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Test
TS EN ISO/EC 17025
AB-0531-T

AB-0531-T
010.217.1 / 2014
05 / 2014

DENEY SERTİFİKASI / *Test Certificate*

Müşterinin Adı ve Adresi / *Customer's Name & Address:* Saray Döküm ve Madeni Aksam San. Turizm A.Ş.
Bağlar Mah. Osmanpaşa Cad. No : 89 Güneşli / İstanbul / TÜRKİYE

Referans No / *Reference No:* 2014.307

Numunenin Adı ve Tarifi / *Sample's Name & Description:* FS 50 Stick System

Numunenin Kabul Tarihi / *Receipt Date of Test Item:* 15.04.2014

Uygulanan Normlar / *Norms Applied:* TS EN 12153 , TS EN 12155 and TS EN 12179

Sonuçlar / *Results:* Air Permeability : TS EN 12152 - Class A4 (600 Pa)
Watertightness : TS EN 12154 - Class R7 (600 Pa)
Wind Resistance : TS EN 13116 - OK at 2400 Pa (+4,65mm<+15mm ; -5,74mm<-15mm)

Test Tarihi / *Date of Test*
24.04.2014

Sayfa Sayısı / *Number of Pages*
1 / 23

Türk Akreditasyon Kurumu (TÜRKAK) deney raporlarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile karşılıklı tanınma anlaşması imzalamıştır.
The Turkish Accreditation Agency (TURKAK) is signatory to the multilateral aggreements of the European co - operation for the Accreditation (EA) and of the International Laboratory Accreditation (ILAC) for the Mutual recognation of test reports.

Uygulanan metodlar, test sonuçları ve genişletilmiş ölçüm belirsizlikleri (talep edilirse), bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir. Bu sertifika yanlız test edilen numuneye ait sonuçları içerir ve ekte sunulan ilgili test raporu ile birlikte geçerlidir.
The applied methods, test results and the uncertainties (if requested) with confidence probability are given on the following pages which are part of this report. This certificate includes the test specimen which is identified above and its valid with the related test report which is presented as annex.

Mühür / *Seal*

Tarih / *Date*
05.05.2014

Test Müh. / *Testing Eng.*
M.Serhat Çolak

Lab. Müdürü / *Lab. Manager*
Oktay Usta

F.15.22 REV NO: C HAZİRAN 2012

PERFORMANCE TEST REPORT

Air Permeability, Watertightness and Resistance to Wind Load

Test Report No: 010.217.1 / 2014

Rendered to	: **Saray Döküm ve Madeni Aksam San. Tur. A.Ş.**	Norms Applied	: **EN 12153**
			: **EN 12155**
			: **EN 12179**
Product	: **FS 50 Stick System**		:
Sample Size	: **3250 mm x 7650 mm**	Classification Norms	: **EN 12152**
			: **EN 12154**
			: **EN 13116**
Sample Description	: **Curtain Walling**		:
	: **Top Hang Sash**		
	: **6 / 16 / 6 mm Insulated Glass**	Test Comp. Date	: **24.04.2014**
Test Performed	: **Air Permeability - Static**	Report Date	: **05.05.2014**
	: **Watertightness - Static**	Record Retention Date	: **05.05.2019**
	: **Wind Resistance - Static**	Number of Pages	: **2 / 23**

Test Results : The Test sample performed in accordance of to following classifications

Air Permeability	: **EN 12152 - Class A 4** *(600 Pa)*
Watertightness	: **EN 12154 - Class R 7** *(600 Pa)*
Wind Resistance	: **EN 13116 - OK** ± *2400 Pa (+ 4,65mm<+15mm ; - 5,74mm<-15mm)*

*This Test Report includes specific test data, results, photographic documention and build drawings of the sample submitted for testing only and thus does not prejudge other related products.
* This certificate is valid with the related test report which is presented together.

Oktay Usta
Testing Manager

FAÇADE TESTING INSTITUTE FTI

M.Serhat Çolak
Testing Engineer

F.15.07 REV. NO: D EKIM 2013

TEST REPORT

Report Number	:	010.217.1 / 2014
Report Date	:	05 / 05 / 2014
Testing Reference	:	TS EN 13830 – Curtain Walling – Product Standard
Product	:	FS 50 Stick System
Client	:	Saray Döküm ve Madeni Aksam San. Turizm A.Ş.

1. PREFACE

This report comprises of tests and results, which were performed by FTI Facade Testing Institute at the address; Çakıl Mahallesi, Şehit Teğmen Tamer Aydın Sokak, No:76 34540 Çatalca - Istanbul/ TURKIYE.

Test sample comprises of a part of facade system which name is FS 50 Stick System which has been constructed by Mayem Alüminyum. for Venezia Project. Tests were carried out on 24 / 04 / 2014 for the determination of the air infiltration, water penetration (under static pressure) and resistance to wind load.

Test sample has been sent to FTI Façade Testing Institute's testing laboratories on 15 / 04 / 2014.

2. CLIENT

SARAY DÖKÜM VE MADENİ AKSAM SAN. TURİZM A.Ş.
Bağlar Mah. Osmanpaşa Cad. No:89
Güneşli / İstanbul / TÜRKİYE

3. TEST METHODS

The above mentioned tests have been carried out as per the test methods provided in project specifications and classified on the standards indicated below. Tests have been reported as the number of 010.217.1 / 2014.

EN 12153	* Curtain Walling – Air Tightness – Test Method
EN 12152	* Curtain Walling – Air Tightness – Performance Requirement and Classification
EN 12155	* Curtain Walling – Water Tightness – Laboratory Tests Under Static Pressure
EN 12154	* Curtain Walling – Water Tightness – Performance Requirements and Classification
EN 12179	* Curtain Walling – Resistance to Wind Load – Test Method
EN 13116	* Curtain Walling – Resistance to Wind Load – Performance Requirements

4. TEST DATE AND PARTICIPANTS

Tests were performed on 24 / 04 / 2014 with the following participants:

Mr. Oktay USTA	FTI	Laboratory Manager
Mr. Öner ARSLAN	FTI	Testing Engineer
Mr. M.Serhat ÇOLAK	FTI	Testing Engineer
Mrs. Ayfer DİNCEL	FTI	Testing Assistant

and partially by;

Mustafa ÇULHA	Saray Alüminyum
Fatih YILMAZ	Mayem Alüminyum
Aytül AYSUNA	Gelişim Cephe
Serhat GÜMÜŞÇÜ	Gelişim Cephe
Fuat KULABEROĞLU	CWG Danışmanlık
Murat SAVAŞ	KİPTAŞ
Mustafa ÇOLAK	KİPTAŞ
Bayram ÇELİK	BG

5. DESCRIPTION OF TEST SAMPLE

* Type of sample	**Curtain Walling**
* System name	**FS 50 Stick System**
* Dimensions of sample (LxH)	**3250 mm x 7650 mm**
* Surface area of sample	**24,86 m^2**
* Fixed joint length	**77,74 m**
* Number of openable part(s)	**2**
* Opening Type	**Top Hang Sash**
* Surface area of openable parts	**1,92 m^2**
* Opening joint length	**8,20 m**
* Glass Type	**6 / 16 / 6 mm Insulated Glass**

6. CONDITIONS

Local Temperature (ºC)	:	18
Atmospheric Pressure (Mbar)	:	1004
Ambient Humidity (%)	:	63
Test Stand	:	2

7. TEST PERFORMANCE

7.1. Pressure Sequence

STEPS		POSITIVE PRESSURE (Pa)	NEGATIVE PRESSURE (Pa)
1	PN	600	600
2	P1=PD	2400	2400
3	P2=PE	3600	3600

PD: Pressure Design ; PN: Pressure Normative ; PE: Pressure Extreme

7.2. Air Permeability

Before starting the test, 3 pulses at 660 Pa is applied to the sample.

During the tests, the pressure at the following values is applied for 10 seconds.

The following data includes the remaining values of the system after tare.

