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JOB: 308 N 7TH ST.
SHEET NO.:
CALCULATED BY: ML DATE: 5/5/2018
REVISIONS:

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FIELD STRUCTURAL TESTING REPORT OF GLASS RAILINGS, TYPES "B" and "C"

308 N 7th Street, Brooklyn, NY

PREPARED BY: Mario Labot, PE

DATE: May 5, 2018

PREPARED FOR: Windloch
467 Brook Avenue, Unit C
Deer Park, NY 11729

REVISIONS:

mla
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FIELD STRUCTURAL TESTING OF GLASS RAILING AT 308 N 7TH STREET, BROOKLYN, NY

EXECUTIVE SUMMARY:

On April 18, 2018, Mr. Harry Pascual and I visited the project site and witnessed a series of testing conducted by Mr. Yoav Ben-Shimon and Mr. Sinn of Windloch on types "B" and "C" installed glass railings. Type "C" was installed on 10th Floor, North side, and Type "B" at 9th Floor, South side.

Both railings were tested with maximum load of 365 pounds applied horizontally, perpendicular to the glass, top, and at three locations: at ends, center of a glass pane and between the two glass panes.

Both railings were also tested with concentrated loads equivalent to wind loads of 30 PSF thru 60 PSF applied horizontally, perpendicular to the glass at middle of their heights using wood Jig.

Both railings withstand the loads without any signs of failures, and residual deflections were below 20 % of the deflections at maximum loads.

MLA suggest that "HIGH IMPACT SHIM" type be used at railing detail "C" to reduce the deflection.

BRIEF DESCRIPTION OF THE SPECIMEN:

TYPE 'B"

Approximately 28 ¾" high above the curb, consisting of two panes of ½" fully tempered glass about 58 11/16" wide, dry glazed into a continuous Aluminum shoe. Top rail is a square shape bent Stainless Steel also dry glazed to the glass.
Support is consisting of brackets, top part is Aluminum flat bar 1/8" thick, 4" wide, the side part is 4" X 6" Aluminum structural angle, 4" wide and ½" thick. Top part is bolted by one concrete anchor to the top of the curb approximately 4" from the edge. The side part uses one concrete anchor approximately 4" from the top of the curb. Spacing of the brackets is approximately 3" from ends and maximum of 9" OC. Concrete curb is CMU fully filled with unknown concrete strength. Brackets and Aluminum shoe are bolted together with one Stainless Steel bolts, with lkw, wrs and hex nut. Typically, the anchor bolt is CON-FLEX 3/8"X 5" with minimum embedment of 4".
Refer to photos 1, 11, 12, 13, 14, 15, and 16 for visual description.

TYPE "C"

Approximately 30" high above the curb, consisting of two panes of ½" fully tempered glass about 56 1/8" wide, dry glazed into a continuous Aluminum shoe. Top rail is a square shape bent Stainless Steel also dry glazed to the glass.

Supports are consisting of 3/8" X 5" CON-FLEX anchor bolts with 4" minimum embedment connecting the Aluminum shoe directly to the top of concrete curb at approximately 3" from ends and maximum 9" OC Curb is CMU fully filled with unknown concrete strength. Aluminum shoe and top stainless steel rail is similar in construction as type "B".
Refer to photos 2, 11, 12, 6 and 17 for visual description.

Both Type "B" and "C" generally complies with Windloch shop drawings attached in this report, refer to Sheets 7 and 8.

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TESTING PROCEDURE:

TYPE "B" and "C"
TEST #1, TEST #2, TEST #3

The concentrated load requirement is 200 pounds applied laterally and vertically (not concurrent) at the top of the railing, per ASTM E985, if the not anticipated impact and panic loads are included it is recommended that the load is increased to 1.825 of the require load. In this case it is 365 pounds. By inspection and experience the horizontal loads are the worst cases therefore the vertical loads will not be tested. Deflections were measured horizontally and manually from the point of load at the railing to the marked opposite side, where sling is fastened. Refer to photos 1 thru 7 for visual description of the test set up.

TESTING SEQUENCE:

1. 50% of Maximum Load
2. Release the load
3. Measure deflection
4. Apply increasing load of 15% up to the maximum load.
5. Measure deflection at maximum load
6. Release the load
7. Measure residual deflection
8. Thru out the test, perform visual inspection for signs of failure

TYPE "B"
TEST 4A, 4B, 4C, and 4D

Concentrated load equivalent to 30 PSF, 45 PSF, 50 PSF and 60 PSF were applied halfway of the railing height from the top of the curb. A wood jig spanning the length of the railing was placed against the exterior of the glass and pulled at three points.
Total area of the glass is 3375 square inches, equivalent concentrated loads are:
30 PSF=704 pounds, 45 PSF=1055 pounds, 50 PSF=1172 pounds, 60 PSF=1407 pounds
Test Loads were 1 ½ of the equivalent loads, the maximum test loads are:
30 PSF=1056 pounds, 45 PSF=1583 pounds, 50 PSF=1758 pounds, 60 PSF= 2111 pounds
Refer to photos 8, 9 and 10 for visual for visual description of the test set up.

