

**PERFORMANCE TEST REPORT**

**PRL ALUMINUM  
PR CW600/PR CW700  
ALUMINUM CURTAIN WALL**

**CCLW JOB #11-5484**

**MAY 9, 2011**

**DATE OF TESTING**

**APRIL 25, 2011**

**TESTED FOR**

**PRL ALUMINUM  
14760 DON JULIAN ROAD  
CITY OF INDUSTRY, CA 91746**

**TESTED BY**

**CONSTRUCTION CONSULTING LABORATORY WEST  
4751 WEST STATE STREET; SUITE B  
ONTARIO, CA 91762**

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## **INTRODUCTION**

The following is a test report outlining the procedure, specimen and test results utilized and obtained during testing of a curtain wall mock up furnished and installed by PRL Aluminum at Construction Consulting Laboratory West, Ontario, California, on April 25, 2011. Testing was conducted in accordance with the current issue of the test standards and industry standards.

## **TEST SPECIMEN**

The test specimen submitted for testing was a one story unitized curtain wall mock up consisting of two (2) standard systems, PR CW-600 and PR CW-700. The overall mock up measured 15'-10 1/2" wide by 11'-4" high.

For a complete description including anchorage, glass and framing details, see drawings (sheets 1 through 9) at the conclusion of this report. Drawings are furnished by PRL Aluminum.

## **WITNESSED BY (all or partial testing)**

David Olague	PRL Aluminum
Frank Fisher	PRL Aluminum
Jack W. Jackson	Construction Consulting Laboratory West
Chad Jackson	Construction Consulting Laboratory West

## **TEST LOADS**

Design loads (100%): **40.0 psf** Positive and **40.0 psf** Negative

All references to positive pressures are considered inward acting and negative is outward.

The mock up was tested in accordance with each applicable AAMA or ASTM standard.

## **TEST EQUIPMENT**

The specimens were installed into a single test chamber constructed of structural shapes covered with steel and plywood bulkheads, accessible through a bulkhead door.

Air infiltration was measured with a Meriam laminar flow element and a Dwyer manometer.

Pressure differentials were measured with a Dwyer electronic manometer.

The pressure differential between the exterior and interior of the chamber was created by a positive and negative blower system.

Water was applied from a vertical spray rack mounted 24" from the specimen. The rack was equipped with swirl-type nozzles spaced two (2) feet on center, vertically and horizontally, which delivered five (5) gallons of water per hour per square foot of wall frontal area.

Structural deflections were measured with numerous dial indicator gages with follow-up hands.

Dynamic winds were generated by a Curtis Wright 3350 radial aircraft engine with a three (3) blade propeller, 14'-5" diameter, which formulates typical and atypical wind conditions.

**TESTING AS FOLLOWS**

**April 25, 2011**

**PRELOAD per ASTM E 330-02**

To set the specimen for testing, a positive pressure differential of **20.0 psf** was applied to the specimen while exhausting air in the air infiltration test. It was held for ten (10) seconds and then reduced to **6.24 psf** to complete the air infiltration test. No failure shall be allowed.

**RESULTS**

There was no indication of or visible signs of any failure.

**AIR INFILTRATION TEST per ASTM E 283-04**

The exterior face of the specimen was covered and then subjected to a positive static pressure differential of **6.24 psf**. Air infiltration was measured. This reading represents the air infiltration through the specimen and the chamber. The visqueen was removed and air infiltration again measured. The difference is the net air infiltration of the specimen.

**ALLOWABLE**

Air infiltration shall not exceed **0.06 cfm** per square foot of fixed wall area as determined by actual measurement.

Fixed Wall Area (179.9 s/f x 0.06) = **10.8 cfm** total allowed.

**RESULTS**

**Specimen passed.**

Gross air reading:	= 16.4 cfm	
Tare reading (chamber):	= <u>11.7 cfm</u>	
<b>Total Net for Mock up</b>	= <b>4.7 cfm</b>	<b>&lt; 10.8 cfm</b>

**STATIC WATER PENETRATION TEST per ASTM E 331-00**

Water was applied to the exterior face of the total specimen, at a minimum rate of five (5) gallons per hour per square foot of wall frontal area, in such a way as to completely cover the exterior face of the specimen. At the same time, a positive differential static pressure of **15.0 psf** was applied to the face of the specimen. The application of pressure and water was maintained for a period of fifteen (15) minutes, with observers viewing the interior of the specimen.

**ALLOWABLE**

No uncontrolled water leakage. Water penetration is defined as the appearance of uncontrolled water, other than condensation, on any indoor face of any part of the exterior wall that is not contained or drained back to the exterior, or that can cause damage to adjacent materials or finishes. Water contained within drained flashings, gutters and sills is not considered water leakage. Sources of water leakage will be identified.

**RESULTS**

**Specimen passed.**

There was no water leakage noted during or after the static water test.

### **DYNAMIC WATER PENETRATION TEST per AAMA 501.1-05**

The specimen was subjected to a dynamic wind load pressure equivalent of **15.0 psf (76.5 mph wind speed)** with a water application of five (5) gallons per hour per square foot of wall frontal area for a duration of fifteen (15) minutes.

#### **ALLOWABLE**

There shall be no uncontrolled water leakage, same as the static water test above.

#### **RESULTS**

##### **Specimen passed.**

There was no water leakage noted during or after the dynamic water test.

### **UNIFORM STRUCTURAL DEFLECTION TEST @ DESIGN - ASTM E 330-02**

The test specimen was subjected to a 50% positive design load of **20.0 psf**. The pressure was held for ten (10) seconds to set for positive testing and released. Indicators were set to zero.

The test specimen was subjected to a positive load of **40.0 psf**, 100% design load, held for ten (10) seconds and released. Indicators were read and all data was recorded.

The blower system, along with the measuring equipment, was then reversed. The test specimen was subjected to a negative 50% design load of **20.0 psf**. The pressure was held for ten (10) seconds to set for negative testing and released. Indicators were set to zero.

