문서번호: 260844　　발주처 : 평입단 건축

구 조 설 계 계 산 서

STRUCTURAL DESIGN AND ANALYSIS

양천 자원 회수시설 계단 및 계단탑 지붕층 설치공사

위 건축물에 대하여 국토교통부 고시 건축구조기준(KDS), 건축법 제48조 및 건축법시행령 제32조(구조안전의 확인)에 따라 기술사법에 의거 등록한 건축구조기술사가 구조계산을 수행하여 구조안전을 확인하였으므로, 본 구조설계계산서에 표시된 구조재료의 강도, 지반조건, 설계하중을 유의하여 구조도면에 표기하시기 바랍니다. 시공 중 현장의 제반조건이 설계조건과 상이하거나 시공 중 구조안전확인, 유지관리 중 구조안전 확인이 필요한 경우에는 미리 책임구조기술자에게 구조안전의 확인을 요청하시기 바랍니다.

2026. 09

차 례	일 자	구 조 설 계 단 계	설 계 자	검 토 자
1	2026.09	-	이 성 로	이 영 극
2				
3				

KSEA 사단법인 한국건축구조기술사회
THE KOREAN STRUCTURAL ENGINEERS ASSOCIATION

韓國建築構造技術士會
THE KOREAN STRUCTURAL ENGINEERS ASSOCIATION

SKY Structure Consultant 하 늘 구 조 기 술 사 사 무 소 (주)
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구 조 설 계 자 (DESIGNED BY) 이 성 로

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1. 구 조 설 계 개 요

1. 구조설계개요

1. 구조물개요

공 사 명	양천 자원 회수 시설 계단실 및 계단탑 지붕 설치공사
대 지 위 치	서울시 양천구
건 물 용 도	자원회수시설
건 물 층 수	계단 : 지상 1층, 계단탑 지붕층 : 지상 2층
연 면 적	-
구 조 형 식	철근콘크리트조
설 계 방 법	철근콘크리트 부분 : 극한강도 설계법(KDS-41)

2. 적용설계기준 및 적용규준

적 용 기 준	건축물의 구조기준 등에 관한 규칙 - 국토교통부 건축구조설계기준(KDS-41)-대한건축학회(국토교통부 고시) 콘크리트구조설계기준 및 해설 - 한국콘크리트학회
참 고 기 준	철근콘크리트구조기준(한국콘크리트학회,KCI-USD12)

3. 구조재료의 규격 및 기준강도

구 조 재 료	재 료 규 격	설계기준 강도(N/mm^2)	
콘 크 리 트	KSF 4009	모든 부재	fck = 27 MPa
철 근	KSD 3504	벽체 및 스터럽(HD19 이하)	fy = 400 MPa (SD400)

4. 기초 및 지반

기 초 형 식	-
파일 지지력	-
설 계 수 위	-
기 타 사 항	

5. 사용프로그램

골 조 해 석	MIDAS GENw PROGRAM
기 초 해 석	-
부 재 설 계	MIDAS SET-art PROGRAM, 기타 BASIC PROGRAM을 사용함

6. 기타 특기 사항

* 시공자는 상기 사항을 확인하고 만약 현장의 제반조건이 상기 설계조건과 다를 경우 설계자의 승인을 득한 후 시공하여야 한다.
* 또한 이 계산은 최소 규정에 의한 설계이므로 현장에서 필요시 단면을 증가시키거나 철근을 보강할 수 있다.

2. 설 계 하 중

1 바닥하중 (FLOOR LOAD)

계단탑 지붕층 (STAIR ROOF)

고정하중		
보호몰탈	(두께 80mm)	1.60 kN/m^2
방수		0.20 kN/m^2
콘크리트 슬래브	(두께 150mm)	3.60 kN/m^2
		5.40 kN/m^2
활하중		1.00 kN/m^2

계 단 (STAIR)

고정하중		
계단부분		
인조석물갈기	(두께 30mm)	0.60 kN/m^2
콘크리트슬래브	(평균두께 258mm)	6.20 kN/m^2
620 / COSθ + 60 × (28 + 17) / 28 =		8.20 kN/m^2
계단참부분		
고름몰탈	(두께 60mm)	1.20 kN/m^2
콘크리트 슬래브	(두께 200mm)	4.80 kN/m^2
		6.00 kN/m^2
활하중		5.00 kN/m^2

2 벽체하중 (WALL LOAD)

외벽 (EXTERIOR WALL)

시멘트몰탈	(두께 24mm)	0.50 kN/m^2
0.5B 시멘트벽돌	(두께 90mm)	1.80 kN/m^2
단열재	(두께 50mm)	0.05 kN/m^2
0.5B 시멘트벽돌	(두께 90mm)	1.80 kN/m^2
석고보드 및 본드	(두께 18mm)	0.10 kN/m^2
		4.30 kN/m^2

내벽 (INTERIOR WALL)

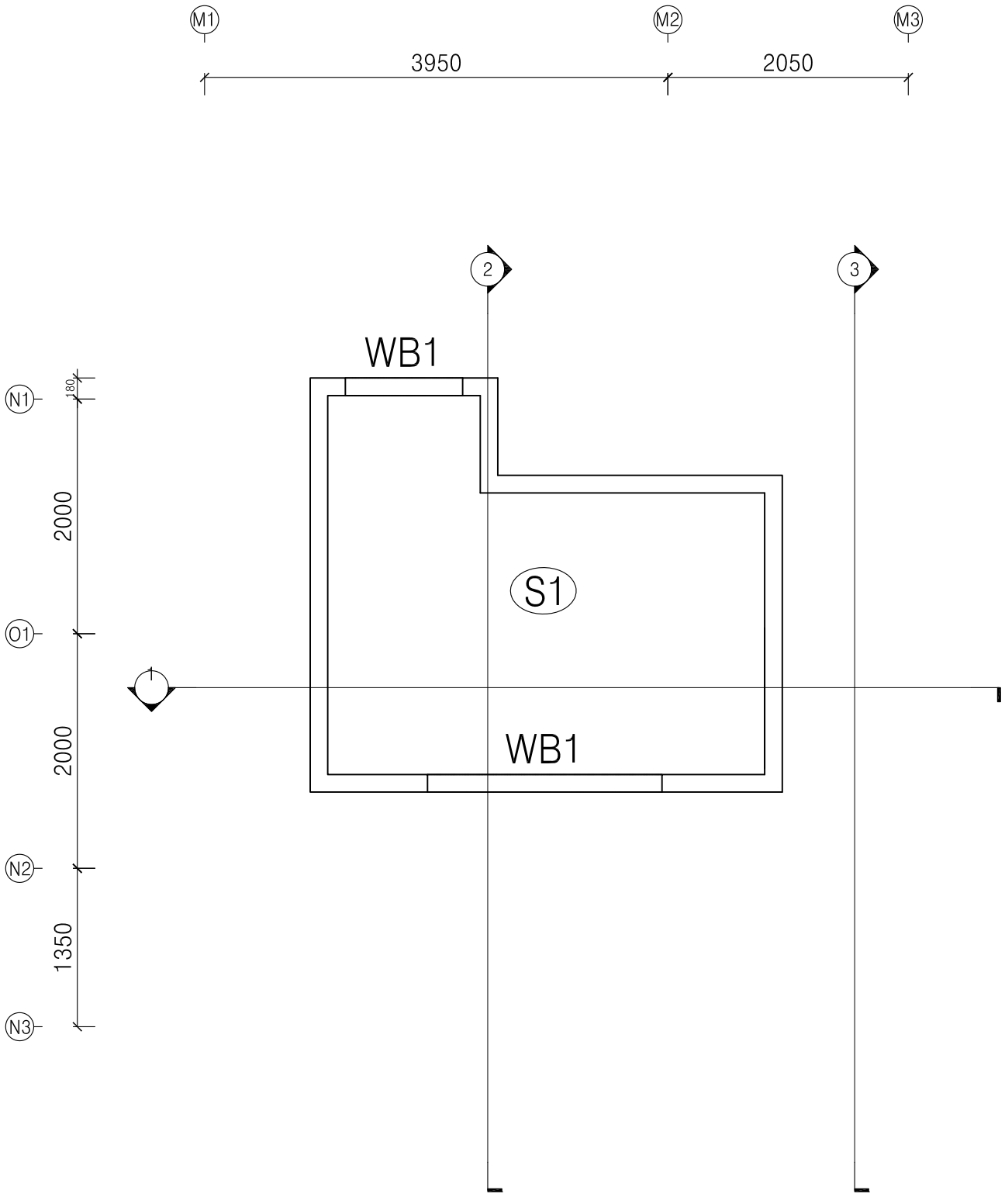
양면몰탈	(두께 36mm)	0.80 kN/m^2
0.5B 시멘트벽돌	(두께 90mm)	1.80 kN/m^2
		2.60 kN/m^2
양면몰탈	(두께 36mm)	0.80 kN/m^2
1.0B 시멘트벽돌	(두께 190mm)	3.60 kN/m^2
		4.40 kN/m^2

창호 (창호면 1m^2당) 0.50 kN/m^2

파라페트 (PARAPET)

