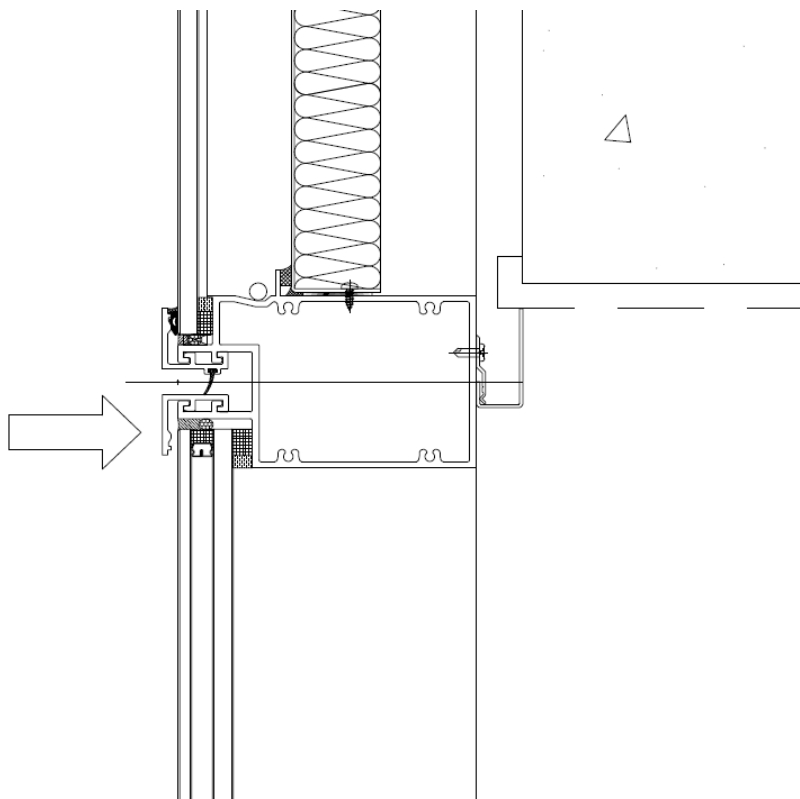
1

玻璃工於永久吊船使用
介刀，介走防水膠和膠條



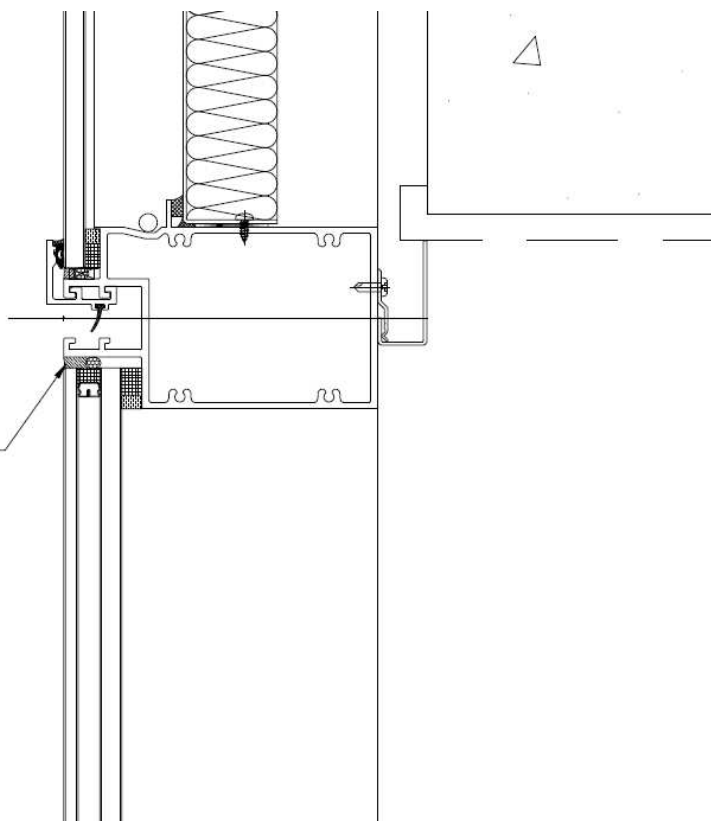
2

用力向內壓，
拆出玻璃扣線

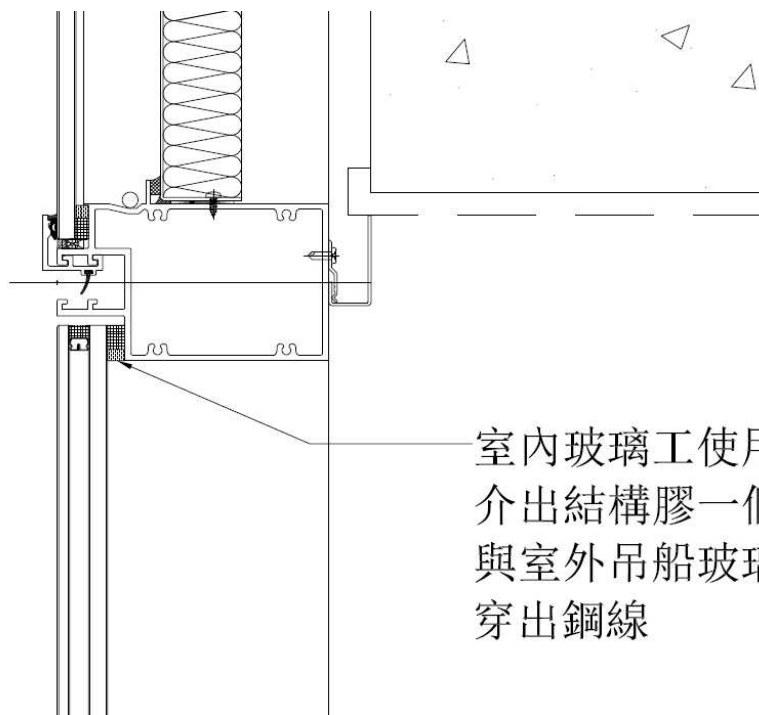


3

玻璃工於永久吊船
使用介刀，
介走防水膠

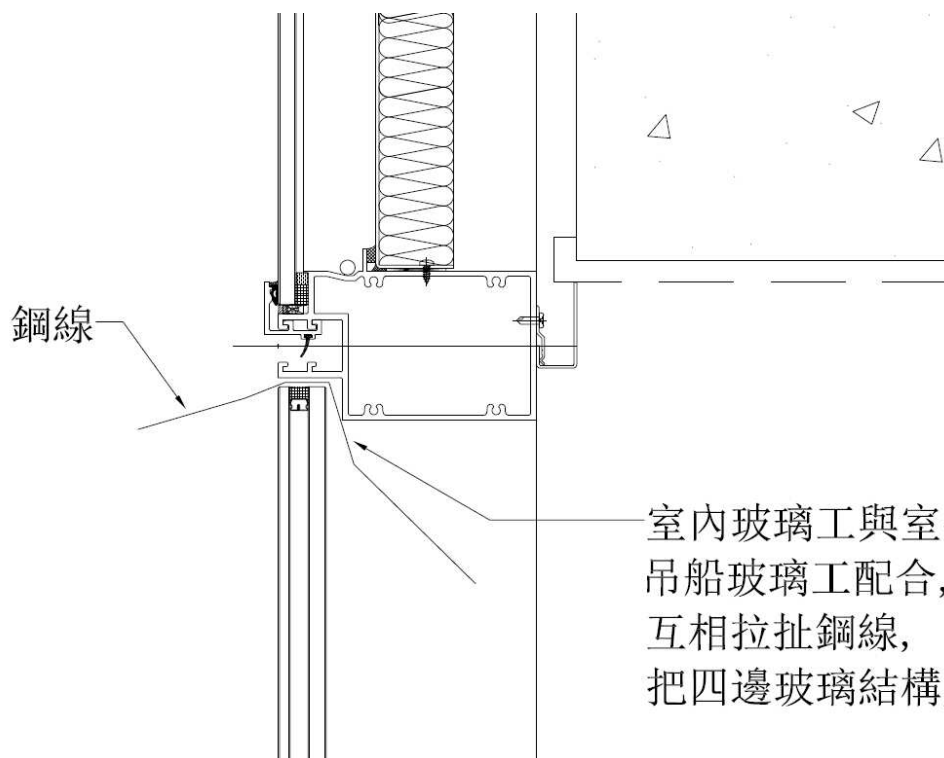


4



室內玻璃工使用介刀，
介出結構膠一個小缺口，
與室外吊船玻璃工配合，
穿出鋼線

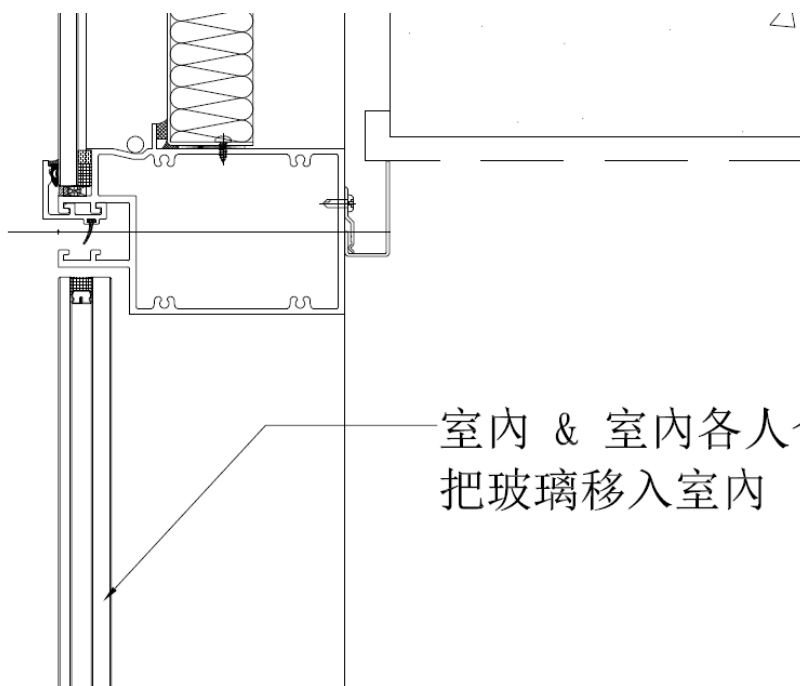
5



鋼線

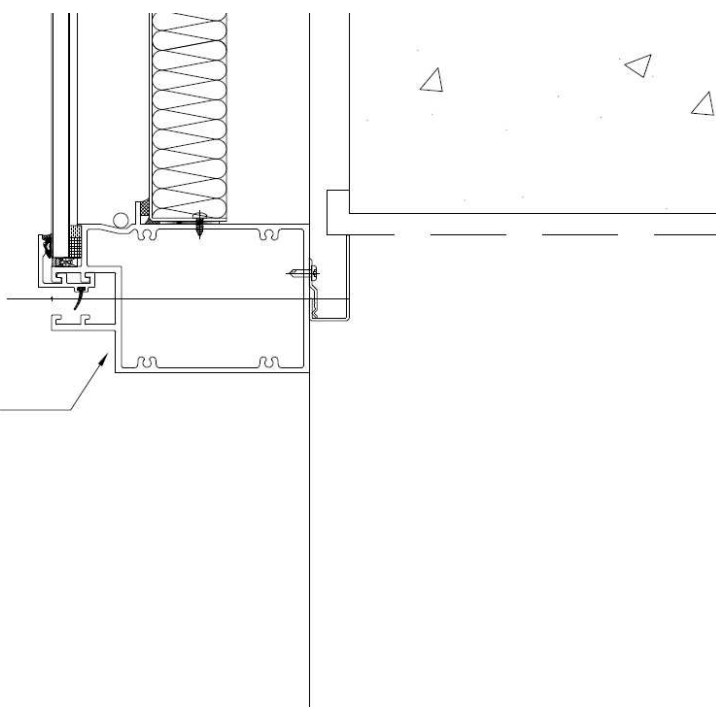
室內玻璃工與室外
吊船玻璃工配合，
互相拉扯鋼線，
把四邊玻璃結構膠介去

6



室內 & 室內各人合作，
把玻璃移入室內

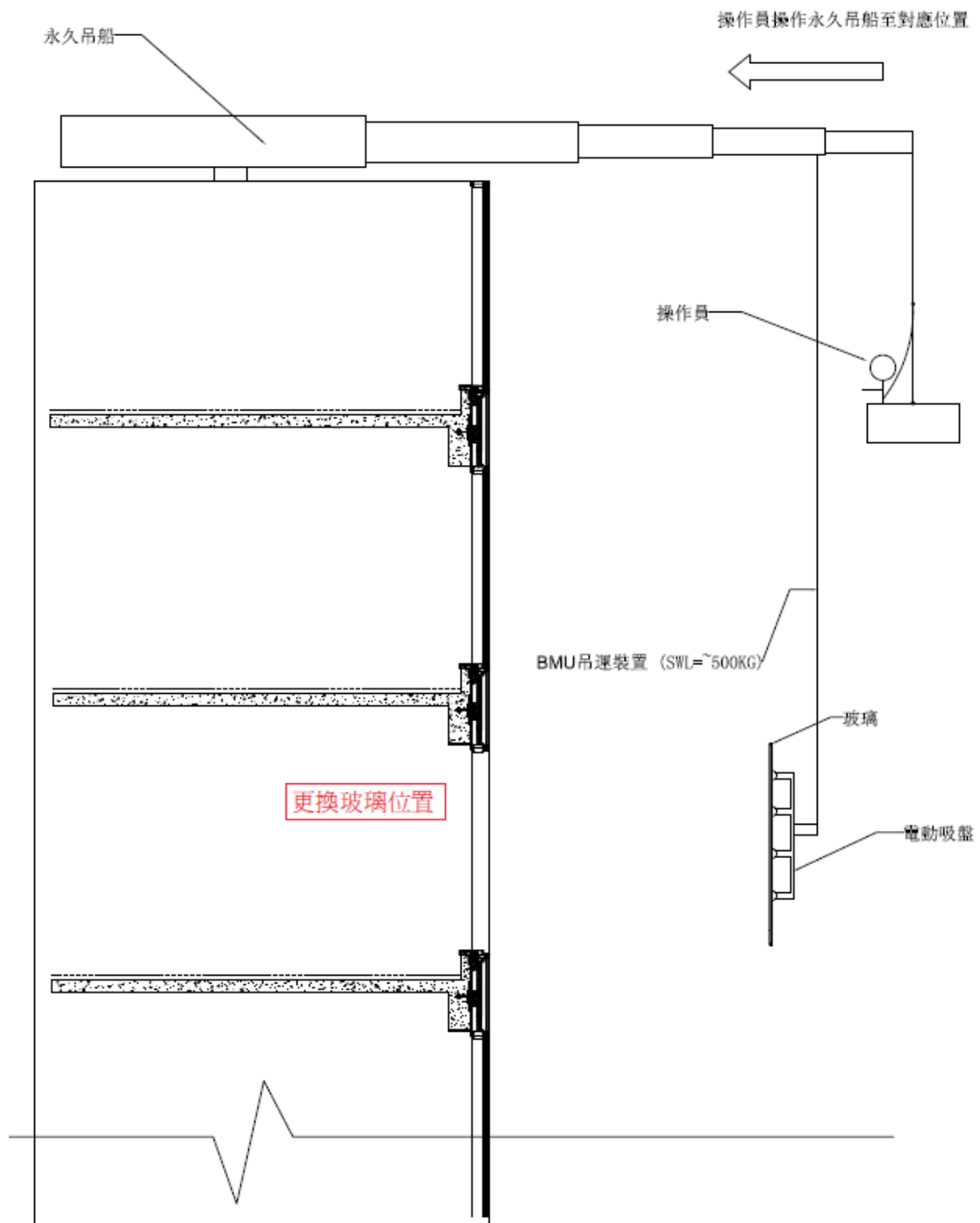
7



處理殘留的結構膠，
把殘留於鋁料的
結構膠全部清理乾淨

- 安裝玻璃

1. 使用電動玻璃吸盤裝置，吊運和安裝玻璃。
2. 使用永久吊船之吊運裝置或吊機，擊穩電動玻璃吸盤，把玻璃吊往安裝層
3. 玻璃工於吊船作業，把結構膠唧於鉛框四邊，準備安裝玻璃
4. 玻璃工操作吊船，把玻璃吊往安裝層。室內玻璃工把玻璃放置於對應位置
5. 室外吊玻璃工操作吊船往安裝位置，重新裝上玻璃扣線，把玻璃固定
6. 完工後，清理安裝位置之垃圾



4. 附件

CHANNEL LIFTERS P2 (4.5)



P2110445DC (For flat materials)

P2HV110445DC (For rough materials)

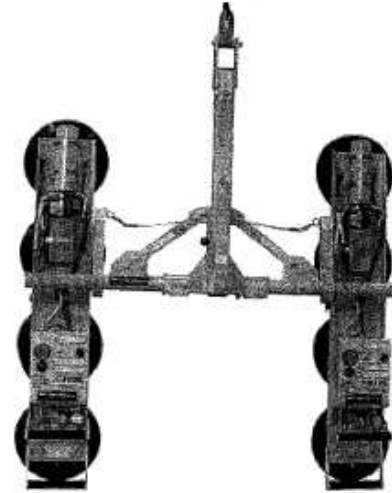
Channel Lifters are comprised of one or more Pad Channels and interchangeable Lift Frames for manually rotating and tilting materials. They may be ordered as complete units or as individual components to expand existing Channel Lifter systems. Lift Frames are available in single-channel or double-channel styles. Pad Channels can be switched from one frame to another in minutes.

Employing a unique system of interchangeable lift frames and pad channels, these Powr-Grip® vacuum lifters conserve resources while supplying maximum versatility in a variety of work settings.

Standard Pad Spread: P2110445DC 51" x 54¼" [1295 x 1378 mm]
 P2HV110445DC 50" x 53¼" [1270 x 1353 mm]
Number / Size of Pads: P2110445DC 8 / 11" [28 cm] dia. lipped
 P2HV110445DC 8 / 10" [25 cm] dia. lipped
Load Capacity: P2110445DC 1400 lbs. [635 kg]
 P2HV110445DC 1200 lbs. [545 kg]

(On smooth, nonporous surfaces.
 Please contact us for recommendations on other surfaces.)