The test specimen was subjected to a negative load of **40.0 psf**, 100% design load, held for ten (10) seconds and released. Indicators were read and all data was recorded.

#### **ALLOWABLE**

Deflection of framing members in a direction normal to the wall plane is limited to **L/175**.

#### **RESULTS**

##### **Specimen passed.**

All measured spans complied with specified criteria. See elevation drawing, sheet 1 of 9, for dial indicator locations. See Charts #1 and #2 on page 6 for deflection and permanent set results (reference bold number - **xx/xx** for **deflection**). There was no glass breakage.

### **SEISMIC RACKING - LATERAL @ DESIGN (elastic) per AAMA 501.4-00**

The bottom framing of the mockup was made to move in a parallel direction with the main wall face. The framing was moved laterally one direction **.75" (3/4")**, returned to zero, then racked in the opposite direction **.75" (3/4")** then returned to zero. This was repeated for a total of three (3) two-stroke cycles.

### **ALLOWABLE**

No failures are allowed. Observations will be recorded.

Failure is defined as breakage including full disengagement or separation of parts or assemblies from the window wall system. Specimen shall remain weatherproof.

### **RESULTS**

**Specimen passed.**

No permanent displacement, deformation, or failure and no glass breakage was noted.

### **REPEAT STATIC WATER PENETRATION TEST per ASTM E331-00**

Same procedure and allowable criteria as previous static water test (15.0 psf).

### **RESULTS**

**Specimen passed.**

There was no uncontrolled water leakage noted during or after the static water test.

### **UNIFORM STRUCTURAL PROOF LOAD TEST per ASTM E 330-02**

The test specimen was subjected to a positive load of **30.0 psf** (75% design load), held for ten (10) seconds and released. Indicators were set to zero.

The test specimen was subjected to a positive load of **60.0 psf** (150% design load), held for ten (10) seconds and released. Indicators were read and all data was recorded.

The blower system, along with the measuring equipment, was reversed. The test specimen was subjected to a negative load of **30.0 psf** (75% design load). The pressure was held for ten (10) seconds and released. Indicators were then set to zero.

The test specimen was subjected to a negative load of **60.0 psf** (150% design load), held for ten (10) seconds and released. Indicators were read and all data was recorded.

### **ALLOWABLE**

There shall be no failures or permanent deformation in excess of L/500 of clear span.

### **RESULTS**

**Specimen passed.**

All measured spans complied with specified criteria. See elevation drawings, sheet 1 of 9, for dial indicator locations. See Charts #3 and #4 on page 7 for deflection and permanent set results (reference bold number - xx/xx for **permanent set**). There was no glass breakage.

### **END OF TESTING**

**STRUCTURAL READINGS  
100% DESIGN LOAD**

**PR CW-600 & PR CW-700  
CCLW REPORT: 11-5484**

**CHART 1 OF 4**

**TEST PRESSURE = 40.0 PSF      POSITIVE**

DIAL IND.	MEMBER	D'TL	REF.	POSITION	GROSS READ	NET READ	ALLOW BELOW	SPAN
1	VERT. MULL. - CW700			BOTTOM	03/00	-		-
2	VERT. MULL. - CW700		(1&3)	MID SPAN	32/01	29/01	77	135"
3	VERT. MULL. - CW700			TOP	03/00	-		-
4	VERT. MULL. - CW600			BOTTOM	02/00	-		-
5	VERT. MULL. - CW600		(4&6)	MID SPAN	25/00	22/00	59	104"
6	VERT. MULL. - CW600			TOP	04/01	-		-

**CHART 2 OF 4**

**TEST PRESSURE = 40.0 PSF      NEGATIVE**

DIAL IND.	MEMBER	D'TL	REF.	POSITION	GROSS READ	NET READ	ALLOW BELOW	SPAN
1	VERT. MULL. - CW700			BOTTOM	06/02	-		-
2	VERT. MULL. - CW700		(1&3)	MID SPAN	42/00	37/-01	77	135"
3	VERT. MULL. - CW700			TOP	04/00	-		-
4	VERT. MULL. - CW600			BOTTOM	04/00	-		-
5	VERT. MULL. - CW600		(4&6)	MID SPAN	27/02	23/01	59	104"
6	VERT. MULL. - CW600			TOP	05/01	-		-

READINGS ARE IN HUNDRETHS OF INCH  
READINGS ARE **DEFLECTION**/PERMANENT SET

DEFL. LIMIT = L/175 or 3/4" MAX.

**STRUCTURAL READINGS  
150% PROOF LOAD**

**PR CW-600 & PR CW-700  
CCLW REPORT: 11-5484**

**CHART 3 OF 4  
TEST PRESSURE = 60.0 PSF      POSITIVE**

DIAL IND.	MEMBER	D'TL	REF.	POSITION	GROSS READ	NET READ	ALLOW L/500	SPAN
1	VERT. MULL. - CW700			BOTTOM	08/02	-		
2	VERT. MULL. - CW700		(1&3)	MID SPAN	57/02	50/01	27	135"
3	VERT. MULL. - CW700			TOP	07/00	-		
4	VERT. MULL. - CW600			BOTTOM	06/02	-		
5	VERT. MULL. - CW600		(4&6)	MID SPAN	51/01	43/01	21	104"
6	VERT. MULL. - CW600			TOP	10/01	-		

**CHART 4 OF 4  
TEST PRESSURE = 60.0 PSF      NEGATIVE**

DIAL IND.	MEMBER	D'TL	REF.	POSITION	GROSS READ	NET READ	ALLOW BELOW	SPAN
1	VERT. MULL. - CW700			BOTTOM	12/03	-		
2	VERT. MULL. - CW700		(1&3)	MID SPAN	61/03	50/02	27	135"
3	VERT. MULL. - CW700			TOP	09/00	-		
4	VERT. MULL. - CW600			BOTTOM	11/04	-		
5	VERT. MULL. - CW600		(4&6)	MID SPAN	52/04	42/02	21	104"
6	VERT. MULL. - CW600			TOP	10/01	-		

READINGS ARE IN HUNDRETHS OF INCH  
READINGS ARE DEFLECTION/**PERMANENT SET**

PERM. SET LIMIT = L/500.

