



steel  
CONNECT

# 4 CRITERIA OF EXTERNAL CLADDING DESIGN TO EXTEND ITS LIFESPAN





# 10 YEARS STEEL ROOFING WITHOUT RUSTS



**& STILL IN  
EXCELLENT  
APPEARANCE**



**22 YEARS STEEL  
ROOFING  
EXPECTED TO  
HAVE MORE  
SERVICE  
LIFESPAN**



**28 YEARS  
STEEL  
ROOFING IN  
EXCELLENT  
CONDITIONS**



# HOW TO ACHIEVE LONGER LIFESPAN FOR YOUR CLADDING THROUGH DESIGN?



1

# ROOF PITCH

# ① ROOF PITCH CONSIDERATION

**THE FLAT  
ROOF DESIGN  
HAS BEEN  
WIDELY  
ADOPTED**





① ROOF PITCH CONSIDERATION

FOR BUILDING  
BLOCKS  
DESIGN

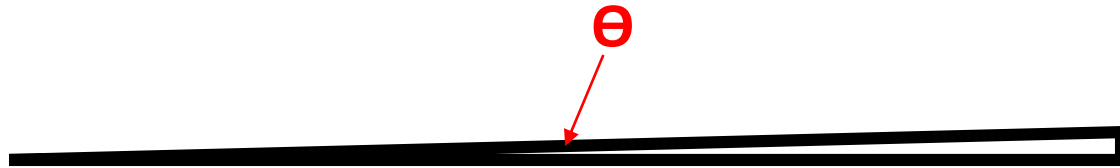
1 ROOF PITCH CONSIDERATION

AND  
MAXIMIZE THE  
SPACE USAGE

# WHAT IS FLAT ROOF

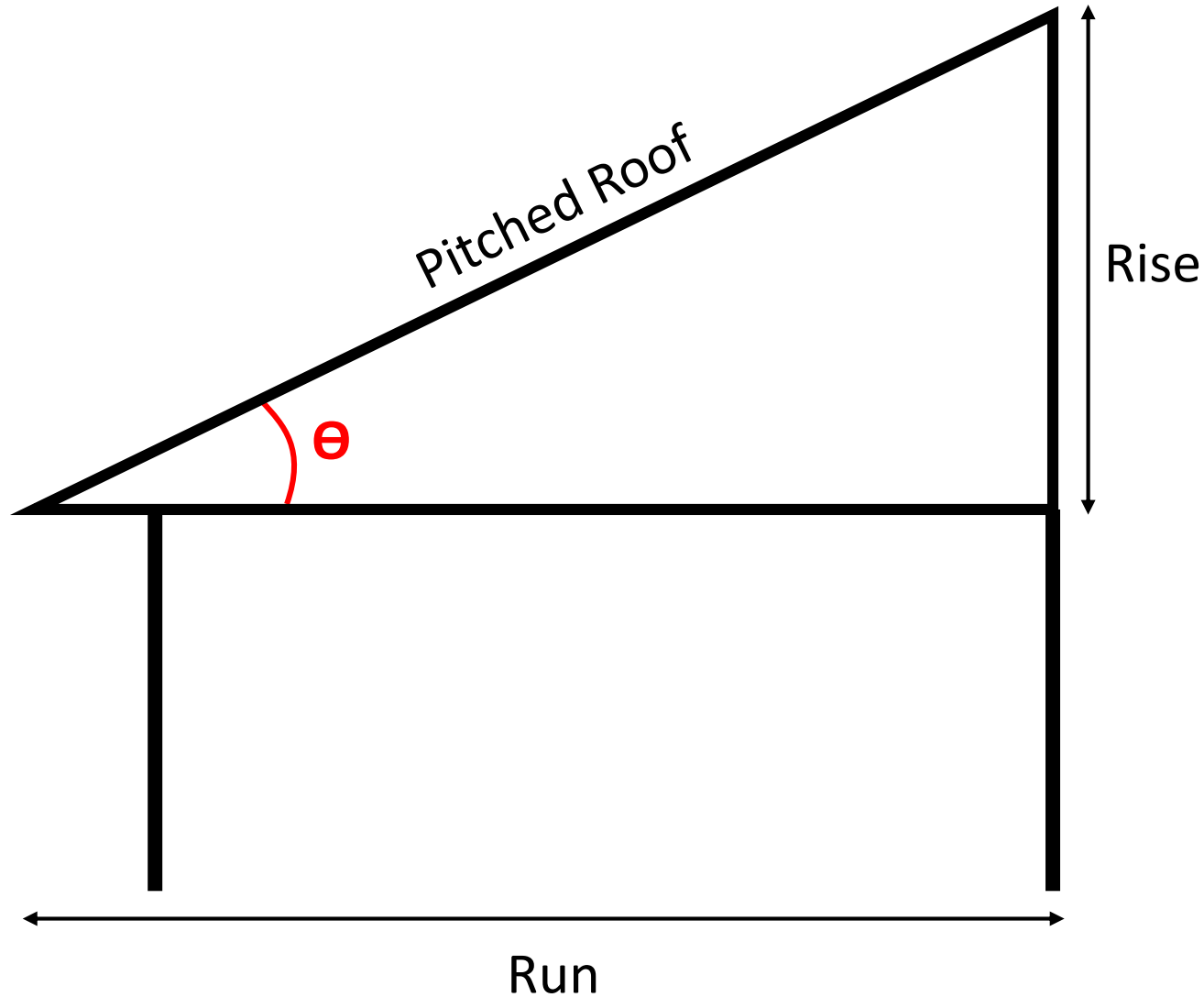
# ① ROOF PITCH CONSIDERATION

**DEFINED AS  
NEARLY  
HORIZONTAL  
ROOF PITCH**



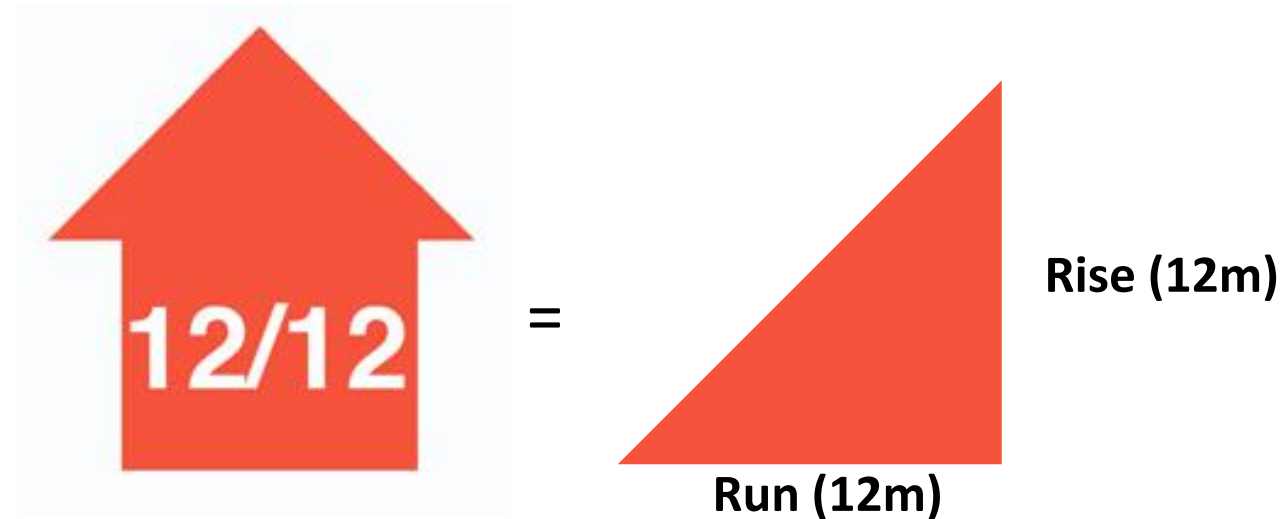
**DEFINED AS  
NEARLY  
HORIZONTAL  
ROOF PITCH**

$$\tan(\theta) = \text{Rise} / \text{Run}$$



# HOW TO DETERMINE ROOF PITCH

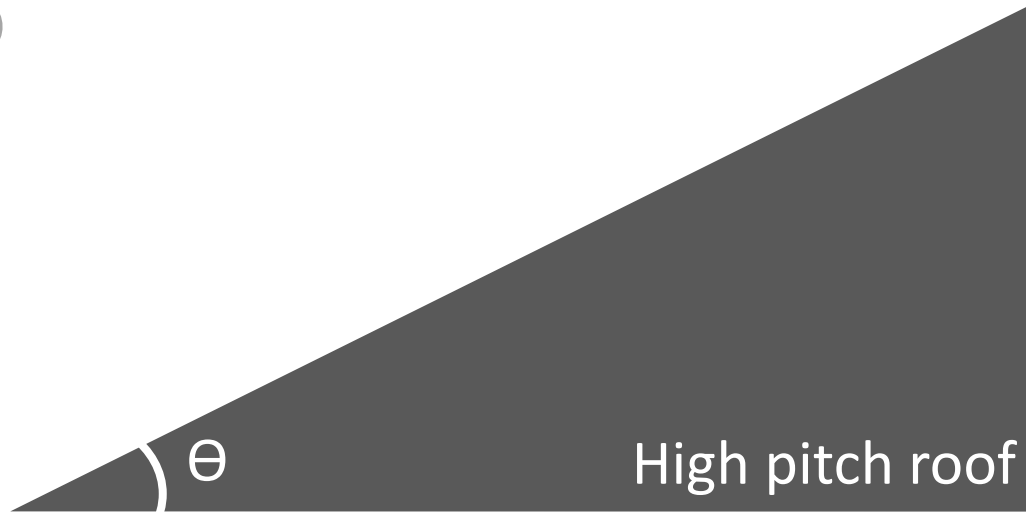
Roof pitch = Rise / Run



CAN BE  
DESCRIBED IN  
A RATIO

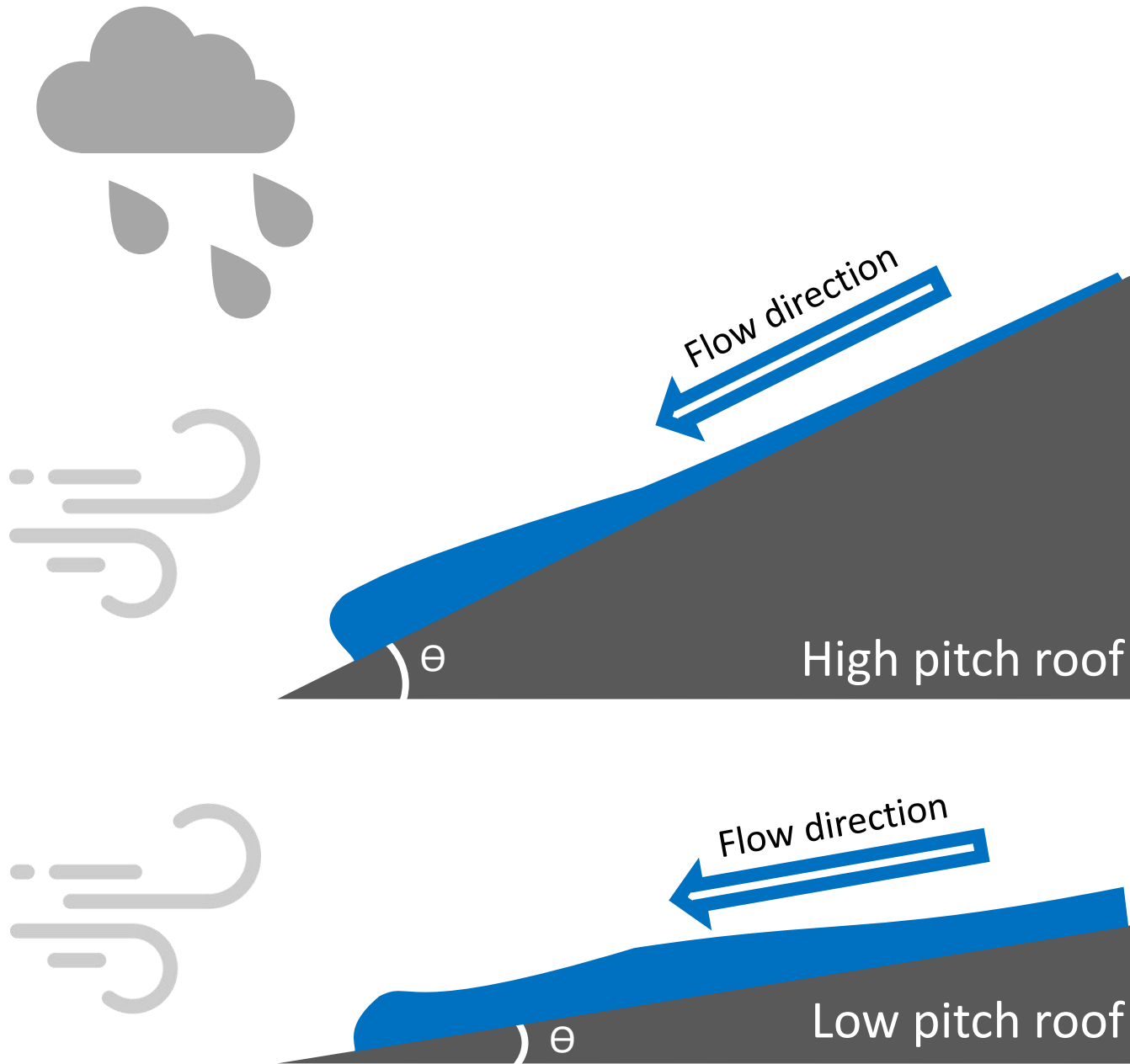
# WHY WOULD YOU WANT TO DETERMINE ROOF PITCH?





