STTelemedia Global Data Centres | aurecon | cta COMMTECH ASIA | Gaa

REQUEST FOR INFORMATION (RFI)

PROJECT :	BKK2	**R.F.I. NO. :**	523213-01-RFI-AR-0022
TO :	CTA	**ATTENTION :**	CTA
SUBMITTED DATE	20-Jan-26	**NEED REPLY BY DATE :**	27-Jan-26

SUBMISSION OF : ■ Q&A ☐ Drawing ■ Document ☐ Others *(as specified below)*

SUBJECT : **Request for Confirmation - Floor Flatness FM2 and Screed Reinforcement details for Data Hall and Related Area**

Total Page (s) : **2** **(Including this page)**

FUNCTION :

☐ Structural (ST) ☐ Electrical & Communication (EL) ☐ Mechanical (ME) ☐ Vertical Transport (VT)

■ Achitectural (AR) ☐ Fire Protection (FI) ☐ Hydraulic & Sanitary (HY) ☐ Other (O)

(1) CONTRACTOR REQUEST FOR INFORMATION :

Request for Clarification regarding Data Hall and related area finishes detail.

GAA would like to request clarification on the following items for the Data Hall and related areas:

1. Floor Flatness (FM2)

Since the final floor finish is Epoxy (Sikafloor 2350 ESD), is the "FM2" flatness requirement still required for the screed? Or is a standard steel trowel finish sufficient?

GAA also note that the FM2 standard is not stated in the project specification. If the designer has a specific standard to follow, please provide the reference or criteria.

2. Screed Reinforcement (Crack Control)

All screed is put on top of existing post-tensioned slab, which allows some movement. Current IFC drawings screed detail does not indicate any requirements of wire mesh, anchor or reinforcement bars installation. GAA is concerned of cracks subsequently and thus would like to propose use of concrete screeding instead of mortar screeding, and additions of wire mesh to the concrete screeding. However, this shall have cost and time impact as initial cost is based on mortar screed only. Please advise options to proceed.

2.1 To proceed with cement sand screed as per IFC details.

2.2 To proceed with concrete screeding and additions of wire mesh steel. There shall be a variarion order (VO) and GAA shall await for SI form CTA.

Requested by :_____ *Engineering Manager*

Reviewed by :_____ *Project Manager*

(2) ATTN : Commtech Asia (Thailand)

☐ For Approval ☐ See Note ■ Please Clarify

Note : Aurecon to provide clarification on the details of the floor screeding work.

From : GAA Group
By :
Name / Position Mr. Itsarate Trachuengtong/ Project Manager
Date : 20-Jan-26

Reviewed By : Commtech Asia (Thailand)
Name / Position Finlay Coady Sr. Project Manager
Date : 22 January 2026

(3) ATTN : AURECON

☐ For Approval ☐ See Note ☐ Please Clarify

Note : SLA: Please refer to the notes in the attached markup and attached sheet no 4 to 10.
AURECON-STR: for question no. 2 please refer comments next page.
Pattarayoos / Structural-Aurecon 23-Jan-2026

From : Commtech Asia (Thailand)
By :
Name / Position ( )
Date :

Reviewed By : Tarkoon Suwansukhum AURECON
Name / Position (Tarkoon S / Architect)
Date : 22 January 2026

(4) ATTN : STT GDC

☑ Clarification only ☐ Not Approved

☐ Approved for proceeding work

☐ Approved with comments, proceeding work in cpmpliance with comments

☐ Approved with comments, not for proceeding work and need to re-submit

Note :
1. Contractor shall submit method statement of floor flatness to achieve FM2
2. CTA, SLA will review document to verify and be prepared for inspection
3. Contractor shall submit screed material for approval prior screeding work
4. Contractor shall submit screeding work method statement.
5. Contractor shall strictly install screeding work with crack control instruction as indicated in document

From : AURECON
By :
Name / Position ( )
Date :