**TESTING COMPLETED**

As built mock-up drawings, furnished by PRL Aluminum, Inc., are reviewed and stamped by the laboratory and attached to the report. They should accompany and are a part of this report.

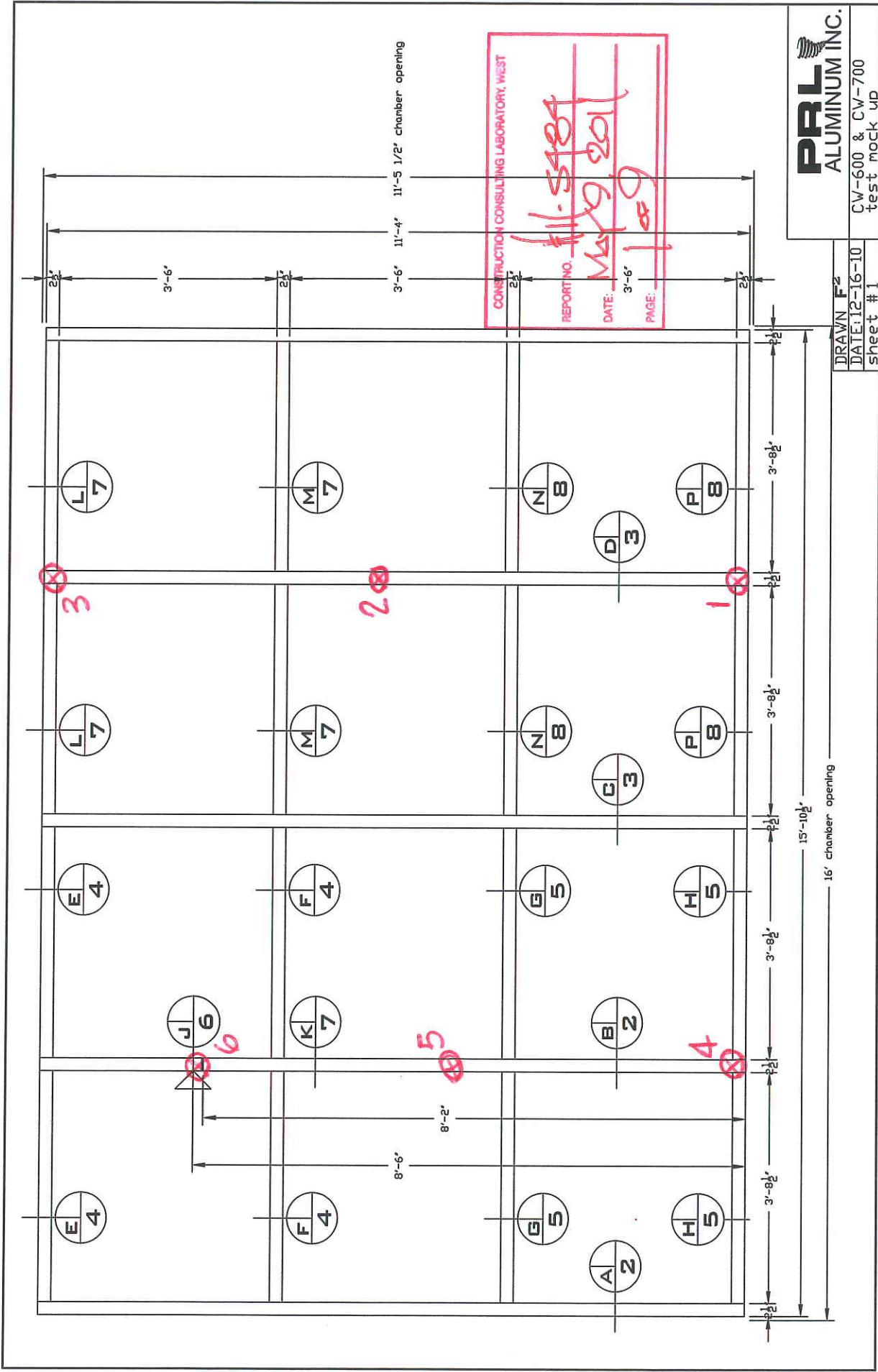
*Jack W. Jackson*

**CONSTRUCTION CONSULTING LABORATORY WEST  
JACK W. JACKSON  
PRESIDENT/MANAGER OF TESTING**

*Francis Pickell, Sr.*

