www.poly-pac .co.uk Polycarbonate Architecture

Technical book

Poly-Pac

arcoPlus® Interlocking

Glazing systems

344X
549

arcoPlus® dott.gallina

Introduction

This technical book has been developed by our Research & Development department, relying on both the CSTB Technical certification N° 2/14-1610 and our internal technical expertise.

Our Research & Development department deals with two main responsibilities:

- To develop new innovative systems;
- To bring its expertise to attend our customers and our technical and sales team in dealing with current complex projects.

Our R&D department has played a major role in providing the market with innovative polycarbonate systems solutions for over 10 years. For instance, its expertise led to such unprecedented polycarbonate applications as:

- 16 meters high ovoid towers in one single length (So Green shopping mall, Seclin, France)
- First CSTB certified solution in France for ventilated polycarbonate cladding application (CSTB Technical Certification N°2/13-1551)
- First ever implemented solution in France for 30 meters long stadium roofing (2x15 meters) with a slope lower than 5° (MMA ARENA Stadium in Le Mans, France)

Our R&D team works in close connection with the various technical departments in CSTB, LNE and GINGER in order to finalise new systems and specific solutions to complex projects falling out from the Technical Certification perimeter.

Our research department know-how has been recognised by the French Ministry of Industry through Poly-Pac recent certification for CIR (Tax Credit for Innovation).

Contents

1 – System definition

ArcoPlus® Interlocking systems are used to create lighting glazing for applications such as cladding or roof "saw tooth". They are made of cellular polycarbonate panels, anti - UV co-extruded on one side.
ArcoPlus® Interlocking systems are assembled vertically by interlocking of longitudinal ribs.
ArcoPlus® Interlocking panels can be used without any restriction of width or height.

2 – Field of application for the system

ArcoPlus® Interlocking systems are suitable for cladding and glazing purposes on buildings of all categories while respecting:

- Regulations in force on a general level
- Implementation condition of uses such as defined in the CSTB Technical Certification 2/09-1352.

ArcoPlus® Interlocking systems can be put in work at an altitude lower than 900 m.
ArcoPlus® Interlocking systems can be used for any building type (industrial, air-conditioned offices, schools, hospitals, sport centres, housing, swimming pool, etc …), would they be heated or not, however not refrigerated.
ArcoPlus® Interlocking systems can be installed with a maximum slope of 15°, including for "saw tooth" application.
They can also be installed in any humidity level (high or low) environments (i.e.: swimming pools).
ArcoPlus® Interlocking systems do not contribute to the functions of loads transmission, bracing and shock resistance for security purpose (railing function). Those functions are dealt with by the supporting structure.
Any application falling out from those criteria can be submitted to our technical department to be assessed within a specific analysis.

3 – Technical Assistance

Technical assistance and distribution over France and UK are provided by Poly-Pac, ZA La Porte de Ker Lann, Bruz (France).

Poly-Pac analyse the solution best suited to the project and develop a detailed list of panels, profiles and accessories required for the installation.

Even though Poly-Pac does not install, the company can attend the beginning of the implementation and provide advices at customer request.

4 – Panels specifications

	344 X	549	547	547A+
Width	333±3	500±3	500±3	500±3
Thickness (mm)	40±0.3	40±0.3	40±0.3	40±0.3
AR	X	√	√	√
IR	X	√	√	√
Bic-coloured	X	√	√	√
UV Tech	√	√	√	√

AR: Anti-glare treatment (visual comfort, prevent from neon effect)
IR: Infrared treatment (prevent from heat increase within the building)
UV Tech: Reinforced UV Protection – 15 years warranty.

Panels are available in various colours. Please refer to our Caleido range.
Due to extrusion process constraints, a visual difference in colour shade is admitted as long as it does not interfere with the mechanical characteristics of the polycarbonate components.
Some treatments like AR (anti-glare) and IR (infrared) can create some shade variations with colour range.

5 – Thermal expansion

While installing the panels, it is essential to check on the polycarbonate panels covering section (R in mm –Drawing on page 11) of the aluminium profile according to the following chart:

Installation T° C	Panel length in meter					
	1	3	5	7	8	10
0°c	20 mm	23 mm	25 mm	27 mm	29 mm	30 mm
15°c	22 mm	26 mm	31 mm	35 mm	39 mm	41 mm
30°c	23 mm	30 mm	36 mm	42 mm	48 mm	53 mm

The linear expansion coefficient is 0,065mm/ml/°C.
Panels are freely expanding within the connectors and the top lateral profiles. Expansion works towards the top.

6 – Thermal specifications

Panels	Uc (W/m². K)	ψi (W/m.K)	χk (W/k)
344 X	1.64	-	0.005
549	1.00	-	0.005
547	1.00	-	0.005
547A+	1.00	-	0.005

CSTB test report: DER/HTO 2009-177-FL/LS
CSTB test report: DIR/HTO 2013-244-RB/LS
ICITE report: N° 960523/16
Uc: Thermal coefficient in the core part of the panel (in between connectors)
ψi et χk: Thermal coefficient alongside the connectors

7 – Shock resistance

Panel	External shocks	Internal shocks
344 X	Q4	O3
549	Q4	O3
547	Q4	O3
547A+	Q4	O3

8 –Interior/ Exterior Sound absorption

Panels	Interior	Exterior	Rw (C, Ctr)
344 X	18 dB(A)	16 dB(A)	19 (-1,-4) dB
549	20 dB(A)	20 dB(A)	21 (-1,-1) dB
547	21 dB(A)	21 dB(A)	21 (0,0) dB

Report CFI d'Andrésy n° ACOU/09/03
Report EUROFINS n° 1.12.AVM.0160/44313
Report EUROFINS n° M1.13.AVM.0482/51984

9 – Optical characteristics

Panels	Colour	Light Transmission (TL) en %	Solar factor (SF) en %
344 X	Cristal	70	72
	Opale	49	60
549	Cristal	50	56
	Opale	28	46
547	Cristal	54	58
	Opale	31	46
547A+	Cristal	54	58
	Opale	31	46

10 – Fire resistance

Panel	Fire classification	Combustible mass (MJ/m²)
344 X	B, s1-d0	103
549	B, s1-d0	103
547	B, s1-d0	119
547A+	B, s1-d0	125

11 – Resistance to chemical agents

ArcoPlus® Interlocking panels have good resistance to most chemicals with which it is likely to come into contact during normal use.

Chemical agents	Resistance
Diluted acids	Good
Concentrated acids	Average to good
Alkali	Low to average
Organic solvents – alcohol	Good
Chlorinated hydrocarbons	Low
Aromatic hydrocarbons	Low
Aliphatic polycarbons	Low
Lubricating oils	Good
Detergents	Good

Preliminary tests are recommended in case of intense or specific exposure. Use of solvent must be avoided.

12 – Stockage

ArcoPlus® systems should be stored avoiding exposure to direct sunlight and rain. Should storage be outside, it should not be directly in contact with the ground (a ventilation space must be kept) and should be protected with a light-coloured non-transparent tarpaulin.
To avoid oxidation, untreated aluminium profiles should be unpacked straight away after unloading to avoid any contact with potential residual humidity within the package and stored in a dry environment. In any case, untreated aluminium profiles should not be kept in contact of each others in a humid environment.
Do not store more than two pallets on top of each other.

In case of heavy wind, use straps.

13 – Maintenance

ArcoPlus® panels should be frequently cleaned with mild soapy water (neutral detergent) and thoroughly rinsed with clear water. Do not use warm water.

Do not use organic solvents, abrasive or alkaline products.

14 – How to replace a damaged panel?

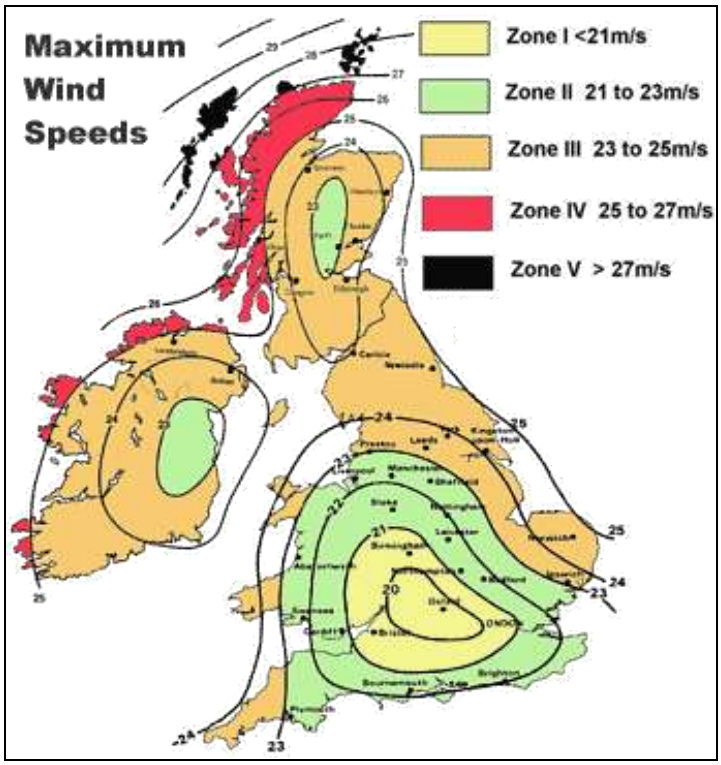
1. Remove the 1169 gasket on top and low part of the cladding
2. Raise the three panels downstream and upstream of the damaged panel and the latter.
3. Pull out the panels set from the low profile.
4. The panel to be replaced is pull out in low part of the set (by pressure of the interior towards outside) and is pull out of the top AL profile by sliping downwards
5. The new panel and the 7 panels set are replaced following the opposite process.

15 - Simplified field of application for the system according to AWW (air, water, wind) and maximum load chart for 344 X

15.1 - Simplified field of application for the system according to AWW

Height building (m)	Zone I		Zone II		Zone III		Zone IV	
	Normal	Exposed	Normal	Exposed	Normal	Exposed	Normal	Exposed
10	√	√	√	√	√	X	√	X
20	√	√	√	X	√	X	X	X
30	√	√	√	X	X	X	X	X
40	√	X	√	X	X	X	X	X
50	√	X	X	X	X	X	X	X

On the basis of air and water infiltration resistance performances under normal pressure of 1200Pa



15.2 – Maximum load on 2 supports for 344 X

Maximum distance between supports	Maximum load N/m²	
1400	Positive pressure	1510
	Negative pressure	1230
1600	Positive pressure	1030
	Negative pressure	930
1800	Positive pressure	720
	Negative pressure	660
2000	Positive pressure	500
	Negative pressure	465

15.3 – Maximum load on 3 supports for 344X

Maximum distance between supports	Maximum load N/m²	
1400	Positive pressure	2210
	Negative pressure	1090
1600	Positive pressure	1650
	Negative pressure	980
1800	Positive pressure	1220
	Negative pressure	850
2000	Positive pressure	940
	Negative pressure	760
2200	Positive pressure	755
	Negative pressure	535

Span is determined according to the minimum between the following criteria of deflection and failure :

- 1/50th deflection of the span or 50 mm max of deflection
- Breakage of the system with a safety factor of 3

16 - Simplified field of application for the system according to AWW (air, water, wind) and maximum load chart for 547A+ - 549

16.1 - Simplified field of application for the system according to AWW

Height building (m)	Zone I		Zone II		Zone III		Zone IV	
	Normal	Exposed	Normal	Exposed	Normal	Exposed	Normal	Exposed
10	√	√	√	√	√	√	√	√
20	√	√	√	√	√	√	√	√
30	√	√	√	√	√	√	√	X
40	√	√	√	√	√	√	√	X
50	√	√	√	√	√	X	X	X

On the basis of air and water infiltration resistance performances under normal pressure of 2400 Pa

16.2 – Maximum load on 2 supports for 547A+

Maximum distance between supports	Maximum load N/m²	
1600	Positive Pressure	1175
	Negative pressure	1134
1800	Positive Pressure	934
	Negative pressure	785
2000	Positive Pressure	782
	Negative pressure	678

16.3 - Maximum load on 3 supports for 547A+

Maximum distance between supports	Maximum load N/m²	
1400	Positive Pressure	1800
	Negative pressure	1159
1800	Positive Pressure	1465
	Negative pressure	882
2000	Positive Pressure	1235
	Negative pressure	820
2400	Positive Pressure	868
	Negative pressure	642

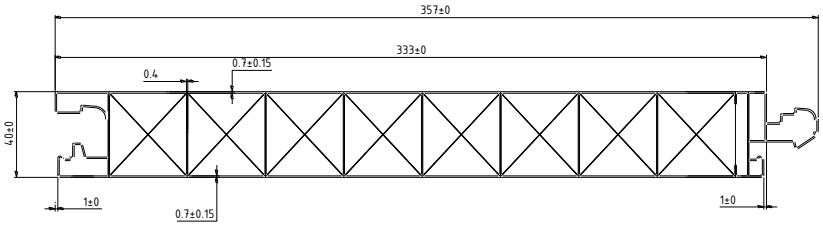
16.4 – Maximum load on 2 supports for 549

Maximum distance between supports	Maximum load N/m²	
1400	Positive Pressure	1310
	Negative pressure	1241
1600	Positive Pressure	995
	Negative pressure	937
1800	Positive Pressure	805
	Negative pressure	754
2000	Positive Pressure	635
	Negative pressure	606
2200	Positive Pressure	558
	Negative pressure	392

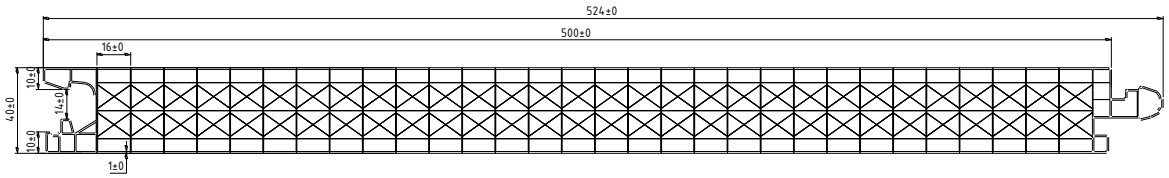
16.5 - Maximum load on 3 supports for 549

Maximum distance between supports	Maximum load N/m²	
1400	Positive Pressure	2425
	Negative pressure	1143
1600	Positive Pressure	1905
	Negative pressure	947
1800	Positive Pressure	1282
	Negative pressure	882
2000	Positive Pressure	1182
	Negative pressure	752
2200	Positive Pressure	1017
	Negative pressure	719
2400	Positive Pressure	826
	Negative pressure	653

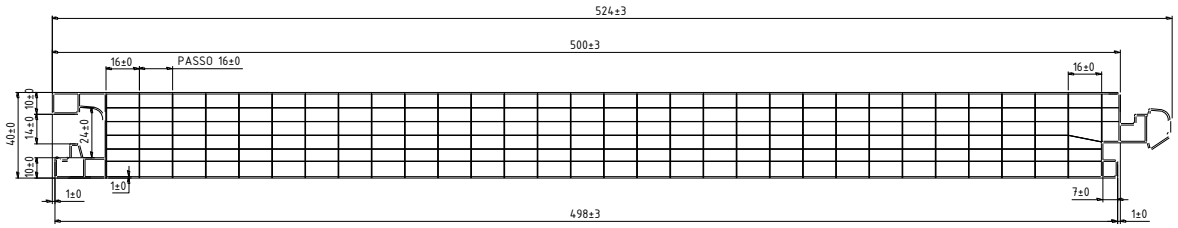
arcoPlus Interlocking panels 344X – 549 – 547A+



