Architectural Testing

ASTM E 1886 and ASTM E 1996 TEST REPORT

Report No.: A2651.02-401-44

Rendered to:

CORAL ARCHITECTURAL PRODUCTS
Tuscaloosa, Alabama

PRODUCT TYPE: 90° Corner Curtain Wall
SERIES/MODEL: PW257 Captured and Butt Glazed

This report contains in its entirety:

Cover Page:	1 page
Report Body:	**13 pages**
Sketches:	**2 pages**
Photographs:	**1 pages**
Drawings:	**15 pages**

SHAWN G. COLLINS
LICENSE
No. 70655
STATE OF FLORIDA
PROFESSIONAL ENGINEER

Digitally Signed by: Shawn G. Collins
2011.02.17 13:48:15 -05'00'

Test Dates:	12/13/10
Through:	12/17/10
Report Date:	02/17/11
Test Record Retention End Date:	12/17/14

1.0 Report Issued To: Coral Architectural Products
3010 Rice Mine Road
Tuscaloosa, Alabama 35406

2.0 Test Laboratory: Architectural Testing, Inc.
2250 Massaro Boulevard
Tampa, Florida 33619
813-628-4300

3.0 Project Summary:

3.1 Product Type: 90° Corner Curtain Wall

3.2 Series/Model: PW257 Captured and Butt Glazed

3.3 Compliance Statement: Results obtained are tested values and were secured by using the designated test method(s). The samples tested met the performance requirements set forth in the referenced test procedures for a ±3828 Pa (±80.0 psf) Design Pressure with missile impacts corresponding to Missile Level D and Wind Zone 4.

3.4 Test Dates: 12/13/2010 - 12/17/2010

3.5 Test Location: Architectural Testing, Inc. test facility in Tampa, Florida.

3.6 Test Sample Source: The test specimens were provided by the client. Representative samples of the test specimen(s) will be retained by Architectural Testing for a minimum of four years from the test completion date.

3.7 Drawing Reference: The test specimen drawings have been reviewed by Architectural Testing and are representative of the test specimen(s) reported herein. Test specimen construction was verified by Architectural Testing per the drawings located in Appendix C. Any deviations are documented herein or on the drawings.

3.8 List of Official Observers:

Name	Company
Bill Smith	Coral Architectural Products
John McClane	Architectural Testing, Inc.
Don Beltz	Architectural Testing, Inc.
Shawn G. Collins, P.E.	Architectural Testing, Inc.

4.0 Test Specification(s):

ASTM E 1886-05, *Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.*

ASTM E 1996-05, *Standard Specification for Performance of Exterior Windows, Glazed Curtain Walls, Doors and Storm Shutters Impacted by Wind Borne Debris in Hurricanes.*

5.0 Test Specimen Description:

5.1 Product Sizes:

Test Specimens #1, #2 and #3:

Overall Area: 27.2 m^2 (292.7 ft^2)	**Width**		**Height**	
	millimeters	**inches**	**millimeters**	**inches**
Overall size	5613	221	3810	150
Overall size 90° Return	1524	60	3810	150

5.2 Frame Construction:

Frame Member	**Material**	**Description**
Head / Sill	Extruded Aluminum	Drawing #16 (PW203), #23 (PW613) & #25 (PW652) on sheet 15 of 15
Vertical Mullion	Extruded Aluminum	Drawing #14 (PW151), #15 (PW202) & #24 (PW650) on sheet 15 of 15
Horizontal Mullion	Extruded Aluminum	Drawing #16 (PW203) & # 26 (PW655) on sheet 15 of 15
Jambs	Extruded Aluminum	Drawing #24 (PW650), #15 (PW202), #23 (PW613)

	Joinery Type	**Detail**
All frame corners	Mechanical	The horizontal members were butt joints, sealed with 0.50" x 0.125" Isocryl joint sealant tape and secured with three (3) #14 x1" hex head screws; through the vertical members into the adjacent horizontal members screw spline.

5.3 Sash/Vent/Panel Construction: Not utilized

5.0 Test Specimen Description: (Continued)

5.4 Weatherstripping:

Description	Quantity	Location
Exterior glazing gasket (NG10)	2 rows	Underside of pressure bar; outer edges
Exterior perimeter gasket (NG11)	1 row	Underside of the pressure bar; outer edge at the perimeter frame members
Pressure bar isolator (NG12)	1 row	Underside of the pressure bar; center
Interior gasket (NG14)	1 row	Exterior side of vertical and horizontal mullions; glazing perimeter

5.5 Glazing:

Glass Type	Spacer Type	Interior Lite	Exterior Lite	Glazing Method
1-5/16" IG	Reinforced Butyl spacer system	1/4" HS – 0.090" SGP interlayer – 1/4" - HS	1/4" - HS	The glass was exterior glazed against a 1/4" rubber stop and back sealed with Dow 995 sealant. The glass was secured from the exterior utilizing #12 x 1-1/4" hex washer head self drilling screws located 2" from ends and 12" on center through the aluminum pressure plates P/N PW204.

Location	Quantity	Daylight Opening		Glass Bite
		millimeters	inches	
Far left side, front face bottom	2	1149 x 2438	45-1/4" x 96"	3/4"
Far left side, front face top transom	2	1149 x 1168	45-1/4" x 46"	3/4"
Center front face and 90° return bottom	3	1429 x 2438	56-1/4" x 96"	3/4"
Center front face and 90° return top transom	3	1429 x 1168	56-1/4" x 46"	3/4"

5.0 Test Specimen Description: (Continued)

5.6 Drainage:

Drainage Method	Size	Quantity	Location
Weep holes zoned draining system	1/4"	30	8" in from each vertical mullion on the under side of the horizontal mullion trim caps and 6" in from each vertical mullion on the center of the pressure plates.

5.7 Hardware: No hardware was utilized.

5.8 Reinforcement:

Drawing Number	Location	Material
Page 9 of 15 butt glaze mullion detail #9 PN SR150	Vertical mullion	A-36 Steel, 1/4" x 4-1/2" x 1-7/8" U-channel with 1/2" x 3-3/4" flat bar steel welded to the interior pocket of the U-channel.
Page 9 of 15 Captured mullion detail #10 PN SR150	Vertical mullion	A-36 Steel, 1/4" x 4-1/2" x 1-7/8" U-channel with 1/2" x 3-3/4" flat bar steel welded to the interior pocket of the U-channel.
Page 9 of 15 Captured corner mullion detail #12 PN SR504	Vertical mullion	A-36 Steel, 1/4" x 4-5/8" x 1-1/4" U-channel

5.9 Screen Construction: Not utilized.

6.0 Installation:

The specimen was installed into a steel C-channel (C-8) and plywood chamber. The rough opening allowed for a 1/2" shim space at the top, bottom and at the jambs. The exterior and interior perimeter of the curtain wall was sealed with Dow 795.

Location	Anchor Description	Anchor Location
Head	1/2"-13 x 2" BGJ steel bolts	One anchor 4" from each jamb and 4" and 6" on each side of the vertical mullions, through the head and steel C-8 channel. The anchors were secured with a flat washer, lock washer and nut.
Jambs	1/2"-13 X 4-1/2" JH FNL steel bolts	The anchors were located 100" from the sill plate and above the intermediate horizontal mullion, through the jamb and the steel C-8 channel. The anchors were secured with a flat washer, lock washer and nut at both jambs.
Sill	1/2" x 4-1/2" #4 wedge anchors	One anchor 4" from each jamb and 4" and 6" on each side of the vertical mullions. The anchors were secured through the sill plate and into the concrete floor with a 3-1/2" embedment.
Vertical mullion reinforcement	1/4"-20 JZ307A bolts	The steel reinforcement was secured to the vertical mullions with one 1/4"-20 x 3" bolt through the mullion at the bottom, above the intermediate horizontal mullion and at the top. Each bolt utilized flat washers, lock washers and nuts. The bottom and top also utilized a second 1/4"-20 x 2" bolt that penetrated through one side of the mullion and steel reinforcement and secured with flat washers, lock washers and nuts.

7.0 Test Results: The results are tabulated as follows:

ASTM E 1886, *Large Missile Impact*

Conditioning Temperature: 20.5°C (69°F)
Missile Weight: 4105 g (9.05 lbs)
Missile Length: 2.5 m (8'1")
Muzzle Distance from Test Specimen: 5.18 m (17'0")

Test Unit #1: Orientation within ±5° of horizontal

Impact #1: Missile Velocity: 15.30 m/s (50.2 fps)	
Impact Area:	Center of the glazing
Observations:	Missile hit target area, broke the exterior lite of glass with no penetration
Results:	Pass

Impact #2: Missile Velocity: 15.12 m/s (49.6 fps)	
Impact Area:	Upper right corner of the glazing
Observations:	Missile hit target area, re-fractured the lite of glass with no penetration
Results:	Pass

Test Unit #2: Orientation within ±5° of horizontal

Impact #1: Missile Velocity: 15.24 m/s (50.0 fps)	
Impact Area:	Lower left corner of the glazing
Observations:	Missile hit target area, broke the exterior glass with no penetration
Results:	Pass

Impact #2: Missile Velocity: 15.14 m/s (49.7 fps)	
Impact Area:	Center of the glazing
Observations:	Missile hit target area, re-fractured the lite of glass with no penetration
Results:	Pass

***Note**: See Architectural Testing Sketch #1 for impact locations.*

7.0 Test Results: (Continued)

ASTM E 1886, *Large Missile Impact*

Conditioning Temperature: 20.5°C (69°F)
Missile Weight: 4105 g (9.05 lbs)
Missile Length: 2.5 m (8'-1")
Muzzle Distance from Test Specimen: 5.18 m (17'0")

Test Unit #3: Orientation within ±5° of horizontal

Impact #1: Missile Velocity: 15.14 m/s (49.7 fps)	
Impact Area:	Upper right corner of the glazing
Observations:	Missile hit target area, broke the exterior glass with no penetration
Results:	Pass

Impact #2: Missile Velocity: 15.05 m/s (49.4 fps)	
Impact Area:	Center of the vertical mullion
Observations:	Missile missed target area, missed the mullion and broke the glass with a tear of 1-1/2" long by 1/8" wide
Results:	NA

Impact #3: Missile Velocity: 14.99 m/s (49.2 fps)	
Impact Area:	Re-impacted the vertical mullion
Observations:	Missile hit target area, dented the mullion
Results:	Pass

***Note**: See Architectural Testing Sketch #1 for impact locations.*

7.0 **Test Results**: (Continued)

ASTM E 1886, *Large Missile Impact*

Conditioning Temperature: 20.5°C (69°F)
Missile Weight: 4105 g (9.05 lbs)
Missile Length: 2.5 m (8'1")
Muzzle Distance from Test Specimen: 5.18 m (17'0")

Test Unit #4: Orientation within ±5° of horizontal

Additional impacts:

Impact #1: Missile Velocity: 15.30 m/s (50.2 fps)	
Impact Area:	Center of horizontal mullion
Observations:	Missile hit target area, dented the aluminum
Results:	Pass

Impact #2: Missile Velocity: 15.42 m/s (50.6 fps)	
Impact Area:	Center of vertical butt joint
Observations:	Missile hit target area, broke the exterior glass fractured laminate glass, no penetration.
Results:	Pass

Impact #3: Missile Velocity: 15.12 m/s (49.6 fps)	
Impact Area:	Center of 90° corner mullion
Observations:	Missile hit target area, dented the aluminum
Results:	Pass

***Note**: See Architectural Testing Sketch #1 for impact locations.*

7.0 Test Results: (Continued)

ASTM E 1886, *Air Pressure Cycling*

Test Unit #1, 2 and 3
Design Pressure: ±3828 Pa (±80.0 psf)

POSITIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator mm (inches)					
			#1	#2	#3	#4	#5	#6
766 to 1914 (16.0 to 40.0)	3500	3.00	4.32 (0.17)	11.17 (0.44)	4.32 (0.17)	11.94 (0.47)	10.67 (0.42)	10.92 (0.43)
00.0 to 2297 (00.0 to 48.0)	300	4.40	4.32 (0.17)	11.68 (0.46)	4.32 (0.17)	13.21 (0.52)	13.46 (0.53)	11.94 (0.47)
2297 to 3062 (40.0 to 64.0)	600	2.90	4.83 (0.19)	15.24 (0.60)	4.32 (0.17)	16.51 (0.65)	17.53 (0.69)	14.73 (0.58)
1148 to 3828 (24.0 to 80.0)	100	4.80	5.59 (0.22)	18.79 (0.74)	4.83 (0.19)	19.56 (0.77)	20.06 (0.79)	18.03 (0.71)
			Permanent Set mm (inches)					
			2.79 (0.11)	1.52 (0.06)	1.27 (0.05)	4.32 (0.17)	3.30 (0.13)	2.03 (0.08)

7.0 Test Results: (Continued)

ASTM E 1886, *Air Pressure Cycling*

Test Unit #1, 2 and 3
Design Pressure: ±3828 Pa (±80.0 psf)

POSITIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator mm (inches)		
			#7	#8	#9
766 to 1914 (16.0 to 40.0)	3500	3.00	5.59 (0.22)	4.32 (0.17)	6.60 (0.26)
00.0 to 2297 (00.0 to 48.0)	300	4.40	5.59 (0.22)	4.32 (0.17)	6.60 (0.26)
1914 to 3062 (40.0 to 64.0)	600	2.90	6.09 (0.24)	4.32 (0.17)	6.60 (0.26)
1148 to 3828 (24.0 to 80.0)	100	4.80	6.35 (0.25)	4.83 (0.19)	6.60 (0.26)
			Permanent Set mm (inches)		
			3.05 (0.12)	1.52 (0.06)	2.79 (0.11)

***Observations**: Glazing was starting to pull away at the miss fire shot area, secured the glazing. No additional damage or deglazing was observed.*

Result: Pass

***Note**: See Architectural Testing Sketch #2 for indicator locations. Test Specimens #1, #2 and #3 were cycled in a common chamber.*

7.0 **Test Results**: (Continued)

ASTM E 1886, *Air Pressure Cycling*

Test Unit #1, 2 and 3
Design Pressure: ±3828 Pa (±80.0 psf)

NEGATIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator mm (inches)					
			#1	#2	#3	#4	#5	#6
1148 to 3828 (24.0 to 80.0)	50	5.20	8.64 (0.34)	25.4 (1.00)	7.62 (0.30)	22.86 (0.90)	25.15 (0.99)	24.38 (0.96)
1914 to 3062 (40.0 to 64.0)	1050	2.50	8.13 (0.32)	21.08 (0.83)	7.62 (0.30)	19.81 (0.78)	21.34 (0.84)	21.08 (0.83)
00.0 to 2297 (00.0 to 48.0)	50	4.10	7.62 (0.30)	17.27 (0.68)	7.11 (0.28)	14.99 (0.59)	14.73 (0.58)	17.27 (0.68)
766 to 1914 (16.0 to 40.0)	3350	3.30	7.37 (0.29)	16.51 (0.65)	7.11 (0.28)	14.73 (0.58)	14.48 (0.57)	16.76 (0.66)
			Permanent Set mm (inches)					
			5.84 (0.23)	7.37 (0.29)	5.08 (0.20)	7.37 (0.29)	7.62 (0.30)	8.13 (0.32)

7.0 Test Results: (Continued)

ASTM E 1886, *Air Pressure Cycling*

Test Unit #1, 2 and 3
Design Pressure: ±3828 Pa (±80.0 psf)

NEGATIVE PRESSURE

Pressure Range Pa (psf)	Number of Cycles	Average Cycle Time (seconds)	Maximum Deflection at Indicator mm (inches)		
			#7	#8	#9
1148 to 3828 (24.0 to 80.0)	50	5.20	5.84 (0.23)	5.84 (0.23)	4.06 (0.16)
1914 to 3062 (40.0 to 64.0)	1050	2.50	5.84 (0.23)	5.59 (0.22)	4.83 (0.19)
00.0 to 2297 (00.0 to 48.0)	50	4.10	6.09 (0.24)	5.08 (0.20)	4.57 (0.18)
766 to 1914 (16.0 to 40.0)	3350	3.30	6.09 (0.24)	5.08 (0.20)	4.57 (0.18)
			Permanent Set mm (inches)		
			3.81 (0.15)	3.56 (0.14)	4.06 (0.16)

***Observations**: No additional damage or deglazing was observed.*

Result: Pass

***Note**: See Architectural Testing Sketch #2 for indicator locations. Test Specimens #1, #2 and #3 were cycled in a common chamber.*

***General Note**: Upon completion of testing, the specimens met the requirements of Section 7 of ASTM E 1996.*

Test Equipment:

Cannon: Constructed from steel piping utilizing compressed air to propel the missile

Missile: 2x4 Southern Pine

Timing Device: Electronic Beam Type

Cycling Mechanism: Computer controlled centrifugal blower with electronic pressure measuring device

Deflection Measuring Device: Linear transducers,

Tape and film were used to seal against air leakage during structural testing. In our opinion, the tape and film did not influence the results of the test.
The service life of this report will expire on the stated Test Record Retention End Date, at which time such materials as drawings, data sheets, samples of test specimens, copies of this report, and any other pertinent project documentation, shall be discarded without notice.

If test specimen contains glazing, no conclusions of any kind regarding the adequacy or inadequacy of the glass in any glazed test specimen(s) can be made. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimen(s) tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, Inc.

Digitally Signed by: John C. McClane

John C McClane
Laboratory Manager

Digitally Signed by: Shawn G. Collins

Shawn G. Collins, P.E.
Laboratory Support Engineer

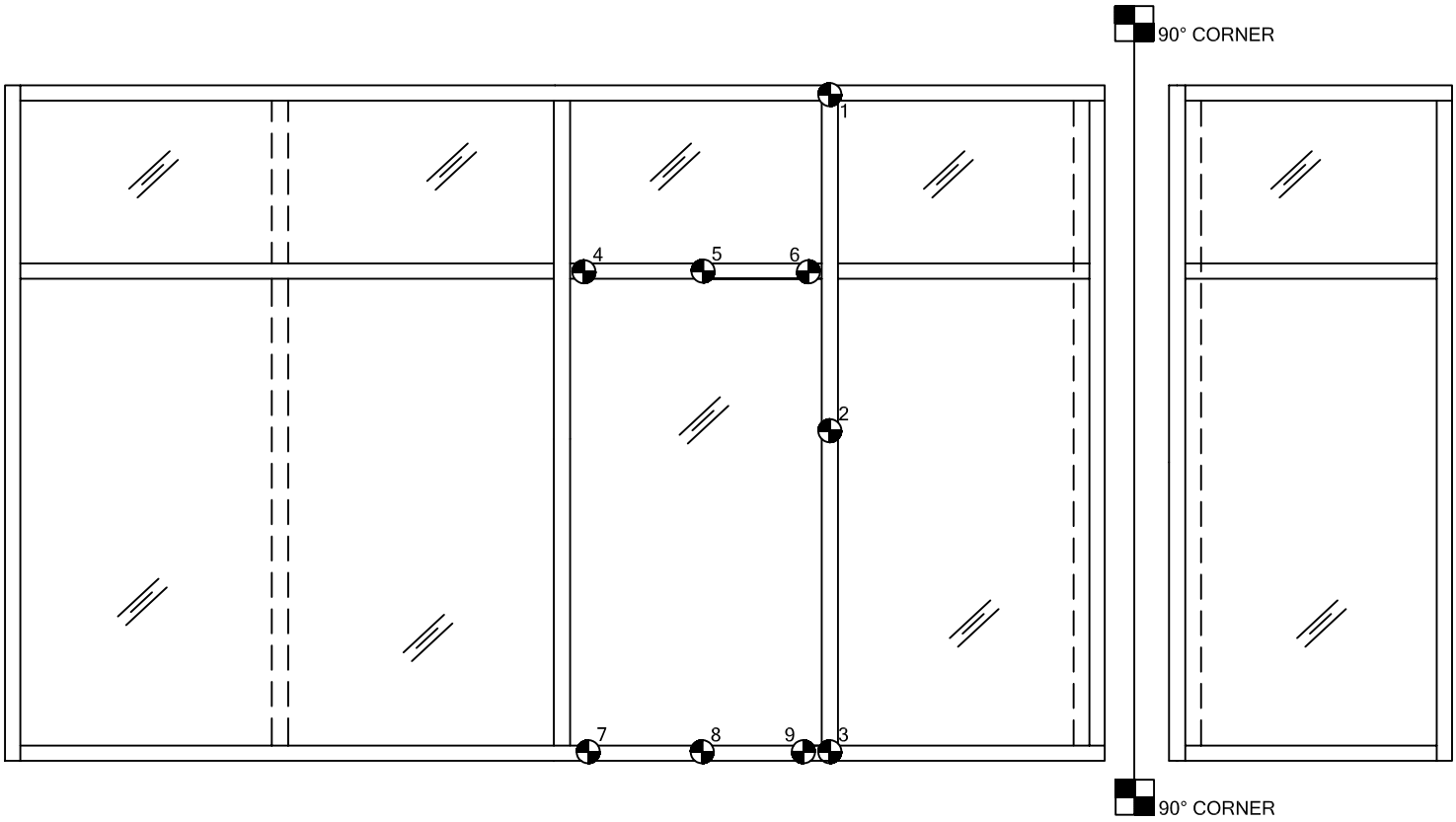
JCM:ck

Attachments (pages): This report is complete only when all attachments listed are included.
Appendix-A: Sketches (2)
Appendix-B: Photographs (1)
Appendix-C: Drawings (15)

Appendix A

Sketches

REV	DATE	DESCRIPTION



LEGEND:

