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From Concept to Construction

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APPEAL SUMMARY

Status: Decision Rendered

Appeal ID: 20224	Project Address: 1200 SW 1st Ave
Hearing Date: 4/10/19	Appellant Name: Joshua Klyber
Case No.: B-021	Appellant Phone: 5034885651
Appeal Type: Building	Plans Examiner/Inspector: Jody Orrison, Cory Stanley
Project Type: commercial	Stories: 17 Occupancy: A-3, B, F-1, S-1 Construction Type: -IA
Building/Business Name: Multnomah County Courthouse	Fire Sprinklers: Yes - Throughout
Appeal Involves: Erection of a new structure	LUR or Permit Application No.: 16-278764-DFS-78-MG
Plan Submitted Option: pdf [File 1] [File 2] [File 3]	Proposed use: Courthouse

APPEAL INFORMATION SHEET

Appeal item 1

Code Section Section 715.4 - Exterior curtain wall/floor intersection

Requires Where fire resistance-rated floor or floor/ceiling assemblies are required, voids created at the intersection of the exterior curtain wall assemblies and such floor assemblies shall be sealed with an approved system to prevent the interior spread of fire. Such systems shall be securely installed and tested in accordance with ASTM E 2307 to provide an F rating for a time period at least equal to the fire-resistance rating of the floor assembly. Height and fire-resistance requirements for curtain wall spandrels shall comply with Section 705.8.5.

Proposed Design Two wall/floor conditions are addressed in EJ#6 to describe the continuity of fire-resistance rated protection at slab edge conditions adjacent to concrete columns. The floor is required to provide 2-hour fire-resistance protection; the rated protection must continue to the noncombustible exterior sheathing in order to prevent vertical flame spread in a fire condition. A condition exists where a column is adjacent to the curtain wall, limiting access to properly protect the vertical mullions below the floor slab. Code Unlimited has been asked to develop an Engineering Judgment letter as an alternate to providing the direct vertical mullion protection in these locations. The protection must be continuous in order to protect against the spread of fire from floor to floor.

While evaluating the protection requirements of the slab edge connection at a curtain wall, the Intertek Design No. CEJ 322 P was selected and formed the basis of the proposed design. This approach was approved under previous appeals for use in the entirety of the building. Upon installation of the previously approved approach, specific site conditions were discovered in which vertical mullion protection could not be installed due to limited access. All other features of the approved approach will be installed. The proposed design presents an alternative to protection of vertical mullions located behind concrete columns.

The vertical gap between the concrete column and the Kingspan panels is to be protected by compressed mineral wool insulation in order to prevent the spread of heat and fire from room to the unprotected vertical mullions. By enclosing these mullions in a protected cavity, the proposed design provides additional protection beyond the minimum requirements of the Intertek design. The Intertek evaluation provides a conservative basis of fire-resistance rating for this assembly, as documented.

Reason for alternative We have reviewed the proposed slab/wall Kingspan assembly against an Intertek tested design. The evaluation from the CEJ 322 P assembly shows that the proposed design provides equivalent, if not superior protection at all critical points, including the vertical mullions below the floor slab.

As detailed in the attached EJ#6 developed by and Oregon Licensed Fire Protection Engineer, it is my opinion that the proposed slab edge protection assembly will meet or exceed the required minimum 2-hour fire-resistance rating as compared and detailed in this letter with the against Intertek OPL Design No. CEJ 322 P.

We urge you to review the documentation and approve this appeal.

Appeal item 2

Code Section Section 715.4 - Exterior curtain wall/floor intersection

Requires Where fire resistance-rated floor or floor/ceiling assemblies are required, voids created at the intersection of the exterior curtain wall assemblies and such floor assemblies shall be sealed with an approved system to prevent the interior spread of fire. Such systems shall be securely installed and tested in accordance with ASTM E 2307 to provide an F rating for a time period at least equal to the fire-resistance rating of the floor assembly. Height and fire-resistance requirements for curtain wall spandrels shall comply with Section 705.8.5.

Proposed Design Two wall/floor conditions are addressed in EJ#7 to describe the continuity of fire-resistance rated protection at slab edge conditions adjacent to concrete columns. The floor is required to provide 2-hour fire-resistance protection; the rated protection must continue to the noncombustible exterior sheathing in order to prevent vertical flame spread in a fire condition. A condition exists where a column is adjacent to the curtain wall, limiting access to properly protect the vertical mullions below the floor slab. Code Unlimited has been asked to develop an Engineering Judgment letter as an alternate to providing the direct vertical mullion protection in these locations. The protection must be continuous in order to protect against the spread of fire from floor to floor.

While evaluating the protection requirements of the slab edge connection at a curtain wall, the Intertek Design No. CEJ 322 P was selected and formed the basis of the proposed design. This approach was approved under previous appeals for use in the entirety of the building. Upon installation of the previously approved approach, specific site conditions were discovered in which vertical mullion protection could not be installed due to limited access. All other features of the approved approach will be installed. The proposed design presents an alternative to protection of vertical mullions located behind concrete columns.

The vertical gap between the concrete column and the Kingspan panels is to be protected by compressed mineral wool insulation in order to prevent the spread of heat and fire from room to the unprotected vertical mullions. By enclosing these mullions in a protected cavity, the proposed design provides additional protection beyond the minimum requirements of the Intertek design.

The Intertek evaluation provides a conservative basis of fire-resistance rating for this assembly, as documented.

Reason for alternative We have reviewed the proposed slab/wall assembly against an Intertek tested design. The evaluation from the CEJ 322 P assembly shows that the proposed design provides equivalent, if not superior protection at all critical points, including the vertical mullions below the floor slab.

As detailed in the attached EJ#7 developed by and Oregon Licensed Fire Protection Engineer, the proposed slab edge protection assembly will meet or exceed the required minimum 2-hour fire-resistance rating as compared in this letter against Intertek Design No. CEJ 322 P.

We urge you to review the documentation and approve this appeal.

APPEAL DECISION

1. Alternate 2 hour exterior curtain wall / floor assembly with engineering analysis: Granted as proposed.

2. Alternate 2 hour exterior curtain wall / floor assembly with engineering analysis: Granted as proposed.

The Administrative Appeal Board finds that the information submitted by the appellant demonstrates that the approved modifications or alternate methods are consistent with the intent of the code; do not lessen health, safety, accessibility, life, fire safety or structural requirements; and that special conditions unique to this project make strict application of those code sections impractical.

Pursuant to City Code Chapter 24.10, you may appeal this decision to the Building Code Board of Appeal within 180 calendar days of the date this decision is published. For information on the appeals process and costs, including forms, appeal fee, payment methods and fee waivers, go to www.portlandoregon.gov/bds/appealsinfo, call (503) 823-7300 or come in to the Development Services Center.



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MULTNOMAH COUNTY CENTRAL COURTHOUSE

COLUMN AT KINGSPAN PANELS

ENGINEERING JUDGEMENT REPORT – EJ # 7

Client Name: SRG Partnership

Client Address: 621 SW Columbia St, Portland, OR 97201

Date: 4/7/2019

Table of Contents

1	Project Overview	3
2	Applicable Codes, Standards, and Guides	3
3	Approach	3
4	Proposed design	3
5	Assembly Analysis.....	5
6	Summary.....	12
7	Conclusion	13

1 PROJECT OVERVIEW

The Multnomah County Central Courthouse (MCCCH) is a new 17-story high rise courthouse building and is currently being constructed in downtown Portland, OR. The building is of Type I-A construction and meets high rise requirements including fire alarms and full sprinkler coverage.

Code Unlimited has provided an analysis for the protection of the floor/slab conditions at the exterior curtain wall on all floors of the building. Per 2014 OSSC Table 601, the floor is required to provide 2-hour fire-resistance protection; the rated protection must continue to the noncombustible exterior sheathing in order to prevent vertical flame spread in a fire condition. A condition exists where a column is adjacent to the curtain wall, limiting access to properly protect the vertical mullions below the floor slab. Code Unlimited has been asked to develop an Engineering Judgment letter as an alternate to providing the direct vertical mullion protection in these locations.