Average Unit Weight: 171 lbs. [78 kg]
Standard Operating Power: 12 volts DC, 10 amps (for each Pad Channel)
Load Movement: Manual rotation, 180° edgewise,
 with locking in three positions.
 Manual tilt, 90° between upright and flat,
 with automatic latching in upright position.
(Units can be tilted ONLY when the lift bar is locked
 in the center position, as shown on drawings.)



- On-board battery and charger
- Battery energy gauge
- Low vacuum warning light
- Vacuum gauge
- Vacuum line filter
- Vacuum reserve tank

DESIGN STANDARDS:

(See www.powrgrip.com for more information.)
 ASME B30.20 - 2006
(BTH-1 Design Category "B", Service Class "F")
 CE
 AS 4991 - 2004

AVAILABLE OPTIONS:

- AC power system (P2110445AC, P2HV110445AC)
(Specifications may not be as listed above. Please contact us for more information.)
- Remote control system (EO8RC1)
- Movable control pendant (EO8RP)
- Dual vacuum system (EO10DVS)
- Individual pad shutoffs (CM1COWB)
- Closed cell foam pad rings (FRHV11)
(Available on P2HV1104 units only)
- Counter-Balancer (CB1)

Environmental conditions can affect product performance and longevity;
 consult the product instructions on www.powrgrip.com or contact a Technical Sales Representative for more information.
 Based on product information at time of publication.

WWW.POWRGRIP.COM



908 West Main - P.O. Box 368
 Laurel, Montana 59044 U.S.A.
 406.628.8231 (phone) - 406.628.8354 (fax)



800.548.7341

Wood's Powr-Grip products are sold through authorized dealers.

Products are manufactured under an ISO 9001 quality management system

Rev. 1.2/06-10 Spec. Sheet 4-2



COMPONENTS

PAD CHANNELS

Each channel features an independent, on-board vacuum generating system, including vacuum pump, vacuum controls and standard features as listed above.