TEST SEQUENCE:
Test sequence is similar to tests 1,2 and 3

TYPE "C"
TEST 5A, 5B, 5C and 5D

Total area of the glass is 3368 square inches, less than 7 square inches almost similar to tests 4A thru 4D, for simplicity maximum test loads of tests 4A thru 4D were used. Test sequence is also similar to tests1, 2, Ind 3

TEST RESULTS: Refer to sheets 3 thru 6 for detailed results of the tests.

Windloch
308 N 7th Street Test Report
Sheet 3 of
Date:

TYPE " B"
TEST #1, #2, and #3
TEST RESULTS

Testing	Test Loads	TEST # 1 (Top End)			TEST # 2 (Top Center Of a Pane)			TEST # 3, (Top Center of the 2 Panes)		
Sequence	%, (pounds)	Deflection	Residual	Visual	Deflection	Residual	Visual	Deflection	Residual	Visual
		(Inches)	Deflection	Observation	(Inches)	Deflection	Observation	(Inches)	Deflection	Observation
			(Inches)			(Inches)			(Inches)	
1	50%, (183)			OK			OK			OK
2	Release Load, (0)			OK			OK			OK
3	Deflection Check	73.062			66.312			73.5		
4	15%, (55)			OK			OK			OK
5	30%, (110)			OK			OK			OK
6	45%, (165)			OK			OK			OK
7	60%, (219)			OK			OK			OK
8	75%, (274)			OK			OK			OK
9	100%, (365)			OK			OK			OK
10	Deflection Check	71.5	1.562		65.5	0.812		73	0.5	
11	Release Load, (0)			OK			OK			OK
12	Deflection Check	72.875	0.1875		66.312	0		73.5	0	

TYPICAL NOTES FOR ALL TEST RESULTS:

1. OK= NO OBSERVED FAILURES, LIKE GLASS BREAKAGE, ALUMINUM SHOE and STAINLESS STEEL RAIL DETACHING FROM THE GLASS, SHEARING OR PULLING OUT OF ANCHOR BOLTS FROM THE CURB, AND PERMANENT DEFORMATION OF BRACKETS

2. DEFLECTIONS WERE MANUALLY MEASURED USING MEASURING TAPE, FROM THE POINT OF LOAD AT RAILING TOP TO WALL DIRECTLY ACROSS THE RAILING FOR TESTS 1, 2, and 3. FOR TESTS 4 AND 5 SERIES, FROM TOP CENTER BETWEEN THE 2 PANES TO THE WALL DIRECTLY ACRROSS THE RAILING.

Windloch
308 N 7th Street Test Report
Sheet 4 of
Date:

TYPE " C"
TEST #1, #2, and #3
TEST RESULTS

Testing	Test Loads	TEST # 1 (Top End)			TEST # 2 (Top Center Of a Pane)			TEST # 3, (Top Center of the 2 Panes)		
Sequence	%, (pounds)	Deflection	Residual	Visual	Deflection	Residual	Visual	Deflection	Residual	Visual
		(Inches)	Deflection	Observation	(Inches)	Deflection	Observation	(Inches)	Deflection	Observation
			(Inches)			(Inches)			(Inches)	
1	50%, (183)			OK			OK			OK
2	Release Load, (0)			OK			OK			OK
3	Deflection Check	180			181.75			182.25		
4	15%, (55)			OK			OK			OK
5	30%, (110)			OK			OK			OK
6	45%, (165)			OK			OK			OK
7	60%, (219)			OK			OK			OK
8	75%, (274)			OK			OK			OK
9	100%, (365)			OK			OK			OK
10	Deflection Check	177.875	2.125		179.875	1.875		180.562	1.688	
11	Release Load, (0)			OK			OK			OK
12	Deflection Check	179.875	0.125		181.75	0		182.25	0	

Windloch
308 N 7th Street Test Report
Sheet 5 of
Date:

TYPE " B"
TEST #4A, #4B, #4C, #4D
TEST RESULTS

Testing Sequence	Test Loads %	TEST # 4A, (30PSF)				TEST # 4B, (45 PSF)			
		Test Loads (pounds)	Deflection (Inches)	Residual Deflection (Inches)	Visual Observation	Test Loads (pounds)	Deflection (Inches)	Residual Deflection (Inches)	Visual Observation
1	50%,	528			OK	792			OK
2	Release Load	0			OK	0			OK
3	Deflection Check		68.75				68.687		
4	15%	159			OK	238			OK
5	30%	317			OK	475			OK
6	45%	476			OK	713			OK
7	60%	634			OK	950			OK
8	75%	792			OK	1188			OK
9	100%	1056			OK	1583			OK
10	Deflection Check		68	0.75			67.625	1.06	
11	Release Load	0			OK	0			OK
12	Deflection Check		68.75	0			68.687	0	