Air permeability measurements based on overall area ;

POSITIVE PRESSURE			
ϕ1 / ϕ2 Pipe	Test Pressure (Pa)	Air Leakage (m^3/h)	Air Leakage ($m^3/h/m^2$)
ϕ1	50	6,39	0,26
ϕ1	100	11,26	0,45
ϕ1	150	14,80	0,60
ϕ1	200	17,49	0,70
ϕ1	250	20,10	0,81
ϕ1	300	22,08	0,89
ϕ1	450	27,38	1,10
ϕ1	600	30,49	**1,23**

Test No : 2014.307.05 / *24.04.2014*

NEGATIVE PRESSURE			
ϕ1 / ϕ2 Pipe	Test Pressure (Pa)	Air Leakage (m^3/h)	Air Leakage ($m^3/h/m^2$)
ϕ1	50	6,26	0,25
ϕ1	100	11,13	0,45
ϕ1	150	13,90	0,56
ϕ1	200	16,04	0,65
ϕ1	250	16,31	0,66
ϕ1	300	17,97	0,72
ϕ1	450	23,22	0,92
ϕ1	600	26,69	**1,07**

Test No : 2014.307.04 / *24.04.2014*

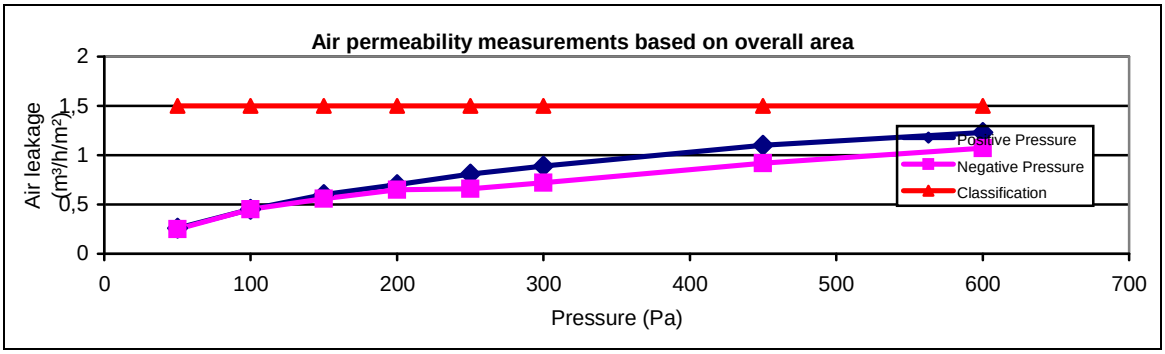
Air permeability measurements based on fixed joint length;

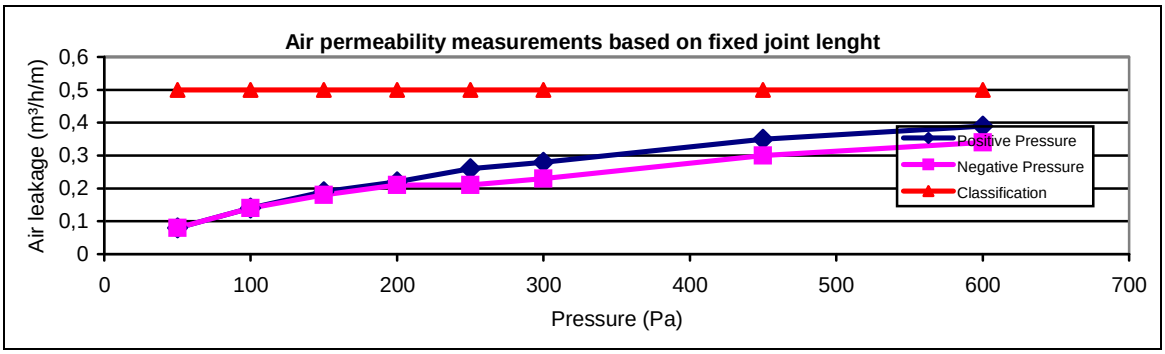
POSITIVE PRESSURE			
ϕ1 / ϕ2 Pipe	Test Pressure (Pa)	Air Leakage (m^3/h)	Air Leakage ($m^3/h/m$)
ϕ1	50	6,39	0,08
ϕ1	100	11,26	0,14
ϕ1	150	14,80	0,19
ϕ1	200	17,49	0,22
ϕ1	250	20,10	0,26
ϕ1	300	22,08	0,28
ϕ1	450	27,38	0,35
ϕ1	600	30,49	**0,39**

Test No : 2014.307.05 / *24.04.2014*

NEGATIVE PRESSURE			
ϕ1 / ϕ2 Pipe	Test Pressure (Pa)	Air Leakage (m^3/h)	Air Leakage ($m^3/h/m$)
ϕ1	50	6,26	0,08
ϕ1	100	11,13	0,14
ϕ1	150	13,90	0,18
ϕ1	200	16,04	0,21
ϕ1	250	16,31	0,21
ϕ1	300	17,97	0,23
ϕ1	450	23,22	0,30
ϕ1	600	26,69	**0,34**

Test No : 2014.307.04 / *24.04.2014*





7.3. Watertightness Under Static Pressure

Before starting the test, 3 pulses at 660 Pa were applied to the sample. Waiting duration between each impacts were 3 seconds.

An adjustable device for spraying water 2,0 l/m^2.min so that a constant and continuous film was applied to the outside surface of the specimen.

The amount of water applied to the façade = 2,0 l/min x 24,86 m^2 = 49,72 l/min. = 2983 l/h

Observations

Pressure Value (Pa)	Time Period (min)	Observations
0	15	No water leakage was observed.
50	5	No water leakage was observed.
100	5	No water leakage was observed.
150	5	No water leakage was observed.
200	5	No water leakage was observed.
300	5	No water leakage was observed.
450	5	No water leakage was observed.
600	5	No water leakage was observed.

Test No : 2014.307.06 / *24.04.2014*

7.4. Resistance to Wind Load

Before starting the test, 3 pulses at - 1200 / +1200 Pa are applied to the sample. Waiting duration between each impacts were 3 seconds. During the tests, the pressure values are applied for 10 seconds.

Acceptable proportion at resistance to wind load:

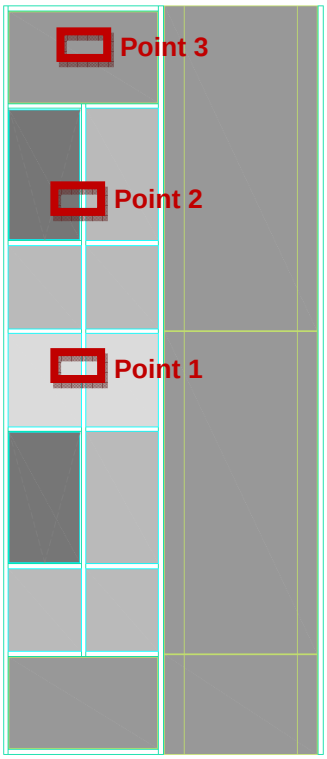
Position: Vertical distance for mullion at middle axis

Scale: **Vertical** **3300 mm**

The measured frontal deflection between points of the structural support should not exceed the minimum of 1/200 of the framing member's span or 15 mm, which is smaller, under the positive and negative design loads:

Vertical **3300/ 200 = 16,5 mm** **or** **<u>15,00 mm</u>**

Specimen dimensions and sensor replacement coordinates;



	X coordinates (mm)	Y coordinates (mm)
External Dimensions	3250	7650
Sensor 1 Replacement	815	3750
Sensor 2 Replacement	815	5275
Sensor 3 Replacement	815	6800

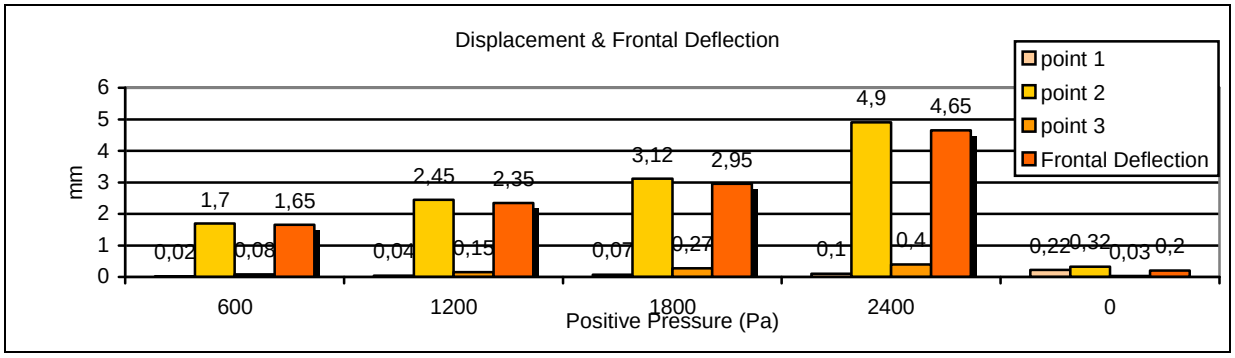
Frontal deflection measurement results on the vertical mullion;