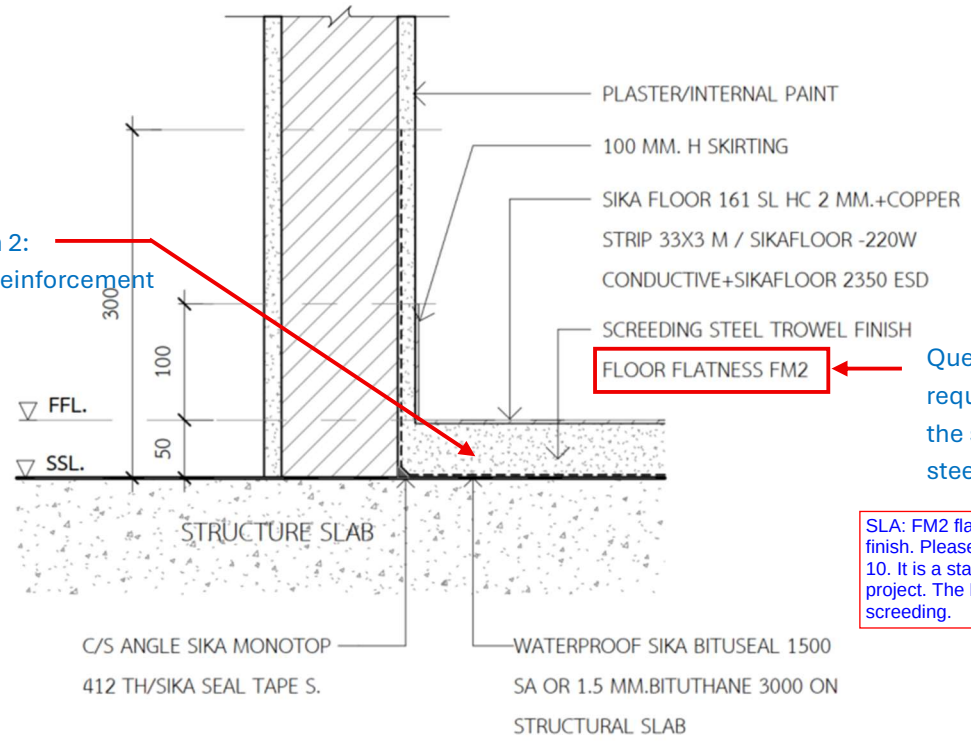
Reviewed By : STT GDC
Name / Position Sirawit Thepsuwan, VP PMO
Date : 2 Feb 2026

CC : ■ STT GDC ■ AURECON ■ Commtech Asia (Thailand) ■ GAA ☐ OTHERS.....

Aurecon's comments for question No.2

1. Screeding is used solely as an Architectural floor leveling finish only. The structural slab below the screed is designed to support the full load. Please refer Architectural specification and drawings for screed requirements.
2. Contractor shall submit method statement and material to construction manager to review prior construction, including appropriate measures to mitigate shrinkage occurring in the screed and therefore minimize risk of potential cracks.

General notes pertaining to screed include the following, to be read in conjunction with th Architectural Specification:
1. Contractor must use high strength low-shrinkage screed materials to minimize shrinkage and reduce the risk of cracking.
2. Mixing and water content must be strictly controlled to prevent excessive shrinkage during curing.
3. Workmanship requirements:
3.1 Avoid screeding during high temperature or strong winds that may cause rapid moisture loss.
3.2 Ensure uniform leveling throughout the work area.
3.3 Check substrate condition before placing screed; it must be clean, dry, and free from dust, oil, or standing water.
4. Cracking prevention measures must be in place to avoid plastic shrinkage cracks caused by rapid evaporation.
5. For large floor areas, appropriate pour sequence is required to reduce shrinkage effects.
6. Proper curing must be carried out using PE sheet, water misting, or curing compound.
7. Curing must maintain adequate moisture throughout the concrete setting period, which is the most critical time for potential cracking.