INDICATES INDICATOR NUMBER

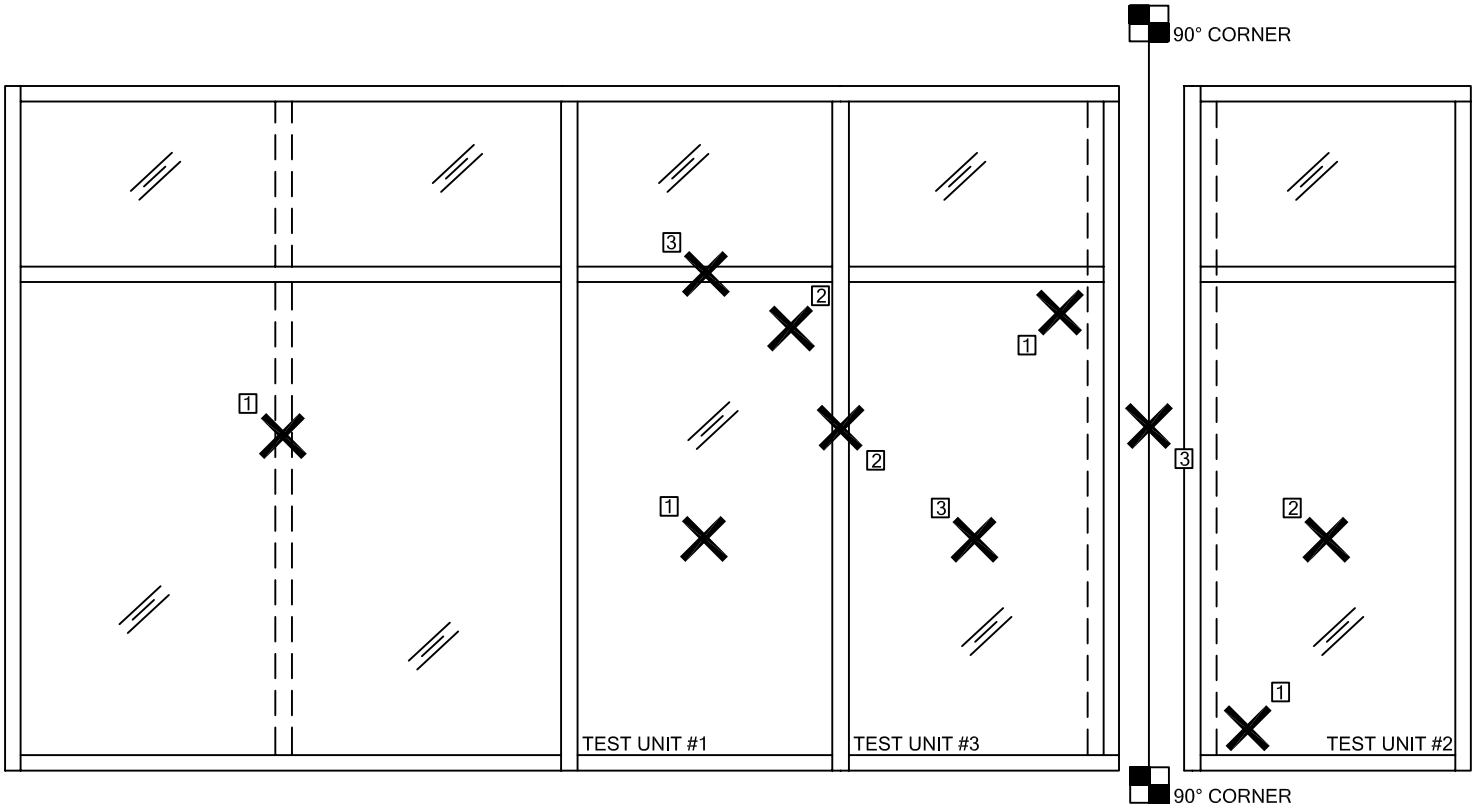
INDICATES INDICATOR LOCATION

INDICATOR LOCATIONS

ASTM 1886/1996 SCALE:NTS

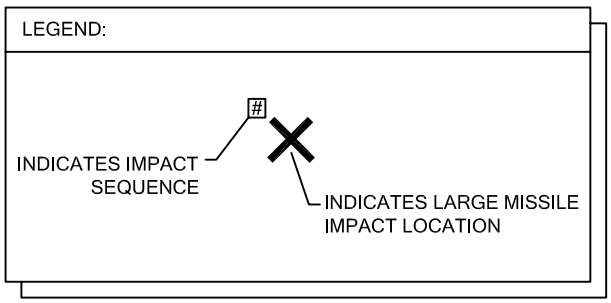
PROJECT NO.	PROJECT NAME:		DRAWING	DWG. BY:	SHEET
A2651.02 401-44	ASTM 1886/1996	Architectural Testing	SKETCH #1	SGC	1 OF 2
	CLIENT: CORAL AP			DATE: 12-28-10	

REV	DATE	DESCRIPTION



LARGE MISSILE IMPACT LOCATIONS

ASTM 1886/1996 SCALE:NTS



PROJECT NO.	PROJECT NAME:		DRAWING	DWG. BY:	SHEET
A2651.02 401-44	ASTM 1886/1996	Architectural Testing	SKETCH #2	SGC	1 OF 1
	CLIENT: CORAL AP			DATE: 12-28-10	

Appendix B

Photographs

Photo No. 1
Specimen # 1, 2 and 3
Test equipment

Appendix C

Drawings

TEST REPORT DRAWINGS
PW257 IMPACT-RESISTANT CURTAIN WALL SYSTEM
FOR USE IN HURRICANE ZONES REQUIRING LARGE MISSILE IMPACT PROTECTION

INDEX TO DRAWINGS	
1	INDEX TO DRAWINGS AND NOTES
2	FRAMING ELEVATION – E1 CAPTURED AND B.G. MULLIONS WITH STEEL –LONG SPAN–
3	FRAMING ELEVATION – E2 CAPTURED MULLION WITHOUT STEEL –SHORT SPAN–
4	FRAMING ELEVATION – E3 B.G. MULLION WITHOUT STEEL –SHORT SPAN–
5	FRAMING ELEVATION – E4 CAPTURED MULLION WITH STEEL –LONG SPAN– DRY GLAZE
6	FRAMING ELEVATION FOR DOORS – E5 CAPTURED MULLION WITH STEEL –LONG SPAN–
7	FRAMING DETAILS
8	FRAMING DETAILS
9	FRAMING DETAILS
10	DOOR AND FRAMING DETAILS
11	DOOR AND FRAMING DETAILS
12	FRAMING DETAILS
13	BILL OF MATERIALS
14	BILL OF MATERIALS AND GLAZING SCHEDULE
15	DIE DRAWINGS

ABBREVIATIONS:
D.L.O. = DAY LIGHT OPENING
D.O.H. = DOOR OPENING HEIGHT
D.O.W. = DOOR OPENING WIDTH
ELEVS = ELEVATIONS
EXT. = EXTERIOR
INT. = INTERIOR
MAX. = MAXIMUM
MIN. = MINIMUM
OPP. = OPPOSITE
TYP. = TYPICAL

Architectural Testing

Test sample complies with these details.
Deficiencies are noted.

Report A2651.02
Date 2/12/11 Tech Jan

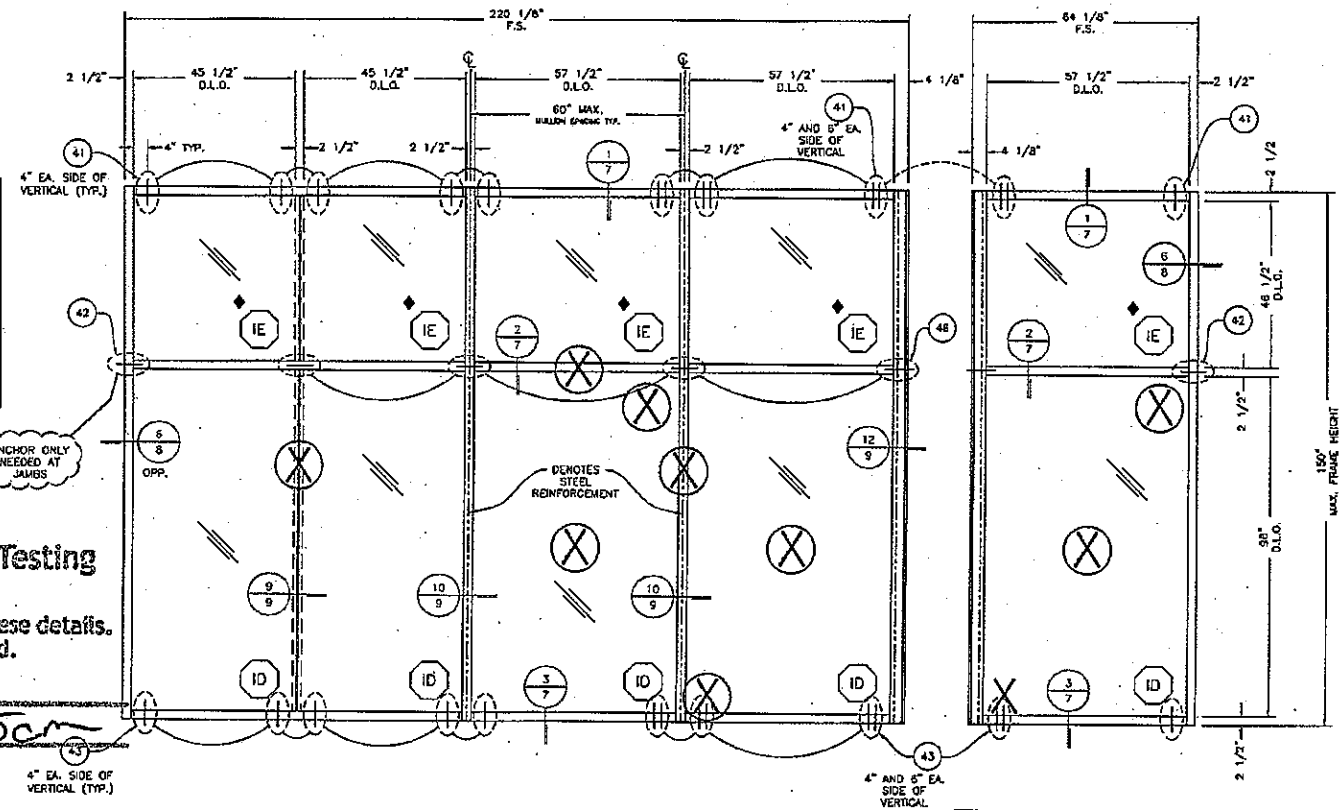
Coral Architectural Products

TEST REPORT DRAWINGS
PW257 IMPACT-RESISTANT
CURTAIN WALL SYSTEM

INDEX TO DRAWINGS AND NOTES

DATE 8/24/2010
DRAWN ALL | CHECKED DCW | APPROVED DCW
PROJECT NO. TEST
DRAWING NO. PW257_01
SHEET 1 OF 15

SPECIMEN #E1	
TEST METHOD	TEST CONDITIONS
AIR INFILTRATION TEST (ASTM E283 AND TAS 202)	1.57 PSF & 6.24 PSF
WATER INFILTRATION TEST (ASTM E331 AND TAS 202)	20.00 PSF
UNIFORM STATIC LOAD TEST (ASTM E330 AND TAS 202)	+/- 80 PSF DESIGN PRESSURE
LARGE MISSILE IMPACT TEST (ASTM E1886/E1996 AND TAS 201)	9-LB 40'/, 2x4 @ 50 FT/SEC
CYCLIC LOAD TEST (ASTM E1996 AND TAS 203)	+/- 80 PSF DESIGN PRESSURE



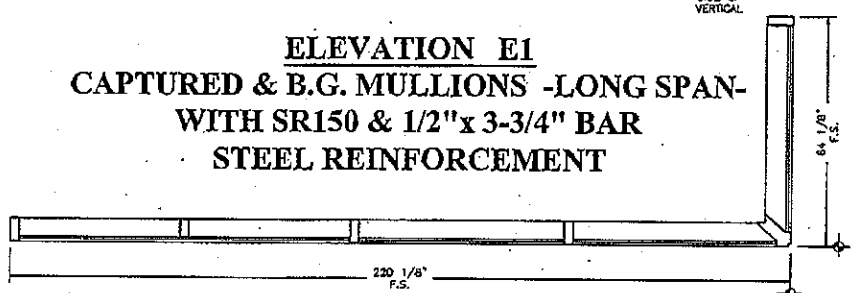
Architectural Testing

Test sample complies with these details. Deviations are noted.