# 1 ROOF PITCH CONSIDERATION

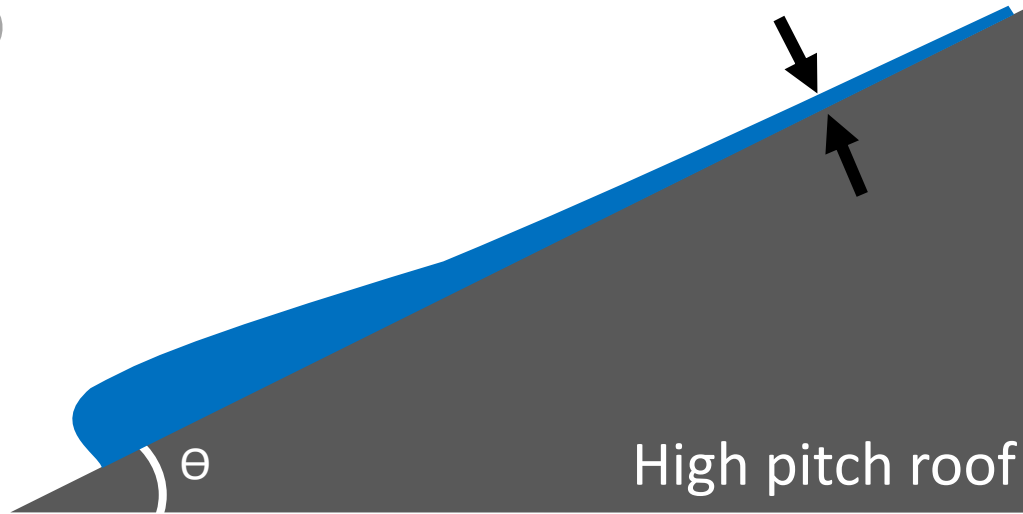
**REACT  
DIFFERENTLY  
DURING  
RAINY DAY**

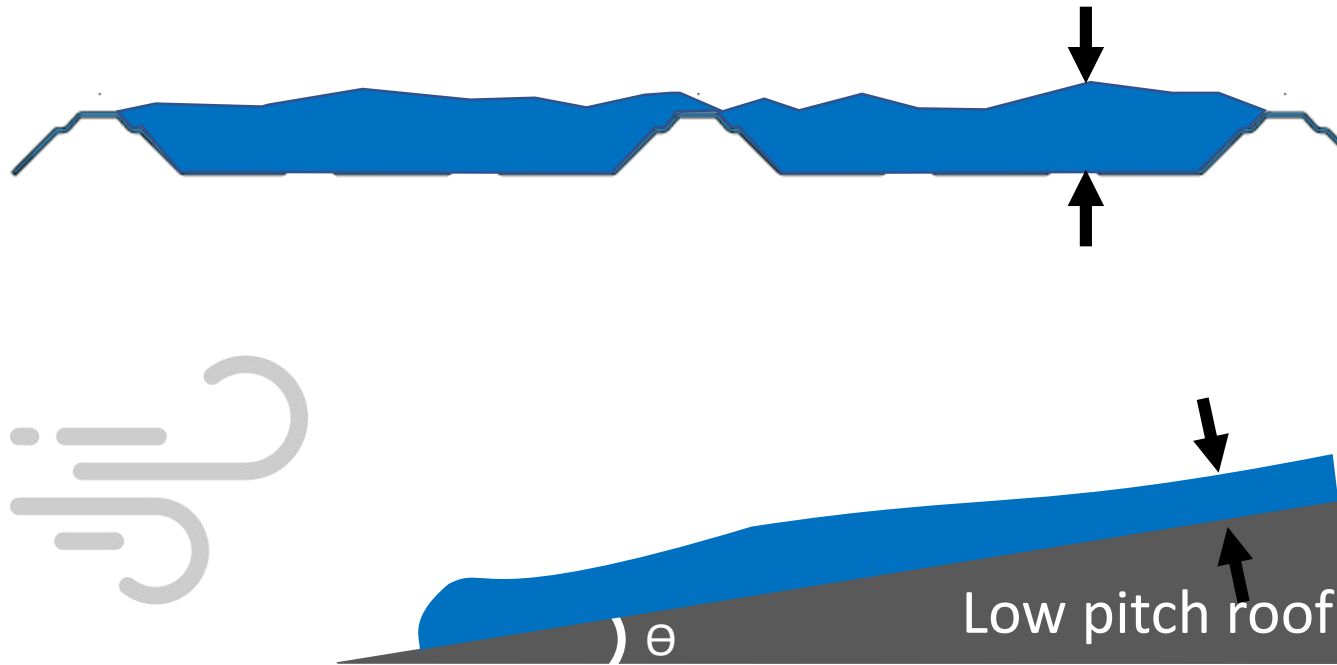


**AFFECT THE  
WATER FLOW  
RATE**

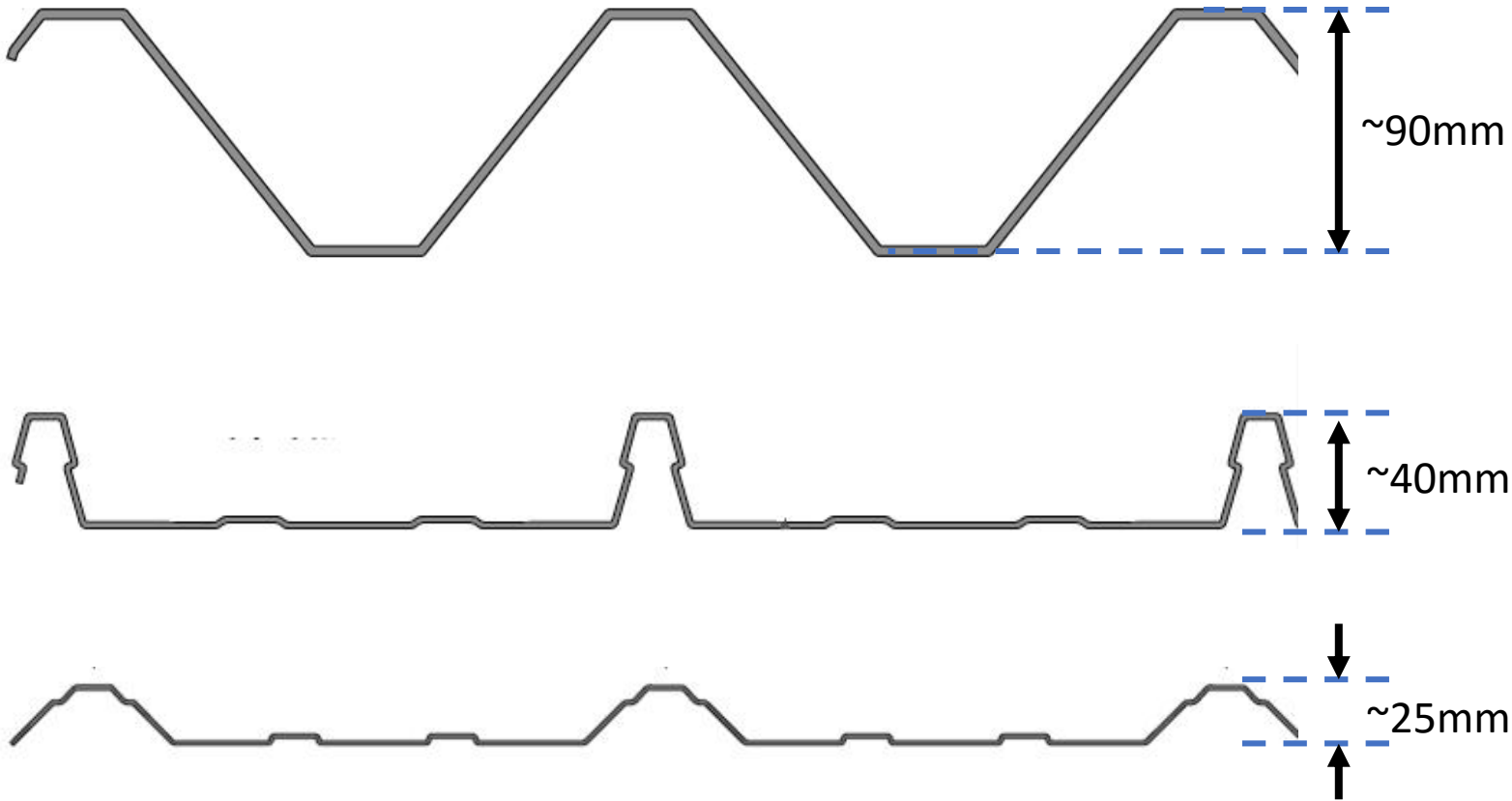
① ROOF PITCH CONSIDERATION

**DETERMINE  
THE WATER  
LEVEL ON THE  
ROOF**



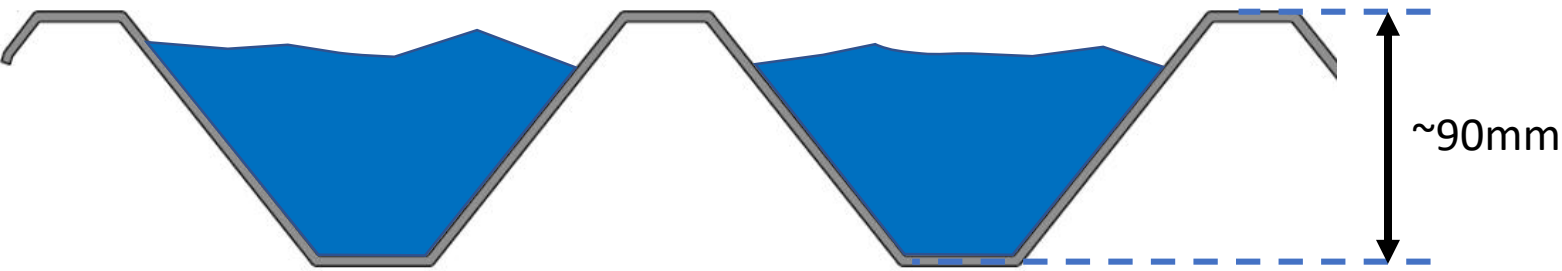
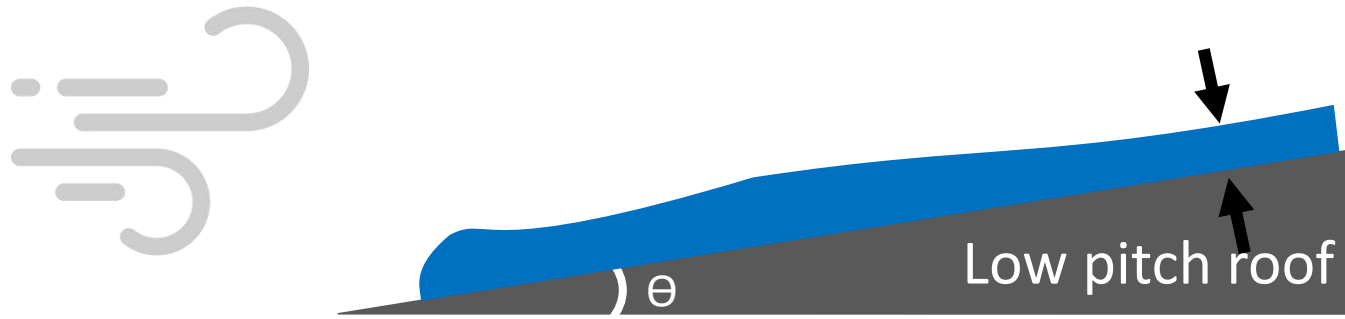


**RISK OF  
LEAKAGE IF  
WATER LEVEL  
BEYOND  
ROOF PROFILE  
HEIGHT**

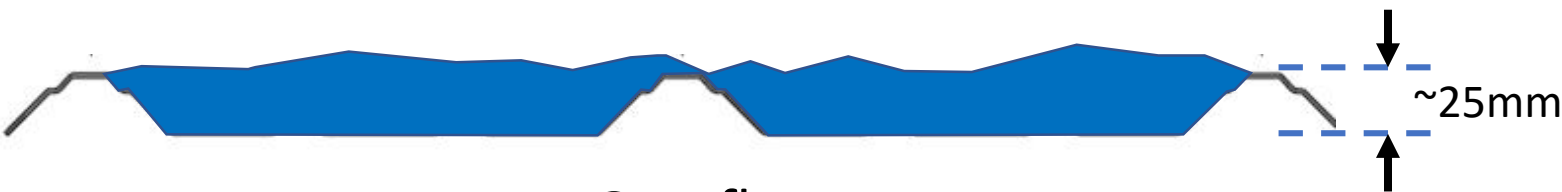


# PROFILE / RIB HEIGHT

1 ROOF PITCH CONSIDERATION



No overflow

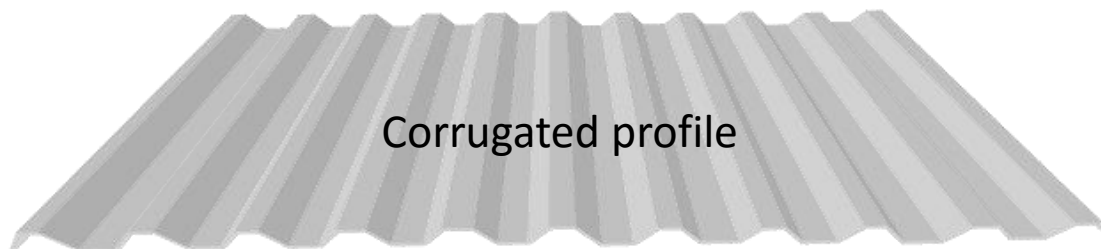


Overflow

**DIFFERENT  
PROFILE TO  
CATER WATER  
RUN-OFF**

Profile	CORRUGATED PROFILE
Steel Grade (N/mm <sup>2</sup> )	G550 ZINCALUME® steel
Effective Width of Coverage	700mm
Depth of Rib	24mm
Minimum Recommended Roof Pitch	3° (sheet length without end lap) 5° (sheet length with end lap)
Base Metal Thickness (BMT)	0.42mm
Total Coated Thickness (TCT)	0.47mm*