Question 2:
Screed Reinforcement

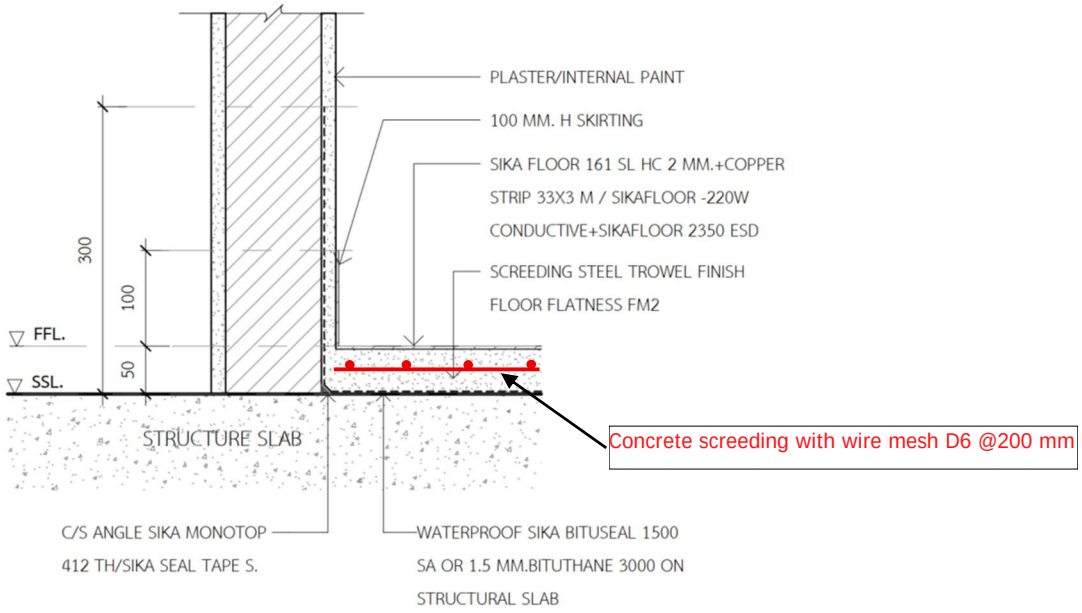
Question 1: FM2 flatness requirement still required for the screed? Or is a standard steel trowel finish sufficient?

SLA: FM2 flatness is related to the screeding floor finish. Please read information on sheet 4 to sheet 10. It is a standard of floor flatness for data center project. The ESD floor finish will be coat over the screeding.

TYPICAL FLOOR DETAIL F6 (DATA HALL)

7
-

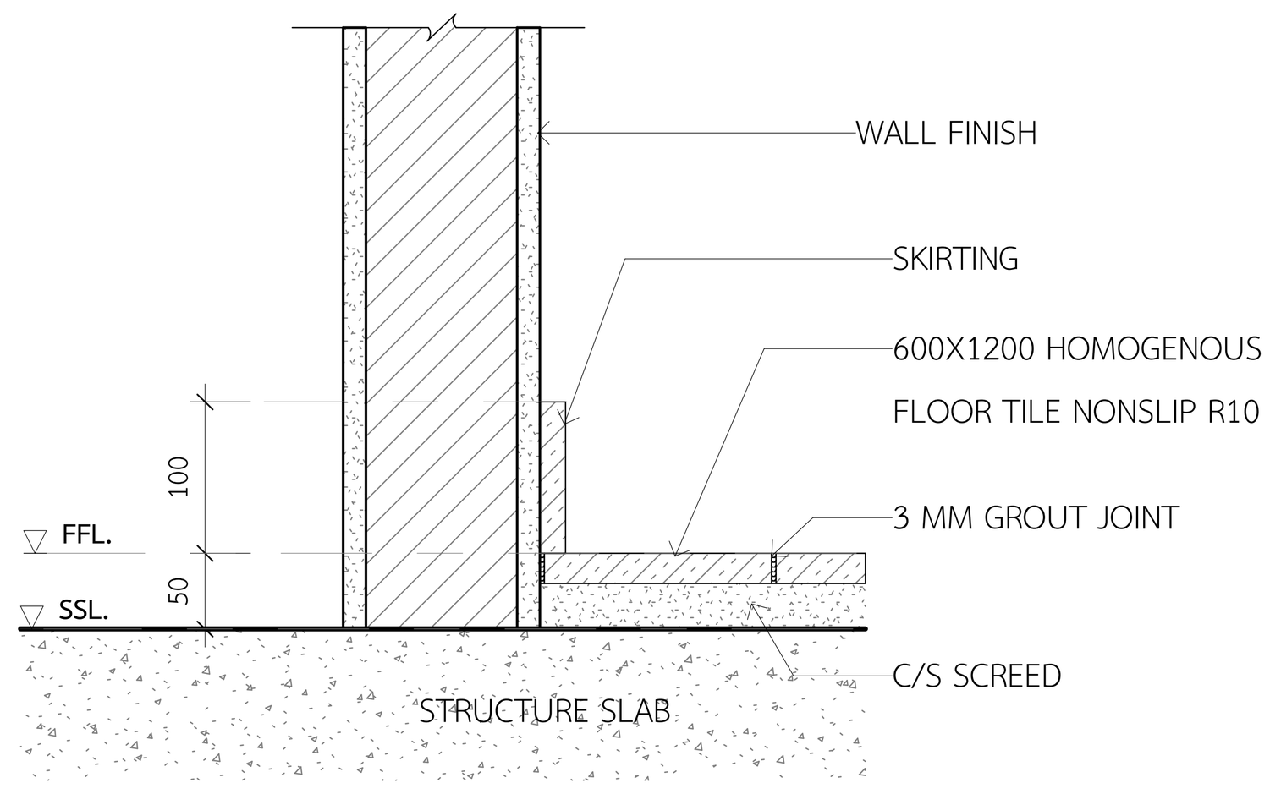
(2.1 Refer to IFC Drawing “523213-02-DRG-AR-9101”)