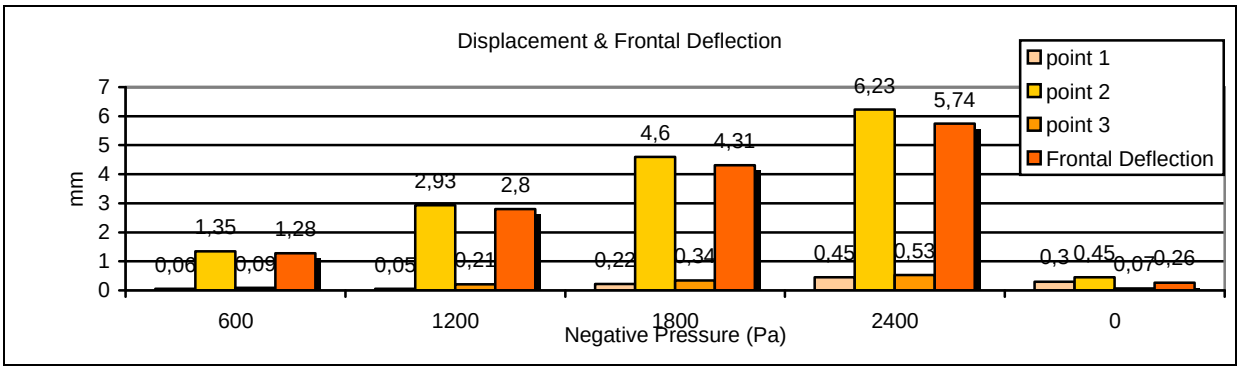
Positive Pressure (Pa)	Point 1 (mm)	Point 2 (mm)	Point 3 (mm)	Frontal Deflection (mm)
0	0,00	0,00	0,00	0,00
600	0,02	1,70	0,08	1,65
1200	0,04	2,45	0,15	2,35
1800	0,07	3,12	0,27	2,95
2400	0,10	4,90	0,40	**4,65**
0	0,22	0,32	0,03	0,20

Test No : 2014.307.07 / *24.04.2014*

Negative Pressure (Pa)	Point 1 (mm)	Point 2 (mm)	Point 3 (mm)	Frontal Deflection (mm)
0	0,00	0,00	0,00	0,00
600	0,06	1,35	0,09	1,28
1200	0,05	2,93	0,21	2,80
1800	0,22	4,60	0,34	4,31
2400	0,45	6,23	0,53	**5,74**
0	0,30	0,45	0,07	0,26

Test No : 2014.307.08 / *24.04.2014*





7.5. Repeated Pressure Test (Cycle Test)

Positive and negative test pressure was applied to 50 cycles at 1200 Pa. Duration time between each impact was 5 seconds.

Test Pressure (Pa)	Cycle	Observations
± 1200	50	No damage was observed.

Test No : 2014.307.09 / *24.04.2014*

7.6. Watertightness Under Static Pressure (Repeat)

Before starting the test, 3 pulses at 660 Pa were applied to the sample. Waiting duration between each impacts were 3 seconds. An adjustable device for spraying water 2,0 l/m^2.min so that a constant and continuous film was applied to the outside surface of the specimen.

The amount of water applied to the façade = 2,0 l/min x 24,86 m^2 = 49,72 l/min. = 2983 l/h

Observations

Pressure Value (Pa)	Time Period (min)	Observations
0	15	No water leakage was observed.
50	5	No water leakage was observed.
100	5	No water leakage was observed.
150	5	No water leakage was observed.
200	5	No water leakage was observed.
300	5	No water leakage was observed.
450	5	No water leakage was observed.
600	5	No water leakage was observed.

Test No : 2014.307.10 / *24.04.2014*

7.7. Increased Load Test (Safety Test – Secure Load)

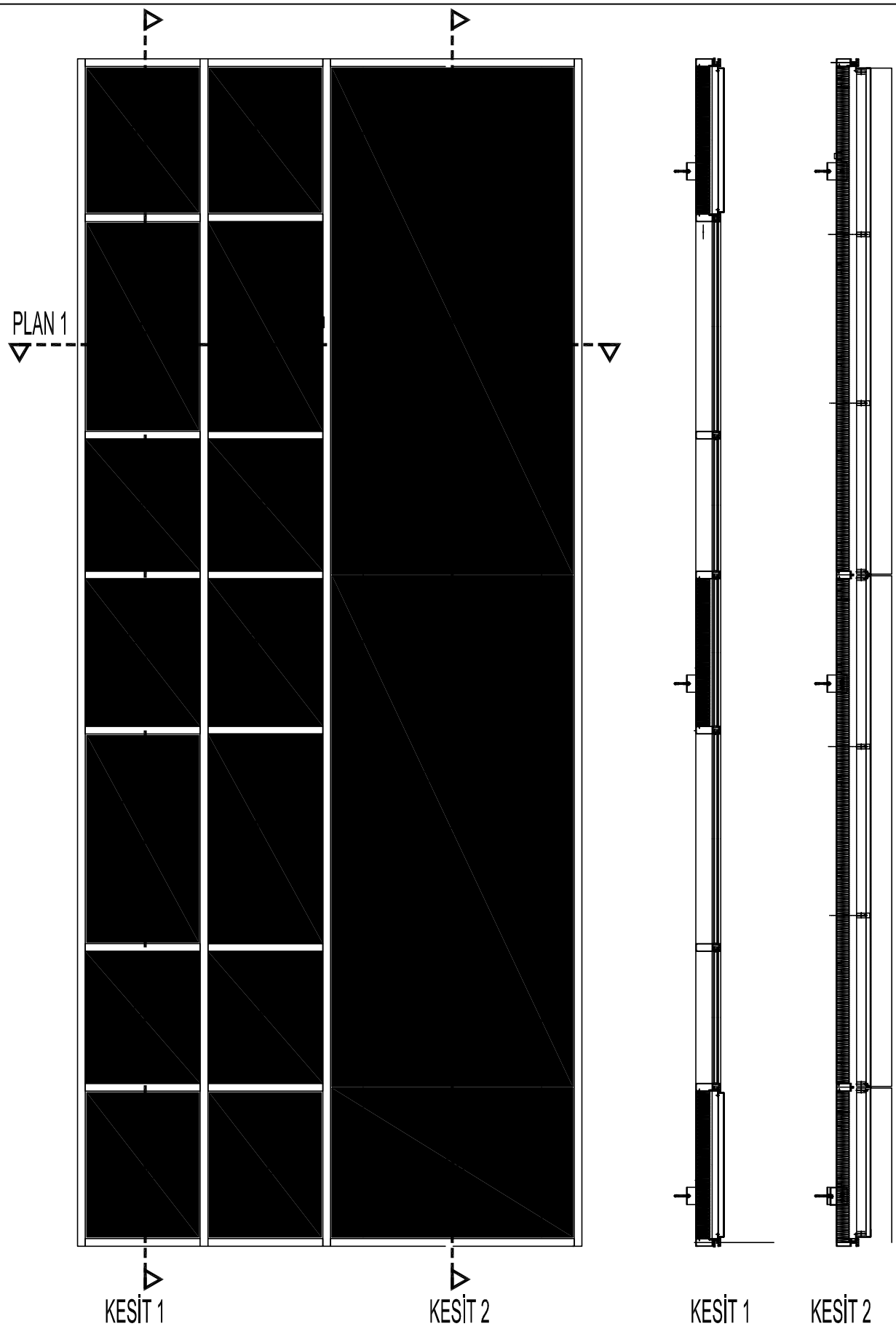
Safety load increased to 1,5 times the design load were applied to the sample.

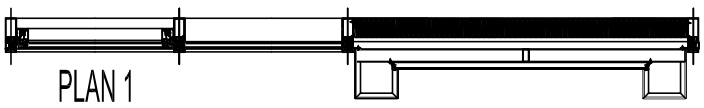
Test Pressure	Applied		Observations
	Positive	Negative	
PE = ± 3600 Pa	+ 3600 Pa	- 3600 Pa	No damage was observed on the sample

Test No : 2014.307.11 / *24.04.2014*

8. RESULTS

	CONDITIONS	RESULTS		CLASSIFICATION
AIR PERMEABILITY EN 12152	at 600 Pa ϕ < 1,5 m³/h,m² at 600 Pa ϕ < 0,5 m³/h,m	Positive Pressure	1,23 0,39	**A 4**
	at 600 Pa ϕ < 1,5 m³/h,m² at 600 Pa ϕ < 0,5 m³/h,m	Negative Pressure	1,07 0,34	**A 4**
WATER-TIGHTNESS (Static Pressure) EN 12154	There should be no water leakage at 600 Pa	No water leakage was observed during the test.		**R7**
RESISTANCE TO WIND LOAD EN 13116	Deflection < 15 mm at +2400 Pa and -2400 Pa	(max. + 4,65 mm) (max. - 5,74 mm)		**OK**
Cycle Test	There should be no damage during 50 cycles at ± 1200 Pa	No damage was observed		**OK**
WATER-TIGHTNESS (Static Pressure) EN 12154 (Repeat)	There should be no water leakage at 600 Pa	No water leakage was observed during the test.		**R7**
RESISTANCE TO SAFETY LOAD EN 13116	There should be no damage at + 3600 Pa and - 3600 Pa	No damage was observed at +3600 Pa and -3600 Pa		**OK**





