NOTICE TO BIDDERS
ADDENDUM #2
Bid 102-22 Athletics Stadiums Project

Palomar Community College District

The following changes, additions, deletions, clarifications or corrections shall become part of the Bid & Contract Documents for the above listed project. This Addendum #2 forms a part of the contract document and modifies the original bidding documents. Acknowledge receipt of Addendum #2 in the space provided on the bid form. Failure to do so may subject bidder to disqualification.

ADDITIONAL DOCUMENTS – Separate attachments

- Geotechnical and Geologic Hazard Investigation Report
- Substitution Form

REQUESTS FOR SUBSITUTION

Please see attached *(Exhibit A & B)* and below a request to substitute the elevator per the specifications with the Kone Monospace 300.

KONE will be happy to provide an alternate MRL (machine room-less) traction elevator, in lieu of the hydraulic elevator specified.
Attached please find the catalog for the KONE MonoSpace 300 product. The advantages of the MRL vs. hydraulic include the following:

1.) up to 70% more efficient
2.) No requirement for equipment room on first landing next to the elevator shaft, the CA state required control room can be located anywhere in the building, creating more usable space for the building.
3.) smaller electrical switch gear and wiring reducing construction costs.
4.) no requirements for sprinklers in the hoistway, reducing construction costs.
5.) lower life cycle costs over the life of the elevator for reduced maintenance visits and costs
6.) No hydraulic fluid in the building, eliminating the smell and environmental impacts of the hydraulic fluid.
7.) Smoother ride
8.) specified 3500 Lb capacity will fit in hoistway as shown on plans

RESPONSE: This substitution request is rejected as it is not submitted with the necessary back up documentation as outlined in 01 60 00 Section1.06B (including the necessary side-by-side comparison). A revised substitution request may be re-submitted with the required information on the form included in this Addendum #2 (See response to Request for Information Questions #4).

REQUESTS FOR INFORMATION - QUESTIONS AND RESPONSES

(1) QUESTION: Request is for each bidder to submit with the bid additional information showing their minimum required experience in the construction of athletic fields/venues by submitting a list of recently completed projects with reference and contact information per the following:

Minimum of 5 projects completed within the last 7 years consisting of athletic fields/venues constructed for any of the following entities:

i. CSU or UC system Universities
ii. California Community Colleges
iii. High Schools located in California

Can construction of public athletic fields/venues/parks for California cities be included in this similar experience? Can construction of athletic fields/venues for Middle Schools located in California be included as similar experience?

RESPONSE: Athletic Fields for parks for the State of California or a City are NOT acceptable for relevant experience. Athletic Fields for Middle Schools are also NOT acceptable as relevant experience.

(2) QUESTION: Will the District be releasing the soils report for this project soon?

RESPONSE: Yes, The Geotechnical Report for the Athletics Stadiums Project is included in this Addendum #2

(3) QUESTION: Regarding the requirement of a minimum of '5 projects completed within the last 7 years' etc. We have 4 projects that meet this requirement in terms of the entities required. We have an additional project that consists of a Joint use field with artificial turf for multi-sport use at a middle school (also available for public use in the evenings/weekends). We request that you find this project acceptable in meeting your requirements.

RESPONSE: See response to Requests for Information - Question No. 1 above.

(4) QUESTION: It was stated at the job walk that all Substitution requests must be submitted on the 'Substitution request form'. However there does not appear to be one provided in the Specs/Bid docs. Please provide the Substitution request form.

RESPONSE: A form which can be utilized for substitution requests is included in this Addendum #2 for use by bidders.

Please see below additional RFI's regarding the Glazing (see attached Exhibit "C" document / details for reference for questions 5 – 10):

(5) QUESTION: Regarding Spec section 08 80 00-05 2.02 A 'Glass Materials'; Is GL-2 Spandrel glazing or Vision glazing? (Foil faced rigid insulation will be visible, if vision glass).

RESPONSE: GL-2 is a vision glazed panel with a shadow box behind. The rigid insulation required in the specifications shall be adhered to the back side of the shadow box metal panel, towards the inside of the building, not visible from the exterior.

(6) QUESTION: Regarding Spec section 08 80 00-05 2.02 A 'Glass Materials'; Will a drain cavity be required at GL-2? If yes, please provide detail for bidding subs to follow.

RESPONSE: Drain cavities are required where indicated in the specifications. The entire curtainwall system, regardless of glazing type shall be tested per Specification

Section 08 44 14. Drain cavities, where required shall be part of the Curtainwall deferred approval shop drawings.

(7) QUESTION: Regarding Spec section 08 80 00-05 2.02 A 'Glass Materials'; if a drain cavity is required at GL-2, will the GL-2 portion of the curtainwall be included in the air & water site testing?

RESPONSE: The entire curtainwall system shall be tested per Specification Section 08 44 14.

(8) QUESTION: Regarding Spec section 08 80 00-05 2.02 A 'Glass Materials'; if a drain cavity is required at GL-2, have the drain cavities been factored into testing requirement performance levels?

RESPONSE: The entire curtainwall system shall be tested per Specification Section 08 44 14.

(9) QUESTION: Regarding Spec section 08 80 00-05 2.02 A 'Glass Materials'; are the shadow box referenced in GL-2 & Composite panel referenced in the curtainwall detail on A10.22 different items?