**FRANCIS PICKELL, SR.  
PROFESSIONAL ENGINEER**





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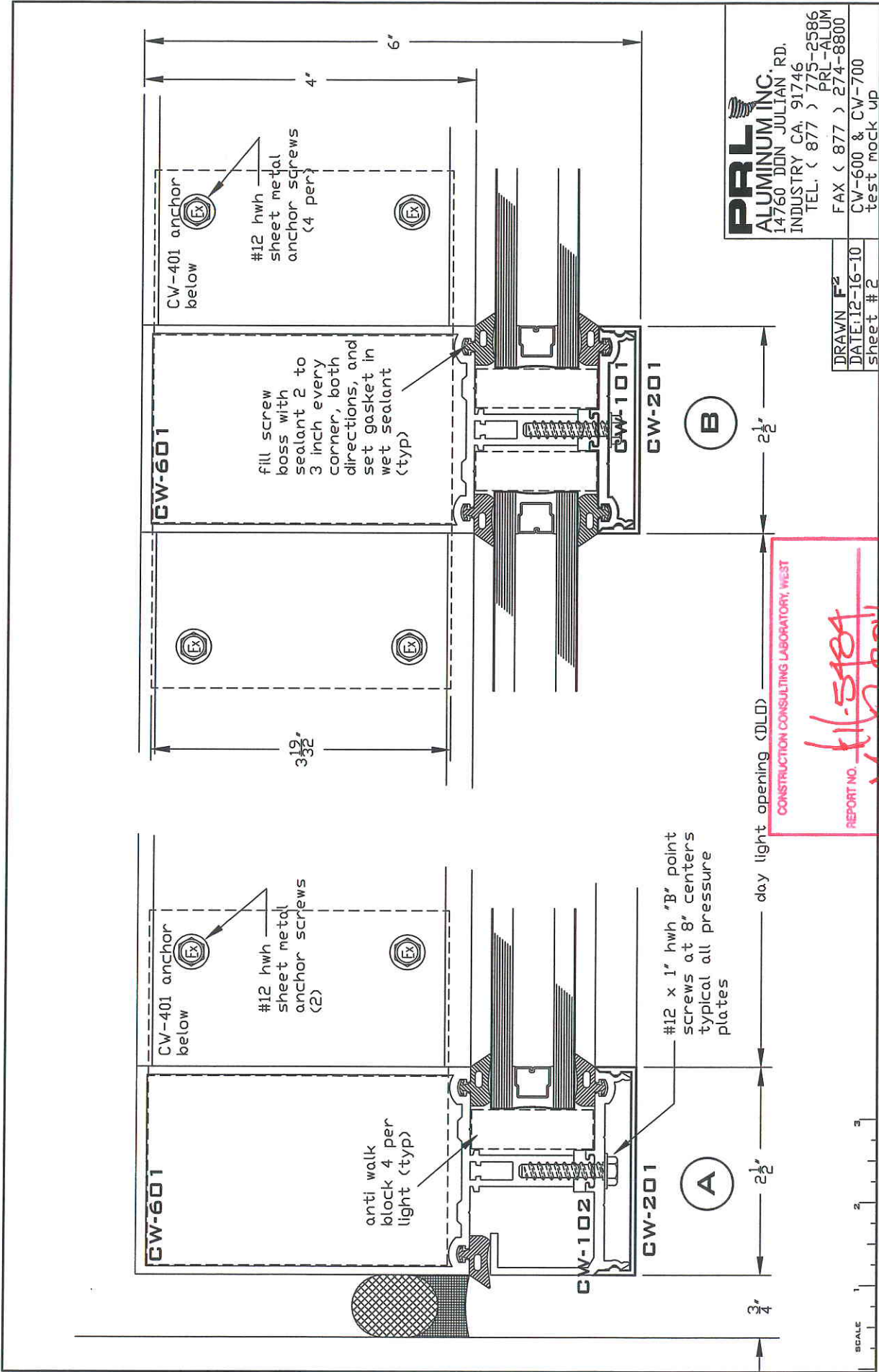
CW-600 & CW-700  
test mock up

DRAWN F2  
DATE: 12-16-10  
sheet #1

16' chamber opening

11'-5 1/2' chamber opening



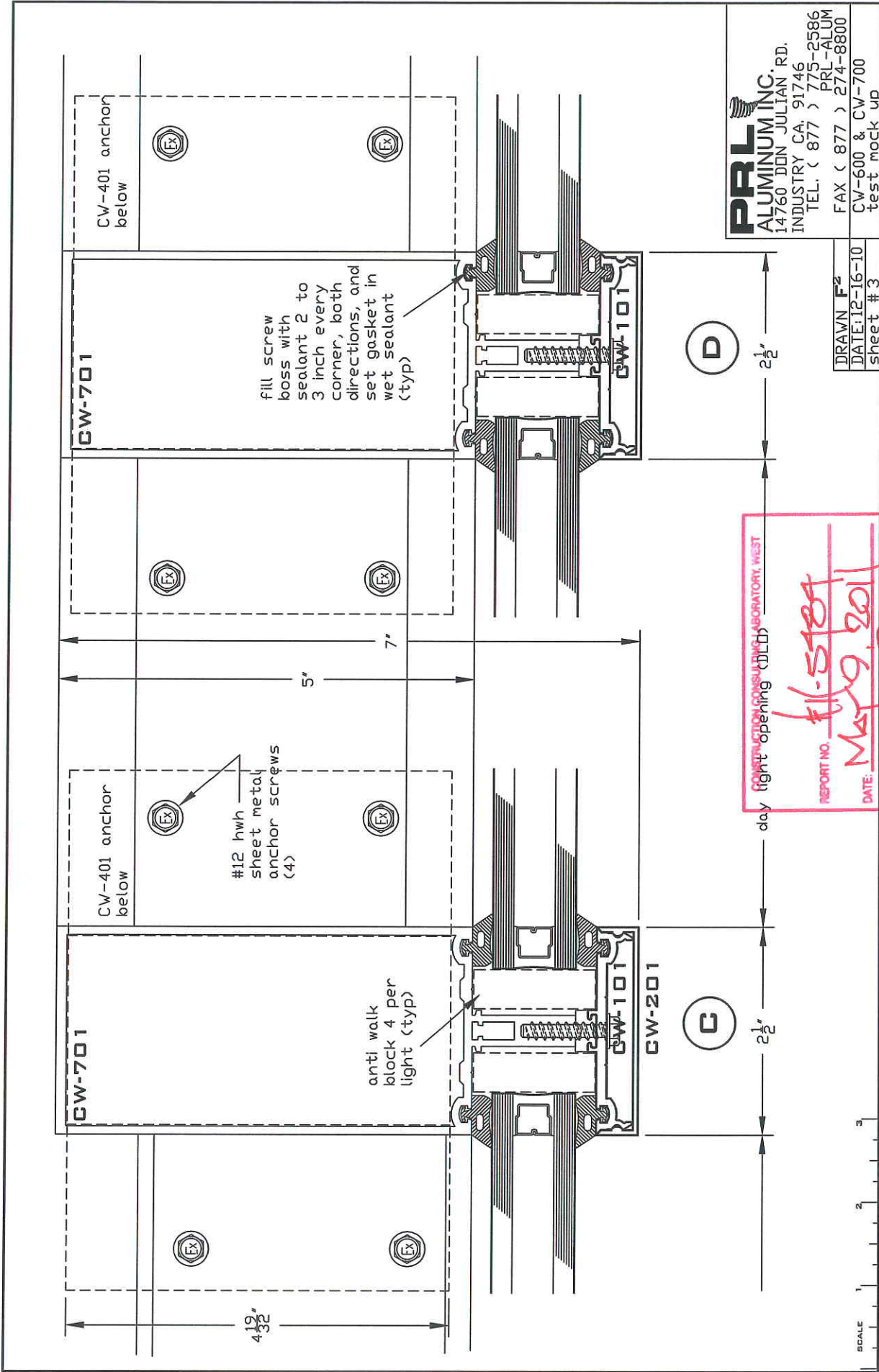


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 CW-600 & CW-700  
 test mock up