- PC1104: (for flat materials) 4 / 11" [28 cm] dia. lipped pads
- PC1004: (for curved materials) 4 / 10" [25 cm] dia. concave pads
- PCHV1104: (for rough materials) 4 / 10" [25 cm] dia. lipped pads

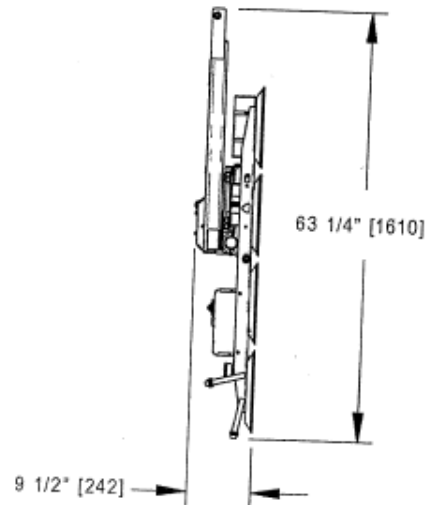
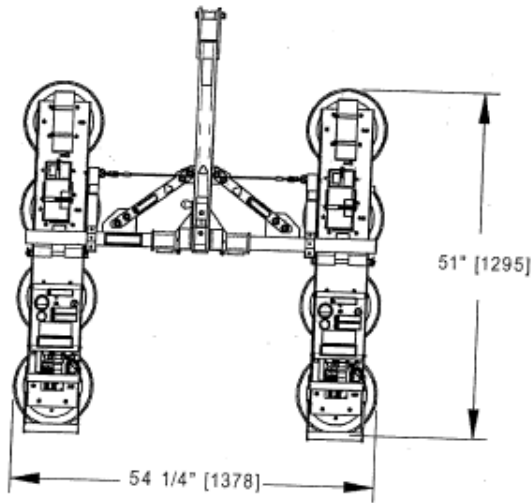
LIFT FRAMES

- PCFT1A1: For one Pad Channel
- PCFT2SA45: For two Pad Channels, approx. 4½' [1.38 m] pad spread
- PCFT2SA7: For two Pad Channels, approx. 7' [2.14 m] pad spread

INTERCHANGEABLE ARMS

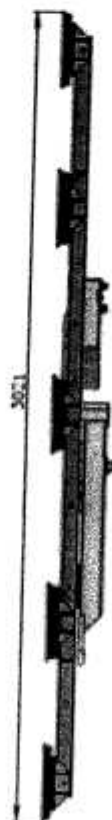
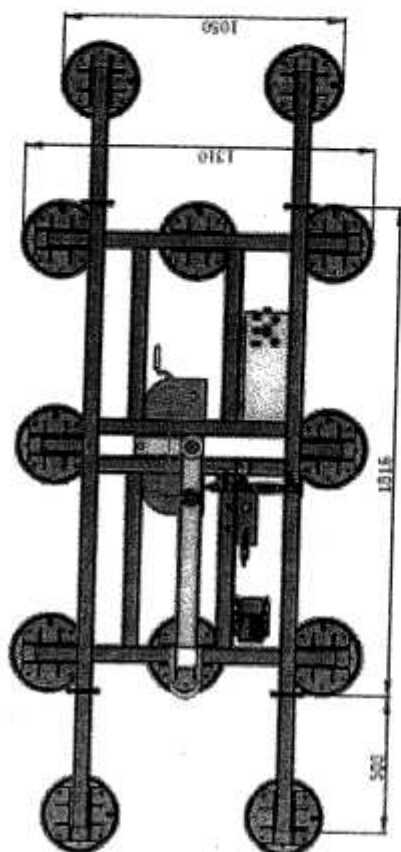
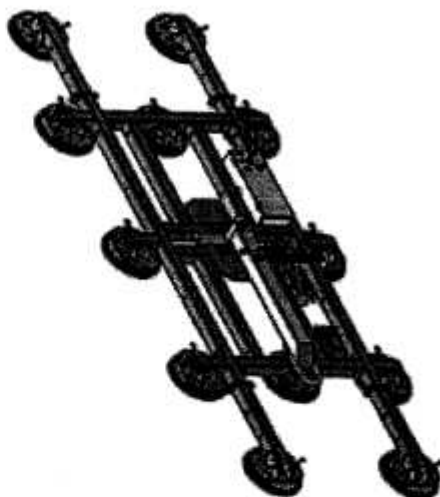
(Pad spread can be changed if optional arms are purchased)

- FA245: Optional arms convert PCFT2SA7 Lift Frame to PCFT2SA45 Lift Frame
- FA27: Optional arms convert PCFT2SA45 Lift Frame to PCFT2SA7 Lift Frame



合共 = 8 個吸盤.
總負荷 = 640 KG.

吊運玻璃吸盤



合共 = 12個吸盤
總負荷 = 1000 Kg.

Certificate No.: A18092233

FORM 4

[Reg. 5(2)&(4)]
[規例第5(2)及(4)條]

證明書號碼

表格四

Factories And Industrial Undertakings (Lifting Appliances And Lifting Gear) Regulations

CERTIFICATE OF TEST AND THOROUGH EXAMINATION OF
LIFTING APPLIANCES (EXCEPT CRANES, CRABS AND WINCHES)Form approved by the commissioner for Labour for the purposes of regulation 5(2) & (4)
of the Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations

工廠及工業經營(起重機械及起重裝置)規例

起重機械(起重機、起重滑車及絞車除外)的測試及徹底檢驗結果證明書

本表格乃由勞工處處長就工廠及工業經營(起重機械及起重裝置)規例第5(2)及(4)條的需要而認可

Name of owner and
address of installation
擁有人姓名及安裝地址遠合有限公司
觀塘倉

Description of appliance(s), type and distinguishing mark 該機械的說明、類別及識別標誌	Test load applied (tonnes) 測試時所用的負荷 (以公噸為單位)	Safe working load (tonnes) 安全操作負荷 (以公噸為單位)	Defects noted, alterations or repairs required. If none, enter "None" and state whether in safe working order 註明所發現的毛病及所需的修改或修理。 如無不妥，即填「無」字並註明是否處於安全操作狀態
Vacuum Lifter Maker: Guangzhou Cowest Machinery Equipment Limited Model: BPD-RH12 Serial No.: 07 Owner's No.: N/M Year: 2018/05/03 No. of Lifter: 12 Qty.: 1 set Max. S.W.L.: 1000 Kg	1250 Kg	1000 Kg	None In Safe Working Order

I hereby certify that on 22-09-2018 the appliance described in this certificate was tested and
 茲證明本人曾於 22-09-2018 年 月 日依照附表1的規定測試及徹底檢驗本證書所
 thoroughly examined by me in accordance with the First Schedule and that the above particulars are correct.
 指的機械，且上述各項均屬確實無訛。

Signature of Registered Professional Engineer

註冊專業工程師簽署

Chan Chor Hong, RP0406990

Qualification BEng, CEng, RPE, MHKIE, MIMechE

註冊資格

Discipline Mechanical

註冊界別

Person or firm by whom person conducting the test
and examination is employed
僱用執行此次測試及檢驗的人士或商號
Smart Star Professional Testing Services Limited
 駿星專業測試服務有限公司
 Tel: 2172 7361 Fax: 2172 6705
Date of certificate 22-09-2018

簽發日期

Any competent examiner or competent person who delivers to an owner a certificate or makes report which is to his knowledge false as to a material particular shall be guilty of an offence and shall be liable on conviction to a fine of \$200,000 and to imprisonment for 12 months.
 任何合資格檢驗員或合資格的人，如向擁有人交付他明知有任何要項屬虛假的證明書或作出他明知有任何要項屬虛假的報告，即屬犯罪；一經定罪，可處罰款二十萬元及監禁十二個月。

FORM 5
表格五
【reg.5(1)】
【規例第5(1)條】

Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations
LIFTING APPLIANCES

CERTIFICATE OF RESULTS OF THOROUGH EXAMINATIONS IN THE PRECEDING TWELVE MONTHS
Form approved by the Commissioner for Labour for the purposes of regulation 5(1) of the Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations
工廠及工業經營(起重機械及起重裝置)規例

起重機械在過往十二個月內進行的徹底檢驗結果證明書
本表格乃由勞工處處長就工廠及工業經營(起重機械及起重裝置)規例第5(1)條的需要而認可

Cert. No. : A18092233

Name of owner 擁有人姓名
遠合有限公司

Address of installation 安裝地址
觀塘倉

(1) Description of appliance, e.g. type, identification marks, maximum safe working load, etc. 該機械的說明，例如：類別，識別標誌，最高安全操作負荷等	(2) Date of examination 檢驗日期	(3) Result of examination Enter details of repairs required or defects. IF none enter "None" and state whether in safe working order. 檢驗結果，註明所需進行的修理或毛病的情況 如無不妥，即填「無」字並註明是否處於安全操作狀態
Vacuum Lifter Maker : Guangzhou Cowest Machinery Equipment Limited Model : BPD-RH12 Serial No. : 07 Owner's No. : N/M Year : 2018/05/03 No. of Lifter : 12 Qty. : 1 set Max. S.W.L. : 1000 Kg	22-09-2018	None In Safe Working Order

I hereby certify that the appliances described in this certificate was thoroughly examined by me on 22-09-2018 and that the above particulars are correct.
茲證明本人曾於 22-09-2018 日徹底檢驗本證明書所指的起重機，且上述各項均屬確實無訛。



Signature of Registered Professional Engineer
註冊專業工程師簽署
Chan Chor Hung, RP0406990
BEng, C.Eng, RPE, M.HKIE, MIMechE

Date of certificate
簽發日期
22-09-2018
Discipline
註冊界別
Mechanical

Any competent examiner or competent person who delivers to an owner a certificate or makes a report which is to his knowledge false as to a material particular shall be guilty of an offence and shall be liable on conviction to a fine of \$200,000 and to imprisonment for 12 months.
任何合資格檢驗員或合資格的人，如向擁有人交付他明知有任何要項屬虛假的證明書或作出他明知有任何要項屬虛假的報告，即屬犯罪；一經定罪，可處罰款二十萬元及監禁十二個月。

Smart Star Professional Testing Services Limited
敏星專業測試服務有限公司
Tel : 2172 7361 Fax : 2172 6705

Certificate No. : A18031330
證明書號碼FORM 4
表格四[reg. 5(2)&(4)]
[規例第5(2)及(4)條]

Factories And Industrial Undertakings (Lifting Appliances And Lifting Gear) Regulations

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本表格乃由勞工處處長就工廠及工業經營(起重機械及起重裝置)規例第5(2)及(4)條的需要而認可

Name of owner and address of installation 擁有人姓名及安裝地址	雄記玻璃工程有限公司 觀塘興業街 19-21 號 明生工業大廈 532 室		
Description of appliance(s), type and distinguishing mark 該機械的說明、類別及識別標誌	Test load applied (tonnes) 測試時所用的負荷 (以公噸為單位)	Safe working load (tonnes) 安全操作之負荷 (以公噸為單位)	Defects noted, alterations or repairs required. If none, enter "None" and state whether in safe working order 註明所發現的毛病及所備的修改或修理。 如無不妥、則填「無」字並註明是否處於安全操作狀態
Vacuum Lifter Maker : Powr-Grip Model : P2110445 Serial No. : N/M Owner's No. : PG03 No. of Lifter : 8 Max. S.W.L. : 640 Kg	800 Kg	640 Kg	None In Safe Working Order