RESPONSE: Correct. The "Composite panel" referenced in all Curtainwall Details shall be interpreted to mean the "Shadow box" as outlined in GL-2.

(10) QUESTION: Please confirm the rigid insulation is to go between the glass & shadow box? Curtainwall details on A10.22 show composite panels fastened to int surface of curtainwall. Rigid "foil faced insulation would be visible through vision glass, if between glass & shadowbox.

RESPONSE: The rigid insulation is to be installed on the back side of the shadowbox between the metal face and the interior of the building, therefore not visible from the exterior.

(11) QUESTION: Hardware set 23B-AD lists SFH101-A & 23-AD lists SFH101-B. Neither of these set is listed in specification section 08 71 00. Please provide.

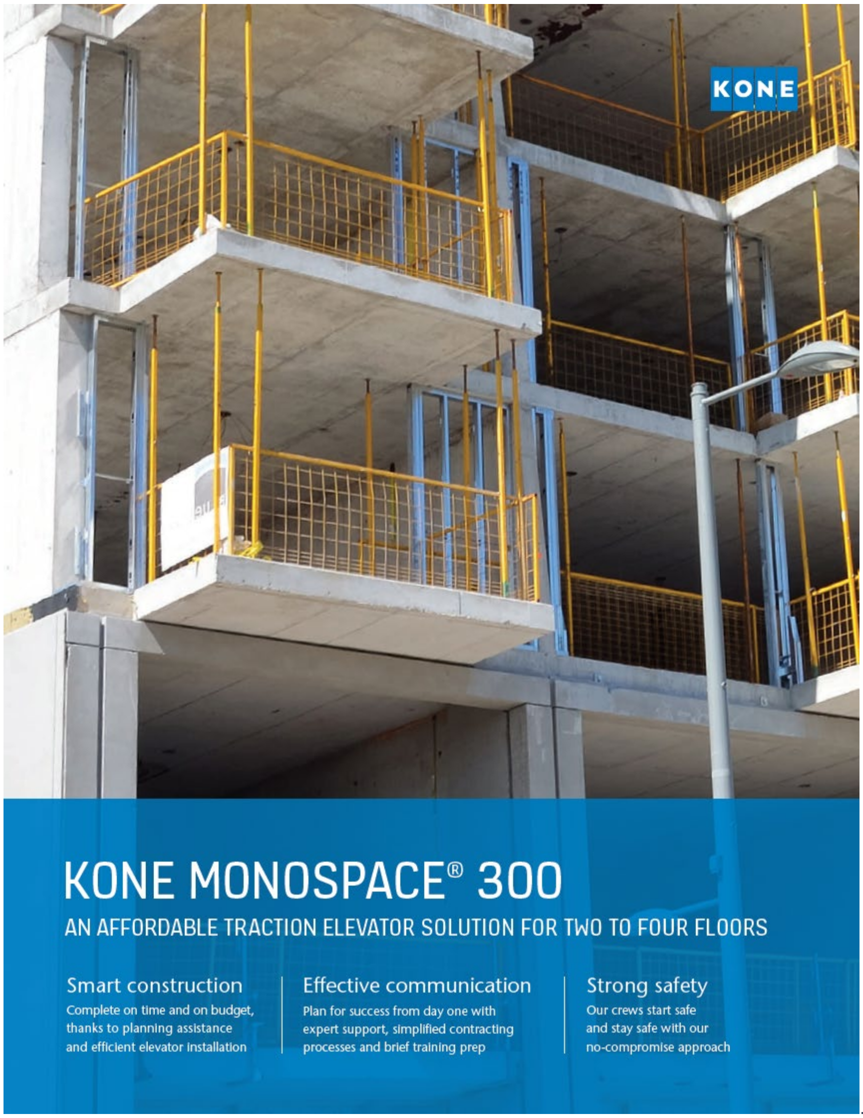
RESPONSE: Sheet A9.11 shall be updated to read that Door SFH101-A be updated to be Hardware Group 10A-AD, and Door SFH101-B shall be updated to be Hardware Group 10-AD.

END OF ADDENDUM #2

Date Issued: Jan 31, 2022

Ambur Borth, Assistant Superintendent
Vice President Finance & Administrative Services
Palomar Community College District

Exhibit "A"


KONE
KONE MONOSPACE® 300
AN AFFORDABLE TRACTION ELEVATOR SOLUTION FOR TWO TO FOUR FLOORS
Smart construction
Complete on time and on budget, thanks to planning assistance and efficient elevator installation
Effective communication
Plan for success from day one with expert support, simplified contracting processes and brief training prep
Strong safety
Our crews start safe and stay safe with our no-compromise approach

KONE MONOSPACE® 300

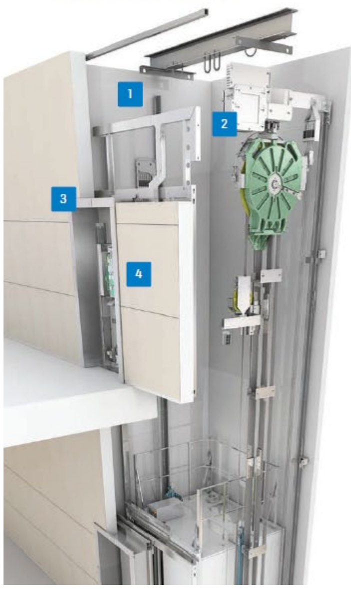
Low-rise construction often comes with high stakes. When you need a space-saving, affordable elevator solution that provides refined installation methods of elevator components, and helps to deliver a complete and on time installation, look no further. Optimized for two to four-story buildings, the KONE MonoSpace 300 has the key things you need to succeed: proven technology, smooth installation and a team with an exemplary safety record.