Report# A2651.02

Date 2/12/11 Tech JCM

ELEVATION E1
CAPTURED & B.G. MULLIONS -LONG SPAN- WITH SR150 & 1/2"x 3-3/4" BAR STEEL REINFORCEMENT



STEEL BUCK FRAME

TESTING:
AIR, WATER, STATIC, IMPACT, AND CYCLE

MAX. ALLOWABLE DEFLECTION (L/180)= 0.833

DESIGN PRESSURE = +/-80 PSF

⊗ = LARGE MISSILE IMPACT LOCATIONS

♦ = INFILL ONLY (DO NOT IMPACT)

NO	BY	DATE	DESCRIPTION
1	---	---	---
2	---	---	---

Coral

Architectural Products

5010 RIDGE MINE ROAD, TUCSON, AZ 85706
PHONE: 800.772.7751 FAX: 520.294.7580

TEST REPORT DRAWINGS
PW257 IMPACT-RESISTANT
CURTAIN WALL SYSTEM

FRAMING ELEVATION

DATE 3/24/2010

DRAWN	CHECKED	APPROVED
ALL	DCW	DCW

PROJECT NO. TEST

DRAWING NO. PW257_01

SHEET 2 OF 15

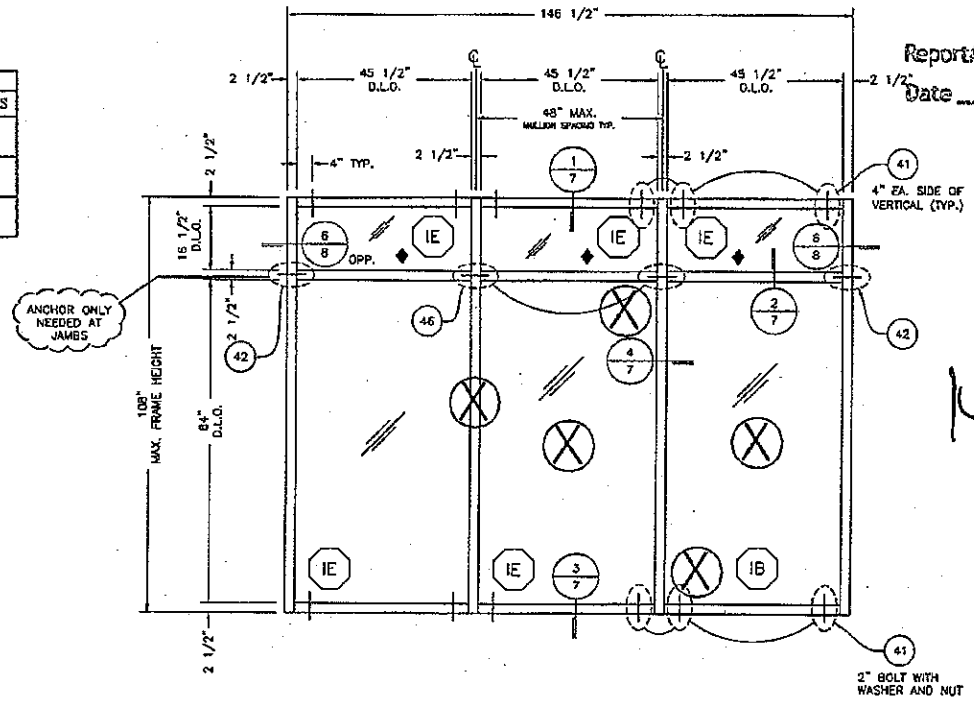
Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# _____

Date _____ Tech _____

SPECIMEN #E2	
TEST METHOD	TEST CONDITIONS
UNIFORM STATIC LOAD TEST (ASTM E330 AND TAS 202)	+/-65 PSF DESIGN PRESSURE
LARGE MISSILE IMPACT TEST (ASTM E1886/E1996 AND TAS 201)	9-LB 4OZ, 2x4 @ 50FT/SEC
CYCLIC LOAD TEST (ASTM E1996 AND TAS 203)	+/-65 PSF DESIGN PRESSURE



NOT USED

ELEVATION E2
CAPTURED MULLION -SHORT SPAN- WITHOUT REINFORCEMENT

STEEL BUCK FRAME

TESTING:
STATIC, IMPACT, AND CYCLE

MAX. ALLOWABLE DEFLECTION (L/180)= 0.600

DESIGN PRESSURE = +/-65 PSF

⊗ = LARGE MISSILE IMPACT LOCATIONS

◆ = INFILL ONLY (DO NOT IMPACT)

0 1'-4" 2'-8" 5'-4"
SCALE: 3/8"=1'-0"

Construction Testing Laboratories, Inc.
Architectural Products
5710 NOBEL DRIVE, SUITE 100, SACHSE, TEXAS 75048-4384
PHONE: 800.772.2537 FAX: 214.902.3538

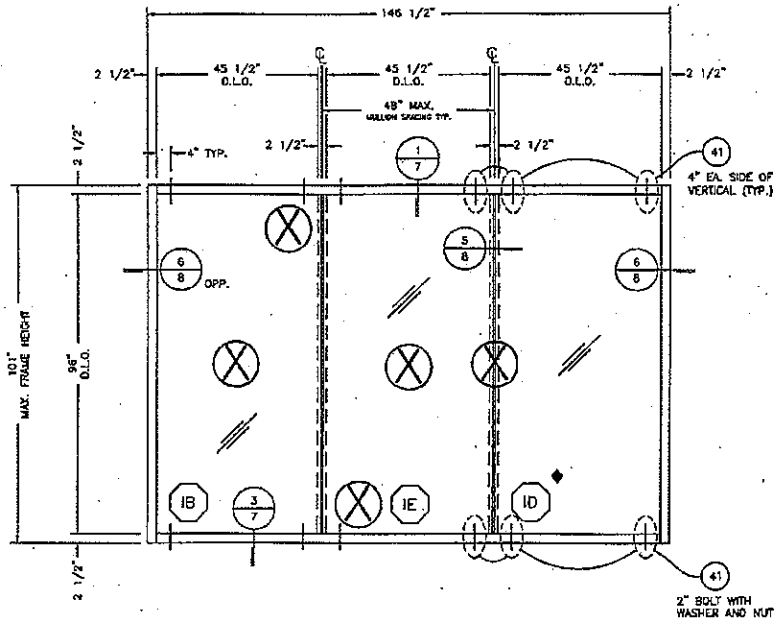
TEST REPORT DRAWINGS
PW257 IMPACT-RESISTANT
CURTAIN WALL SYSTEM

FRAMING ELEVATION

DRAWN	CHECKED	APPROVED
MLL	DCW	DCW

DATE 3/24/2010
PROJECT NO. TEST
DRAWING NO. PW257_01
SHEET 3 OF 15

SPECIMEN #E3	
TEST METHOD	TEST CONDITIONS
UNIFORM STATIC LOAD TEST (ASTM E330 AND TAS 202)	+/- 65 PSF DESIGN PRESSURE
LARGE MISSILE IMPACT TEST (ASTM E1886/E1996 AND TAS 201)	9-LB 4OZ. 2x4 @ 50FT/SEC
CYCLIC LOAD TEST (ASTM E1996 AND TAS 203)	+/- 65 PSF DESIGN PRESSURE



Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# _____

Date _____ Tech _____

NOT USED

ELEVATION E3
B.G. MULLION -SHORT SPAN- WITHOUT REINFORCEMENT

STEEL BUCK FRAME

TESTING:
STATIC, IMPACT, AND CYCLE

MAX. ALLOWABLE DEFLECTION (L/180)= 0.561

DESIGN PRESSURE = +/-65 PSF

⊗ = LARGE MISSILE IMPACT LOCATIONS

♦ = INFILL ONLY (DO NOT IMPACT)

0 1'-4" 2'-8" 5'-4"
SCALE: 3/8"=1'-0"

NO	BY	DATE	DESCRIPTION
1			

Consul
Architectural Projects
3010 RICE MINE ROAD, TUSCALOOSA, AL 35406
PHONE: 800-752-7737 FAX: 800-256-7320

TEST REPORT DRAWINGS
PW257 IMPACT-RESISTANT
CURTAIN WALL SYSTEM

FRAMING ELEVATION

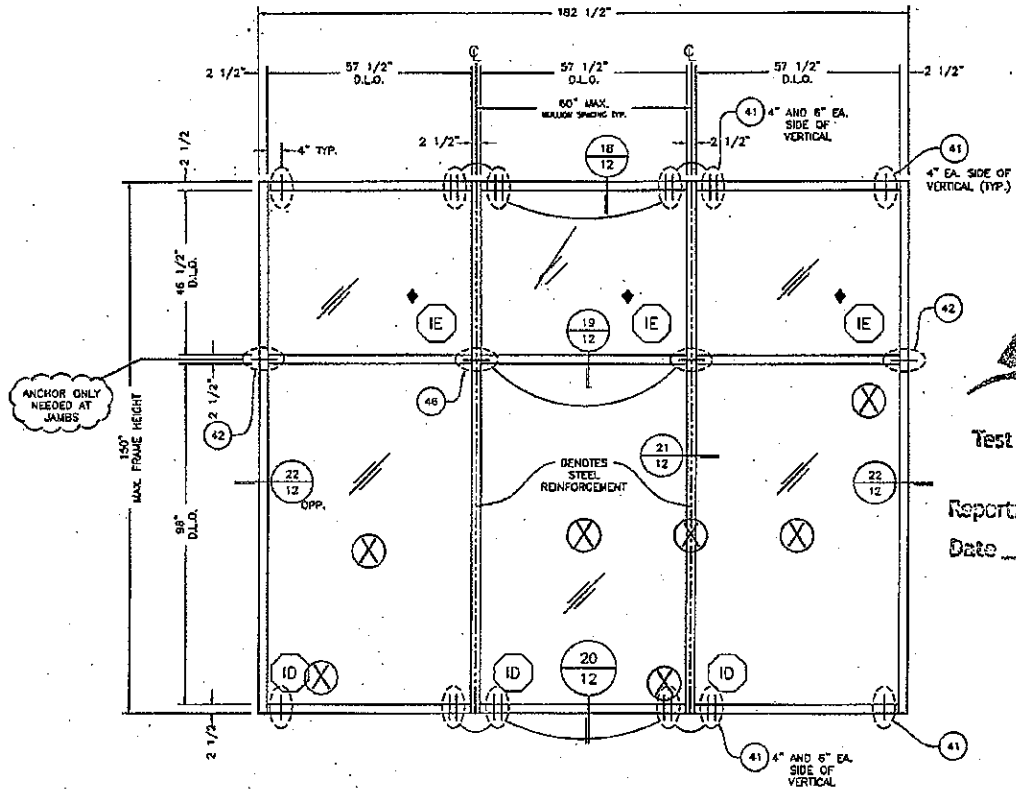
DATE	3/24/2010		
DRAWN	CHECKED	APPROVED	
ALL	DCW	DCW	

PROJECT NO. TEST

DRAWING NO. PW257_01

SHEET 4 OF 15

SPECIMEN #E1	
TEST METHOD	TEST CONDITIONS
AIR INFILTRATION TEST (ASTM E283 AND TAS 202)	1.57 PSF & 6.24 PSF
WATER INFILTRATION TEST (ASTM E331 AND TAS 202)	20.00 PSF
UNIFORM STATIC LOAD TEST (ASTM E330 AND TAS 202)	+/-80 PSF DESIGN PRESSURE
LARGE MISSILE IMPACT TEST (ASTM E1886/E1996 AND TAS 201)	9-LB 4OZ. 2x4 @ 50FT/SEC
CYCLIC LOAD TEST (ASTM E1996 AND TAS 203)	+/-80 PSF DESIGN PRESSURE



Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# _____

Date _____ Tech _____

NOT USED

ELEVATION E4 - DRY GLAZE
CAPTURED MULLION -LONG SPAN-
WITH SR150 & 1/2"X 3-3/4" BAR
STEEL REINFORCEMENT

STEEL BUCK FRAME

TESTING:
IMPACT, AND CYCLE

MAX. ALLOWABLE DEFLECTION (L/180)= 0.833

DESIGN PRESSURE = +/-80 PSF

⊗ = SMALL MISSILE IMPACT LOCATIONS

♦ = INFILL ONLY (DO NOT IMPACT)

0 1'-4" 2'-8" 5'-4"
SCALE: 3/8"=1'-0"