I hereby certify that on 13-03-2018 the appliance described in this certificate was tested and
 茲證明本人曾於 13-03-2018 年 03 月 13 日依照附表 1 的規定測試及徹底檢驗本證書所
 thoroughly examined by me in accordance with the First Schedule and that the above particulars are correct.
 指之機械，且上述各項均屬確實無訛。

Signature of Registered Professional Engineer

註冊專業工程師簽署

Chan Chor Hung, RP0406990

Qualification BEng, CEng, RPE, MHKIE, MIMechE
註冊資格Discipline Mechanical
註冊界別Person or firm by whom person conducting the test
and examination is employed
僱用執行此項測試及檢驗的人士或商號J & H Consultants Ltd.
榮軒顧問服務有限公司
Mobile: 6655-1879Date of certificate 13-03-2018
簽發日期

Any competent examiner or competent person who delivers to an owner a certificate or makes report which is to his knowledge false as to a material particular shall be guilty of an offence and shall be liable on conviction to a fine of \$200,000 and to imprisonment for 12 months.
 任何合資格檢驗員或合資格的人，如向擁有人交付他明知有任何要項屬虛假的證明書或作出他明知有任何要項屬虛假的報告，即屬犯罪；一經定罪，可處罰款二十萬元及監禁十二個月。

Name of owner 擁有人姓名
 雄記玻璃工程有限公司

【reg-5(1)】
 【規例第5(1)條】

FORM 5
 表格五
Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations
LIFTING APPLIANCES

CERTIFICATE OF RESULTS OF THOROUGH EXAMINATIONS IN THE PRECEDING TWELVE MONTHS
Form approved by the Commissioner for Labour for the purposes of regulation 5(1) of the Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations
 工廠及工業經營(起重機械及起重裝置)規例

Cert. No. : A18031330

起重機械在過往十二個月內進行的徹底檢驗結果證明書

本表格乃由勞工處處長就工廠及工業經營(起重機械及起重裝置)規例第5(1)條的需要而認可

Address of installation 安裝地址
 觀塘興業街 19-21 號
 明生工業大廈 532 室

(1) Description of appliance, e.g. type, identification marks, maximum safe working load, etc. 該機械的說明, 例如: 類別, 識別標誌, 最高安全操作負荷等	(2) Date of examination 檢驗日期	(3) Result of examination Enter details of repairs required or defects. If none enter "None", and state whether in safe working order. 備錄結果, 註明所需進行的修理或毛病的詳情 如無不妥, 則填「無」字並註明是否處於安全操作狀態
Vacuum Lifter Maker : Powr-Grip Model : P2110445 Serial No. : N/M Owner's No. : PG03 No. of Lifter : 8 Max. S.W.L. : 640 Kg	13-03-2018	None In Safe Working Order

I hereby certify that the appliances described in this certificate was thoroughly examined by me on 13-03-2018 and that the above particulars are correct.
 茲證明本人曾於 年 月 日 檢驗本證明書所指的起重機, 且上述各項均屬確實無訛。



Signature of Registered Professional Engineer
 註冊專業工程師簽署
 Chan Chor Hung, IP0406903

Date of certificate 13-03-2018
 簽發日期
 Discipline 註冊界別
 Mechanical

Any competent examiner or competent person who delivers to an owner a certificate or makes a report which is to his knowledge false as to a material particular shall be guilty of an offence and shall be liable on conviction to a fine of \$200,000 and to imprisonment for 12 months.

任何合資格檢驗員或合資格的人, 如向擁有人交付他明知有任何要項屬虛偽的證明書或作出他明知有任何要項屬虛偽的報告, 即屬犯罪; 一經定罪, 可處罰款二十萬元及監禁十二個月。

J & H Consultants Ltd.
 傑軒顧問服務有限公司
 Mobile: 6655-1879



Designation: C 1036 – 06

Standard Specification for Flat Glass¹

This standard is issued under the fixed designation C 1036; 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 (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This specification covers the requirements for annealed, monolithic flat glass supplied as cut sizes or stock sheets.

1.2 This specification is applicable for laboratory and field evaluation only to the extent that such evaluation can be carried out in accordance with the test method(s) prescribed herein.

1.3 This specification covers the quality requirements of flat, transparent, clear, and tinted glass. This glass is intended to be used primarily for architectural glazing products including: coated glass, insulating glass units, laminated glass, mirrors, spandrel glass, or similar uses.

Note: 1—Reflective distortion is not addressed in this specification.

1.4 This specification covers the quality requirements of patterned or wired glasses intended to be used primarily for decorative and general glazing applications.

1.5 The values given in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

- 2.1 *ASTM Standards:*²
- C 162 Terminology of Glass and Glass Products
- 2.2 *NFRC Standard:*³

¹ 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 Oct. 15, 2006. Published November 2006. Originally approved in 1985. Last previous edition approved in 2001 as C 1036 – 01.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ National Fenestration Rating Council, 84884 Georgia Ave., Suite 320, Silver Spring, MD 20910.

NFRC 300 Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems

3. Terminology

3.1 *Definitions*—For additional definitions of terms, refer to Terminology C 162.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *associated distortion, n*—alteration of viewed images caused by variations in glass flatness or inhomogeneous portions within the glass.

3.2.2 *bevel, n*—angled surface at the edge of a lite of glass.

3.2.3 *blemish, n*—imperfection in the body or on the surface of the glass; for the purpose of this specification, blemishes are divided into two categories:

3.2.3.1 *linear blemish, n*—scratches, rubs, digs, and other similar imperfections.

3.2.3.2 *point blemish, n*—crush, knots, dirt, stones, gaseous inclusions, and other similar imperfections.

3.2.4 *chip depth, n*—measured distance of a chip from the face of the glass into the thickness.

3.2.5 *chip length, n*—distance parallel to the edge of the glass from one edge of a chip to the other.

3.2.6 *chip width, n*—perpendicular distance from the edge of the glass to the inner edge of the chip.

3.2.7 *crush, n*—lightly pitted condition with a dull gray appearance.

3.2.8 *cut size, n*—glass ordered cut to its final intended size.

3.2.9 *dig, n*—deep, short scratch.

3.2.10 *dirt, n*—small particle of foreign matter embedded in the surface of flat glass.

3.2.11 *fire crack, n*—small, sometimes microscopic fissure in the edge of wired or patterned glass.

3.2.12 *flare, n*—protrusion on the glass edge or corner of an otherwise rectangular surface.

3.2.13 *gaseous inclusion, n*—round or elongated bubble in the glass.

3.2.14 *knot, n*—inhomogeneity in the form of a vitreous lump.

3.2.15 *line, n*—fine cords or string, usually on the surface of flat glass.



TABLE 1 Allowable Shell Chip Size and Distribution (Type I Glass) for Cut Size and Stock Sheet Qualities

Description	Q1	Q2	Q3	Q4
Chip depth	Chip depth \leq 25 % of glass thickness	Chip depth \leq 50 % of glass thickness	Chip depth \leq 50 % of glass thickness	Chip depth \leq 50 % of glass thickness
Chip width ^a	Chip width \leq 25 % of glass thickness or 1.6 mm (1/16 in.) whichever is greater	Chip width \leq 50% of glass thickness or 1.6 mm (1/16 in.) whichever is greater	Chip width \leq glass thickness or 6 mm (1/4 in.) whichever is greater	Not limited
Chip length ^a	Chip length \leq 2 times the chip width	Chip length \leq 2 times the chip width	Chip length \leq 2 times the chip width	Not limited

^a Chip width and length are not applicable to stock sheets.

TABLE 2 Dimensional Tolerance for Rectangular Shapes of Type 1 Transparent, Flat Glass^a

Nominal Designation		Thickness Range				Length and Width Tolerance ^a				Squareness (D1-D2)			
SI Designation ^b mm	Traditional Designation	mm		in.		Cut Size		Stock Sheet		Cut Size		Stock Sheet	
		min	max	min	max	\pm mm	(\pm in.)	\pm mm	(\pm in.)	mm	(in.)	mm	(in.)
1.0	microslide	0.79	1.24	0.031	0.049	1.6	(1/16)	6.4	(1/4)	2.0	(5/64)	3.0	(1/8)
1.5	photo	1.27	1.78	0.05	0.07	1.6	(1/16)	6.4	(1/4)	2.0	(5/64)	3.0	(1/8)
2	picture	1.80	2.13	0.071	0.084	1.6	(1/16)	6.4	(1/4)	2.0	(5/64)	3.0	(1/8)
2.5	single	2.16	2.57	0.085	0.101	1.6	(1/16)	6.4	(1/4)	2.0	(5/64)	3.0	(1/8)
2.7	lamt	2.59	2.90	0.102	0.114	1.6	(1/16)	6.4	(1/4)	2.0	(5/64)	3.0	(1/8)
3 ^c	double, 1/8 in.	2.92	3.40	0.115	0.134	1.6	(1/16)	6.4	(1/4)	2.0	(5/64)	3.0	(1/8)
4	1/8 in.	3.78	4.19	0.149	0.165	1.6	(1/16)	6.4	(1/4)	2.0	(5/64)	3.0	(1/8)
5	3/16 in.	4.57	5.05	0.18	0.199	1.6	(1/16)	6.4	(1/4)	2.0	(5/64)	3.0	(1/8)
6	1/4 in.	5.56	6.20	0.219	0.244	1.6	(1/16)	6.4	(1/4)	2.0	(5/64)	3.0	(1/8)
8	3/8 in.	7.42	8.43	0.292	0.332	2.0	(5/64)	6.4	(1/4)	2.8	(5/64)	6.0	(1/4)
10	7/16 in.	9.02	10.31	0.355	0.406	2.4	(5/32)	6.4	(1/4)	3.4	(1/8)	6.0	(1/4)
12	1/2 in.	11.91	13.49	0.469	0.531	3.2	(1/8)	6.4	(1/4)	4.5	(11/64)	10.0	(3/8)
16	5/8 in.	15.09	16.66	0.595	0.656	4.0	(5/16)	6.4	(1/4)	5.7	(23/40)	12.0	(1/2)
19	3/4 in.	18.26	19.84	0.719	0.781	4.8	(3/16)	6.4	(1/4)	6.8	(1/4)	14.0	(9/16)
22	7/8 in.	21.44	23.01	0.844	0.906	5.6	(7/32)	6.4	(1/4)	7.9	(19/64)	16.0	(5/8)
25	1 in.	24.61	26.19	0.969	1.031	6.4	(1/4)	6.4	(1/4)	9.0	(11/32)	18.0	(3/4)

^a Length and width of cut size and stock sheets of flat glass include flares and bevels.