2 APPLICABLE CODES, STANDARDS, AND GUIDES

- 2014 Oregon Structural Specialty Code (OSSC)
- 2014 Oregon Structural Specialty Code Appendix N, Oregon Fire Code (OFC)

3 APPROACH

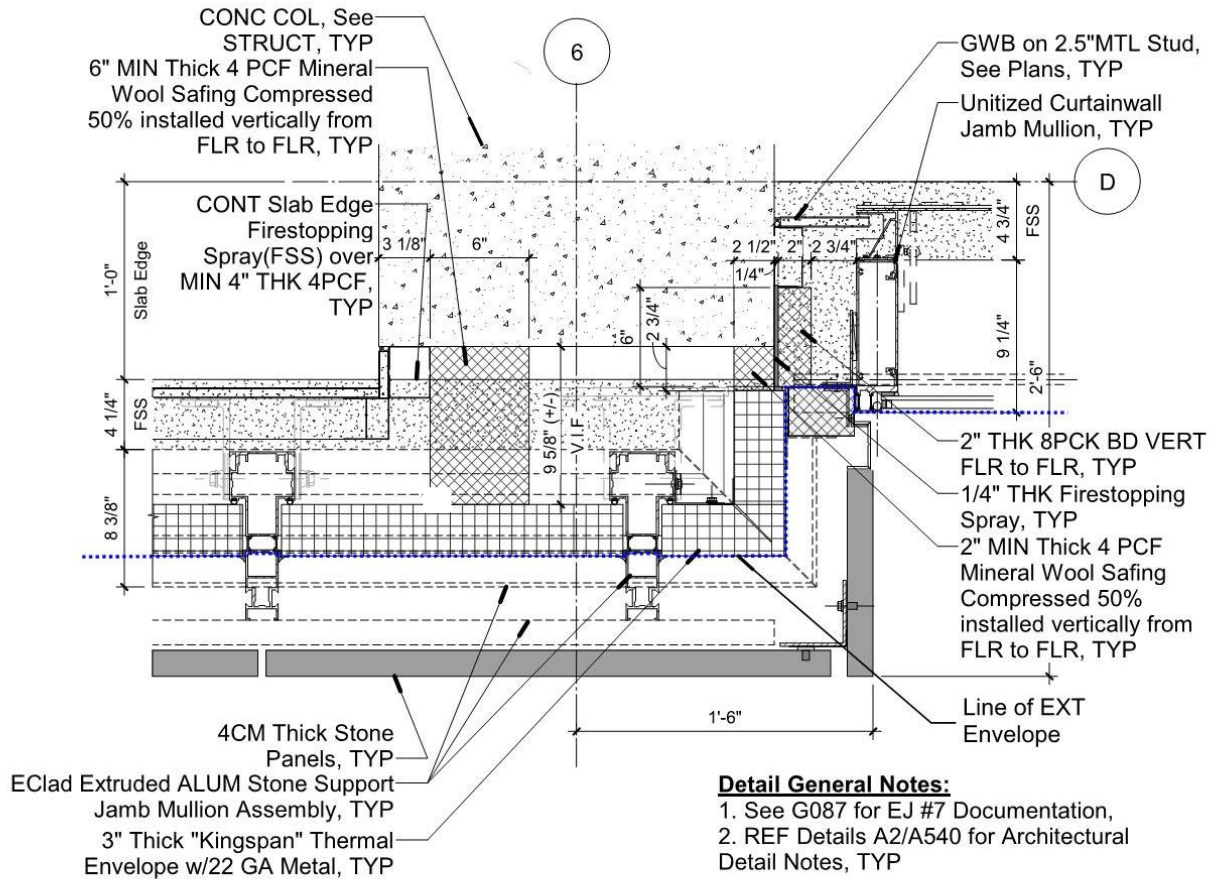
- The proposed floor assembly has been analyzed in accordance with 2014 OSSC §703.3 Alternative Methods for Determining Fire Resistance.
- Portions of the tested assembly are modified to suit the unique design conditions. The modification is analyzed for equivalency using published fire test data and acceptable fire science principles.

4 PROPOSED DESIGN

The proposed design is to be installed at multiple locations where a concrete column is adjacent to the curtain wall. Due to the limited access behind the column, typical mullion protection cannot be installed. Additionally, the right side of the detail will require a modified protection scheme due to required movement of the curtainwall support assembly.

As an alternate to the tested assembly, mineral wool will be compressed between the column and the Kingspan wall panels in order to isolate the vertical mullions from heat and fire.

In order to prevent the passage of heat in the vertical gap between the curtain wall and column, the gap on the **left side** of the detail will be filled with compressed mineral wool, the vertical gap is protected by means of 6 inches of compressed 4 pcf mineral wool. On the **right side** of the assembly, 2" thick compressed 4 pcf mineral wool will be installed against the curtain wall. This vertical gap will be coated with firestopping spray and then covered with 2"- 8 pcf mineral board to complete the vertical assembly.



A4 FIRESTOPPING PLAN DETAIL @ 6/D - L5 thru L17
G080 1 1/2" = 1'-0"

Figure 1: Plan view of column located adjacent to curtain wall

5 ASSEMBLY ANALYSIS

The proposed curtain wall slab edge condition was compared to the Intertek tested curtain wall slab edge design assembly CEJ 322 P shown in the figure below.

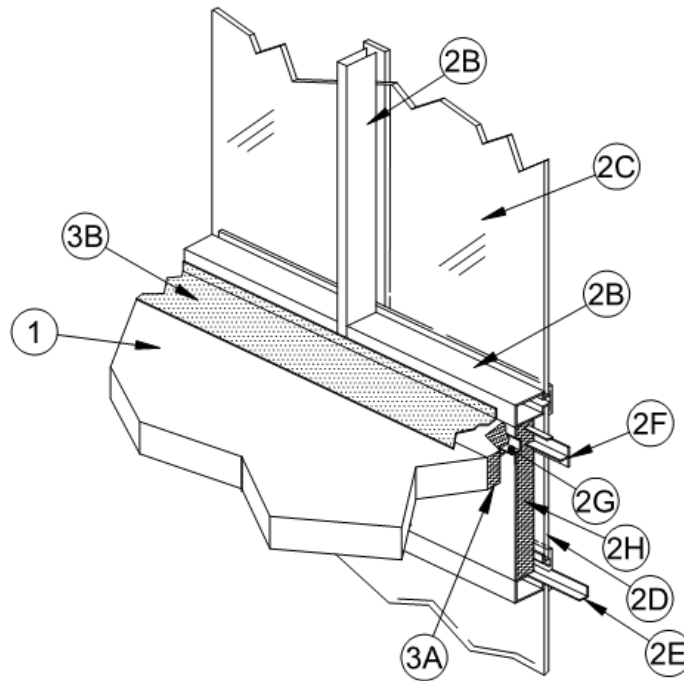
Design No. STI/JS 120-01 OPL Design No. CEJ 322 P

F Rating - 2 HOUR

L Rating - <1 SCFM/LF

Rated for $\pm 6\%$ horizontal movement @ 33% Compression (See ITEM 3A)

Rated for $\pm 3\%$ vertical shear movement @ 33% Compression (See ITEM 3A)



1. **Concrete Floor Assembly** - Two-hour rated concrete floor assembly made from either lightweight or normal weight concrete with a density of 100-150 pcf, with a min. thickness of 4 in. at the joint face. Overall slab thickness may vary to accommodate various blockout depths (longitudinal recesses) formed in the concrete, to house the architectural cover plate. The blockout width may also vary without restriction.
2. **Curtain Wall Assembly** - The curtain wall assembly shall incorporate the following construction features:
 - A. **Mounting Attachment** - (Not Shown) The mounting attachments to the floor slab shall be connected to the joint face of the floor slab, in accordance with the curtain wall manufacturer's instructions. Attachments are to be secured to each mullion in the perimeter joint protection region at a max. spacing of 60 in. o.c.