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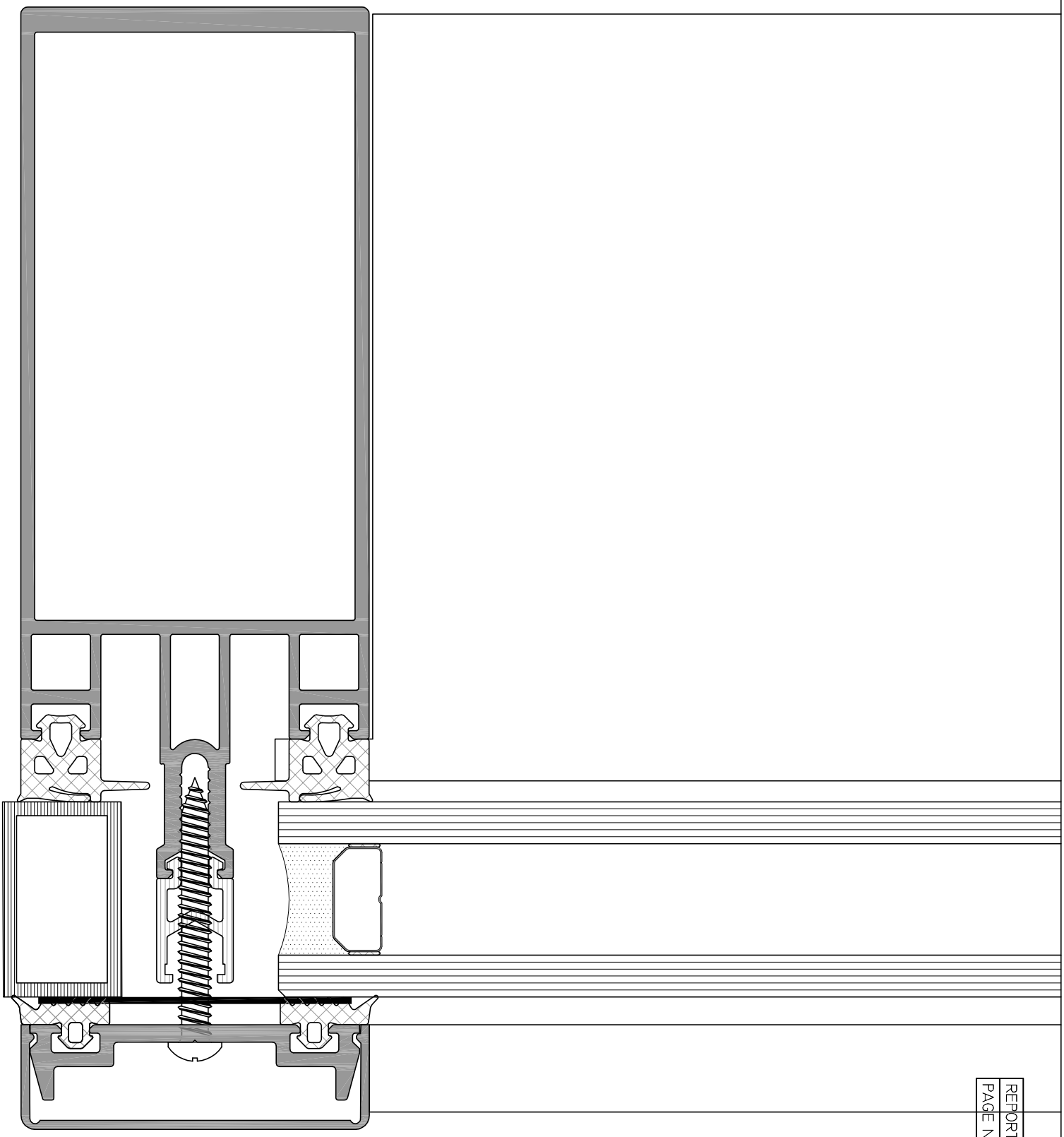
ACCREDITATION NO:	AB-0531-T				
REPORT NO:	010.217.1/2014	PROJECT CODE:	2014.307	DATE:	05.05.2014
PREPARED BY:	S.ÇOLAK	CLIENT:	SARAY DOKUM VE MADENI AKSAM SAN.TUR.A.S.	REV.NO:	A
CONTROL BY:	O.USTA	EXPLANATION:	AIR INFILTRATION, WATERTIGHTNESS AND WIND RESISTANCE TEST		

REPORT NO:	
PAGE NO:	12/23



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CONTROL BY:	O.USTA	EXPLANATION:	AIR INFILTRATION,WATERTIGHTNESS AND WIND LOAD TEST		

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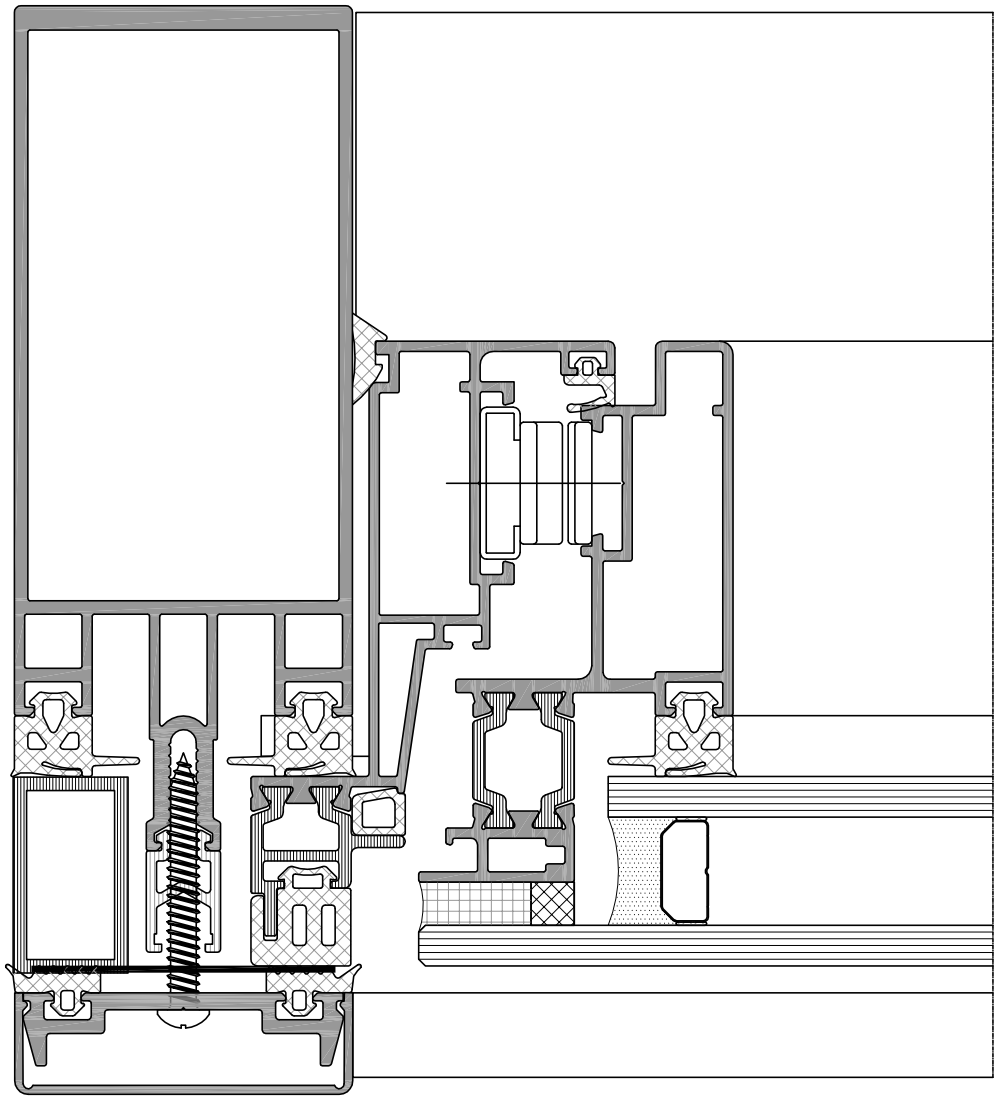