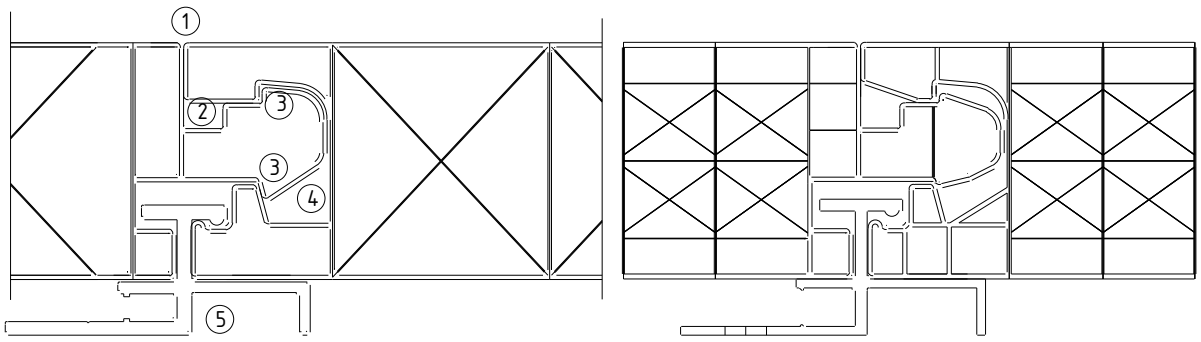
ArcoPlus 344X panel



ArcoPlus 549 panel



arcoPlus 547 / 547A+ panel



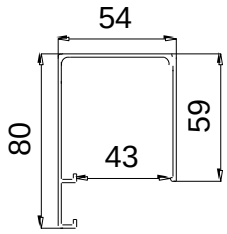
344 X - 547 - 547A+ - 549 ARCOPLUS
Interlocking description

1 Bringing External UV protected faces into line
2 Low pressure channel
3 Adjacent panel assembly
4 Important drainage channel
5 Fixing halter maintaining the 2 interlocking faces

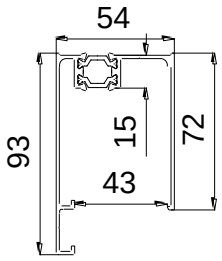
Aluminium profiles and Accessories

Lateral and top profiles

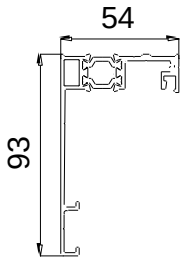
Ref. 4045



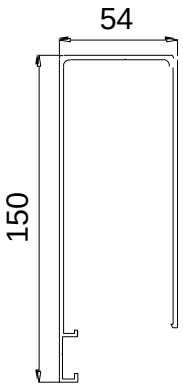
Ref. 4045 TH/4585



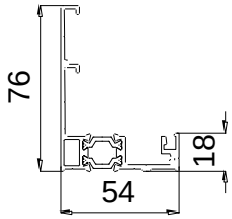
Top profile
Ref. 4598



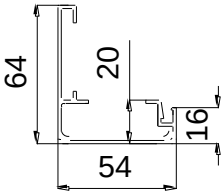
Top profile
Ref. 4136



Lateral, top and low profile
Ref. 4597

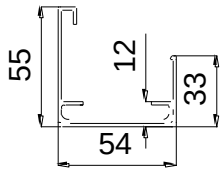


Lateral and low profile
Ref. 4140

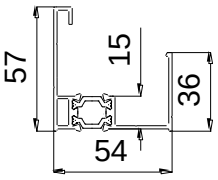


Low profiles

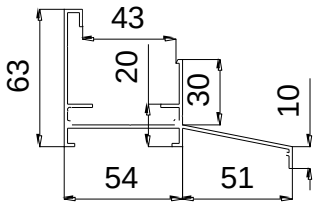
Ref. 4047



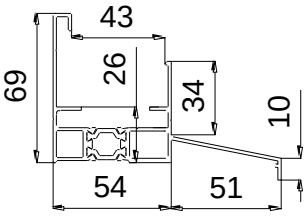
Ref. 4047 TH/4587



Ref. 4046

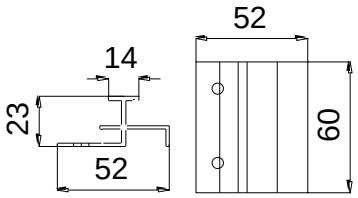


Ref. 4046 TH

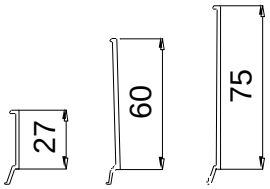


Gasket
Ref. 1169

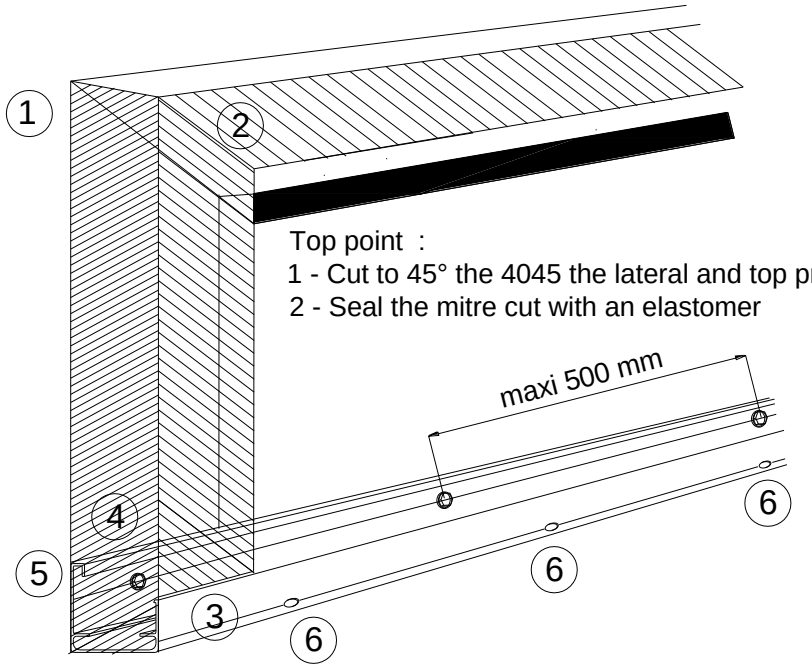
Fixing halter
Ref. 4050



Al clips for profiles
Ref. P 30 P 60 (4742) P 75 (4743)



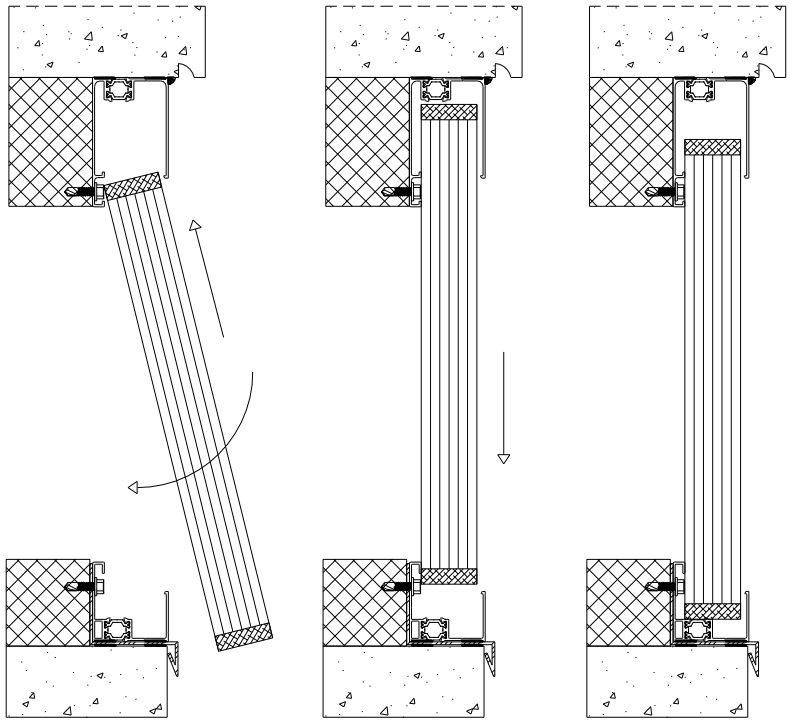
Implementation: Recovering of panels



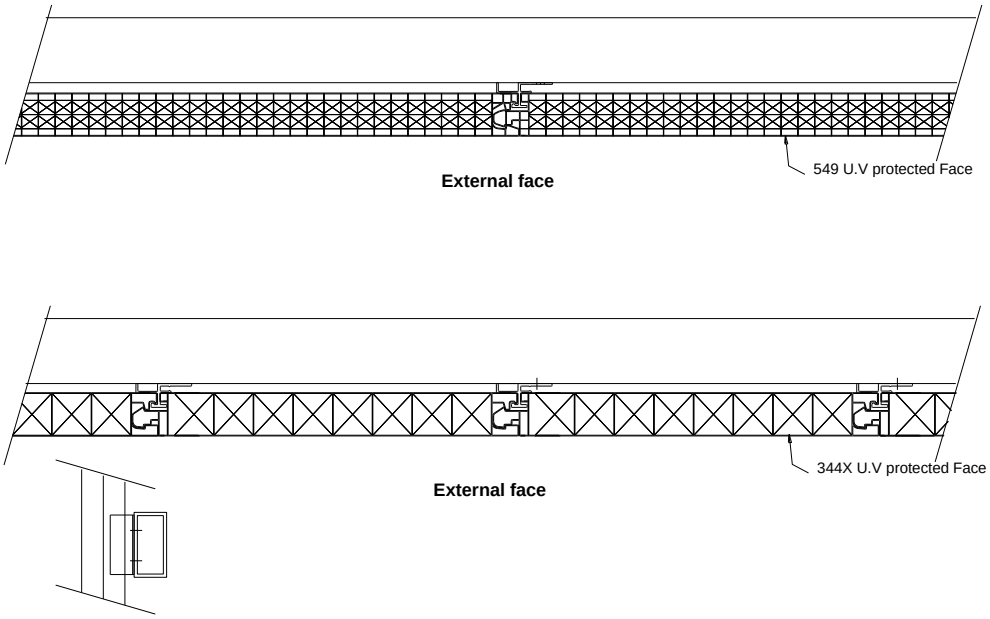
Top point :
1 - Cut to 45° the 4045 the lateral and top profiles
2 - Seal the mitre cut with an elastomer

Low point :
3 - Shape the lateral profile front border as much as the length of the low profile front face
4 - Shape the back border following the same principle
5 - Seal the profiles mitre cuts and junctions with an elastomer mastic
6 - Check the drainage of the low profiles (below or on facade every 333 mm diam 8)