^b These designations apply only to ASTM International and may not reflect other international standards.

^c Within the 3.0 designation there are some applications that may require different thickness ranges such as DST. (Typical minimum thickness for DST is 0.120 in.)

3.2.16 *patterned glass, n*—rolled flat glass having a pattern on one or both surfaces.

3.2.17 *ream, n*—linear distortion as a result of nonhomogeneous layers of flat glass.

3.2.18 *rub, n*—abrasion of a glass surface producing a frosted appearance.

3.2.19 *scratch, n*—damage on a glass surface in the form of a line caused by the movement of an object across and in contact with the glass surface.

3.2.20 *shell chip, n*—circular indentation in the glass edge as a result of breakage of a small fragment out of an otherwise regular surface.

3.2.21 *stock sheets, n*—glass ordered in sizes intended to be cut to create final or cut size (that is, uncuts, intermediates, jumbos, and lehr ends).

3.2.22 *stone, n*—crystalline inclusion in glass.

3.2.23 *string, n*—straight or curled line, usually resulting from slow solution of a large grain of sand or foreign material.

3.2.24 *tinted glass, n*—glass formulated to have a uniform color throughout the glass, with the purpose of reducing glare, solar heat gain, or visible/ultraviolet (UV) transmittance.

3.2.25 *v-chip, n*—v-shaped imperfection in the edge of the glass lite.

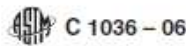


TABLE 3 Allowable Point Blemish Size and Distribution For Cut Size Qualities^A

Blemish Size mm (in.) ^{B,C,D}	Q1 Quality 1	Q2 Quality 2	Q3 Quality 3	Q4 Quality 4
< 0.50 (0.02)	Allowed ^E	Allowed ^E	Allowed	Allowed
≥ 0.50 < 0.80 ≥ (0.02) < (0.03)	Allowed with a minimum separation of 1500 mm (60 in.) ^F	Allowed with a minimum separation of 600 mm (24 in.) ^F	Allowed	Allowed
≥ 0.80 < 1.20 ≥ (0.03) < (0.05)	None allowed	Allowed with a minimum separation of 1200 mm (48 in.) ^F	Allowed	Allowed
≥ 1.20 < 1.50 ≥ (0.05) < (0.06)	None allowed	Allowed with a minimum separation of 1500 mm (60 in.) ^F	Allowed with a minimum separation of 600 mm (24 in.) ^F	Allowed
≥ 1.50 < 2.00 ≥ (0.06) < (0.08)	None allowed	None allowed	Allowed with a minimum separation of 600 mm (24 in.) ^F	Allowed
≥ 2.00 < 2.50 ≥ (0.08) < (0.10)	None allowed	None allowed	None allowed	Allowed with a minimum separation of 600 mm (24 in.) ^F
≥ 2.5 ≥ (0.10)	None allowed	None allowed	None allowed	None allowed

^A Table values are for 6.0 mm (1/4 in.) and less. For glass thicker than 6.0 mm (1/4 in.) and less than or equal to 12.0 mm (1/2 in.), they may contain proportionally larger blemishes for the same minimum separation distances. (For example, a 12-mm Q3 sample with a blemish size of ≥ 3.0 < 4.0 mm, the allowable minimum separation would be 600 mm.) Table 3 does not apply to glass thicker than 12.0 mm (1/2 in.). Allowable blemishes for glass thicker than 12.0 mm (1/2 in.) shall be determined by agreement between the buyer and the seller.

^B See 6.1.1.1 for detection of point blemishes.

^C See 6.1.1.2 for measurement of point blemishes.

^D For Q1 and Q2 only, the blemish size includes associated distortion (see 6.1.1.2).

^E Provided that normally nondetectable blemishes do not form a cluster that is detectable at 1800 mm (6 ft).

^F See 6.1.1.4 for minimum blemish separation.

TABLE 4 Point Blemishes Allowed for Stock Sheets

Glass Area	Point Blemishes Allowed
If glass area < 7 m ² (75 ft ²)	Allowable blemishes per Table 3 PLUS one rejectable point blemish
If glass area ≥ 7 m ² (75 ft ²) but < 14 m ² (150 ft ²)	Allowable blemishes per Table 3 PLUS two rejectable point blemishes
If glass area ≥ 14 m ² (150 ft ²)	Allowable blemishes per Table 3 PLUS three rejectable point blemishes

3.2.26 *vision interference angle, n*—angle at which distortion in transmission first appears (see Fig. 1).

3.2.27 *wired glass, n*—flat glass with a layer of wire mesh embedded in the glass.

4. Classification and Intended Use

NOTE 2—When referencing this specification, the user shall indicate the title and date of the specification and the type, class, quality (including cut-size or stock sheets), size, and thickness of the glass.

4.1 *Types, Classes, Forms, Qualities, and Finishes*—Glass shall be of the following types, classes, forms, qualities, and finishes, as specified:

4.1.1 *Type 1—Transparent Flat Glass:*

4.1.1.1 *Class 1—Clear:*

Quality	Typical Use
Quality-Q1 (cut-size or stock sheets)	Production of high-quality mirrors.
Quality-Q2 (cut-size or stock sheets)	Production of general use mirrors and other applications.
Quality-Q3 (cut-size or stock sheets)	Production of architectural glass products including coated, heat treated, laminated, and other select glass products.
Quality-Q4 (cut-size or stock sheets)	General glazing applications.

4.1.1.2 *Class 2—Tinted:*

Quality	Typical Use
Quality-Q1	Not available.
Quality-Q2 (cut-size or stock sheets)	Production of general use mirrors and other applications.
Quality-Q3 (cut-size or stock sheets)	Production of architectural glass products including coated, heat treated, laminated, and other select glass products.
Quality-Q4 (cut-size or stock sheets)	General glazing applications.

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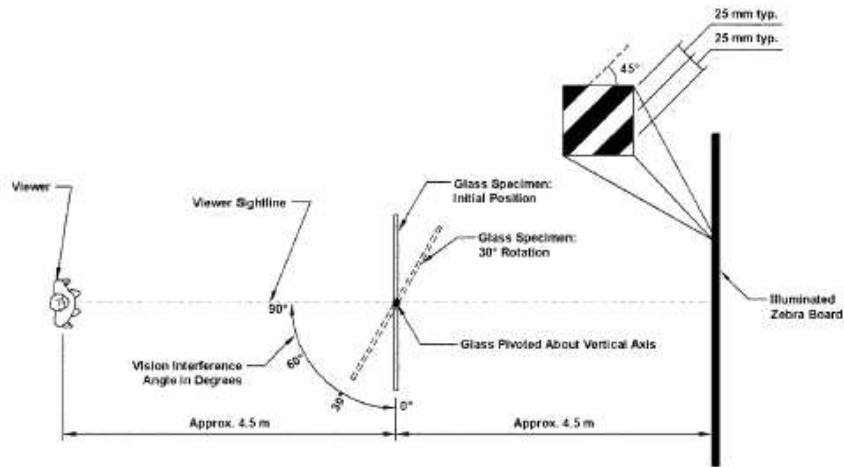


FIG. 1 Vision Interference Angle Procedure

TABLE 5 Allowable Linear Blemish Size and Distribution for Cut Size and Stock Sheet Qualities

Linear Blemish Size ^a Intensity Length	Q1 Quality 1 Distribution	Q2 Quality 2 Distribution	Q3 Quality 3 Distribution	Q4 Quality 4 Distribution
Faint ≤ 75 mm (3 in.)	Allowed with a minimum separation of 1500 mm (60 in.)	Allowed with a minimum separation of 1200 mm (48 in.)	Allowed	Allowed
Faint > 75 mm (3 in.)	None allowed	None allowed	Allowed	Allowed
Light ≤ 75 mm (3 in.)	None allowed	Allowed with a minimum separation of 1200 mm (48 in.)	Allowed	Allowed
Light > 75 mm (3 in.)	None allowed	None allowed	Allowed	Allowed
Medium ≤ 75 mm (3 in.)	None allowed	None allowed	Allowed with a minimum separation of 600 mm (24 in.)	Allowed
Medium > 75 mm (3 in.)	None allowed	None allowed	None allowed	Allowed
Heavy ≤ 150 mm (6 in.)	None allowed	None allowed	None allowed	Allowed with a minimum separation of 600 mm (24 in.)
Heavy > 150 mm (6 in.)	None allowed	None allowed	None allowed	None allowed

^a See 8.1.1.3 for detection of linear blemishes.

4.1.2 *Type II—Patterned and Wired Flat Glass:*

4.1.2.1 *Class 1—Clear*

4.1.2.2 *Class 2—Tinted:*

Quality	Typical Use
Quality-Q5	Applications in which design and aesthetic characteristics are major considerations.
Quality-Q6	Applications in which functional characteristics are a consideration and blemishes are not a major concern.
Form	Description
Form 1	Wired glass, polished both sides
Form 2	Wired glass, patterned surfaces
Form 3	Patterned glass
Finish	Description
Finish 1 (F1)	Patterned one side
Finish 2 (F2)	Patterned both sides
Mesh	Description
Mesh 1 (M1)	Diamond
Mesh 2 (M2)	Square
Mesh 3 (M3)	Parallel strand
Mesh 4 (M4)	Special
Pattern	Description
Pattern 1 (P1)	Linear
Pattern 2 (P2)	Geometric
Pattern 3 (P3)	Random
Pattern 4 (P4)	Special

5. Requirements

5.1 *Requirements for Type I (Transparent Flat Glass):*

5.1.1 *Edge Requirements*—Edges of glass shall be supplied as specified.

NOTE 3—Edges may be supplied or specified, or both, as factory cut, seamed, ground, polished, beveled, mitered, and so forth. See manufacturers' literature for more information.

5.1.1.1 *Shell Chips*—Shell chips are permitted. (See Table 1 for acceptance criteria.)

5.1.1.2 *V-Chips*—Visible V-chips are not permitted. (See 6.1.1 for viewing criteria.)