# MINIMUM ROOF PITCH RECOMMENDED IN BROCHURES



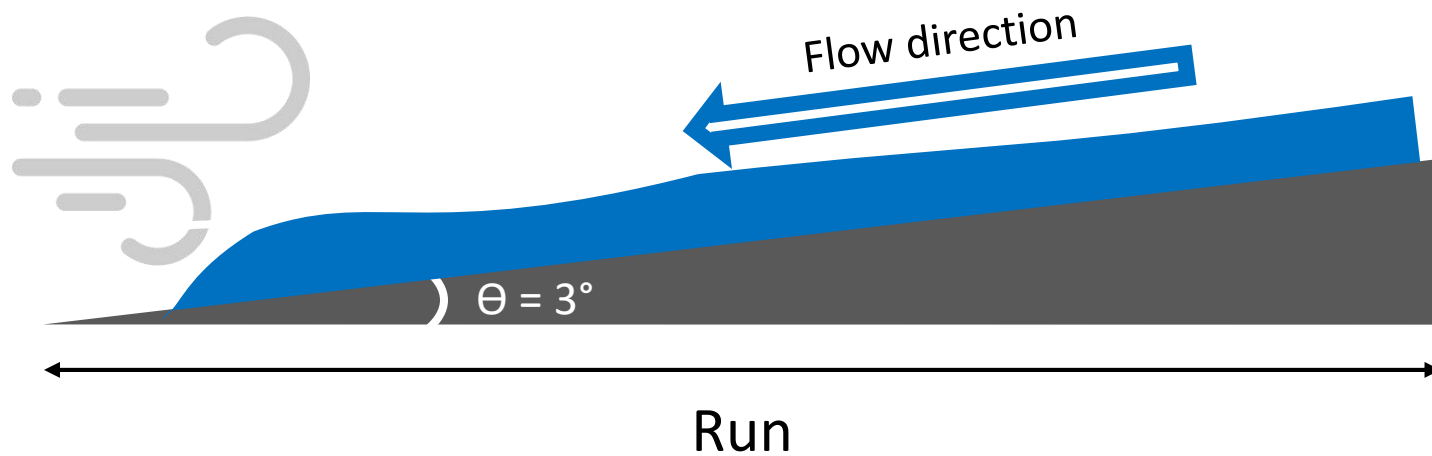
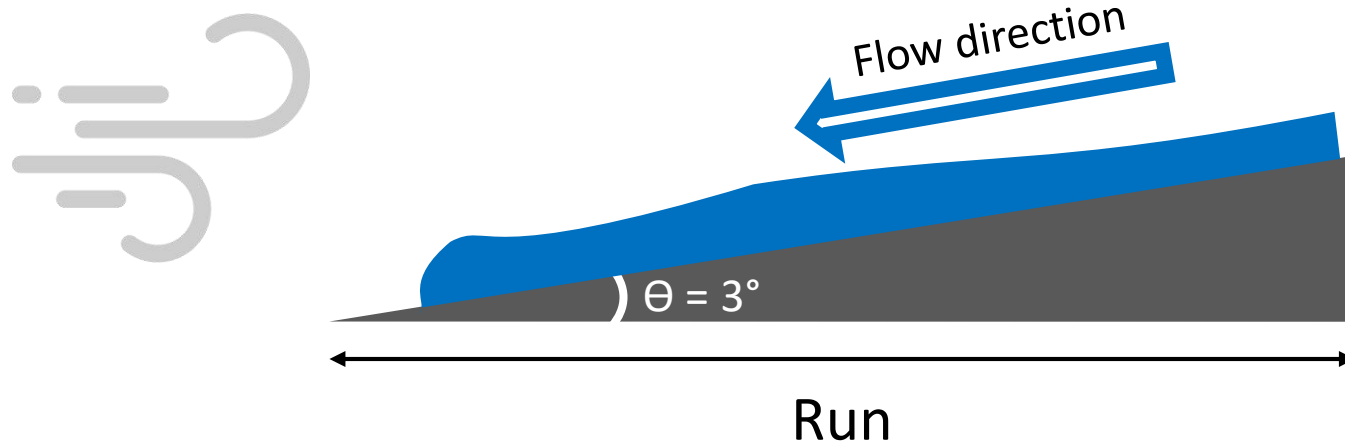
Steel Grade (MPa)	G550 (550MPa minimum yield stress)
Effective Width of Coverage	980mm
Depth of Rib	43mm
Minimum Recommended Roof Pitch	2° (1 in 30)
Base Metal Thickness	0.42mm, 0.48mm & 0.60mm

**MINIMUM  
ROOF PITCH  
RECOMMENDED  
IN BROCHURES**





# CONSTANT CLIMATE CHANGE



**LONGER  
ROOF RUN**

Corrugated Profile (Rib height = 29mm)

Rainfall Intensity (mm/hour)	Roof Slope			
	1 in 20 (3°)	1 in 12 (5°)	1 in 7.5( 7.5°)	1 in 6 (10°)
200	105	123	139	152
250	84	98	111	121
300	70	82	92	101
400	52	61	69	76

Unit in meter

Corrugated Profile (Rib height = 24mm)

Rainfall Intensity (mm/hour)	Roof Slope			
	1 in 20 (3°)	1 in 12 (5°)	1 in 7.5(7.5°)	1 in 6(10°)
150	43	51	57	63
200	32	38	43	47
250	26	30	34	38
300	22	25	28	31
400	16	19	21	23

Unit in meter

**MAXIMUM LENGTH GIVEN RAIN INTENSITY & ROOF PITCH**

Concealed Fixed Profile (Rib height = 43mm)

Peak rainfall intensity (mm/hr)	Roof Slope (degrees)					
	2	3	4	5	8	10
100	502	588	663	732	873	1003
150	334	392	442	488	582	669
200	251	294	331	366	436	502
250	201	235	265	293	349	401
300	167	196	221	244	291	334
400	125	147	166	183	218	251
500	100	118	133	146	175	201

**HIGHER RIB  
CAN CATER  
LONGER  
ROOF LENGTH**

Penetrations will alter the flow of water on a roof. For assistance in design of roofs with penetrations, please seek advice from our information line.

# 1 ROOF PITCH CONSIDERATION

## CASE STUDY ON LONG LENGTH ROOF



1 ROOF PITCH CONSIDERATION

**DEEP  
CORRUGATION  
CAN CARRY  
MORE WATER**

# ① ROOF PITCH CONSIDERATION

**ABLE TO  
SUSTAIN MORE  
LOAD**

# ① ROOF PITCH CONSIDERATION

**SHOW NO  
SIGN OF  
PONDING**





① ROOF PITCH CONSIDERATION

**INTERNALLY  
NO LEAKAGE**



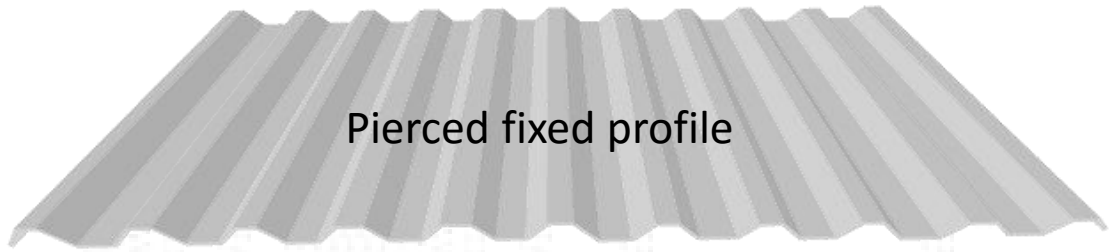
2

# PROFILE & BUILDING GEOMETRY

**STEEL  
PROFILES CAN  
HELP FORM  
BUILDINGS  
INTO  
DIFFERENT  
SHAPES**

# TO BUILD BUILDINGS IN WIDE ARRAY OF GEOMETRIES

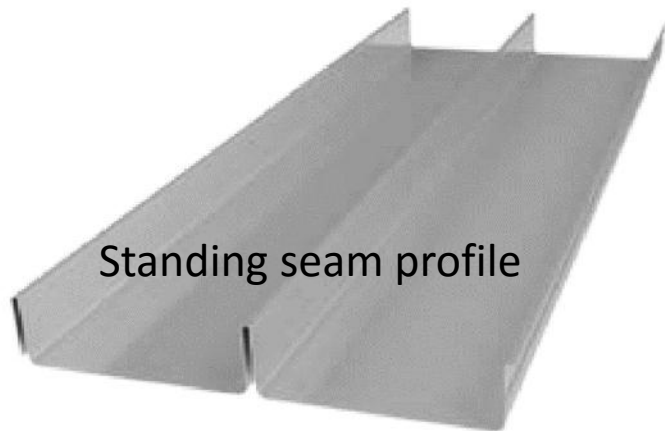
**AND STILL BE  
SECURED &  
LOCKED  
PROPERLY  
ONTO THE  
STRUCTURE**