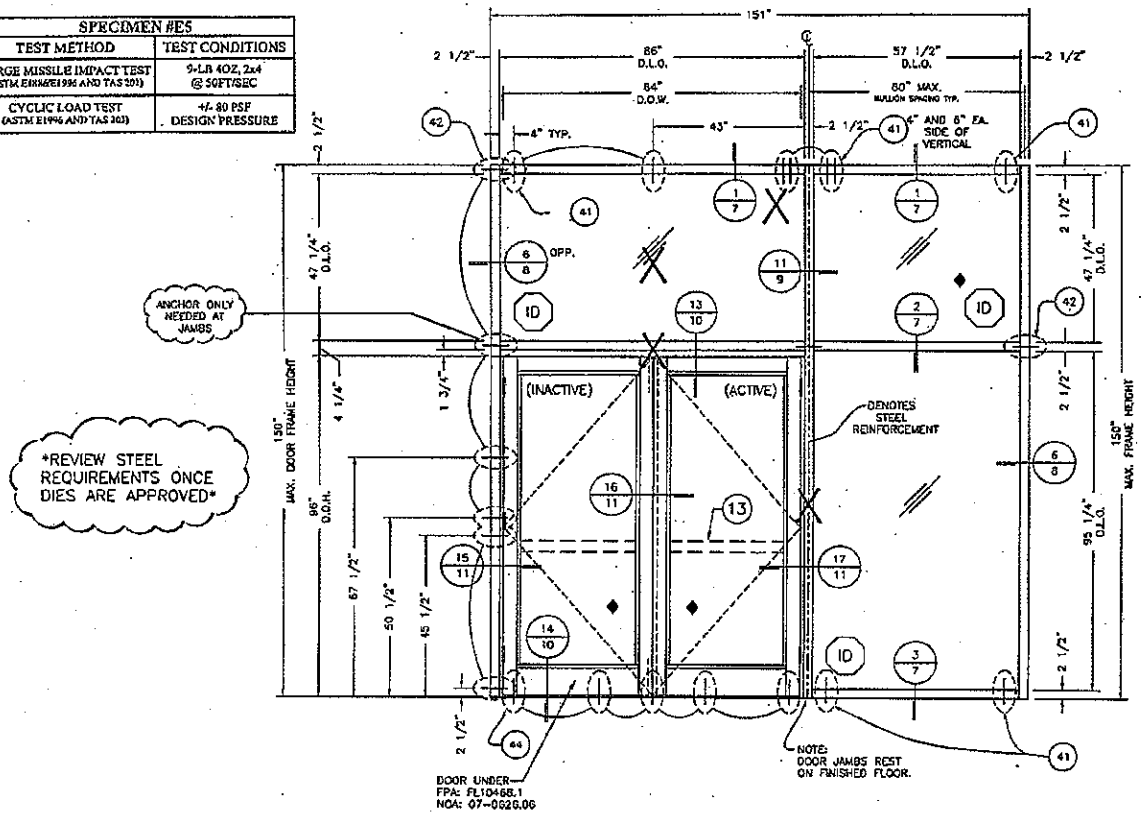
Coral Architectural Products

TEST REPORT DRAWINGS
PW257 IMPACT-RESISTANT
CURTAIN WALL SYSTEM

FRAMING ELEVATION

DATE 5/24/2010
DRAWN AELL | CHECKED DCW | APPROVED DCW
PROJECT NO.
DRAWING NO. PW257_01
SHEET 5 OF 15

SPECIMEN #E5	
TEST METHOD	TEST CONDITIONS
LARGE MISSILE IMPACT TEST (ASTM E1886/E1996 AND TAS 201)	9-LB 4OZ, 2x4 @ 50FT/SEC
CYCLIC LOAD TEST (ASTM E1996 AND TAS 203)	+/- 80 PSF DESIGN PRESSURE

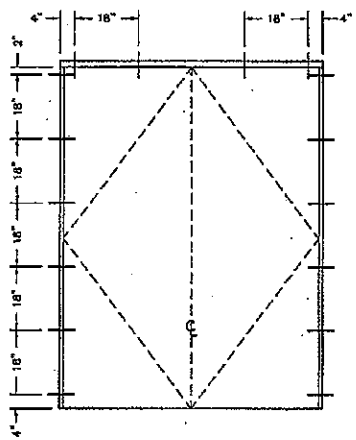


Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# _____

Date _____ Tech _____



LOCATIONS FOR
DOOR SUB-FRAME ATTACHMENT
TO CURTAIN WALL ALUMINUM

ELEVATION E5
CAPTURED MULLION -LONG SPAN-
WITH SR150 & 3/4"x 3-3/4" BAR STEEL REINFORCEMENT
FOR SERIES 381 ENTRANCE DOORS

NOT USED

STEEL BUCK FRAME

TESTING:
IMPACT, AND CYCLE

MAX. ALLOWABLE DEFLECTION (L/180)= 0.833

DESIGN PRESSURE = +/-80 PSF

X = LARGE MISSILE IMPACT LOCATIONS

◆ = INFILL ONLY (DO NOT IMPACT)

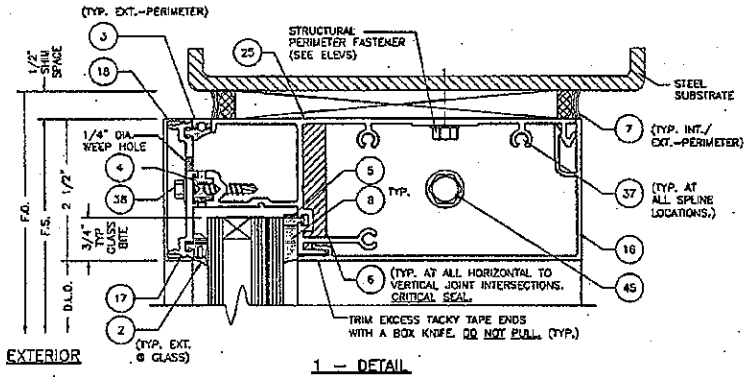
0 1'-4" 2'-8" 5'-4"
SCALE: 3/8"=1'-0"

Coral
Architectural Products
3910 PGA BLVD. PALM BEACH GARDENS, FL 33410
PHONE 800.327.2727 FAX 800.330.3327

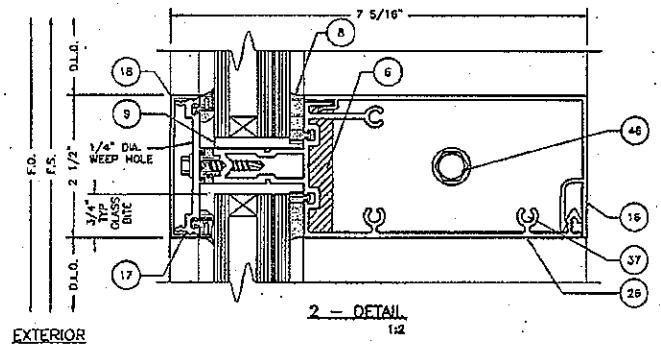
TEST REPORT DRAWINGS
PW257 IMPACT-RESISTANT
CURTAIN WALL SYSTEM

FRAMING ELEVATION FOR DOORS

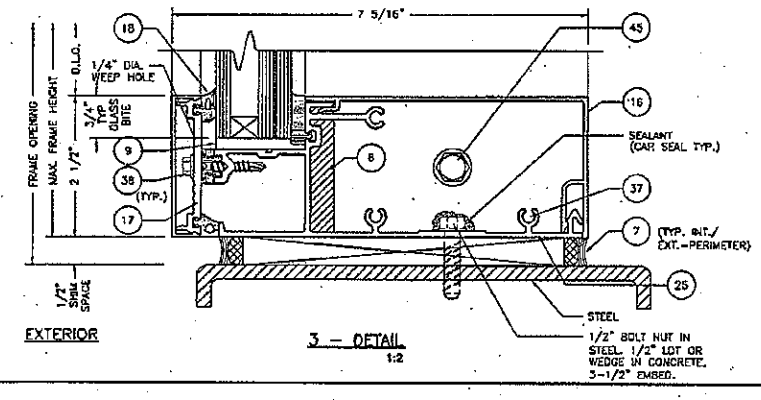
DATE 3/24/2010
DRAWN MLL | CHECKED DCW | APPROVED DCW
PROJECT NO. TEST
DRAWING NO. PW257_01
SHEET 6 OF 15



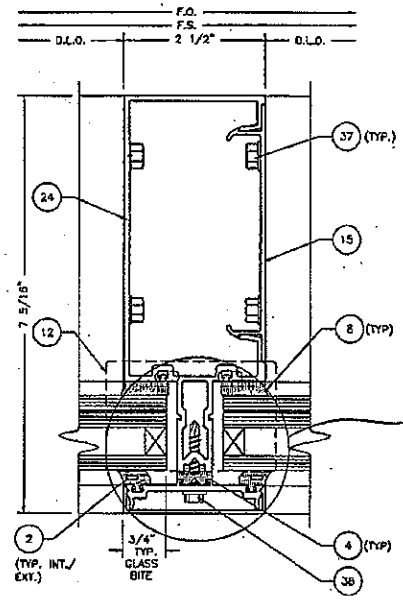
1 – DETAIL
1:2



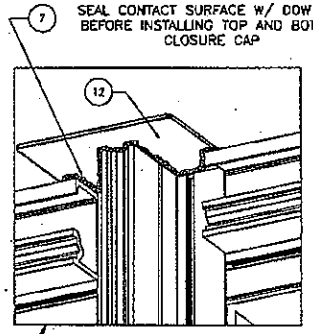
2 – DETAIL
1:2



3 – DETAIL
1:2



4 – DETAIL
1:2



TOP SHOWN
CLOSURE CAP
(BOTTOM SIMILAR)

NOT USED

Architectural Testing

Test sample complies with these details.
Deviations are noted

Report# 42651.02

Date _____ Tech JCM

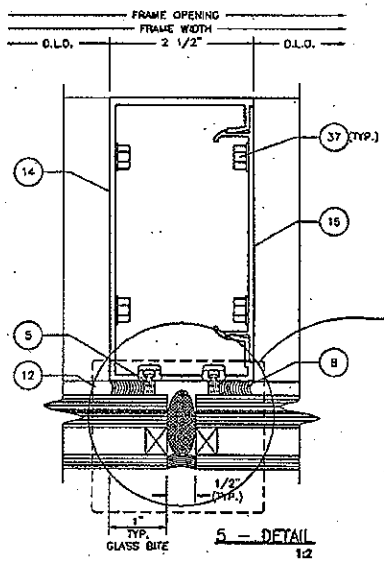
Jcm

Coral Architectural Products

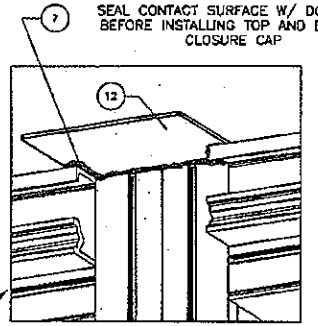
TEST REPORT DRAWINGS
PW257 IMPACT-RESISTANT
CURTAIN WALL SYSTEM

FRAMING DETAILS

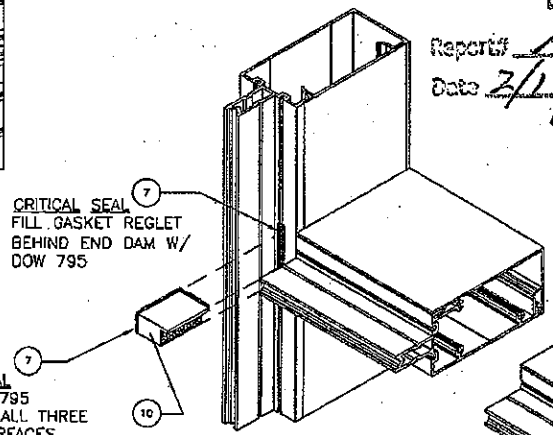
DATE 6/24/2010
DRAWN MJL | CHECKED DCW | APPROVED DCW
PROJECT NO.
DRAWING NO. PW257_01
SHEET 7 OF 15

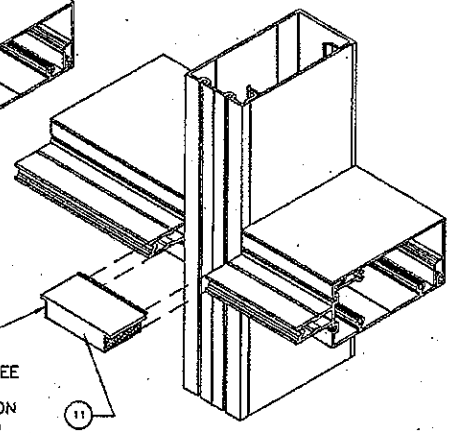


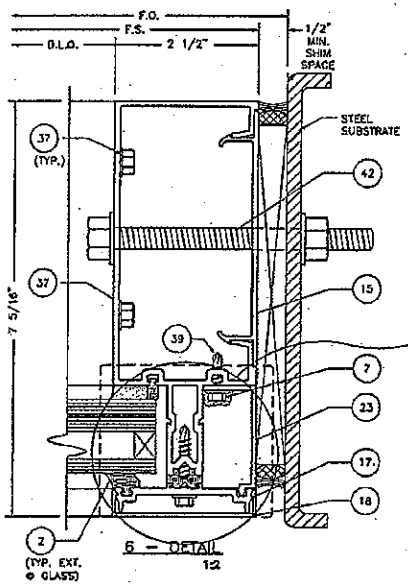
5 — DETAIL
1:2



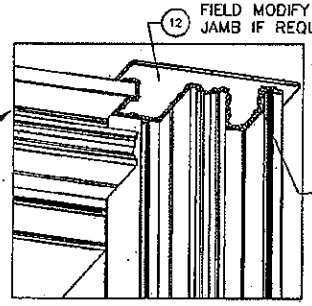
TOP SHOWN
CLOSURE CAP
(BOTTOM SIMILAR)