5.1.2 *Dimensional Tolerances*—Tolerances for length, width, squareness, and thickness for rectangular shapes shall be in accordance with Table 2. Nonrectangular shapes shall use

TABLE 6 Allowable Distortion (Type I Glass) for Cut Size and Stock Sheet Qualities^A

	Q1	Q2	Q3	Q4
Allowable Vision Interference Angle ^B	≥ 60°	≥ 50°	≥ 35°	≥ 25°

^A Table 6 does not apply to glass thicker than 6.0 mm (¼ in.). Allowable distortion for glass thicker than 6.0 mm (¼ in.) shall be determined by agreement between the buyer and the seller.

^B See 6.1.2 (and Fig. 1) for determining the vision interference angle.

the same thickness tolerances in Table 2. For linear dimensions of nonrectangular shapes, the length and width requirements in Table 2 shall be used. For nonlinear dimensions of nonrectangular shapes, tolerances shall be as agreed upon by the involved parties.

5.1.3 *Blemishes*—Allowable blemishes are addressed in Section 6 and in Tables 3-5.

5.1.4 *Uniformity*—For cut sizes of glass with a thickness of 6 mm (¼ in.) or less, the glass shall not vary in thickness more than 0.1 mm (0.004 in.) over a 100-mm (4-in.) length.

5.1.5 *Distortion*—Reams, strings, lines, and other allowable distortion (in transmission) are addressed in Section 6 and Table 6.

5.1.6 *Squareness*—The squareness requirements for cut glass are shown in 6.1.4 and Table 2.

5.2 *Requirements for Type II (Patterned and Wired Flat Glass):*

5.2.1 *Wired (Forms 1 and 2):*

5.2.1.1 *Form 1 (Polished Both Sides)*—Glass may contain waviness that does not interfere with vision normal to the surface.

5.2.1.2 *Form 2 (Patterned One or Both Sides)*—Glass shall not contain fire cracks.

5.2.1.3 *Dimensional Tolerances*—Tolerance for length, width, and thickness shall be in accordance with Table 7.

5.2.1.4 *Wire and Mesh*—Diameter of wires shall be from 0.43 to 0.64 mm (0.017 to 0.025 in.). Discoloration and slight distortion of wire are permissible. Wired glass may contain numerous gaseous inclusions along the wire.

(1) *Mesh M1*, diamond shall be welded. Opening in the mesh shall not exceed 32 mm (1¼ in.) between wire intersections measured across diagonal corners of the diamond.

(2) *Mesh M2*, square shall be welded. Opening in the mesh shall not exceed 16 mm (¾ in.) between wire intersections measured along a side of the square.

(3) *Mesh M3*, parallel strand, spacing shall be as specified.

(4) *Mesh M4*, as specified.

5.2.2 *Patterned (Form 3):*

5.2.2.1 *Dimensional Tolerances—Finishes F1 and F2, Patterns P1, P2, P3, and P4*—Tolerances for Patterns P1 and P2 for length, width, and thickness shall be in accordance with Table 8. Check with the manufacturer for thickness and dimensional tolerances on random Pattern P3 and special Pattern P4.

5.2.2.2 *Blemishes*—Allowable blemishes are addressed in Section 6 and in Table 9.

5.2.2.3 *Patterned glass* shall not contain fire cracks.

5.2.2.4 *Surface Pattern:*

(1) *Quality Q5*—Surface pattern shall be clear, sharp, defined, and free of obvious disfiguration that affects the appearance of the pattern.

(2) *Quality Q6*—Surface pattern shall be free of large areas of blemishes. Scattered areas of non-uniform surface and scattered surface blemishes are permissible.

NOTE 4—Patterned glass can vary slightly in both configuration and color from run to run.

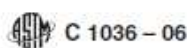


TABLE 7 Thickness and Tolerance for Wired Glass^a

SI Designation mm	Traditional Designation In.	Thickness Range mm		Thickness Range In.		Length and Width Tolerance	
		min	max	min	max	± mm	(± In.)
6	¼	6.4	7.6	0.252	0.299	4.8	(¼)
10	¾	8.76	10.03	0.303	0.390	4.8	(¾)

^a While the designation in millimetres and inches (traditional designation) are the same as shown in Table 2, actual wire glass thickness is greater than nonwire glass.

TABLE 8 Thickness and Tolerance for Patterned Glass

Designation (mm)	Traditional Designation	Thickness Range mm		Thickness Range In.		Length and Width Tolerance	
		min	max	min	max	± mm	(± In.)
2	Picture	1.90	2.14	0.071	0.084	1.6	(¼)
2.5	Single	2.15	2.90	0.085	0.114	1.6	(¼)
3	Double ½ in.	3.00	3.61	0.118	0.142	1.6	(¼)
4	⅝ in.	3.62	4.37	0.143	0.172	1.6	(¼)
5	¾ in.	4.39	5.42	0.173	0.213	1.6	(¼)
5.5	⅞ in.	5.43	5.90	0.214	0.232	2.4	(⅜)
6	⅞ in.	5.70	7.60	0.224	0.299	3.2	(½)
8	1 in.	7.61	9.10	0.300	0.358	4.0	(⅜)
10	1 ¼ in.	9.11	10.70	0.359	0.421	4.8	(⅜)
12	1 ½ in.	11.50	13.00	0.453	0.512	4.8	(⅜)

6. Test Methods

6.1 Test Methods for Type 1 Glass (Transparent Flat Glass):

6.1.1 Viewing Conditions for Blemish Detection—All visual inspections shall be made with 20/20 vision (naked eye or corrected). Place samples in the vertical position at the distance as specified in the sections following. The viewer shall look through the sample at an angle of 90° (perpendicular) to the surface using the following lighting unless otherwise specified: daylight (without direct sunlight) or other uniform diffused background lighting that simulates daylight, with a minimum luminance of 1700 lux (160 foot-candles) measured at the surface of the glass facing the light source. See Fig. 2.

6.1.1.1 Blemish Detection for Point Blemish (Knots, Dirt, Stones, Crush, Gaseous Inclusions, and Other Similar Blemishes)—Place samples at a distance of approximately 1 m (39 in.) from the viewer. If a blemish is detected, refer to Tables 3 and 4 for evaluation criteria.

6.1.1.2 Point Blemish Measurement—Point blemish size shall be determined by measuring the maximum length and perpendicular width of the blemish and calculating the average of the two dimensions. The allowable blemish sizes listed in Table 3 include associated distortion for Q1 and Q2, but Q3 and Q4 do not include associated distortion.

6.1.1.3 Detection for Linear Blemishes (Scratches, Rubs, Digs, and Other Similar Blemishes)—Place samples approximately 4 m (160 in.) from the viewer. The viewer shall move towards the specimen until a blemish is detected (if any). The distance from the viewer to glass surface when the blemish is first detectable is defined as the detection distance. Blemish

intensity is determined by comparing the detection distance to the blemish intensity chart in Table 10. Refer to Table 5 for evaluation criteria.

6.1.1.4 Blemish Distribution—To determine the separation between blemishes (see Table 3 and Table 5), measure the distance between the two closest points of the blemishes. The minimum separation distance between blemishes is determined by the minimum separation required for the larger of the two blemishes.

6.1.2 Ream, Strings, Lines, and Distortion—(See Fig. 1.) Place sample, with the direction of the draw oriented vertically, at a distance of approximately 4.5 m (15 ft) from a zebra board with a measured illumination of 215 lux (20 foot-candles) minimum with 25-mm (1-in.) black-and-white diagonal stripes. Start with the glass sample parallel with the zebra board (identified as 0°) and perpendicular with the viewer's line of sight. Rotate the specimen clockwise from zero until it reaches the angle at which the distortion appears and report that angle as the vision interference angle. Refer to Table 6 for evaluation criteria. If the direction of draw cannot be determined, then the sample shall also be viewed turning the sample 90° and evaluated as stated above. The lower of the two interference angles measured shall be used to compare to the evaluation criteria in Table 6.

6.1.3 Dimensional Measurements—To measure the length and width of cut size and stock sheets of flat glass, measure the perpendicular distance from edge to edge, including flares and bevels.



TABLE 9 Allowable Blemish Size and Distribution for Cut Size and Stock Sheet Patterned Glass^a

Blemish Size ^{b,c,d} mm (In.)	O5 Quality 5	O6 Quality 6
< 2.50 (0.10)	Allowed	Allowed
≥ 2.50 < 4.00 ≥ (0.10) < (0.16)	Allowed with a minimum separation of 600 mm (24 In.)	Allowed with a minimum separation of 600 mm (24 In.)
≥ 4.00 < 6.00 ≥ (0.16) < (0.24)	Allowed with a minimum separation of 1200 mm (48 In.)	Allowed with a minimum separation of 1200 mm (48 In.)
≥ 6.00 < 8.00 ≥ (0.24) < (0.31)	Allowed with a minimum separation of 1500 mm (60 In.)	Allowed with a minimum separation of 1500 mm (60 In.)
≥ 8.00 < 10.00 ≥ (0.31) < (0.39)	Allowed with a minimum separation of 1500 mm (60 In.)	Allowed with a minimum separation of 1500 mm (60 In.)
≥ 10.00 < 15.00 ≥ (0.39) < (0.59)	Allowed with a minimum separation of 1500 mm (60 In.)	Allowed with a minimum separation of 1500 mm (60 In.)
≥ 15.00 < 19.00 ≥ (0.59) < (0.75)	Not allowed	Allowed with a minimum separation of 1500 mm (60 In.)
> 19.00 (0.75)	Not allowed	Not allowed

^a Table values are for 6.0 mm (¼ in.) and less. For glass thicker than 6.0 mm (¼ in.) and less than or equal to 12.0 mm (½ in.), they may contain proportionally larger blemishes for the same minimum separation distances. (For example, a 12-mm O5 sample with a blemish size of ≥ 20.0 < 30.0 mm, the allowable minimum separation would be 1500 mm.) Table 9 does not apply to glass thicker than 12.0 mm (½ in.). Allowable blemishes for glass thicker than 12.0 mm (½ in.) shall be determined by agreement between the buyer and the seller.

^b See 6.1.1.1 for detection of point blemishes.

^c See 6.2.3 for measurement of point blemishes.

^d Blemishes not specifically mentioned shall be compared to the blemish they most closely resemble.

TABLE 10 Blemish Intensity Chart

Detection Distance	Blemish Intensity
Over 3.3 m (132 In.)	Heavy
3.3 to 1.01 m (132 to 40 In.)	Medium
1 to 0.2 m (39 to 8 In.)	Light
Less than 0.2 m (8 In.)	Faint

6.1.4 *Squareness Measurement*—After measuring the length and width for compliance with dimensional tolerance, measure the length of both diagonals (corner to corner). The difference in length between the two diagonals (D1–D2) shall not exceed the limits set forth in Table 2.