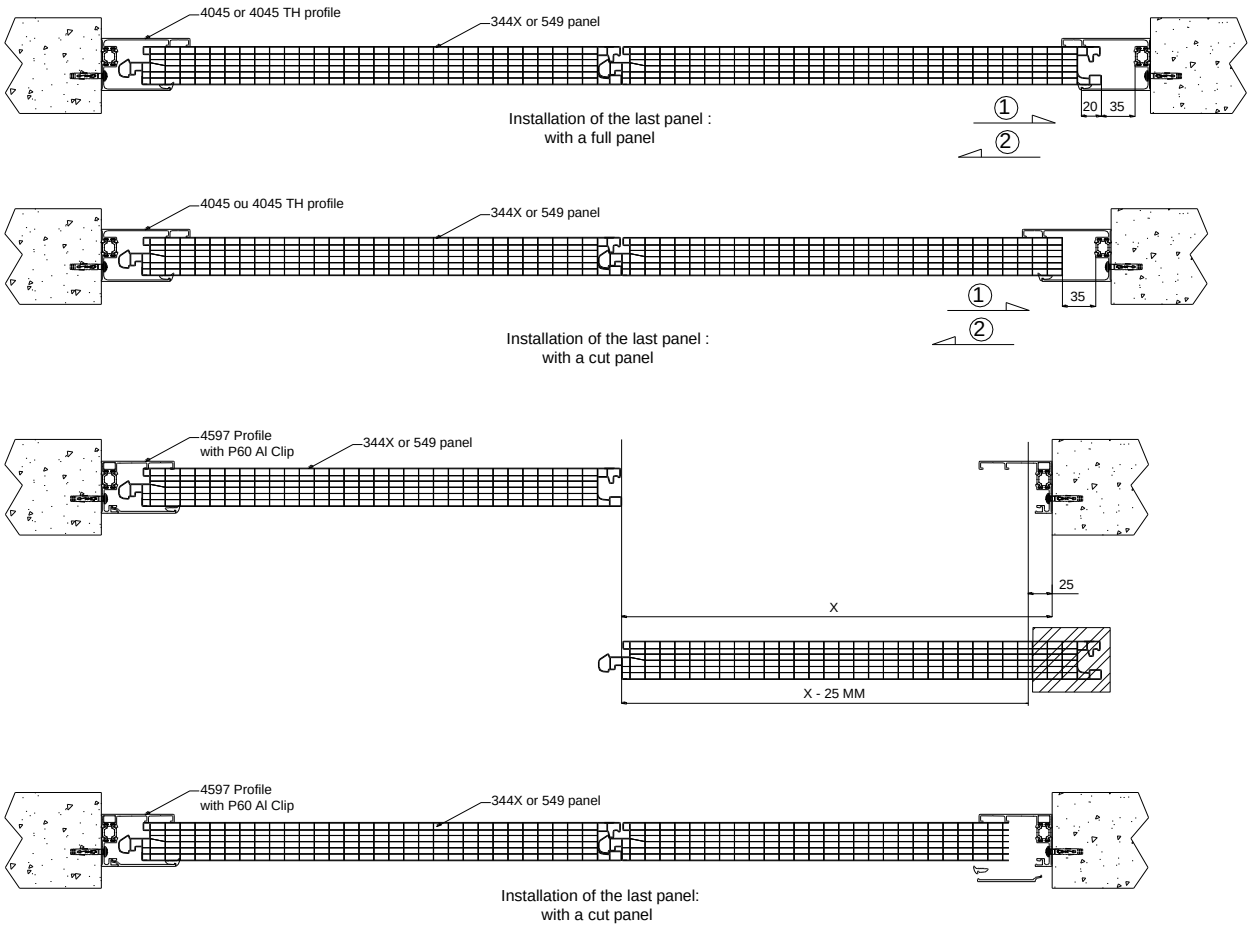
Implementation: Fitting of the panels



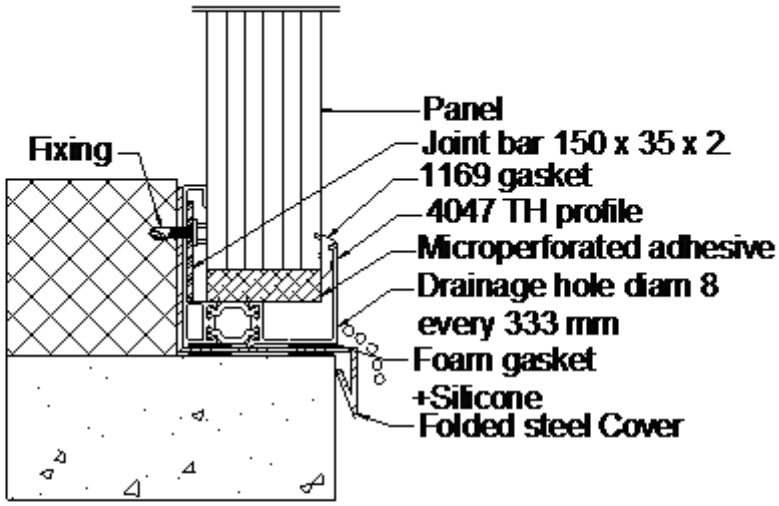
Implementation of the halter ref. 4050

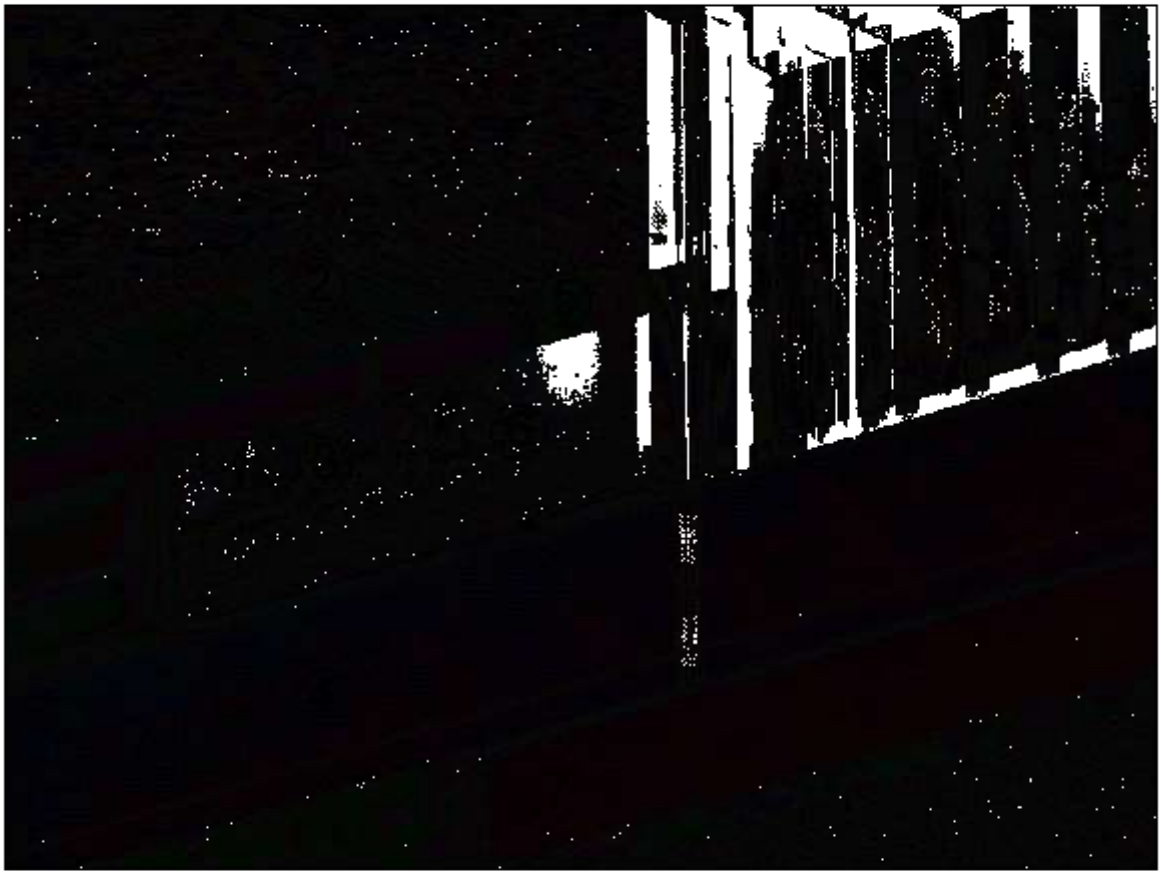


Implementation: Fitting of the last panel



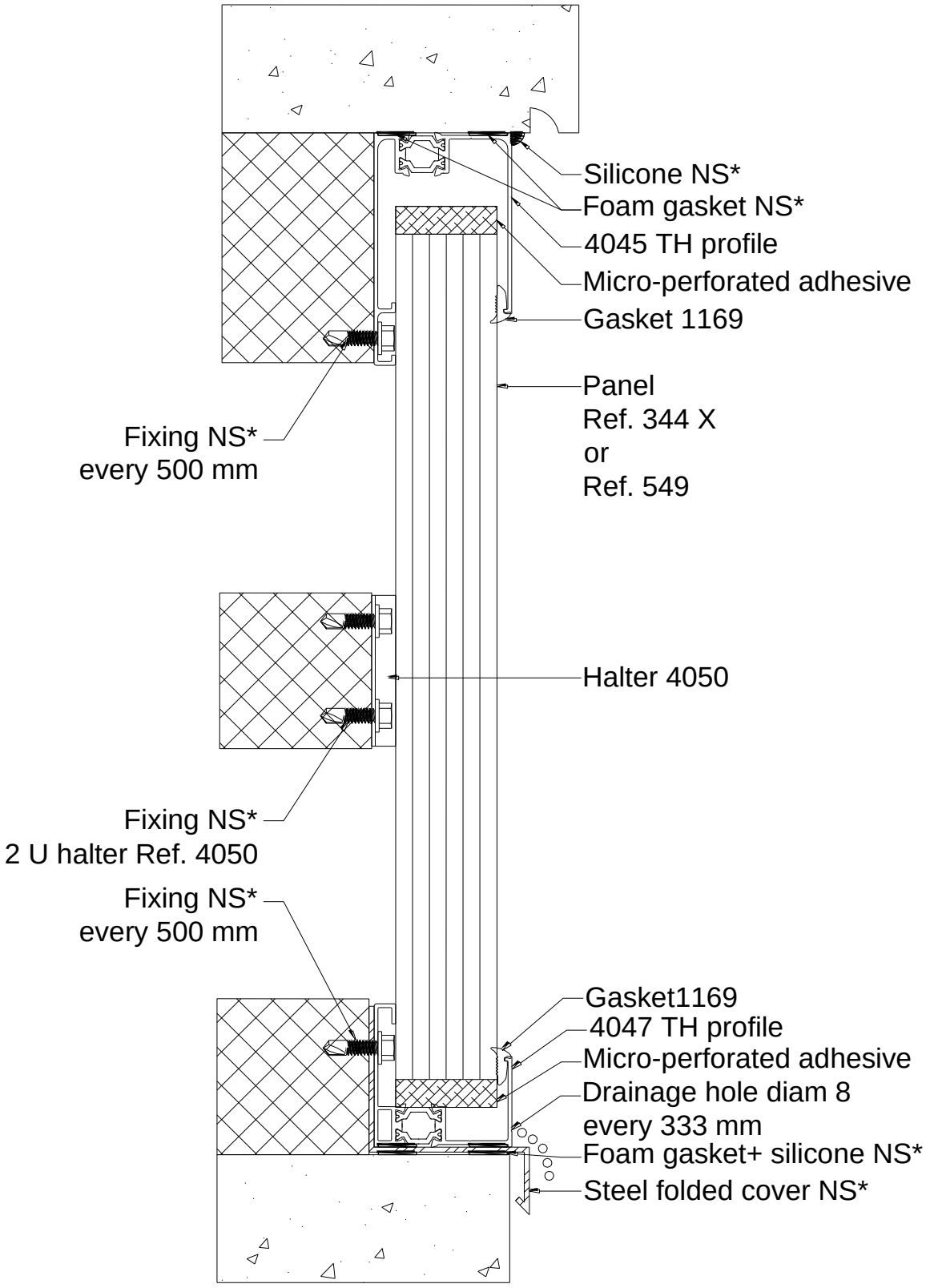
Implementation: Principle of junction with joint bar





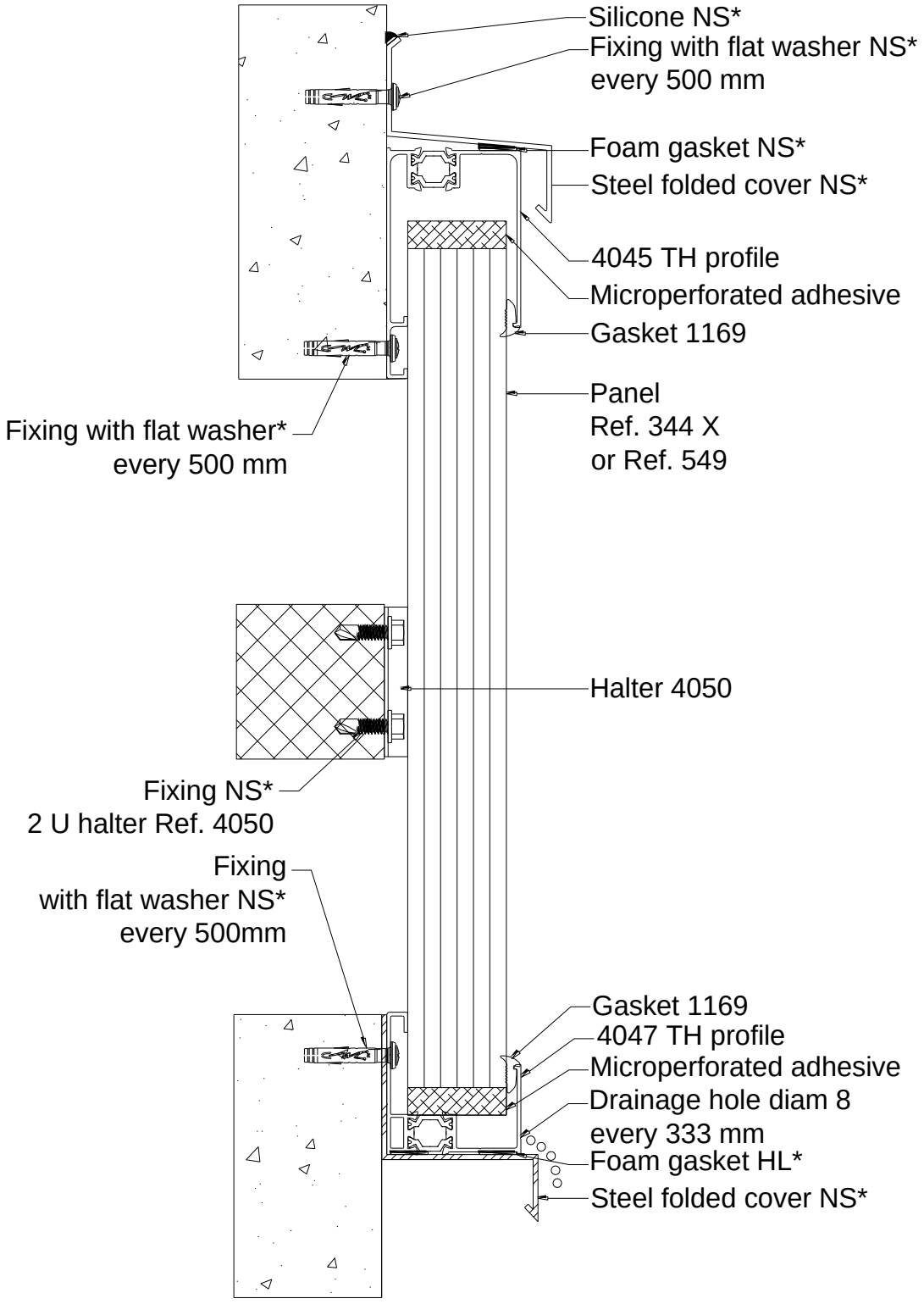
① Building internal floor
② Low support
③ Joint bar 150 x 35 x 2
④ AL low profile ref. 4047 TH
⑤ 5 mm mastic expansion clearance
⑥ Stainless steel screw A2 diam 4 x XX mm
⑦ Folded AL cover
⑧ ArcoPlus panel

Vertical application: Fitting in rabbet
with thermally broken profiles ref. 4047 TH & 4045 TH – Up to 7 m high



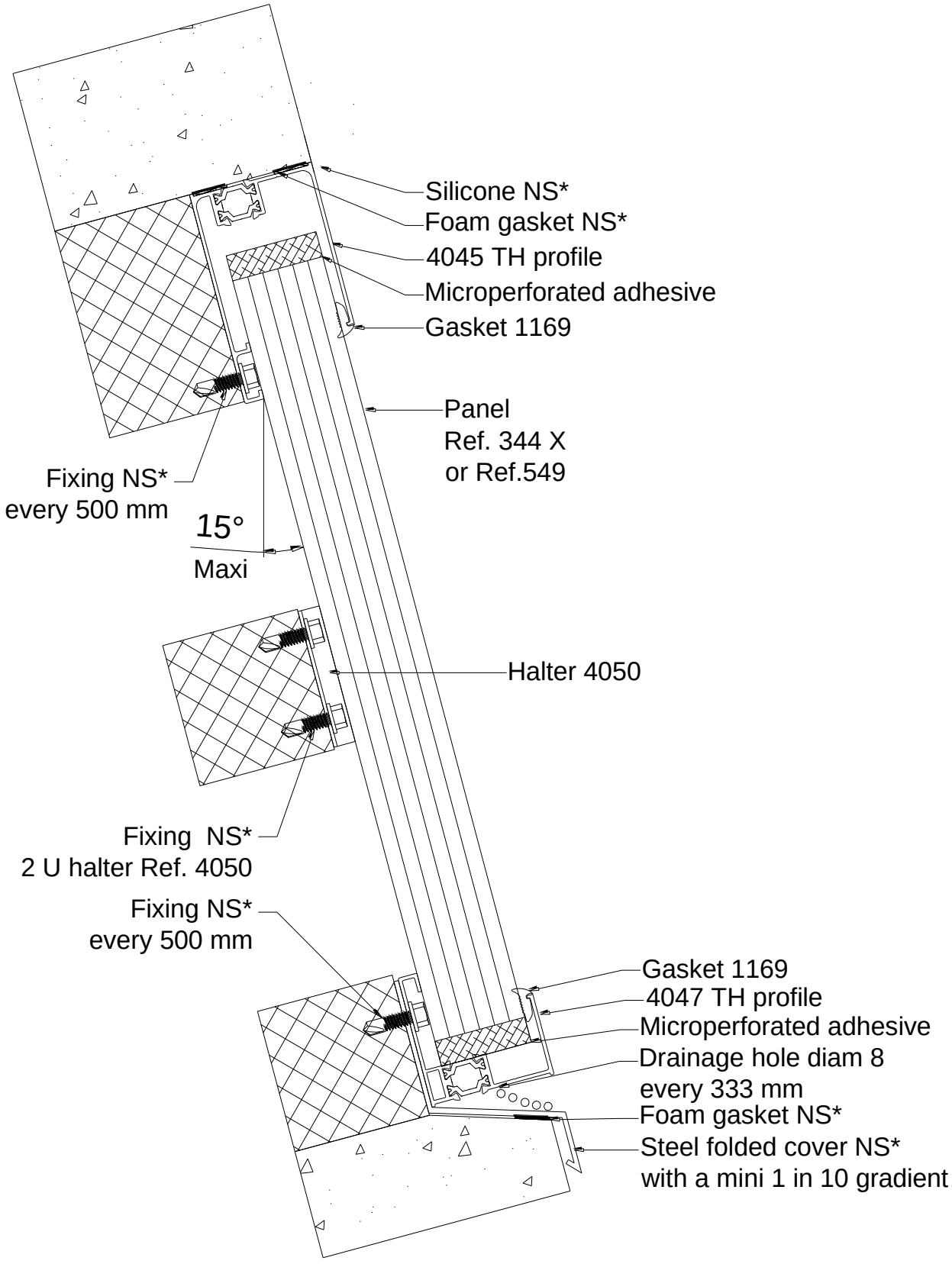
NS* : Not supplied

Vertical application: front of building fitting
with thermally broken profiles ref. 4047 TH & 4045 TH – Up to 7 m high