Testing Sequence	Test Loads %	TEST # 4C, (50 PSF)				TEST # 4D, (60 PSF)			
		Test Loads (pounds)	Deflection (Inches)	Residual Deflection (Inches)	Visual Observation	Test Loads (pounds)	Deflection (Inches)	Residual Deflection (Inches)	Visual Observation
1	50%,	879			OK	1056			OK
2	Release Load	0			OK	0			OK
3	Deflection Check		67.687				67.625		
4	15%	264			OK	317			OK
5	30%	528			OK	634			OK
6	45%	792			OK	950			OK
7	60%	1055			OK	1267			OK
8	75%	1319			OK	1584			OK
9	100%	1758			OK	2111			OK
10	Deflection Check		66.562	1.1			66.125	1.5	
11	Release Load	0			OK	0			OK
12	Deflection Check		67.625	0.062			67.56	0.065	

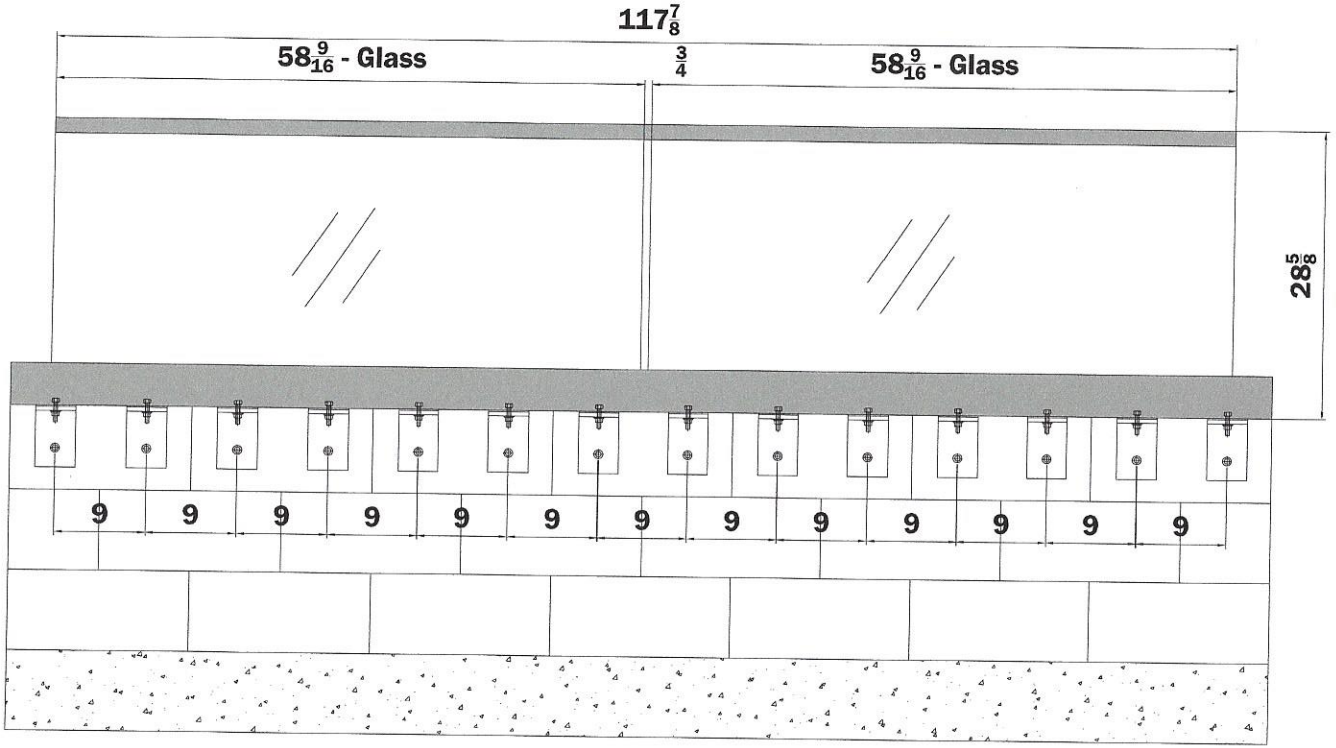
Windloch
308 N 7th Street Test Report
Sheet 6 of
Date:

TYPE " C"
TEST #5A, #5B, #5C, #5D
TEST RESULTS

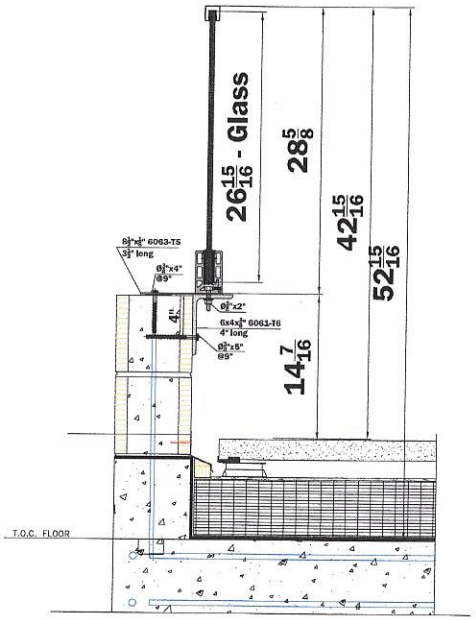
Testing	Test Loads	TEST # 5A, (30PSF)				TEST # 5B, (45 PSF)			
Sequence	%	Test Loads	Deflection	Residual	Visual	Test Loads	Deflection	Residual	Visual
		(pounds)	(Inches)	Deflection	Observation	(pounds)	(Inches)	Deflection	Observation
				(Inches)				(Inches)	
1	50%,	528			OK	792			OK
2	Release Load	0			OK	0			OK
3	Deflection Check		181.5				181.437		
4	15%	159			OK	238			OK
5	30%	317			OK	475			OK
6	45%	476			OK	713			OK
7	60%	634			OK	950			OK
8	75%	792			OK	1188			OK
9	100%	1056			OK	1583			OK
10	Deflection Check		179.687	1.81			67.625	2.5	
11	Release Load	0			OK	0			OK
12	Deflection Check		181.5	0			181.25	0.18	