Pierced fixed profile



Concealed fixed profile



Standing seam profile

# USING DIFFERENT VERSATILE PROFILES

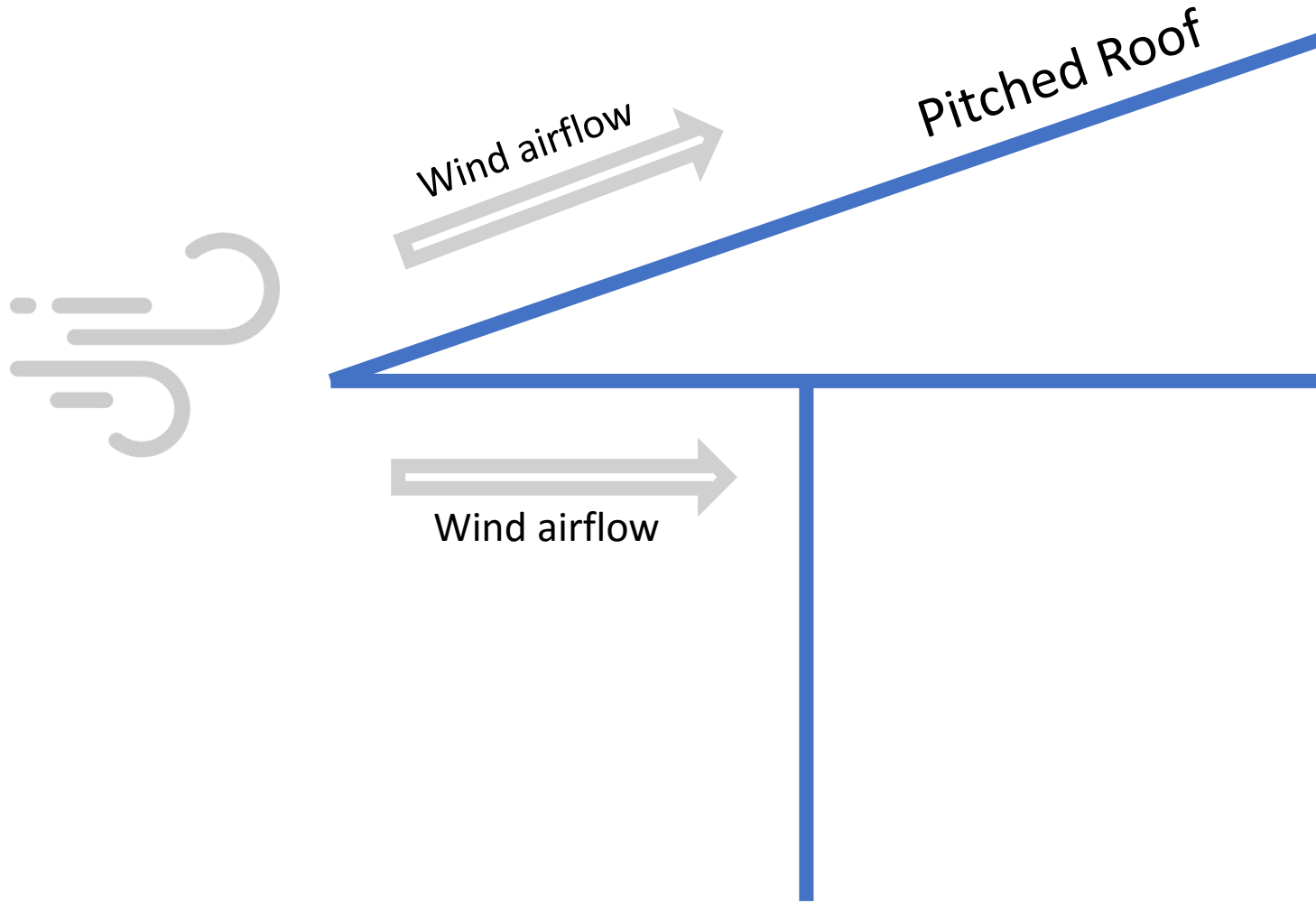


# CLIMATE CHANGE POSTS RISK TO BUILDINGS

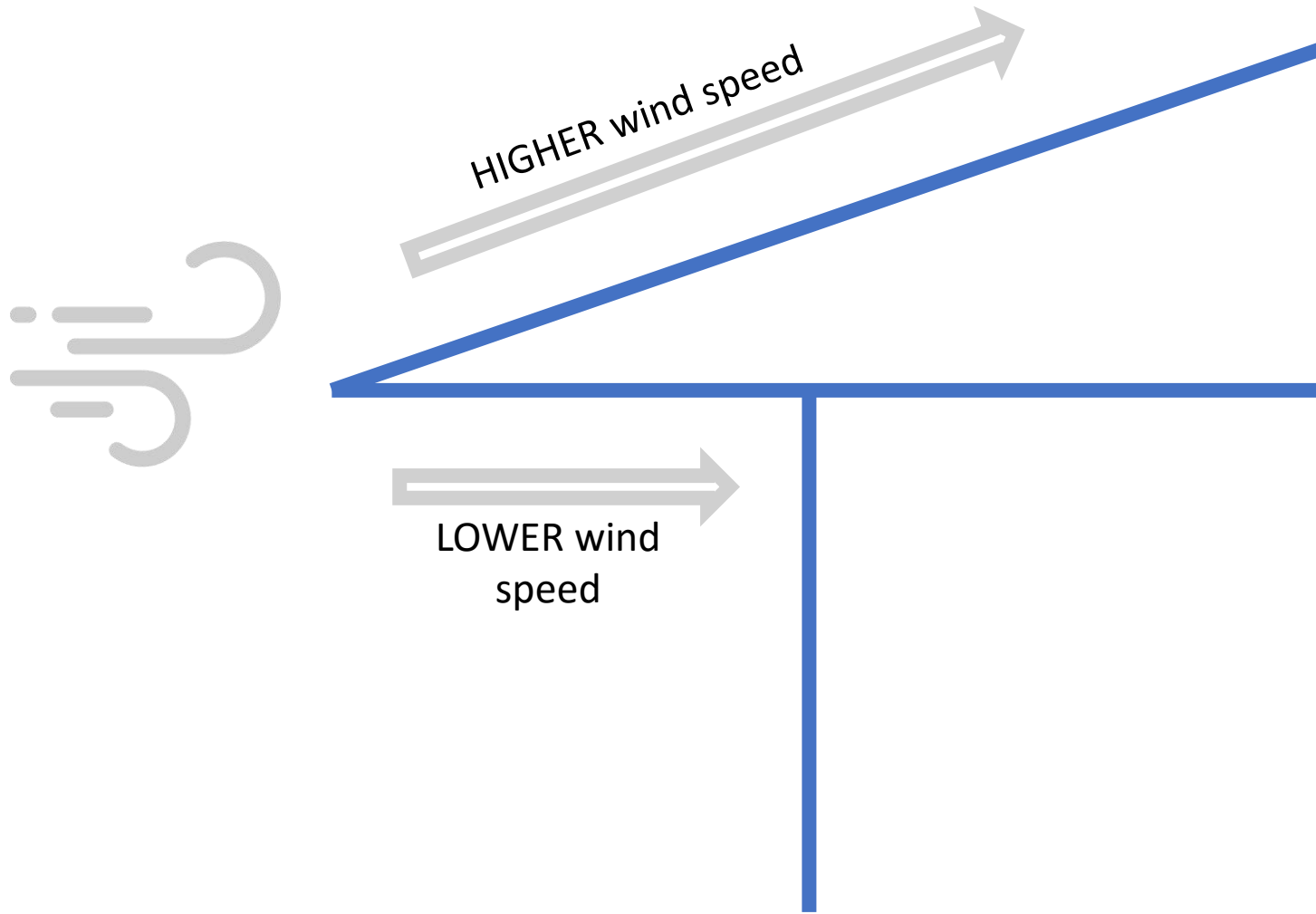


# HOW TO PREVENT WIND UPLIFT?

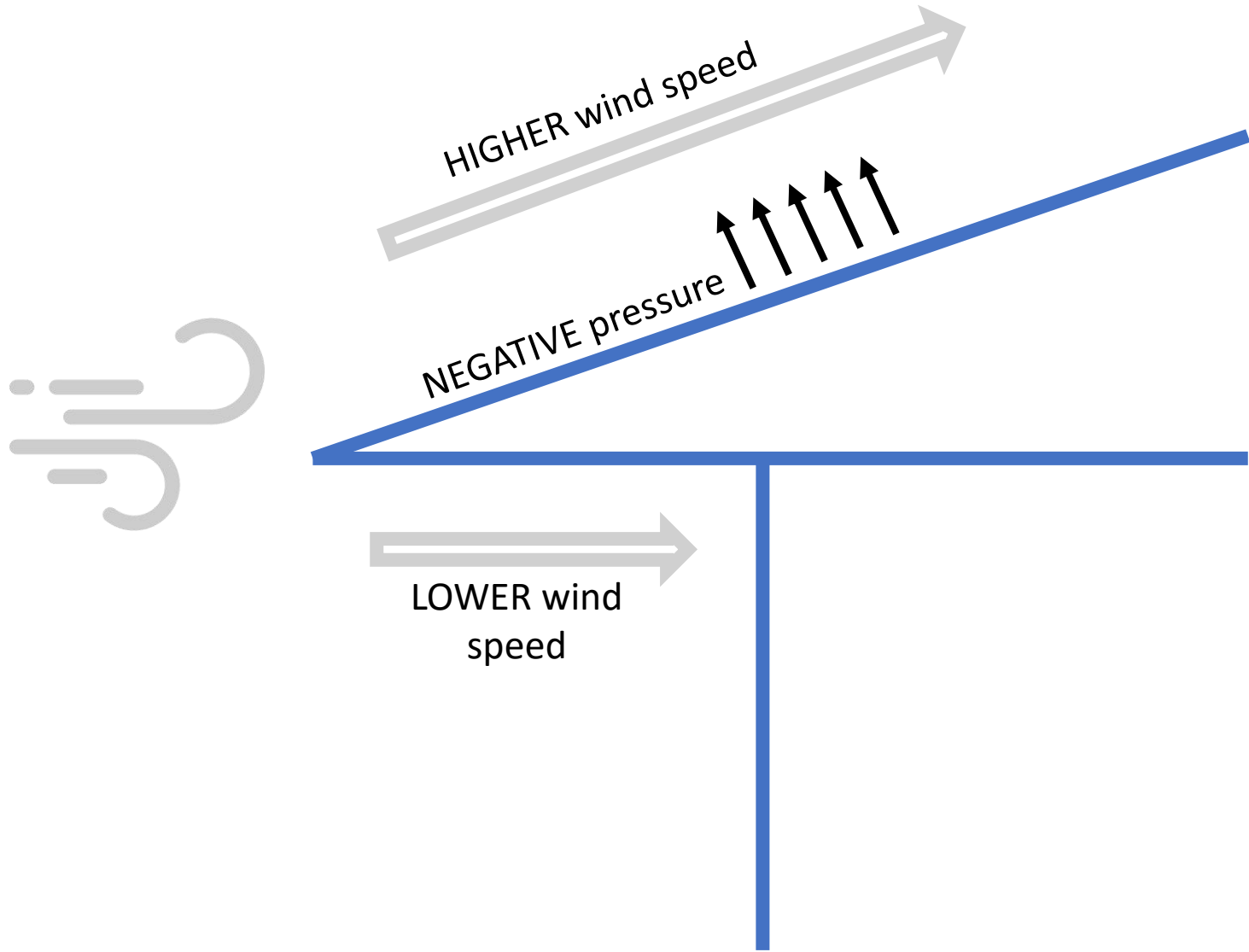




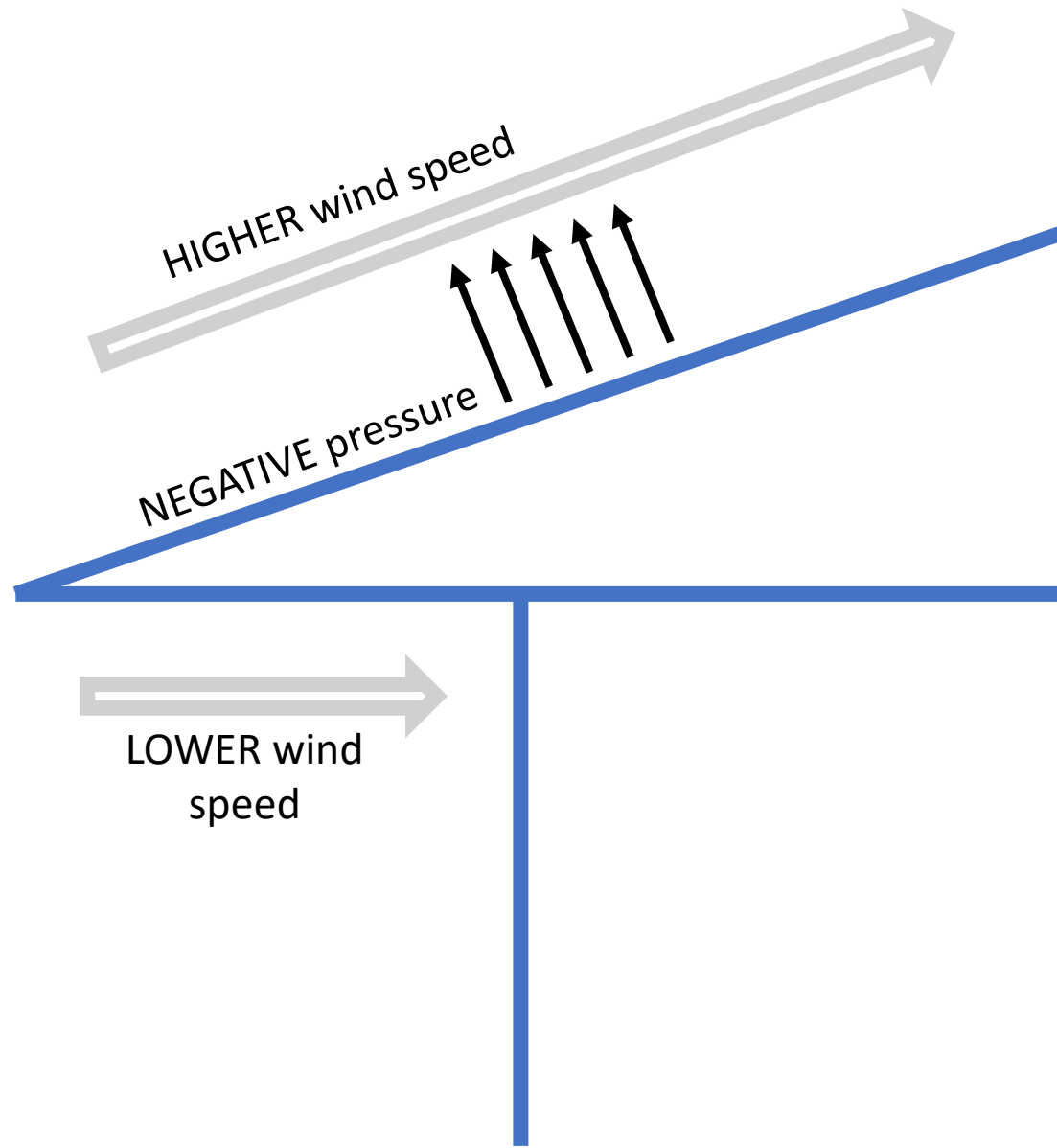
# WIND BLOWN AT A BUILDING



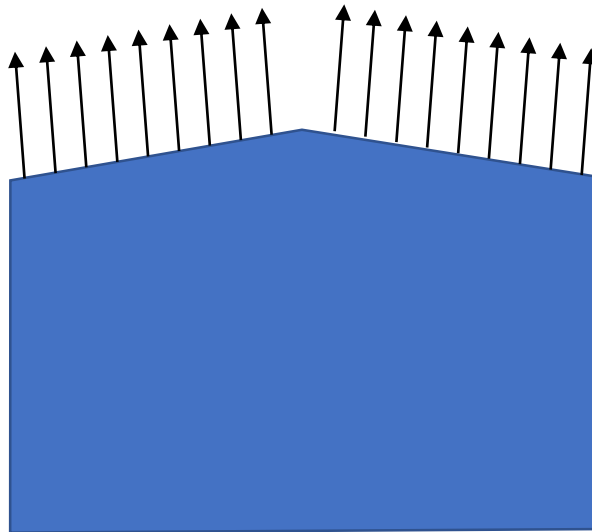
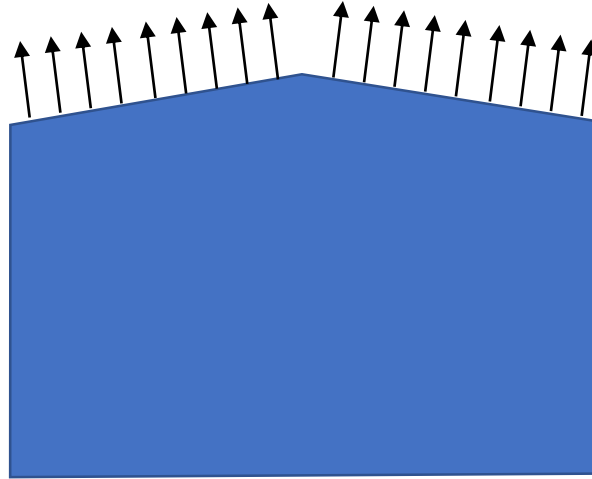
# WIND SPEED DIFFERENCE



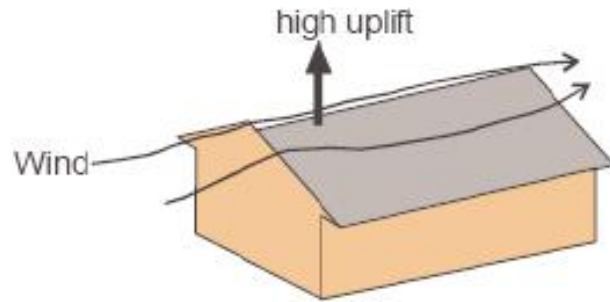
**SIDE WITH  
HIGHER WIND  
SPEED =  
NEGATIVE  
PRESSURE**



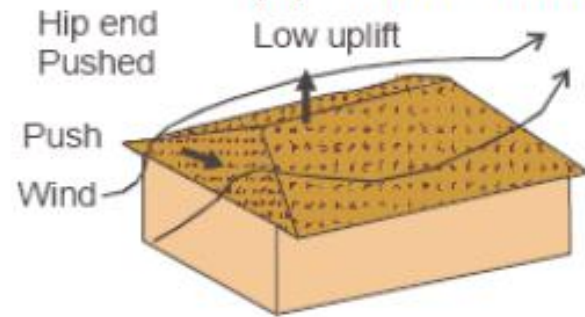
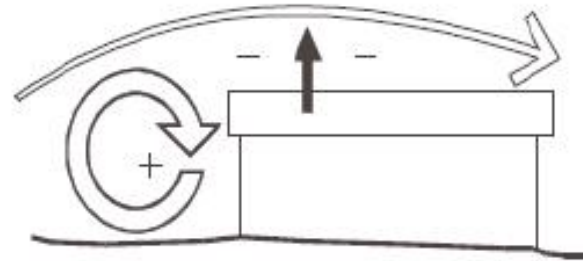
**STRONGER  
WIND =  
HIGHER  
NEGATIVE  
PRESSURE**



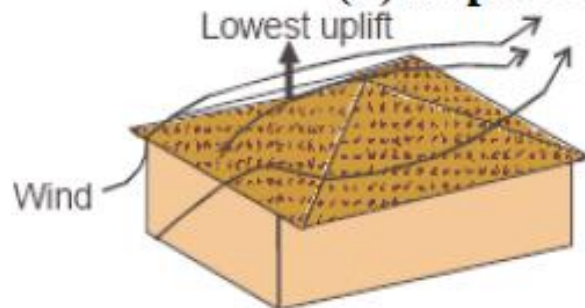
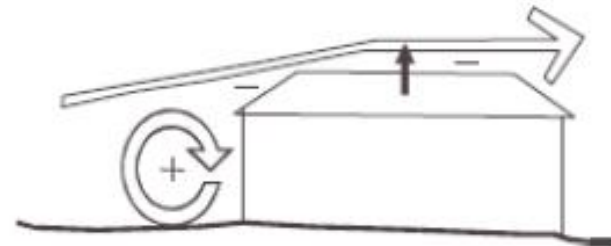
**AFFECTED BY  
WIND SPEED**



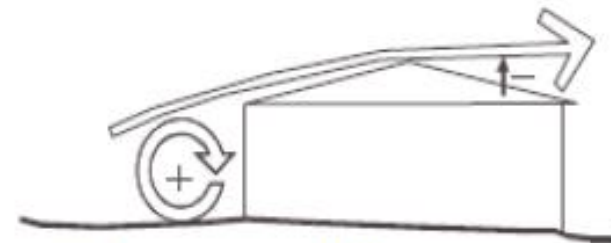
**(a) Gable ended roofs gets high uplift**