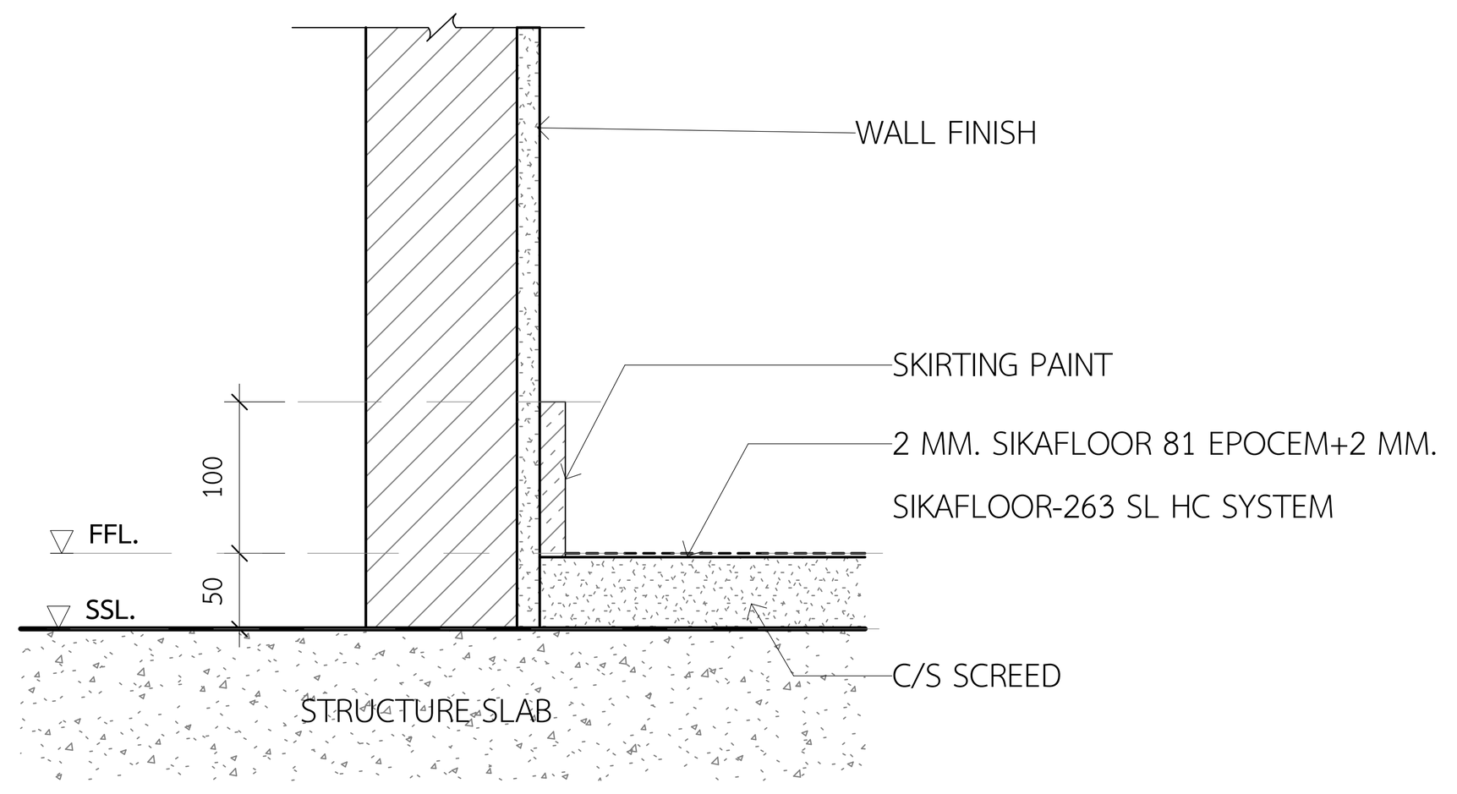
TYPICAL FLOOR DETAIL F6 (DATA HALL)