- B. Aluminum Framing** - Size rectangular aluminum tubing mullions and transoms, according to the curtain wall system manufacturer's guidelines. Min. overall dimensions of the extruded framing sections are 0.100 in. thick aluminum with a minimum 3-3/4 in. depth and a minimum of 2-1/2 in. width. Mullion and transom covers are added to the external side of the framing, giving the framing system a total depth of nominal 5-1/4 in. Mullions are to be spaced a minimum 60 in. o.c. and spandrel transoms are to be spaced a min. 10 in. o.c. For the spandrel region, the lower transom must be placed a min. of 5-1/2 in. below the concrete floor (as measured from the underside of the floor to the top side of the transom) and the upper transom (as measured from the top surface of the floor to the underside of the transom) may be located flush with the top surface of the floor, while maintaining the min. 10 in. spandrel height.
- C. Vision Glass Panels** - Size and install panels to curtain wall framing according to the curtain wall system manufacturer's guidelines. Use min. 1/4 in. thick, clear heat-strengthened (HS) glass or tempered glass with a max. width and height less than the aluminum framing o.c. spacing, which allows the glass to be secured between the notched shoulder of the aluminum framing and pressure bar. Panels are secured with a thermal break (rubber extrusion), pressure bar (aluminum extrusion), min. 1/4-20 x 5/8 in. long screws, and a snap face (aluminum extrusion).
- D. Spandrel Panels** - Size and install panels to curtain wall framing according to the curtain wall system manufacturer's guidelines. Use min 1/4 in. thick, clear heat-strengthened (HS) glass, tempered glass or solid aluminum panels with a max width and height less than the aluminum framing o.c. spacing, which allows the glass or aluminum panels to be secured between the notched shoulder of the aluminum framing and pressure bar. Panels are secured with a thermal break (rubber extrusion), pressure bar (aluminum extrusion), min 1/4-20 x 5/8 in. long screws, and a snap face (aluminum extrusion).
- E. Perimeter Spandrel Panels** - Min. 20 GA 1-1/2 in. x 1-1/2 in. galvanized steel angle is placed around the entire inside perimeter of the spandrel framing and is secured to the aluminum wall framing (Item 2B) with 3/4 in. long hex-head self-drilling self-tapping sheet metal screws spaced max. 8 in. o.c.
- F. Reinforcing Angle** - At the horizontal butt joints of the curtain wall insulation (Item 2H) in the spandrel area, place two 1-1/2 in. by 1-1/2 in. by 20 GA steel angles back-to-back to form a "T". Locate the "T" reinforcing angle at the horizontal centerline of the perimeter joint protection and secure the "T" angle to the perimeter spandrel angles (Item 2E) with 3/4 in. long hex-shaped self-drilling self-tapping sheet metal screws spaced max. 8 in. o.c.
- G. Perimeter Fire Barrier Reinforcement Angle** - Constructed of min. 20 GA 1-1/2 in. x 1-1/2 in. steel angle. The horizontal leg of the angle is fully embedded into the packing material (Item 3A) at the centerline of the perimeter fire barrier, and the vertical leg is secured to the interior side of every vertical aluminum wall framing (Item 2B) member with at least two min. 1/2 in. long, No. 10 sheet metal screws, spaced max. 1 in. o.c. The angle is to be continuous along the length of the perimeter fire barrier. Where joints are required, overlap the angle 12 in. and secure the adjoining angle with at least three min. 1/2 in. long, No. 10 sheet metal screws spaced max. 4 in. o.c., placed in both the vertical and horizontal legs of the angle.
- H. Curtain Wall Insulation** - A nom. 2 in. thick, 8 pcf density mineral wool batt insulation, faced on one side with aluminum foil scrim (vapor retarder) which faces the room interior, is installed to all cavities of the spandrel region between the framing. The batt is to be fitted tightly to the framing with the perimeter spandrel angle (Item 2E) and impaling screws (Item 2I). Seal all meeting edges of insulation with nom. 4 in. wide pressure sensitive aluminum foil faced tape centered over the junction so that approximately 2 in. of tape covers each edge of the adjacent insulation. Place a horizontal seam at the centerline of the perimeter joint protection and reinforce with angle (Item 2F). Install the 24 in. wide batts without vertical seams, spanning the full length between the vertical curtain wall framing members. The interior face of the batt insulation is, if required compressed, flush with the interior face of the curtain wall framing creating a min. 1-in. air space between the insulation and the glass.

3. Perimeter Joint Protection - The perimeter joint (linear opening) is not to exceed an 8 in. nom. joint width (joint width at installation). The perimeter joint treatment shall incorporate the following construction features:

A. Packing Material - Install min. 4 in. thick, 4 pcf density, mineral wool batt insulation installed with the fibers running parallel to the slab edge and curtain wall. After the perimeter fire barrier reinforcement angle (Item 2G) is installed, compress the packing material 33% in the nominal joint width. Compress the batt insulation into the perimeter joint flush with the top surface of the concrete floor slab (Item 1) and its mid depth is compressed against the interior surface of the curtain wall insulation (Item 2H) which is supported by the 20 GA steel reinforcing angle (Item 2F). Splices (butt joints) in the lengths of mineral wool batt insulation are to be tightly compressed together.

B. Fill, Void or Cavity Material - Apply a min. wet film thickness of 1/8 in. over the packing material (Item 3A) and overlap the liquid spray material a min. 1/2 in. onto the adjacent curtain wall framing (Item 2B) and concrete floor slab assembly (Item 1). If the spraying process is stopped and the applied liquid spray material cures to an elastomeric film before process is restarted, then overlap the edge of the cured spray material at least 1/8 in. with the liquid spray material.

Specified Technologies - SpecSeal AS Elastomeric Firestop Spray

*Before testing, the test specimen was cycled 500 times at 30 cpm according to ASTM E1399.

I. Impaling Screws - (Not Shown) Attach curtain wall insulation to the perimeter spandrel angle (Item 2E) with min. No. 8 bugle-head self-drilling self-tapping screws, with a 1-1/2 in. diameter galvanized speed clip spaced max. 8 in. o.c. at the centerline of the flange. Screws should be sized in accordance with the curtain wall insulation thickness, to maintain a firm attachment to the perimeter spandrel angle. Screws shall be installed so that the interior face of the curtain wall insulation is flush with the interior face of the framing.

J. Framing (Mullion) Covers - (Not Shown) Nominal 8 pcf mineral wool batt insulation, faced on one side with aluminum foil scrim (vapor retarder) which faces the room interior. Framing covers are below the perimeter joint treatment and are nominal 2 in. thick, 7 in. wide and 5 in. tall. Framing covers above the perimeter joint treatment are nominal 2 in. thick, 7 in. wide and 2-1/2 in. tall. Center framing covers, over each vertical framing member and secure to the member with No. 8 bugle-head self-drilling self-tapping screws, with a 1-1/2 in. diameter galvanized speed clip spaced a min. 1 in. from each edge. Encapsulate the framing covers with nom. 4 in. wide pressure sensitive aluminum foil faced tape. Overlap the tape approximately 2 in. onto the adjacent aluminum framing. Framing covers do not pass through the perimeter joint treatment. They are butted to top and bottom surfaces of the perimeter joint treatment.

Figure 2: Intertek CEJ 322 P Assembly.

Table 1: Comparison between Tested and Proposed curtain wall assembly.

Element	Intertek OPL Design No. CEJ 322 P	Proposed Assembly
1. Concrete Floor Assembly	Two-hour rated concrete floor assembly made from either lightweight or normal weight concrete with a density of 100-150 pcf, with a min. thickness of 4 in. at the joint face. Overall slab thickness may vary to accommodate various blackout depths (longitudinal recesses) formed in the concrete, to house the architectural cover plate. The blackout width may also vary without restriction.	Two-hour rated post-tensioned, normal weight concrete floor with a thickness of 10 in. at the joint face. Exceeds minimum thickness
2. Curtain Wall Assembly	The curtain wall assembly shall incorporate the following construction features:	The Aluminum stone support assembly shall incorporate the following construction features:
2A. Mounting Attachment (Not Shown)	The mounting attachments to the floor slab shall be connected to the joint face of the floor slab, in accordance with the curtain wall manufacturer's instructions. Attachments are to be secured to each mullion in the perimeter joint protection region at a max. spacing of 60 in. o.c.	The mounting attachments to the floor slab shall be connected to the joint face of the floor slab, in accordance with the curtain wall manufacturer's instructions. The EClad Mullion maximum spacing of 3'-3" (39in.). Equivalent System
2B. Aluminum Framing	Size rectangular aluminum tubing mullions and transoms, according to the curtain wall system manufacturer's guidelines. Min. overall dimensions of the extruded framing sections are 0.100 in. thick aluminum with a minimum 3-3/4 in. depth and a minimum of 2-1/2 in. width. Mullion and transom covers are added to the external side of the framing, giving the framing system a total depth of nominal 5-1/4 in. Mullions are to be spaced a minimum 60 in. o.c. and spandrel transoms are to be spaced a min. 10 in. o.c. For the spandrel region, the lower transom must be placed a min. of 5-1/2 in. below the concrete floor (as measured from the underside of the floor to the top side of the transom) and the upper transom (as measured from the top surface of the floor to the underside of the transom) may be located flush with the top surface of the floor, while maintaining the min. 10 in. spandrel height.	EClad Mullion and Extruded aluminum HSR rail thickness is 0.125". EClad Mullions have a maximum spacing of 3'-3". Equivalent System

2C. Vision Glass Panels	Size and install panels to curtain wall framing according to the curtain wall system manufacturer's guidelines. Use min. 1/4 in. thick, clear heat-strengthened (HS) glass or tempered glass with a max. width and height less than the aluminum framing o.c. spacing, which allows the glass to be secured between the notched shoulder of the aluminum framing and pressure bar. Panels are secured with a thermal break (rubber extrusion), pressure bar (aluminum extrusion), min. 1/4-20 x 5/8 in. long screws, and a snap face (aluminum extrusion).	3" thick "Kingspan" Thermal envelope w/22 GA Metal Skin. Equivalent System
2D. Spandrel Panels	Size and install panels to curtain wall framign [sic] according to the curtain wall system manufacturer's guidelines. Use min 1/4 in. thick, clear heat-strengthened (HS) glass, tempered glass or solid aluminum panels with a max width and height less than the aluminum framing o.c. spacing, which allows the glass or aluminum panels to be secured between the notched shoulder of the aluminum framing and pressure bar. Panels are secured with a thermal break (rubber extrusion), pressure bar (aluminum extrusion), min 1/4-20 x 5/8 in. long screws, and a snap face (aluminum extrusion).	Kingspan metal panel replace the Spandrel Panels. Equivalent System
2E. Perimeter Spandrel Panels	Min. 20 GA 1-1/2 in. x 1-1/2 in. galvanized steel angle is placed around the entire inside perimeter of the spandrel framing and is secured to the aluminum wal [sic] framing (Item 2B) with 3/4 in. long hex-head self-drilling self-tapping sheet metal screws spaced max. 8 in. o.c.	Spiral anchors or impaling Clips to be utilized with the assembly. These will allow the MW to remain in place during a fire. Equivalent System
2F. Reinforcing Angle	At the horizontal butt joints of the curtain wall insulation (Item 2H) in the spandrel area, place two 1-1/2 in. by 1-1/2 in. by 20 GA steel angles back-to-back to form a "T". Locate the "T" reinforcing angle at the horizontal centerline of the perimeter joint protection and secure the "T" angle to the perimeter spandrel angles (Item 2E) with 3/4 in. long hex-shaped self-drilling self-tapping sheet metal screws spaced max. 8 in. o.c.	Not required for this assembly.MW to be compressed against Kingspan Panel. Equivalent System