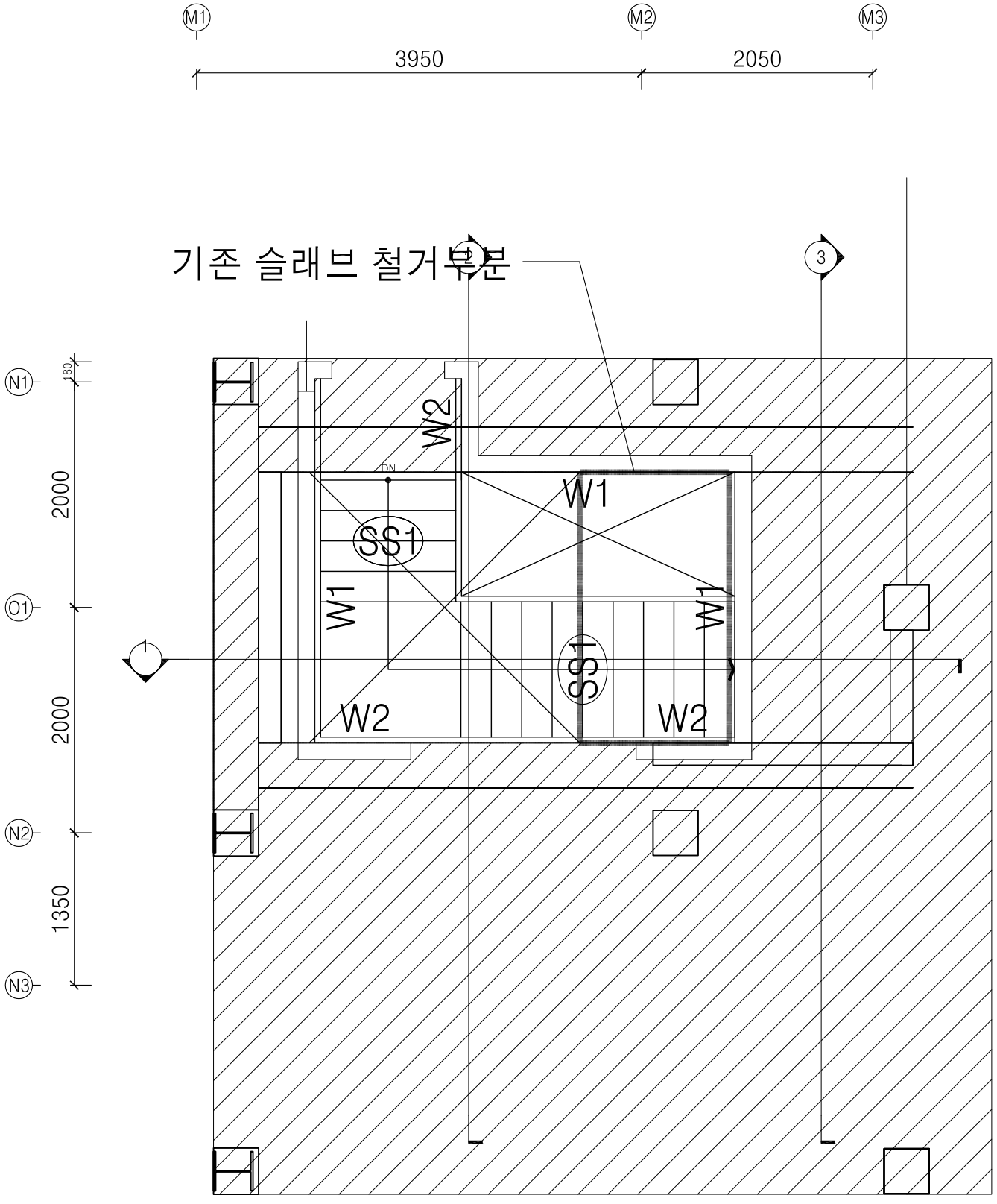
콘크리트벽	(두께 120mm)	2.90 kN/m^2

3. 구 조 평 면 도



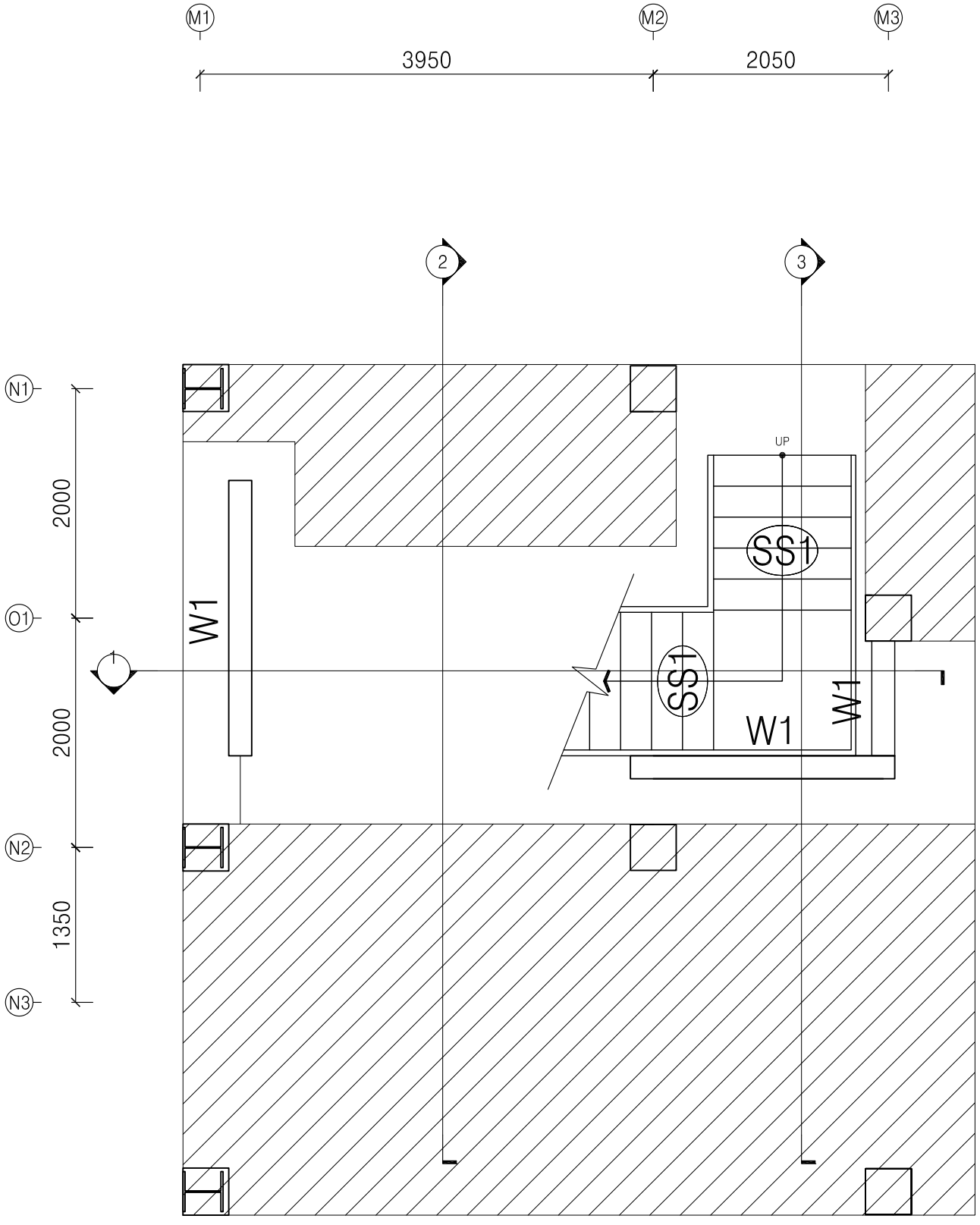
Note.
1. ▨ : 기존 구조체부분

3 2층 계단 지붕 구조평면도
SCALE 1/50



Note.
1. ▨ : 기존 구조체부분

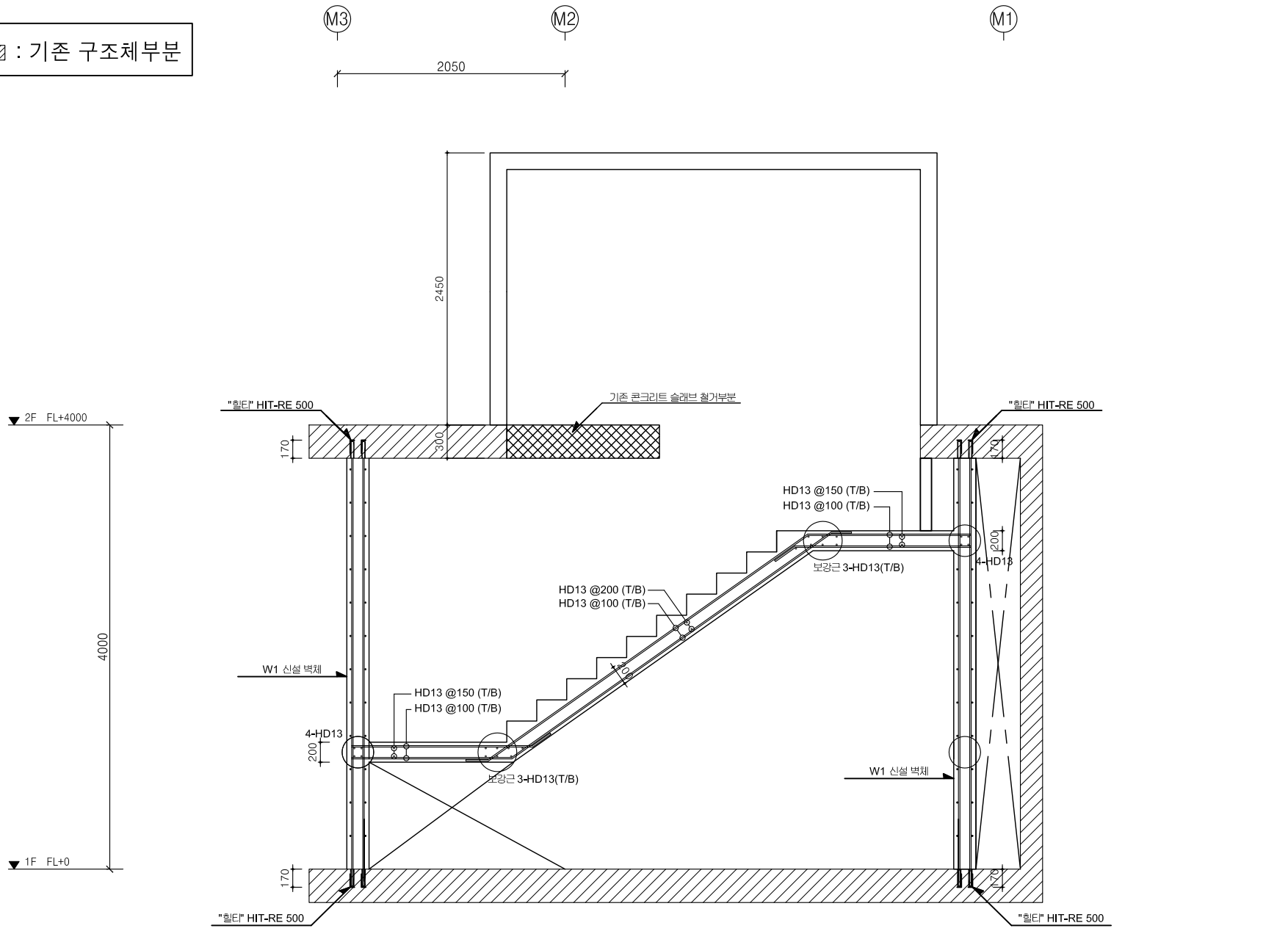
2 2층 구조평면도
SCALE 1/50



Note.
1. ▨ : 기존 구조체부분

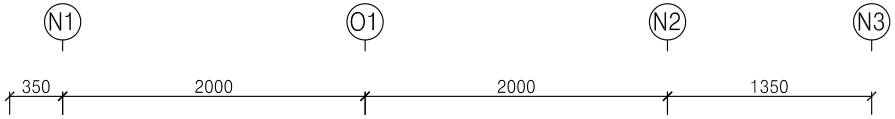
1 1층 구조평면도
SCALE 1/50

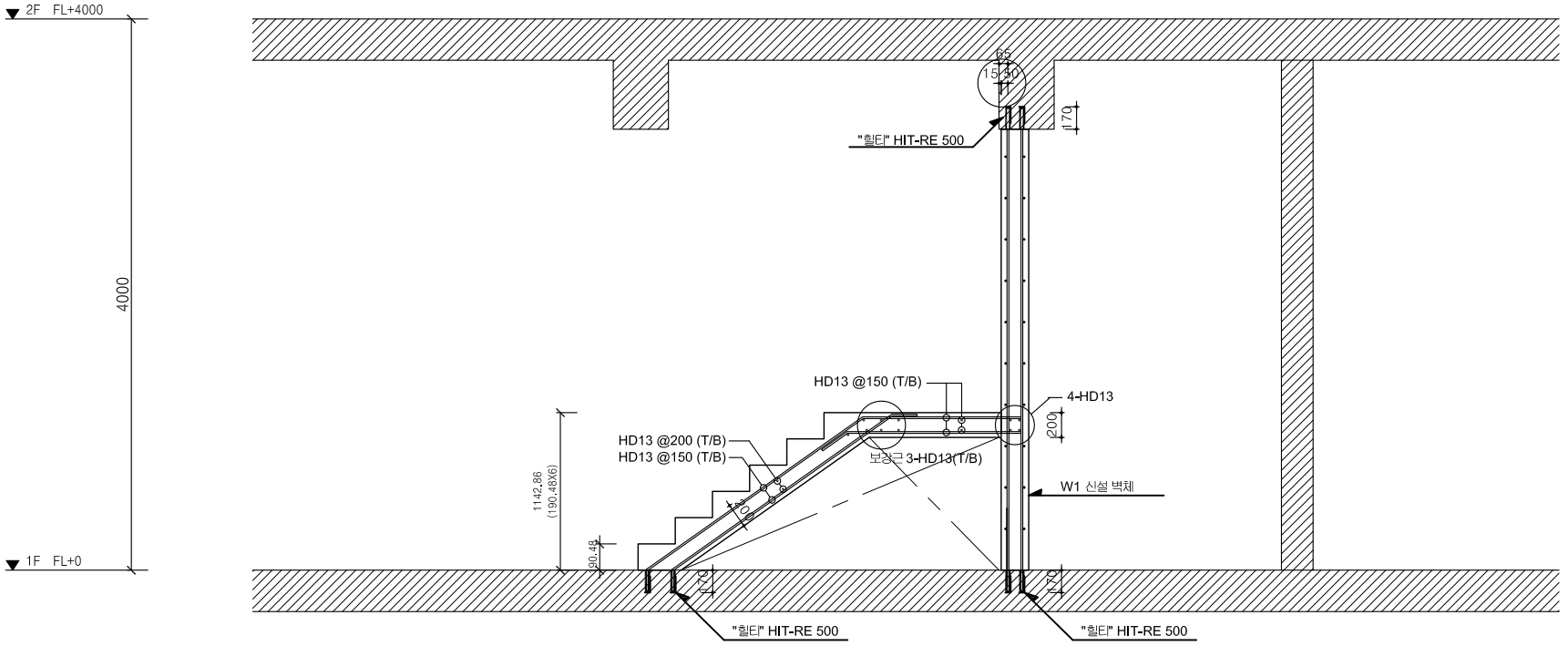
Note.
1. ▨ : 기존 구조체부분



1 확대단면도1
SCALE 1/50

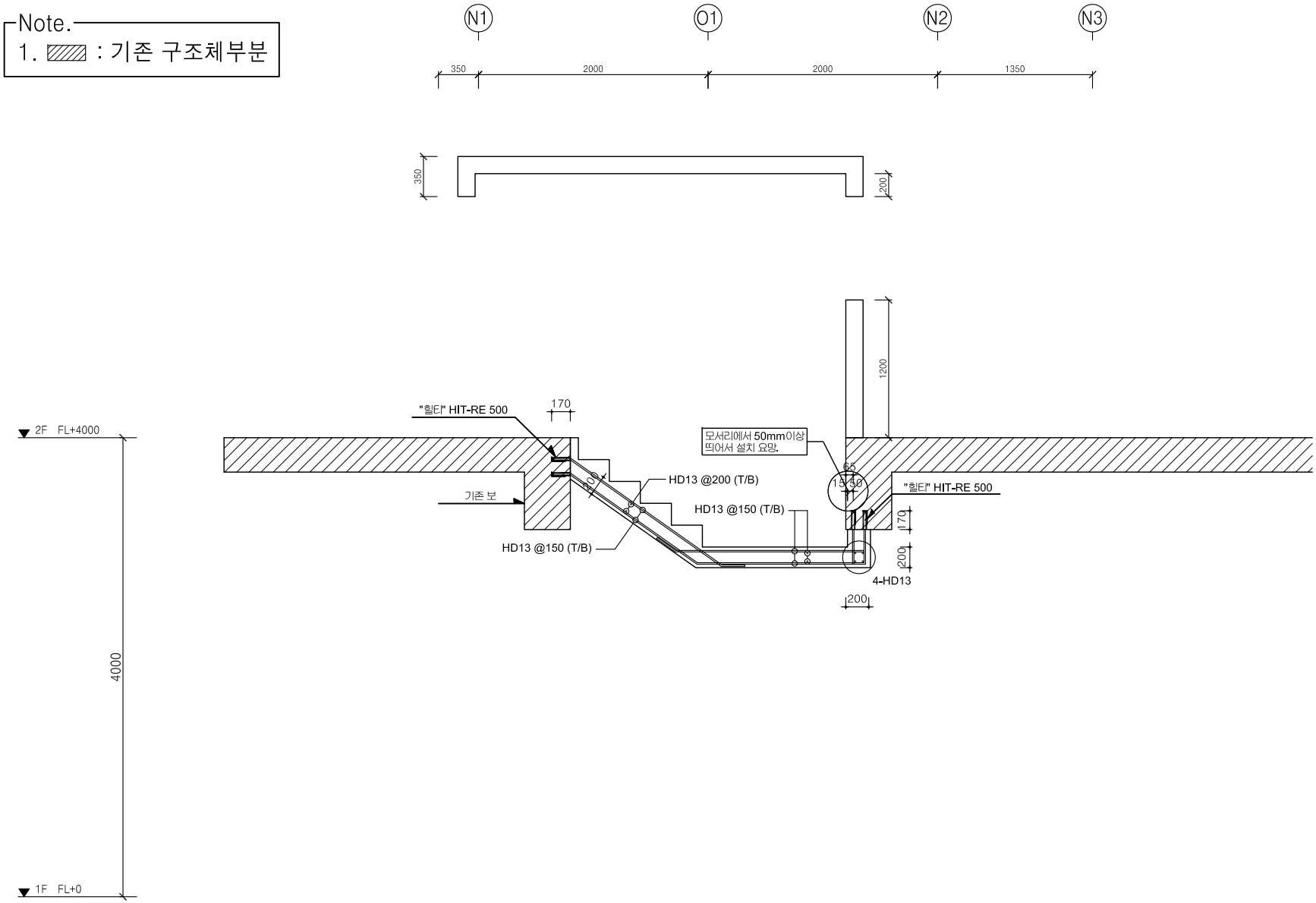
Note.
1. ▨ : 기존 구조체부분





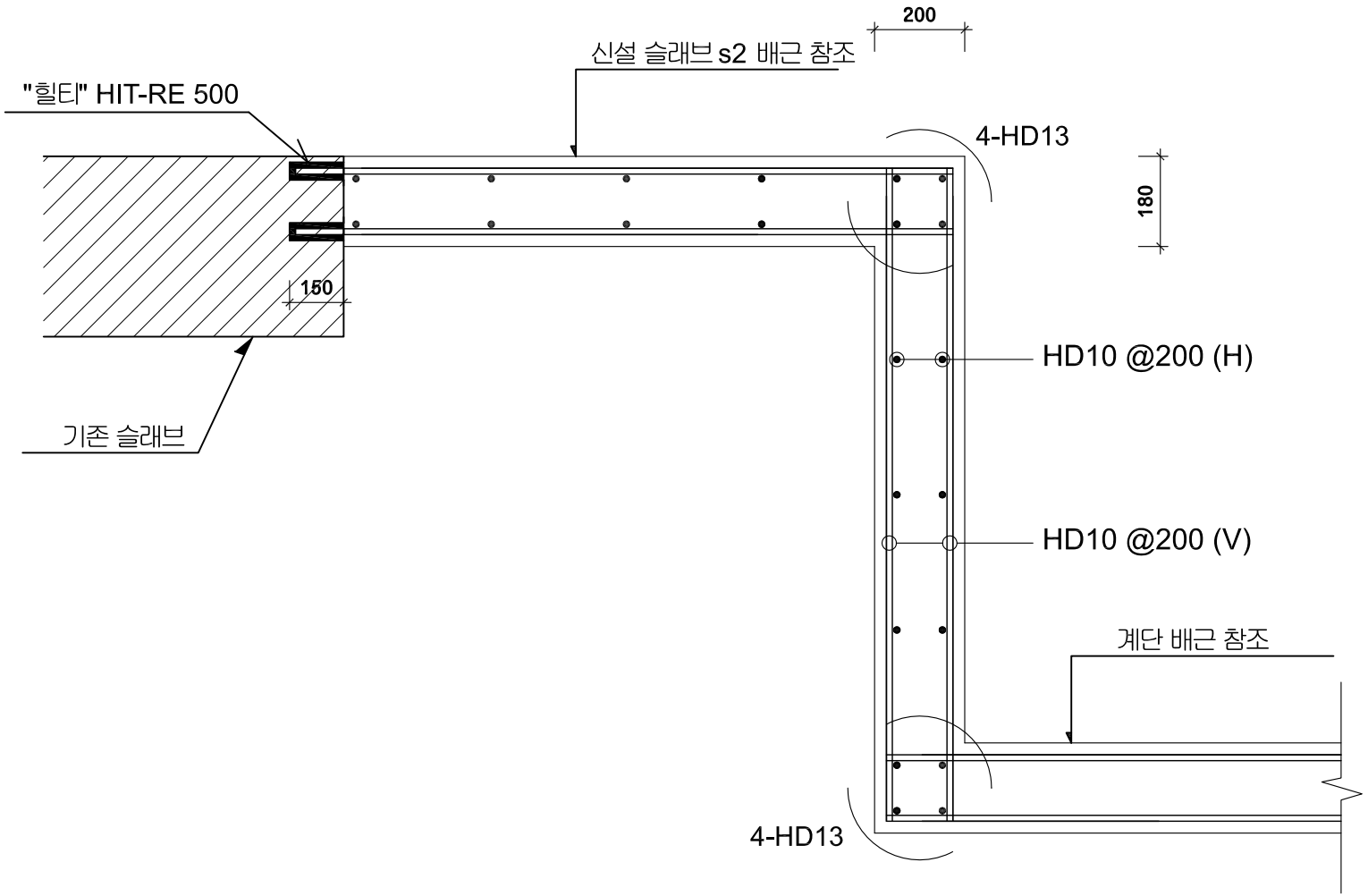
1 확대단면도2
SCALE 1/50

Note.
1. ▨ : 기존 구조체부분



1 확대단면도3
SCALE 1/50

Note.
1. ▨ : 기존 구조체부분



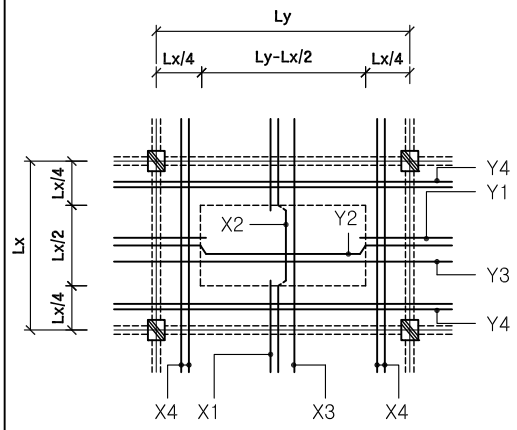
1 A – A' 단면 상세 ㅐ
SCALE 1/50

4. 부 재 리 스 트

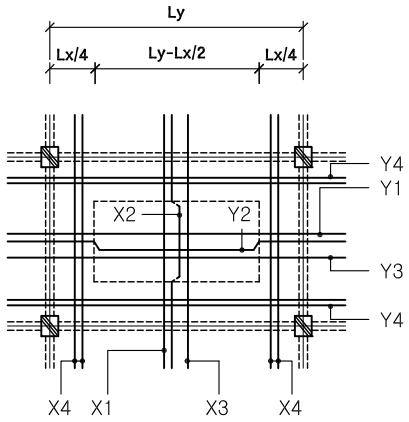
SLAB LIST

Fck = 27 MPa
Fy = 400 MPa (SD400)

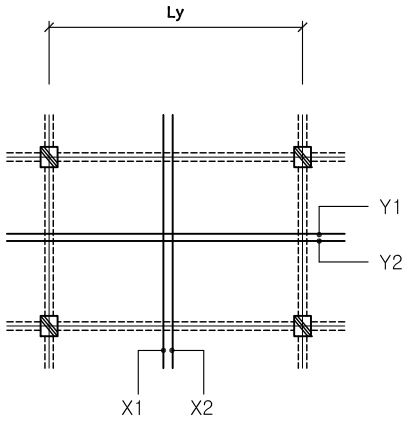
TYPE "A"



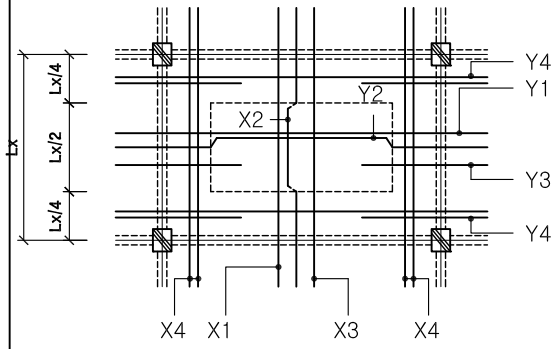
TYPE "B"



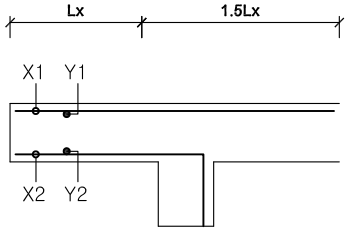
TYPE "C"



TYPE "D"



TYPE "E"



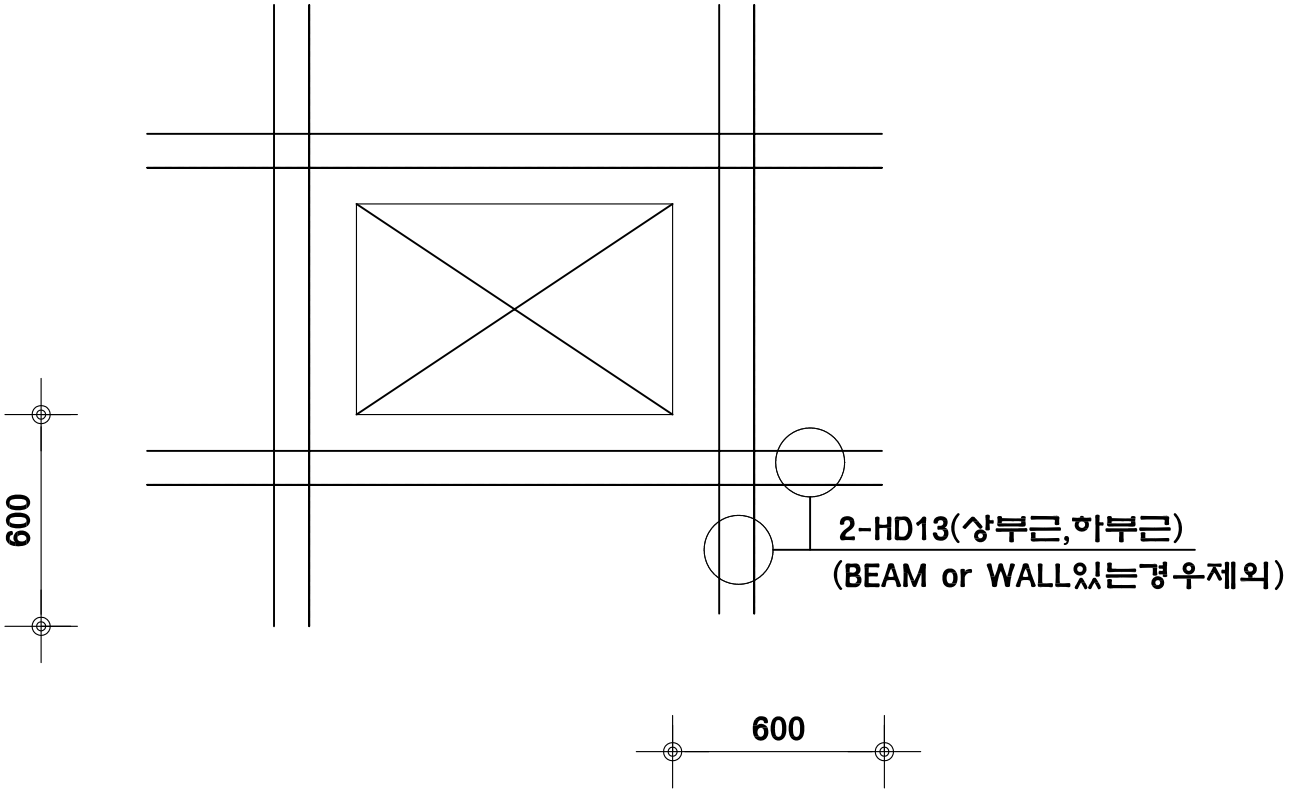
REMARK

: TOP BAR

: BOTTOM BAR

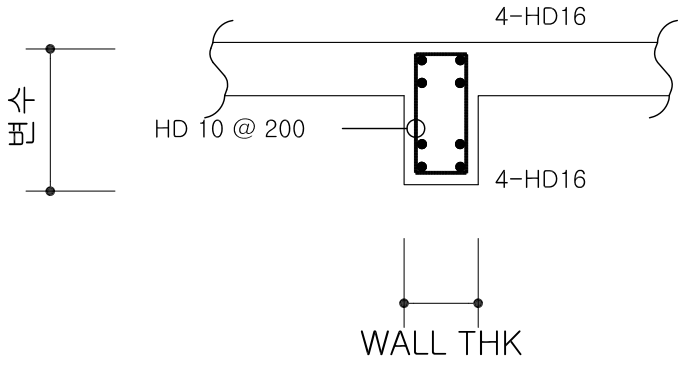
NAME	TYP	THK	RE-BAR				REMARK
			X1	X2	X3	X4	
			Y1	Y2	Y3	Y4	
2S1	C	150	HD10 @200	HD10 @200			
			HD10 @200	HD10 @200			
2S2	C	180	HD10 @200	HD10 @200			
			HD10 @200	HD10 @200			

SLAB OPEN 보강



Fck = 27 MPa
Fy = 400 MPa (SD400)

2WB1

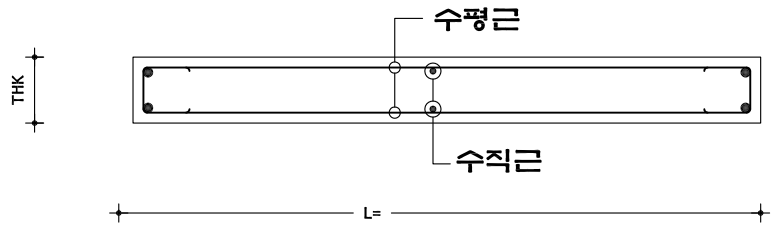


Fck = 27 MPa
Fy = 400 MPa (SD400)

APT. WALL DESIGN

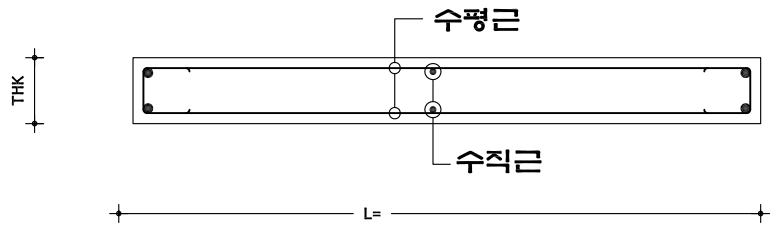
동 No.