Testing	Test Loads	TEST # 5C, (50 PSF)				TEST # 5D, (60 PSF)			
Sequence	%	Test Loads	Deflection	Residual	Visual	Test Loads	Deflection	Residual	Visual
		(pounds)	(Inches)	Deflection	Observation	(pounds)	(Inches)	Deflection	Observation
				(Inches)				(Inches)	
1	50%,	879			OK	1056			OK
2	Release Load	0			OK	0			OK
3	Deflection Check		181.187				181.125		
4	15%	264			OK	317			OK
5	30%	528			OK	634			OK
6	45%	792			OK	950			OK
7	60%	1055			OK	1267			OK
8	75%	1319			OK	1584			OK
9	100%	1758			OK	2111			OK
10	Deflection Check		178.437	2.75			177.625	3.5	
11	Release Load	0			OK	0			OK
12	Deflection Check		181	0.18			180.812	0.312	

SHEET. 7 OF ——
5/5/2018



Type B



Wind Load
30 PSF,
45 PSF

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(941)-718-4868 Fax
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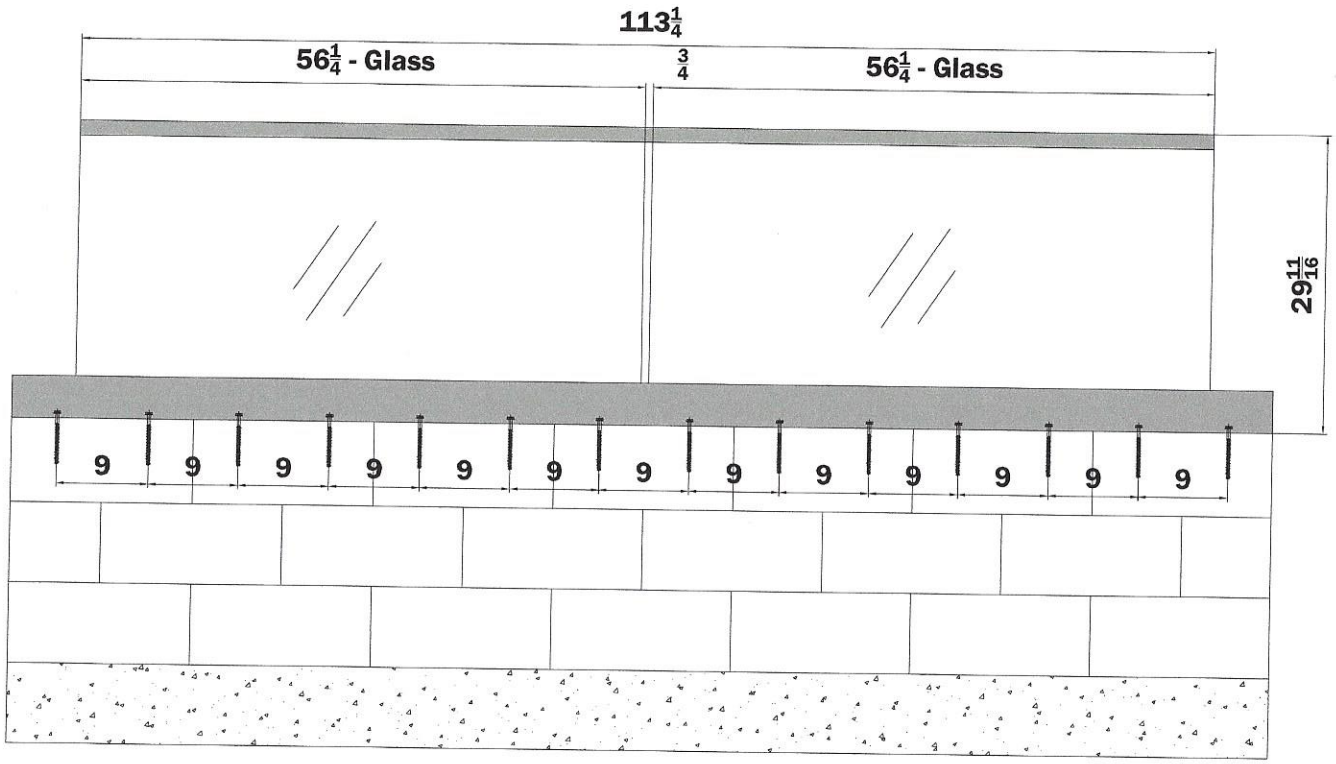
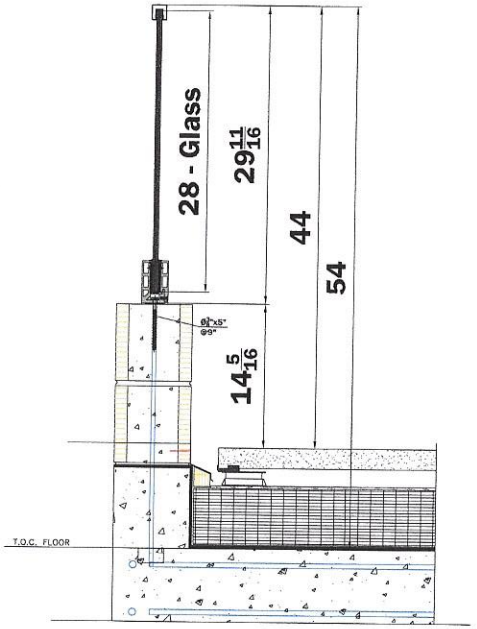
WWW.WINDLOCH.COM