6 — DETAIL
1:2



TOP SHOWN
CLOSURE CAP
(BOTTOM SIMILAR)

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# AZ651.02

Date 2/12/11 Tech JCM

Corral

Architectural Products

30 RICE AVE. OXNARD, CA. 93036
PHONE 805-725-7310 FAX 805-483-4354

REV	BY	DATE	DESCRIPTION

TEST REPORT DRAWINGS
PW257 IMPACT-RESISTANT
CURTAIN WALL SYSTEM

FRAMING DETAILS

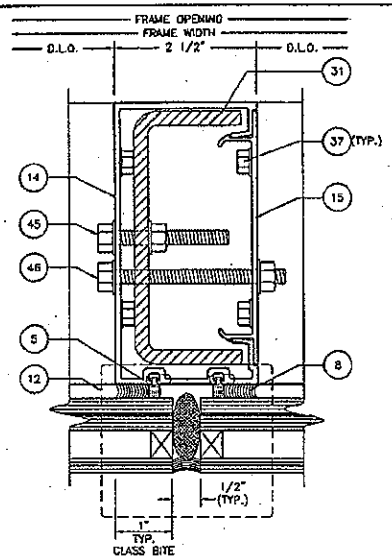
DATE 8/24/2010

DRAWN	CHECKED	APPROVED
MLL	DCW	DCW

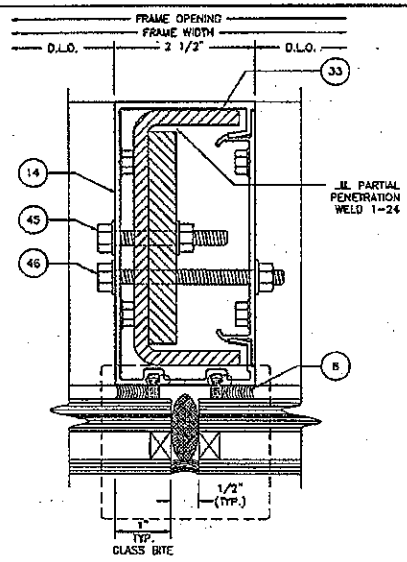
PROJECT NO.

DRAWING NO. PW257_01

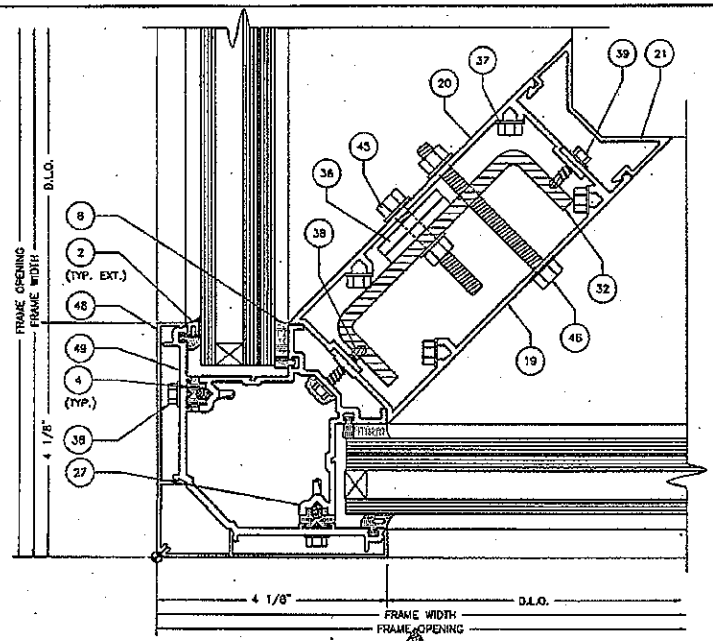
SHEET 8 OF 15



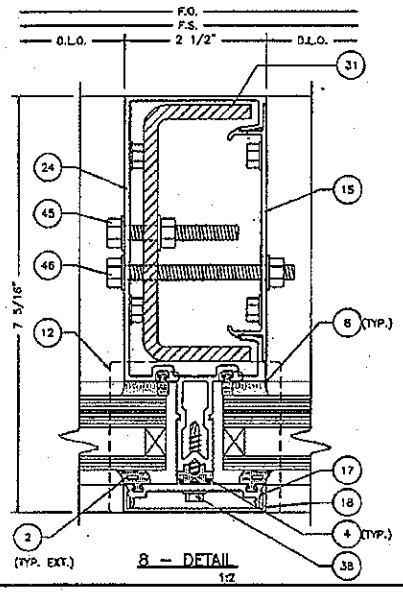
7 – DETAIL
1:2



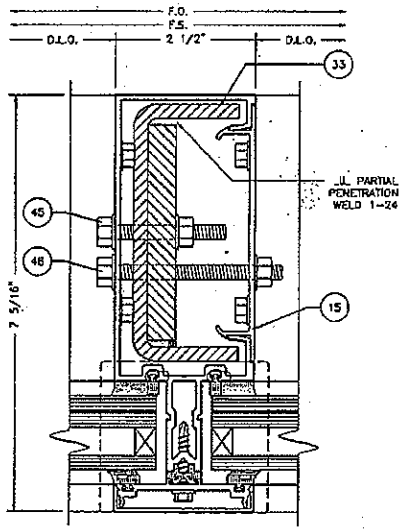
9 – DETAIL
1:2



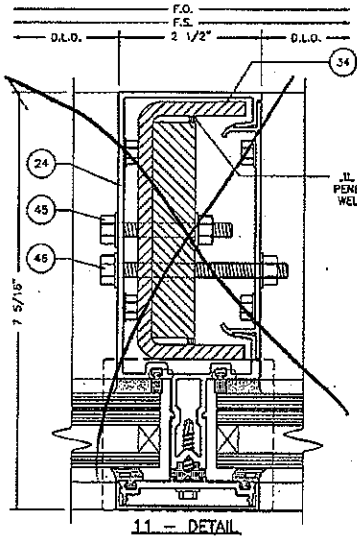
DETAIL



8 – DETAIL
1:2



10 – DETAIL
1:2



11 – DETAIL
1:2

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# A2651.02

Date 2/17/11 Tech JCM

Coral Architectural Products

NO.	BY	DATE	DESCRIPTION
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TEST REPORT DRAWINGS
PW257 IMPACT-RESISTANT
CURTAIN WALL SYSTEM

FRAMING DETAILS

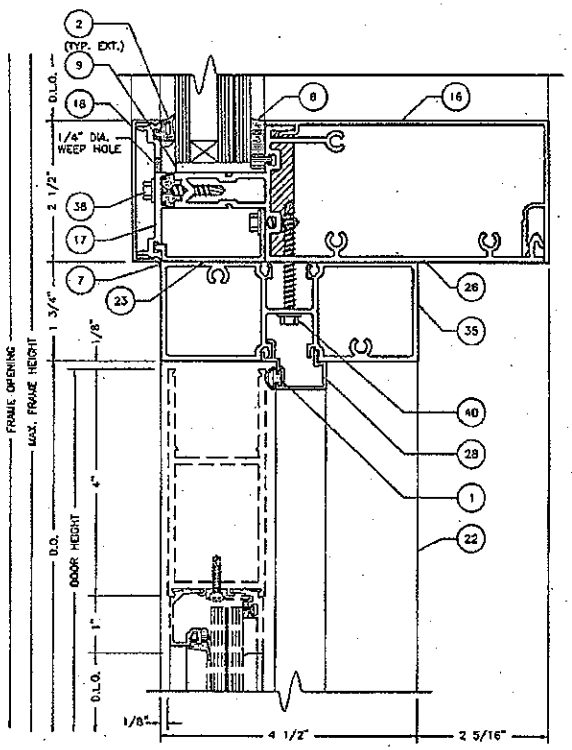
DATE 8/24/2010

DRAWN	CHECKED	APPROVED
MLL	DCW	DCW

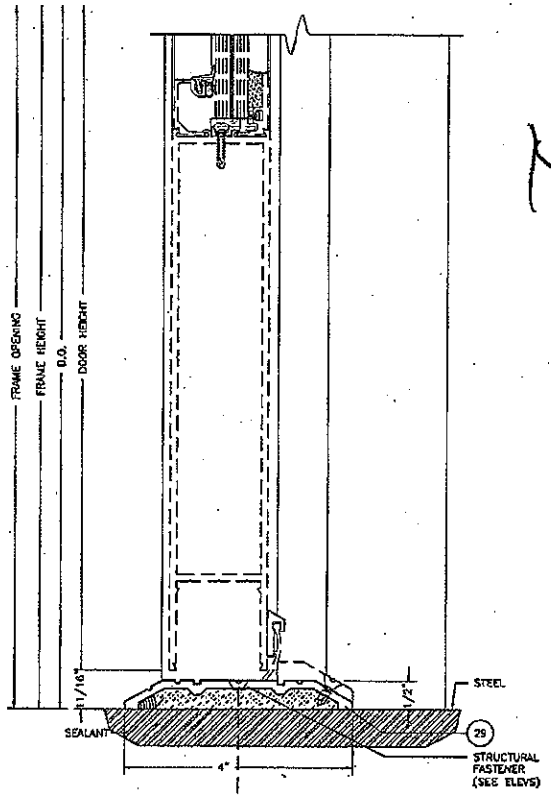
PROJECT NO.

DRAWING NO. PW257_01

SHEET 9 OF 15



13 – DETAIL
1:2



14 – DETAIL
1:2

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Reports _____

Date _____ Tech _____

NOT USED

Coral

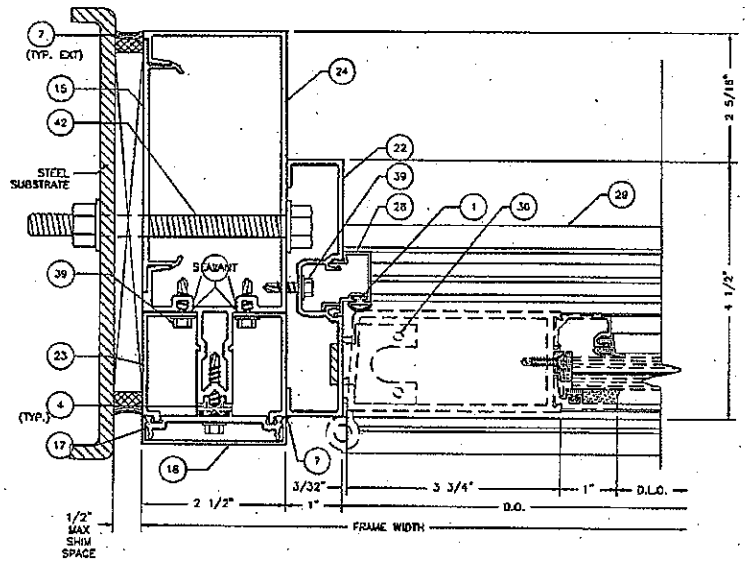
Architectural Products, Inc.
5010 NOCTURNE ROAD TUSCALOOSA, ALABAMA
PHONE (205) 372-7277 FAX (205) 462-6161