W1



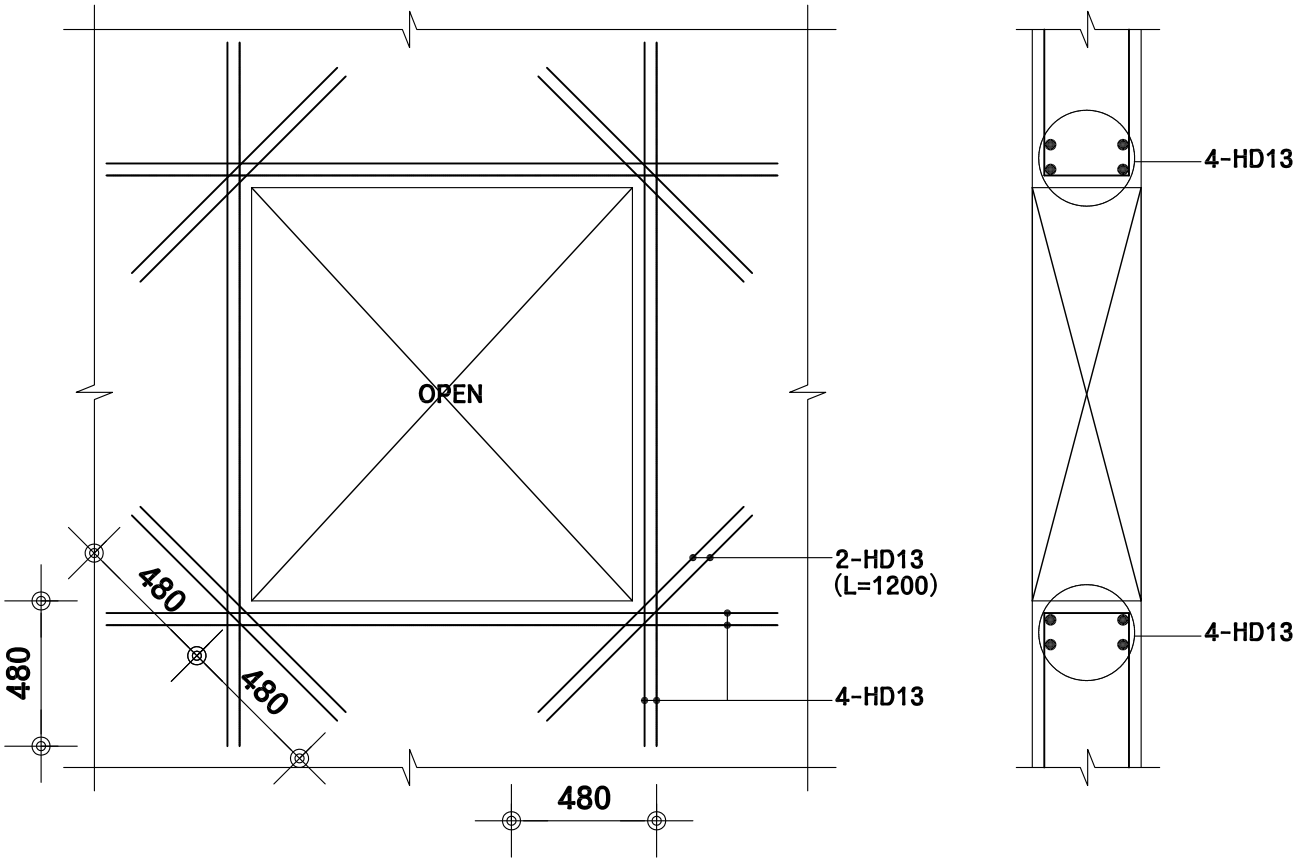
	THK.(mm)	수직근	수평근	
-1 층	200	HD 13 @200 (D)	HD 10 @300 (D)	
-2 층	200	HD 10 @300 (D)	HD 10 @300 (D)	

W2

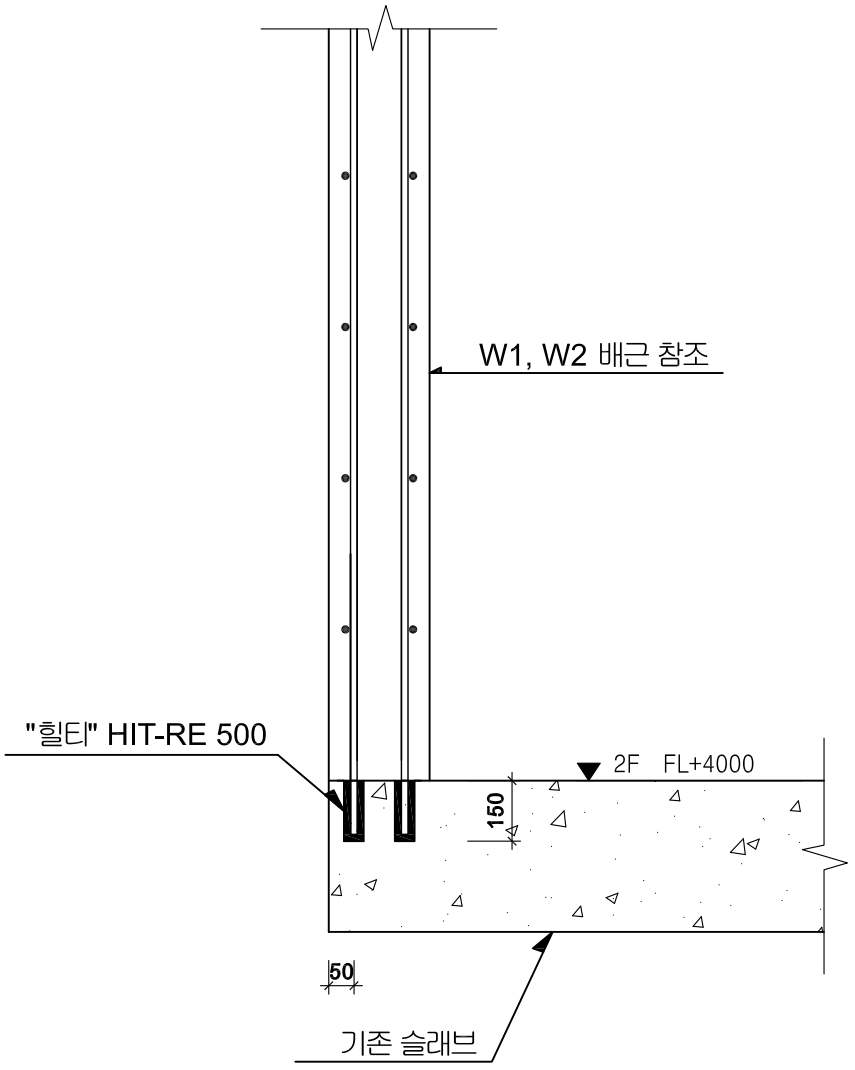


	THK.(mm)	수직근	수평근	
B1 - 2 층	200	HD 10 @150 (D)	HD 10 @200 (D)	

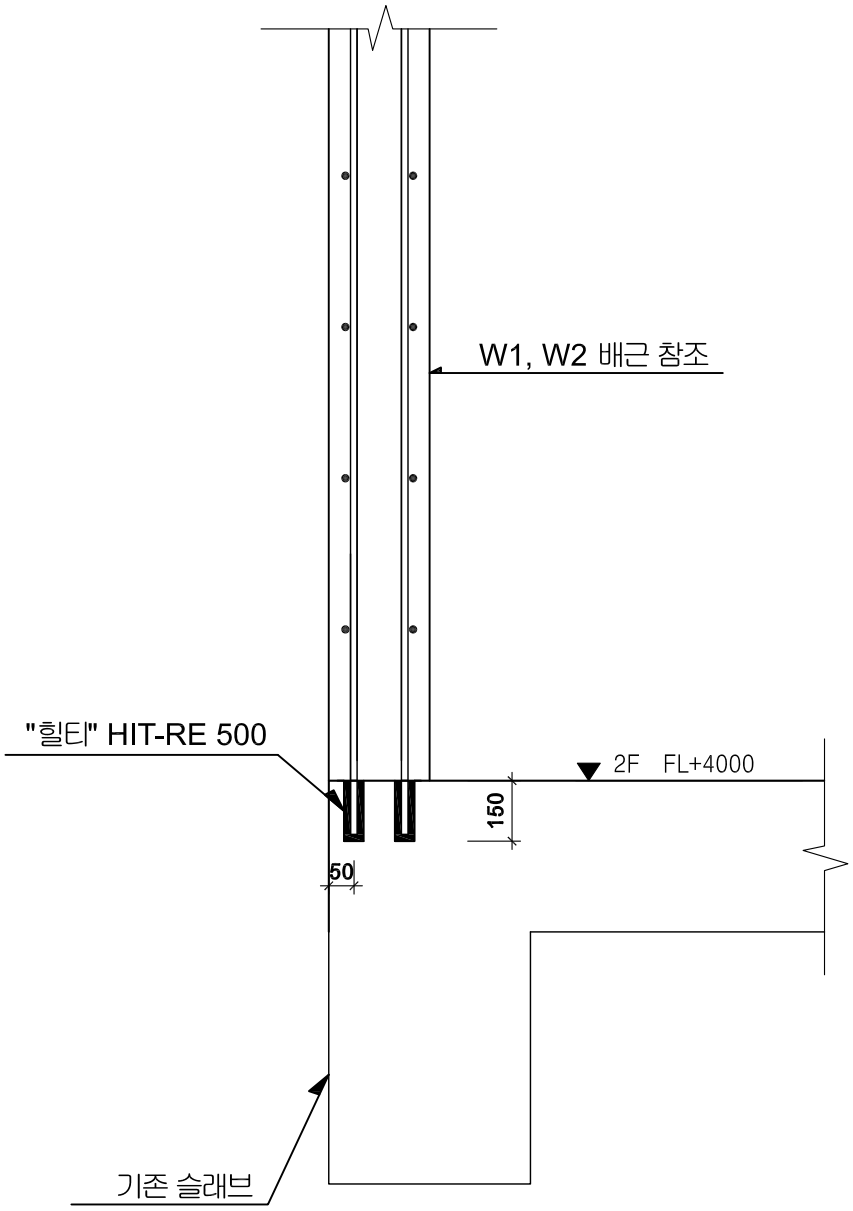
WALL OPEN 보강



기존 슬래브 & 신설 벽체 (W1, W2)

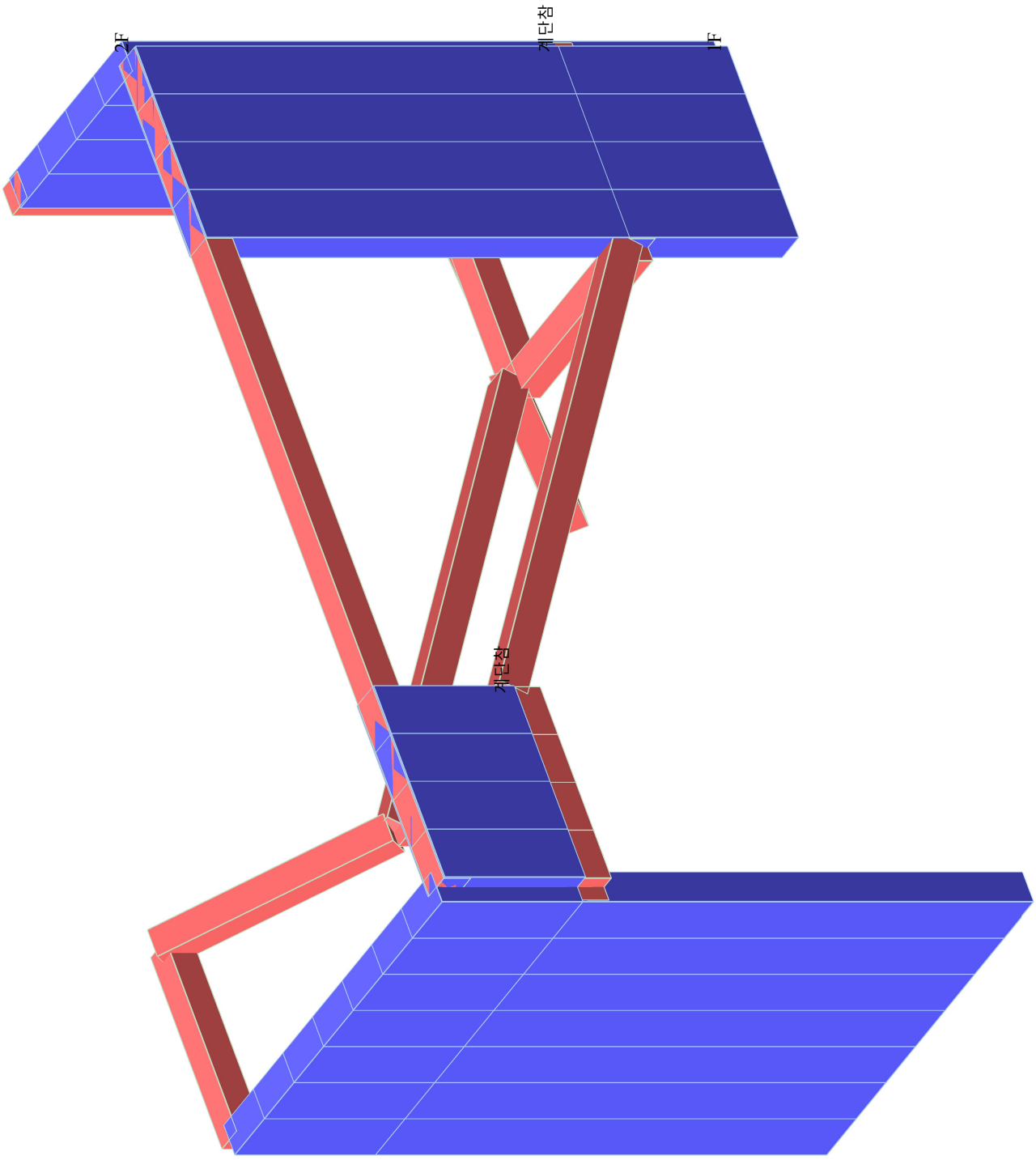


기존 보 & 신설 벽체 (W1, W2)



5. 구 조 해 석 및 결 과

– 계 단 –


2F
계단참
1F
계단참

Certified by :

PROJECT TITLE :

MIDAS	**Company**		**Client**	
	Author		**File Name**	계단 구조1.spf

* MASS GENERATION DATA FOR LATERAL ANALYSIS OF BUILDING [UNIT: kN, m]

STORY NAME	TRANSLATIONAL MASS (X-DIR)	(Y-DIR)	ROTATIONAL MASS	CENTER OF MASS (X-COORD)	(Y-COORD)
2F	0.0	0.0	0.0	0.0	0.0
계단참	0.0	0.0	0.0	0.0	0.0
계단참	0.0	0.0	0.0	0.0	0.0
1F	0.0	0.0	0.0	0.0	0.0
TOTAL :	0.0	0.0			

* ADDITIONAL MASSES FOR THE CALCULATION OF EQUIVALENT SEISMIC FORCE

Note. The following masses are between two adjacent stories or on the nodes released from floor rigid diaphragm by *Diaphragm Disconnect command. The masses are proportionally distributed to upper/lower stories according to their vertical locations. For dynamic analysis, however, floor masses and masses on vertical elements remain at their original locations.