PROJECT NAME: 308N 7th street, Brooklyn, NY		CAD FILE : 308N 7.dwg
DESCRIPTION: Glass rail Type B		DATE: 04/16/18 / REV. 1
		SCALE::
DESIGN BY: YOAV BEN-SHIMON	SYSTEM MODEL: GRS-107	DRAWING NUMBER: 1

SHEET 8 OF ____
5/5/2018



Type C



Wind Load
30 PSF,
45 PSF

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PROJECT NAME: 308N 7th street, Brooklyn, NY		CAD FILE : 308N 7.dwg
DESCRIPTION: Glass rail Type C		DATE: 04/16/18 / REV. 1
		SCALE:
DESIGN BY: YOAV BEN-SHIMON	SYSTEM MODEL: GRS-107	DRAWING NUMBER: 1


10 NEVINS STREET
PHOTO # 1, DETAIL "B"
TEST # 1, 365 Concentrated Load at Top End
CLIENT: WINDLOCH
SHEET 9 OF
SLING
GRABBER
365 pounds MAXIMUM CONCENTRATED LOAD
04/18/2018 12:06

10 NEVINS STREET
CLIENT: WINDLOCH
PHOTO # 2, DETAIL # C"
TEST # 1, 365 Pounds, Maximum Concentrated Load
SHEET 10 OF


10 NEVINS STREET
CLIENT: WINDLOCH
PHOTO # 3, DETAIL " B"
TEST # 2, 365 Pounds, Maximum Concentrated Load
At Top Center of a Glass Pane
SHEET 11 OF
GRABBER
365 Pounds, Maximum Concentrated Load
SLING
THESE CABLES NOT INCLUDED IN THE TEST
04/18/2018 12:11


10 NEVINS STREET
CLIENT: WINDLOCH
PHOTO # 4, DETAIL "C"
TEST # 2, 365 Pounds, Maximum Concentrated Load at Center Of a Glass Pane
SHEET OF
CENTER TOP OF A GLASS PANE
GRABBER
SLING
365 pounds, MAXIMUM CONCENTRATED LOAD
THESE CABLES NOT INCLUDED IN THE TEST
04/18/2018 10:37


10 NEVINS STREET
CLIENT: WINDLOCH
PHOTO # 5, DETAIL "B"
TEST # 3, 365 Pounds Maximum
Concentrated Load
At Top Center of the two
Glass Panes.
SHEET 15
SLING
GRABBER
365 Pounds Maximum Concentrated Load
These Cables Not Included in The Test
04/18/2018 12:08