2G. Perimeter Fire Barrier Reinforcement Angle	Constructed of min. 20 GA 1-1/2 in. x 1-1/2 in. steel angle. The horizontal leg of the angle is fully embedded into the packing material (Item 3A) at the centerline of the perimeter fire barrier, and the vertical leg is secured to the interior side of every vertical aluminum wall framing (Item 2B) member with at least two min. 1/2 in. long, No. 10 sheet metal screws, spaced max. 1 in. o.c. The angle is to be continuous along the length of the perimeter fire barrier. Where joints are required, overlap the angle 12 in. and secure the adjoining angle with at least three min. 1/2 in. long, No. 10 sheet metal screws spaced max. 4 in. o.c., placed in both the vertical and horizontal legs of the angle.	Not required as the joint will be completely filled with Mineral Wool. Exceeds Minimum requirement
2H. Curtain Wall Insulation	<p>A nom. 2 in. thick, 8 pcf density mineral wool batt insulation, faced on one side with aluminum foil scrim (vapor retarder) which faces the room interior, is installed to all cavities of the spandrel region between the framing. The batt is to be fitted tightly to the framing with the perimeter spandrel angle (Item 2E) and impaling screws (Item 2I). Seal all meeting edges of insulation with nom. 4 in. wide pressure sensitive aluminum foil faced tape centered over the junction so that approximately 2 in. of tape covers each edge of the adjacent insulation. Place a horizontal seam at the centerline of the perimeter joint protection and reinforce with angle (Item 2F).</p> <p>Install the 24 in. wide batts without vertical seams, spanning the full length between the vertical curtain wall framing members. The interior face of the batt insulation is, if required compressed, flush with the interior face of the curtain wall framing creating a min. 1-in. air space between the insulation and the glass.</p>	<p>Not required for this assembly as the vertical MW adjacent to the concrete column will replace this item and provide sufficient protection to the cavity gap behind the column.</p> <p>Equivalent System</p>

2I. Impaling Screws (Not Shown)	<p>Attach curtain wall insulation to the perimeter spandrel angle (Item 2E) with min. No. 8 bugle-head self-drilling self-tapping screws, with a 1-1/2 in. diameter galvanized speed clip spaced max. 8 in. o.c. at the centerline of the flange. Screws should be sized in accordance with the curtain wall insulation thickness, to maintain a firm attachment to the perimeter spandrel angle. Screws shall be installed so that the interior face of the curtain wall insulation is flush with the interior face of the framing.</p>	<p>Curtain wall insulation will be attached with impaling pins or spiral anchors to ensure MW will remain in place during a fire.</p> <p>Equivalent Protection</p>
2J. Framing (Mullion) Covers (Not Shown)	<p>Nominal 8 pcf mineral wool batt insulation, faced on one side with aluminum foil scrim (vapor retarder) which faces the room interior. Framing covers are below the perimeter joint treatment and are nominal 2 in. thick, 7 in. wide and 5 in. tall. Framing covers above the perimeter joint treatment are nominal 2 in. thick, 7 in. wide and 2-1/2 in. tall. Center framing covers, over each vertical framing member and secure to the member with No. 8 bugle-head self-drilling self-tapping screws, with a 1-1/2 in. diameter galvanized speed clip spaced a min. 1 in. from each edge. Encapsulate the framing covers with nom. 4 in. wide pressure sensitive aluminum foil faced tape. Overlap the tape approximately 2 in. onto the adjacent aluminum framing. Framing covers do not pass through the perimeter joint treatment. They are butted to top and bottom surfaces of the perimeter joint treatment.</p>	<p>Mullion covers will not be installed over mullions located behind the column.</p> <p>Compressed mineral wool batt insulation will be installed vertically between the concrete column and the curtain wall on each side of the unprotected vertical mullions. Thereby providing protection of the mullions.</p> <p>Superior System</p>
3. Perimeter Joint Protection	<p>The perimeter joint (linear opening) is not to exceed an 8 in. nom. joint width (joint width at installation). The perimeter joint treatment shall incorporate the following construction features:</p>	<p>The standard perimeter joint (linear opening) maximum will be 7.5" in. joint width.</p> <p>Where required, at select locations gap extends to 10-5/8" in. Mineral Board of 2" thickness shall be installed to close the gap to less than 8" wide.</p> <p>Equivalent Protection</p>

3A. Packing Material	Install min. 4 in. thick, 4 pcf density, mineral wool batt insulation installed with the fibers running parallel to the slab edge and curtain wall. After the perimeter fire barrier reinforcement angle (Item 2G) is installed, compress the packing material 33% in the nominal joint width. Compress the batt insulation into the perimeter joint flush with the top surface of the concrete floor slab (Item 1) and its mid depth is compressed against the interior surface of the curtain wall insulation (Item 2H) which is supported by the 20 GA steel reinforcing angle (Item 2F). Splices (butt joints) in the lengths of mineral wool batt insulation are to be tightly compressed together.	Install min. 4 in. thick, 4 pcf density, mineral wool batt insulation installed with the fibers running parallel to the slab edge and curtain wall. Compress the packing material 33% in the nominal joint width. Compress the batt insulation into the perimeter joint flush with the top surface of the concrete floor slab and its mid depth is compressed against the interior surface of the curtain wall insulation. Splices (butt joints) in the lengths of mineral wool batt insulation are to be tightly compressed together. Equivalent System
3B. Fill, Void, or Cavity Material	Apply a min. wet film thickness of 1/8 in. over the packing material (Item 3A) and overlap the liquid spray material a min. 1/2 in. onto the adjacent curtain wall framing (Item 2B) and concrete floor slab assembly (Item 1). If the spraying process is stopped and the applied liquid spray material cures to an elastomeric film before process is restarted, then overlap the edge of the cured spray material at least 1/8 in. with the liquid spray material.	Apply a min. wet film thickness of 1/8 in. over the packing material (Item 3A) and overlap the liquid spray material a min. 1/2 in. onto the adjacent curtain wall framing (Item 2B) and concrete floor slab assembly (Item 1). If the spraying process is stopped and the applied liquid spray material cures to an elastomeric film before process is restarted, then overlap the edge of the cured spray material at least 1/8 in. with the liquid spray material. Equivalent System
Fire-Resistance Rating	2-Hour	2-Hour (minimum)

6 SUMMARY

While evaluating the protection requirements of the slab edge connection at a curtain wall, the Intertek Design No. CEJ 322 P was selected and formed the basis of the proposed design. This approach was approved under previous appeals for use in the entirety of the building. Upon installation of the previously approved approach, specific site conditions were discovered in which vertical mullion protection could not be installed due to limited access. All other features of the approved approach will be installed. The proposed design presents an alternative to protection of vertical mullions located behind concrete columns.

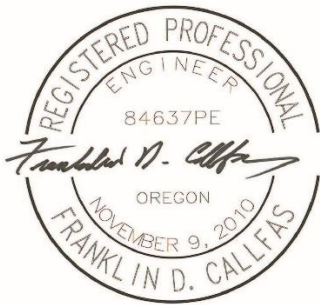
The vertical gap between the concrete column and the Kingspan panels is to be protected by compressed mineral wool insulation in order to prevent the spread of heat and fire from room to the unprotected vertical

mullions. By enclosing these mullions in a protected cavity, the proposed design provides additional protection beyond the minimum requirements of the Intertek design. The Intertek evaluation provides a conservative basis of fire-resistance rating for this assembly, as documented in the table above.