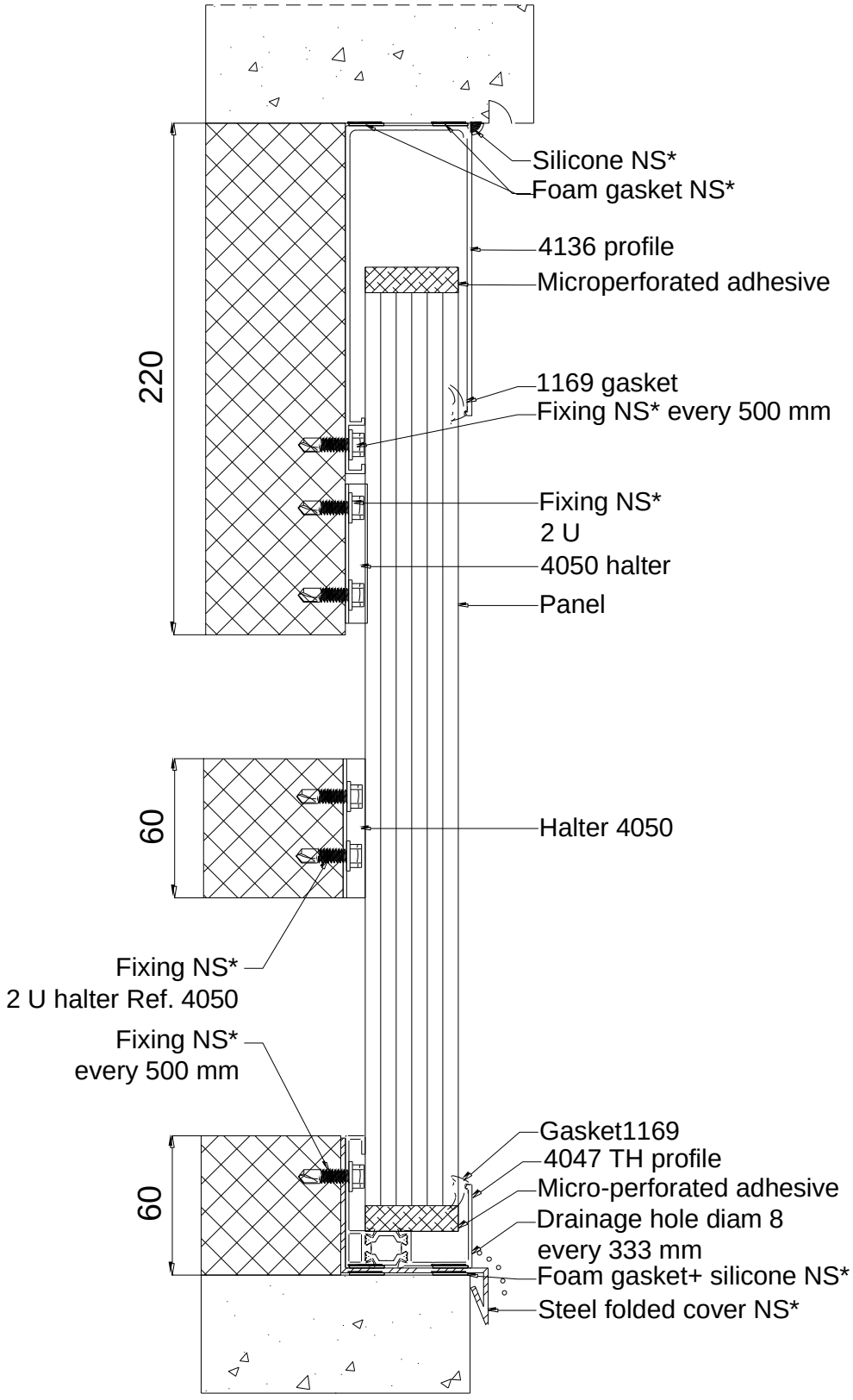


NS* : Not supplied

Inclined application: Fitting in rabbet
with thermally broken profiles ref. 4047 TH & 4045 TH – Up to 6 m high



Vertical application: fitting in rabbet
with profiles ref. 4047TH & 4136 – Up to 16 m high



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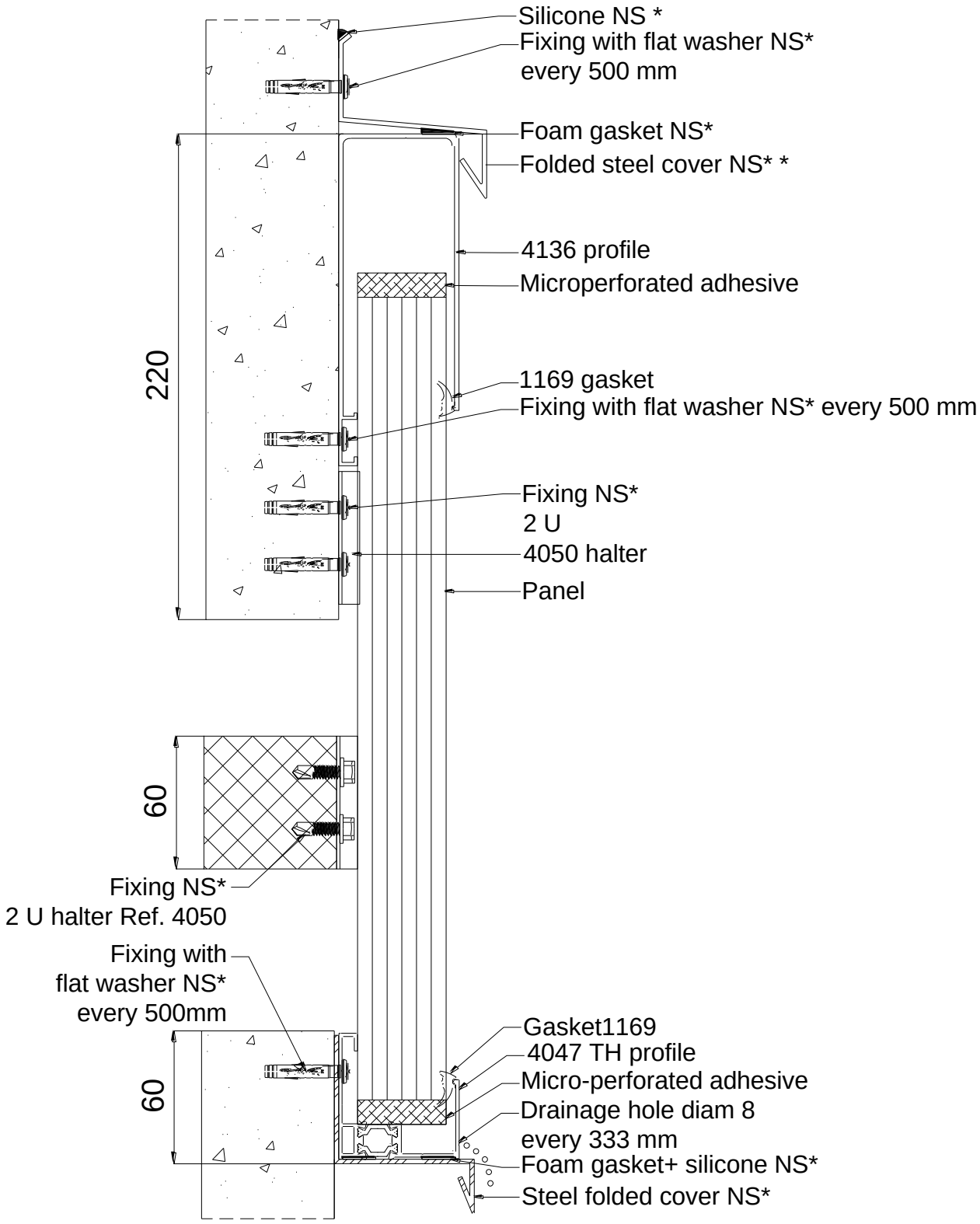
Vertical application: front of building fitting with profiles ref. 4047TH & 4136 – Up to 16 m high



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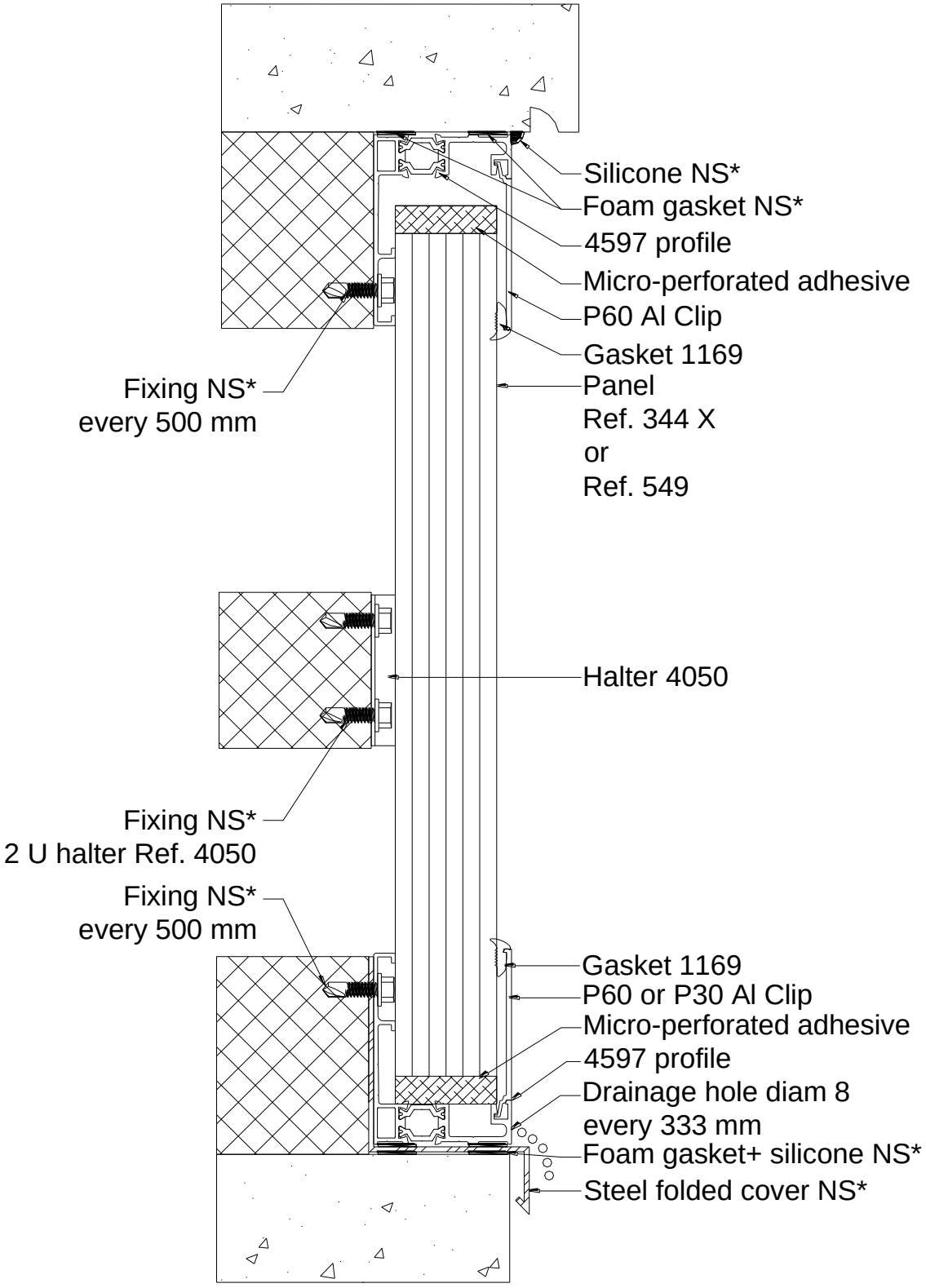
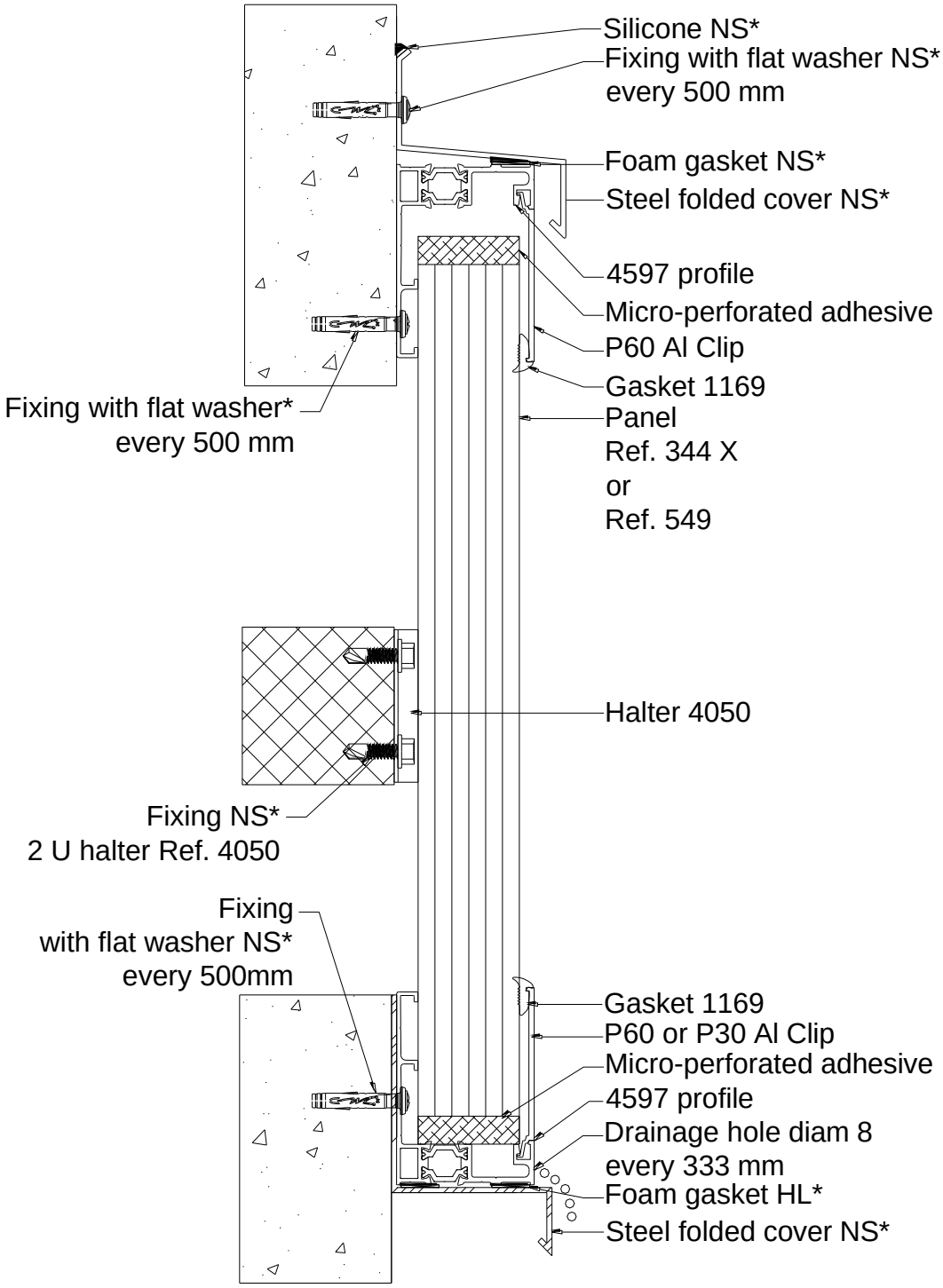
Vertical application: Fitting in rabbet
with thermally broken profiles ref. 4597 – Up to 10 m high



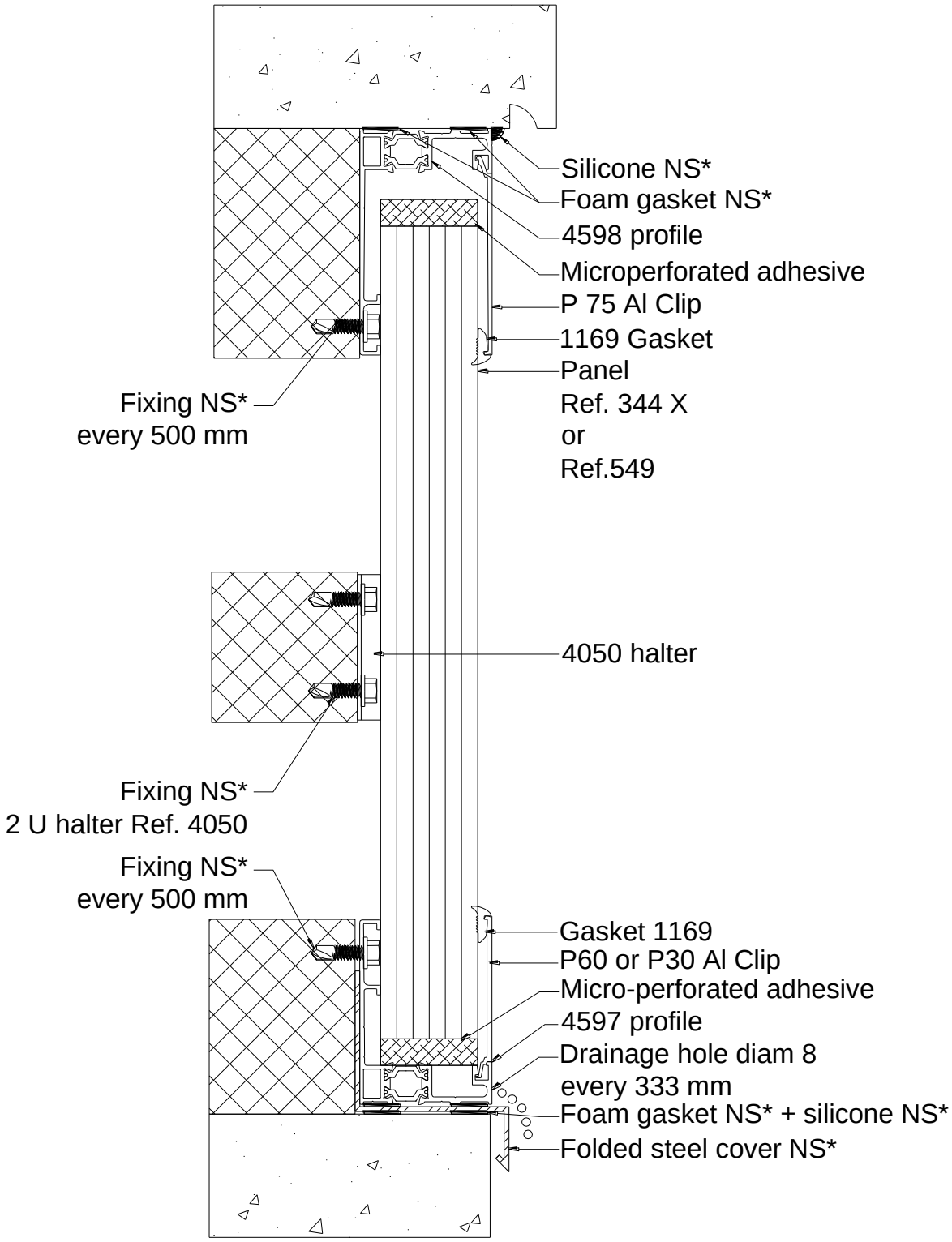
NS* : Not supplied

Vertical application: front of building fitting with thermally broken profiles ref. 4597 – Up to 7 m high