STORY NAME	TRANSLATIONAL MASS (X-DIR)	(Y-DIR)
2F	4.91719213	4.91719213
계단참	5.64694342	5.64694342
계단참	8.22047137	8.22047137
1F	4.27538729	4.27538729
TOTAL :	23.0599942	23.0599942

* EQUIVALENT SEISMIC LOAD IN ACCORDANCE WITH KOREAN BUILDING CODE (KDS(41-17-00:2019)) [UNIT: kN, m]

Seismic Zone	: 1
EPA (S)	: 0.18
Site Class	: S4
Acceleration-based Site Coefficient (Fa)	: 1.44800
Velocity-based Site Coefficient (Fv)	: 2.04800
Design Spectral Response Acc. at Short Periods (Sds)	: 0.42475
Design Spectral Response Acc. at 1 s Period (Sd1)	: 0.24030
Seismic Use Group	: I
Importance Factor (Ie)	: 1.20
Seismic Design Category from Sds	: C
Seismic Design Category from Sd1	: D
Seismic Design Category from both Sds and Sd1	: D
Period Coefficient for Upper Limit (Cu)	: 1.4597
Fundamental Period Associated with X-dir. (Tx)	: 0.1380
Fundamental Period Associated with Y-dir. (Ty)	: 0.1380
Response Modification Factor for X-dir. (Rx)	: 3.0000
Response Modification Factor for Y-dir. (Ry)	: 3.0000
Exponent Related to the Period for X-direction (Kx)	: 1.0000
Exponent Related to the Period for Y-direction (Ky)	: 1.0000
Seismic Response Coefficient for X-direction (Csx)	: 0.1699
Seismic Response Coefficient for Y-direction (Csy)	: 0.1699
Total Effective Weight For X-dir. Seismic Loads (Wx)	: 184.201855
Total Effective Weight For Y-dir. Seismic Loads (Wy)	: 184.201855

Certified by :

PROJECT TITLE :

MIDAS	Company		Client	
	Author		File Name	계단 구조1.spf

Scale Factor For X-directional Seismic Loads : 1.00
Scale Factor For Y-directional Seismic Loads : 0.00

Accidental Eccentricity For X-direction (Ex) : Positive
Accidental Eccentricity For Y-direction (Ey) : Positive

Torsional Amplification for Accidental Eccentricity : Do not Consider
Torsional Amplification for Inherent Eccentricity : Do not Consider

Total Base Shear Of Model For X-direction : 31.295650
Total Base Shear Of Model For Y-direction : 0.000000
Summation Of Wi*Hi^k Of Model For X-direction : 453.899586
Summation Of Wi*Hi^k Of Model For Y-direction : 0.000000

==========
ECCENTRICITY RELATED DATA
==========

STORY NAME	X-DIRECTIONAL LOAD				Y-DIRECTIONAL LOAD			
	ACCIDENTAL ECCENT.	INHERENT ECCENT.	ACCIDENTAL AMP.FACTOR	INHERENT AMP.FACTOR	ACCIDENTAL ECCENT.	INHERENT ECCENT.	ACCIDENTAL AMP.FACTOR	INHERENT AMP.FACTOR
2F	-0.1275	0.0	1.0	0.0	0.2825	0.0	1.0	0.0
계단참	-0.1275	0.0	1.0	0.0	0.065	0.0	1.0	0.0
계단참	-0.069	0.0	1.0	0.0	0.065	0.0	1.0	0.0
G.L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The accidental amplification factors are automatically set to 1.0 when torsional amplification effect to accidental eccentricity is not considered.
The inherent amplification factors are automatically set to 0 when torsional amplification effect to inherent eccentricity is not considered.
The inherent amplification factors are all set to 'the input value - 1.0'.(This is to exclude the true inherent torsion)

** Story Force , Seismic Force x Scale Factor + Added Force

S E I S M I C L O A D G E N E R A T I O N D A T A X-D I R E C T I O N

STORY NAME	STORY WEIGHT	STORY LEVEL	SEISMIC FORCE	ADDED FORCE	STORY FORCE	STORY SHEAR	OVERTURN. MOMENT	ACCIDENT. TORSION	INHERENT TORSION	TOTAL TORSION
2F	48.21799	4.0	13.29821	0.0	13.29821	0.0	0.0	1.695522	0.0	1.695522
계단참	55.37393	3.05	11.64473	0.0	11.64473	13.29821	12.6333	1.484703	0.0	1.484703
계단참	80.60994	1.143	6.35271	0.0	6.35271	24.94294	60.19949	0.438337	0.0	0.438337
G.L.	--	0.0	--	--	--	31.29565	95.97041	---	---	---

S E I S M I C L O A D G E N E R A T I O N D A T A Y-D I R E C T I O N

STORY NAME	STORY WEIGHT	STORY LEVEL	SEISMIC FORCE	ADDED FORCE	STORY FORCE	STORY SHEAR	OVERTURN. MOMENT	ACCIDENT. TORSION	INHERENT TORSION	TOTAL TORSION
2F	48.21799	4.0	13.29821	0.0	0.0	0.0	0.0	0.0	0.0	0.0

계단참	55.37393	3.05	11.64473	0.0	0.0	0.0	0.0	0.0	0.0	0.0
계단참	80.60994	1.143	6.35271	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G.L.	--	0.0	--	--	--	0.0	0.0	---	---	---

==========
COMMENTS ABOUT TORSION
==========

If torsional amplification effects are considered :

Accidental Torsion , Story Force * Accidental Eccentricity * Amp. Factor for Accidental Eccentricity
Inherent Torsion , Story Force * Inherent Eccentricity * Amp. Factor for Inherent Eccentricity

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If torsional amplification effects are not considered :

Accidental Torsion , Story Force * Accidental Eccentricity
Inherent Torsion , 0

The inherent torsion above is the additional torsion due to torsional amplification effect.
The true inherent torsion is considered automatically in analysis stage when the seismic force is applied to the structure.

Certified by :

PROJECT TITLE :

MIDAS	**Company**		**Client**	
	Author		**File Name**	계단 구조1.spf

* MASS GENERATION DATA FOR LATERAL ANALYSIS OF BUILDING [UNIT: kN, m]

STORY NAME	TRANSLATIONAL MASS (X-DIR)	(Y-DIR)	ROTATIONAL MASS	CENTER OF MASS (X-COORD)	(Y-COORD)
2F	0.0	0.0	0.0	0.0	0.0
계단참	0.0	0.0	0.0	0.0	0.0
계단참	0.0	0.0	0.0	0.0	0.0
1F	0.0	0.0	0.0	0.0	0.0
TOTAL :	0.0	0.0			

* ADDITIONAL MASSES FOR THE CALCULATION OF EQUIVALENT SEISMIC FORCE

Note. The following masses are between two adjacent stories or on the nodes released from floor rigid diaphragm by *Diaphragm Disconnect command. The masses are proportionally distributed to upper/lower stories according to their vertical locations. For dynamic analysis, however, floor masses and masses on vertical elements remain at their original locations.

STORY NAME	TRANSLATIONAL MASS (X-DIR)	(Y-DIR)
2F	4.91719213	4.91719213
계단참	5.64694342	5.64694342
계단참	8.22047137	8.22047137
1F	4.27538729	4.27538729
TOTAL :	23.0599942	23.0599942

* EQUIVALENT SEISMIC LOAD IN ACCORDANCE WITH KOREAN BUILDING CODE (KDS(41-17-00:2019)) [UNIT: kN, m]

Seismic Zone	: 1
EPA (S)	: 0.18
Site Class	: S4
Acceleration-based Site Coefficient (Fa)	: 1.44800
Velocity-based Site Coefficient (Fv)	: 2.04800
Design Spectral Response Acc. at Short Periods (Sds)	: 0.42475
Design Spectral Response Acc. at 1 s Period (Sd1)	: 0.24030
Seismic Use Group	: I
Importance Factor (Ie)	: 1.20
Seismic Design Category from Sds	: C
Seismic Design Category from Sd1	: D
Seismic Design Category from both Sds and Sd1	: D
Period Coefficient for Upper Limit (Cu)	: 1.4597
Fundamental Period Associated with X-dir. (Tx)	: 0.1380
Fundamental Period Associated with Y-dir. (Ty)	: 0.1380
Response Modification Factor for X-dir. (Rx)	: 3.0000
Response Modification Factor for Y-dir. (Ry)	: 3.0000
Exponent Related to the Period for X-direction (Kx)	: 1.0000
Exponent Related to the Period for Y-direction (Ky)	: 1.0000
Seismic Response Coefficient for X-direction (Csx)	: 0.1699
Seismic Response Coefficient for Y-direction (Csy)	: 0.1699
Total Effective Weight For X-dir. Seismic Loads (Wx)	: 184.201855
Total Effective Weight For Y-dir. Seismic Loads (Wy)	: 184.201855

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PROJECT TITLE :

MIDAS	Company		Client	
	Author		File Name	계단 구조1.spf

Scale Factor For X-directional Seismic Loads : 0.00
Scale Factor For Y-directional Seismic Loads : 1.00

Accidental Eccentricity For X-direction (Ex) : Positive
Accidental Eccentricity For Y-direction (Ey) : Positive

Torsional Amplification for Accidental Eccentricity : Do not Consider
Torsional Amplification for Inherent Eccentricity : Do not Consider

Total Base Shear Of Model For X-direction : 0.000000
Total Base Shear Of Model For Y-direction : 31.295650
Summation Of Wi*Hi^k Of Model For X-direction : 0.000000
Summation Of Wi*Hi^k Of Model For Y-direction : 453.899586

==========
ECCENTRICITY RELATED DATA
==========

STORY NAME	X-DIRECTIONAL LOAD ACCIDENTAL ECCENT.	X-DIRECTIONAL LOAD INHERENT ECCENT.	X-DIRECTIONAL LOAD ACCIDENTAL AMP.FACTOR	X-DIRECTIONAL LOAD INHERENT AMP.FACTOR	Y-DIRECTIONAL LOAD ACCIDENTAL ECCENT.	Y-DIRECTIONAL LOAD INHERENT ECCENT.	Y-DIRECTIONAL LOAD ACCIDENTAL AMP.FACTOR	Y-DIRECTIONAL LOAD INHERENT AMP.FACTOR
2F	-0.1275	0.0	1.0	0.0	0.2825	0.0	1.0	0.0
계단참	-0.1275	0.0	1.0	0.0	0.065	0.0	1.0	0.0
계단참	-0.069	0.0	1.0	0.0	0.065	0.0	1.0	0.0
G.L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The accidental amplification factors are automatically set to 1.0 when torsional amplification effect to accidental eccentricity is not considered.
The inherent amplification factors are automatically set to 0 when torsional amplification effect to inherent eccentricity is not considered.
The inherent amplification factors are all set to 'the input value - 1.0'.(This is to exclude the true inherent torsion)

** Story Force , Seismic Force x Scale Factor + Added Force

S E I S M I C L O A D G E N E R A T I O N D A T A X - D I R E C T I O N

STORY NAME	STORY WEIGHT	STORY LEVEL	SEISMIC FORCE	ADDED FORCE	STORY FORCE	STORY SHEAR	OVERTURN. MOMENT	ACCIDENT. TORSION	INHERENT TORSION	TOTAL TORSION
2F	48.21799	4.0	13.29821	0.0	0.0	0.0	0.0	0.0	0.0	0.0
계단참	55.37393	3.05	11.64473	0.0	0.0	0.0	0.0	0.0	0.0	0.0
계단참	80.60994	1.143	6.35271	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G.L.	--	0.0	--	--	--	0.0	0.0	---	---	---

S E I S M I C L O A D G E N E R A T I O N D A T A Y - D I R E C T I O N

STORY NAME	STORY WEIGHT	STORY LEVEL	SEISMIC FORCE	ADDED FORCE	STORY FORCE	STORY SHEAR	OVERTURN. MOMENT	ACCIDENT. TORSION	INHERENT TORSION	TOTAL TORSION
2F	48.21799	4.0	13.29821	0.0	13.29821	0.0	0.0	3.756745	0.0	3.756745

계단참	55.37393	3.05	11.64473	0.0	11.64473	13.29821	12.6333	0.756907	0.0	0.756907
계단참	80.60994	1.143	6.35271	0.0	6.35271	24.94294	60.19949	0.412926	0.0	0.412926
G.L.	--	0.0	--	--	--	31.29565	95.97041	---	---	---

==========
COMMENTS ABOUT TORSION
==========

If torsional amplification effects are considered :

Accidental Torsion , Story Force * Accidental Eccentricity * Amp. Factor for Accidental Eccentricity
Inherent Torsion , Story Force * Inherent Eccentricity * Amp. Factor for Inherent Eccentricity

---

If torsional amplification effects are not considered :

Accidental Torsion , Story Force * Accidental Eccentricity
Inherent Torsion , 0

The inherent torsion above is the additional torsion due to torsional amplification effect.
The true inherent torsion is considered automatically in analysis stage when the seismic force is applied to the structure.

Design Conditions

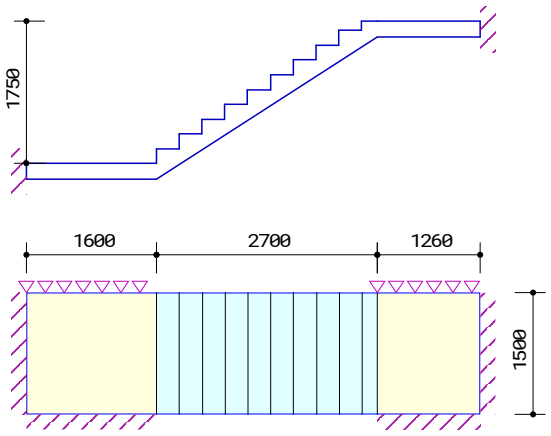
Design Code : KCI-USD12

Material Data

f_{ck} = 27 N/mm²
f_y = 400 N/mm²

Section Dimension

Landing Length	L_l	:	1.60 m
	L_r	:	1.26 m
Stair Length	L_s	:	2.70 m
Stair Width	W	:	1.50 m
Tread Width	W_t	:	280 mm
Stair Height	H_s	:	1.75 m
Landing Thk.	T_l	:	200 mm
Stair Thk.	T_s	:	200 mm
Re-bar Cover	c_c	:	30 mm



Design Loads

-. Live Load LL = 5000 N/m²
-. Stair Finish Load FL_s = 3400 N/m²
-. Landing Finish Load FL_l = 1200 N/m²

Stair Load

-. DL = $FL_s + W_{self}$ = 10802 N/m²
-. $W_{u,S}$ = 1.2×DL + 1.6×LL = 20962 N/m²

Landing Load

-. DL = $FL_l + W_{self}$ = 5907 N/m²
-. $W_{u,L}$ = 1.2×DL + 1.6×LL = 15089 N/m²

Shear Force Diagram

(Unit : kN/m)

▶ X-X Shear

-1	2	3	3	1	-7	94	94	7	3	2	2	2	2	2	3	4	7	94	-7	-4	1	0	-1
-1	2	3	3	3	5	33	34	11	6	4	3	3	3	4	5	8	21	34	17	2	1	1	-1
-1	1	2	2	3	8	19	20	11	6	4	3	3	3	3	5	8	16	20	13	4	1	-0	-1
-1	0	1	2	3	6	12	13	9	5	3	3	2	2	3	4	6	11	13	9	4	1	-1	-1
-1	-0	1	1	2	4	7	8	6	4	2	2	2	2	2	3	5	7	8	6	2	1	-1	-1
-1	-0	-0	0	0	2	4	4	3	2	2	1	1	1	1	2	3	4	4	3	1	-0	-1	-1
-0	-0	-1	-1	-1	-1	-0	1	1	0	1	1	1	1	1	1	1	1	0	-1	-1	-1	-1	-0
0	-1	-1	-2	-3	-3	-3	-3	-2	-1	-1	-0	-0	-0	-0	-1	-2	-3	-3	-3	-3	-2	-1	0
0	-1	-2	-3	-4	-6	-7	-7	-5	-3	-1	-1	-1	-1	-1	-2	-4	-6	-7	-6	-4	-3	-1	0
1	-1	-2	-4	-6	-9	-11	-10	-7	-4	-2	-1	-1	-1	-2	-3	-6	-9	-10	-10	-6	-3	-1	1
1	-1	-3	-4	-7	-12	-15	-15	-10	-5	-3	-2	-2	-2	-2	-4	-7	-13	-15	-13	-8	-4	-1	1
1	-2	-3	-5	-8	-15	-21	-21	-13	-6	-3	-2	-2	-2	-3	-4	-9	-17	-21	-18	-10	-4	-1	1
1	-2	-4	-5	-8	-17	-30	-29	-14	-6	-4	-3	-2	-3	-3	-4	-9	-22	-30	-24	-10	-4	-1	1
0	-3	-4	-5	-7	-18	-44	-43	-14	-5	-4	-3	-3	-3	-3	-4	-7	-28	-44	-31	-9	-4	-1	1
-1	-3	-5	-5	-6	-15	-70	-69	-6	-4	-3	-3	-3	-3	-3	-4	-4	-28	-70	-36	-7	-3	-2	0
-2	-5	-6	-6	-5	-11	-136	-103	-1	-2	-2	-2	-2	-2	-2	-2	-2	6	-135	-32	-3	-2	-2	-1

▶ Y-Y Shear

3	6	7	10	20	50	134	-131	-64	-43	-29	-17	-5	11	22	35	51	79	-135	-89	-32	-16	-9	-4
-3	-1	1	3	7	19	30	-34	-26	-19	-13	-8	-3	5	10	16	22	34	19	-30	-12	-4	-1	3
-6	-3	-1	2	5	10	11	-17	-18	-14	-10	-6	-2	4	8	12	16	18	10	-11	-7	-2	2	5
-7	-4	-1	2	4	6	5	-12	-14	-12	-9	-6	-2	4	7	11	13	14	7	-5	-5	-2	3	7
-8	-4	-1	2	3	4	-2	-10	-12	-11	-9	-5	-2	4	7	10	12	12	6	-3	-3	-1	3	8
-9	-4	-1	2	3	3	-3	-9	-11	-11	-9	-5	-2	4	7	10	11	10	6	-1	-2	-1	3	8
-9	-5	-1	2	3	2	-3	-8	-11	-10	-8	-5	-2	4	7	10	11	10	6	1	-2	-1	3	8
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-8	-4	-1	2	3	3	-4	-9	-11	-11	-9	-6	-2	4	7	10	11	11	7	-1	-2	-2	3	7
-7	-4	1	3	4	4	-3	-10	-12	-12	-9	-6	-2	4	8	11	12	12	7	-2	-3	-2	2	6
-7	-3	1	3	5	5	-3	-12	-14	-13	-10	-6	-2	4	8	11	14	14	8	-4	-5	-3	1	5
-5	-2	2	4	7	8	4	-15	-17	-15	-10	-6	-2	4	8	12	16	17	9	-7	-7	-5	-1	4
-4	-1	2	4	8	12	9	-20	-22	-16	-11	-6	-2	4	9	13	19	22	12	-12	-11	-6	-2	3
-2	1	2	5	10	18	18	-31	-29	-18	-12	-7	-2	4	9	15	23	31	18	-19	-14	-7	-3	1
-1	1	2	4	9	22	30	-56	-36	-21	-14	-8	-3	5	11	17	27	55	37	-30	-15	-7	-3	-1
0	1	1	2	4	11	18	-134	-49	-37	-26	-16	-5	10	21	31	43	60	134	-18	-7	-3	-1	-1

Check Shear Force

Strength Reduction Factor ϕ = 0.750

Check Left Landing

V_u = 70.3 kN/m < ϕV_c = 106.3 kN/m ---> O.K.

Check Stair

V_u = 68.9 kN/m < ϕV_c = 106.3 kN/m ---> O.K.

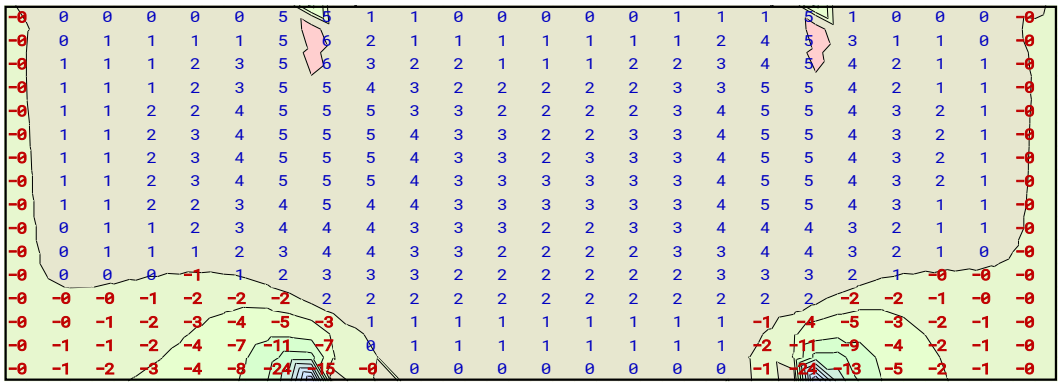
Check Right Landing

V_u = 69.8 kN/m < ϕV_c = 106.3 kN/m ---> O.K.