SMART CONSTRUCTION

With no need for temporary work platforms, block-outs, machine rooms, you save time and money along with minimizing coordination with other trades. You do not need a separate control space, as the elevator controller is located in the door jamb of the top landing. For single-car installations, hall fixtures can be integrated into the elevator doorframe to reduce complexity.

KONE 24/7 CONNECTED SERVICES

A KONE Care elevator maintenance agreement paves the way for the benefits of KONE 24/7 Connected Services. This solution allows our teams to better predict issues and helps us take action before a potential shutdown occurs. For our customers and building tenants, KONE 24/7 Connected Services helps deliver full transparency – with upgraded reporting and communications on maintenance work – and peace of mind.



EFFECTIVE COMMUNICATION

We're part of your team from day one, helping you plan for success with planning, budgeting, simplified contracting, project management and elevator construction. We provide brief, web-based training to make sure your team is properly prepared for the elevator installation.

STRONG SAFETY

With KONE you can rest assured that our work will start safe and stay safe. We make no compromises when it comes to safety and our exemplary safety record helps to inspire confidence and peace of mind. Our installation technicians hold weekly Toolbox Talks to discuss safety topics, and each and every one of our crews is required to demonstrate their safety procedure competencies in quarterly audit inspections.

INNOVATIVE DESIGN

1. **KONE hoist beam and pit ladder**
   Project-specific hoist beam and a pit ladder are provided by KONE and delivered to the site at the right time.
2. **KONE EcoDisc® motor**
   Because it's located at the top of the hoistway, the eco-efficient hoisting mechanism is not susceptible to ground flood damage.
3. **Jamb-mounted fixtures**
   Signalization and landing call buttons are quick and easy to install, speeding up the handover process.
4. **Integrated Control Solution**
   All control and logic components fit inside the top-floor wall, freeing up valuable building space.

Copyright © 2020 KONE Inc. All rights reserved. All examples and images are for illustration purposes only. Actual data, information, and results may vary.

SF3065 - Rev 0920
Printed in the U.S.

KONE

KONE MONOSPACE® 300

CONFIGURATION & DIMENSIONS

Max Travel
48 ft.

Max Landings
4

Speed
150 fpm (.75 m/s)

Car Height F
7 ft. 6 in. (2286 mm)

Entrance Height G
7 ft. (2134 mm)

Visit kone.us for the latest project-specific details, BIM, CAD drawings, CSI specifications, electrical data, reaction loads and building access requirements.

				A	A SEISMIC	B	B SEISMIC	C	D	E	
		CAPACITY LBS. (kg)	OPENING TYPE[10]	HOISTWAY WIDTH (mm)	HOISTWAY WIDTH (mm)	HOISTWAY DEPTH (mm)	HOISTWAY DEPTH (mm)	INTERIOR WIDTH (mm)	INTERIOR DEPTH (mm)	DOOR WIDTH (mm)	STRETCHER ACCOMMODATION[9]
FRONT OPENING	PASSENGER	2000 (907)	Side Opening	7'-4" (2235)	7'-9" (2362)	5'-9" (1753)	5'-9 1/2" (1766)	5'-8 7/8" (1750)	4'-4 7/16" (1332)	3'-0" (914)	NO
		2500 (1134)	Side Opening or Center Opening	8'-4" (2540)	8'-9" (2667)	5'-9" (1753)	5'-9 1/2" (1766)	6'-8 7/8" (2055)	4'-4 7/16" (1332)	3'-6" (1067)	NO
		3000 (1361)	Side Opening or Center Opening	8'-4" (2540)	8'-7" (2616)	6'-3" (1905)	6'-3 1/2" (1918)	6'-5 5/8" (1971)	5'-7/16" (1536)	3'-6" (1067)	NO
		3500 (1588)	Side Opening or Center Opening	8'-4" (2540)	8'-7" (2616)	6'-11" (2108)	6'-11" (2108)	6'-5 5/8" (1971)	5'-6 5/8" (1693)	3'-6" (1067)	YES[9]
FRONT & REVERSE OPENING	PASSENGER	2000 (907)	Side Opening	7'-4" (2235)	7'-9" (2362)	6'-3 3/4" (1924)	6'-3 3/4" (1924)	5'-8 7/8" (1750)	4'-4 7/16" (1332)	3'-0" (914)	NO
		2500 (1134)	Side Opening or Center Opening	8'-4" (2540)	8'-9" (2667)	6'-3 3/4" (1924)	6'-3 3/4" (1924)	6'-8 7/8" (2055)	4'-4 7/16" (1332)	3'-6" (1067)	NO
		3000 (1361)	Side Opening or Center Opening	8'-4" (2540)	8'-7" (2616)	6'-11 3/4" (2127)	6'-11 3/4" (2127)	6'-5 5/8" (1971)	5'-7/16" (1536)	3'-6" (1067)	NO
		3500 (1588)	Side Opening or Center Opening	8'-4" (2540)	8'-7" (2616)	7'-6" (2286)	7'-6" (2284)	6'-5 5/8" (1971)	5'-6 5/8" (1693)	3'-6" (1067)	NO