DRAWN **F<sup>2</sup>**  
 DATE: 12-16-10  
 sheet # 2

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 CW-600 & CW-700  
 test mock up

DRAWN F<sup>2</sup>  
 DATE: 12-16-10  
 sheet # 3

CONSTRUCTION CONSULTING LABORATORY, WEST  
 light opening (DLB)  
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SCALE 1 2 3

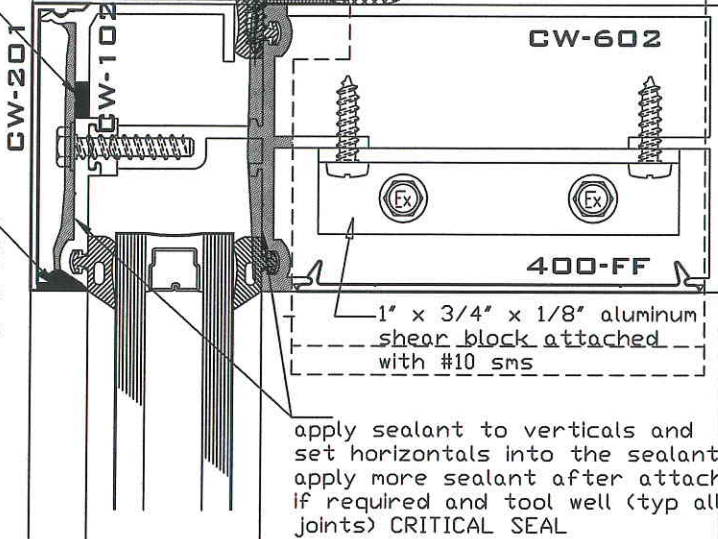
2 1/2 x 2 3/4 x 0.04 closer plate at top of mullions, set on bed of sealant and secure with #10 x 1/2 sms

#12 hwh sheet metal anchor screws

5/16 DIA WEEP HOLES, 2 PER 9" FROM END

(E)

WEEP HOLES ACIEVED BY CUTTING OFF LEG AT ENDS OF EXTRUSION AT 45° (APROX 7/16)



apply sealant to verticals and set horizontals into the sealant, apply more sealant after attachment if required and tool well (typ all joints) CRITICAL SEAL

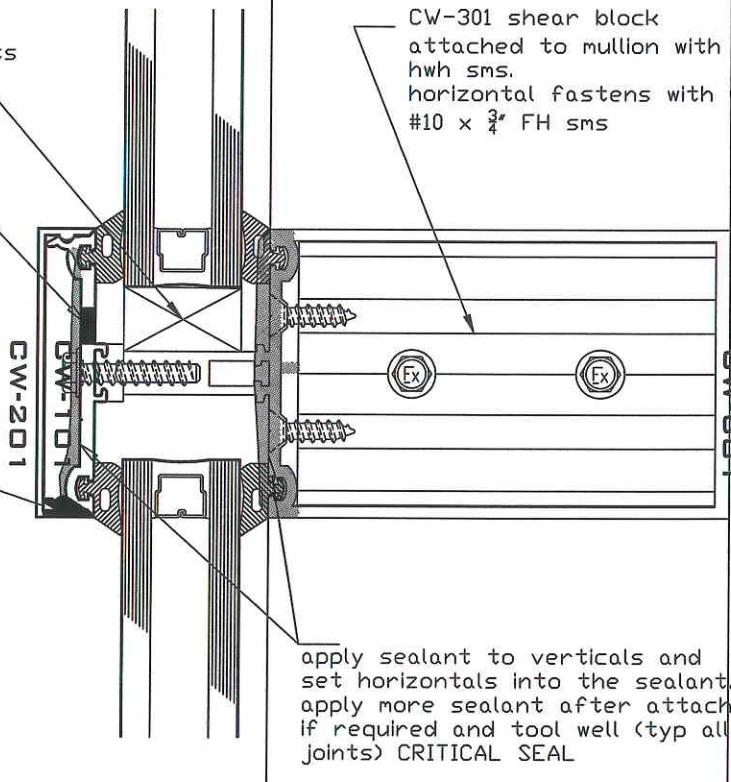
4" long x 80 duro setting blocks, 2 per light @ 1/4 points

CW-301 shear block attached to mullion with (2) #10 x 3/4 hwh sms, horizontal fastens with (2) #10 x 3/4 FH sms

5/16 DIA WEEP HOLES, 2 PER 9" FROM END

(F)

1/4" x 1/2" long weep holes, 2 per 3" from end.



apply sealant to verticals and set horizontals into the sealant, apply more sealant after attachment if required and tool well (typ all joints) CRITICAL SEAL