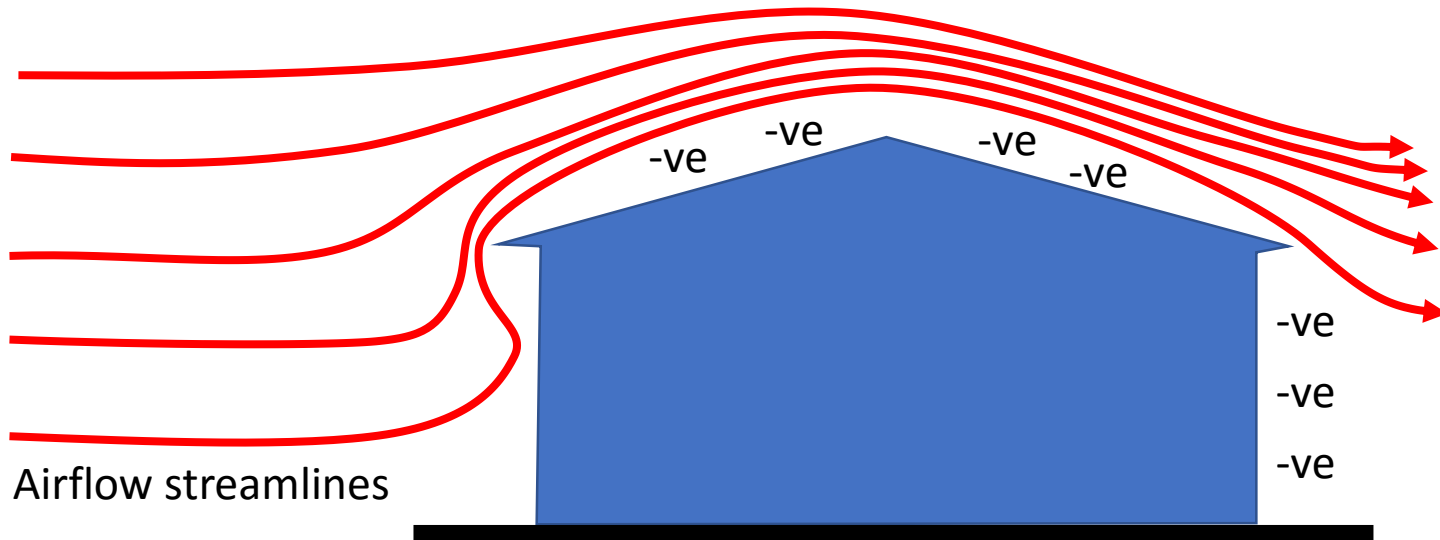
**(b) Hip roofs gets lower uplift**



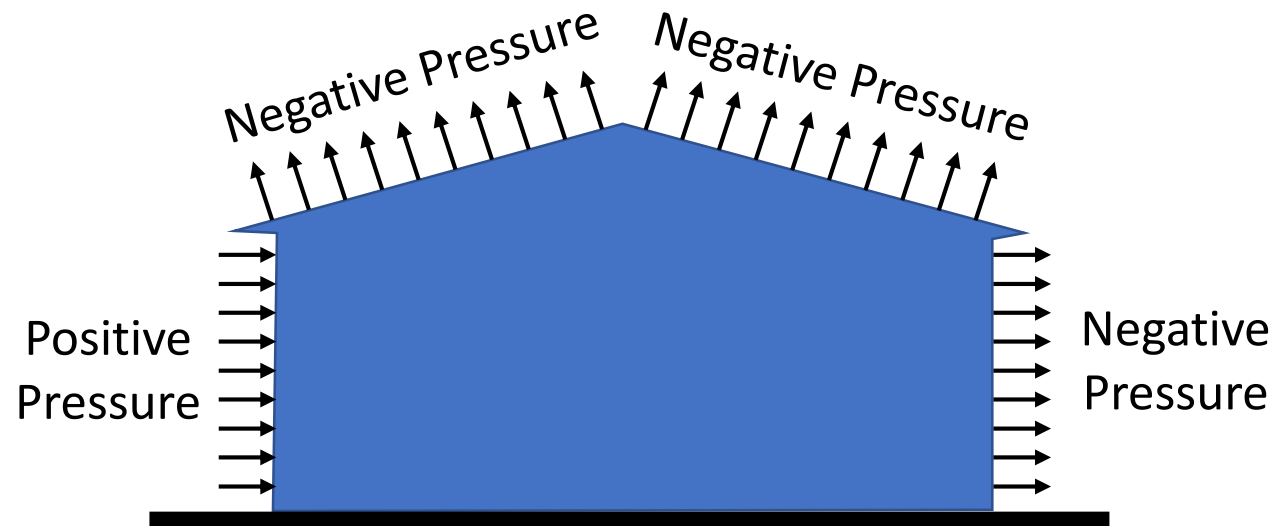
**(c) Pyramidal roofs gets lowest uplift**