CLEAR OVERHEAD H AND PIT DEPTH I

CAPACITY LBS. (kg)	150 FPM (.75 m/s)	
	Pit Depth (mm)	Clear Overhead (mm)
2000 to 3500 (907 to 1588)	5'-0" (1524)	11'-8" (3556)[1]

CONTROL SPACE

		J	K	L
CAPACITY LBS. (kg)	CONTROLLER SPACE	WIDTH (mm)	DEPTH (mm)	DOOR WIDTH (mm)
2000 to 3500 (907 to 1588)	Remote Closet	4'-1" (1245)	1'-8" (508)	3'-6" (1067)
2000 to 3500 (907 to 1588)	Adjacent or Remote Room	5'-0" (1524)	Dimension (B)	3'-0" (914)

Notes

(1) An 8” inch tall hoist beam is required for installation (by others). Dimension H reflects 11’-8” clearance under hoist beam. This clearance is available with a flush or moveable hoist beam.

(2) If an EBD (Emergency Battery Device) is required please contact your KONE Sales Professional for further detail regarding dimensions, J and L.

(3) The published hoistway A dimensions represent the minimum clear inside requirements. Construction efficiencies can be realized by increasing these dimensions by up to 2” (51 mm).

(4) For pit depths less than 5’ (1524 mm) please contact a KONE Sales Professional.

(5) The published interior width C and depth D dimensions represent the minimum clear inside requirements without raised panels. For interior width C and Depth D dimensions with raised panels please contact a KONE sales Professional.

(6) A pit ladder wall pocket may be required. Please contact a KONE sales Professional.

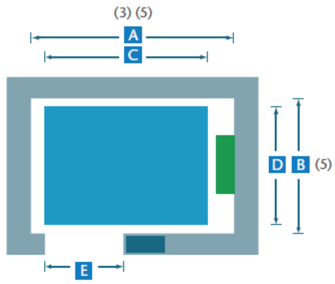
(7) Contact your local KONE Sales Professional regarding local code variations when utilizing the integrated remote closet options.

(8) If IBC (International Building Code) 2018 or ASME A17.1-2019/CSA B44-19 code is applicable, contact your local sales professional for controller space configurations.

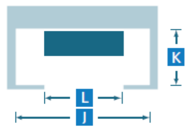
(9) Stretcher accessibility based only for side opening type and International / California Building Code specified 24 inch by 84 inch stretcher with 5 inch degree radius corners. Customers in Canada, please review stretcher compliance with your local sales representatives.

(10) All KONE MonoSpace 300 elevators utilize a single speed door.

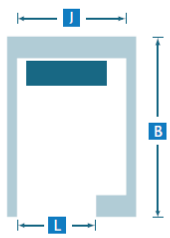
Plan views



Integrated Control Solution (standard)

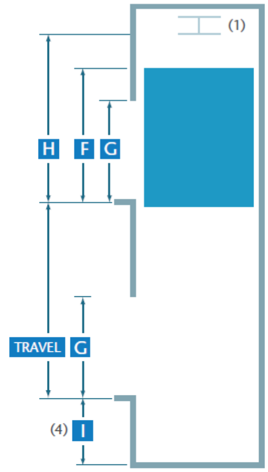


Remote Control Closet
(option 1)
(2)(7)



Adjacent or
Remote Control Room
(option 2)
(2)(7)

Section view



KONE

kone.us

Copyright © 2021 KONE Inc. This publication is for general informational purposes only. KONE Inc. reserves the right to alter the product design and specifications without prior notice. Minor differences between printed and actual colors may exist. KONE MonoSpace® and KONE MiniSpace™ are trademarks or registered trademarks of KONE Corporation.

SF3071 - Rev 0421
Printed in the U.S.

EXHIBIT "C"

Long Glazing & Doors
14402 Bond Ct.
El Cajon, CA 92021
Phone # 619 456-9997
Email:
Contact:

LONG GLAZING & DOORS

REQUEST FOR INFORMATION

PROJECT NAME	RFI NUMBER	DATE OF REQUEST
PALOMAR COLLEGE- ATHLETICS BLDG	507-001	1/27/2022
PROJECT LOCATION	PROJECT ID	DRAWING ID
1140 WEST MISSION RD, SAN MARCOS, CA 92069	#507	1/18/2022
RFI OVERVIEW	SECTION(S) REFERENCED	

REQUEST / CLARIFICATION REQUIRED

2.02 GLASS MATERIALS

A. GL2: Shadow Box at Vision Glass: Screw attach formed sheet metal within mullion frame behind insulating glass, seal tight surrounding edges to prevent migration of warm moist air to inside shadow box. Color to match adjacent aluminum. Drain cavity to exterior to prevent trapped condensation water. Provide rigid insulation behind sheet metal, insulation on interior side with foil faced surface.