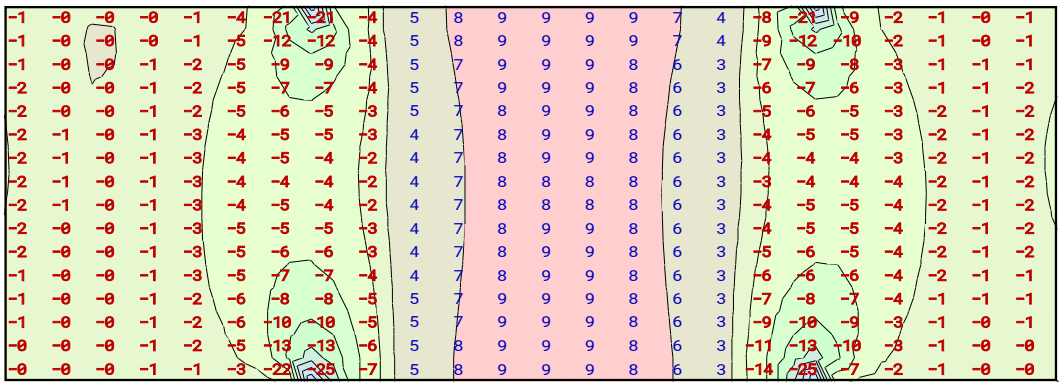
Bending Moment Diagram

(Unit : kN·m/m)

▶ X-X Moment



▶ Y-Y Moment

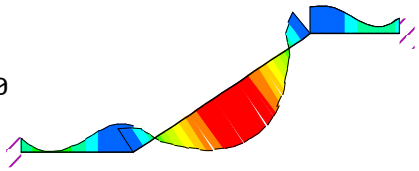


Check Bending Moment

계단 길이 방향 검토 : 부모멘트

-. $M_{u,neg}$ = -8.0 kN·m/m

-. $A_{s,req}$ = 400 mm²/m ==> D13 @ 300



계단 길이 방향 검토 : 정모멘트

-. $M_{u,pos}$ = 8.9 kN·m/m

-. $A_{s,req}$ = 400 mm²/m ==> D13 @ 300

좌측 계단참 폭방향 검토 : 부모멘트

-. $M_{u,neg}$ = -11.7 kN·m/m

-. $A_{s,req}$ = 400 mm²/m ==> D13 @ 300



좌측 계단참 폭방향 검토 : 정모멘트

-. $M_{u,pos}$ = 4.1 kN·m/m

-. $A_{s,req}$ = 400 mm²/m ==> D13 @ 300

우측 계단참 폭방향 검토 : 부모멘트

-. $M_{u,neg}$ = -11.4 kN·m/m

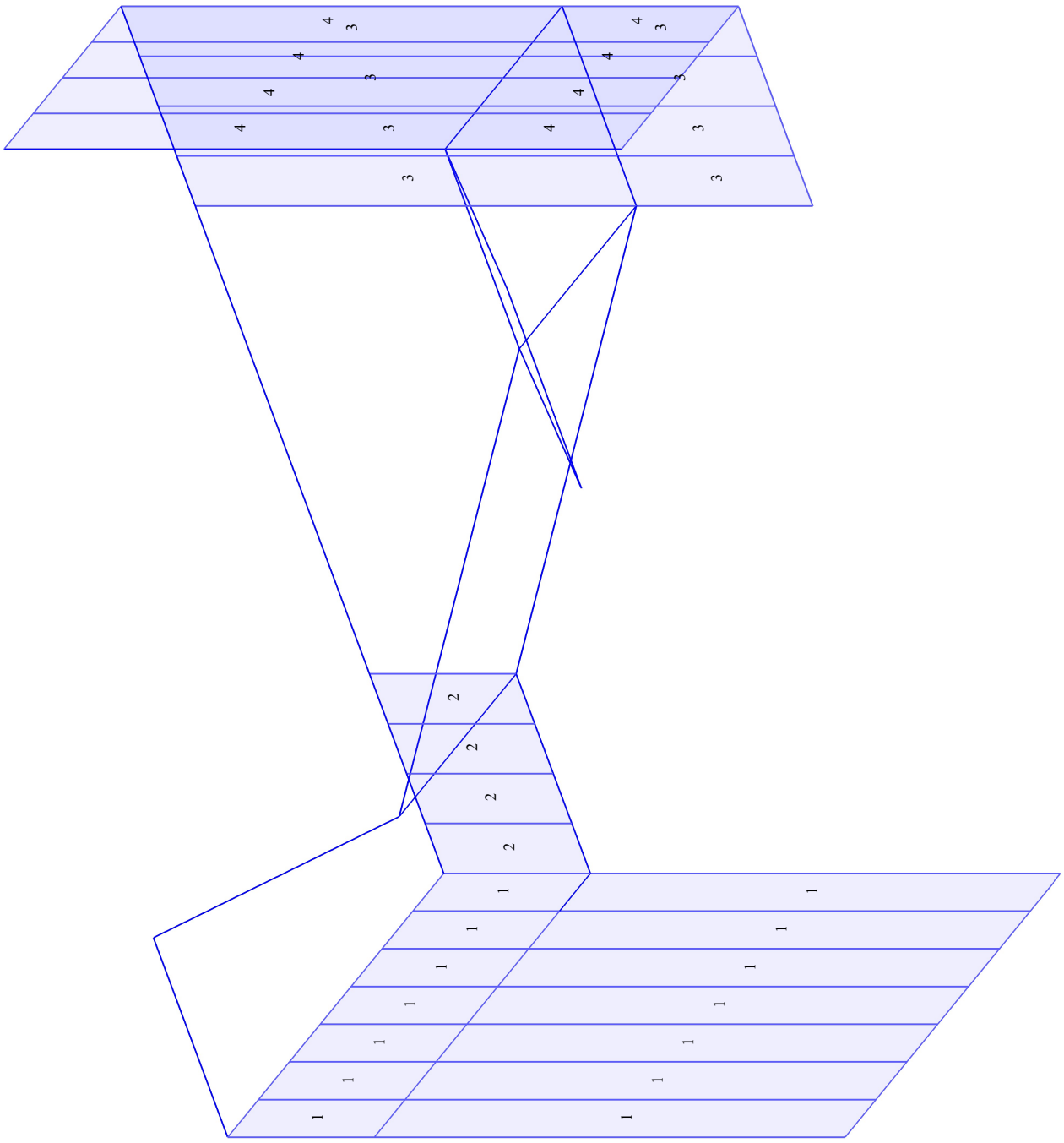
-. $A_{s,req}$ = 400 mm²/m ==> D13 @ 300



우측 계단참 폭방향 검토 : 정모멘트

-. $M_{u,pos}$ = 3.8 kN·m/m

-. $A_{s,req}$ = 400 mm²/m ==> D13 @ 300



Wall ID

Certified by :

PROJECT TITLE :

MIDAS	Company		Client	
	Author		File Name	계단 구조1.rcs

```
------------------------------------------------------------------------------------------
 midas Gen - RC-Wall Design     [ KDS 41 20 : 2022 ] Method 1                Gen 2026
==========================================================================================

      +=========================================================+
      |  MIDAS(Modeling, Integrated Design & Analysis Software)  |
      |  midas Gen - Design & checking system for windows        |
      +=========================================================+
      |  RC-Member(Beam/Column/Brace/Wall) Analysis and Design    |
      |  Based On  KDS 41 20 : 2022, KDS 41 30 : 2018,           |
      |            KCI-USD12, KCI-USD07, KCI-USD03, KCI-USD99,   |
      |            KSCE-USD96, AIK-USD94, AIK-WSD2K, ACI318-19,  |
      |            ACI318M-19, ACI318-14, ACI318M-14, ACI318-11, |
      |            ACI318-08, ACI318-05, ACI318-02, ACI318-99,   |
      |            ACI318-95, ACI318-89, GB/T50010-10,           |
      |            GB50010-02, BS8110-97, Eurocode2:04,          |
      |            Eurocode2, NSR-10, CSA-A23.3-94, AIJ-WSD99,   |
      |            IS456:2000, NSCP 2015, NTC-DCEC(2023),        |
      |            NTC-DCEC(2017), TWN-USD112, TWN-USD100,       |
      |                                          (c)SINCE 1989  |
      +=========================================================+
      |  MIDAS Information Technology Co.,Ltd.         (MIDAS IT)  |
      |  MIDAS IT Design Development Team                        |
      +=========================================================+
      |            HomePage : www.MidasUser.com                  |
      +=========================================================+
      |  Gen 2026                                                |
      +=========================================================+
```

*.DEFINITION OF LOAD COMBINATIONS WITH SCALING UP FACTORS.

LCB	C	Loadcase Name(Factor) + Loadcase Name(Factor) + Loadcase Name(Factor)
1	1	DL(1.400)
2	1	DL(1.200) + LL(1.600)
3	1	DL(1.200) + EX(1.000) + EY(0.300) + LL(1.000)
4	1	DL(1.200) + EX(1.000) + EY(-0.300) + LL(1.000)
5	1	DL(1.200) + EY(1.000) + EX(0.300) + LL(1.000)
6	1	DL(1.200) + EY(1.000) + EX(-0.300) + LL(1.000)
7	1	DL(1.200) + EX(-1.000) + EY(-0.300) + LL(1.000)
8	1	DL(1.200) + EX(-1.000) + EY(0.300) + LL(1.000)
9	1	DL(1.200) + EY(-1.000) + EX(-0.300) + LL(1.000)
10	1	DL(1.200) + EY(-1.000) + EX(0.300) + LL(1.000)
11	1	DL(0.900) + EX(1.000) + EY(0.300)
12	1	DL(0.900) + EX(1.000) + EY(-0.300)
13	1	DL(0.900) + EY(1.000) + EX(0.300)
14	1	DL(0.900) + EY(1.000) + EX(-0.300)
15	1	DL(0.900) + EX(-1.000) + EY(-0.300)
16	1	DL(0.900) + EX(-1.000) + EY(0.300)
17	1	DL(0.900) + EY(-1.000) + EX(-0.300)
18	1	DL(0.900) + EY(-1.000) + EX(0.300)

Certified by :

PROJECT TITLE :

MIDAS	**Company**		**Client**	
	Author		**File Name**	계단 구조1.rcs

Certified by :

PROJECT TITLE :

MIDAS	**Company**		**Client**	
	Author		**File Name**	계단 구조1.rcs

midas Gen - RC-Wall Design [KDS 41 20 : 2022] Method 1 Gen 2026

*.Wall ID = 1, Wall Mark = wM0001 Double Layer Rebar. <<RC-Wall Design Result>>.
*.V-Rebar : fy = 0 ~ 400 N/mm^2, H-Rebar : fys = 400 N/mm^2.

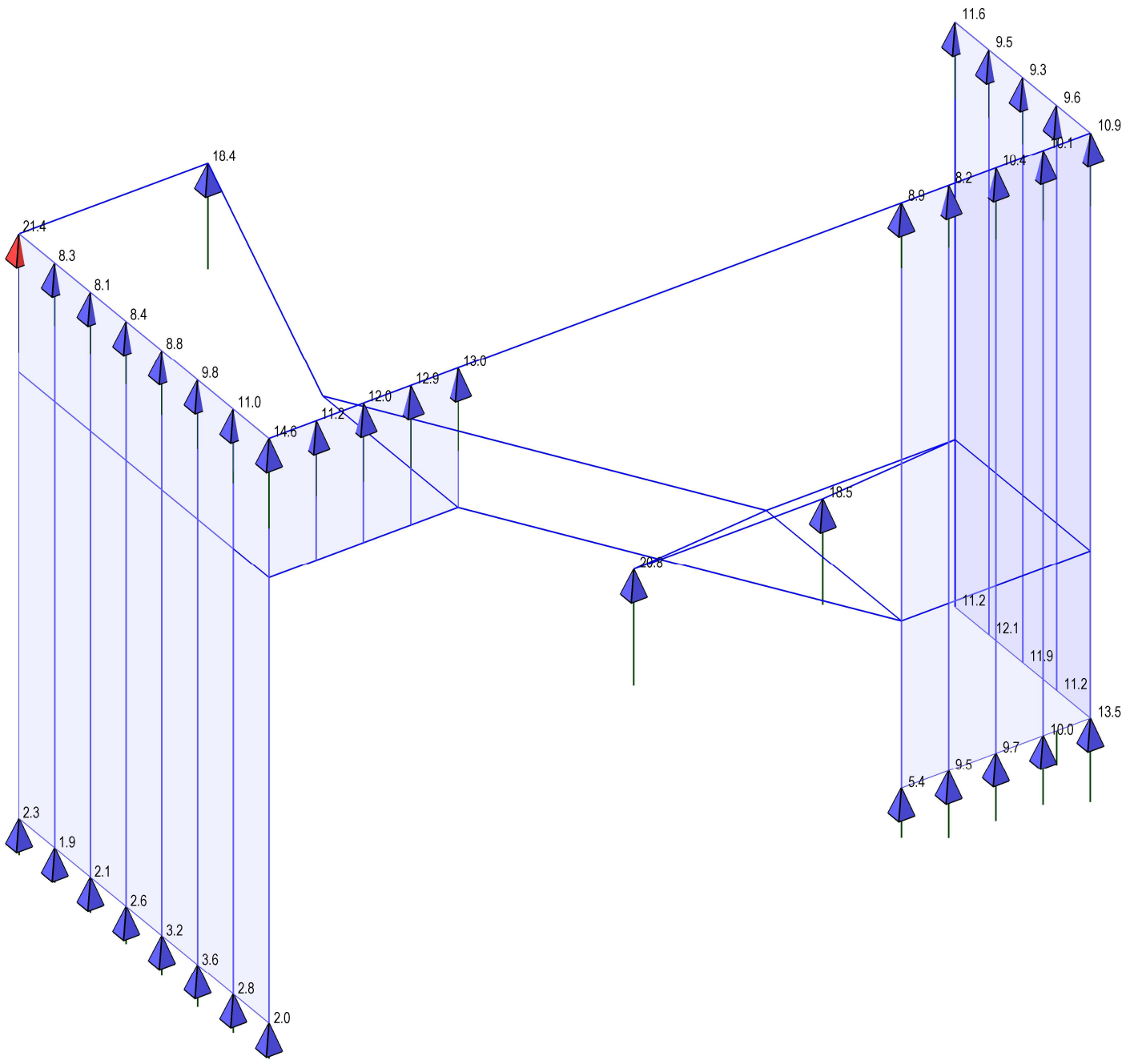
STO	HTw	Lw	hw	fck	fy	fys	Pu(kN)	Mc(kN-m,LCB)	Vu(kN,LCB)	AsV	V-Rebar	AsH	H-Rebar	End-Rebar
계단참	950	2550	200	27	400	400	-59.	8.(3)	9.(10)	357.	D10@400	408.	D10@350	Not Use
계단참	950	2550	200	27	400	400	-59.	8.(3)	9.(10)	357.	D10@400	408.	D10@350	Not Use
1F	3050	2550	200	27	400	400	-37.	4.(1)	5.(5)	357.	D10@400	408.	D10@350	Not Use

*.Wall ID = 2, Wall Mark = wM0002 Double Layer Rebar. <<RC-Wall Design Result>>.
*.V-Rebar : fy = 0 ~ 400 N/mm^2, H-Rebar : fys = 400 N/mm^2.

STO	HTw	Lw	hw	fck	fy	fys	Pu(kN)	Mc(kN-m,LCB)	Vu(kN,LCB)	AsV	V-Rebar	AsH	H-Rebar	End-Rebar
계단참	950	1300	200	27	400	400	-44.	7.(8)	9.(7)	476.	D10@300	408.	D10@350	Not Use
계단참	950	1300	200	27	400	400	-44.	7.(8)	9.(7)	476.	D10@300	408.	D10@350	Not Use

*.Wall ID = 3, Wall Mark = wM0003 Double Layer Rebar. <<RC-Wall Design Result>>.
*.V-Rebar : fy = 0 ~ 400 N/mm^2, H-Rebar : fys = 400 N/mm^2.

STO	HTw	Lw	hw	fck	fy	fys	Pu(kN)	Mc(kN-m,LCB)	Vu(kN,LCB)	AsV	V-Rebar	AsH	H-Rebar	End-Rebar
계단참	2857	1300	200	27	400	400	-34.	3.(3)	2.(3)	476.	D10@300	408.	D10@350	Not Use
계단참	2857	1300	200	27	400	400	-34.	3.(3)	2.(3)	476.	D10@300	408.	D10@350	Not Use
1F	1143	1300	200	27	400	400	37.	0.(2)	4.(11)	476.	D10@300	408.	D10@350	Not Use