7 CONCLUSION

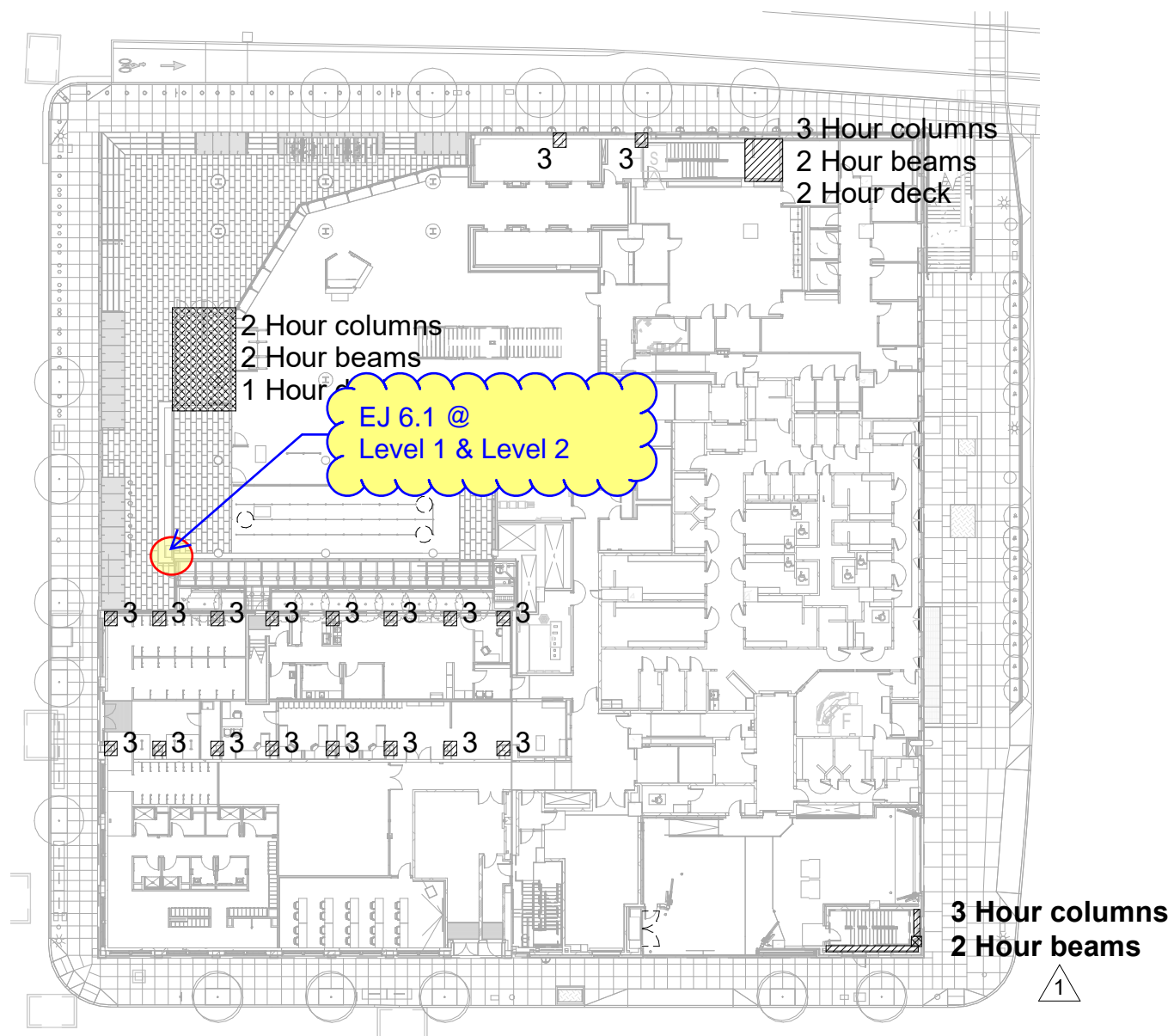
We have reviewed the proposed slab/wall assembly (Fig.1) against an Intertek tested design. The evaluation from the CEJ 322 P assembly shows that the proposed design provides equivalent, if not superior protection at all critical points, including the vertical mullions below the floor slab.

As detailed above, the proposed slab edge protection assembly will meet or exceed the required minimum 2-hour fire-resistance rating as compared in this letter against Intertek Design No. CEJ 322 P.

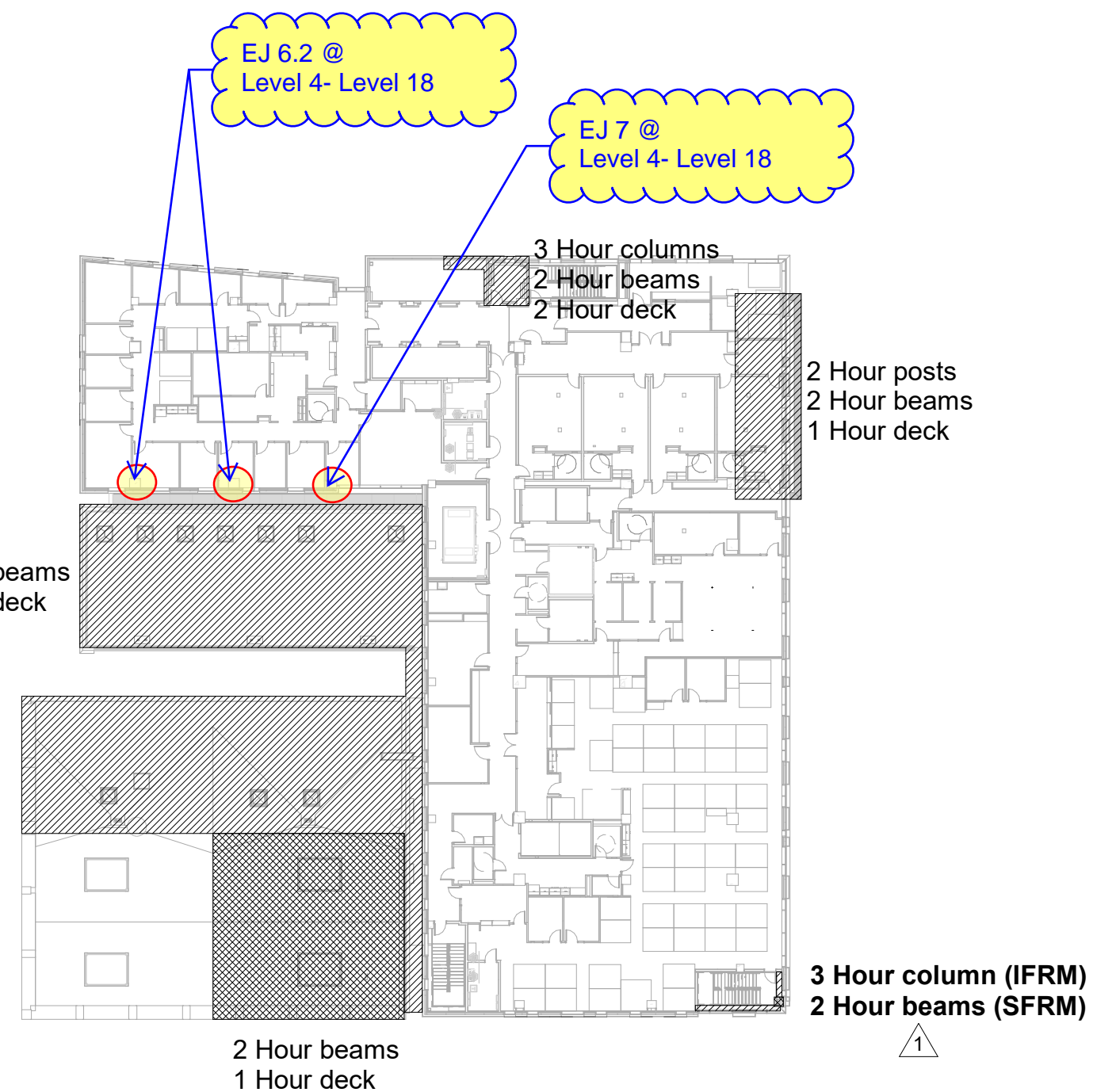


EXPIRES 12-31-19

Franklin Callfas
Principal/Fire Protection Engineer
Code Unlimited



Level 1 and Level 2



Level 4 to 18 as noted

Scope of Unique Condition EJ's @ MCCCH



Experienced. Innovative. Trusted.

MULTNOMAH COUNTY CENTRAL COURTHOUSE

COLUMN AT KINGSPAN PANELS

ENGINEERING JUDGEMENT REPORT – EJ # 6

Client Name: SRG Partnership

Client Address: 621 SW Columbia St, Portland, OR 97201

Date: 4/7/2019

Table of Contents

1	Project Overview	3
2	Applicable Codes, Standards, and Guides	3
3	Approach	3
4	Proposed design	3
5	Assembly Analysis.....	6
6	Summary.....	13
7	Conclusion	14

1 PROJECT OVERVIEW

The Multnomah County Central Courthouse (MCCCH) is a new 17-story high rise courthouse building and is currently being constructed in downtown Portland, OR. The building is of Type I-A construction and meets high rise requirements including fire alarms and full sprinkler coverage.

Code Unlimited has provided an analysis for the protection of the floor/slab conditions at the exterior curtain wall on all floors of the building. Per 2014 OSSC Table 601, the floor is required to provide 2-hour fire-resistance protection; the rated protection must continue to the noncombustible exterior sheathing in order to prevent vertical flame spread in a fire condition. A condition exists where a column is adjacent to the curtain wall, limiting access to properly protect the vertical mullions below the floor slab. Code Unlimited has been asked to develop an Engineering Judgment letter as an alternate to providing the direct vertical mullion protection in these locations.

2 APPLICABLE CODES, STANDARDS, AND GUIDES

- 2014 Oregon Structural Specialty Code (OSSC)
- 2014 Oregon Structural Specialty Code Appendix N, Oregon Fire Code (OFC)

3 APPROACH

- The proposed floor assembly has been analyzed in accordance with 2014 OSSC §703.3 Alternative Methods for Determining Fire Resistance.
- Portions of the tested assembly are modified to suit the unique design conditions. The modification is analyzed for equivalency using published fire test data and acceptable fire science principles.