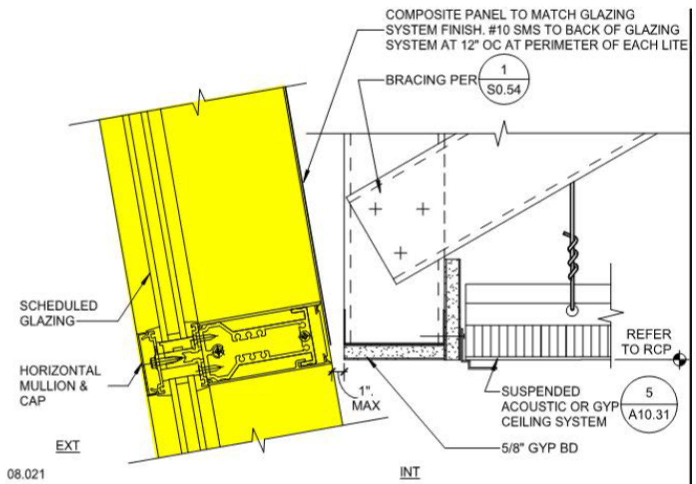
1. Mockup: provide mockup of shadow box for approval by Architect.

Questions	
1	Is GL-2 Spandrel glazing or Vision glazing? (Foil faced rigid insulation will be visible, if vision glass)
2a	Will a drain cavity be rquired at GL-2?
2b	If yes, please provide detail for bidding subs to follow.
2c	If yes, will the GL-2 portion of the curtainwall be included in the air & water site testing?
2d	If yes, have the drain cavities been factored into testing requirement perfromance levels?
3	Is the shadow box reference in GL-2 & Composite panel reference in the curtainwall detail on A10.22 different items?
4	Is the rigid insulation going between the glass & shadow box? Curtainwall details on A10.22 shows composite panel fastened to int surface of curtainwall. Rigid "foil faced insulation would be visible through vision glass, if between glass & shadowbox.

NAME & TITLE OF RESPONDING PARTY	DATE OF RESPONSE

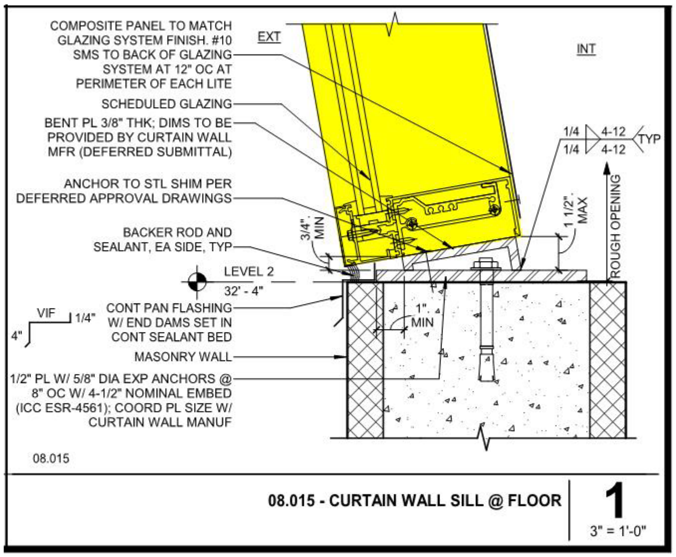
This Document Has Related Attachments YES

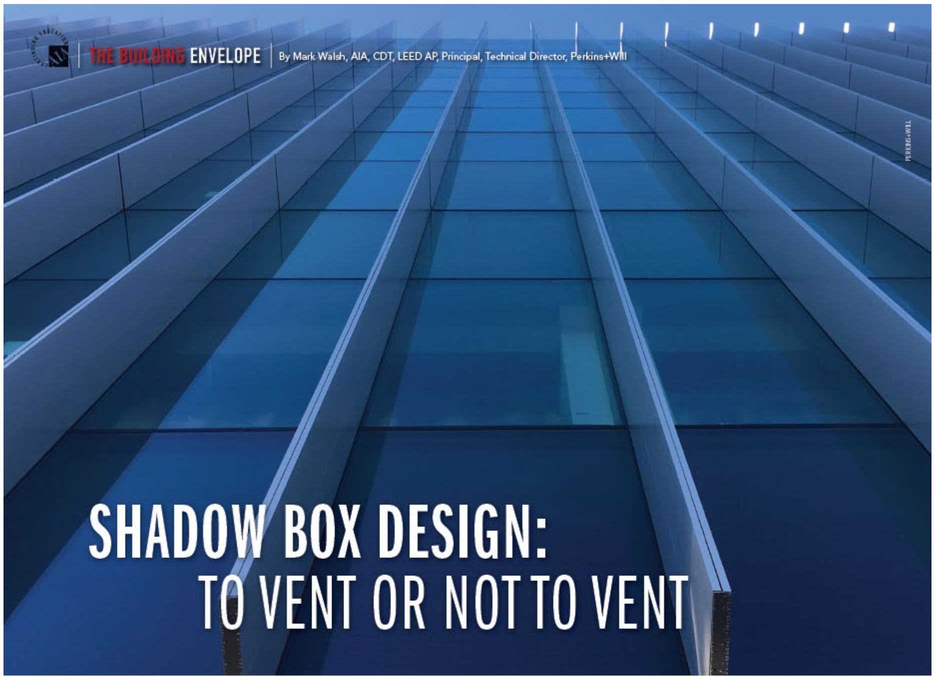
LONG GLAZING & DOORS
Long Glazing License# 1013077 (C-17)
14402 Bond Ct.
El Cajon, CA 92021
619-456-9997
James@LGDUSA.com
Visit. Us @WWW. LGDUSA.com