midas Gen
POST-PROCESSOR

REACTION FORCE

FORCE-Z

MIN. REACTION
NODE= 173
FZ: 1.8758E+00

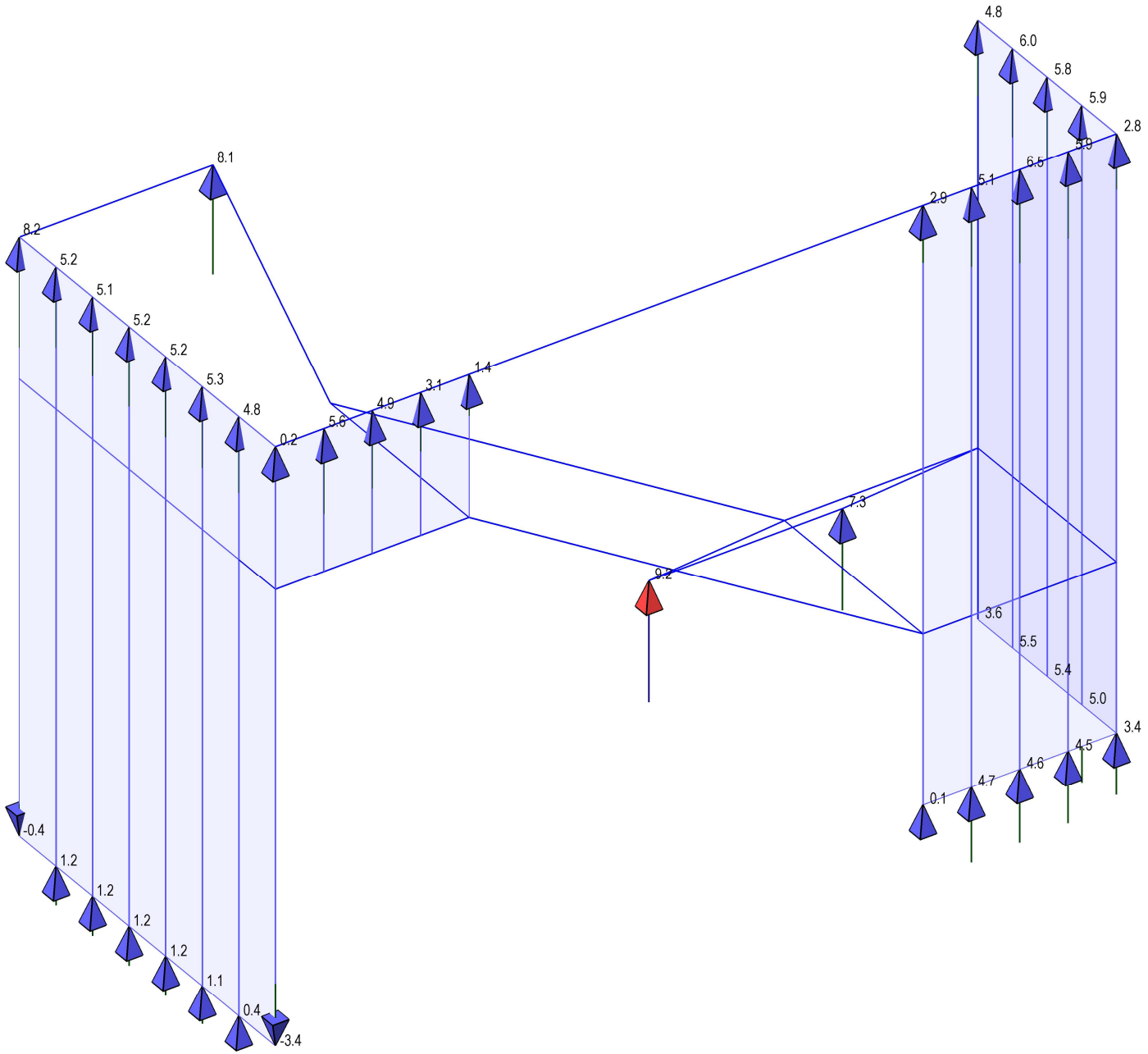
MAX. REACTION
NODE= 113
FZ: 2.1351E+01

CBMAX: 999

MAX : 113
MIN : 173

FILE: 계단 구조1
UNIT: kN
DATE: 09/03/2026

VIEW-DIRECTION
X:-0.466
Y:-0.691
Z: 0.552



midas Gen
POST-PROCESSOR

REACTION FORCE

FORCE-Z

MIN. REACTION
NODE= 111
FZ: -3.3942E+00

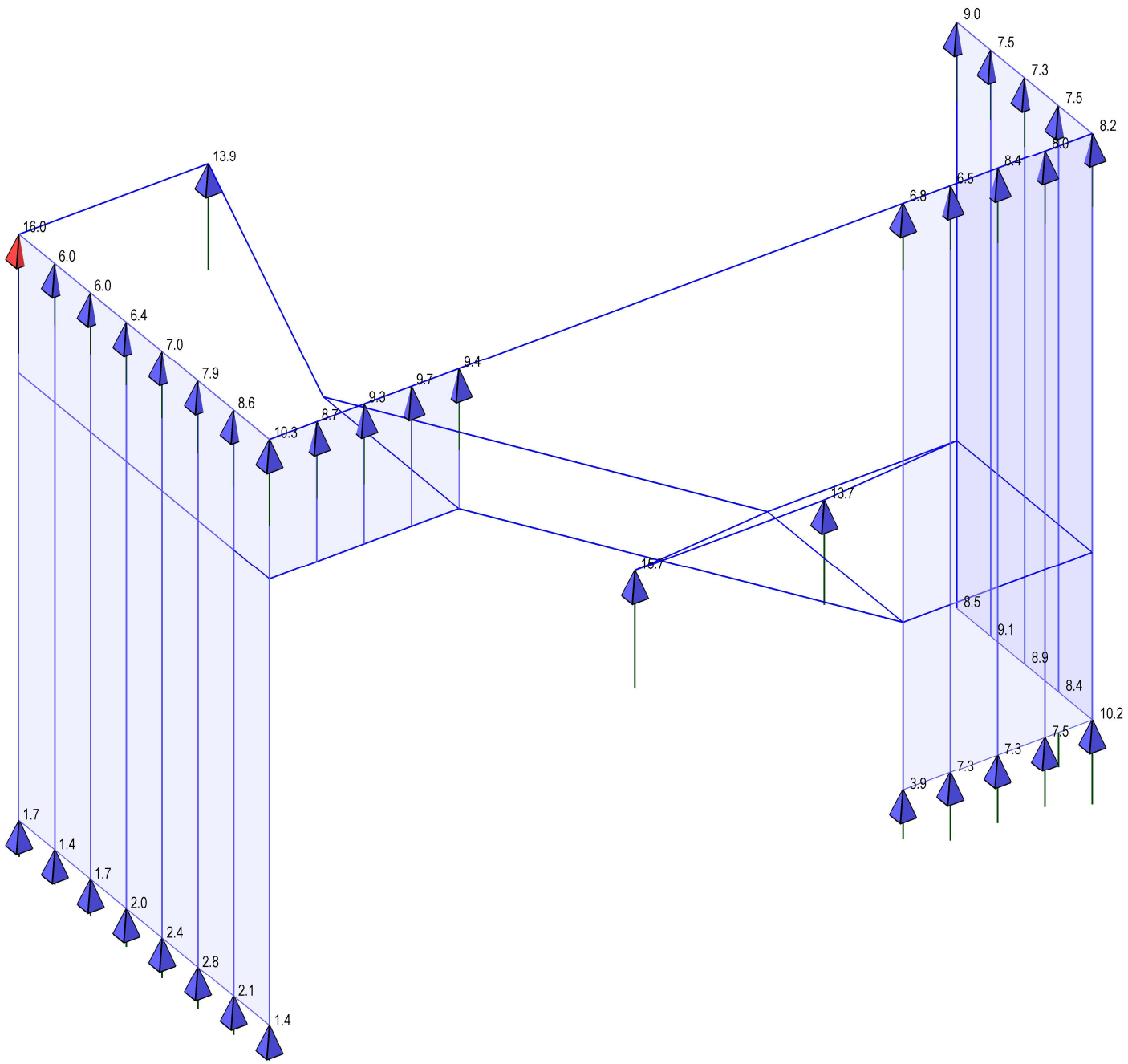
MAX. REACTION
NODE= 138
FZ: 9.2470E+00

CBMIN: 999

MAX : 138
MIN : 111

FILE: 계단 구조1
UNIT: kN
DATE: 09/03/2026

VIEW-DIRECTION
X:-0.466
Y:-0.691
Z: 0.552



midas Gen
POST-PROCESSOR

REACTION FORCE

FORCE-Z

MIN. REACTION
NODE= 173
FZ: 1.4215E+00

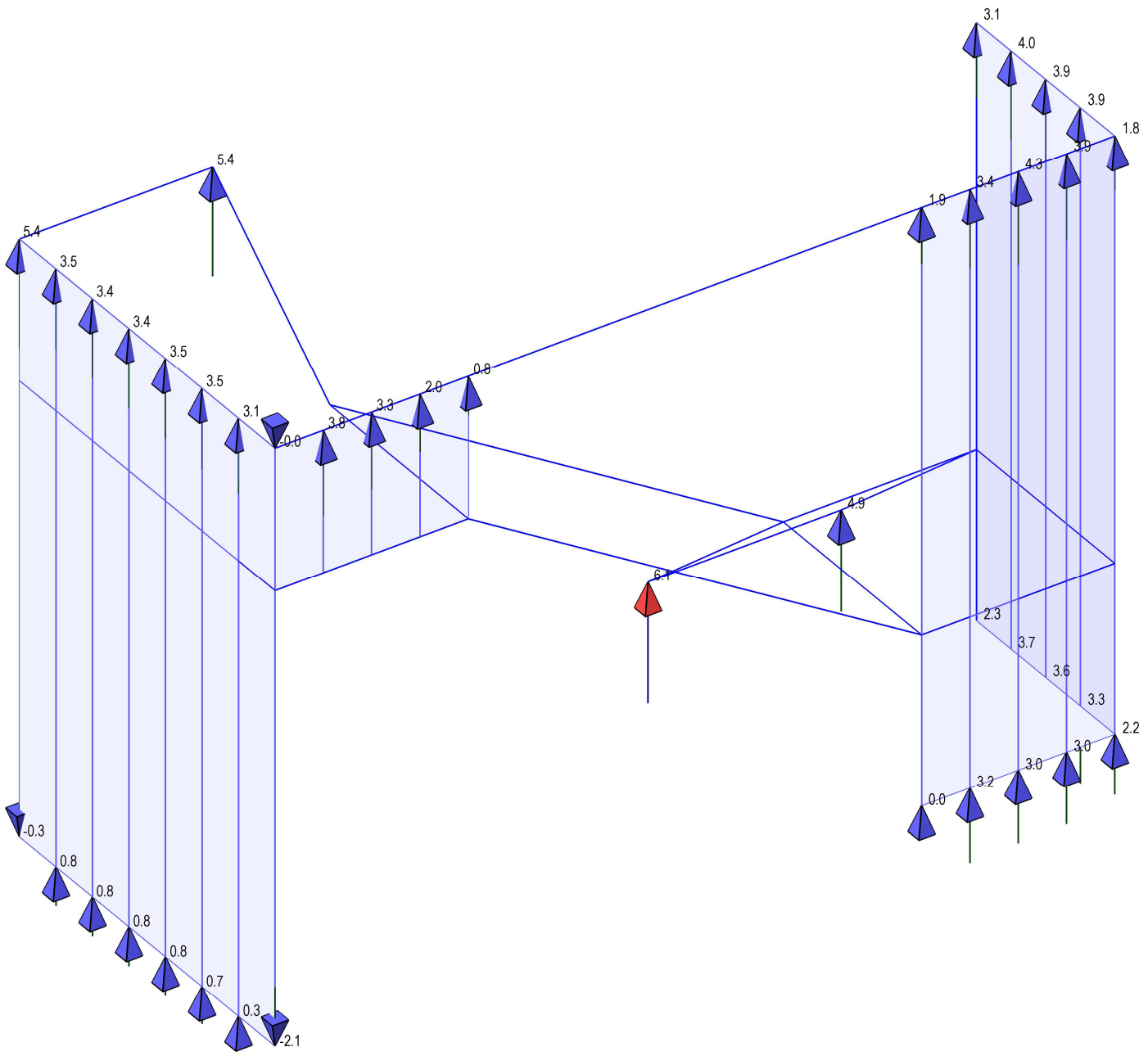
MAX. REACTION
NODE= 113
FZ: 1.6031E+01

CBMAX: 888

MAX : 113
MIN : 173

FILE: 계단 구조1
UNIT: kN
DATE: 09/03/2026

VIEW-DIRECTION
X:-0.466
Y:-0.691
Z: 0.552



midas Gen
POST-PROCESSOR

REACTION FORCE

FORCE-Z

MIN. REACTION
NODE= 111
FZ: -2.0686E+00

MAX. REACTION
NODE= 138
FZ: 6.1499E+00

CBMIN: 888

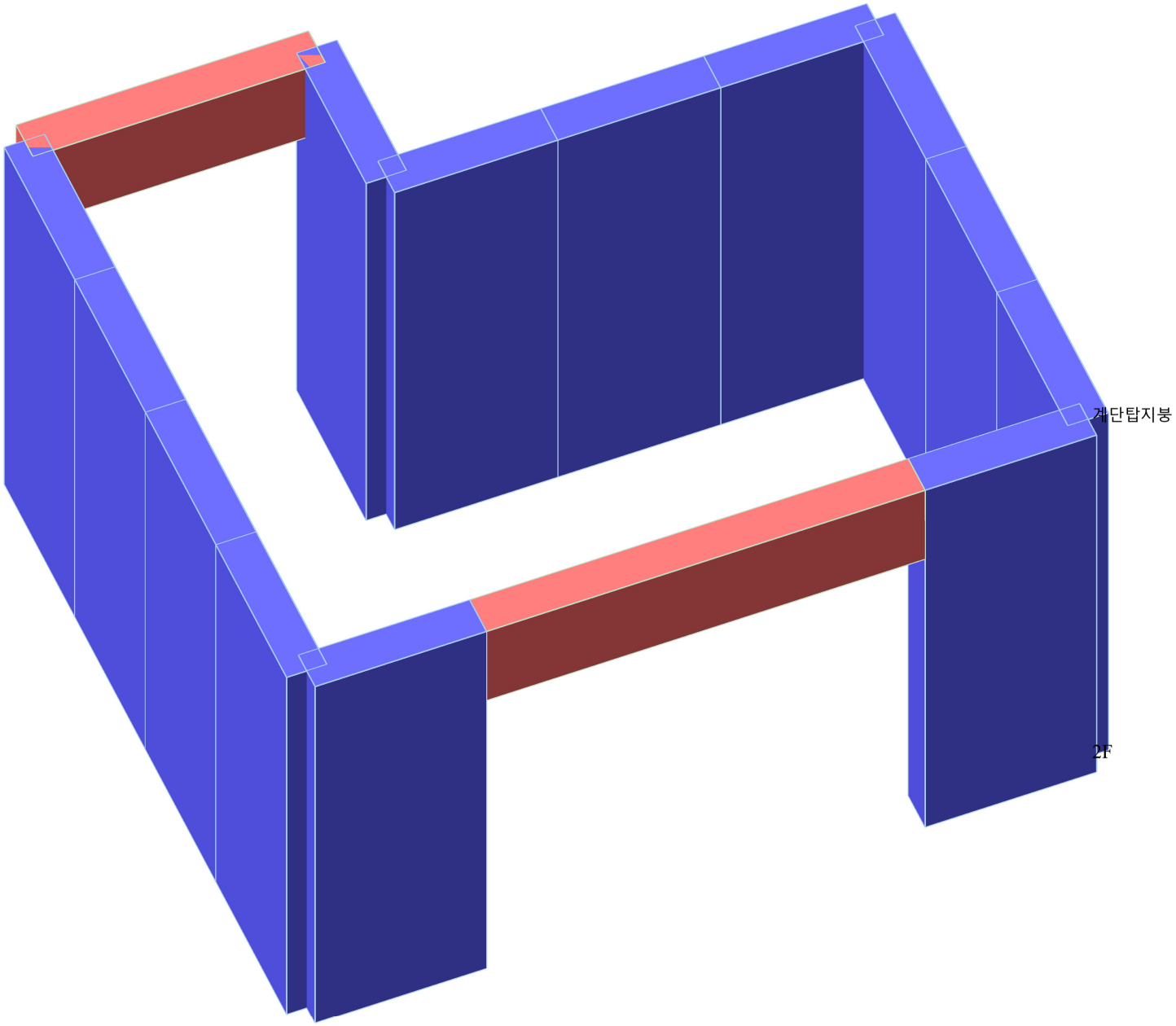
MAX : 138
MIN : 111

FILE: 계단 구조1
UNIT: kN
DATE: 09/03/2026

VIEW-DIRECTION
X:-0.466
Y:-0.691
Z: 0.552

- 계단탑 지붕층 -

계단탑 지붕



Certified by :

PROJECT TITLE :

MIDAS	Company		Client	
	Author		File Name	계단탑지붕층.spf

* MASS GENERATION DATA FOR LATERAL ANALYSIS OF BUILDING [UNIT: kN, m]

STORY NAME	TRANSLATIONAL MASS (X-DIR)	(Y-DIR)	ROTATIONAL MASS	CENTER OF MASS (X-COORD)	(Y-COORD)
계단탑지붕	13.3750535	13.3750535	49.7994442	1.83464861	1.52771893
2F	0.0	0.0	0.0	0.0	0.0
TOTAL :	13.3750535	13.3750535			

* ADDITIONAL MASSES FOR THE CALCULATION OF EQUIVALENT SEISMIC FORCE

Note. The following masses are between two adjacent stories or on the nodes released from floor rigid diaphragm by *Diaphragm Disconnect command. The masses are proportionally distributed to upper/lower stories according to their vertical locations. For dynamic analysis, however, floor masses and masses on vertical elements remain at their original locations.

STORY NAME	TRANSLATIONAL MASS (X-DIR)	(Y-DIR)
계단탑지붕	0.0	0.0
2F	6.40080426	6.40080426
TOTAL :	6.40080426	6.40080426

* EQUIVALENT SEISMIC LOAD IN ACCORDANCE WITH KOREAN BUILDING CODE (KDS(41-17-00:2019)) [UNIT: kN, m]

Seismic Zone	: 1
EPA (S)	: 0.18
Site Class	: S4
Acceleration-based Site Coefficient (Fa)	: 1.44800
Velocity-based Site Coefficient (Fv)	: 2.04800
Design Spectral Response Acc. at Short Periods (Sds)	: 0.42475
Design Spectral Response Acc. at 1 s Period (Sd1)	: 0.24030
Seismic Use Group	: I
Importance Factor (Ie)	: 1.20
Seismic Design Category from Sds	: C
Seismic Design Category from Sd1	: D
Seismic Design Category from both Sds and Sd1	: D
Period Coefficient for Upper Limit (Cu)	: 1.4597
Fundamental Period Associated with X-dir. (Tx)	: 0.1975
Fundamental Period Associated with Y-dir. (Ty)	: 0.1975
Response Modification Factor for X-dir. (Rx)	: 3.0000
Response Modification Factor for Y-dir. (Ry)	: 3.0000
Exponent Related to the Period for X-direction (Kx)	: 1.0000
Exponent Related to the Period for Y-direction (Ky)	: 1.0000
Seismic Response Coefficient for X-direction (Csx)	: 0.1699
Seismic Response Coefficient for Y-direction (Csy)	: 0.1699
Total Effective Weight For X-dir. Seismic Loads (Wx)	: 131.155775
Total Effective Weight For Y-dir. Seismic Loads (Wy)	: 131.155775
Scale Factor For X-directional Seismic Loads	: 1.00
Scale Factor For Y-directional Seismic Loads	: 0.00

Accidental Eccentricity For X-direction (Ex) : Positive
Accidental Eccentricity For Y-direction (Ey) : Positive

Torsional Amplification for Accidental Eccentricity : Do not Consider
Torsional Amplification for Inherent Eccentricity : Do not Consider

Total Base Shear Of Model For X-direction : 22.283191
Total Base Shear Of Model For Y-direction : 0.000000
Summation Of Wi*Hi^k Of Model For X-direction : 321.331648
Summation Of Wi*Hi^k Of Model For Y-direction : 0.000000

ECCENTRICITY RELATED DATA

STORY NAME	X-DIRECTIONAL LOAD ACCIDENTAL ECCENT.	X-DIRECTIONAL LOAD INHERENT ECCENT.	X-DIRECTIONAL LOAD ACCIDENTAL AMP.FACTOR	X-DIRECTIONAL LOAD INHERENT AMP.FACTOR	Y-DIRECTIONAL LOAD ACCIDENTAL ECCENT.	Y-DIRECTIONAL LOAD INHERENT ECCENT.	Y-DIRECTIONAL LOAD ACCIDENTAL AMP.FACTOR	Y-DIRECTIONAL LOAD INHERENT AMP.FACTOR
계단탑지붕	-0.169	0.0	1.0	0.0	0.19375	0.0	1.0	0.0
G.L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The accidental amplification factors are automatically set to 1.0 when torsional amplification effect to accidental eccentricity is not considered.
The inherent amplification factors are automatically set to 0 when torsional amplification effect to inherent eccentricity is not considered.
The inherent amplification factors are all set to 'the input value - 1.0'.(This is to exclude the true inherent torsion)

** Story Force , Seismic Force x Scale Factor + Added Force

SEISMIC LOAD GENERATION DATA X-DIRECTION

STORY NAME	STORY WEIGHT	STORY LEVEL	SEISMIC FORCE	ADDED FORCE	STORY FORCE	STORY SHEAR	OVERTURN. MOMENT	ACCIDENT. TORSION	INHERENT TORSION	TOTAL TORSION
계단탑지붕	131.1558	2.45	22.28319	0.0	22.28319	0.0	0.0	3.765859	0.0	3.765859
G.L.	--	0.0	--	--	--	22.28319	54.59382	---	---	---

SEISMIC LOAD GENERATION DATA Y-DIRECTION

STORY NAME	STORY WEIGHT	STORY LEVEL	SEISMIC FORCE	ADDED FORCE	STORY FORCE	STORY SHEAR	OVERTURN. MOMENT	ACCIDENT. TORSION	INHERENT TORSION	TOTAL TORSION
계단탑지붕	131.1558	2.45	22.28319	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G.L.	--	0.0	--	--	--	0.0	0.0	---	---	---

COMMENTS ABOUT TORSION

Certified by :

PROJECT TITLE :

MIDAS	**Company**		**Client**	
	Author		**File Name**	계단탑지붕층.spf

If torsional amplification effects are considered :

Accidental Torsion , Story Force * Accidental Eccentricity * Amp. Factor for Accidental Eccentricity
Inherent Torsion , Story Force * Inherent Eccentricity * Amp. Factor for Inherent Eccentricity

---

If torsional amplification effects are not considered :

Accidental Torsion , Story Force * Accidental Eccentricity
Inherent Torsion , 0

The inherent torsion above is the additional torsion due to torsional amplification effect.
The true inherent torsion is considered automatically in analysis stage when the seismic force is applied to the structure.