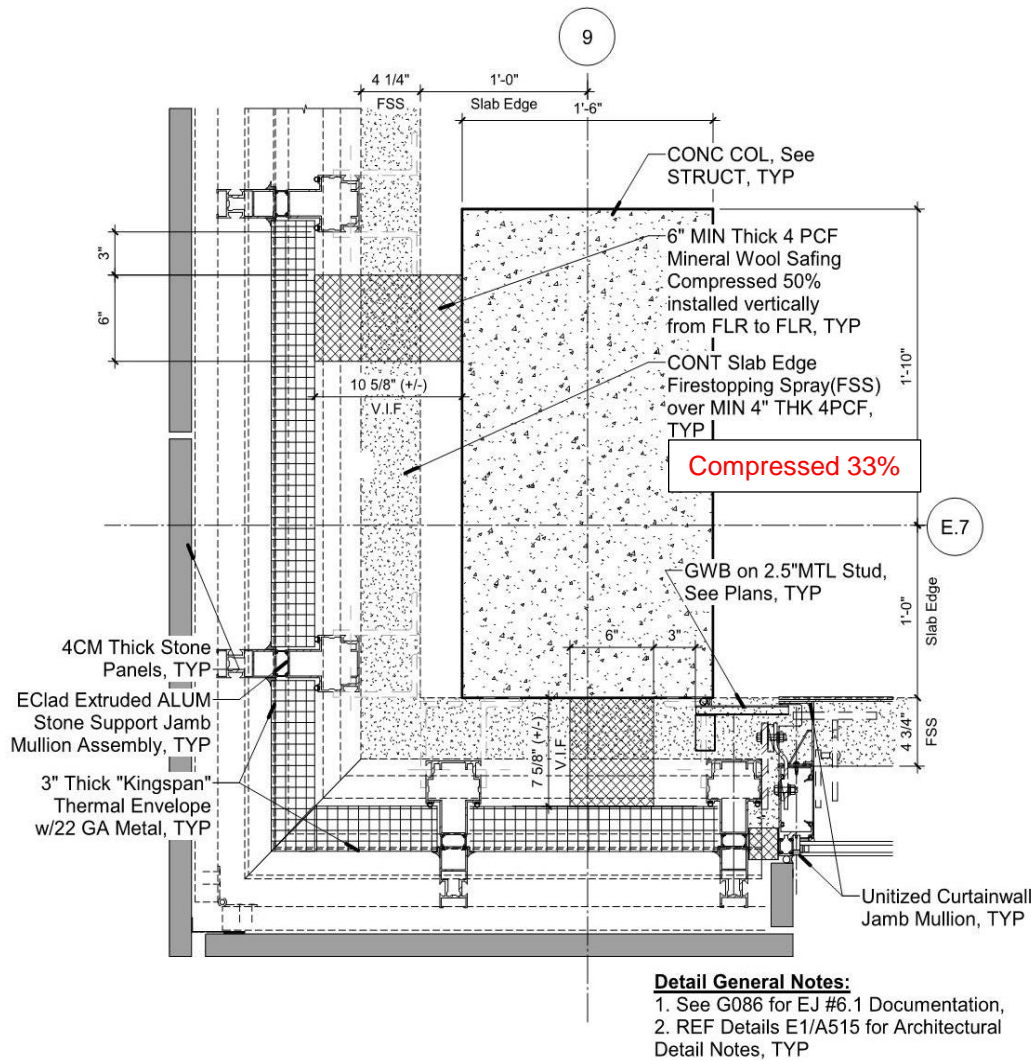
4 PROPOSED DESIGN

The proposed design is to be installed at multiple locations where a concrete column is adjacent to the curtain wall. Due to the limited access behind the column, typical mullion protection cannot be installed. As an alternate, mineral wool will be compressed between the column and the Kingspan wall panels in order to isolate the vertical mullions from heat and fire.

There are two different conditions,

- Condition 1 –
The concrete column is located in a corner adjacent to two Kingspan wall panels (figure 1).
- Condition 2 –
The column is located adjacent to a single Kingspan wall panel (figure 2).

In order to prevent the passage of heat in the vertical gap between the curtain wall and column, the gap will be filled with compressed mineral wool. Both conditions address the vertical gaps in a similar manner by means of 6 inches of compressed 4 pcf mineral wool.



A2 FIRESTOPPING PLAN DETAIL @ COL 9/E.7 - L 1 & 2
G080 1 1/2" = 1'-0"

Figure 1: Plan view of column located adjacent to two curtain walls.

5 ASSEMBLY ANALYSIS

The proposed curtain wall slab edge condition was compared to the Intertek tested curtain wall slab edge design assembly CEJ 322 P shown in the figure below.

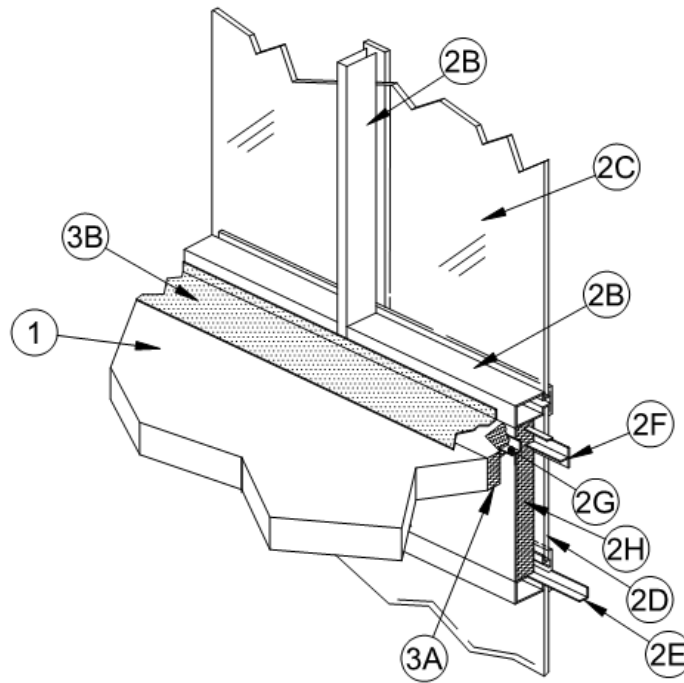
Design No. STI/JS 120-01 OPL Design No. CEJ 322 P

F Rating - 2 HOUR

L Rating - <1 SCFM/LF

Rated for $\pm 6\%$ horizontal movement @ 33% Compression (See ITEM 3A)

Rated for $\pm 3\%$ vertical shear movement @ 33% Compression (See ITEM 3A)



1. **Concrete Floor Assembly** - Two-hour rated concrete floor assembly made from either lightweight or normal weight concrete with a density of 100-150 pcf, with a min. thickness of 4 in. at the joint face. Overall slab thickness may vary to accommodate various blockout depths (longitudinal recesses) formed in the concrete, to house the architectural cover plate. The blockout width may also vary without restriction.
2. **Curtain Wall Assembly** - The curtain wall assembly shall incorporate the following construction features:
 - A. **Mounting Attachment** - (Not Shown) The mounting attachments to the floor slab shall be connected to the joint face of the floor slab, in accordance with the curtain wall manufacturer's instructions. Attachments are to be secured to each mullion in the perimeter joint protection region at a max. spacing of 60 in. o.c.