REV	BY	DATE	DESCRIPTION
-	-	-	-

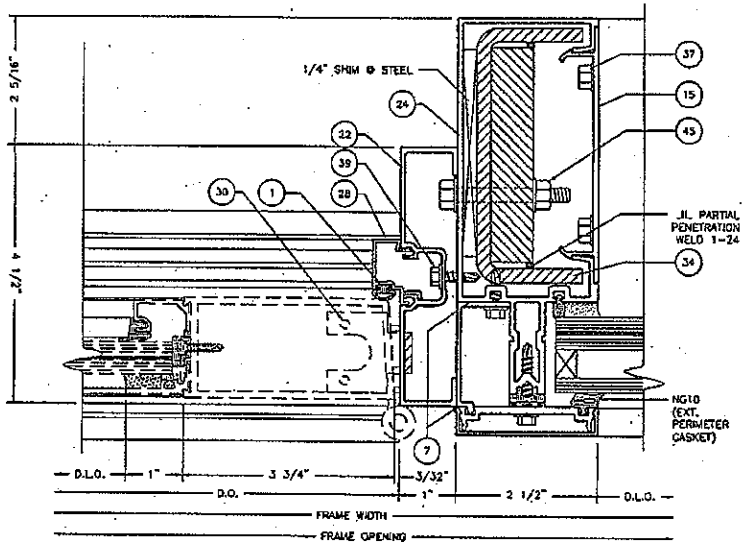
TEST REPORT DRAWINGS
PW257 IMPACT-RESISTANT
CURTAIN WALL SYSTEM

DOOR AND FRAMING DETAILS

DATE	8/24/2010	
DRAWN MLL	CHECKED DCW	APPROVED DCW
PROJECT NO.		
DRAWING NO.	PW257_01	
SHEET	10 OF 15	



15 – DETAIL
12



17 – DETAIL
12

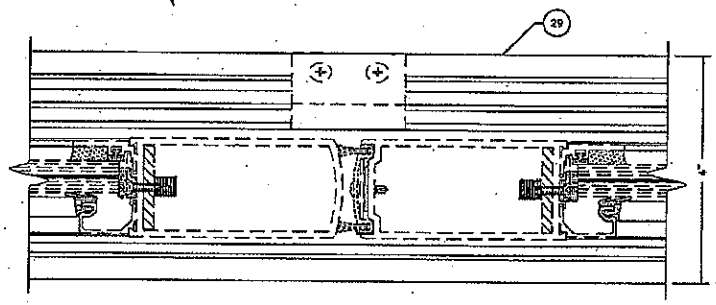
NOT USED

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# _____

Date _____ Tech _____



16 – DETAIL
12

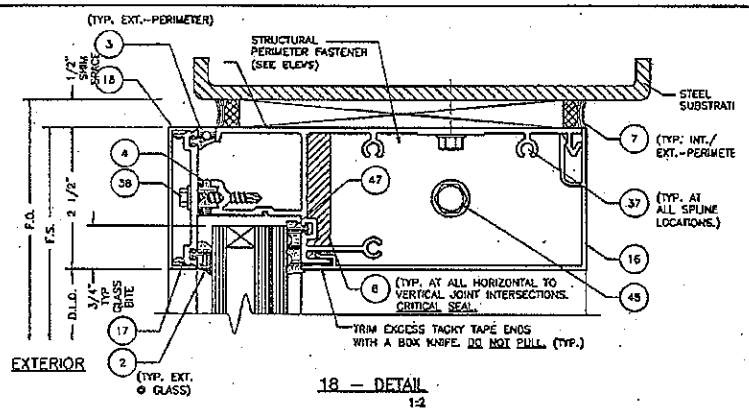
REV	BY	DATE	DESCRIPTION
-	-	-	-

Construction Testing Laboratories, Inc.
Architectural Products
5010 PRESCOTT AVENUE, DALLAS, TEXAS 75206 (214) 363-7520
PHONE: 800-442-4281 FAX: 800-442-4281

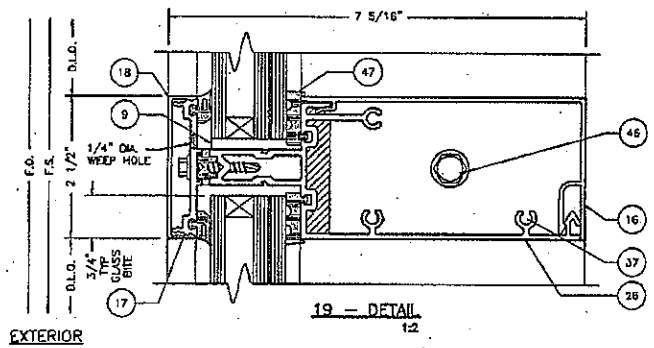
TEST REPORT DRAWINGS
PW257 IMPACT-RESISTANT
CURTAIN WALL SYSTEM

DOOR AND FRAMING DETAILS

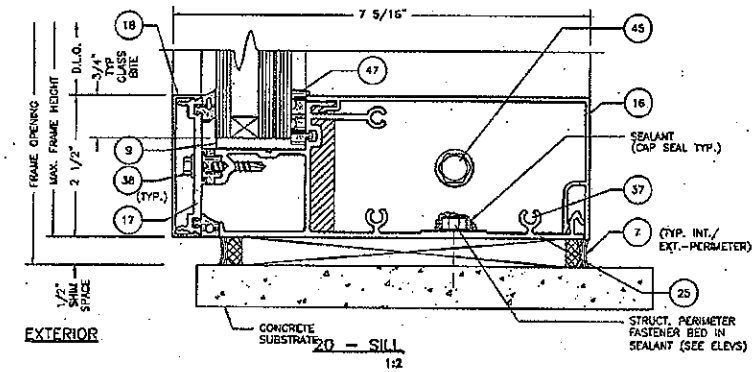
DATE	8/24/2010		
DRAWN	CHECKED	APPROVED	
WLL	DCW	DCW	
PROJECT NO.			
DRAWING NO.	PW257_01		
SHEET	11 OF 15		



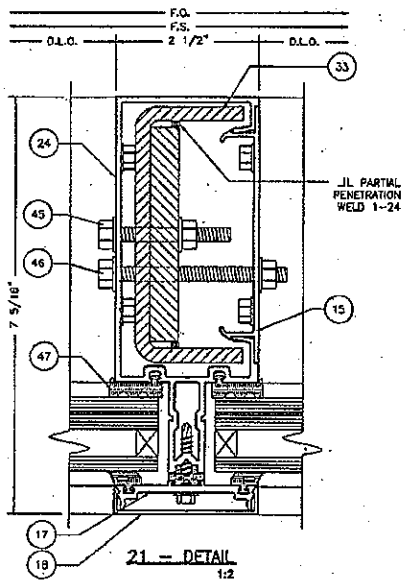
18 – DETAIL
1:2



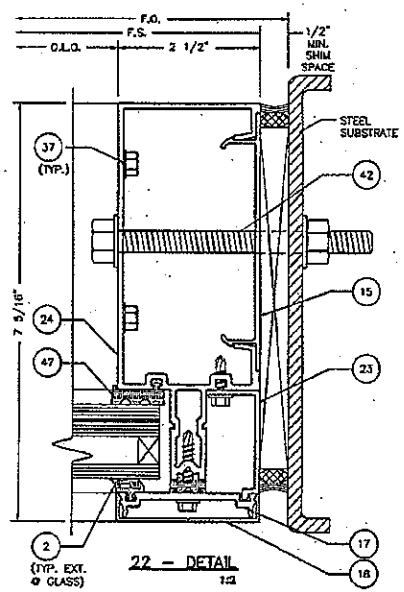
19 – DETAIL
1:2



20 – SILL
1:2



21 – DETAIL
1:2



22 – DETAIL
1:2

NOT USED

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# _____

Date _____ Tech _____

Corvil
Architectural Products
3618 RICE MINE ROAD, TUSCALOOSA, AL 35406
PHONE: (800) 726-7727 FAX: (800) 435-6281

NO.	BY	DATE	DESCRIPTION
—	—	—	—

TEST REPORT DRAWINGS
PW257 IMPACT-RESISTANT
CURTAIN WALL SYSTEM

FRAMING DETAILS

DATE	8/24/2010	
DRAWN JWZ	CHECKED DCW	APPROVED DCW
PROJECT NO.		
DRAWING NO.	PW257_01	
SHEET	12 OF 15	

BILL OF MATERIALS

ITEM NO.	P/N	DESCRIPTION	DIMENSIONS	MATERIAL	MANUFACTURER	3NOTES
1	NG5	BULB GASKET – DOORFRAME STOP	0.165 SPACE	EPDM	VARIES	
2	NG10	EXTERIOR GLAZING GASKET	0.250 SPACE	EPDM	VARIES	
3	NG11	EXTERIOR PERIMETER GASKET	0.300 SPACE	EPDM	VARIES	
4	NG12	PRESSURE BAR GASKET (ISOLATOR)	0.140 SPACE	EPDM	VARIES	
5	NG14	INTERIOR SPACER GASKET	0.250 SPACE	EPDM	VARIES	
6	SM5601	JOINT SEALANT TAPE	0.500 X 0.125 X VARIES	BUTYL	SCHNEE–MOOREHEAD	
7	795	SILICONE – PERIMETER SEALANT	FILL SPACE	SILICONE	DOW CORNING	USED @ PERIMETER
8	995	SILICONE – GLASS TO METAL	FILL SPACE	SILICONE	DOW CORNING	GLASS TO METAL AND INTERNAL
9	SB18	SETTING BLOCK @ SILL & HORIZONTAL	1.562 X 0.188 X 4.000	EPDM	VARIES	2 PER LITE
10	SP204	END DAM @ CAPTURED MULLION	1.287 X 1.787 X 0.745	EVA FOAM	CORAL INDUSTRIES, INC.	LOCATE 1 @ EACH END OF HORIZONTAL
11	SP208	BRIDGE DAM @ B.G. MULLION	3.123 X 1.562 X 0.745	EVA FOAM	CORAL INDUSTRIES, INC.	LOCATE 1 @ HORIZONTAL AND B.G. MULLION
12	SP211	MULLION CAP	3.000 X 2.691 X 0.048	6063–T6 ALUMINUM	CORAL INDUSTRIES, INC.	LOCATE @ TOP AND BOTTOM OF VERTICAL
13	2086	JACKSON 2086 PANIC	36.000 X 7.3125 X 3.000	ALUMINUM	JACKSON	
14	PW151	B.G. MULLION	2.500 X 5.000 X 0.094	6063–T6 ALUMINUM	CORAL INDUSTRIES, INC.	
15	PW202	OPEN BACK MULLION FILLER	0.681 X 4.484 X 0.094	6063–T6 ALUMINUM	CORAL INDUSTRIES, INC.	
16	PW203	HEAD/ SILL/ HORIZONTAL TRIM	2.500 X 4.980 X 0.078	6063–T6 ALUMINUM	CORAL INDUSTRIES, INC.	
17	PW204	PRESSURE BAR	2.443 X 0.433 X 0.125	6063–T6 ALUMINUM	CORAL INDUSTRIES, INC.	
18	PW205	FACE COVER	2.500 X 0.500 X 0.062	6063–T6 ALUMINUM	CORAL INDUSTRIES, INC.	
19	PW208	FEMALE HALF 90° CORNER	1.625 X 6.110 X 0.094	6063–T6 ALUMINUM	CORAL INDUSTRIES, INC.	
20	PW209	MALE HALF 90° CORNER	1.875 X 6.110 X 0.094	6063–T6 ALUMINUM	CORAL INDUSTRIES, INC.	
21	PW210	INTERIOR CORNER TRIM	2.500 X 1.288 X 0.078	6063–T6 ALUMINUM	CORAL INDUSTRIES, INC.	
22	PW214	SUB DOORFRAME	1.000 X 4.500 X 0.080	6063–T6 ALUMINUM	CORAL INDUSTRIES, INC.	
23	PW613	POCKET FILLER FOR PW650	0.937 X 1.943 X 0.078	6063–T6 ALUMINUM	CORAL INDUSTRIES, INC.	
24	PW650	VERTICAL MULLION	2.500 X 6.593 X 0.094	6063–T6 ALUMINUM	CORAL INDUSTRIES, INC.	
25	PW652	HEAD/SILL	2.390 X 6.495 X 0.094	6063–T6 ALUMINUM	CORAL INDUSTRIES, INC.	
26	PW655	INTERMEDIATE HORIZONTAL	2.390 X 6.495 X 0.094	6063–T6 ALUMINUM	CORAL INDUSTRIES, INC.	
27	PW658	GLAZING TEE – 90° CORNER	3.334 X 3.334 X 0.094	6063–T6 ALUMINUM	CORAL INDUSTRIES, INC.	
28	DS200	DOORFRAME STOP	0.882 X 1.149 X 0.050	6063–T6 ALUMINUM	CORAL INDUSTRIES, INC.	
29	TH4	THRESHOLD	0.500 X 4.000 X 0.125	6063–T6 ALUMINUM	CORAL INDUSTRIES, INC.	
30	TH403	THRESHOLD CLIP	1.390 X 1.516 X 1.909	STEEL	VARIES	