7
-

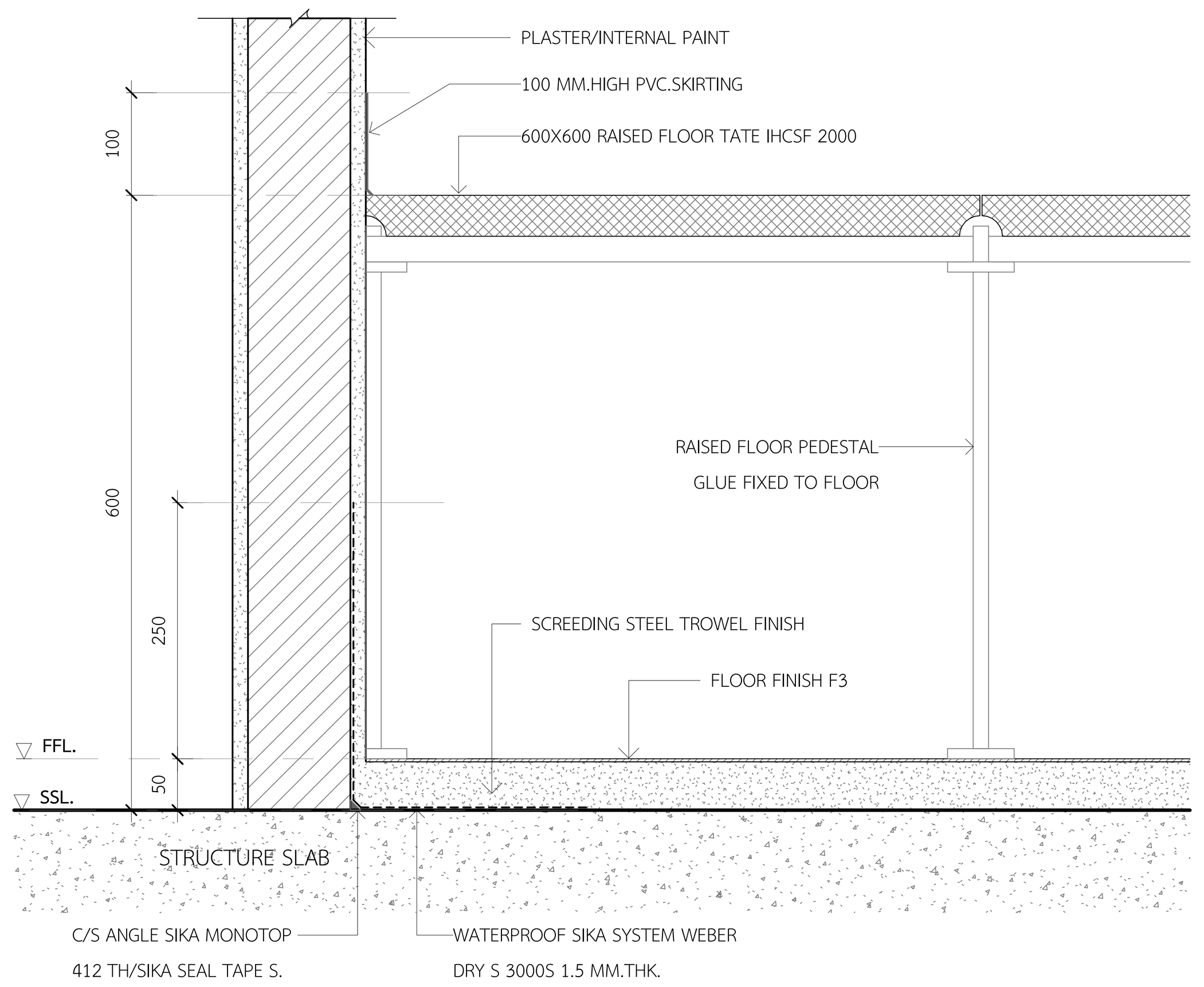
(2.2 GAA Propose Drawing)