# GEOMETRY OF BUILDING CAN AFFECT THE WIND UPLIFT TENDENCY

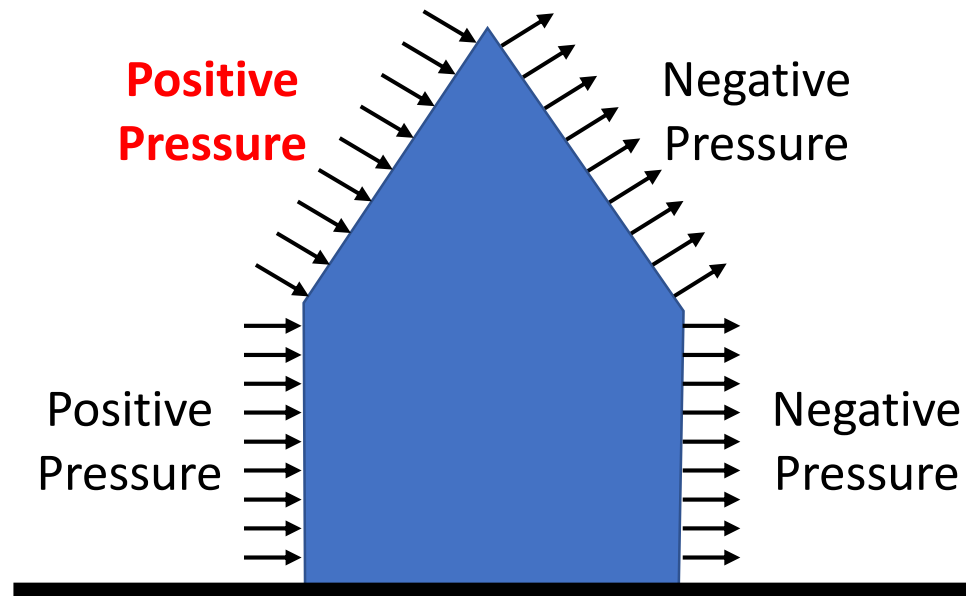


# WIND AIRFLOW DIRECTION

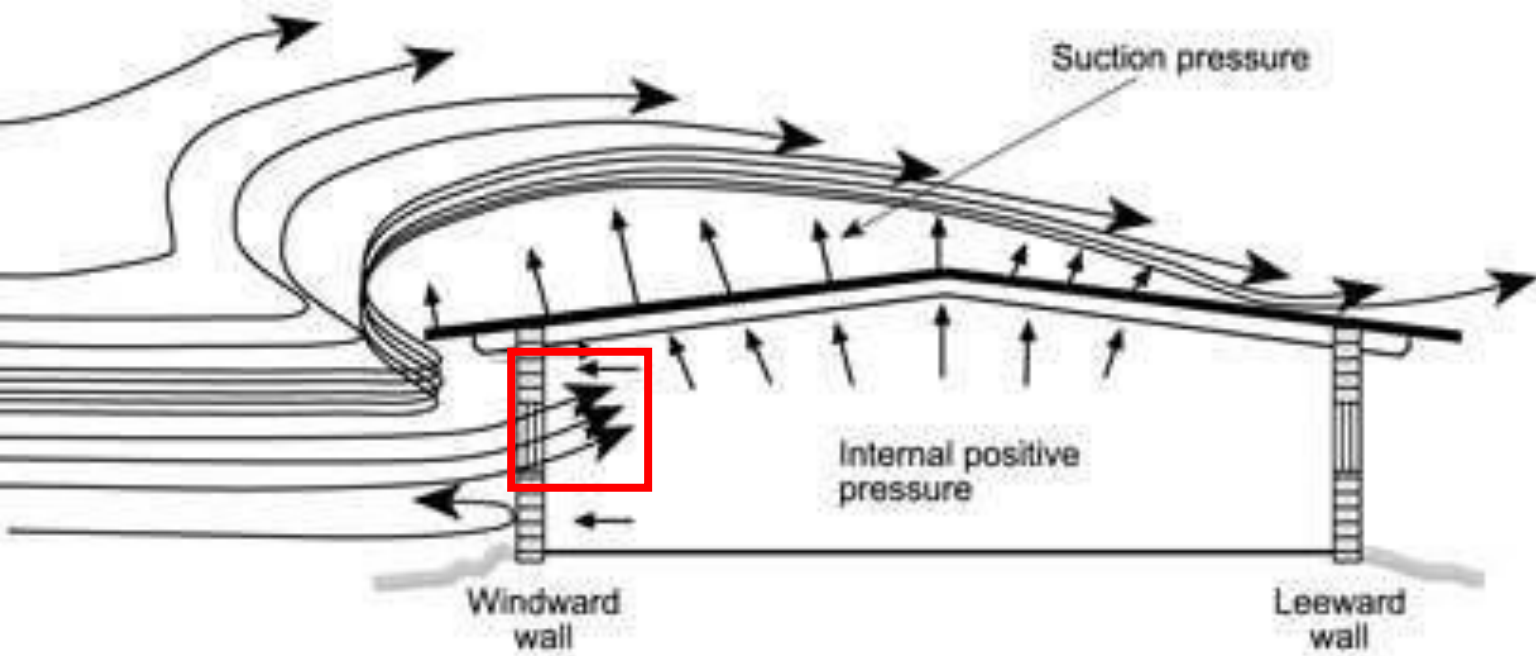


# AREAS OF POSITIVE & NEGATIVE PRESSURE

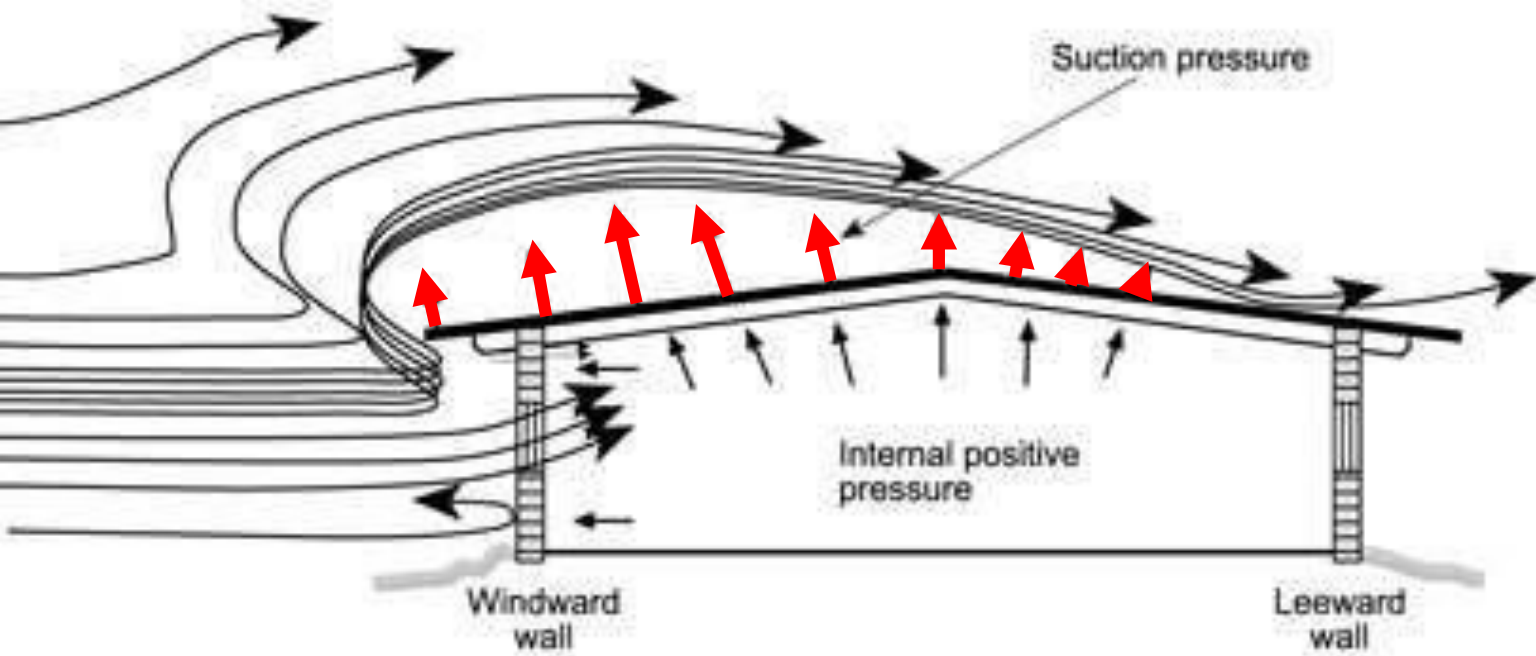




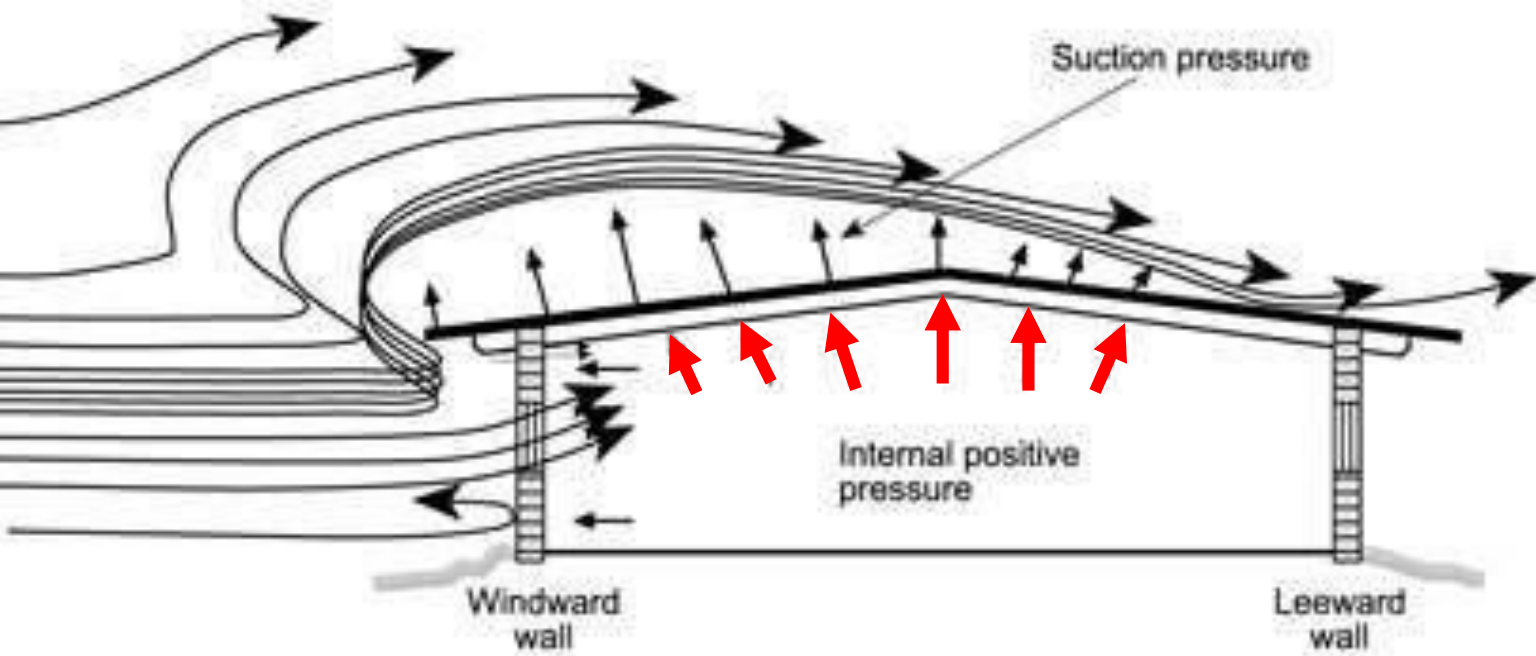
# AREAS OF POSITIVE & NEGATIVE PRESSURE



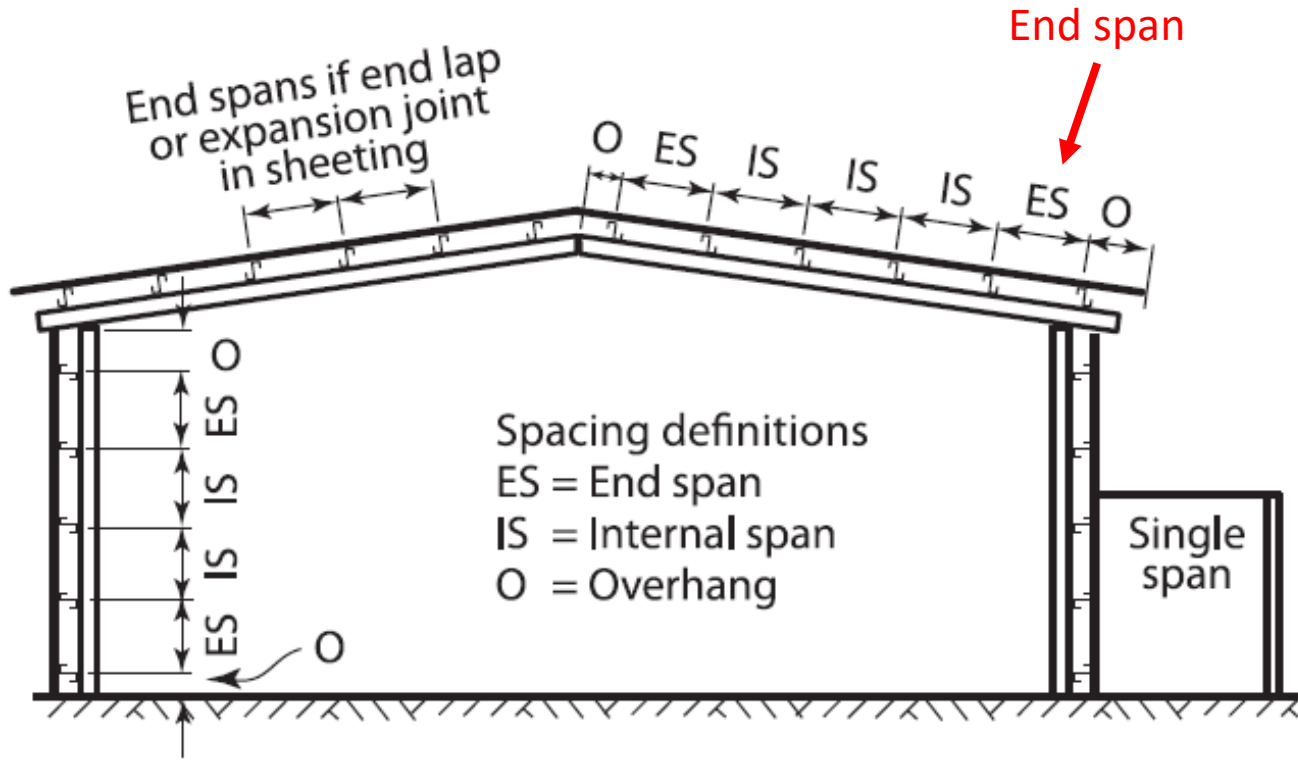
# HOW ABOUT BUILDING WITH OPENINGS?



# NEGATIVE PRESSURE FROM EXTERNAL



# POSITIVE PRESSURE FROM INTERNAL



# DETERMINE PROFILE LOCKING STRENGTH

# LOCKING FORCE FOR CONCEALED FIXED PROFILE

Concealed Fixed Profile  
(0.42mm BMT) ←

With edge stiffener (mm)

Span type		900	1200	1500	1800	2100	2400
Single	Serviceability	2.05	1.65	1.29	0.96	0.70	0.52
	Strength*	5.16	4.70	4.25	3.83	3.44	3.10
End	Serviceability	1.44	1.20	1.01	0.87	0.79	0.72
	Strength*	3.64	2.79	2.07	1.60	1.32	1.17
Internal	Serviceability	0.97	0.85	0.74	0.71	0.69	0.67
	Strength*	2.92	2.26	1.74	1.48	1.40	1.38

Concealed Fixed Profile  
(0.48mm BMT) ←

With edge stiffener (mm)

Span type		900	1200	1500	1800	2100	2400
Single	Serviceability	2.57	2.07	1.60	1.19	0.85	0.62
	Strength*	7.13	6.07	5.07	4.19	3.51	3.07
End	Serviceability	1.73	1.54	1.36	1.18	1.03	0.89
	Strength*	3.78	3.26	2.74	2.24	1.81	1.48
Internal	Serviceability	1.43	1.19	1.02	1.01	0.98	0.94
	Strength*	3.65	2.76	2.10	2.00	1.90	1.80

Unit in kPa



# LOCKING FORCE FOR CONCEALED FIXED PROFILE

Concealed Fixed Profile (0.42mm BMT) ←		With edge stiffener (mm)					
Span type		900	1200	1500	1800	2100	2400
Single	Serviceability	2.05	1.65	1.29	0.96	0.70	0.52
	Strength*	5.16	4.70	4.25	3.83	3.44	3.10
End	Serviceability	1.44	1.20	1.01	0.87	0.79	0.72
	Strength*	3.64	2.79	2.07	1.60	1.32	1.17
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Concealed Fixed Profile (0.48mm BMT) ←		With edge stiffener (mm)					
Span type		900	1200	1500	1800	2100	2400
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	Strength*	7.13	6.07	5.07	4.19	3.51	3.07
End	Serviceability	1.73	1.54	1.36	1.18	1.03	0.89
	Strength*	3.78	3.26	2.74	2.24	1.81	1.48
Internal	Serviceability	1.43	1.19	1.02	1.01	0.98	0.94
	Strength*	3.65	2.76	2.10	2.00	1.90	1.80

Unit in kPa



# LOCKING FORCE FOR CONCEALED FIXED PROFILE

Concealed Fixed Profile (0.42mm BMT) ←		With edge stiffener (mm)					
Span type		900	1200	1500	1800	2100	2400
Single	Serviceability	2.05	1.65	1.29	0.96	0.70	0.52
	Strength*	5.16	4.70	4.25	3.83	3.44	3.10
End	Serviceability	1.44	1.20	1.01	0.87	0.79	0.72
	Strength*	3.64	2.79	2.07	1.60	1.32	1.17
Internal	Serviceability	0.97	0.85	0.74	0.71	0.69	0.67
	Strength*	2.92	2.26	1.74	1.48	1.40	1.38

Concealed Fixed Profile (0.48mm BMT) ←		With edge stiffener (mm)					
Span type		900	1200	1500	1800	2100	2400
Single	Serviceability	2.57	2.07	1.60	1.19	0.85	0.62
	Strength*	7.13	6.07	5.07	4.19	3.51	3.07
End	Serviceability	1.73	1.54	1.36	1.18	1.03	0.89
	Strength*	3.78	3.26	2.74	2.24	1.81	1.48
Internal	Serviceability	1.43	1.19	1.02	1.01	0.98	0.94
	Strength*	3.65	2.76	2.10	2.00	1.90	1.80

Unit in kPa





Pierced fixed corrugated profile (0.42mm BMT)

Type of Span	Fasteners per sheet per support	Limit State	Span (mm)					
			900	1200	1500	1800	2100	2400
Single	3 ←	Serviceability	2.04	1.64	1.27	0.96	0.72	0.54
		Strength	9.30	7.60	6.05	4.80	3.85	3.25
	4 ←	Serviceability	4.24	3.07	2.02	1.20	0.68	0.42
		Strength	11.40	9.20	7.35	5.80	4.75	4.10
End	3	Serviceability	2.05	1.83	1.60	1.40	1.21	1.02
		Strength	6.50	4.90	3.60	2.60	2.05	1.70
	4	Serviceability	3.75	3.19	2.67	2.20	1.78	1.41
		Strength	7.70	6.30	5.10	4.15	3.50	3.00
Internal	3	Serviceability	1.96	1.81	1.67	1.52	1.37	1.23
		Strength	7.70	6.40	5.20	4.20	3.20	2.50
	4	Serviceability	4.74	4.05	3.38	2.67	2.20	1.73
		Strength	9.50	7.55	6.00	4.80	3.90	3.30

Unit in kPa



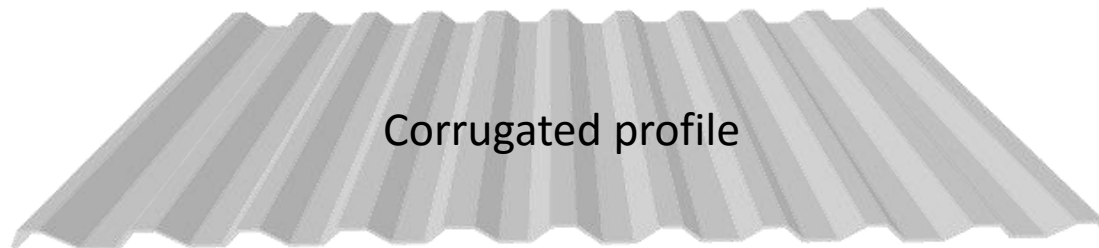
# LOCKING FORCE FOR CORRUGATED PROFILE

Pierced fixed corrugated profile (0.42mm BMT)

Type of Span	Fasteners per sheet per support	Limit State	Span (mm)					
			900	1200	1500	1800	2100	2400
Single	3	Serviceability	2.04	1.64	1.27	0.96	0.72	0.54
		Strength	9.30	7.60	6.05	4.80	3.85	3.25
	4	Serviceability	4.24	3.07	2.02	1.20	0.68	0.42
		Strength	11.40	9.20	7.35	5.80	4.75	4.10
End	3 ←	Serviceability	2.05	1.83	1.60	1.40	1.21	1.02
		Strength	6.50	4.90	3.60	2.60	2.05	1.70
	4 ←	Serviceability	3.75	3.19	2.67	2.20	1.78	1.41
		Strength	7.70	6.30	5.10	4.15	3.50	3.00
Internal	3	Serviceability	1.96	1.81	1.67	1.52	1.37	1.23
		Strength	7.70	6.40	5.20	4.20	3.20	2.50
	4	Serviceability	4.74	4.05	3.38	2.67	2.20	1.73
		Strength	9.50	7.55	6.00	4.80	3.90	3.30

# LOCKING FORCE FOR CORRUGATED PROFILE

Unit in kPa

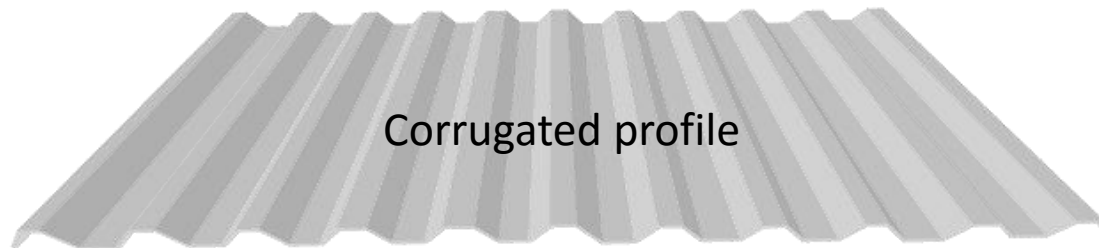


Pierced fixed corrugated profile (0.42mm BMT)