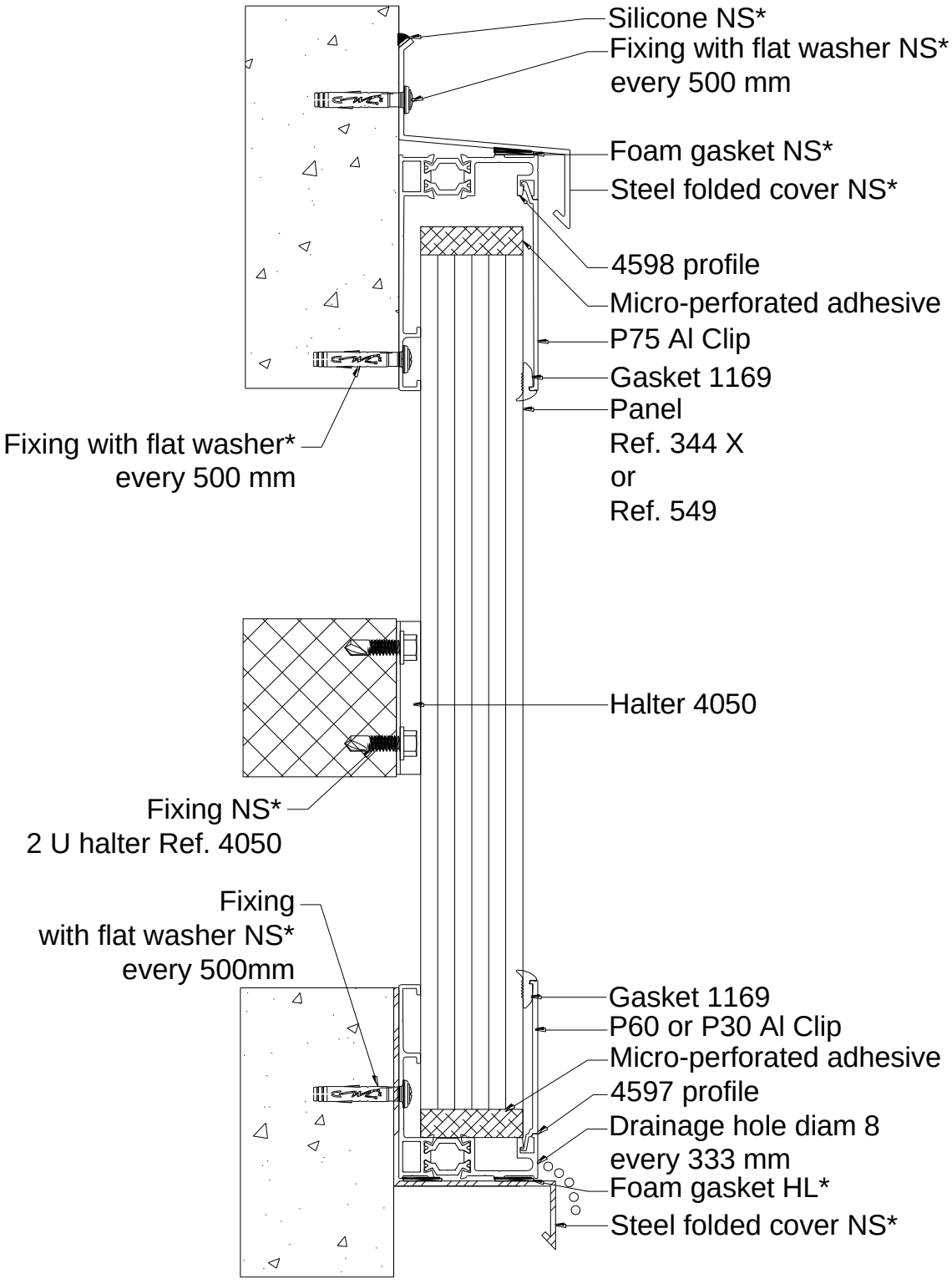
NS* : Not supplied

Inclined application: Fitting in rabbet
with thermally broken profiles ref. 4597 & 4598 – Up to 12 m high



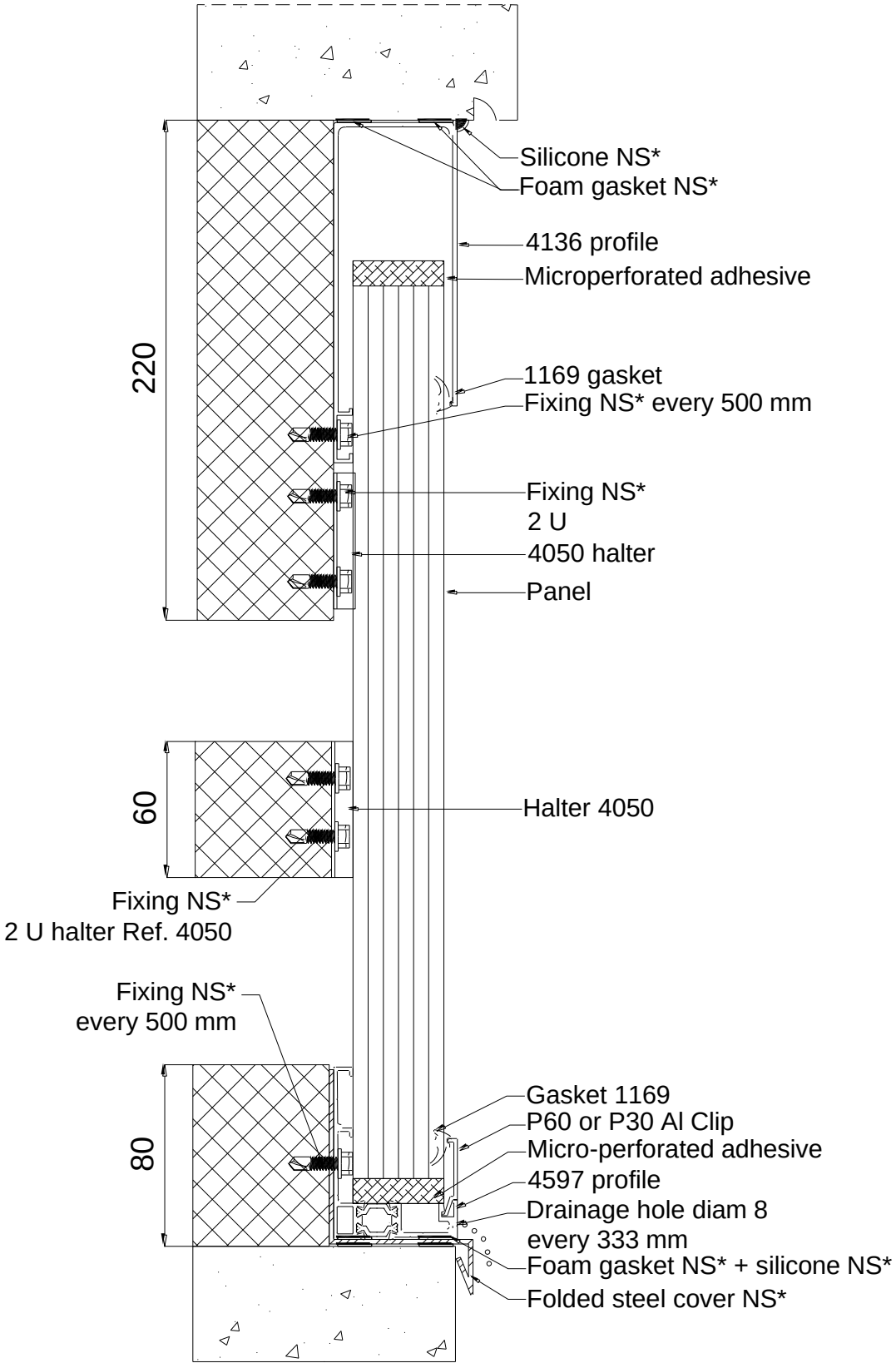
NS* : Not supplied

Vertical application: front of building fitting
with thermally broken profiles ref. 4597 & 4598 – Up to 12 m high



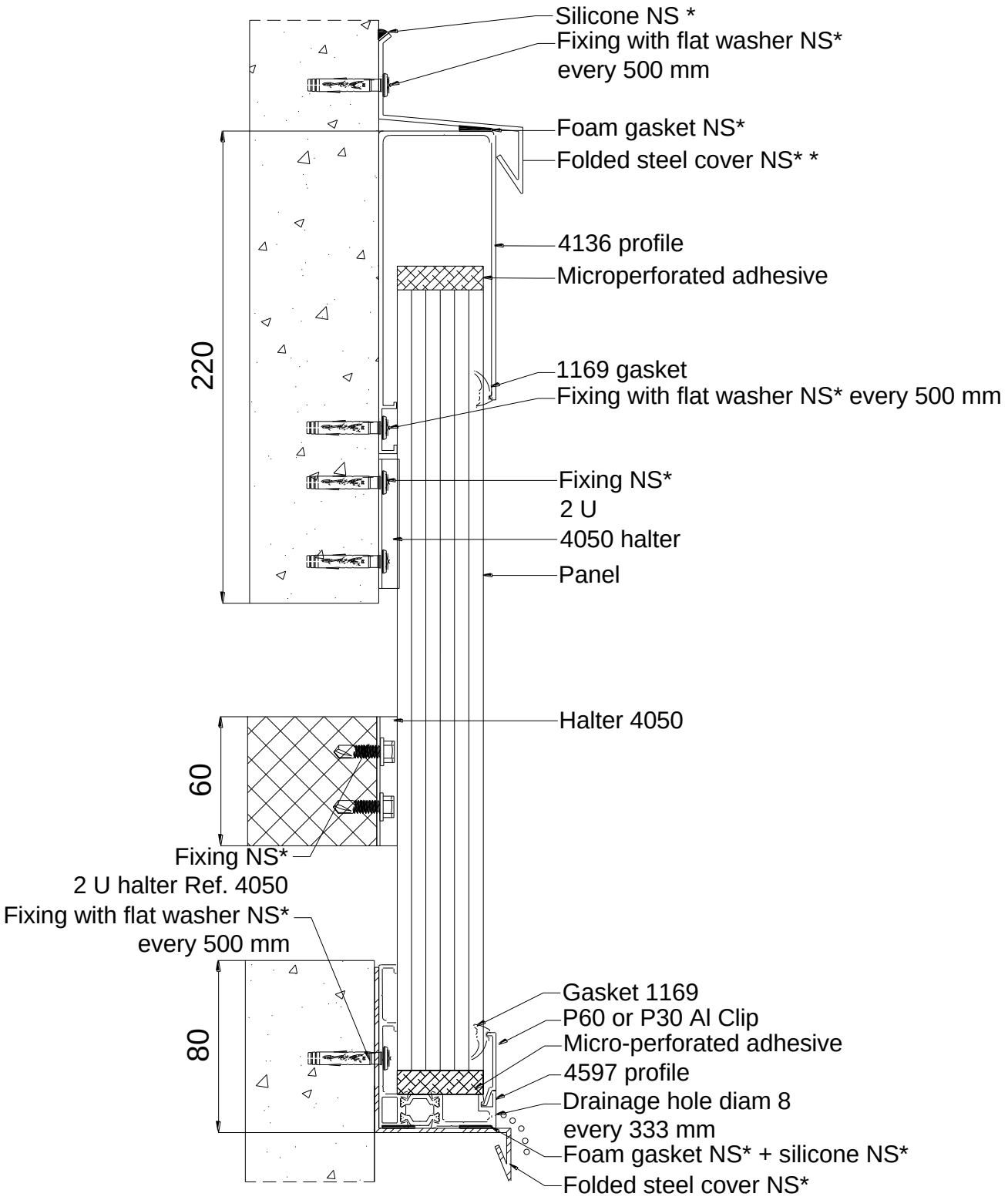
NS* : Not supplied

Vertical application: fitting in rabbet
with profiles ref. 4047TH & 4136 – Up to 16 m high



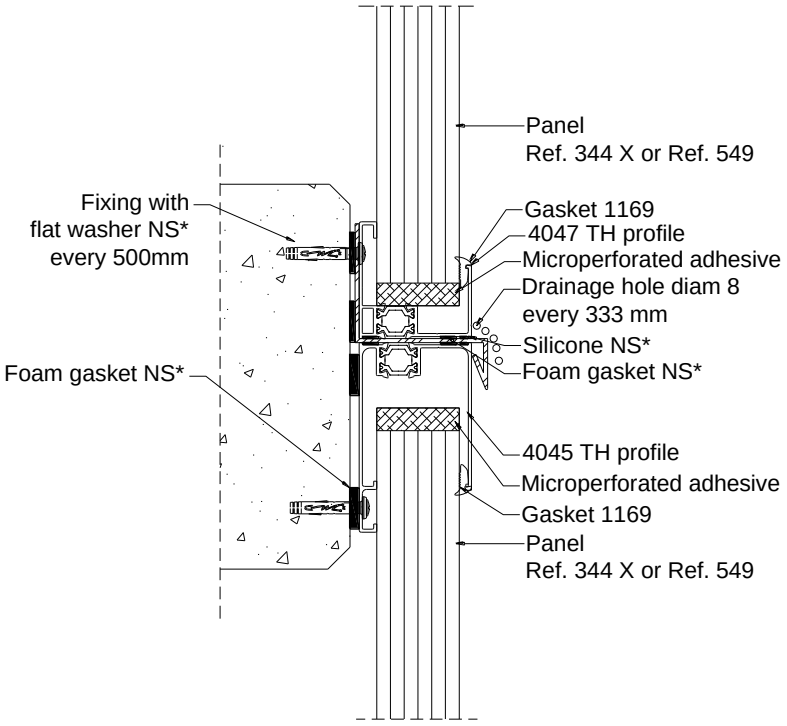
NS* : Not supplied

Vertical application: front of building fitting with profiles ref. 4047TH & 4136 – Up to 16 m high