Certified by :

PROJECT TITLE :

MIDAS	Company		Client	
	Author		File Name	계단탑지붕층.spf

* MASS GENERATION DATA FOR LATERAL ANALYSIS OF BUILDING [UNIT: kN, m]

STORY NAME	TRANSLATIONAL MASS (X-DIR)	TRANSLATIONAL MASS (Y-DIR)	ROTATIONAL MASS	CENTER OF MASS (X-COORD)	CENTER OF MASS (Y-COORD)
계단탑지붕	13.3750535	13.3750535	49.7994442	1.83464861	1.52771893
2F	0.0	0.0	0.0	0.0	0.0
TOTAL :	13.3750535	13.3750535			

* ADDITIONAL MASSES FOR THE CALCULATION OF EQUIVALENT SEISMIC FORCE

Note. The following masses are between two adjacent stories or on the nodes released from floor rigid diaphragm by *Diaphragm Disconnect command. The masses are proportionally distributed to upper/lower stories according to their vertical locations. For dynamic analysis, however, floor masses and masses on vertical elements remain at their original locations.

STORY NAME	TRANSLATIONAL MASS (X-DIR)	TRANSLATIONAL MASS (Y-DIR)
계단탑지붕	0.0	0.0
2F	6.40080426	6.40080426
TOTAL :	6.40080426	6.40080426

* EQUIVALENT SEISMIC LOAD IN ACCORDANCE WITH KOREAN BUILDING CODE (KDS(41-17-00:2019)) [UNIT: kN, m]

Seismic Zone	: 1
EPA (S)	: 0.18
Site Class	: S4
Acceleration-based Site Coefficient (Fa)	: 1.44800
Velocity-based Site Coefficient (Fv)	: 2.04800
Design Spectral Response Acc. at Short Periods (Sds)	: 0.42475
Design Spectral Response Acc. at 1 s Period (Sd1)	: 0.24030
Seismic Use Group	: I
Importance Factor (Ie)	: 1.20
Seismic Design Category from Sds	: C
Seismic Design Category from Sd1	: D
Seismic Design Category from both Sds and Sd1	: D
Period Coefficient for Upper Limit (Cu)	: 1.4597
Fundamental Period Associated with X-dir. (Tx)	: 0.1975
Fundamental Period Associated with Y-dir. (Ty)	: 0.1975
Response Modification Factor for X-dir. (Rx)	: 3.0000
Response Modification Factor for Y-dir. (Ry)	: 3.0000
Exponent Related to the Period for X-direction (Kx)	: 1.0000
Exponent Related to the Period for Y-direction (Ky)	: 1.0000
Seismic Response Coefficient for X-direction (Csx)	: 0.1699
Seismic Response Coefficient for Y-direction (Csy)	: 0.1699
Total Effective Weight For X-dir. Seismic Loads (Wx)	: 131.155775
Total Effective Weight For Y-dir. Seismic Loads (Wy)	: 131.155775
Scale Factor For X-directional Seismic Loads	: 0.00
Scale Factor For Y-directional Seismic Loads	: 1.00

Accidental Eccentricity For X-direction (Ex) : Positive
Accidental Eccentricity For Y-direction (Ey) : Positive

Torsional Amplification for Accidental Eccentricity : Do not Consider
Torsional Amplification for Inherent Eccentricity : Do not Consider

Total Base Shear Of Model For X-direction : 0.000000
Total Base Shear Of Model For Y-direction : 22.283191
Summation Of Wi*Hi^k Of Model For X-direction : 0.000000
Summation Of Wi*Hi^k Of Model For Y-direction : 321.331648

ECCENTRICITY RELATED DATA

STORY NAME	X-DIRECTIONAL LOAD ACCIDENTAL ECCENT.	X-DIRECTIONAL LOAD INHERENT ECCENT.	X-DIRECTIONAL LOAD ACCIDENTAL AMP.FACTOR	X-DIRECTIONAL LOAD INHERENT AMP.FACTOR	Y-DIRECTIONAL LOAD ACCIDENTAL ECCENT.	Y-DIRECTIONAL LOAD INHERENT ECCENT.	Y-DIRECTIONAL LOAD ACCIDENTAL AMP.FACTOR	Y-DIRECTIONAL LOAD INHERENT AMP.FACTOR
계단탑지붕	-0.169	0.0	1.0	0.0	0.19375	0.0	1.0	0.0
G.L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The accidental amplification factors are automatically set to 1.0 when torsional amplification effect to accidental eccentricity is not considered.
The inherent amplification factors are automatically set to 0 when torsional amplification effect to inherent eccentricity is not considered.
The inherent amplification factors are all set to 'the input value - 1.0'.(This is to exclude the true inherent torsion)

** Story Force , Seismic Force x Scale Factor + Added Force

SEISMIC LOAD GENERATION DATA X-DIRECTION

STORY NAME	STORY WEIGHT	STORY LEVEL	SEISMIC FORCE	ADDED FORCE	STORY FORCE	STORY SHEAR	OVERTURN. MOMENT	ACCIDENT. TORSION	INHERENT TORSION	TOTAL TORSION
계단탑지붕	131.1558	2.45	22.28319	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G.L.	--	0.0	--	--	--	0.0	0.0	---	---	---

SEISMIC LOAD GENERATION DATA Y-DIRECTION

STORY NAME	STORY WEIGHT	STORY LEVEL	SEISMIC FORCE	ADDED FORCE	STORY FORCE	STORY SHEAR	OVERTURN. MOMENT	ACCIDENT. TORSION	INHERENT TORSION	TOTAL TORSION
계단탑지붕	131.1558	2.45	22.28319	0.0	22.28319	0.0	0.0	4.317368	0.0	4.317368
G.L.	--	0.0	--	--	--	22.28319	54.59382	---	---	---

COMMENTS ABOUT TORSION

Certified by :

PROJECT TITLE :

MIDAS	**Company**		**Client**	
	Author		**File Name**	계단탑지붕층.spf

If torsional amplification effects are considered :

Accidental Torsion , Story Force * Accidental Eccentricity * Amp. Factor for Accidental Eccentricity
Inherent Torsion , Story Force * Inherent Eccentricity * Amp. Factor for Inherent Eccentricity

---

If torsional amplification effects are not considered :

Accidental Torsion , Story Force * Accidental Eccentricity
Inherent Torsion , 0

The inherent torsion above is the additional torsion due to torsional amplification effect.
The true inherent torsion is considered automatically in analysis stage when the seismic force is applied to the structure.

Design Conditions

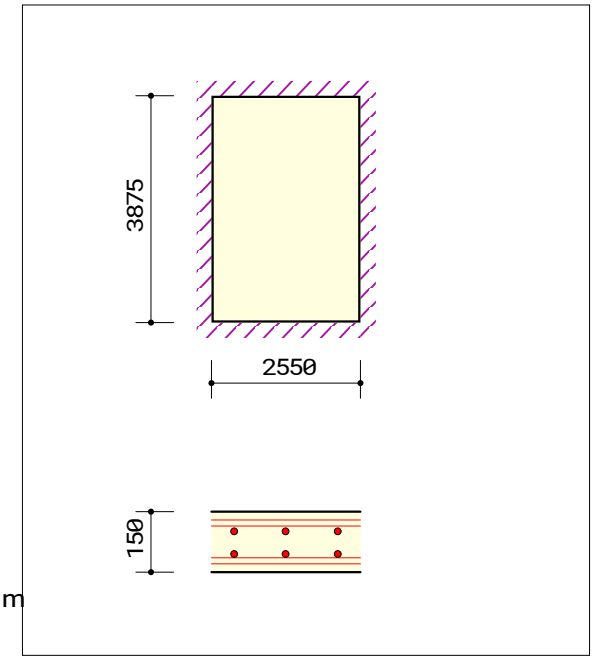
Design Code : KCI-USD12

Material & Dim.

Concrete f_{ck} = 24 N/mm²
Re-bar f_y = 400 N/mm²
Slab Dim. : 2550x3875x150 mm (c_c=30mm)
Edge Beam
UP = 300x300, DN = 300x300 mm
LT = 300x300, RT = 300x300 mm

Applied Loads

Dead Load W_d = 5.40 kN/m²
Live Load W_l = 1.00 kN/m²
$W_u = 1.2 \times W_d + 1.6 \times W_l$ = 8.08 kN/m²



Check Minimum Slab Thk.

$\beta = L_{ny}/L_{nx}$ = 1.5889
$h_{req} = l_n(800+f_y/1.4)/(36000+5000\beta(\alpha_m-0.2))$ = 90 mm
Thk = 150 > T_{req} = 120 mm ---> O.K.

Flexure Reinforcement

DIRECTION	Location	Mu (kN·m/m)	ρ (%)	A_{st} (mm²/m)	Spacing D10	D10+D13	D13	D13+D16
Short Span	Cont	4.02	0.091	104	@300	@300	@300	@300
	Pos	1.88	0.042	49	@300	@300	@300	@300
Long Span	Cont	1.76	0.047	49	@300	@300	@300	@300
	Pos	0.85	0.023	24	@300	@300	@300	@300
Min Bar			0.200	300	@230	@330	@420	@450

Check Shear Strength

Strength Reduction Factor Φ = 0.750

Short Direction Shear

V_{ux} = 8.7 < ΦV_c = 70.1 kN/m ---> O.K.

Long Direction Shear

V_{uy} = 2.4 < ΦV_c = 64.2 kN/m ---> O.K.

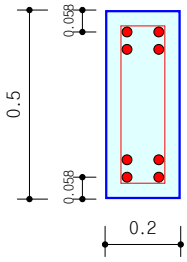
Certified by :

MIDAS	Company		Project Title	
	Author		File Name	계단탑지붕층.mgb

1. Design Information

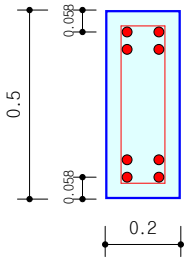
Design Code	KDS 41 20 : 2022	Unit System	kN, m
Material Data	fck = 27000, fy = 400000, fys = 400000 KPa		
Section Property	B1 (No : 1)	Beam Span	2.175m

[END-I]



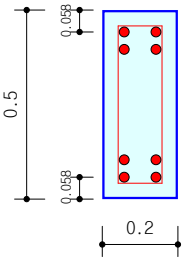
TOP 4-D16
BOT 4-D16
STIRRUPS 2-D10 @200

[MID]



TOP 4-D16
BOT 4-D16
STIRRUPS 2-D10 @200

[END-J]



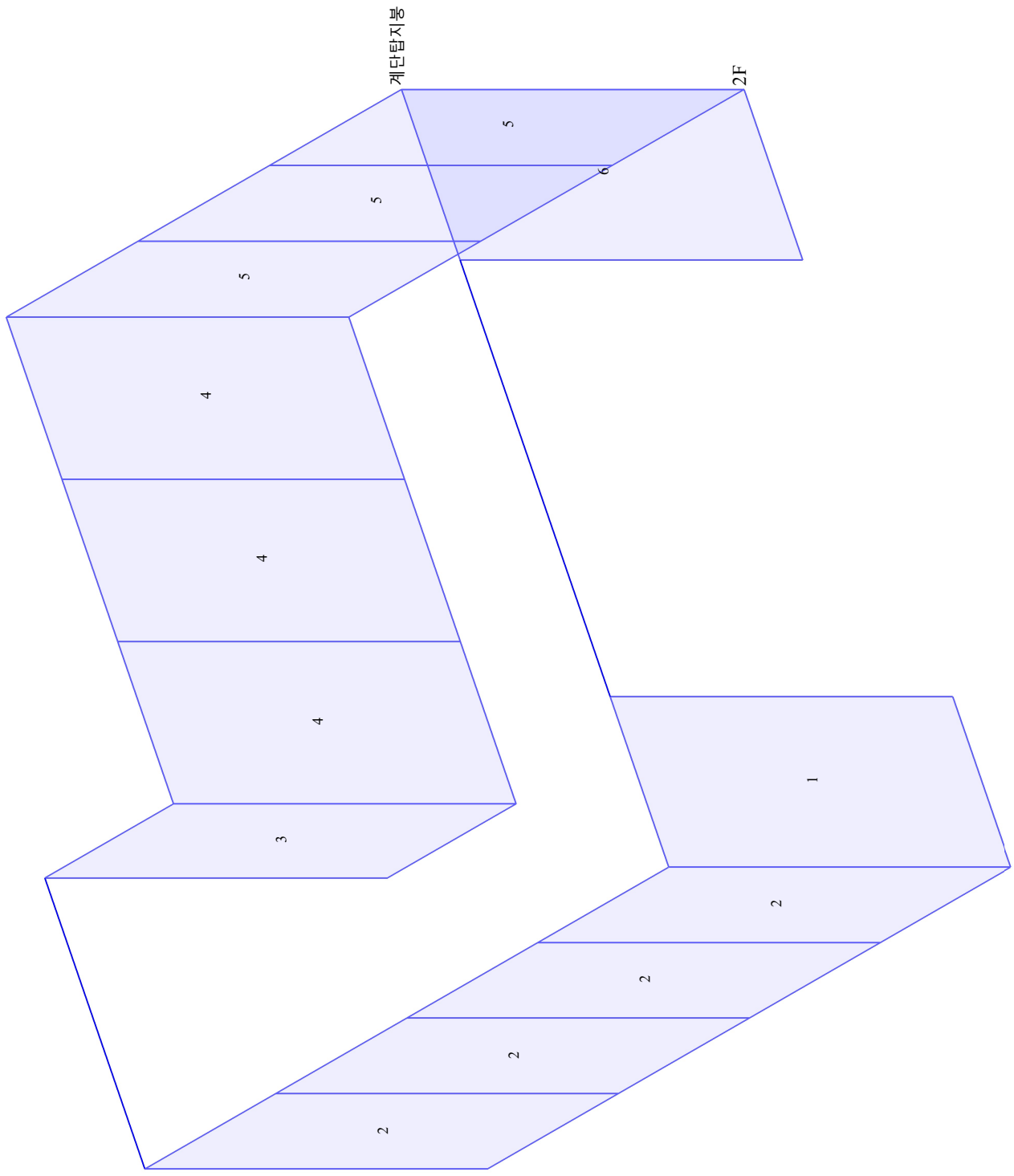
TOP 4-D16
BOT 4-D16
STIRRUPS 2-D10 @200

2. Bending Moment Capacity

	END-I	MID	END-J
(-) Load Combination No.	18	18	18
Moment (Mu)	0.00	0.00	0.00
Factored Strength (φMn)	104.40	104.40	104.40
Check Ratio (Mu/φMn)	0.0000	0.0000	0.0000
(+) Load Combination No.	2	2	2
Moment (Mu)	5.72	7.66	5.72
Factored Strength (φMn)	104.40	104.40	104.40
Check Ratio (Mu/φMn)	0.0548	0.0734	0.0548
Using Rebar Top (As.top)	0.0008	0.0008	0.0008
Using Rebar Bot (As.bot)	0.0008	0.0008	0.0008

3. Shear Capacity

	END-I	MID	END-J
Load Combination No.	2	2	2
Factored Shear Force (Vu)	13.55	7.14	13.55
Shear Strength by Conc.(φVc)	54.76	54.76	54.76
Shear Strength by Rebar.(φVs)	90.21	90.21	90.21
Using Shear Reinf. (AsV)	0.0007	0.0007	0.0007
Using Stirrups Spacing	2-D10 @200	2-D10 @200	2-D10 @200
Check Ratio	0.0935	0.0492	0.0934



Wall ID

midas Gen - RC-Wall Design [KDS 41 20 : 2022] Method 1 Gen 2026

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+=========================================================+
|  MIDAS(Modeling, Integrated Design & Analysis Software)  |
|  midas Gen - Design & checking system for windows        |
+=========================================================+
|  RC-Member(Beam/Column/Brace/Wall) Analysis and Design    |
|  Based On  KDS 41 20 : 2022, KDS 41 30 : 2018,           |
|            KCI-USD12, KCI-USD07, KCI-USD03, KCI-USD99,   |
|            KSCE-USD96, AIK-USD94, AIK-WSD2K, ACI318-19,  |
|            ACI318M-19, ACI318-14, ACI318M-14, ACI318-11, |
|            ACI318-08, ACI318-05, ACI318-02, ACI318-99,   |
|            ACI318-95, ACI318-89, GB/T50010-10,           |
|            GB50010-02, BS8110-97, Eurocode2:04,          |
|            Eurocode2, NSR-10, CSA-A23.3-94, AIJ-WSD99,   |
|            IS456:2000, NSCP 2015, NTC-DCEC(2023),        |
|            NTC-DCEC(2017), TWN-USD112, TWN-USD100,       |
|                                          (c)SINCE 1989  |
+=========================================================+
|  MIDAS Information Technology Co.,Ltd.        (MIDAS IT)  |
|  MIDAS IT Design Development Team                        |
+=========================================================+
|            HomePage : www.MidasUser.com                  |
+=========================================================+
|  Gen 2026                                                |
+=========================================================+
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*.DEFINITION OF LOAD COMBINATIONS WITH SCALING UP FACTORS.

LCB	C	Loadcase Name(Factor) + Loadcase Name(Factor) + Loadcase Name(Factor)
1	1	DL(1.400)
2	1	DL(1.200) + LL(1.600)
3	1	DL(1.200) + EX(1.000) + EY(0.300) + LL(1.000)
4	1	DL(1.200) + EX(1.000) + EY(-0.300) + LL(1.000)
5	1	DL(1.200) + EY(1.000) + EX(0.300) + LL(1.000)
6	1	DL(1.200) + EY(1.000) + EX(-0.300) + LL(1.000)
7	1	DL(1.200) + EX(-1.000) + EY(-0.300) + LL(1.000)
8	1	DL(1.200) + EX(-1.000) + EY(0.300) + LL(1.000)
9	1	DL(1.200) + EY(-1.000) + EX(-0.300) + LL(1.000)
10	1	DL(1.200) + EY(-1.000) + EX(0.300) + LL(1.000)
11	1	DL(0.900) + EX(1.000) + EY(0.300)
12	1	DL(0.900) + EX(1.000) + EY(-0.300)
13	1	DL(0.900) + EY(1.000) + EX(0.300)
14	1	DL(0.900) + EY(1.000) + EX(-0.300)
15	1	DL(0.900) + EX(-1.000) + EY(-0.300)
16	1	DL(0.900) + EX(-1.000) + EY(0.300)
17	1	DL(0.900) + EY(-1.000) + EX(-0.300)
18	1	DL(0.900) + EY(-1.000) + EX(0.300)

Certified by :

PROJECT TITLE :

MIDAS	Company		Client	
	Author		File Name	계단탑지붕층.rcs

midas Gen - RC-Wall Design [KDS 41 20 : 2022] Method 1 Gen 2026

*.Wall ID = 1, Wall Mark = wM0001 Double Layer Rebar. <<RC-Wall Design Result>>.
*.V-Rebar : fy = 0 ~ 400 N/mm^2, H-Rebar : fys = 400 N/mm^2.

STO	HTw	Lw	hw	fck	fy	fys	Pu(kN)	Mc(kN-m,LCB)	Vu(kN,LCB)	AsV	V-Rebar	AsH	H-Rebar	End-Rebar
2F	2450	850	200	27	400	400	6.	9.(8)	8.(8)	357.	D10@400	408.	D10@350	Not Use

*.Wall ID = 2, Wall Mark = wM0002 Double Layer Rebar. <<RC-Wall Design Result>>.
*.V-Rebar : fy = 0 ~ 400 N/mm^2, H-Rebar : fys = 400 N/mm^2.