Type of Span	Fasteners per sheet per support	Limit State	Span (mm)					
			900	1200	1500	1800	2100	2400
Single	3	Serviceability	2.04	1.64	1.27	0.96	0.72	0.54
		Strength	9.30	7.60	6.05	4.80	3.85	3.25
	4	Serviceability	4.24	3.07	2.02	1.20	0.68	0.42
		Strength	11.40	9.20	7.35	5.80	4.75	4.10
End	3 ←	Serviceability	2.05	1.83	1.60	1.40	1.21	1.02
		Strength	6.50	4.90	3.60	2.60	2.05	1.70
	4 ←	Serviceability	3.75	3.19	2.67	2.20	1.78	1.41
		Strength	7.70	6.30	5.10	4.15	3.50	3.00
Internal	3	Serviceability	1.96	1.81	1.67	1.52	1.37	1.23
		Strength	7.70	6.40	5.20	4.20	3.20	2.50
	4	Serviceability	4.74	4.05	3.38	2.67	2.20	1.73
		Strength	9.50	7.55	6.00	4.80	3.90	3.30

# LOCKING FORCE FOR CORRUGATED PROFILE

Unit in kPa





3

# TREATMENT OF UNWASHED AREAS

**DURABLE  
MATERIAL THAT  
CAN  
WITHSTAND  
MARINE  
CONDITION**

③ TREATMENT OF UNWASHED AREA

**DURABLE  
MATERIAL THAT  
CAN  
WITHSTAND  
MARINE  
CONDITION**

# 15 YEARS STEEL CLADDING IN MARINE CONDITION



# WHAT IS UNWASHED AREA?



# WHAT IS CONSIDERED AS UNWASHED AREA?

### 3 TREATMENT OF UNWASHED AREA



**WHAT IS  
CONSIDERED  
AS  
UNWASHED  
AREA?**

# SALT-LADEN AIR

# INDUSTRIAL CONTAMINANT

**SIGN OF SALT  
SETTLEMENT  
ON  
UNWASHED  
AREA**

# INDUSTRIAL DUST SETTLEMENT ON UNWASHED AREA

# INDUSTRIAL CONTAMINANT ON WASHED AREA

### ③ TREATMENT OF UNWASHED AREA

**>20 YEARS IN  
INDUSTRIAL  
ENVIRONMENT  
(WASHED  
AREA)**



### ③ TREATMENT OF UNWASHED AREA

**>20 YEARS IN  
INDUSTRIAL  
ENVIRONMENT  
(WASHED  
AREA)**



WASHED AREA



UNWASHED  
AREA

③ TREATMENT OF UNWASHED AREA

**>30 YEARS IN  
INDUSTRIAL  
ENVIRONMENT  
(WASHED VS  
UNWASHED)**



UNWASHED  
AREA

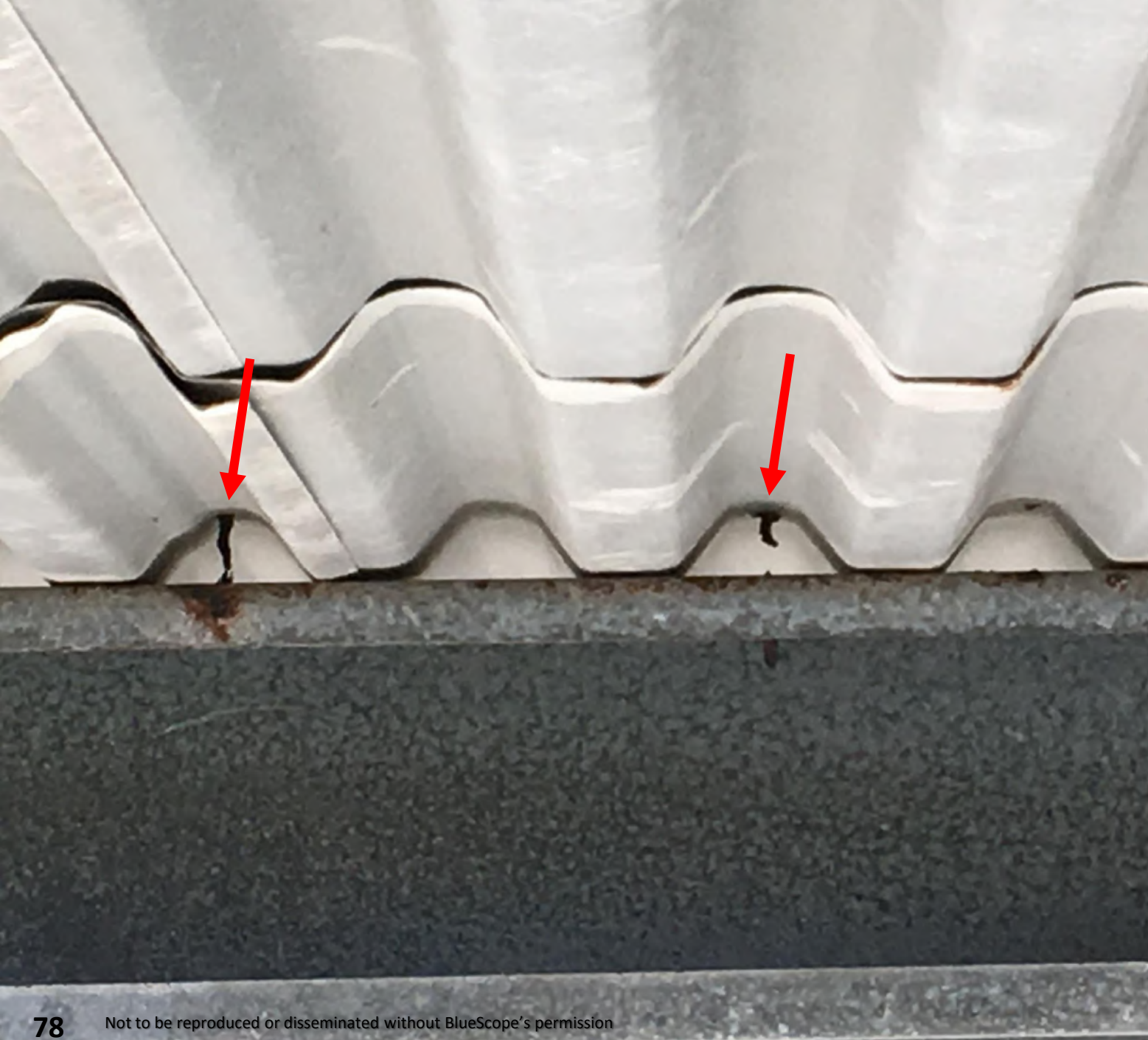
③ TREATMENT OF UNWASHED AREA

>30 YEARS IN  
INDUSTRIAL  
ENVIRONMENT  
(UNWASHED  
AREA)