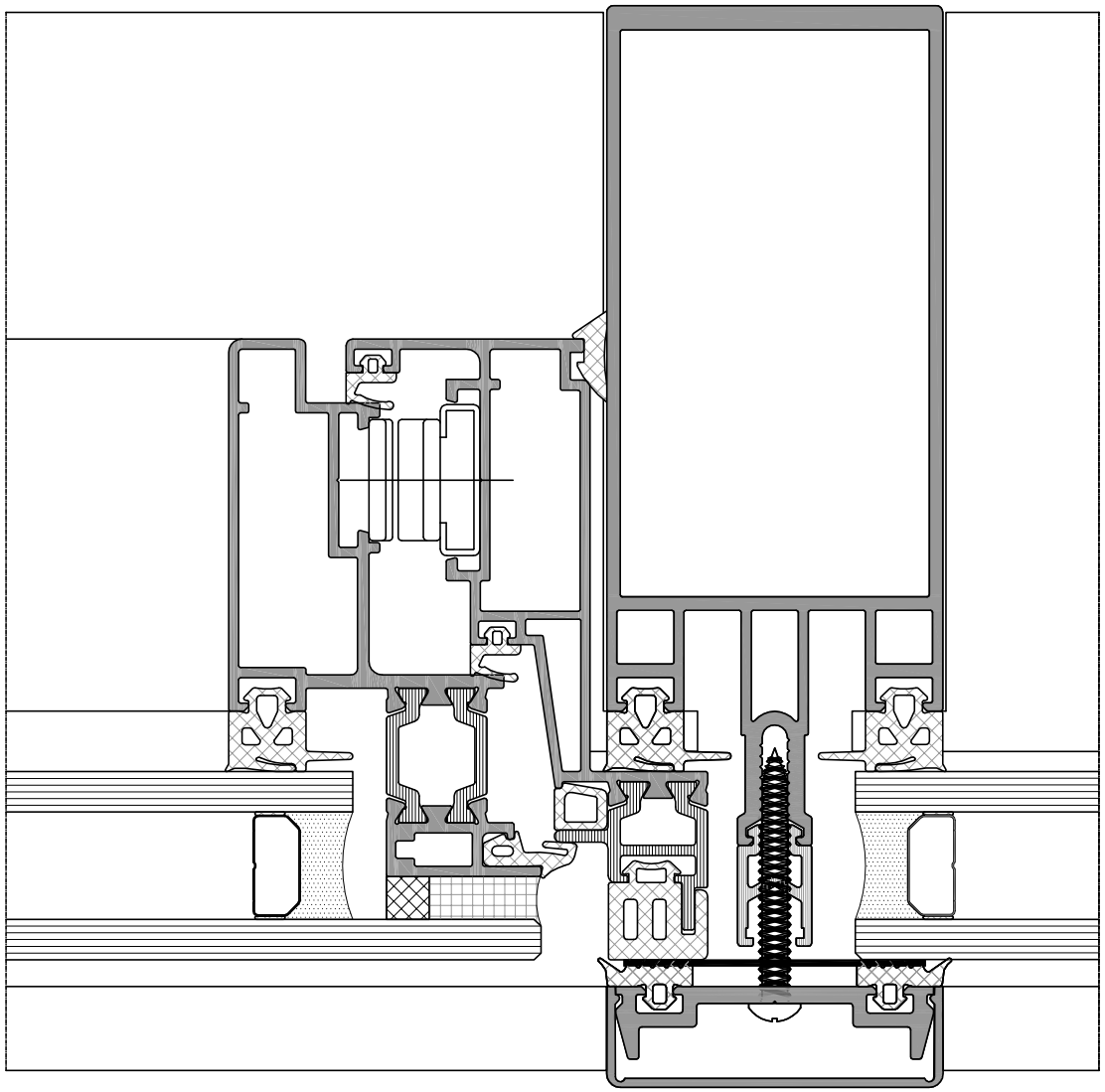

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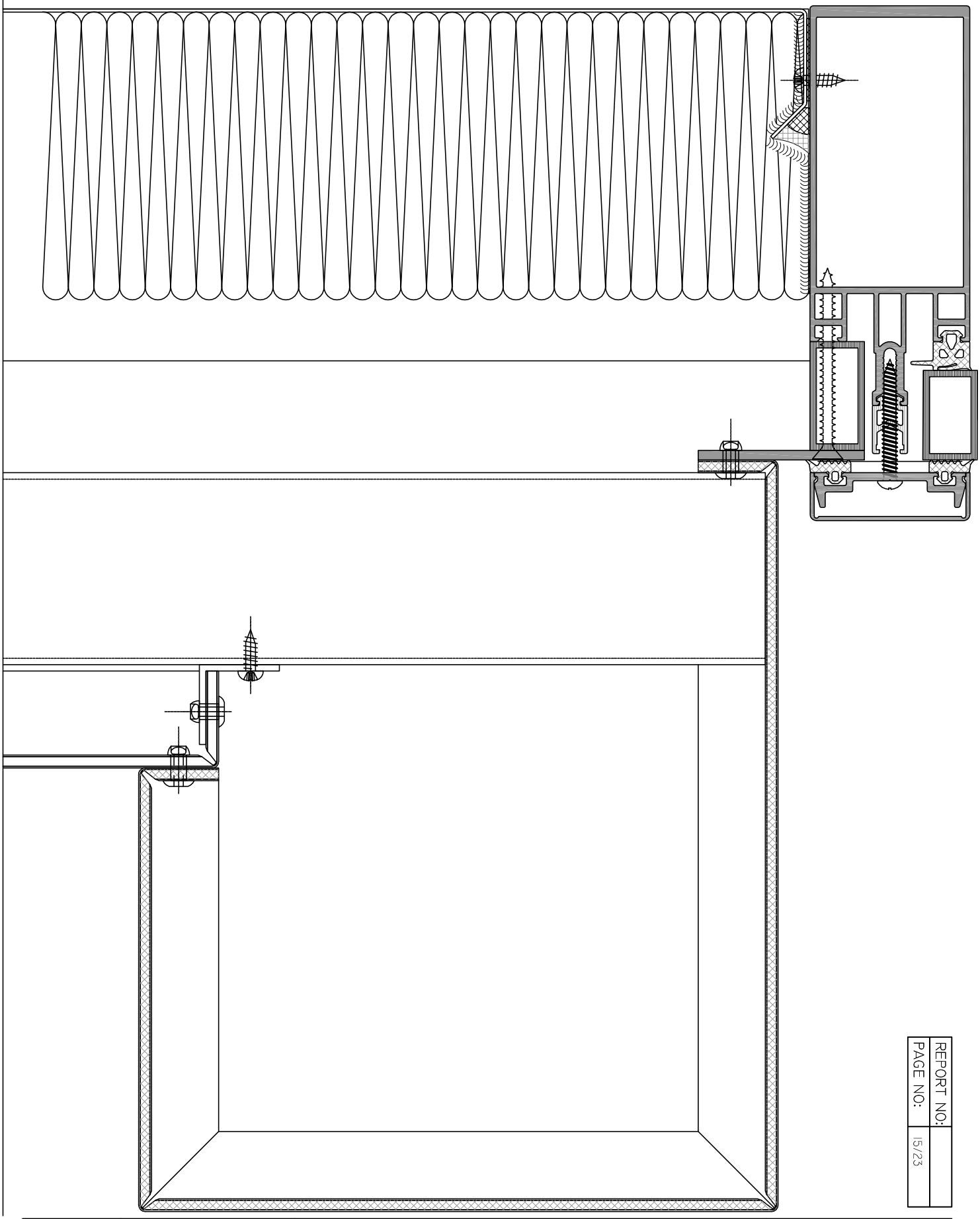
CONTROL BY	O.USTA	EXPLANATION	AIR INFILTRATION,WATERTIGHTNESS AND WIND LOAD TEST		



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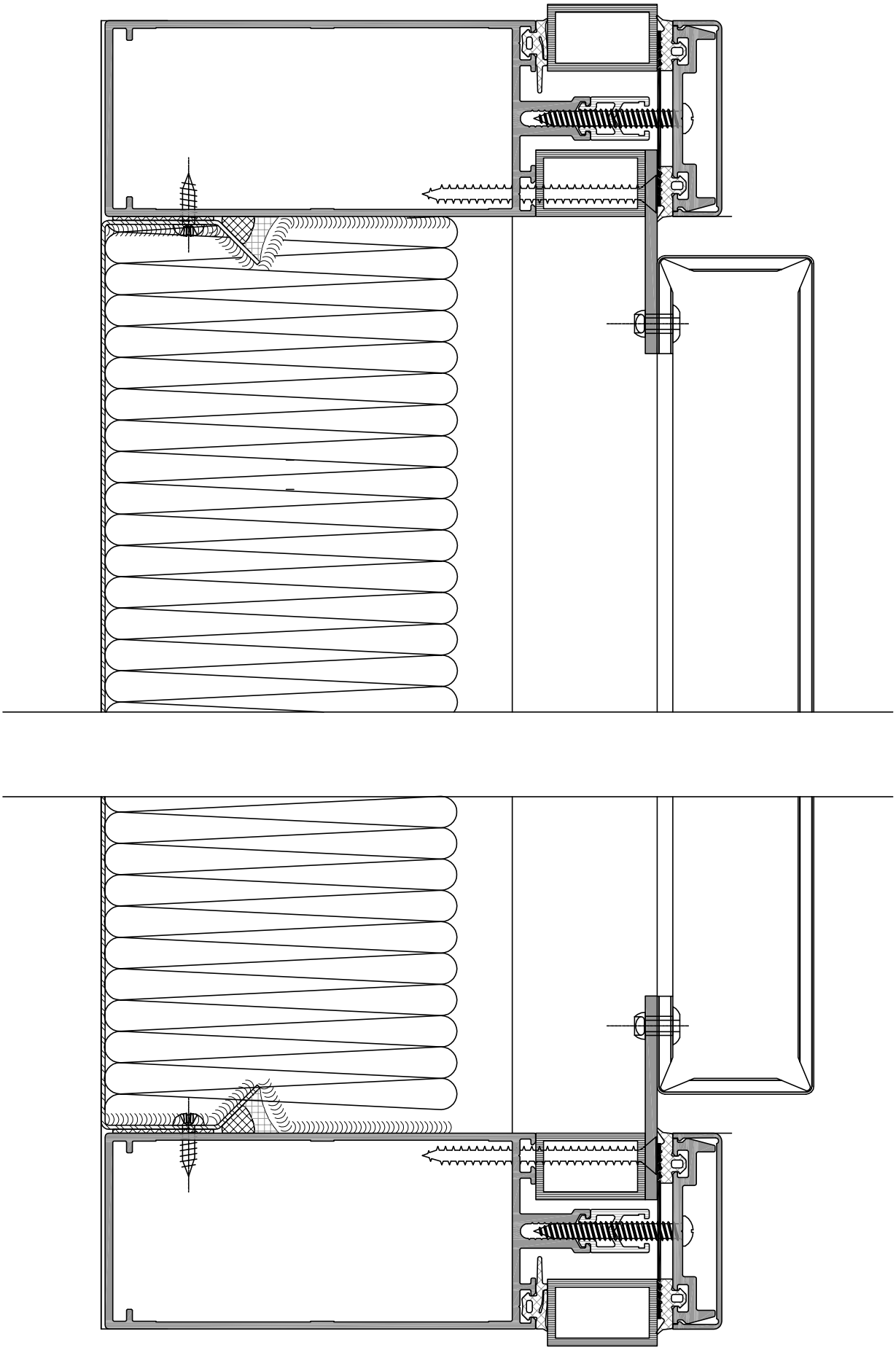
PREPARED BY:	S.ÇOLAK	CLIENT:	SARAY DOKUM VE MADENI AKSAM SAN.TUR.A.S.	REV.NO:	A
CONTROL BY:	O.USTA	EXPLANATION:	AIR INFILTRATION,WATERTIGHTNESS AND WIND LOAD TEST		