STO	HTw	Lw	hw	fck	fy	fys	Pu(kN)	Mc(kN-m,LCB)	Vu(kN,LCB)	AsV	V-Rebar	AsH	H-Rebar	End-Rebar
2F	2450	3380	200	27	400	400	80.	2.(1)	12.(10)	357.	D10@400	408.	D10@350	Not Use

*.Wall ID = 3, Wall Mark = wM0003 Double Layer Rebar. <<RC-Wall Design Result>>.
*.V-Rebar : fy = 0 ~ 400 N/mm^2, H-Rebar : fys = 400 N/mm^2.

STO	HTw	Lw	hw	fck	fy	fys	Pu(kN)	Mc(kN-m,LCB)	Vu(kN,LCB)	AsV	V-Rebar	AsH	H-Rebar	End-Rebar
2F	2450	830	200	27	400	400	1.	2.(12)	1.(8)	357.	D10@400	408.	D10@350	Not Use

*.Wall ID = 4, Wall Mark = wM0004 Double Layer Rebar. <<RC-Wall Design Result>>.
*.V-Rebar : fy = 0 ~ 400 N/mm^2, H-Rebar : fys = 400 N/mm^2.

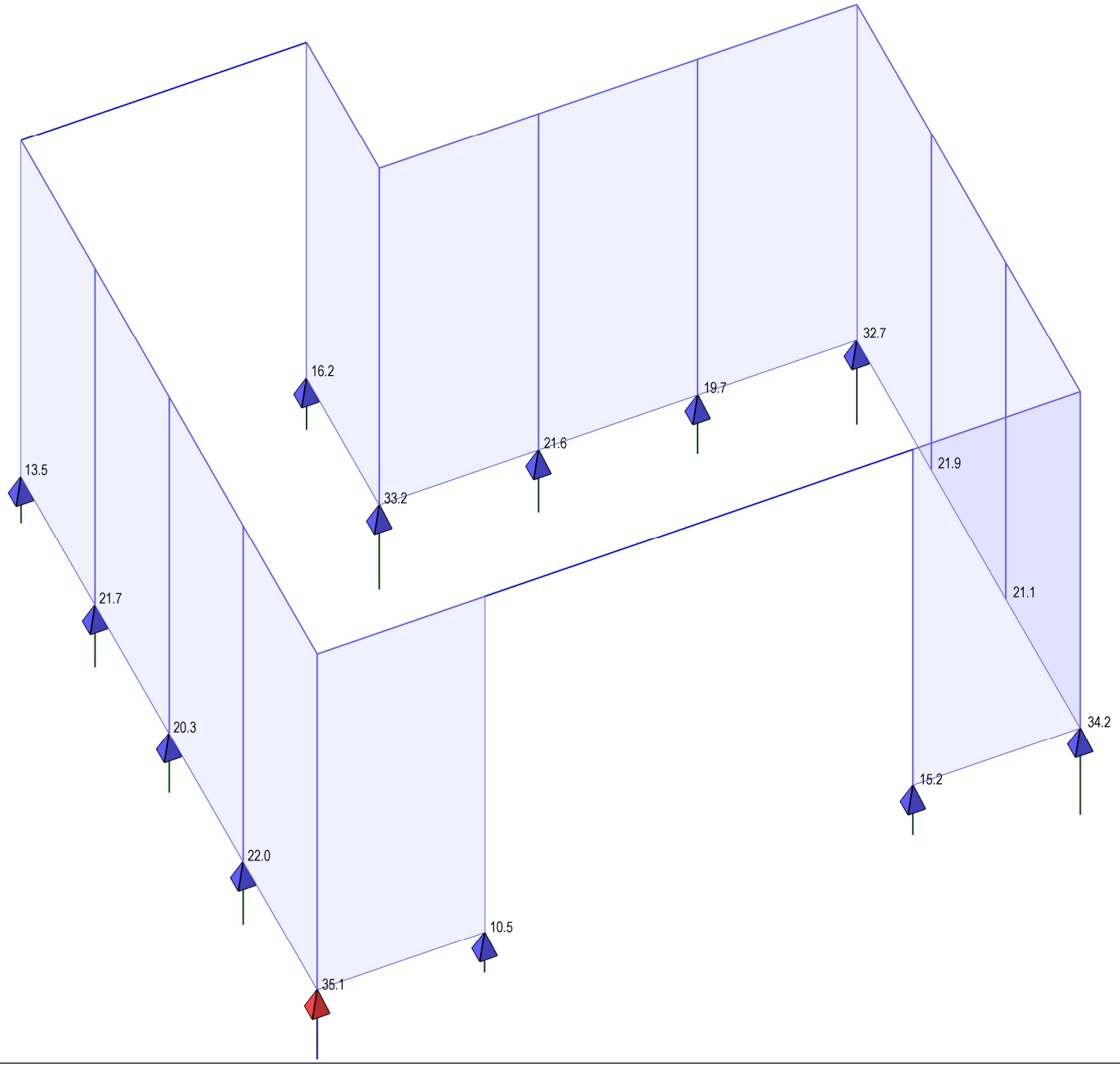
STO	HTw	Lw	hw	fck	fy	fys	Pu(kN)	Mc(kN-m,LCB)	Vu(kN,LCB)	AsV	V-Rebar	AsH	H-Rebar	End-Rebar
2F	2450	2425	200	27	400	400	51.	34.(7)	18.(4)	357.	D10@400	408.	D10@350	Not Use

*.Wall ID = 5, Wall Mark = wM0005 Double Layer Rebar. <<RC-Wall Design Result>>.
*.V-Rebar : fy = 0 ~ 400 N/mm^2, H-Rebar : fys = 400 N/mm^2.

STO	HTw	Lw	hw	fck	fy	fys	Pu(kN)	Mc(kN-m,LCB)	Vu(kN,LCB)	AsV	V-Rebar	AsH	H-Rebar	End-Rebar
2F	2450	2550	200	27	400	400	0.	4.(16)	12.(5)	357.	D10@400	408.	D10@350	Not Use

*.Wall ID = 6, Wall Mark = wM0006 Double Layer Rebar. <<RC-Wall Design Result>>.
*.V-Rebar : fy = 0 ~ 400 N/mm^2, H-Rebar : fys = 400 N/mm^2.

STO	HTw	Lw	hw	fck	fy	fys	Pu(kN)	Mc(kN-m,LCB)	Vu(kN,LCB)	AsV	V-Rebar	AsH	H-Rebar	End-Rebar
2F	2450	850	200	27	400	400	6.	9.(3)	8.(3)	357.	D10@400	408.	D10@350	Not Use



midas Gen
POST-PROCESSOR

REACTION FORCE

FORCE-Z

MIN. REACTION
NODE= 8
FZ: 1.0525E+01

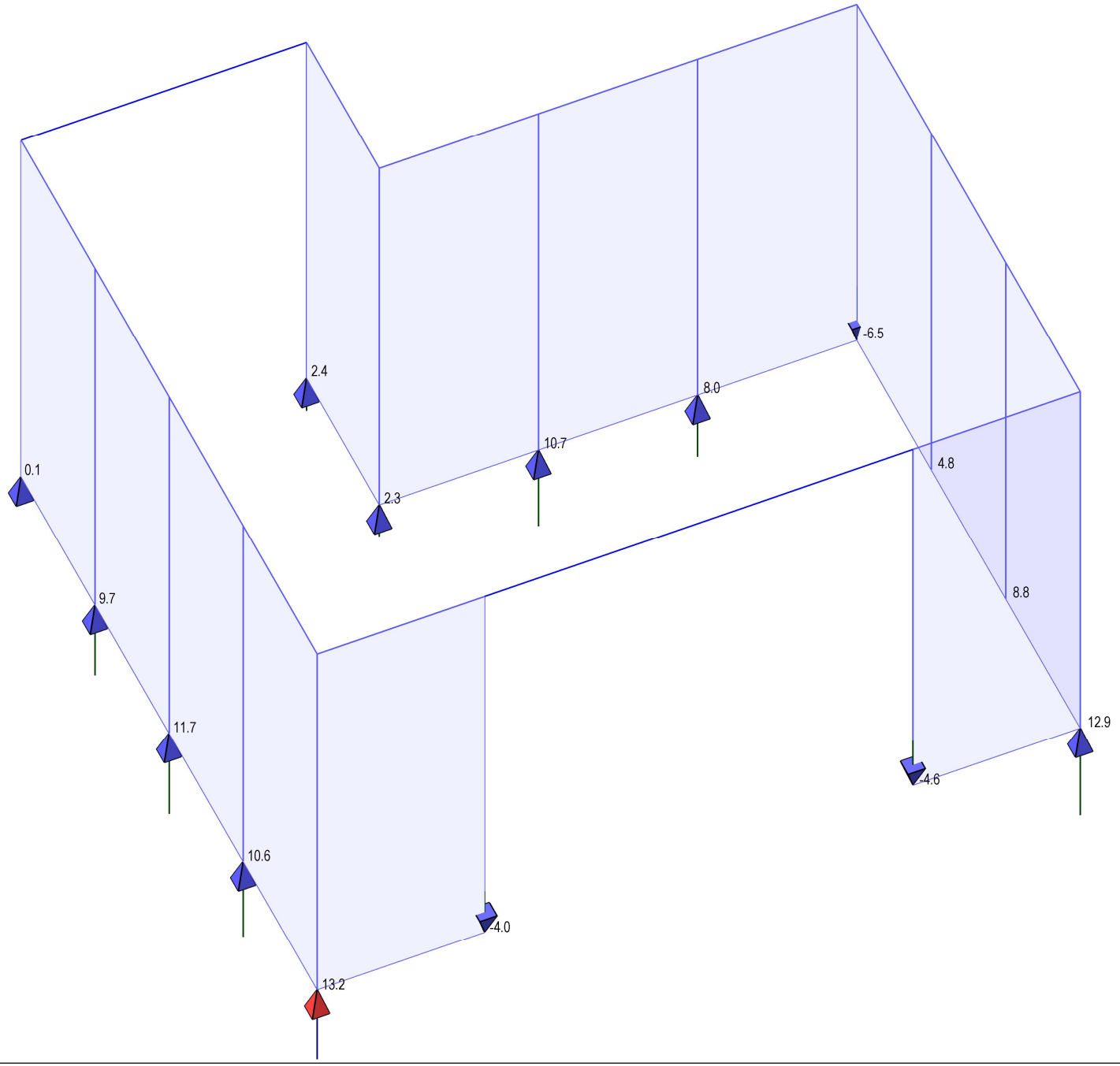
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NODE= 1
FZ: 3.5149E+01

CBMAX: 999

MAX : 1
MIN : 8

FILE: 계단탑지붕층 *
UNIT: kN
DATE: 09/03/2026

VIEW-DIRECTION
X:-0.259
Y:-0.581
Z: 0.772



midas Gen
POST-PROCESSOR

REACTION FORCE

FORCE-Z

MIN. REACTION
NODE= 7
FZ: -6.4556E+00

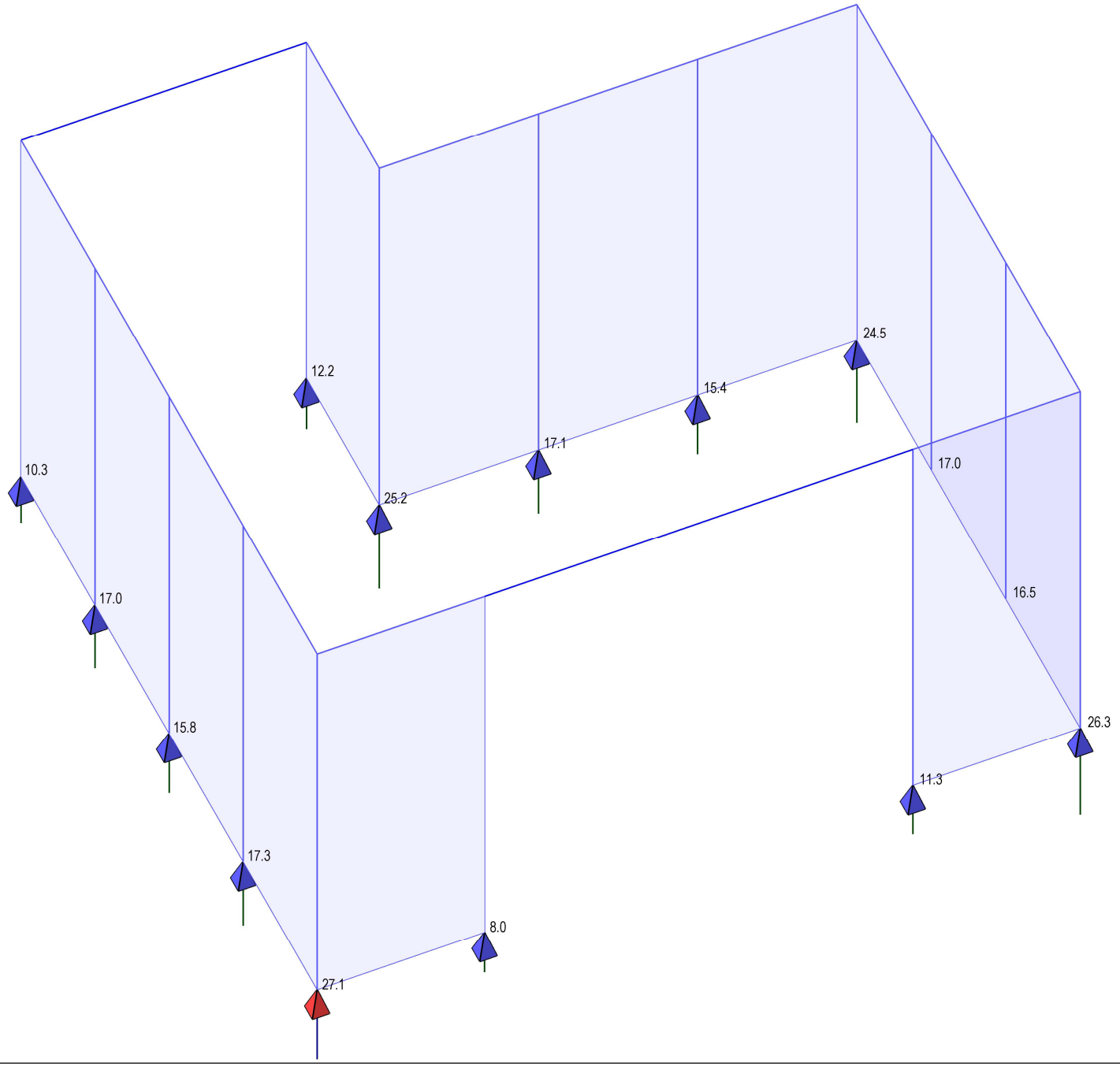
MAX. REACTION
NODE= 1
FZ: 1.3180E+01

CBMIN: 999

MAX : 1
MIN : 7

FILE: 계단탑지붕층 *
UNIT: kN
DATE: 09/03/2026

VIEW-DIRECTION
X:-0.259
Y:-0.581
Z: 0.772



midas Gen
POST-PROCESSOR

REACTION FORCE

FORCE-Z

MIN. REACTION
NODE= 8
FZ: 7.9797E+00

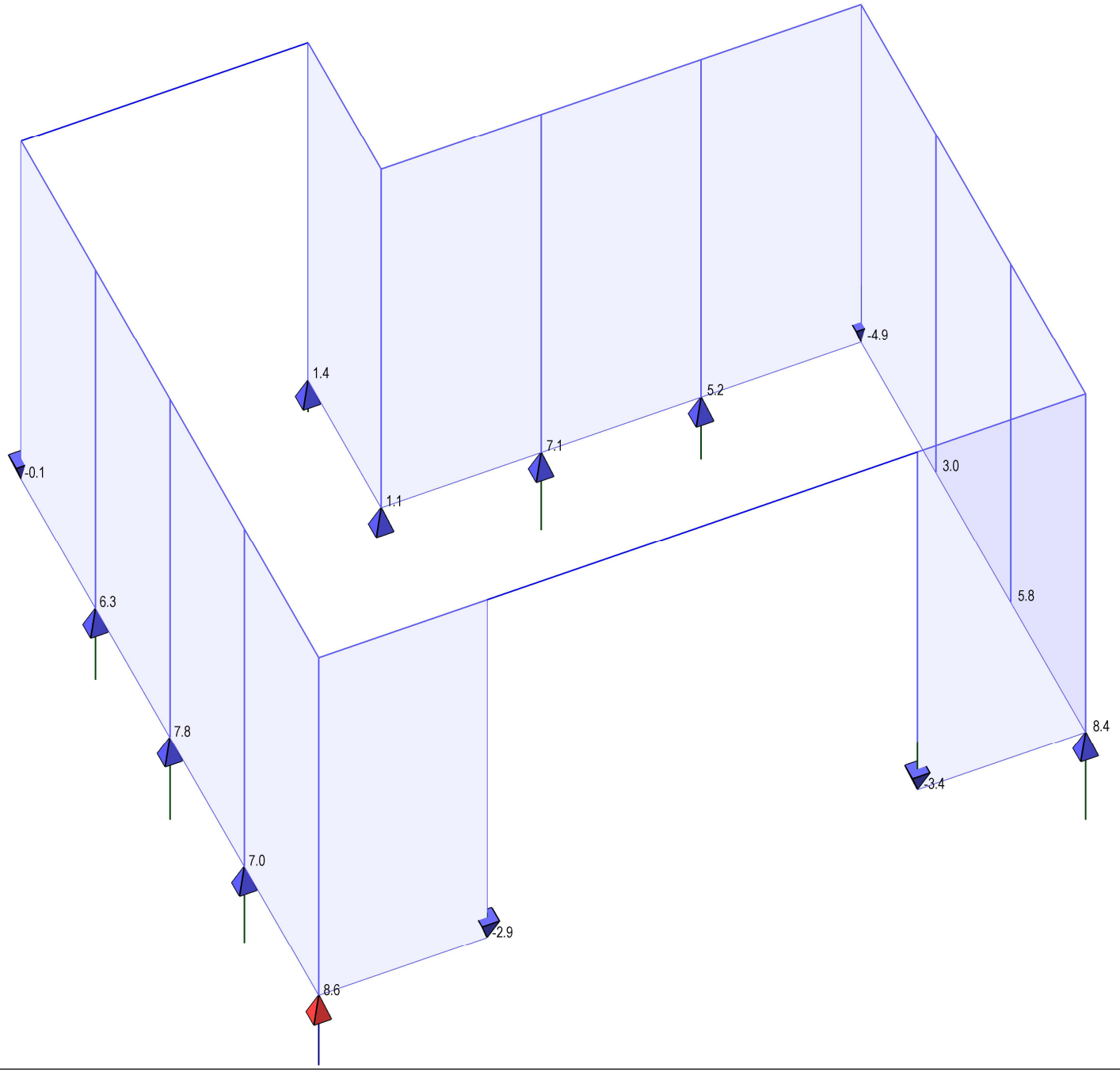
MAX. REACTION
NODE= 1
FZ: 2.7062E+01

CBMAX: 888

MAX : 1
MIN : 8

FILE: 계단탑지붕층 *
UNIT: kN
DATE: 09/03/2026

VIEW-DIRECTION
X:-0.259
Y:-0.581
Z: 0.772



midas Gen
POST-PROCESSOR

REACTION FORCE

FORCE-Z

MIN. REACTION
NODE= 7
FZ: -4.8875E+00

MAX. REACTION
NODE= 1
FZ: 8.5628E+00

CBMIN: 888

MAX : 1
MIN : 7

FILE: 계단탑지붕층 *
UNIT: kN
DATE: 09/03/2026

VIEW-DIRECTION
X:-0.259
Y:-0.581
Z: 0.772