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SCALE 1 2 3

DRAWN F<sup>2</sup>  
 DATE: 12-16-10  
 sheet # 4

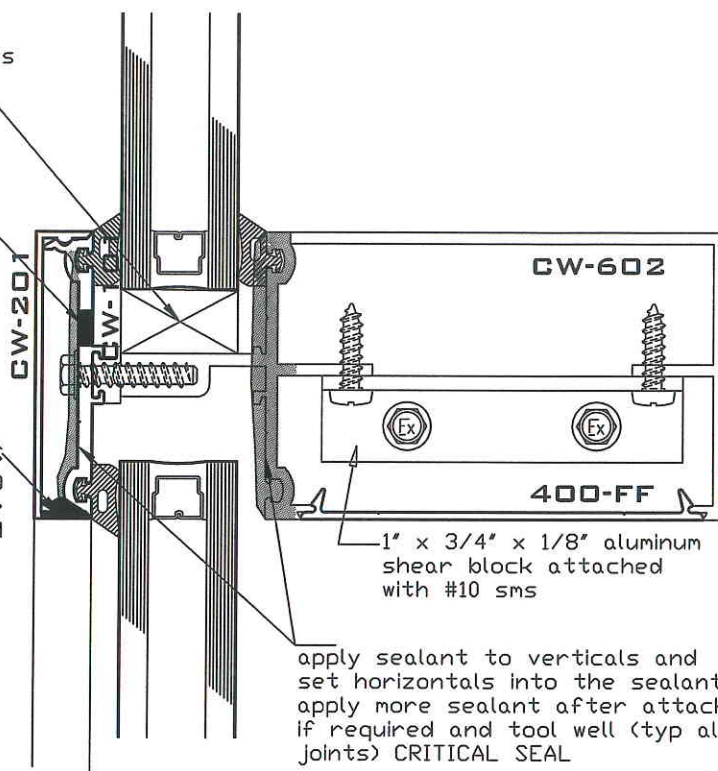
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 CW-600 & CW-700  
 test mock up

4" long x 80 duro setting blocks.  
2 per light @ 1/4 points

5/16 DIA WEEP HOLES, 2 PER 9" FROM END

(G)

WEEP HOLES achieved by drilling 3/8" dia hole 2 per at 3" from end



apply sealant to verticals and set horizontals into the sealant. apply more sealant after attachment if required and tool well (typ all joints) CRITICAL SEAL

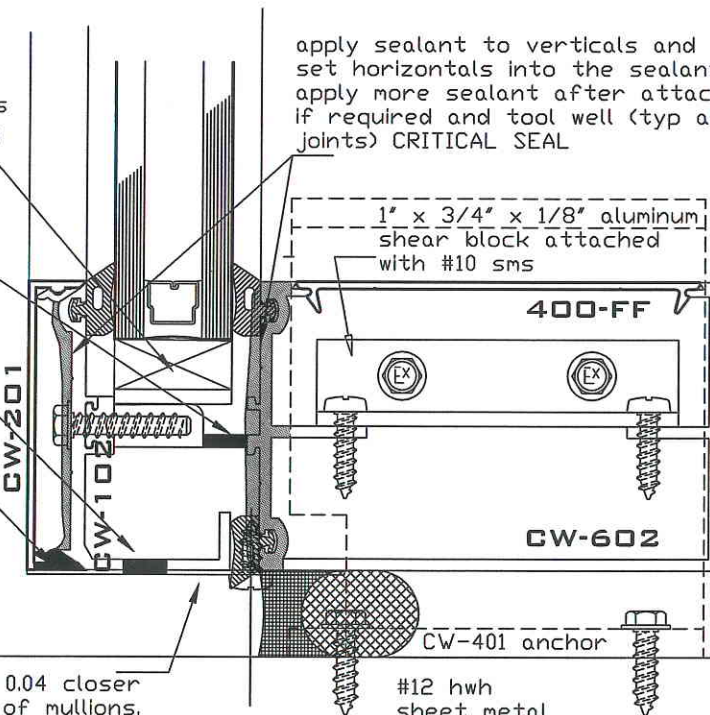
4" long x 80 duro setting blocks.  
2 per light @ 1/4 points sitting on 1/8" aluminum flat

3/8 DIA WEEP HOLES, 2 PER 9" FROM END

3/8 DIA WEEP HOLES, 2 PER 6" FROM END

(H)

WEEP HOLES ACIEVED BY CUTTING OFF LEG AT ENDS OF EXTRUSION AT 45° (APROX 7/16)



apply sealant to verticals and set horizontals into the sealant. apply more sealant after attachment if required and tool well (typ all joints) CRITICAL SEAL

2 1/2 x 2 3/4 x 0.04 closer plate at bottom of mullions. set on bed of sealant and secure with #10 x 1/2 sms

#12 hwh sheet metal anchor screws

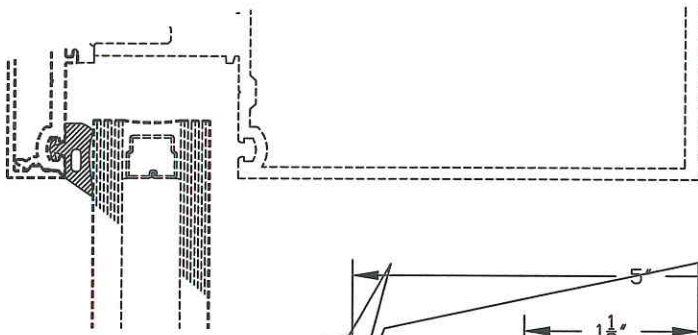
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DRAWN F<sup>2</sup>  
DATE: 12-16-10  
sheet # 5