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REPORT NO:	010.217.1/2014	PROJECT CODE:	2014.307	DATE:	05.05.2014
PREPARED BY:	S.ÇOLAK	CLIENT:	SARAY DOKUM VE MADENI AKSAM SAN.TUR.A.S.	REV.NO:	A
CONTROL BY:	O.USTA	EXPLANATION:	AIR INFILTRATION,WATERTIGHTNESS AND WIND LOAD TEST		

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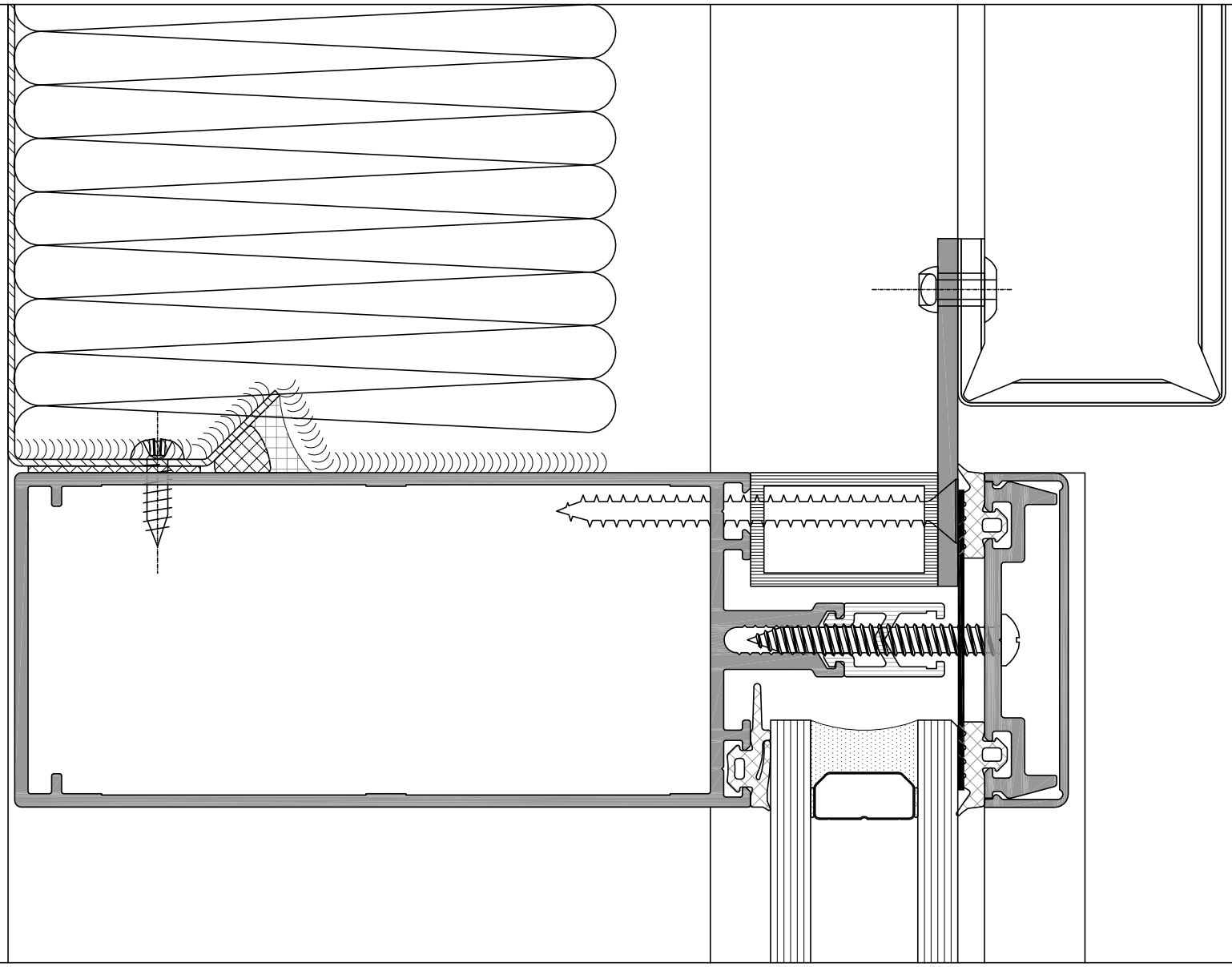

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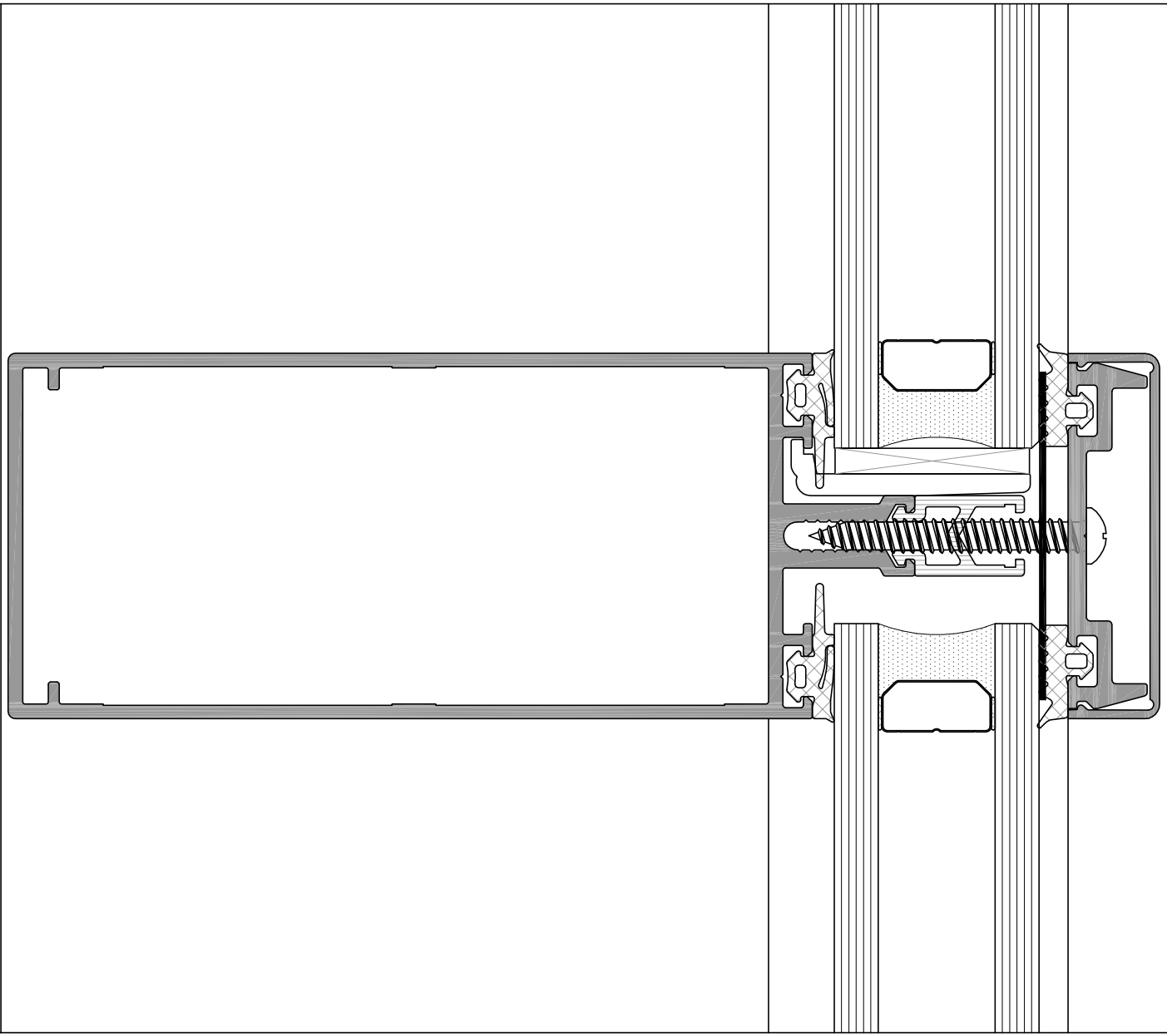
REPORT NO	010.217.1/2014	SAMPLE NO	2014.307	DATE	05.05.2014
PREPARED BY	S.ÇOLAK	CLIENT	SARAY DOKUM VE MADENI AKSAM SAN.TUR.A.S.	REV.NO	A
CONTROL BY	O.USTA	EXPLANATION	AIR INFILTRATION,WATERTIGHTNESS AND WIND LOAD TEST		