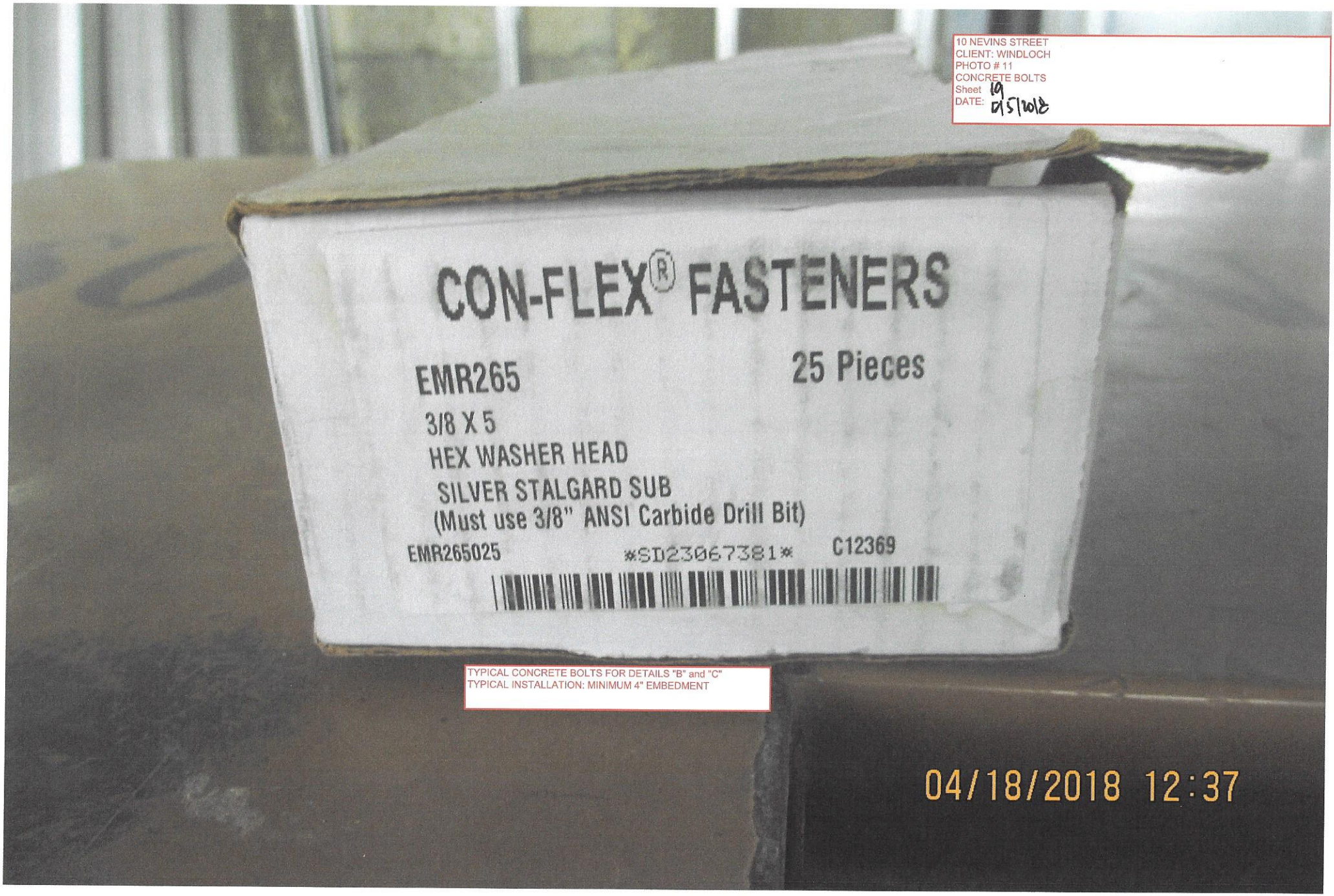

10 NEVINS STREET
CLIENT: WINDLOCH
PHOTO # 6, DETAIL " C"
TEST # 3, 365 Pounds Maximum Concentrated Load At top Center of The two Glass Panes
SHEET 14
DATE: 5/15/2018
GRABBER
SLING
365 Pounds Maximum Concentrated Load
These Cables not included in the Test
04/18/2018 10:29

10 NEVINS STREET
CLIENT: WINDLOCH
PHOTO # 7 Details "B" and "C"
TESTS #1,#2, and #3, Typical Tension Meter
SHEET 15
DATE: 5/5/2018


10 NEVINS STREET
CLIENT: WINDLOCH
PHOTO # 8, TYPICAL TEST # 4, Wind Load 30 PSF to 60 PSF
Detail "B"
Sheet 10
DATE: 5/5/2018
Wood Jig against Exterior Surface of Glass
Three Points Pulling Cable
Come Along
Load Cell
Concentrated Loads 522 pounds to 2088 pounds
Load Cell Meter
Not Visible
04/18/2018 12:23