6.1.5 *Solar/Optical Properties*—If specified, the reflectance and transmittance of glass are to be determined in accordance with NFRC 300.

6.2 *Test Methods for Type II Glass (Wired or Patterned Glass)*:

6.2.1 *Associated Distortion and Blemish Appraisal*—Because of the variety of uses of patterned and wired glass, specific inspection guidelines are beyond the scope of this specification. Check with the manufacturer for more information.

6.2.2 *Dimensional Measurements*—To measure the length and width of cut size and stock sheets of flat glass, measure the perpendicular distance from edge to edge, including flares and

bevels. Measurements taken at any point shall meet the tolerance requirements of Table 7 or Table 8, or both.

6.2.3 *Point Blemish Measurement*—Point blemish size shall be determined by measuring the maximum length and perpendicular width of the blemish and calculating the average of the two dimensions. The allowable blemish sizes listed in Table 9 do not include associated distortion.

6.2.4 *Solar/Optical Properties*—For patterned and wired glass, consult with the manufacturer when the solar and optical properties are required.

6.2.5 *Measuring the Thickness of Patterned Glass*—The thickness of patterned glass shall be determined by measuring high point to high point to the precision and accuracy in Table 8, using a measuring device with 19-mm (¾-in.) diameter or greater contact surfaces. As an alternate method, the thickness may be measured using two bars with flat and parallel surfaces 75 mm (3 in.) long or greater × 6 mm (0.25 in.) wide or greater × 6 mm (0.25 in.) thick or greater.

7. Package Marking

7.1 Each package of glass shall be identified by the manufacturer and include the manufacturer’s name or trademark, nominal thickness, and place of manufacture.

8. Keywords

8.1 architectural glass; flat glass; glazing; patterned glass; tinted glass; transparent glass; wired glass

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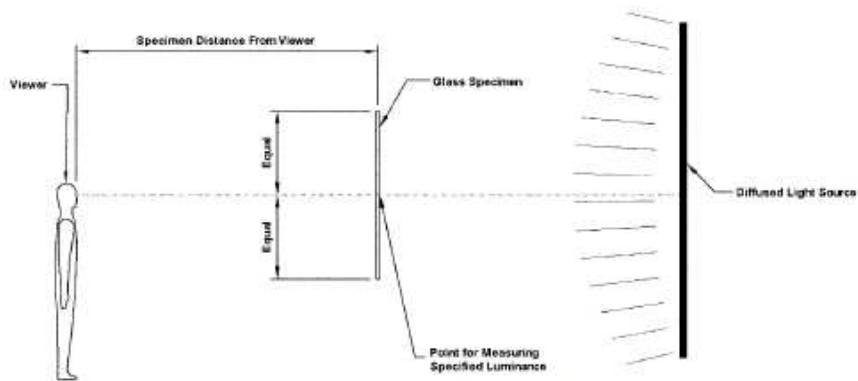


FIG. 2 Viewing Conditions for Blemish Detection

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Item	Job Task	Hazard	People Affected	Cause of Hazard	Worst Harm Due to Hazard	Existing Control Measures	P	I	S	Risk Level (RL)	Futher Control Measures	Required training	PPE Required	Action by	Residue Risk Index
1	Transportation and delivery of Glass Panel	<ul style="list-style-type: none"> Falling object 	worker / rigger / operator / public	<ol style="list-style-type: none"> LALG Failure Improper lifting method overloading adverse weather poor communication 	Fatality / public injury	<ol style="list-style-type: none"> All LALG exam by RPE with valid certificate Designated and banksman and designed lifting supervisor Walkie talkie CPI for mobile crane Lifting gears should be examined by RPE prior to use and apply colour system Guard rope should be provided 	2	5		2 x 5 Red	<ol style="list-style-type: none"> extended all outriggers of crane lorry with suitable supports. Fence off lifting zone stop lifting operation during adverse weather e.g. strong wind / heavy rainfall only the worker held with "Trade specific advance safety training" card - A12 should be allowed to carry out rigging work 	<ul style="list-style-type: none"> Induction Training Toolbox talk A12 	<ul style="list-style-type: none"> Safety gloves Safety shoes Safety helmets with chin strap Reflective vest 	<ul style="list-style-type: none"> Site Foreman Rigger Foreman 	1 x 5 Orange
1.1	Ditto	Person falling from height	worker / rigger / operator / public	1. no suitable fall protection	Fatality	1. use safety harness	2	5		2 x 5 Red	2. Use safety harness anchorage to independent life line on the hook of crane lorry during loading and unloading	ditto	Safety Harness	- Site Foreman - Rigger Foreman	1 x 5 Orange
1.2	Ditto	Trapped by Lifting materials	worker / rigger / operator / public	<ol style="list-style-type: none"> Improper training poor communication 	Fatality	<ol style="list-style-type: none"> Designated and banksman and designed lifting supervisor Walkie talkie Guard Rope 	2	5		2 x 5 Red	<ol style="list-style-type: none"> Keep good housekeeping at lifting zone Reduce materials stacking at lifting zone 	ditto	<ul style="list-style-type: none"> Safety gloves 	- Site Foreman - Rigger Foreman	1 x 5 Orange

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1.3	Ditto	Trapped by long vehicle	worker / rigger / operator / public	1. poor setting of site layout 2. Improper training for worker / banksman 3. indequate reserving equipment 4. inadequate warning notice 5. inadequate lighting	Fatality / public pedestrain	1.Designated and banksman and designed lifting supervisor 2. side mirrors and reserving CCTV in long vehicle 3. warning notice display 4. separate access for pedestrain and vehicle	2		5	2 x 5 Red	5. Designated traffic controller for vehicle moving sppecifically at pedestrain road and live traffic 6. Temporary fence off the public pedestrain if nccessary	ditto	• Reflective vest	• Site Foreman • Rigger Foreman	1 x 5 Orange
1.4	Ditto	Manual handling operation	worker / rigger / operator / public	1. heavy loading 2. improper material handling method	Sprained back or strained muscles & low back injury	1. use trolley 2. use mobile crane and crane lorry	3	3		3 x 3 Yellow	3. use mechanical aid to avoid manual lifting 4. conduct manual handling risk assessment if necessary	ditto	• Safety gloves	• Site Foreman • Rigger Foreman	1 x 3 Yellow
2	Hoisting / Storage of Materials	Materials collapse	worker	Improper stacking of materials	boldy injury	1. Metal frame / storage rack with valid certificate 2. Lifting gears should be examined by RPE prior to use and apply colour system	3	3		3 x 3 Yellow	3. Provide enough storage area for material on site. 4. Fence off storage area with proper signage 5. only the worker held with "Trade specific advance safety training" card - A12 should be allowed to carry out rigging work	Induction Training Toolbox talk	• Safety gloves	• Site Foreman • Foreman	1 x 3 Yellow

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Item	Job Task	Hazard	People Affected	Cause of Hazard	Worst Harm Due to Hazard	Existing Control Measures	P	S	Risk Level (RL)	Futher Control Measures	Required training	PPE Required	Action by	Residue Risk Index
2.1	Ditto	overload of derick crane / delivery truck	worker /pedestrain	1. overturning 2. excess S.W.L. 3. improper lifting method	Fatality / body injury	1. Compentent Operator 2. extended the outrigger	3	3	3 x 3 Yellow	3. Certified by RPE before use	ditto	ditto	<ul style="list-style-type: none"> Site Foreman Competent riggers 	1 x 3 Yellow
3	Dismantle Glass Panel	Trapped by materials	worker /rigger	1. inadequate training	body injury	1. provide training	3	3	3 x 3 Yellow	2. use guard rope	Induction Training Toolbox talk	<ul style="list-style-type: none"> Safety gloves 	<ul style="list-style-type: none"> Site Foreman Competent riggers 	1 x 3 Yellow
3.1	Ditto	person falling from height	worker /rigger	1. inadequate fall protective measures 2. poor housekeeping	Fatality	1. Safety harness 2. permit to work (outside edge fencing) 3. the independent lifelines and their anchorages should be examined by RPE prior to use and the examination certificates should be posted nearby for checking	3	5	3 x 5 Red	4. use safety harness and lanyard and anchor to independent life line 5. fence off the working area with warning sign 6. keep good housekeeping	ditto TTAD Training course certificate Registered skilled worker	<ul style="list-style-type: none"> Safety harness and lanyard 	<ul style="list-style-type: none"> Site Foreman Competent riggers 	1 x 5 Orange

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Item	Job Task	Hazard	People Affected	Cause of Hazard	Worst Harm Due to Hazard	Existing Control Measures	P	I	S	Risk Level (RL)	Futher Control Measures	Required training	PPE Required	Action by	Residue Risk Index
3.2	Ditto	Falling object	worker / rigger / operator / public	1. LALG Failure 2. Improper lifitng method 3. falling of unit / trolley 4. overloading 5. adverse weather 6.poor communication 7. poor workmanship	Fatality / public injury	1. All LALG exam by RPE with valid certificate 2.Designated and banksman and designed lifting supervisor 3. Walkie talkie 4. Lifting gears should be examined by RPE prior to use and apply colour system 5. Fence off lifting zone 6.stop lifting operation during adverse weather e.g. strong wind / heavy rainfall 7. use agreed lifting method 8. provide safety wire to tie the trolley during transportation	3		5	3 x 5 Red	9. provide specfic trainign to all workers 10. checking all the curtain wall after installation 11. installation procedures should be strictly carried out with the agreed procedures 12. loose material / equipments should be kept inside container and tie properly. Use safery rope for all hand tools. 13. only the worker held with "Trade specific advance safety training" card - A12 should be allowed to carry out rigging work	In-house rules training Counterweight winch operator (Supplier provide safety training course record & issue certificate)	<ul style="list-style-type: none"> • Safety gloves • Safety shoes • Safety helmets with chin strap • Reflective vest • Full body Harness 	<ul style="list-style-type: none"> • Site Foreman • Subcontractor / site area representative 	1 x 5 orange
3.3	Ditto	electric shock	worker / rigger	1. poor maintenance of electrical tools and equipment	Fatality	1. Only 110V hand-held power tools are allowed 2. use highly durable waterproofing electric wire 3. use waterproofing electric plugs and socket	2		5	2 x 5 Red	4. Cordless handheld tools are recommed for work at site which should be proper use on gondola and/or somewhere the power cable cannot be reach	ditto	ditto	<ul style="list-style-type: none"> • Site Foreman • Subcontractor / site area representative 	1 x 5 orange