08.025 - EXTERIOR CURTAIN WALL MULLION @ INT CEILING **5** 3" = 1'-0"

LONG GLAZING & DOORS
Long Glazing License# 1013077 (C-17)
14402 Bond Ct.
El Cajon, CA 92021
619-456-9997
James@LGDUSA.com
Visit. Us @WWW. LGDUSA.com





SHADOW BOX DESIGN: TO VENT OR NOT TO VENT

A curtain wall shadow box is a spandrel assembly consisting of vision glass at the building exterior and an opaque infill at the interior side of the curtain wall system. Shadow boxes are generally used for one of two aesthetic reasons: to maintain the visual continuity of a curtain wall system as it crosses from vision glass to spandrel areas; or to give the spandrels the quality of having visual depth.

Shadow boxes are often preferred over opaque-fritted spandrel glass because they use the same glass as adjacent vision areas and render the opaque areas of the curtain wall nearly indistinguishable from the vision areas.

SHADOW BOX FAILURE

In 2017, we conducted a comprehensive review of literature related to the design of shadow boxes, including their failure and subsequent remediation. For a summary of the literature review and salient points, go to BDCnetwork.com/SBappendix.

The literature review revealed four categories of shadow box failure:

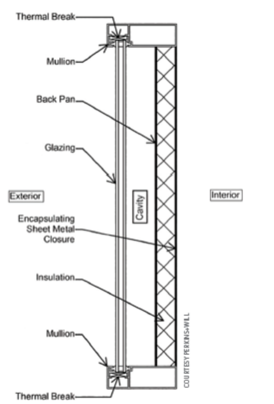
- Condensation in the shadow box cavity
- Dust and debris infiltration into the shadow box cavity
- Thermal transfer (either excessively hot or cold) from the shadow box cavity to the interior surfaces of surrounding curtain wall mullions
- Structural failure of the exterior glass or shadow box back pan.

Condensation can form inside a shadow box cavity when moisture-laden air in the cavity is cooled to the dew point. In cold and temperate climates, winter interior building air is typically warmer and has a higher relative humidity than outside air, so infiltration of interior building air into the cavity can become a source of shadow box condensation. In warmer climates, daytime outdoor air that is introduced into the shadow box can be a source of condensation when temperatures drop at nighttime.

Condensation itself is aesthetically objectionable but tends to be transient and dissipates. It can, however, have long-term consequences that affect shadow box performance and appearance. The condensation can leave visible deposits on the interior surfaces of the shadow box cavity that cannot be easily cleaned. Additionally, the condensation can deposit solvents or particulates from finishes, adhesives, or sealants that can deteriorate other finishes and seals inside the cavity.

Since the exterior glass of a shadow box is vision glass, the presence of dust or debris in the cavity is aesthetically undesirable. Shadow box cavities are generally inaccessible after they are installed, so dust or debris that gets inside the cavity is difficult and costly to clean or remove.

FIGURE 1
MODES OF SHADOW BOX FAILURE



Components of a typical shadow box

Dust and debris can enter the shadow box cavity during assembly of the units, while they are stockpiled on site, during installation of the curtain wall or by way of cavity vents after the shadow box has been installed.

The shadow box cavity is typically located to the interior of the curtain wall mullion thermal break and, therefore, allows thermal conductivity between the cavity and the interior surfaces of curtain wall mullions at the perimeter of the shadow box. If the shadow box cavity is excessively hot, it can heat the interior surface of adjacent mullions to temperatures that can be painful or scalding in extreme conditions. If the shadow box cavity is excessively cold, surfaces of adjacent mullions that are exposed to the building interior can be cooled below the dew point, causing uncontrolled condensation inside the building.

Excessively high or low pressure inside a sealed shadow box cavity, due to very hot or cold (respectively) air trapped inside the cavity, can deform the shadow box back pan, damage seals, or break the exterior glass.

The primary means to combat these failures is some form of cavity ventilation, or a complete and deliberate lack thereof. Shadow boxes can be: vented directly to the exterior; vented indirectly to the exterior by way of the mullion cavities; vented to the building interior; or sealed.

VENTILATION STRATEGIES

Ventilation directly to the exterior. Shadow box cavity ventilation directly to the exterior is commonly done by leaving gaps in the glazing gaskets of the vision glass and putting porous baffles in the resulting openings. Typical practice is to provide vents in the vertical mullions near the top of the shadow box unit and in the horizontal mullion at the bottom (figure 2). This arrangement prevents the direct infiltration of liquid water (rain) and insects through the vents and promotes a convective flow of air through the cavity.