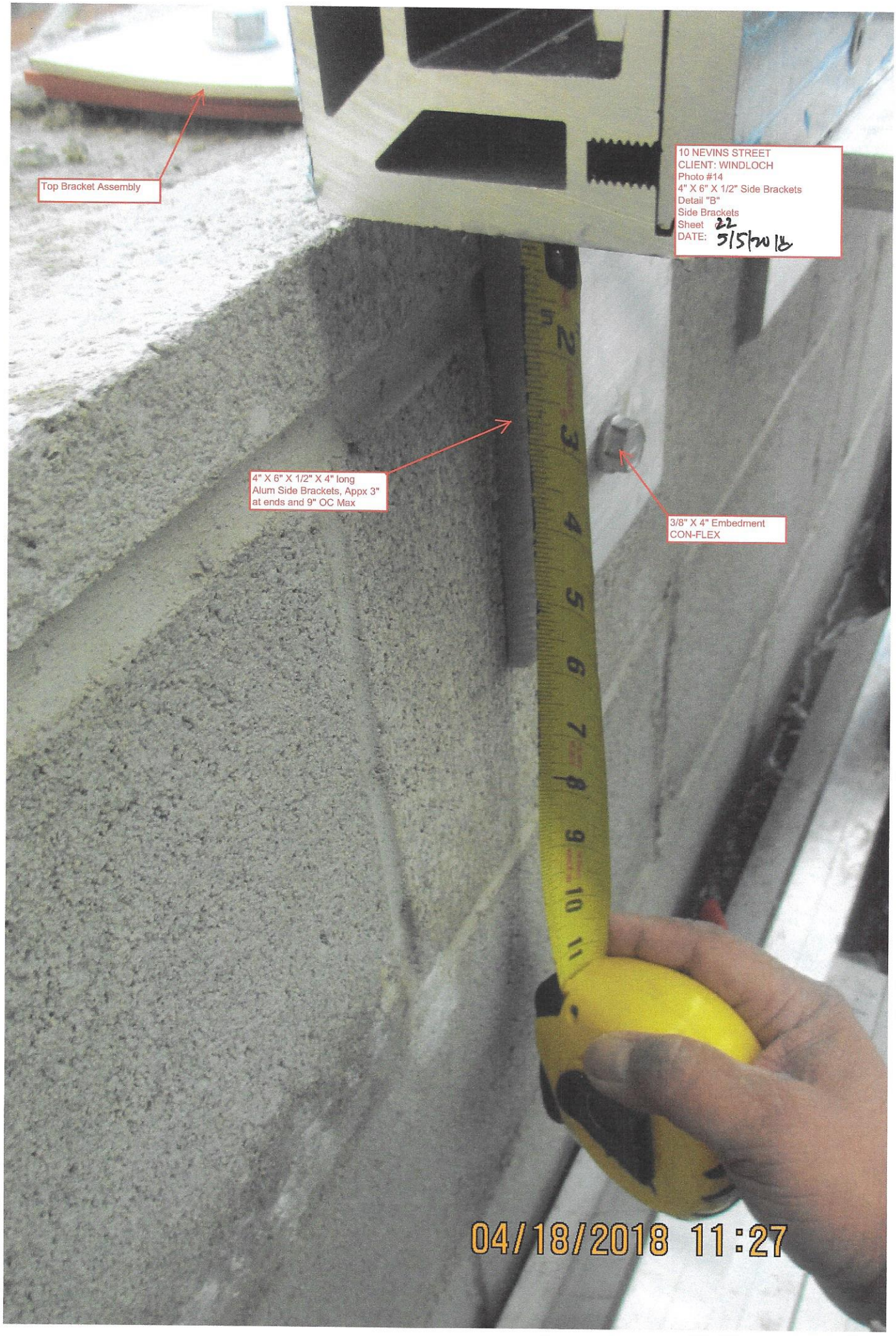

10 NEVINS STREET
CLIENT: WINDLOCH
PHOTO # 9, TYPICAL TEST # 5, Wind Loads 30 PSF to 60 PSF
Detail "C"
Sheet
DATE: 4/5/2018
Wood Jig, Against Glass Exterior Surface
Three Points Pulling Cables
Load Cell
Concentrated Loads 526 pounds to 2100 pounds
SLING
Load Cell Meter
04/18/2018 10:42


OPTIMA DIGITAL TENSION METER, MODEL OP-901A
TYPICAL AT TESTS # 4 and #5
10 NEVINS STREET
CLIENT: WINDLOCH
PHOTO # 10, Details "B" and "C"
Tests # 4 and #5, Wind Loads 30 PSF to 60 PSF
Sheet 18 of
DATE:: 5/5/2018
MODEL OP-901A
OPTIMA
OVER
ACCEPT
UNDER
Gross
Net
Tared
Hold
lb
kg
Battery
ON OFF
HOLD
UNITS
TARE
ZERO
SET
DIGITAL WEIGHT INDICATOR
04/18/2018 12:08