- B. Aluminum Framing** - Size rectangular aluminum tubing mullions and transoms, according to the curtain wall system manufacturer's guidelines. Min. overall dimensions of the extruded framing sections are 0.100 in. thick aluminum with a minimum 3-3/4 in. depth and a minimum of 2-1/2 in. width. Mullion and transom covers are added to the external side of the framing, giving the framing system a total depth of nominal 5-1/4 in. Mullions are to be spaced a minimum 60 in. o.c. and spandrel transoms are to be spaced a min. 10 in. o.c. For the spandrel region, the lower transom must be placed a min. of 5-1/2 in. below the concrete floor (as measured from the underside of the floor to the top side of the transom) and the upper transom (as measured from the top surface of the floor to the underside of the transom) may be located flush with the top surface of the floor, while maintaining the min. 10 in. spandrel height.
- C. Vision Glass Panels** - Size and install panels to curtain wall framing according to the curtain wall system manufacturer's guidelines. Use min. 1/4 in. thick, clear heat-strengthened (HS) glass or tempered glass with a max. width and height less than the aluminum framing o.c. spacing, which allows the glass to be secured between the notched shoulder of the aluminum framing and pressure bar. Panels are secured with a thermal break (rubber extrusion), pressure bar (aluminum extrusion), min. 1/4-20 x 5/8 in. long screws, and a snap face (aluminum extrusion).
- D. Spandrel Panels** - Size and install panels to curtain wall framing according to the curtain wall system manufacturer's guidelines. Use min 1/4 in. thick, clear heat-strengthened (HS) glass, tempered glass or solid aluminum panels with a max width and height less than the aluminum framing o.c. spacing, which allows the glass or aluminum panels to be secured between the notched shoulder of the aluminum framing and pressure bar. Panels are secured with a thermal break (rubber extrusion), pressure bar (aluminum extrusion), min 1/4-20 x 5/8 in. long screws, and a snap face (aluminum extrusion).
- E. Perimeter Spandrel Panels** - Min. 20 GA 1-1/2 in. x 1-1/2 in. galvanized steel angle is placed around the entire inside perimeter of the spandrel framing and is secured to the aluminum wall framing (Item 2B) with 3/4 in. long hex-head self-drilling self-tapping sheet metal screws spaced max. 8 in. o.c.
- F. Reinforcing Angle** - At the horizontal butt joints of the curtain wall insulation (Item 2H) in the spandrel area, place two 1-1/2 in. by 1-1/2 in. by 20 GA steel angles back-to-back to form a "T". Locate the "T" reinforcing angle at the horizontal centerline of the perimeter joint protection and secure the "T" angle to the perimeter spandrel angles (Item 2E) with 3/4 in. long hex-shaped self-drilling self-tapping sheet metal screws spaced max. 8 in. o.c.
- G. Perimeter Fire Barrier Reinforcement Angle** - Constructed of min. 20 GA 1-1/2 in. x 1-1/2 in. steel angle. The horizontal leg of the angle is fully embedded into the packing material (Item 3A) at the centerline of the perimeter fire barrier, and the vertical leg is secured to the interior side of every vertical aluminum wall framing (Item 2B) member with at least two min. 1/2 in. long, No. 10 sheet metal screws, spaced max. 1 in. o.c. The angle is to be continuous along the length of the perimeter fire barrier. Where joints are required, overlap the angle 12 in. and secure the adjoining angle with at least three min. 1/2 in. long, No. 10 sheet metal screws spaced max. 4 in. o.c., placed in both the vertical and horizontal legs of the angle.
- H. Curtain Wall Insulation** - A nom. 2 in. thick, 8 pcf density mineral wool batt insulation, faced on one side with aluminum foil scrim (vapor retarder) which faces the room interior, is installed to all cavities of the spandrel region between the framing. The batt is to be fitted tightly to the framing with the perimeter spandrel angle (Item 2E) and impaling screws (Item 2I). Seal all meeting edges of insulation with nom. 4 in. wide pressure sensitive aluminum foil faced tape centered over the junction so that approximately 2 in. of tape covers each edge of the adjacent insulation. Place a horizontal seam at the centerline of the perimeter joint protection and reinforce with angle (Item 2F). Install the 24 in. wide batts without vertical seams, spanning the full length between the vertical curtain wall framing members. The interior face of the batt insulation is, if required compressed, flush with the interior face of the curtain wall framing creating a min. 1-in. air space between the insulation and the glass.

3. Perimeter Joint Protection - The perimeter joint (linear opening) is not to exceed an 8 in. nom. joint width (joint width at installation). The perimeter joint treatment shall incorporate the following construction features:

A. Packing Material - Install min. 4 in. thick, 4 pcf density, mineral wool batt insulation installed with the fibers running parallel to the slab edge and curtain wall. After the perimeter fire barrier reinforcement angle (Item 2G) is installed, compress the packing material 33% in the nominal joint width. Compress the batt insulation into the perimeter joint flush with the top surface of the concrete floor slab (Item 1) and its mid depth is compressed against the interior surface of the curtain wall insulation (Item 2H) which is supported by the 20 GA steel reinforcing angle (Item 2F). Splices (butt joints) in the lengths of mineral wool batt insulation are to be tightly compressed together.

B. Fill, Void or Cavity Material - Apply a min. wet film thickness of 1/8 in. over the packing material (Item 3A) and overlap the liquid spray material a min. 1/2 in. onto the adjacent curtain wall framing (Item 2B) and concrete floor slab assembly (Item 1). If the spraying process is stopped and the applied liquid spray material cures to an elastomeric film before process is restarted, then overlap the edge of the cured spray material at least 1/8 in. with the liquid spray material.

Specified Technologies - SpecSeal AS Elastomeric Firestop Spray

*Before testing, the test specimen was cycled 500 times at 30 cpm according to ASTM E1399.

I. Impaling Screws - (Not Shown) Attach curtain wall insulation to the perimeter spandrel angle (Item 2E) with min. No. 8 bugle-head self-drilling self-tapping screws, with a 1-1/2 in. diameter galvanized speed clip spaced max. 8 in. o.c. at the centerline of the flange. Screws should be sized in accordance with the curtain wall insulation thickness, to maintain a firm attachment to the perimeter spandrel angle. Screws shall be installed so that the interior face of the curtain wall insulation is flush with the interior face of the framing.

J. Framing (Mullion) Covers - (Not Shown) Nominal 8 pcf mineral wool batt insulation, faced on one side with aluminum foil scrim (vapor retarder) which faces the room interior. Framing covers are below the perimeter joint treatment and are nominal 2 in. thick, 7 in. wide and 5 in. tall. Framing covers above the perimeter joint treatment are nominal 2 in. thick, 7 in. wide and 2-1/2 in. tall. Center framing covers, over each vertical framing member and secure to the member with No. 8 bugle-head self-drilling self-tapping screws, with a 1-1/2 in. diameter galvanized speed clip spaced a min. 1 in. from each edge. Encapsulate the framing covers with nom. 4 in. wide pressure sensitive aluminum foil faced tape. Overlap the tape approximately 2 in. onto the adjacent aluminum framing. Framing covers do not pass through the perimeter joint treatment. They are butted to top and bottom surfaces of the perimeter joint treatment.

Figure 2: Intertek CEJ 322 P Assembly.

Table 1: Comparison between Tested and Proposed curtain wall assembly.

Element	Intertek OPL Design No. CEJ 322 P	Proposed Assembly
1. Concrete Floor Assembly	Two-hour rated concrete floor assembly made from either lightweight or normal weight concrete with a density of 100-150 pcf, with a min. thickness of 4 in. at the joint face. Overall slab thickness may vary to accommodate various blockout depths (longitudinal recesses) formed in the concrete, to house the architectural cover plate. The blockout width may also vary without restriction.	Two-hour rated post-tensioned, normal weight concrete floor with a thickness of 10 in. at the joint face. Exceeds minimum thickness
2. Curtain Wall Assembly	The curtain wall assembly shall incorporate the following construction features:	The Aluminum stone support assembly shall incorporate the following construction features:
2A. Mounting Attachment (Not Shown)	The mounting attachments to the floor slab shall be connected to the joint face of the floor slab, in accordance with the curtain wall manufacturer's instructions. Attachments are to be secured to each mullion in the perimeter joint protection region at a max. spacing of 60 in. o.c.	The mounting attachments to the floor slab shall be connected to the joint face of the floor slab, in accordance with the curtain wall manufacturer's instructions. The EClad Mullion maximum spacing of 3'-3" (39in.). Equivalent System
2B. Aluminum Framing	Size rectangular aluminum tubing mullions and transoms, according to the curtain wall system manufacturer's guidelines. Min. overall dimensions of the extruded framing sections are 0.100 in. thick aluminum with a minimum 3-3/4 in. depth and a minimum of 2-1/2 in. width. Mullion and transom covers are added to the external side of the framing, giving the framing system a total depth of nominal 5-1/4 in. Mullions are to be spaced a minimum 60 in. o.c. and spandrel transoms are to be spaced a min. 10 in. o.c. For the spandrel region, the lower transom must be placed a min. of 5-1/2 in. below the concrete floor (as measured from the underside of the floor to the top side of the transom) and the upper transom (as measured from the top surface of the floor to the underside of the transom) may be located flush with the top surface of the floor, while maintaining the min. 10 in. spandrel height.	EClad Mullion and Extruded aluminum HSR rail thickness is 0.125". EClad Mullions have a maximum spacing of 3'-3". Equivalent System

2C. Vision Glass Panels	Size and install panels to curtain wall framing according to the curtain wall system manufacturer's guidelines. Use min. 1/4 in. thick, clear heat-strengthened (HS) glass or tempered glass with a max. width and height less than the aluminum framing o.c. spacing, which allows the glass to be secured between the notched shoulder of the aluminum framing and pressure bar. Panels are secured with a thermal break (rubber extrusion), pressure bar (aluminum extrusion), min. 1/4-20 x 5/8 in. long screws, and a snap face (aluminum extrusion).	3" thick "Kingspan" Thermal envelope w/22 GA Metal Skin. Equivalent System
2D. Spandrel Panels	Size and install panels to curtain wall framign [sic] according to the curtain wall system manufacturer's guidelines. Use min 1/4 in. thick, clear heat-strengthened (HS) glass, tempered glass or solid aluminum panels with a max width and height less than the aluminum framing o.c. spacing, which allows the glass or aluminum panels to be secured between the notched shoulder of the aluminum framing and pressure bar. Panels are secured with a thermal break (rubber extrusion), pressure bar (aluminum extrusion), min 1/4-20 x 5/8 in. long screws, and a snap face (aluminum extrusion).	Kingspan metal panel replace the Spandrel Panels. Equivalent System
2E. Perimeter Spandrel Panels	Min. 20 GA 1-1/2 in. x 1-1/2 in. galvanized steel angle is placed around the entire inside perimeter of the spandrel framing and is secured to the aluminum wal [sic] framing (Item 2B) with 3/4 in. long hex-head self-drilling self-tapping sheet metal screws spaced max. 8 in. o.c.	Spiral anchors or impaling Clips to be utilized with the assembly. These will allow the MW to remain in place during a fire. Equivalent System
2F. Reinforcing Angle	At the horizontal butt joints of the curtain wall insulation (Item 2H) in the spandrel area, place two 1-1/2 in. by 1-1/2 in. by 20 GA steel angles back-to-back to form a "T". Locate the "T" reinforcing angle at the horizontal centerline of the perimeter joint protection and secure the "T" angle to the perimeter spandrel angles (Item 2E) with 3/4 in. long hex-shaped self-drilling self-tapping sheet metal screws spaced max. 8 in. o.c.	Not required for this assembly.MW to be compressed against Kingspan Panel. Equivalent System