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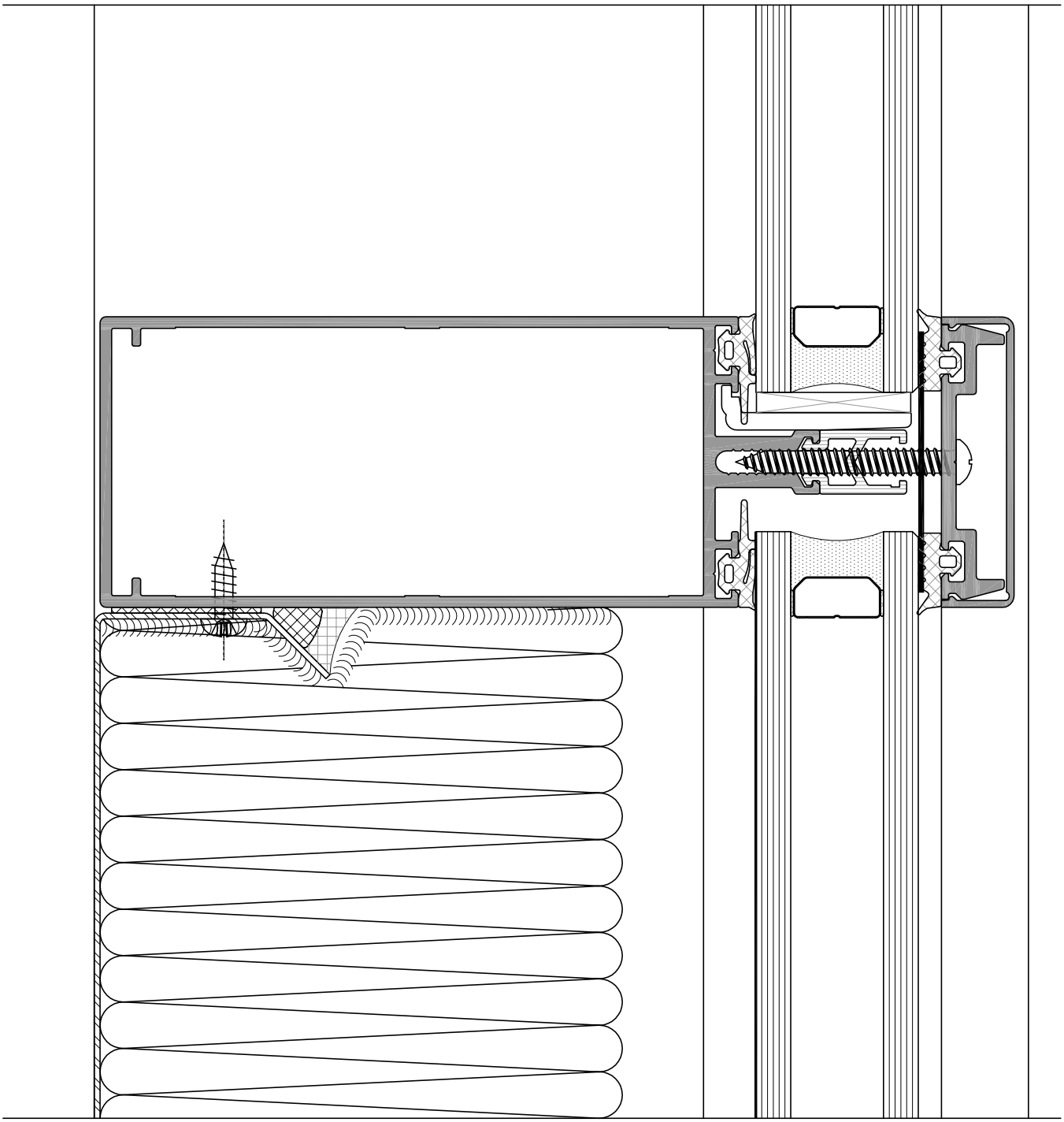
REPORT NO	010.217.1/2014	SAMPLE NO	2014.307	DATE	05.05.2014
PREPARED BY	S.ÇOLAK	CLIENT	SARAY DOKUM VE MADENI AKSAM SAN.TUR.A.S.	REV.NO	A
CONTROL BY	O.USTA	EXPLANATION	AIR INFILTRATION,WATERTIGHTNESS AND WIND LOAD TEST		