CW-600 & CW-700  
test mock up





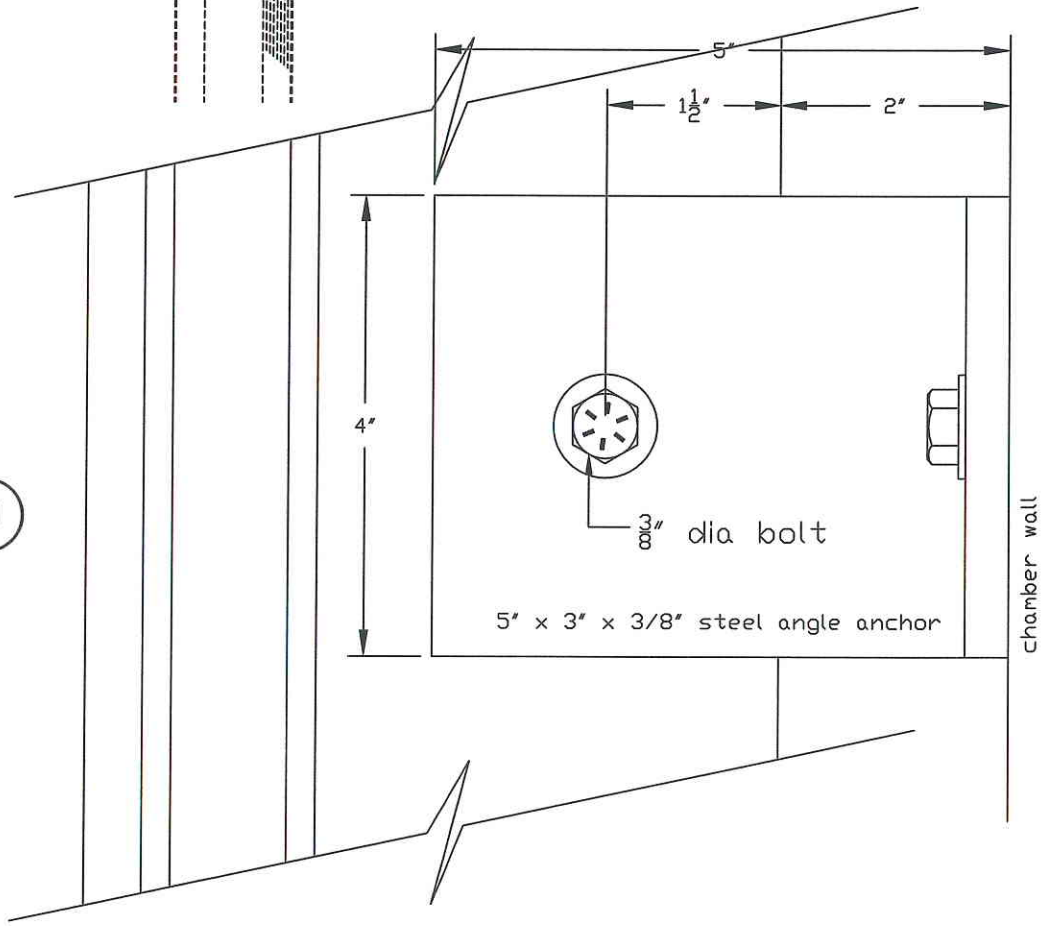
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U



ANCHOR DETAIL

SCALE 1 2 3

DRAWN **F<sup>2</sup>**

DATE: 12-16-10

sheet # 6

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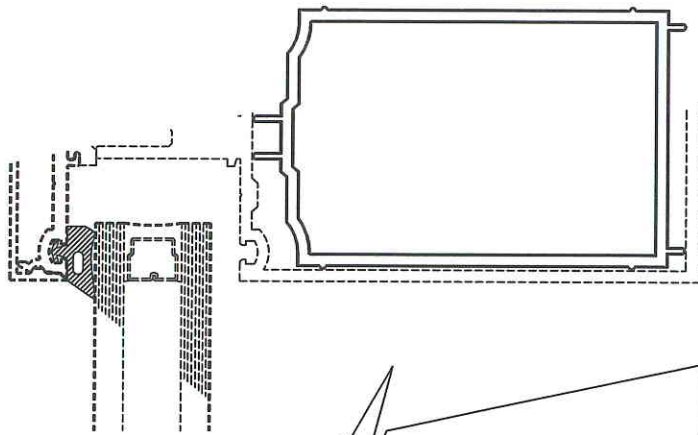
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CW-600 & CW-700

test mock up



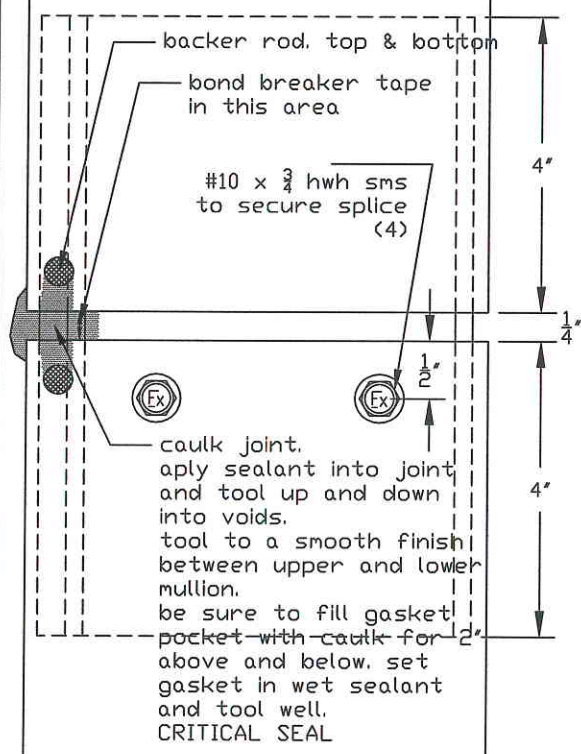
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(K)



MULLION SPLICE DETAIL

SCALE 1 2 3

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 DATE: 12-16-10  
 sheet # 7

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 CW-600 & CW-700  
 test mock up

2 1/2 x 2 3/4 x 0.04 closer plate at top of mullions, set on bed of sealant and secure with #10 x 1/2 sms

#12 hwh sheet metal anchor screws

5/16 DIA WEEP HOLES, 2 PER 9" FROM END

CW-401 anchor

CW-702



WEEP HOLES ACIEVED BY CUTTING OFF LEG AT ENDS OF EXTRUSION AT 45° (APROX 7/16)

400-FF

1" x 3/4" x 1/8" aluminum shear block attached with #10 sms

apply sealant to verticals and set horizontals into the sealant, apply more sealant after attachment if required and tool well (typ all joints) CRITICAL SEAL

4" long x 80 duro setting blocks, 2 per light @ 1/4 points

CW-301 shear block attached to mullion with (2) #10 x 3/4 hwh sms, horizontal fastens with (2) #10 x 3/4 FH sms

5/16 DIA WEEP HOLES, 2 PER 9" FROM END



1/4" x 1/2" long weep holes, 2 per 3" from end.