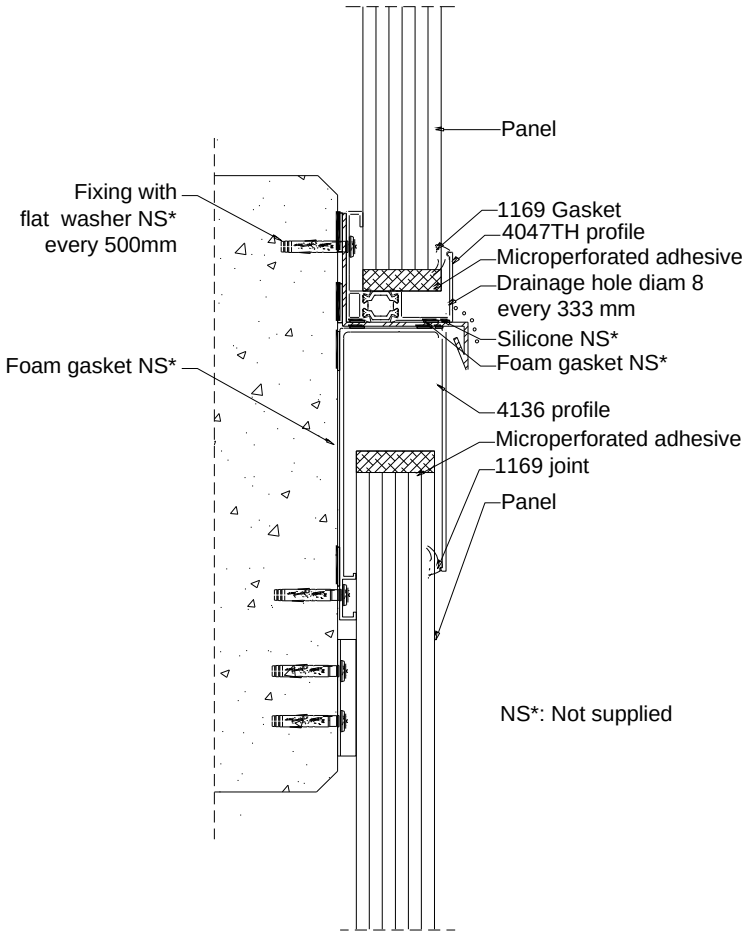


NS* : Not supplied

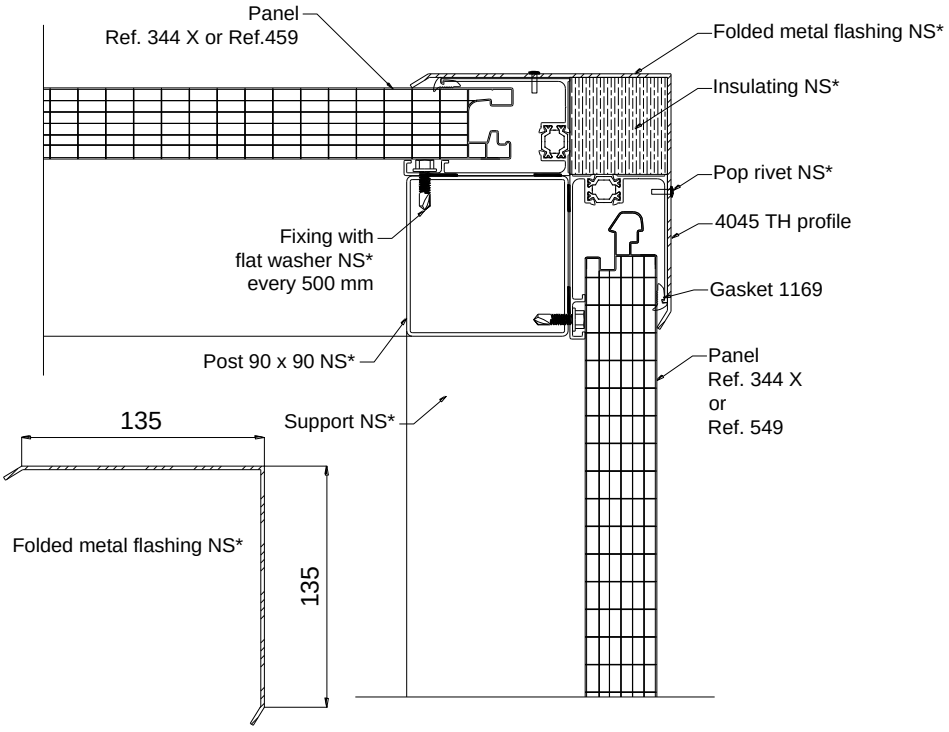
Junction of superposed cladding with Profiles ref. 4047 TH & 4045 TH



Junction of superposed cladding with Profiles ref. 4047 TH & 4136

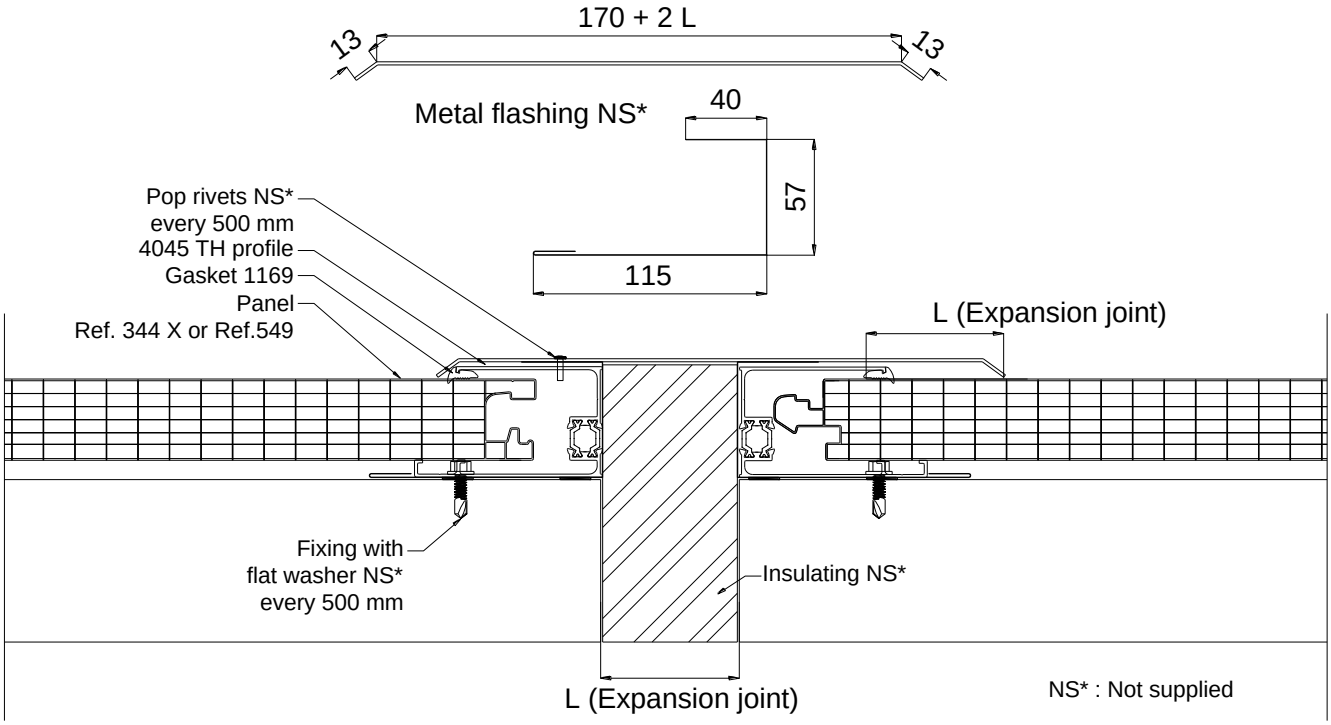


Angles with thermally broken Profiles ref. 4045 TH



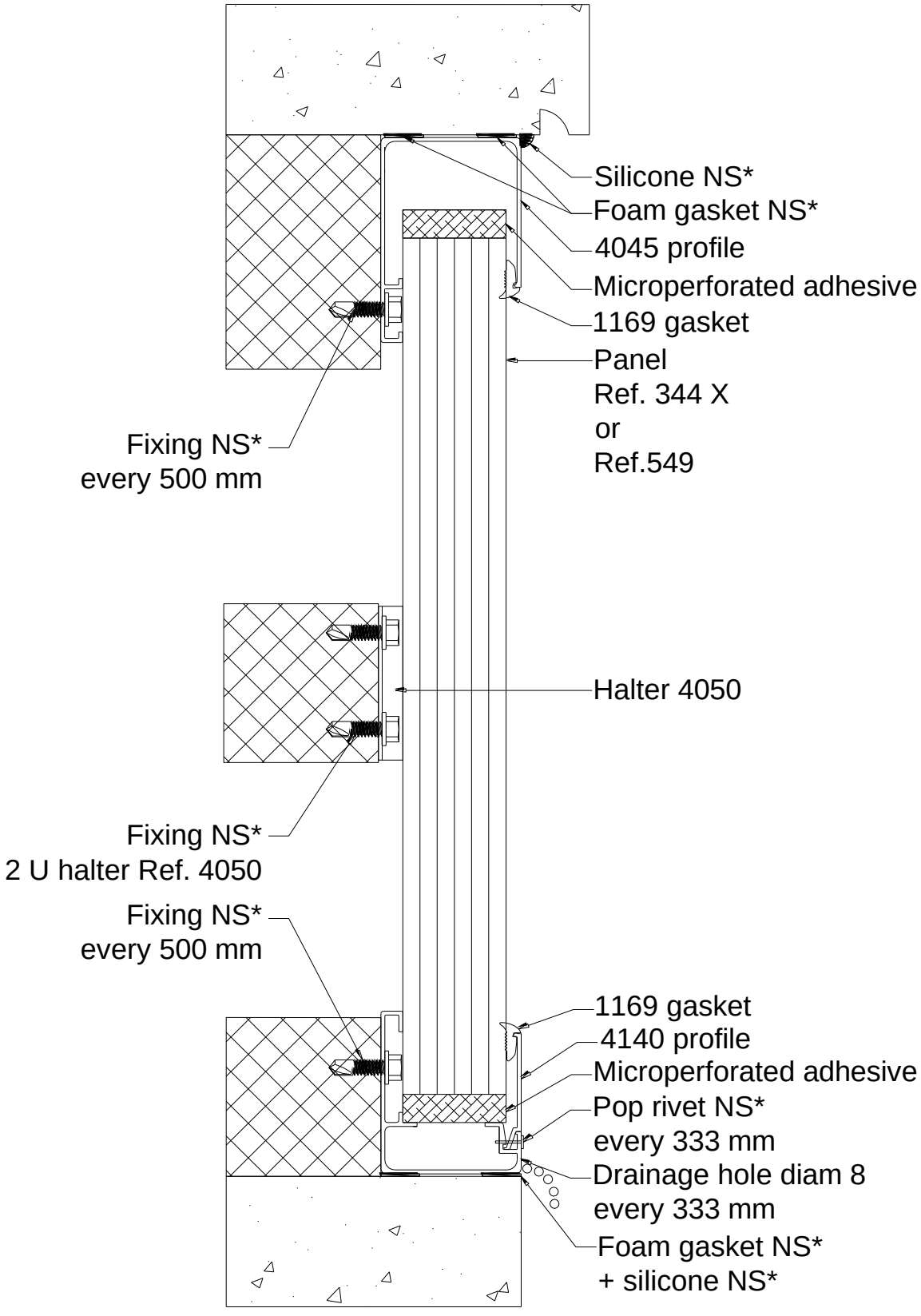
NS* : Not supplied

Junction of expansion with Profiles ref. 4045 TH



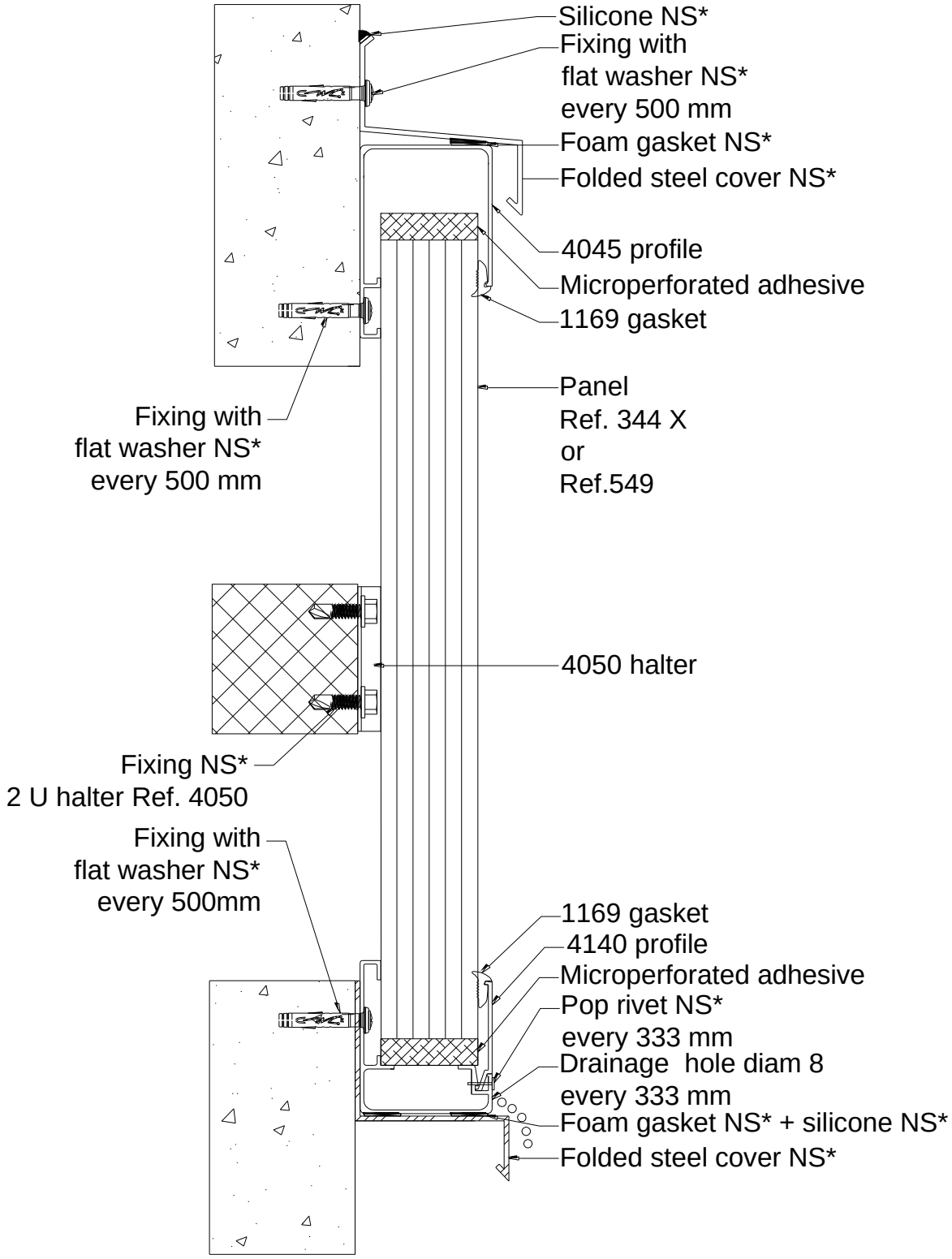
NS* : Not supplied

Vertical application: fitting in rabbet
with AL clip profiles ref. 4140 et 4045 – Up to 7 m high