2G. Perimeter Fire Barrier Reinforcement Angle	Constructed of min. 20 GA 1-1/2 in. x 1-1/2 in. steel angle. The horizontal leg of the angle is fully embedded into the packing material (Item 3A) at the centerline of the perimeter fire barrier, and the vertical leg is secured to the interior side of every vertical aluminum wall framing (Item 2B) member with at least two min. 1/2 in. long, No. 10 sheet metal screws, spaced max. 1 in. o.c. The angle is to be continuous along the length of the perimeter fire barrier. Where joints are required, overlap the angle 12 in. and secure the adjoining angle with at least three min. 1/2 in. long, No. 10 sheet metal screws spaced max. 4 in. o.c., placed in both the vertical and horizontal legs of the angle.	Not required as the joint will be completely filled with Mineral Wool. Exceeds Minimum requirement
2H. Curtain Wall Insulation	A nom. 2 in. thick, 8 pcf density mineral wool batt insulation, faced on one side with aluminum foil scrim (vapor retarder) which faces the room interior, is installed to all cavities of the spandrel region between the framing. The batt is to be fitted tightly to the framing with the perimeter spandrel angle (Item 2E) and impaling screws (Item 2I). Seal all meeting edges of insulation with nom. 4 in. wide pressure sensitive aluminum foil faced tape centered over the junction so that approximately 2 in. of tape covers each edge of the adjacent insulation. Place a horizontal seam at the centerline of the perimeter joint protection and reinforce with angle (Item 2F). Install the 24 in. wide batts without vertical seams, spanning the full length between the vertical curtain wall framing members. The interior face of the batt insulation is, if required compressed, flush with the interior face of the curtain wall framing creating a min. 1-in. air space between the insulation and the glass.	Not required for this assembly as the vertical MW adjacent to the concrete column will replace this item and provide sufficient protection to the cavity gap behind the column. Equivalent System

2I. Impaling Screws (Not Shown)	<p>Attach curtain wall insulation to the perimeter spandrel angle (Item 2E) with min. No. 8 bugle-head self-drilling self-tapping screws, with a 1-1/2 in. diameter galvanized speed clip spaced max. 8 in. o.c. at the centerline of the flange. Screws should be sized in accordance with the curtain wall insulation thickness, to maintain a firm attachment to the perimeter spandrel angle. Screws shall be installed so that the interior face of the curtain wall insulation is flush with the interior face of the framing.</p>	<p>Curtain wall insulation will be attached with impaling pins or spiral anchors to ensure MW will remain in place during a fire.</p> <p>Equivalent Protection</p>
2J. Framing (Mullion) Covers (Not Shown)	<p>Nominal 8 pcf mineral wool batt insulation, faced on one side with aluminum foil scrim (vapor retarder) which faces the room interior. Framing covers are below the perimeter joint treatment and are nominal 2 in. thick, 7 in. wide and 5 in. tall. Framing covers above the perimeter joint treatment are nominal 2 in. thick, 7 in. wide and 2-1/2 in. tall. Center framing covers, over each vertical framing member and secure to the member with No. 8 bugle-head self-drilling self-tapping screws, with a 1-1/2 in. diameter galvanized speed clip spaced a min. 1 in. from each edge. Encapsulate the framing covers with nom. 4 in. wide pressure sensitive aluminum foil faced tape. Overlap the tape approximately 2 in. onto the adjacent aluminum framing. Framing covers do not pass through the perimeter joint treatment. They are butted to top and bottom surfaces of the perimeter joint treatment.</p>	<p>Mullion covers will not be installed over mullions located behind the column.</p> <p>Nominal 6 inch thick, 4 pcf compressed mineral wool batt insulation will be installed vertically between the concrete column and the curtain wall on each side of the unprotected vertical mullions. Thereby providing protection of the mullions.</p> <p>Superior System</p>
3. Perimeter Joint Protection	<p>The perimeter joint (linear opening) is not to exceed an 8 in. nom. joint width (joint width at installation). The perimeter joint treatment shall incorporate the following construction features:</p>	<p>The standard perimeter joint (linear opening) maximum will be 7.5" in. joint width.</p> <p>Where required, at select locations gap extends to 10-5/8" in. Mineral Board of 2" thickness shall be installed to close the gap to less than 8" wide.</p> <p>Equivalent Protection</p>

3A. Packing Material	Install min. 4 in. thick, 4 pcf density, mineral wool batt insulation installed with the fibers running parallel to the slab edge and curtain wall. After the perimeter fire barrier reinforcement angle (Item 2G) is installed, compress the packing material 33% in the nominal joint width. Compress the batt insulation into the perimeter joint flush with the top surface of the concrete floor slab (Item 1) and its mid depth is compressed against the interior surface of the curtain wall insulation (Item 2H) which is supported by the 20 GA steel reinforcing angle (Item 2F). Splices (butt joints) in the lengths of mineral wool batt insulation are to be tightly compressed together.	Install min. 4 in. thick, 4 pcf density, mineral wool batt insulation installed with the fibers running parallel to the slab edge and curtain wall. Compress the packing material 33% in the nominal joint width. Compress the batt insulation into the perimeter joint flush with the top surface of the concrete floor slab and its mid depth is compressed against the interior surface of the curtain wall insulation. Splices (butt joints) in the lengths of mineral wool batt insulation are to be tightly compressed together. Equivalent System
3B. Fill, Void, or Cavity Material	Apply a min. wet film thickness of 1/8 in. over the packing material (Item 3A) and overlap the liquid spray material a min. 1/2 in. onto the adjacent curtain wall framing (Item 2B) and concrete floor slab assembly (Item 1). If the spraying process is stopped and the applied liquid spray material cures to an elastomeric film before process is restarted, then overlap the edge of the cured spray material at least 1/8 in. with the liquid spray material.	Apply a min. wet film thickness of 1/8 in. over the packing material (Item 3A) and overlap the liquid spray material a min. 1/2 in. onto the adjacent curtain wall framing (Item 2B) and concrete floor slab assembly (Item 1). If the spraying process is stopped and the applied liquid spray material cures to an elastomeric film before process is restarted, then overlap the edge of the cured spray material at least 1/8 in. with the liquid spray material. Equivalent System
Fire-Resistance Rating	2-Hour	2-Hour (minimum)

6 SUMMARY

While evaluating the protection requirements of the slab edge connection at a curtain wall, the Intertek Design No. CEJ 322 P was selected and formed the basis of the proposed design. This approach was approved under previous appeals for use in the entirety of the building. Upon installation of the previously approved approach, specific site conditions were discovered in which vertical mullion protection could not be installed to limited access areas. All other features of the approved approach will be installed. The proposed design presents an alternative to protection of vertical mullions located behind concrete columns.

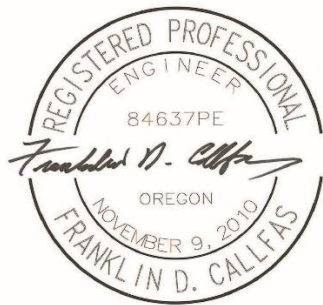
MCCCH Engineering Judgement Report

The vertical gap between the concrete column and the Kingspan panels is to be protected by compressed mineral wool insulation in order to prevent the spread of heat and fire from room to the unprotected vertical mullions. By enclosing these mullions in a protected cavity, the proposed design provides additional protection beyond the minimum requirements of the Intertek design. The Intertek evaluation provides a conservative basis of fire-resistance rating for this assembly, as documented in the table above.

7 CONCLUSION

We have reviewed the proposed slab/wall assembly (Fig.1, 2) against an Intertek tested design. The evaluation from the CEJ 322 P assembly shows that the proposed design provides equivalent, if not superior protection at all critical points, including the vertical mullions below the floor slab.

As detailed above, the proposed slab edge protection assembly will meet or exceed the required minimum 2-hour fire-resistance rating as compared in this letter against Intertek Design No. CEJ 322 P.



EXPIRES 12-31-19

Franklin Callfas
Principal/Fire Protection Engineer
Code Unlimited