(CONTINUED ON SHEET 15)

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# A2651.02

Date 2/17/11 Tech JCM

Coral
Architectural Products
3010 BISCEYNE ROAD, TUSCALOOSA, AL 35406
PHONE 800-772-7737 FAX 800-445-4258

TEST REPORT DRAWINGS
PW257 IMPACT-RESISTANT
CURTAIN WALL SYSTEM

BILL OF MATERIALS

DATE 8/24/2010
DRAWN MLL | CHECKED DGW | APPROVED DGW
PROJECT NO.
DRAWING NO. PW257_01
SHEET 13 OF 15

BILL OF MATERIALS

ITEM NO.	P/N	DESCRIPTION	DIMENSIONS	MATERIAL	MANUFACTURER	3NOTES
31	SR150	REINFORCEMENT CHANNEL	4.500 X 1.875 X 0.250	A36 STEEL	VARIES	STEEL REINFORCEMENT FOR (14) AND (24)
32	SR504	REINFORCEMENT CHANNEL	4.562 X 1.250 X 0.250	A36 STEEL	VARIES	STEEL REINFORCEMENT FOR (14) AND (24)
33		SR150 WITH REINFORCEMENT BAR	3.750 X 0.500	A36 STEEL	VARIES	STEEL REINFORCEMENT FOR (14) AND (24)
34		SR150 WITH REINFORCEMENT BAR	3.750 X 0.750	A36 STEEL	VARIES	STEEL REINFORCEMENT FOR (14) AND (24)
35	FL207	DOOR HEADER	1.750 X 4.500 X 0.085	6063-T6 ALUMINUM	CORAL INDUSTRIES, INC.	
36	AS13	SQUARE NUT	1.475 X1.475 X .180	STEEL	VARIES	
37	AS16	FASTENER	#14 X 1" HHSTS	STEEL	VARIES	TYP. SPLINE SCREW
38	AS32	FASTENER	#12 x 1-1/4" HWH #3 SELF DRILL	STEEL	VARIES	
39	AS25	FASTENER	#12 x 3/4" HWH SELF DRILL	STEEL	VARIES	
40	AS37	FASTENER	#12 X 2" HWH SELF DRILL	STEEL	VARIES	
41	FASTENER	PERIMETER ANCHOR TO STEEL SUBSTRATE	1/2"-13 X 2" BOLT WITH WASHER AND NUT	STEEL	VARIES	
42	FASTENER	PERIMETER ANCHOR TO STEEL SUBSTRATE	1/2"-13 X 4-1/2" BOLT WITH WASHER AND NUT	STEEL	VARIES	
43	FASTENER	PERIMETER ANCHOR TO CONCRETE SUBSTRATE	1/2"X3-1/2" MIN. EMBED WEDGE ANCHOR POWERS	STEEL	VARIES	
44	FASTENER	PERIMETER ANCHOR TO STEEL SUBSTRATE	#12 X 1-1/2" PFH SELF DRILL	STEEL	VARIES	
45	FASTENER	STEEL REINFORCEMENT ATTACHMENT	1/4-20 X 2" BOLT WITH WASHER AND NUT	STEEL	VARIES	
46	FASTENER	THROUGH BOLT	1/4-20 X 3" BOLT WITH WASHER AND NUT	STEEL	VARIES	USED @ HORIZONTALS
47	NG16	DRY GLAZE INTERIOR SPACER GASKET	0.260 SPACE	EPDM	VARIES	
48	PW658	CORNER FACE COVER	4.064 X .500 X 0.078	6063-T6 ALUM	CORAL INDUSTRIES, INC.	
49	PW654	CORNER PRESSURE BAR	3.954 X 3.954 X .125	6063-T6 ALUM	CORAL INDUSTRIES, INC.	
50	SP214	CORNER MULLION CAP	4.000 X 3.826 X 0.048	6063-T6 ALUM	CORAL INDUSTRIES, INC.	LOCATE @ TOP AND BOTTOM OF VERTICAL CORNER MULLION

GLAZING SCHEDULE

GLASS MARK	GLASS DESCRIPTION	MANUFACTURER	MAXIMUM D.L.O. SIZE (INCHES)	SQUARE FEET	MAXIMUM DESIGN PRESSURE (PSF)
(IE)	1-5/16" INSULATED -1/4" H.S. -1/2" AIR SPACER -1/4" H.S. - DUPONT BUTCITE 090 PSV INTERLAYER N.O.A. #	DUPONT	57-1/2" X 96"	38.3	± 80
(IB)	1-5/16" INSULATED -1/4" H.S. -1/2" AIR SPACER -1/4" H.S. -.090 SAFLEX PVB INTERLAYER -1/4" H.S. N.O.A. #	SOLUTIA	45-1/2" X 96"	30.3	± 80
(ID)	1-5/16" INSULATED -1/4" H.S. -1/2" AIR SPACER -1/4" H.S. -SENTRY GLASS PWS .090 -1/4" H.S.	DUPONT	57-1/2" X 96"	38.3	± 80

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# 42651.02

Date 2/12/11 Tech JCM

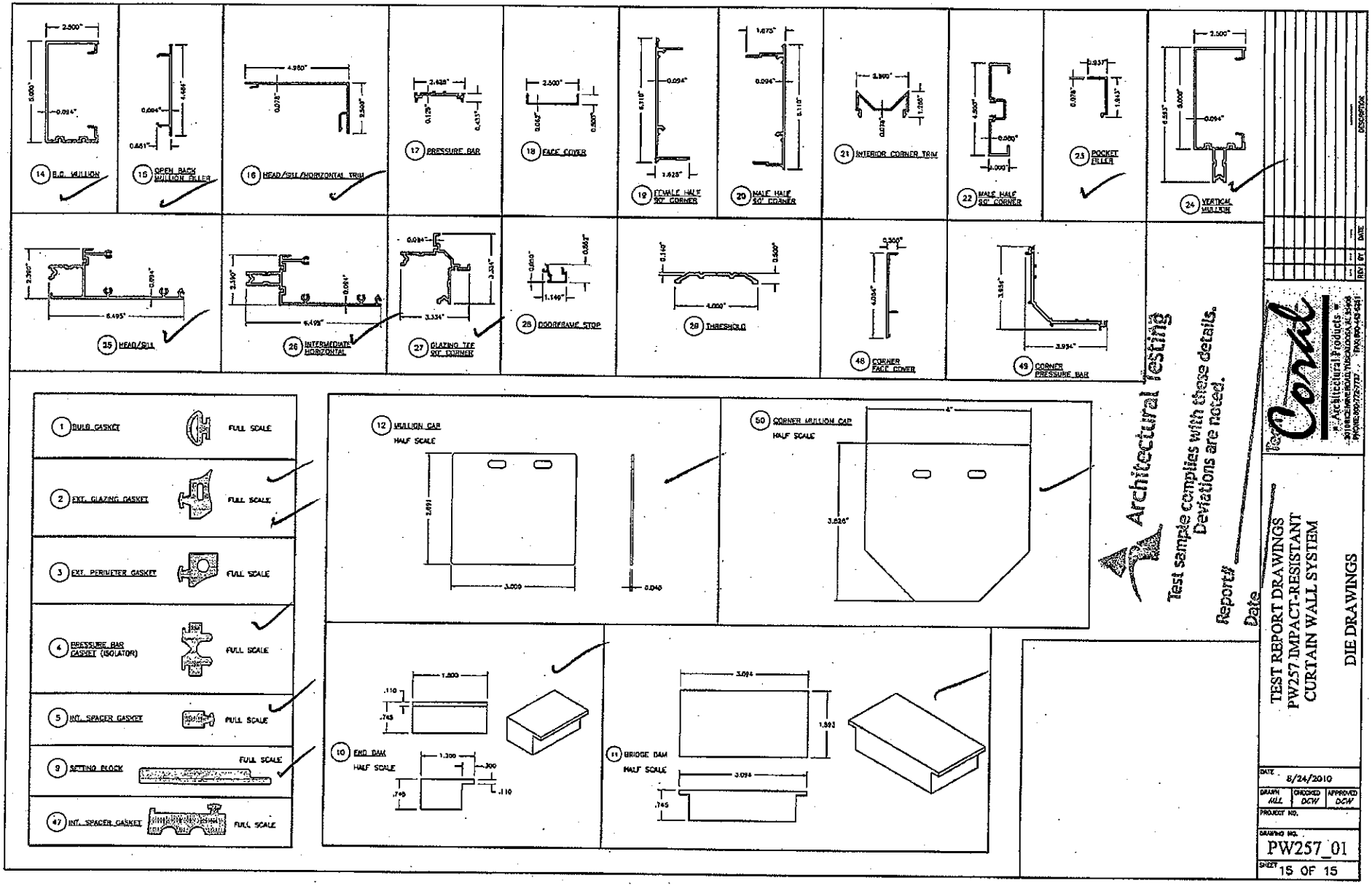
Coral
Architectural Products
3010 EXECUTIVE DRIVE CLEARWATER, FL 33762
PHONE(800)-778-7207 FAX(800)-441-0251

REV	BY	DATE	DESCRIPTION

TEST REPORT DRAWINGS
PW257 IMPACT RESISTANT
CURTAIN WALL SYSTEM

BILL OF MATERIALS AND GLAZING SCHEDULE

DATE 8/24/2010
DRAWN HLL | CHECKED DCW | APPROVED DCW
PROJECT NO.
DRAWING NO. PW257_01
SHEET 14 OF 15


14 E.G. MULLION
15 OPEN BACK MULLION FILLER
16 HEAD/SILL/HORIZONTAL TRIM
17 PRESSURE BAR
18 FACE COVER
19 FEMALE HALF 90° CORNER
20 MALE HALF 90° CORNER
21 INTERIOR CORNER TRIM
22 MALE HALF 90° CORNER
23 POCKET FILLER
24 VERTICAL MULLION
25 HEAD/SILL
26 INTERMEDIATE HORIZONTAL
27 GLAZING TEE 90° CORNER
28 DOORFRAME STOP
29 THRESHOLD
48 CORNER FACE COVER
49 CORNER PRESSURE BAR
1 BULB GASKET FULL SCALE
2 EXT. GLAZING GASKET FULL SCALE
3 EXT. PERIMETER GASKET FULL SCALE
4 PRESSURE BAR GASKET (ISOLATOR) FULL SCALE
5 INT. SPACER GASKET FULL SCALE
9 SETTING BLOCK FULL SCALE
47 INT. SPACER GASKET FULL SCALE
12 MULLION CAP HALF SCALE
50 CORNER MULLION CAP HALF SCALE
10 END DAM HALF SCALE
11 BRIDGE DAM HALF SCALE
Architectural Testing
Test sample complies with these details.
Deviations are noted.
Report#
Date
Construction Products
TEST REPORT DRAWINGS
PW257 IMPACT-RESISTANT
CURTAIN WALL SYSTEM
DIE DRAWINGS
DATE 8/24/2010
DRAWN MLL
CHECKED DCW
APPROVED DCW
PROJECT NO.
DRAWING NO. PW257_01
SHEET 15 OF 15