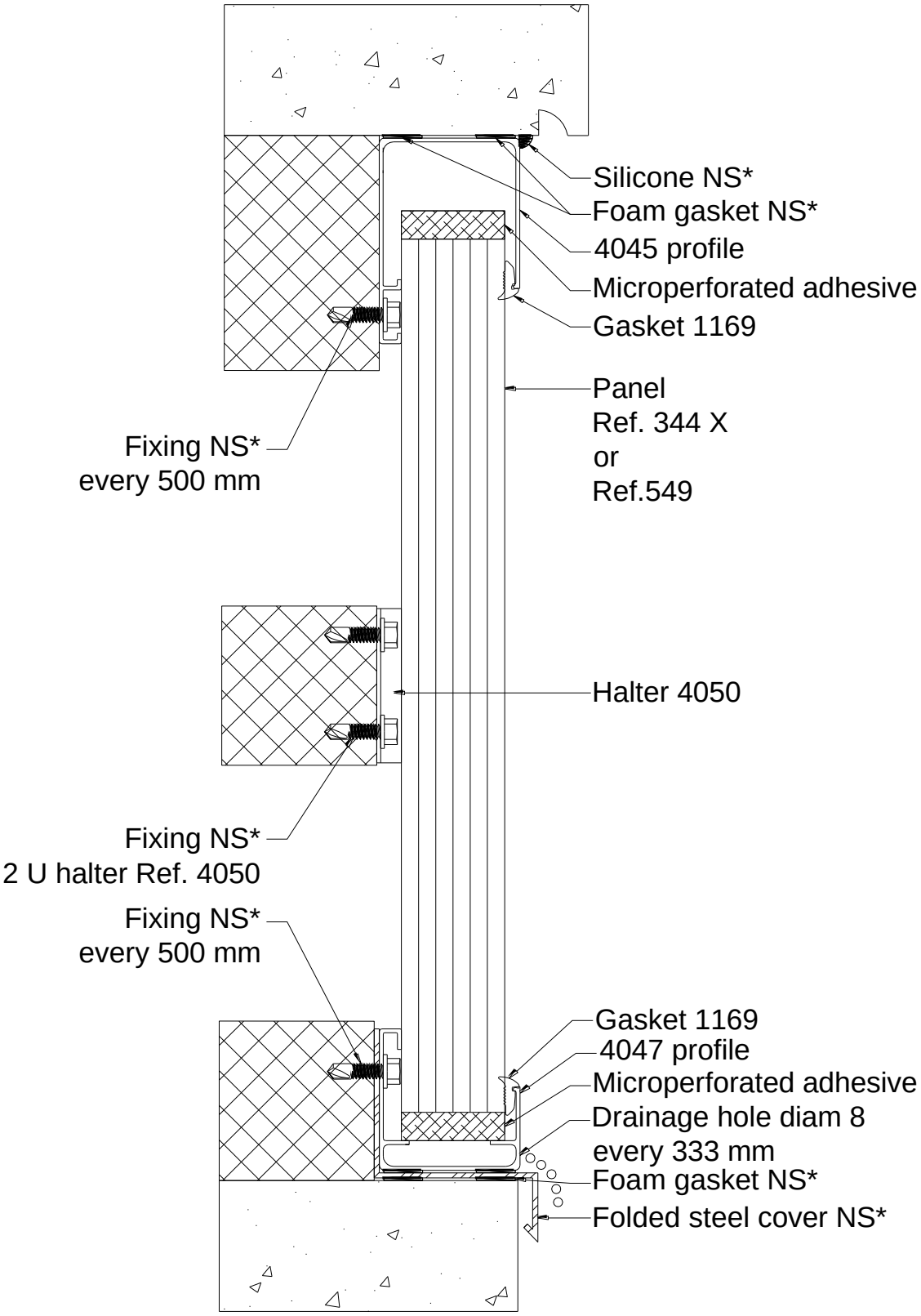
NS* : Not supplied

Vertical application: front of building fitting with AL clip profiles ref. 4140 et 4045 – Up to 7 m high



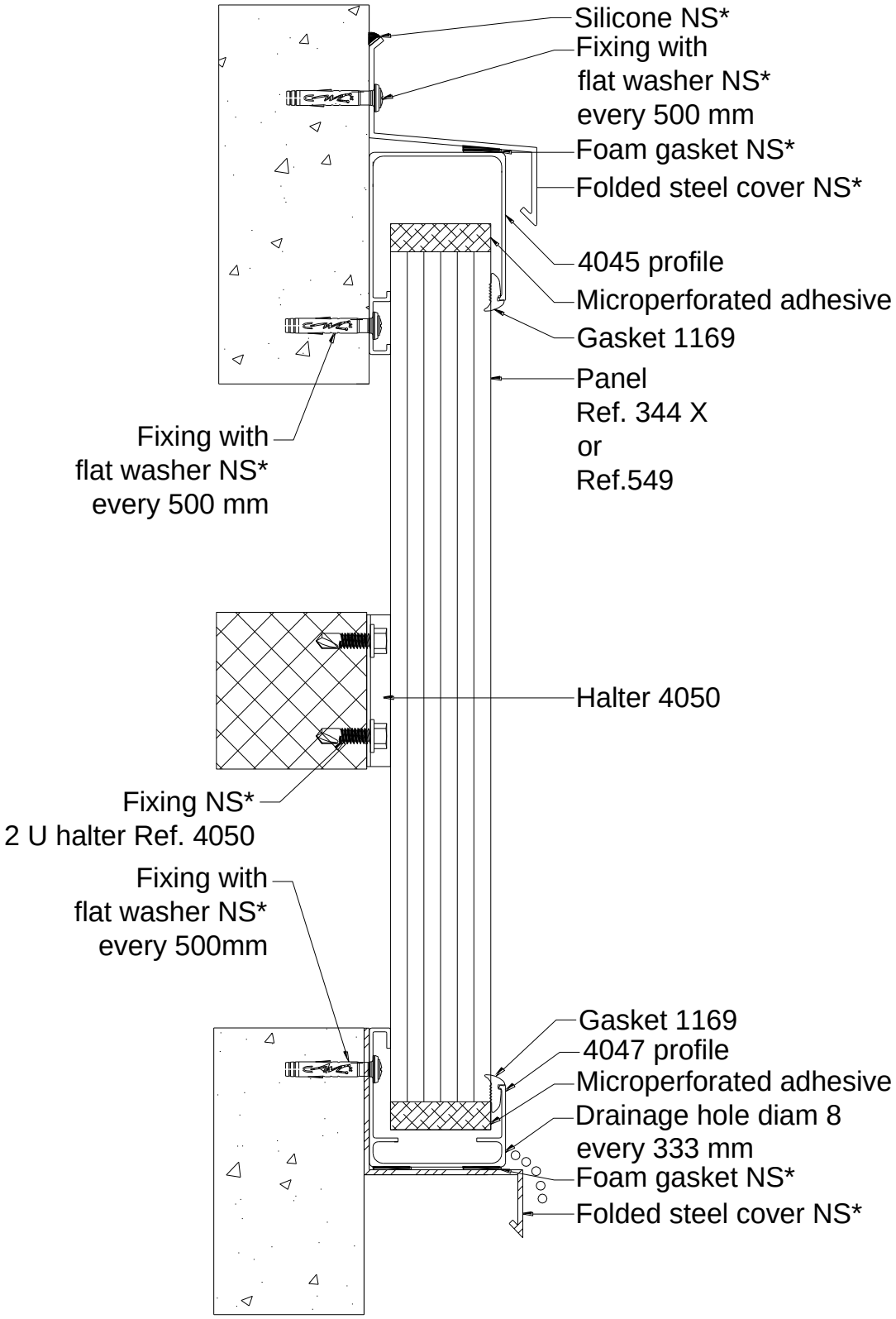
NS*: Not supplied

Vertical application: Fitting in rabbet
with standard profiles ref. 4047 & 4045 – Up to 7 m high



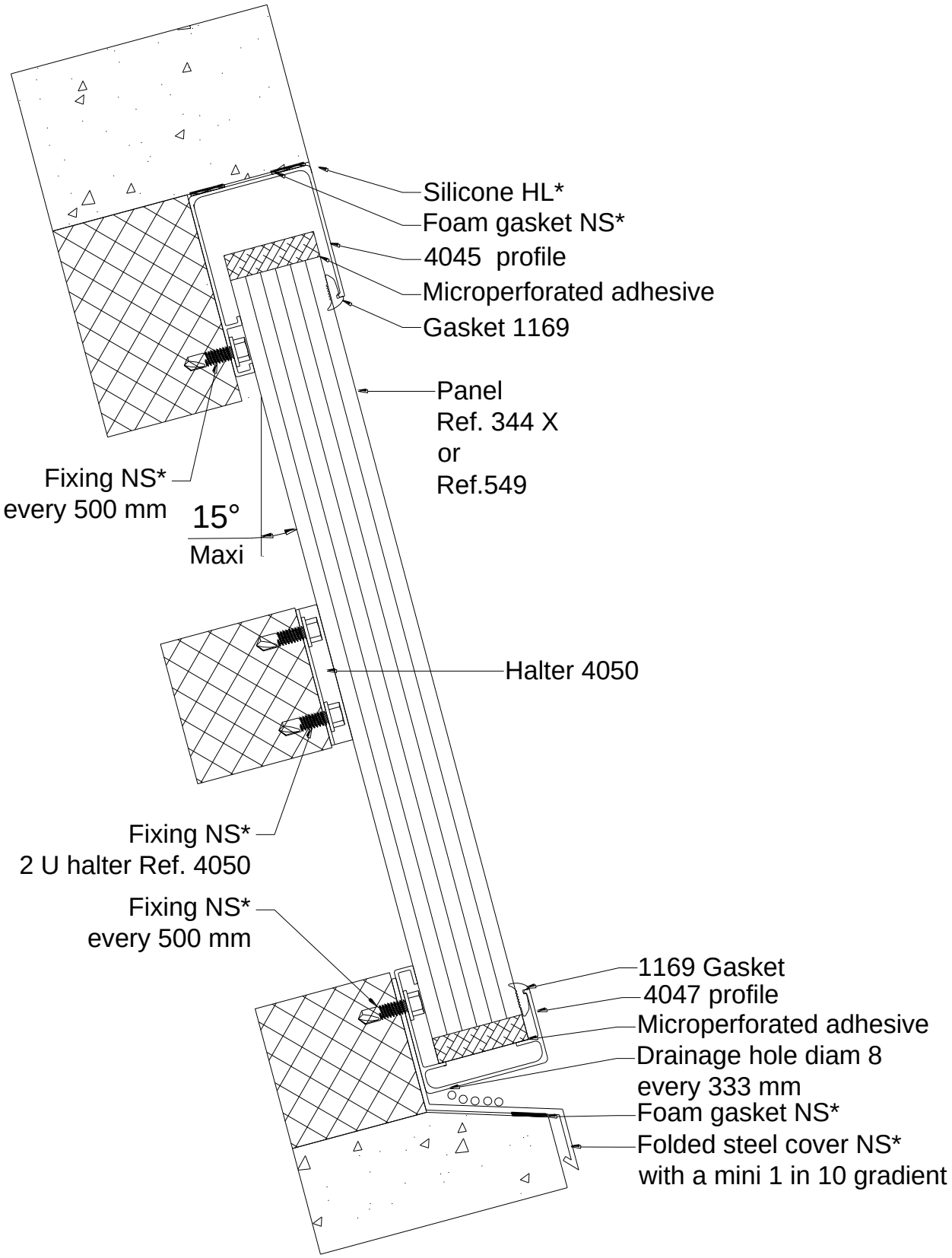
NS*: Not supplied

Vertical application: Front of building fitting with standard Profiles ref. 4047 & 4045 – Up to 7 m high



NS*: Not supplied

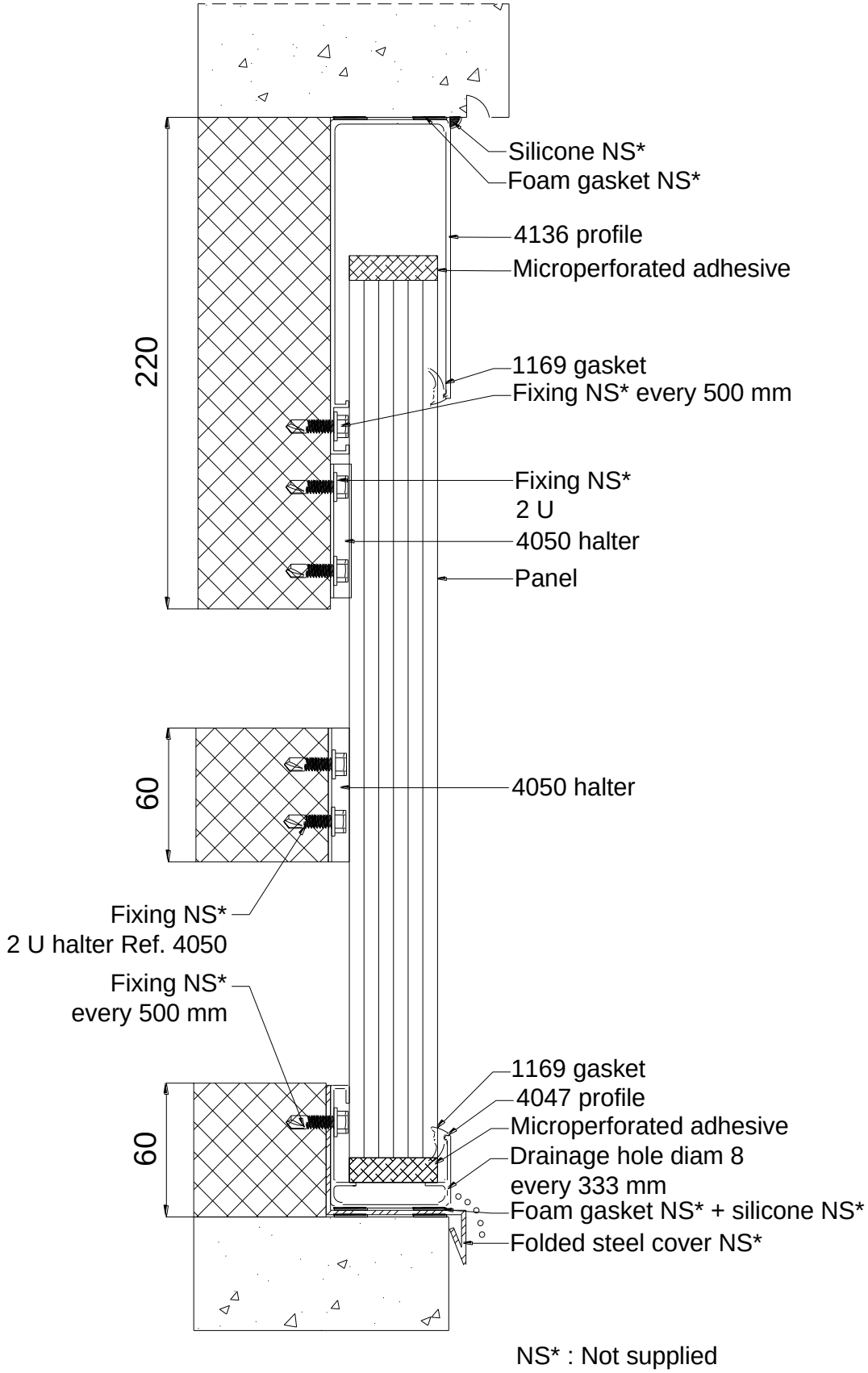
Inclined application: Fitting in rabbet
with standard Profiles ref. 4047 & 4045 – Up to 6 m high



NS*: Not supplied

Vertical application: Fitting in rabbet

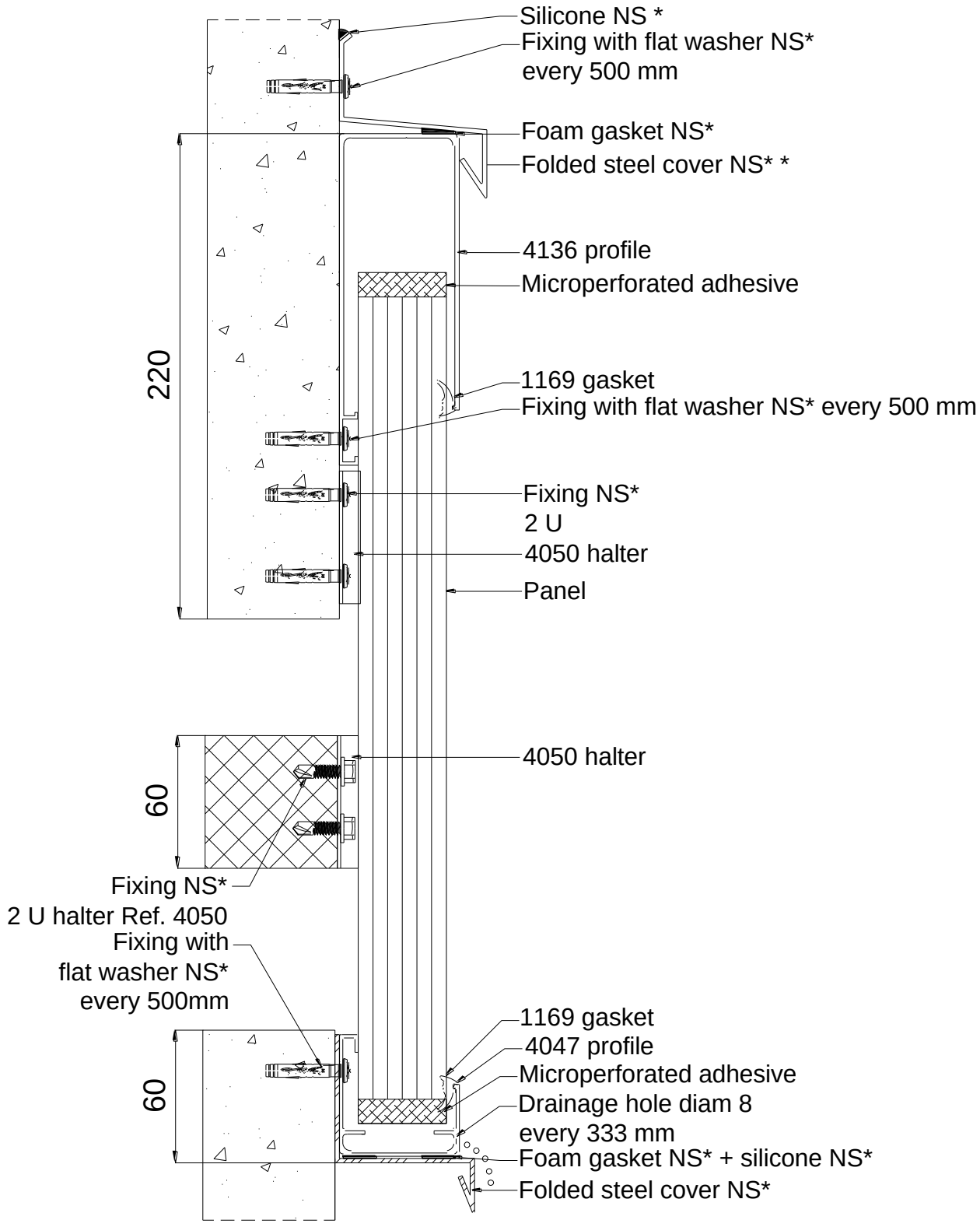
with standard profiles ref. 4047 & 4136 – Up to 16 m high