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Item	Job Task	Hazard	People Affected	Cause of Hazard	Worst Harm Due to Hazard	Existing Control Measures	P	I	S	Risk Level (RL)	Futher Control Measures	Required training	PPE Required	Action by	Residue Risk Index
3.4	Ditto	heat stoke	worker / rigger	1. insufficient water drinking 2. inadequete rest area / shelter 3. inadequete rest time	Fatality	1. shelter 2. drinking more water 3. worker rest area 4. provide training to worker 5. arrange enough rest time to worker by frontline management	2	5		2 x 5 Red	6. Instruct uncomfortable worker to take rest proactively 7. provide washing / cooling facilities to worker especially at roof level	ditto	ditto	• Site Foreman	1 x 5 orange

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Item	Job Task	Hazard	People Affected	Cause of Hazard	Worst Harm Due to Hazard	Existing Control Measures	P	I	S	Risk Level (RL)	Futher Control Measures	Required training	PPE Required	Action by	Residue Risk Index
4	Use of Gondola	Failure of gondola	The related works / gondola operators	1. Unsafe operation	Fatality / Serious injuries	1. Ensure that all gondola should be thoroughly tested and examined by the competent examiner prior to commencement of work and should also be obtained approved certificates (Form 2 &3) 2. Ensure that all gondola should be inspected by the competent person once a week and filled the inspection result in the Form 1 3. Ensure that all gondola operators should attend the safe operation course which conducted by appointed instructors of gondola supply company. 4. Ensure that all gondola operators should be wear harness with fall arrestors to securely anchor the independent lifeline prior to commencement of work	2		5	2 x 5 Red	5. all works should be terminated under inclement weathers (Tropical Cyclones Warning Signals, Rainstorm Warning Thunderstorm Wawrning) 6. Gondola must complete the "Critical Parts Inspection" in accordance with Gammon's requiriement 7. wind speed limit 11.1m/s	Gondola Supplier provide safety training course record & issue certificate	1. PPE 2. safe use of gondola 3.safety helmet 4. helmet chinstrap 5. eye protectors 6.safety shoes 7. safety harness 8. fall arrestor 9. independent lifeline 10. reflective vest	Site Foreman SS	1 x 5 orange

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4.3	Ditto	Fall of Person	The related works / gondola operators	1. Unsafe operation	Fatality / Serious injuries	<p>1. Ensure that all gondola should be thoroughly tested and examined by the competent examiner prior to commencement of work and should also be obtained approved certificates (Form 2 &3)</p> <p>2. Ensure that all gondola should be inspected by the competent person once a week and filled the inspection result in the Form 1</p> <p>3. Ensure that all gondola operators should attend the safe operation course which conducted by appointed instructors of gondola supply company.</p> <p>4. Ensure that all gondola operators should be wear harness with fall arrestors to securely anchor the independent lifeline prior to commencement of work</p>	2	5	2 x 5 Red	<p>5. all cleaning works should be terminated under inclement weathers (Tropical Cyclones Warning Signals, Rainstorm Warning Thunderstorm Wawrning)</p> <p>6.Ensure that one independent lifeline should only be used for one operator</p>	ditto	<p>1. PPE</p> <p>2. safe use of gondola</p> <p>PPE dittoed the above</p>	Site Foreman SS	1 x 5 orange
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4.1	Ditto	Fall of object	workers and persons underneath	1. Unsafe operation	Fatality / Serious injuries	<p>1. the working zone should be fenced off with barriers and warning notices should be displayed on the prominent position to prevent unauthorized entry</p> <p>2. ensure hand rope and helmet chinstrap should be provided to all workers for hanging their hand tools and safety helmets</p> <p>3. ensure that all unused tools or materials should not be stored in the gondola, and always use the bucket to carry them</p>	2	5	2 x 5 Red	<p>4. all gondola operation should be terminated under inclement weathers (Tropical Cyclones Warning Signals, Rainstorm Warning Thunderstorm Wawrning)</p>	ditto	<p>1. PPE</p> <p>2. safe use of gondola</p> <p>3. prevention of falling objects</p> <p>PPE dittoed the above</p>	ditto	1 x 5 orange
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5	Installation of Capping works	body injuries (e.g. hand, eye, ear, or body)	The related workers	unsafe use of portable electric drill	Serious injuries	1. the designated working zone should be fenced off with barriers and warning notices should be displayed on the prominent position to prevent unauthorized entry 2. proper glove should be worn by the workers who responsible to carry out modification work for aluminium materials. 3. proper eye protectors and war plugs should be worn by related workwes during works	2	5	2 x 5 Red	4. implement the existing control	Registered skilled worker	1. PPE 2. safe use of portable electric tools 3. safety helmet 4. protective gloves 5. eye protector 6. ear protector 7. safety shoes 8. reflective vest 9. helmet chinstrap	ditto	1 x 5 orange
5.1	ditto	electric shock	ditto	ditto	fatality / Serious injuries	1. Only 110V hand-held power tools are allowed 2. an appointed qualified electrician will physically check to ensure all electric tools and machines are in good condition prior to commencement of work 2. use highly durable waterproofing electric wire 3. use waterproofing electric plugs and sockets	2	5	2 x 5 Red	4. Cordless handheld tools are recommed for work at site which should be proper use on gondola and/or somewhere the power cable cannot be reach	ditto	1. PPE 2. safe use of portable electric tools PPE dittoed the above	ditto	1 x 5 orange

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5.2	ditto	Dust hazzard	ditto	Lack of preventive measure and PPE	Serious injuries	1. Water sprayed method for drilling 2. warning sign affixed 3. wear respiration / mask 4. keep weel ventilation in the working area 5. install dust barriers if necessary	2	5	2 x 5 Red	6. implement the existing control	ditto	1. Mask PPE dittoed the above	ditto	1 x 5 orange
5.3	ditto	Noise hazzard	ditto	Lack of preventive measure and PPE	Serious injuries	1. Ear protection zone idenfied 2. warning sign affixed 3. wearing ear-plugs if exposing with noise control area 4. adopt low silence type electril dirll	2	5	2 x 5 Red	5. implement the existing control	ditto	1. Ear plug PPE dittoed the above	ditto	1 x 5 orange

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5.4	ditto	Body back injury	all workers in relation to transportation of c/w materials and bracket	improper manual handling	Serious injuries	1. ensure that tools-box talk of "safe manual handling preventing against body injury" should be conducted to all relevant workers prior to commencement of work. 2. always handle the heavy materials by mechanical equipment instead of manual handling if possible 3. employ sufficient number of workers of adequate physical capabilities for the work. 4. Appoint a competent person to carry out manual handling risk assessment and provide a briefing or training to related workers for manual handling works	2	5	2 x 5 Red	5. ensure the PPE for manual handling such as safety shoes, protective gloves should be properly used by the related workers.	Safe manual handling	1. PPE PPE dittoed the above	ditto	1 x 5 orange
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Item	Job Task	Hazard	People Affected	Cause of Hazard	Worst Harm Due to Hazard	Existing Control Measures	P	I	S	Risk Level (RL)	Futher Control Measures	Required training	PPE Required	Action by	Residue Risk Index
6	ditto	body injury by slipped, tripped, contused	ditto	insufficient lighting or poor house keeping	serious injuies	1. sufficient lighting should be properly provided at workplace 2. Ensure all materials and tools were properly stacked and all surplus materials, debris, waste or refuse should be clean off regularly in order to keep the site tidiness 3. ensure safe access to and egress from the workplace should be properly provided and maintained at all time.	2	5		2 x 5 Red	4. implement the existing control	<ul style="list-style-type: none"> • Induction Training • Toolbox talk • FCB 	1. PPE 2. House keeping PPE dittoed the above	<ul style="list-style-type: none"> • Site Foreman • Subcontractor / site area representative 	1 x 5 orange





Prepared by _____ 黃妙婷 (Safety Supervisor) ,

Endorsed by _____ Jason Leung (Project Manager)

		IMPACT SEVERITY					
		1	2	3	4	5	
		Minor	Moderate	Significant	Major	Critical	
PROBABILITY (P)	5	Very likely, almost certain: >90%	5	10	15	20	25
	4	Probable: 50 - 90%	4	8	12	16	20
	3	Possible: 10 - 50%	3	6	9	12	15
	2	Remote: 1- 10%	2	4	6	8	10
	1	Improbable: So unlikely, assumed not to occur	1	2	3	4	5
RATING CATEGORIES	Financial Impact on Gross Profit (HK\$) (C)	< \$1M	>=\$1M - < \$5M	>= \$5M - < \$20M	>=\$20M - < \$50M	>= \$50M	
	Health, Safety and Security Environment (S)	Negligible impact.	Minor injury involving first aid or minor illness. Reversible health effect.	Serious injury or illness.	Serious injuries also involving the public. Irreversible, life shortening health effect or disability. Potential prosecution. Breach in security.	A fatality or fatalities. Conviction	
			Isolated environmental impact.	Short- term adverse environmental impact requiring recovery actions. Isolated nuisance complaint	Medium term adverse environmental impact. Potential prosecution. Complaints concerning pollution.	Prolonged adverse effect on the environment. Conviction	
	Project Delivery Quality Reputation (D)	Negligible impact.	Late or inconsistent delivery of client/ business requirements.	Delays to programme result in only partial delivery to client requirements.	Irrecoverable delay to project. Threat to future trading with core client and or to business objectives.	Association with high profile, sensitive issues / project / service provided has a critical impact on client / business interests.	
Minor remedial works.			Complaints and uncertainties about product quality and services provided.	Major complaint, defect or work rejected.	Quality of product provided is considered to have a critical impact on client / business interests.		
Client and stakeholder relationships strained.			Client dissatisfaction and damaged stakeholder relationships.	Criticism by local media. Major impact on goodwill and stakeholder relationships.	Threat to business survival and Group credibility.		

Risk Index Guide

Conditions for Tolerance

-  Extreme - Unacceptable risk, must use alternative method or introduce additional controls to reduce risk rating.
-  Major - Only acceptable if no other method is viable, with identified control measures in place and additional supervision / monitoring.
-  Moderate - Acceptable with identified control measures in place and supervising / monitoring.
-  Minor - Acceptable with identified control measures in place.

} Significant Risks to be reported in Monthly PM meetings for discussion and agreement by referring to Section 4.6 of PDS/15.