CW-201

CW-701

apply sealant to verticals and set horizontals into the sealant, apply more sealant after attachment if required and tool well (typ all joints) CRITICAL SEAL

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SCALE 1 2 3

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 test mock up

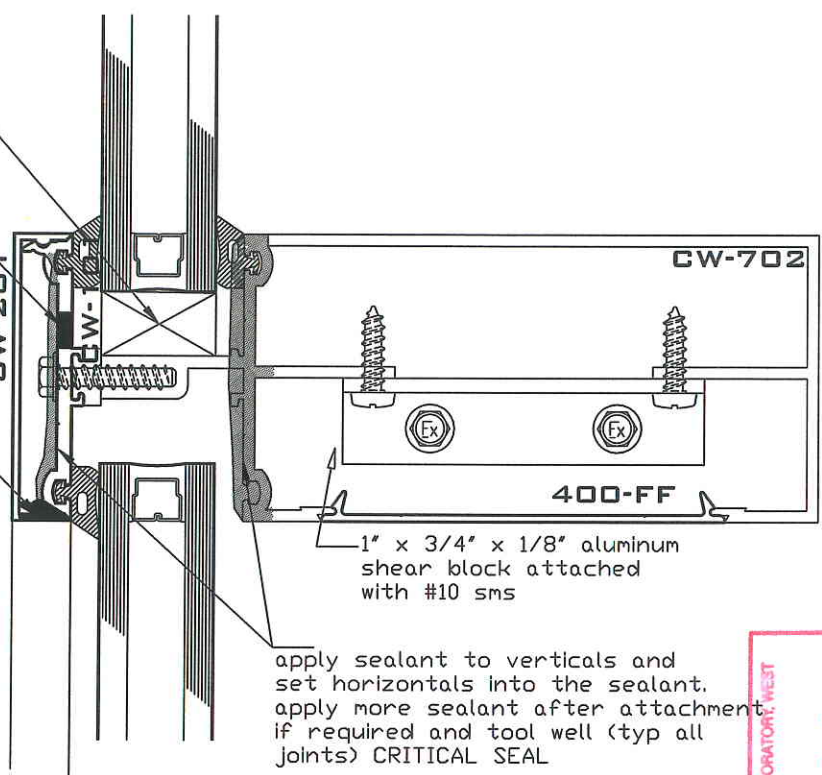
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 DATE: 12-16-10  
 sheet # 8

4" long x 80 duro setting blocks.  
2 per light @ 1/4 points

5/16 DIA WEEP HOLES, 2 PER 9" FROM END

(N)

WEEP HOLES achieved by drilling 3/8" dia hole 2 per at 3" from end



1" x 3/4" x 1/8" aluminum shear block attached with #10 sms  
apply sealant to verticals and set horizontals into the sealant. apply more sealant after attachment if required and tool well (typ all joints) CRITICAL SEAL

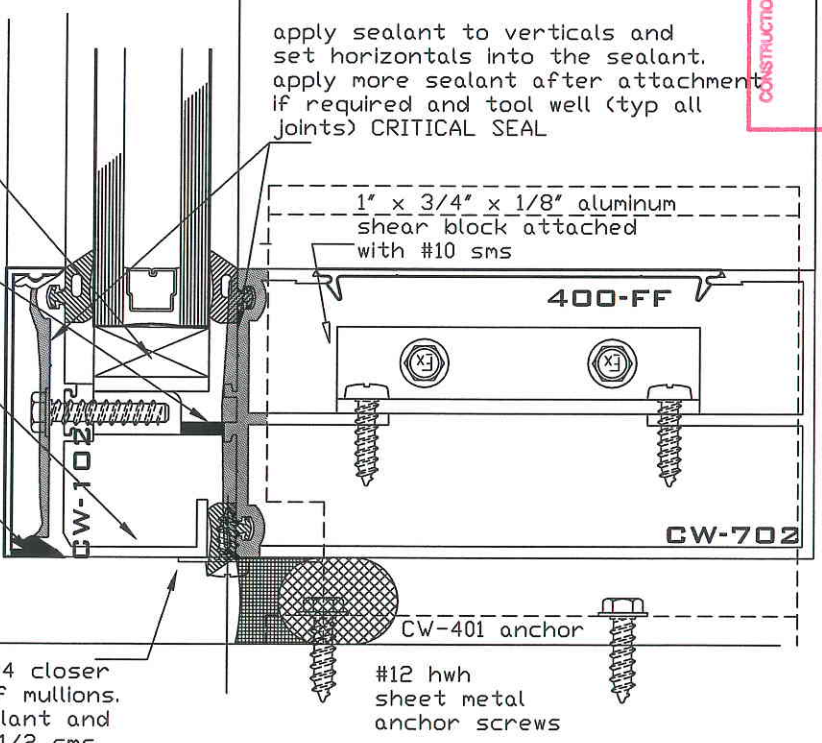
4" long x 80 duro setting blocks. 2 per light @ 1/4 points sitting on 1/8" aluminum flat

3/8 DIA WEEP HOLES, 2 PER 9" FROM END

no weep holes ends left open

(P)

WEEP HOLES ACIEVED BY CUTTING OFF LEG AT ENDS OF EXTRUSION AT 45° (APROX 7/16)



apply sealant to verticals and set horizontals into the sealant. apply more sealant after attachment if required and tool well (typ all joints) CRITICAL SEAL

2 1/2 x 1 1/4 x 0.04 closer plate at bottom of mullions. set on bed of sealant and secure with #10 x 1/2 sms

CW-401 anchor  
#12 hwh sheet metal anchor screws

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SCALE 1 2 3

DRAWN F<sup>2</sup>  
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test mock up