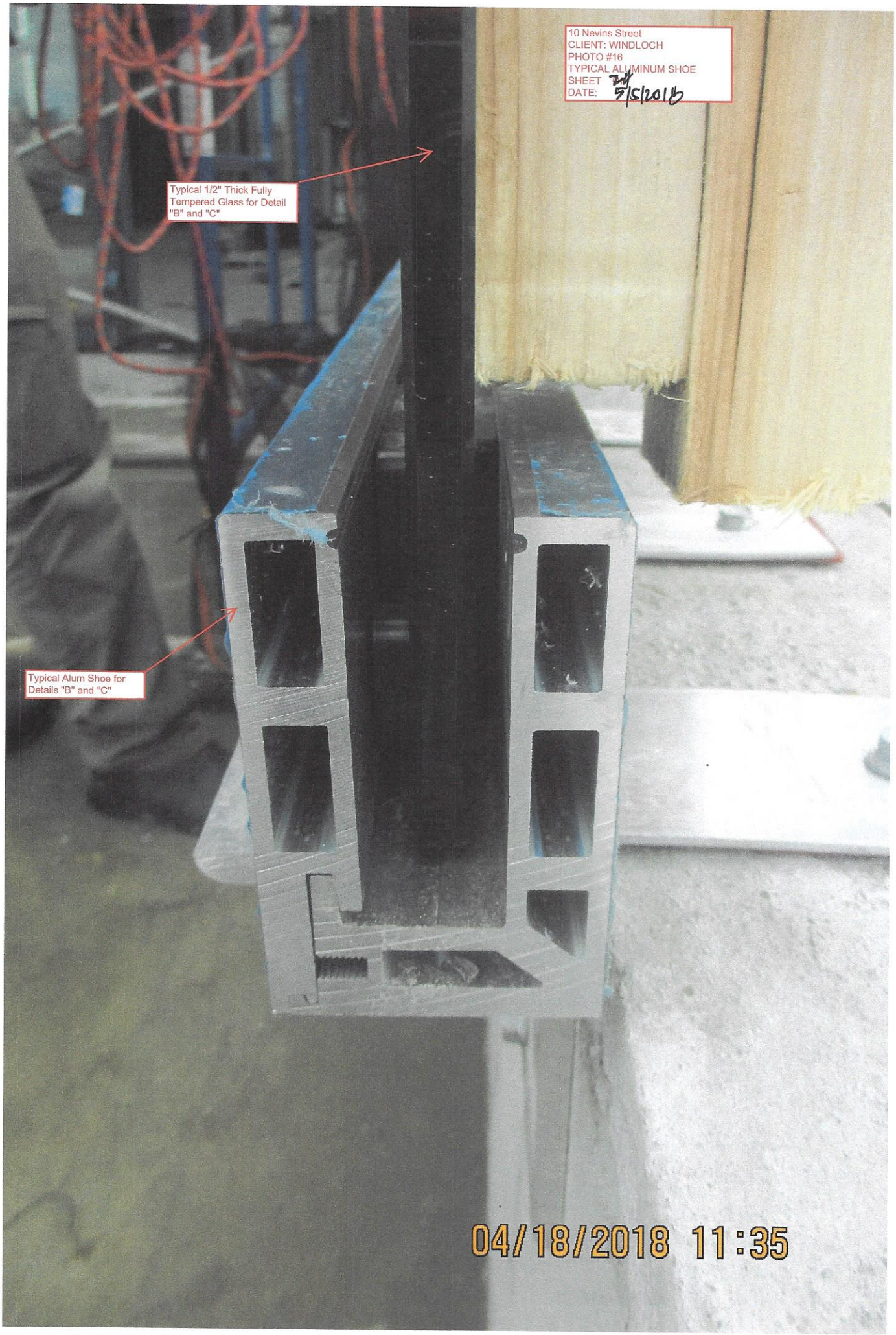

10 NEVINS STREET
CLIENT: WINDLOCH
PHOTO # 11
CONCRETE BOLTS
Sheet 10
DATE: 04/5/2018
CON-FLEX® FASTENERS
EMR265
25 Pieces
3/8 X 5
HEX WASHER HEAD
SILVER STALGARD SUB
(Must use 3/8" ANSI Carbide Drill Bit)
EMR265025
SD2306738 1
C12369
TYPICAL CONCRETE BOLTS FOR DETAILS "B" and "C"
TYPICAL INSTALLATION: MINIMUM 4" EMBEDMENT
04/18/2018 12:37


10 Nevins Street
CLIENT: WINDLOCH
PHOTO # 12
CONCRETE BOLTS
Sheet 20
DATE: 5/5/2018
3/8 " X 5" Concrete Bolts, CON-FLEX
04/18/2018 12:37
CON-FLEX® FASTENERS
EMPR265
3/8 X 5
HEX WASHER HEAD
25 Pieces


10 NEVINS STREET
CLIENT: WINDLOCH
PHOTO # 13
DETAIL "B"
Top Bracket
Sheet
DATE: 4/18/2018
1/8" Thick X 4 1/2" Wide
Alum Top Brackets, Appx. 3" from ends
and 9" OC Max
3/8" X 4" Embedment, CON-FLEX
Concrete Bolts, 1 per Bracket
Top of CMU filled with
Concrete
04/18/2018 11:28


Top Bracket Assembly
10 NEVINS STREET
CLIENT: WINDLOCH
Photo #14
4" X 6" X 1/2" Side Brackets
Detail "B"
Side Brackets
Sheet 22
DATE: 5/15/2018
4" X 6" X 1/2" X 4" long
Alum Side Brackets, Appx 3"
at ends and 9" OC Max
3/8" X 4" Embedment
CON-FLEX
04/18/2018 11:27


10 NEVINS STREET
CLIENT" WINDLOCH
Photo # 15
1/4" S/S Bolts
Detail "B"
Sheet
DATE: 5/5/2018
1/4" dia S/S bolts, Washer, Lkw, Hex nut, 1 per connection, (Connecting top, shoe and side bracket)
04/18/2018 11:29


10 Nevins Street
CLIENT: WINDLOCH
PHOTO #16
TYPICAL ALUMINUM SHOE
SHEET
DATE: 5/5/2018
Typical 1/2" Thick Fully Tempered Glass for Detail "B" and "C"
Typical Alum Shoe for Details "B" and "C"
04/18/2018 11:35


10 NEVINS STREET
CLIENT: WINDLOCH
PHOTO #17
Detail "C"
Alum Shoe Installation
Sheet 25
DATE: 9/5/2018
Aluminum Shoe on top of CMU, filled with concrete, connected to CMU with 3/8" X 4" Embedment Con Flex Conc. Bolts, appx 3" from ends and 9" OC Max
04/18/2018 11:04