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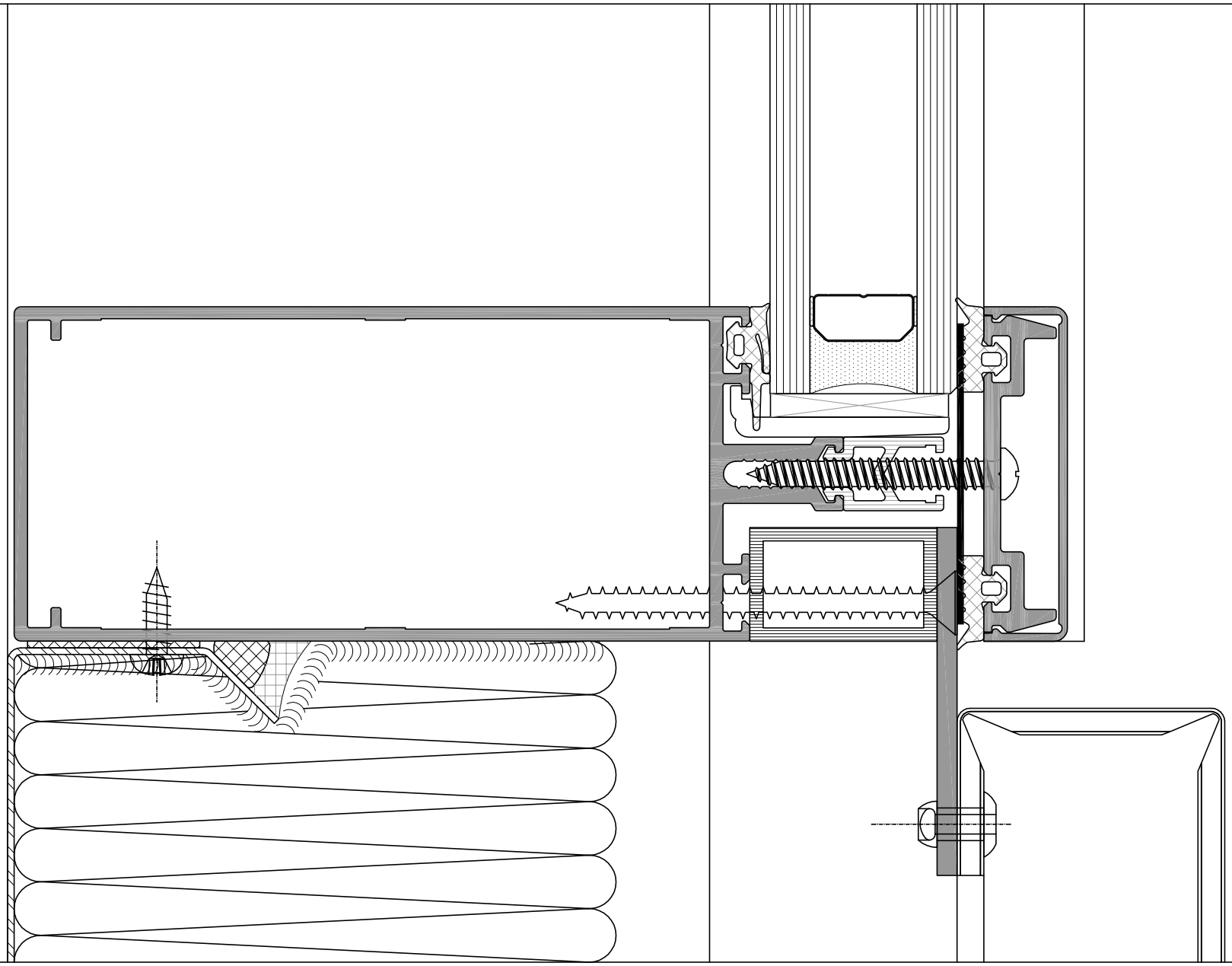
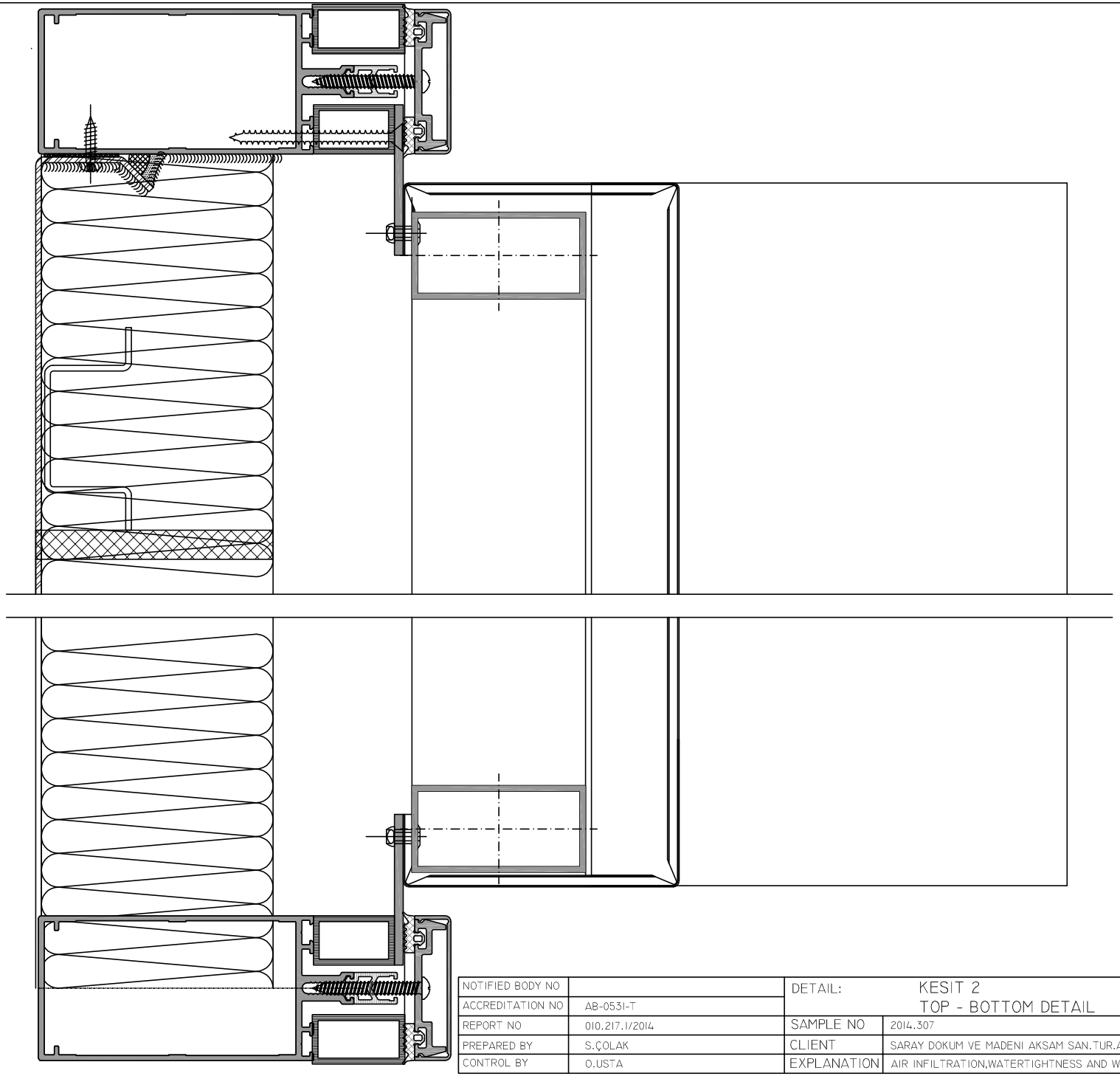
REPORT NO:	010.217.1/2014	PROJECT CODE:	2014.307	DATE:	05.05.2014
PREPARED BY:	S.ÇOLAK	CLIENT:	SARAY DOKUM VE MADENI AKSAM SAN.TUR.A.S.	REV.NO:	A
CONTROL BY:	O.USTA	EXPLANATION:	AIR INFILTRATION,WATERTIGHTNESS AND WIND LOAD TEST		

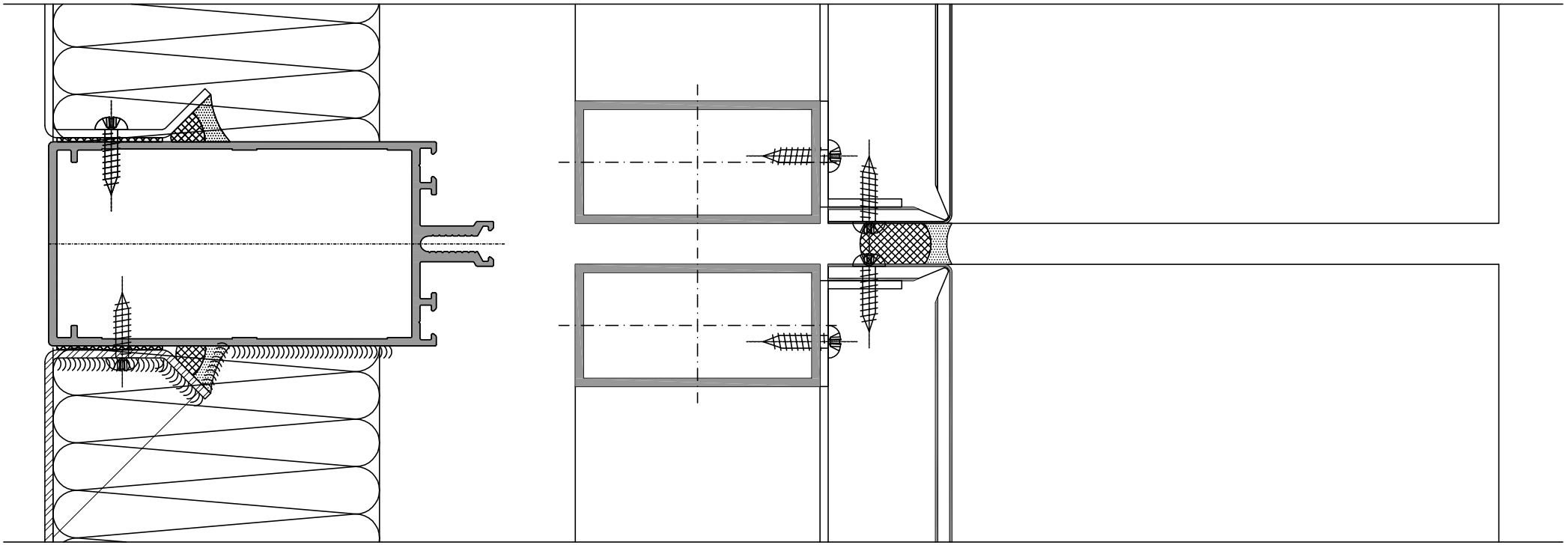
FTI



NOTIFIED BODY NO		DETAIL:	KESIT I BETWEEN VISION AND COMPOSITE PARTS		
ACCREDITATION NO	AB-0531-T				
REPORT NO	010.217.1/2014	SAMPLE NO	2014.307	DATE	05.05.2014
PREPARED BY	S.ÇOLAK	CLIENT	SARAY DOKUM VE MADENI AKSAM SAN.TUR.A.S.	REV.NO	A
CONTROL BY	O.USTA	EXPLANATION	AIR INFILTRATION,WATERTIGHTNESS AND WIND LOAD TEST		



NOTIFIED BODY NO		DETAIL:	KESIT 2 TOP - BOTTOM DETAIL		
ACCREDITATION NO	AB-0531-T				
REPORT NO	010.217.1/2014	SAMPLE NO	2014.307	DATE	05.05.2014
PREPARED BY	S.ÇOLAK	CLIENT	SARAY DOKUM VE MADENI AKSAM SAN.TUR.A.S.	REV.NO	A
CONTROL BY	O.USTA	EXPLANATION	AIR INFILTRATION,WATERTIGHTNESS AND WIND LOAD TEST		



NOTIFIED BODY NO		DETAIL:	KESIT 2 MIDDLE DETAIL		
ACCREDITATION NO	AB-0531-T				
REPORT NO	010.217.1/2014	SAMPLE NO	2014.307	DATE	05.05.2014
PREPARED BY	S.ÇOLAK	CLIENT	SARAY DOKUM VE MADENI AKSAM SAN.TUR.A.S.	REV.NO	A
CONTROL BY	O.USTA	EXPLANATION	AIR INFILTRATION,WATERTIGHTNESS AND WIND LOAD TEST