**WHY SHOULD  
WE PAY  
ATTENTION TO  
THE  
UNWASHED  
AREA?**



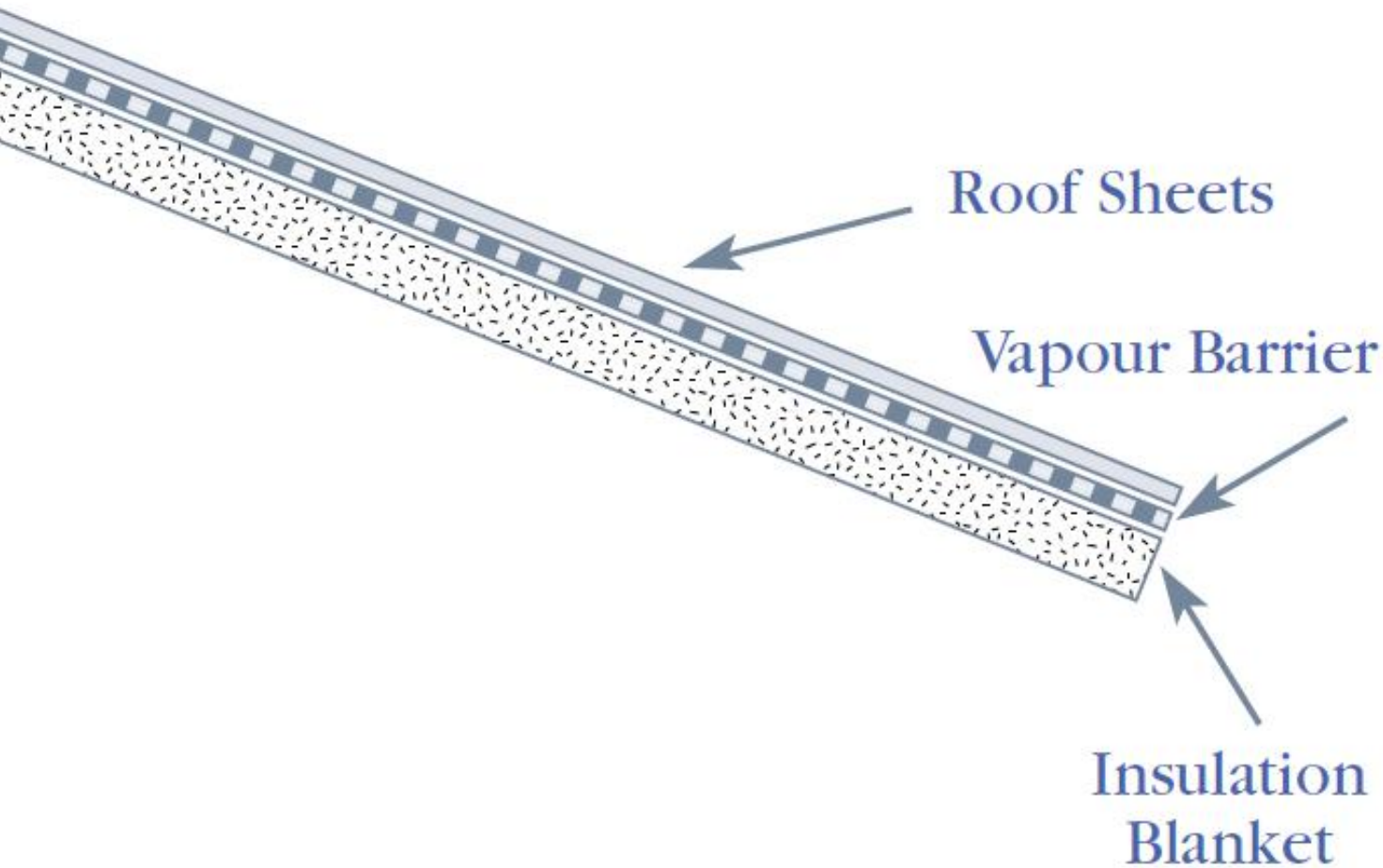
# POTENTIAL UNWASHED AREA CORROSION



**POTENTIAL  
DETACHMENT  
FROM  
STRUCTURE**

# MINIMIZE EFFECT OF UNWASHED AREA





**OR ELIMINATE  
UNWASHED  
AREAS  
ENTIRELY BY  
PAIRING WITH  
VAPOUR  
BARRIER**



### 3 TREATMENT OF UNWASHED AREA

**EXAMPLE  
CAN BE FOIL  
MATERIAL**



③ TREATMENT OF UNWASHED AREA

**TO SHIELD THE  
UNWASHED  
SURFACES  
FROM  
EXTERNAL  
EXPOSURE**

③ TREATMENT OF UNWASHED AREA

**TO SHIELD THE  
UNWASHED  
SURFACES  
FROM  
EXTERNAL  
EXPOSURE**





# CEILING & VAPOUR BARRIER

# CEILING & VAPOUR BARRIER





4

# IMMERSION AREAS

Steel cladding

Dwarf wall

# DWARF WALL + STEEL CLADDING

4 PREVENTION OF CLADDING IMMERSION



Steel cladding

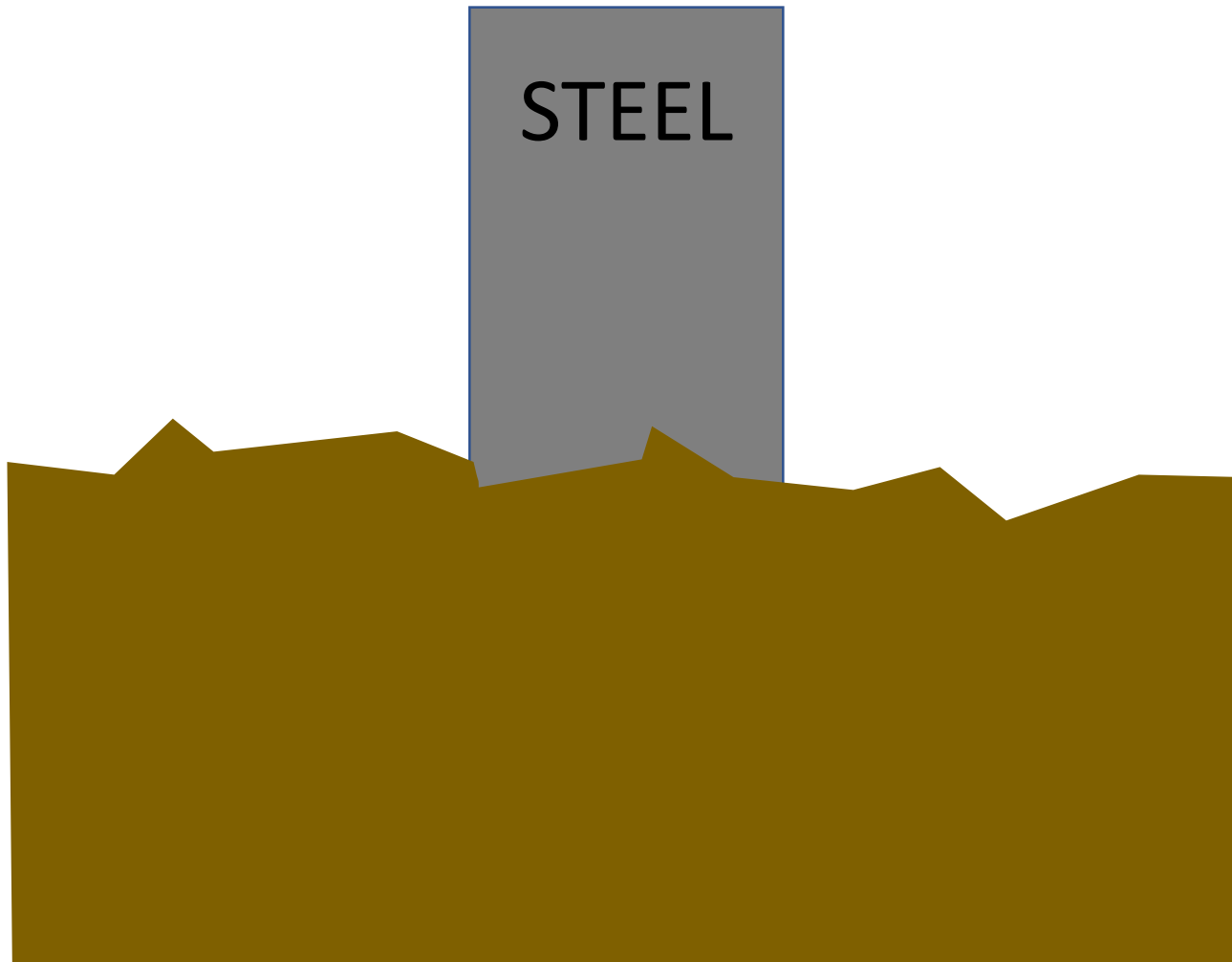
STEEL CLADDING

11/11/2019 03:15 PM

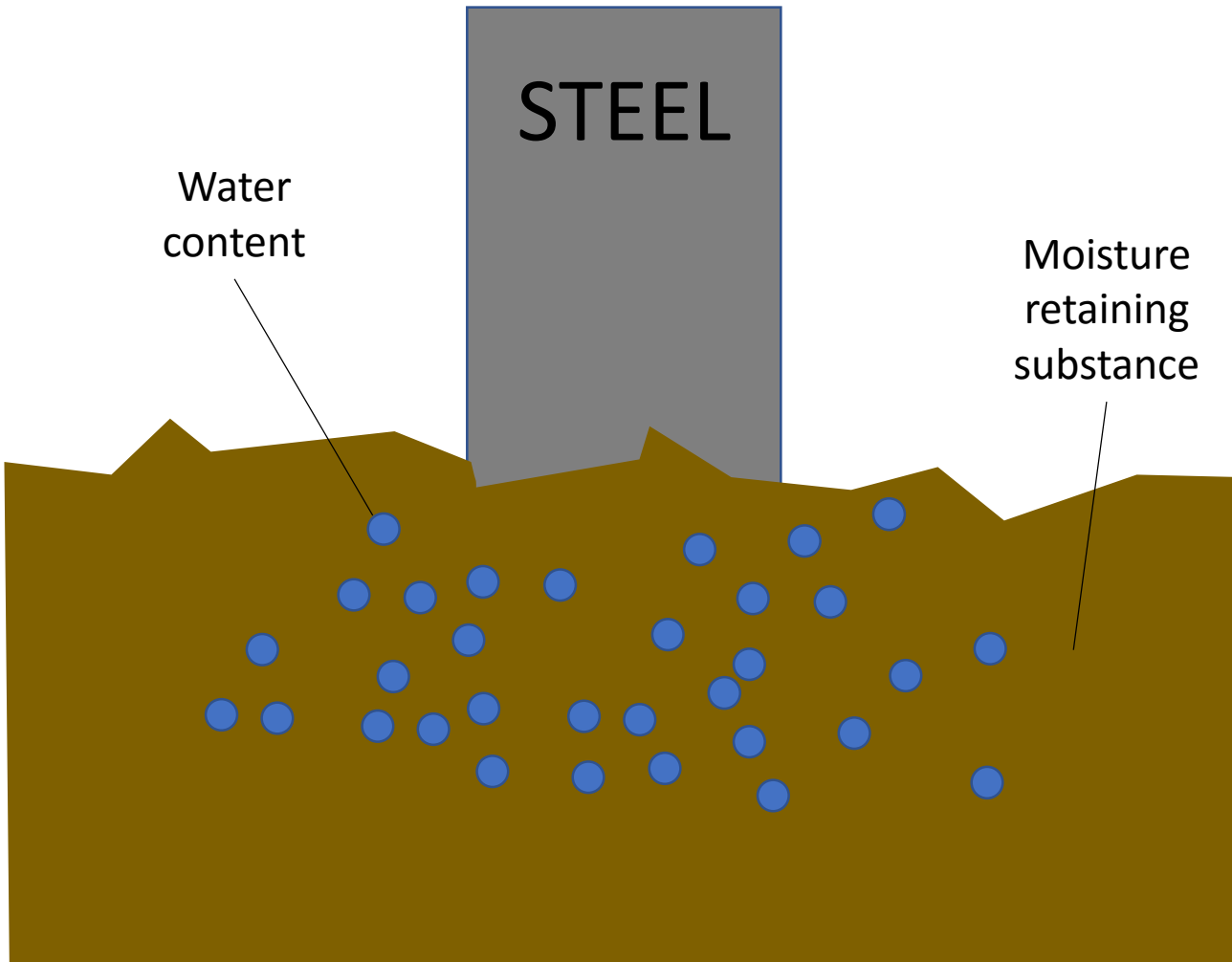


# WHAT IS DEFINED AS IMMERSED AREA?

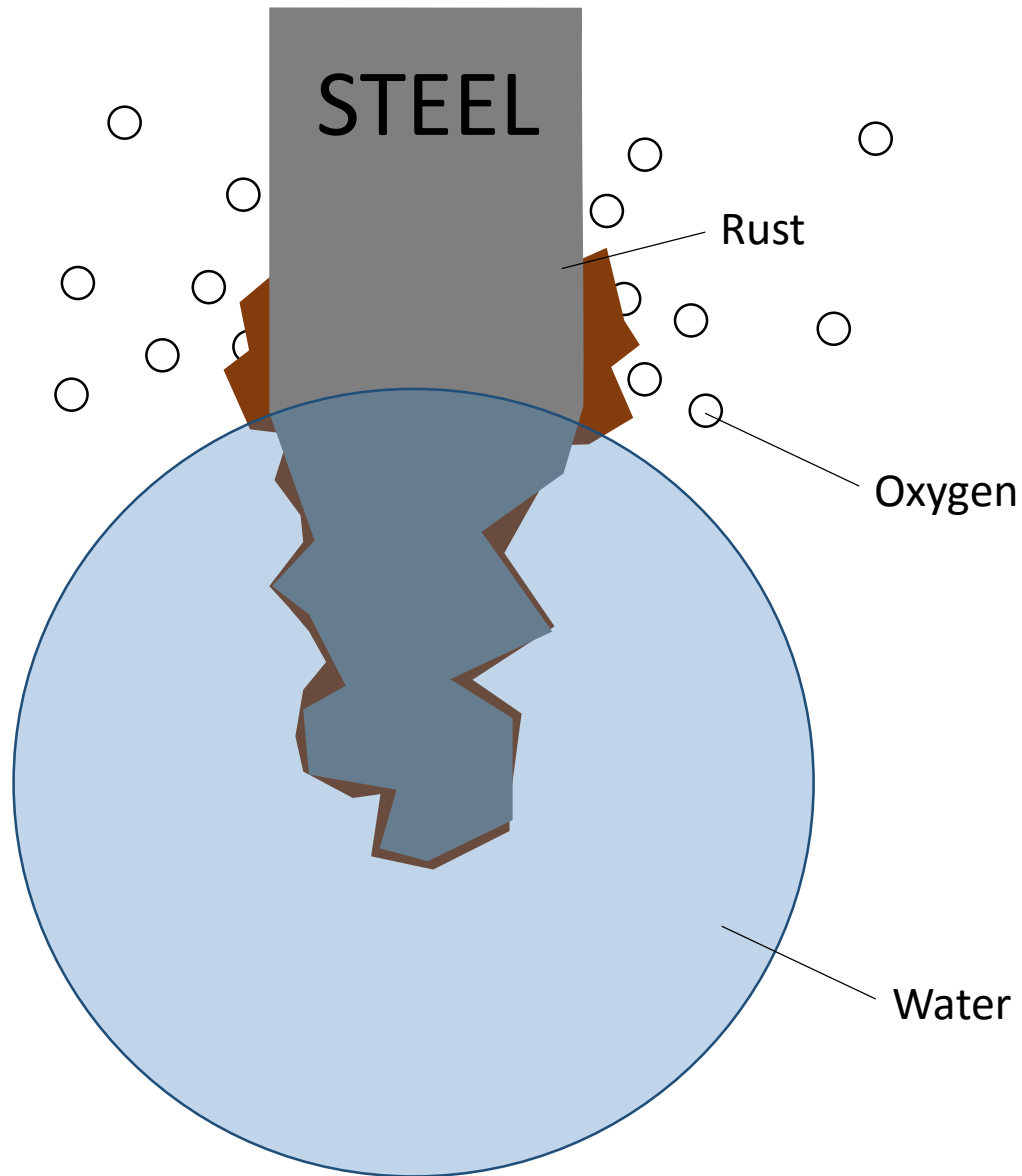




**WHAT IS  
DEFINED AS  
IMMERSED  
AREA?**



WHAT IS  
DEFINED AS  
IMMERSED  
AREA?



# CORROSION REACTION AT IMMERSED AREA

4 PREVENTION OF CLADDING IMMERSION

HOW DOES  
IMMERSED  
AREA LOOK  
LIKE?



4 PREVENTION OF CLADDING IMMERSION

HOW DOES  
IMMERSED  
AREA LOOK  
LIKE?



4 PREVENTION OF CLADDING IMMERSION

HOW DOES  
IMMERSED  
AREA LOOK  
LIKE?

**4** PREVENTION OF CLADDING  
IMMERSION

**STEEL  
CLADDING  
WITH A  
CLEARANCE  
FROM  
GROUND**





④ PREVENTION OF CLADDING  
IMMERSION

**NOT DIRECTLY  
IN CONTACT  
WITH ANY  
PLATFORM**

4 PREVENTION OF CLADDING  
IMMERSION

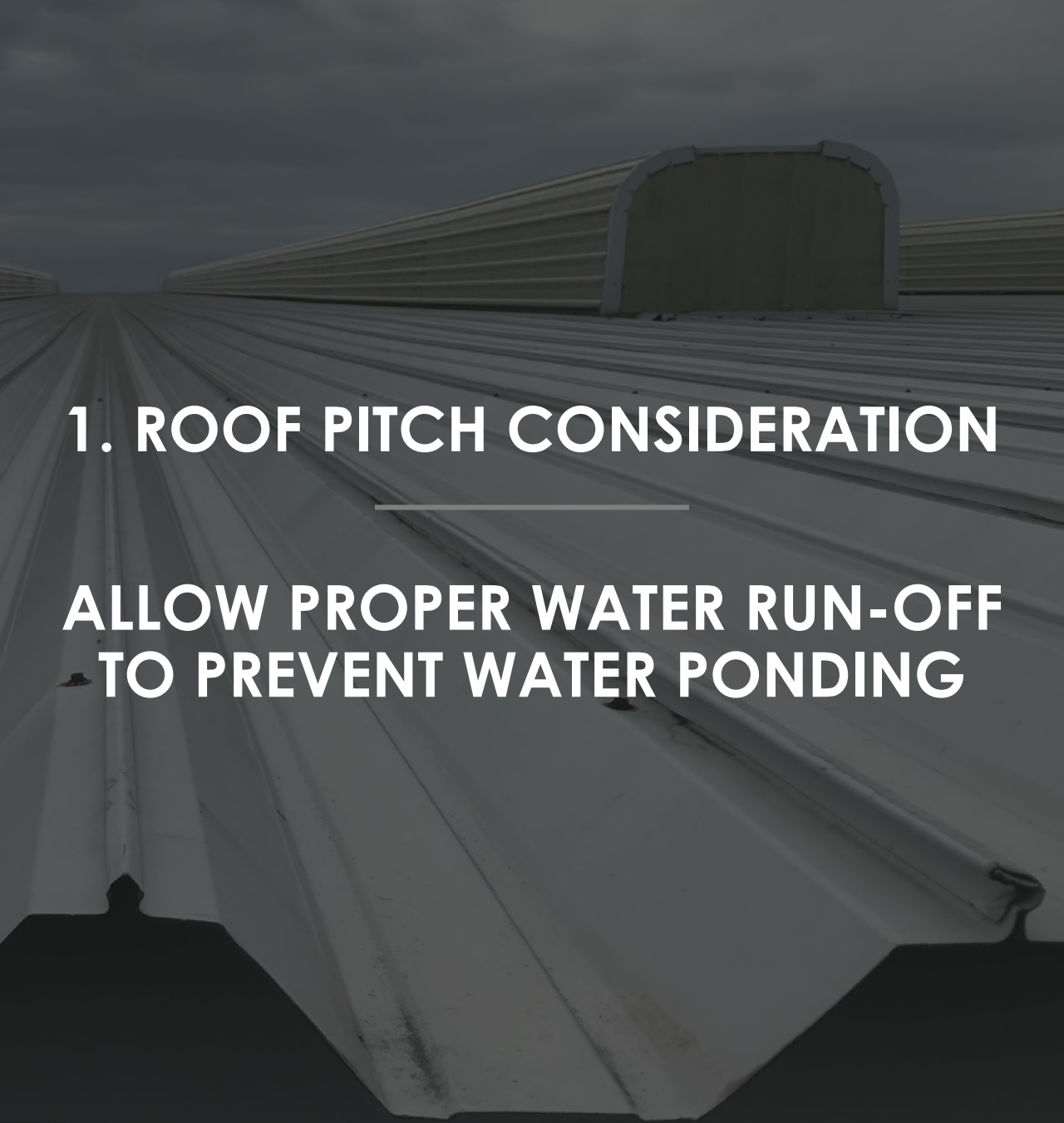
**NOT DIRECTLY  
IN CONTACT  
WITH ANY  
PLATFORM**

# PREVENT IMMERSED AREA

Sufficient masonry dwarf wall height



# TREATMENT AT IMMERSED SURFACE



## 1. ROOF PITCH CONSIDERATION

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**ALLOW PROPER WATER RUN-OFF  
TO PREVENT WATER PONDING**



## 2. SUITABLE PROFILE & BUILDING GEOMETRY

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**MINIMIZE PRESSURE DIFFERENCE  
OR MAXIMIZE LOCKING  
STRENGTH TO PREVENT WIND  
UPLIFT**



## 3. TREATMENT OF UNWASHED AREA

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**MINIMIZE DEBRIS  
ACCUMULATION & PREVENT  
DETERIORATION FROM  
UNWASHED AREA**



## 4. PREVENTION OF CLADDING IMMERSION

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**ELIMINATE IMMERSION WITH  
MOISTURE RETAINING  
SUBSTANCES**





# steel CONNECT

Colorbond®

Zincalume®

TrueCore®

VERMOE™



events@bluescope.  
com.my



bluescope.com.my



BlueScope  
Malaysia



NS BlueScope  
Malaysia