There are several potential benefits of venting the cavity directly to the exterior. The direct connection equalizes the pressure between the cavity and the exterior environment, preventing pressure buildup inside the cavity. The introduc-

LEARNING OBJECTIVES

After reading this article, you should be able to:

- **DESCRIBE the primary applications for shadow box assemblies in curtain wall systems.**
- **DISCUSS the most common reasons why shadow box assemblies fail.**
- **IDENTIFY the primary ventilation strategies for curtain wall shadow box assemblies.**
- **UNDERSTAND the pros and cons of different ventilation strategies for curtain wall shadow box assemblies.**

FIGURE 2
VENTILATION STRATEGIES

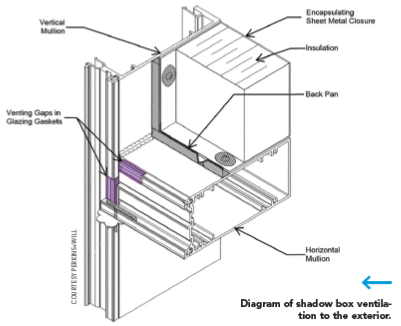


Diagram of shadow box ventilation to the exterior.

tion of unconditioned exterior air also discourages condensation inside the cavity as long as the flow of air through the cavity is sufficient to ensure that the air inside the cavity has similar temperature and relative humidity to the exterior environment.[1] In the event that condensation does form inside the cavity, the convective flow of air promotes drying and dissipation of the condensation.

There are, however, potential drawbacks to direct ventilation to the exterior. In temperate or cold climates, the introduction of very cold exterior air into the cavity can cool the mullions at the perimeter of the shadow box to a point where uncontrolled condensation can form on mullion surfaces inside the building and result in water damage to adjacent materials.[2] Exterior air that enters the cavity can also carry particulates that can collect on the inner surfaces of the shadow box. This is of particular concern in sandy or heavily polluted environments.[3]

Finally, it is very likely that intermittent condensation will occur in any climate that experiences moderate-to-large temperature swings in a short period of time, as with the passing of a cold front or at nightfall. This condensation is likely to dissipate in relatively short order, but is aesthetically objectionable in the meantime and can leave deposits on the cavity surfaces that can accumulate over time.

Ventilation to the mullion cavities, indirect to the exterior. Ventilation to the mullion cavities is done by providing baffled holes in the vertical mullions bounding the shadow box. In most curtain wall systems, the mullion cavities are used as a weeping system and have holes to the exterior to drain any water that gets inboard of the primary water seal. The weep holes provide a connection between the exterior environment and the mullion cavity, and since the shadow boxes are ventilated into the mullion cavity, they have an indirect connection to the exterior.

Indirect ventilation provides pressure relief for—and airflow through—the shadow box cavity without a direct connection to the exterior that can introduce very cold air or dust and debris. A small amount of dust may make its way through the mullion cavities and to the shadow box, but the baffled vent holes prevent the vast majority of that dust from entering the cavity. The mullion cavity is typically on the interior side of the curtain wall thermal break, so it will be tempered by the interior environment. The shadow box ventilation air has to pass through this moderately tempered zone and is, thus, brought closer to the interior building temperature before it is introduced into the shadow box cavity. This tempering mitigates the likelihood that the cavity, and the surrounding mullions will become excessively hot or cold.

There are no significant drawbacks to this approach, but there two important limitations. First, this approach is impractical in stick-built curtain wall systems due to the difficulty of ensuring complete separation of the interior mullion cavities from the interior building environment. Joinery and assembly of stick-built systems introduce a multitude of potential paths for infiltration of interior building air into the mullion cavity through splices, screw holes, or other openings in the mullion walls. This necessitates the use of a unitized curtain wall system, which has its own issues.

Second, many unitized curtain wall systems have a water and air barrier at the outboard split mullion joint that is near, or in line with, the plane of the glass (figure 3). This barrier prevents the mullion cavity from having a direct connection to the exterior. There is, however, an inboard split mullion connection, which, if not sealed, would provide a direct connection between the mullion cavity and the interior building environment.

There are also potential paths for interior air infiltration at the intersections of horizontal and vertical mullions and at stack joints or sills. It is possible to seal these during shop fabrication, but care must be taken by the designer in specifying these requirements and by the manufacturer in the subsequent fabrication. In the absence of a complete seal between the mullion cavities and the building interior, ventilation into the mullion cavity would provide an environmental connection between the shadow box and the interior building environment, which is not desirable (see below).

Ventilation to the building interior is usually accomplished by leaving gaps between the shadow box back pan/insulation/closure assembly and the adjacent mullions (figure 4).

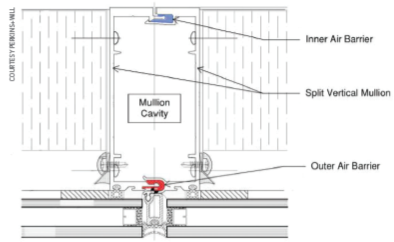
There are serious risks in ventilating the shadow box cavity to the building interior, especially in cold or moderate climates. First, the shadow box cavity and its interior surfaces tend to be colder than the interior building environment in the winter. When warm, moisture-laden air from the building interior is allowed into a cooler shadow box cavity, the risk of condensation is very high. Since the relative humidity of the interior building air will be fairly stable, dissipation of the condensation through introduction of interior building air will likely be slow. Also, the interior building environment is likely to have significant particulate matter in the air that can get into the shadow box cavity and leave aesthetically unappealing deposits.

The only real benefit of ventilation to the building interior is that it offers pressure relief for the shadow box cavity.

Sealed cavity. The final ventilation strategy is not to provide any ventilation at all. In this case, the shadow box cavity is completely sealed from both the interior building environment and the exterior.