NS* : Not supplied

Vertical application: Front of building fitting

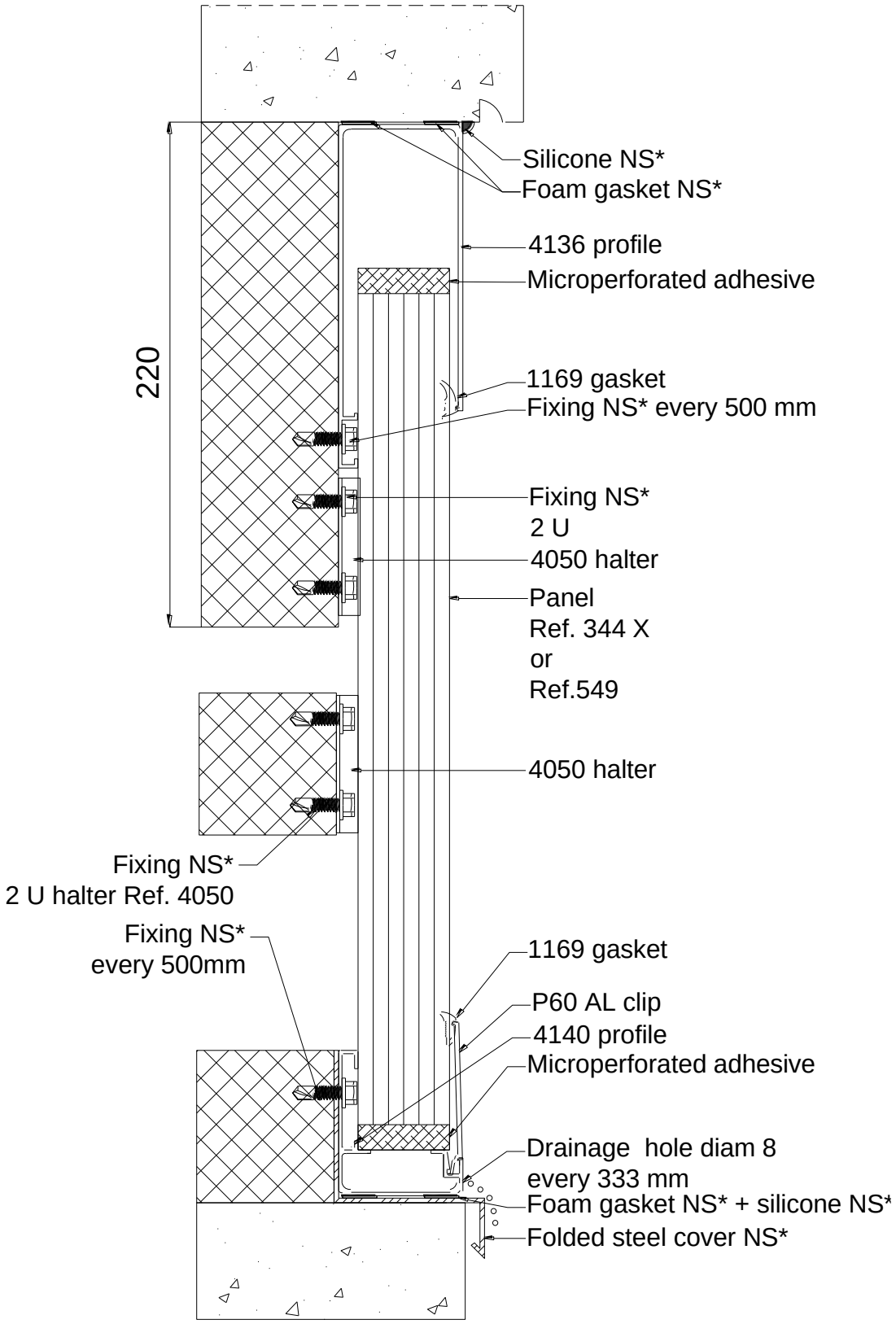
with standard profiles ref. 4047 & 4136 – Up to 16 m high



NS* : Not supplied

Vertical application: Fitting in rabbet

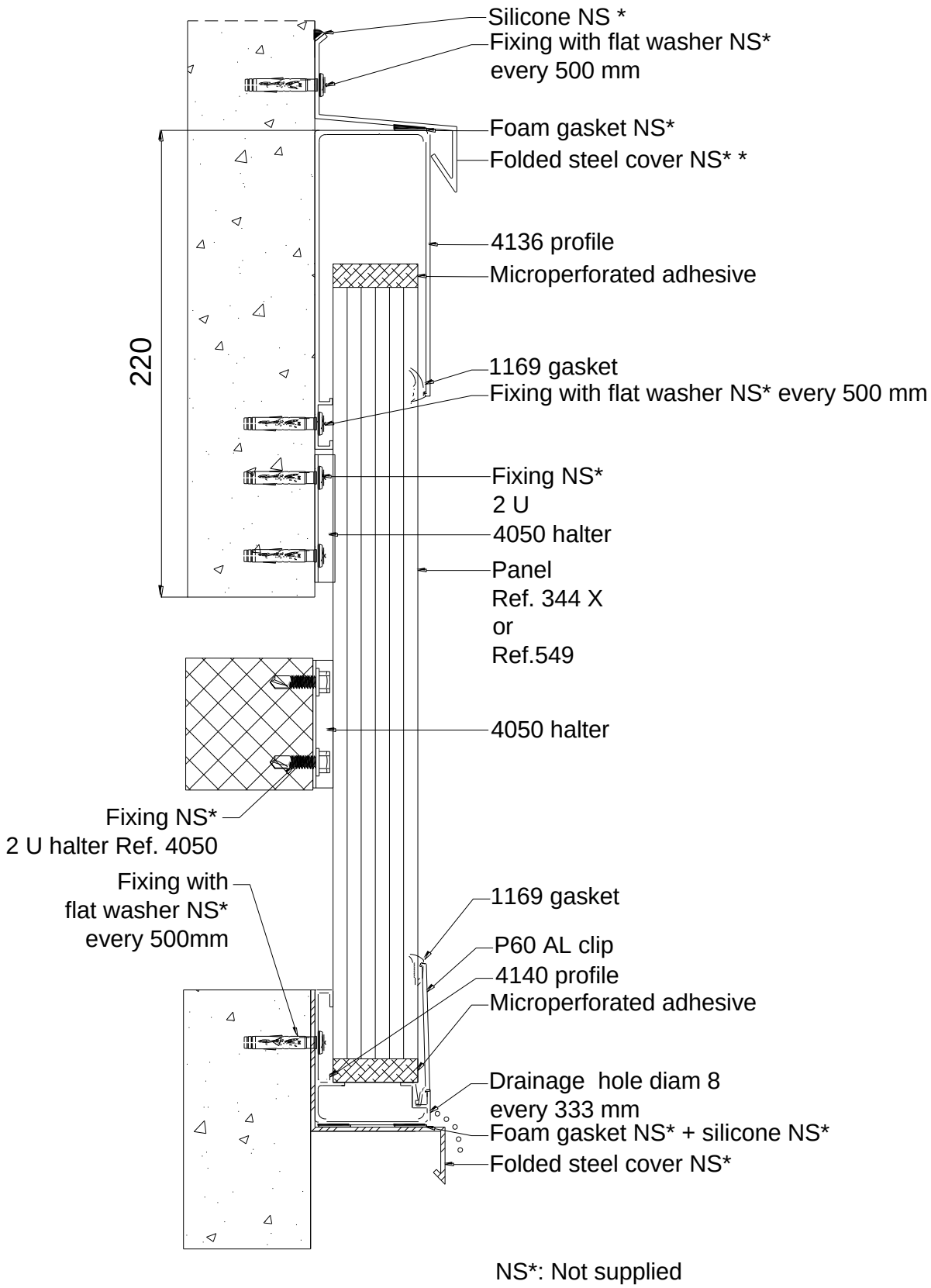
with standard profiles ref. 4140 & 4136 – Up to 16 m high



NS*: Not supplied

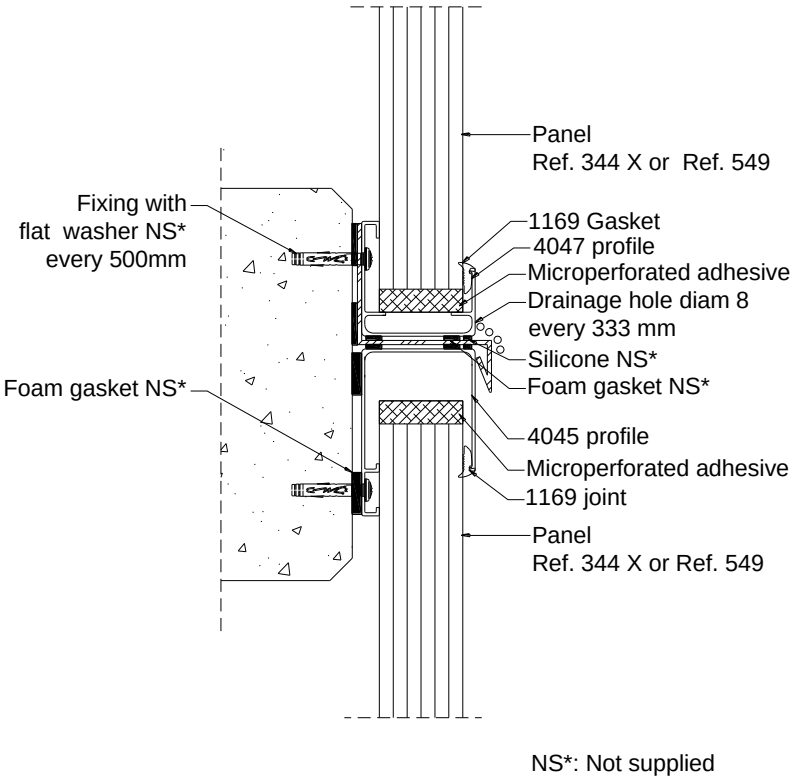
Vertical application: Front of building fitting

with standard profiles ref. 4140 & 4136 – Up to 16 m high

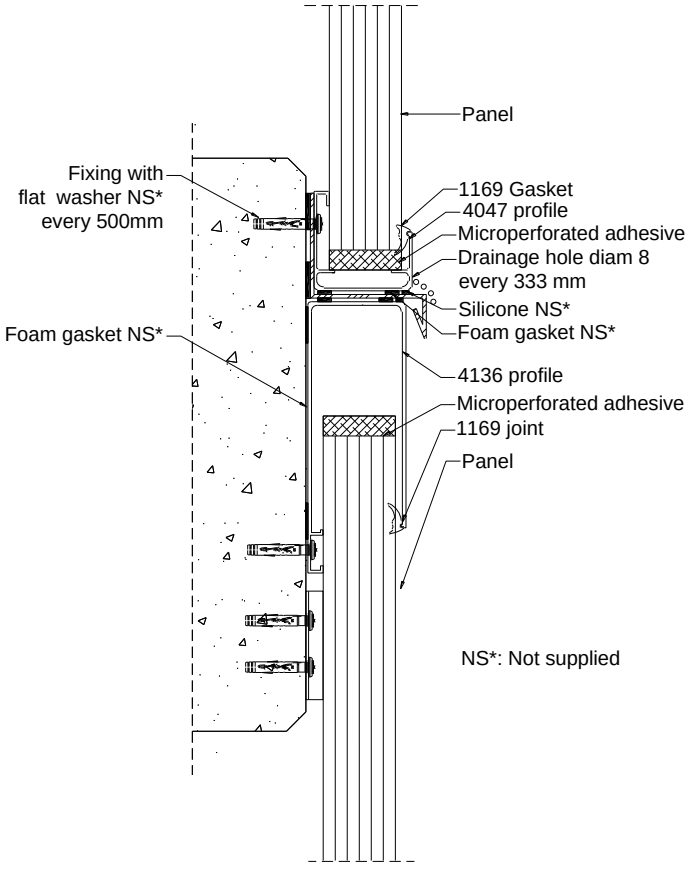


NS*: Not supplied

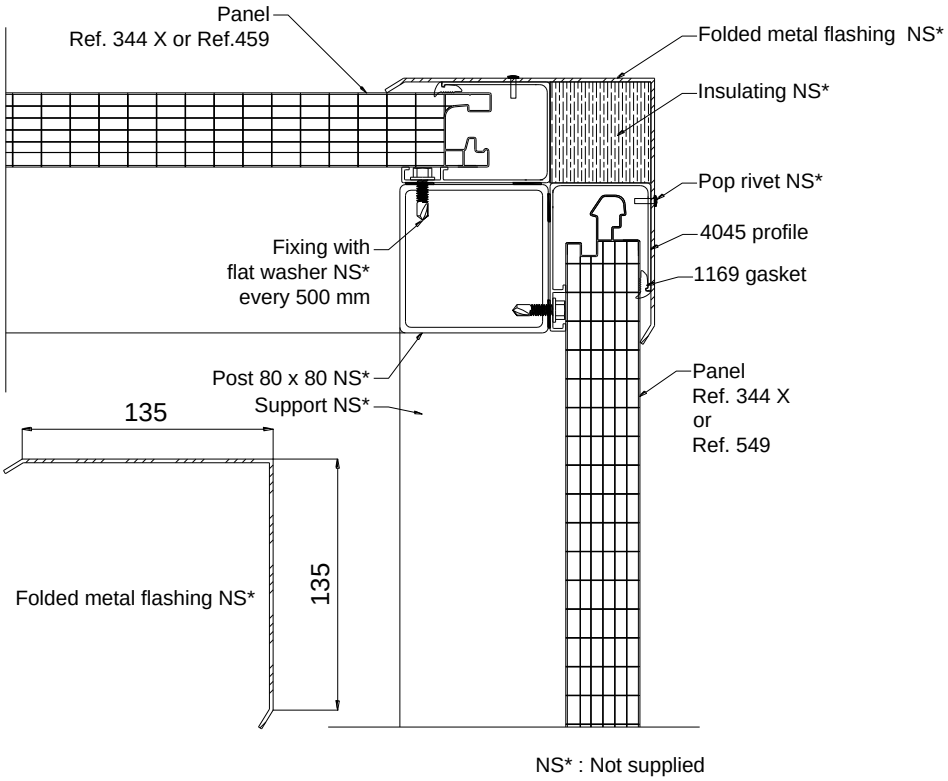
Junction of superposed cladding with Profiles ref. 4047 et 4045



Junction of superposed cladding with Profiles ref. 4047 et 4136



Angle with standard Profiles ref. 4045



NS* : Not supplied

Junction of expansion with Profiles ref. 4045