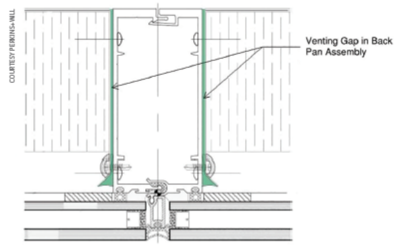
The lack of any airflow into or out of the cavity can lead to elevated temperatures and pressures, especially on hot days and at times where there is direct sunlight on the shadow box. Excessive heat can degrade sealants and finishes inside the shadow box cavity to the point where they fail.

FIGURE 3
VENTILATION TO THE BUILDING INTERIOR



Unitized curtain wall split mullion showing the air barriers required for ventilation to the mullion cavity.

FIGURE 4



Shadow box ventilation to the building interior.

If a sealed cavity is the chosen solution, the designer must ensure that all finishes, sealants, and other materials in or adjacent to the shadow box cavity are stable at high temperatures. In similar fashion to the direct ventilation to the exterior, extreme temperatures inside the shadow box cavity can transfer to the mullions bounding the shadow box and result in interior mullion surfaces that are hot, or even scalding, to the touch.

There is some evidence that heat buildup in the cavity can induce elevated pressure inside the shadow box. The pressure can build to a point where an annealed (rather than heat-strengthened or tempered) glass light can break. There is little evidence of this mode of failure in completed buildings, however, the party responsible for engineering the curtain wall system should calculate potential pressure buildup (based on design criteria) and verify that both the vision glass and the shadow box back pan can withstand anticipated pressures without failure.[1]

The other major risk of sealing the cavity is that dust, debris, or very humid air is trapped inside during the fabrication process. If dust or debris is trapped inside, there is no way to remove it other than disassembling the shadow box (usually from the building exterior). If very humid air is trapped inside the cavity, it can condense during cool weather or at nighttime after installation, leaving condensation and the resultant debris on the inside surfaces of the shadow box. This risk can be mitigated by specifying that the cavity be protected from the infiltration of dust, debris, and moisture throughout fabrication, delivery, and installation. Please note that protection from dust, debris, and liquid moisture infiltration is readily achievable with established quality assurance and quality control processes, but the control of humidity requires careful climate control at the fabrication facility that may be difficult for some manufacturers to achieve. This should be taken into account in the selection of acceptable manufacturers.

RECOMMENDATIONS

Having considered the benefits and drawbacks of the ventilation strategies identified above, it is this author's primary recommendation that shadow box cavities be ventilated indirectly to the exterior through the mullion cavities. This recommendation does come with the caveat that the curtain wall must be a unitized system and that careful specification and fabrication ensure a complete seal between the mullion cavities and the interior building environment, and that the shadow box cavity be protected from infiltration of dust, debris, and moisture throughout its fabrication, delivery, and installation.

If a unitized system is not feasible, or if the chosen unitized system does not allow a complete seal between the mullion cavities and the building interior, the alternative recommendation is to specify a completely sealed shadow box cavity.

When specifying a sealed shadow box cavity, it is critical that all materials inside the cavity are suitable for high-temperature applications. It is also recommended that the shadow box glass be tempered or heat strengthened and that the specifications require the curtain wall contractor to determine the highest anticipated temperature inside the cavity and verify the ability of the glass and the back pan to withstand the resultant pressure. Finally, if the shadow box can be anticipated to receive direct sunlight, some consideration should be given to the possibility that the interior surfaces of the bounding mullions can get hot to the touch. It is recommended that the mullions adjacent to the shadow box not be in highly trafficked areas or in locations where they can be touched by children or others who are heat-sensitive.+

FOOTNOTES

[1] Michno, Michel (Enclos). "Analysis and Design of Spandrel and Shadowbox Panels in Unitized Curtain Walls." Glass Performance Days 2009 [2] Apogee Advanced Glazing Group. "A.A.G.G. 'Shadow Box' Design Guidelines." Technical Bulletin 505 (May 23, 2005) [3] Kragh, Mikkel, Stanley Yee and Larry Carbary (Dow Corning Corporation), and Neil McClellan (HOK). "Performance of Shadow Boxes in Curtain Wall Assemblies." CTBUH 2014 Shanghai Conference Proceedings

For the full appendix: BDCnetwork.com/SBappendix

Addendum 2 - Bid 102-22

Final Audit Report 2022-01-31

Created:	2022-01-31
By:	Debbi Claypool (dclaypool@palomar.edu)
Status:	Signed
Transaction ID:	CBJCHBCAABAAyHFPfq4FN3g-Yn3REOW5nADZknpvJDVF

"Addendum 2 - Bid 102-22" History

Document created by Debbi Claypool (dclaypool@palomar.edu)

2022-01-31 - 9:10:01 PM GMT- IP address: 205.153.156.222

Document emailed to Ambur Borth (aborth@palomar.edu) for signature

2022-01-31 - 9:10:48 PM GMT

Document e-signed by Ambur Borth (aborth@palomar.edu)

Signature Date: 2022-01-31 - 9:40:40 PM GMT - Time Source: server- IP address: 172.248.221.155

Agreement completed.

2022-01-31 - 9:40:40 PM GMT