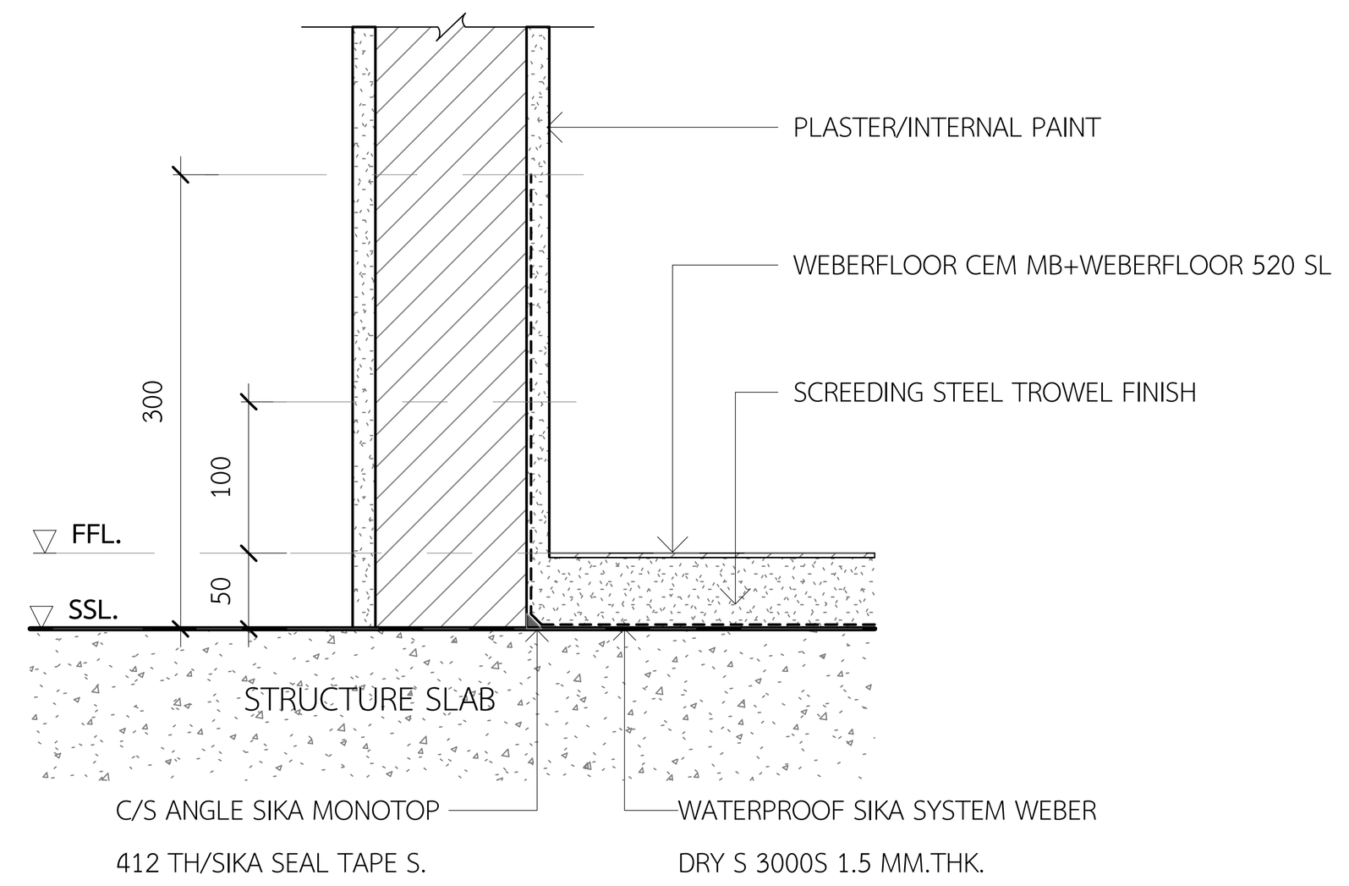
1 TYPICAL FLOOR DETAIL F1 (HALL LOBBY)
SCALE 1 : 5



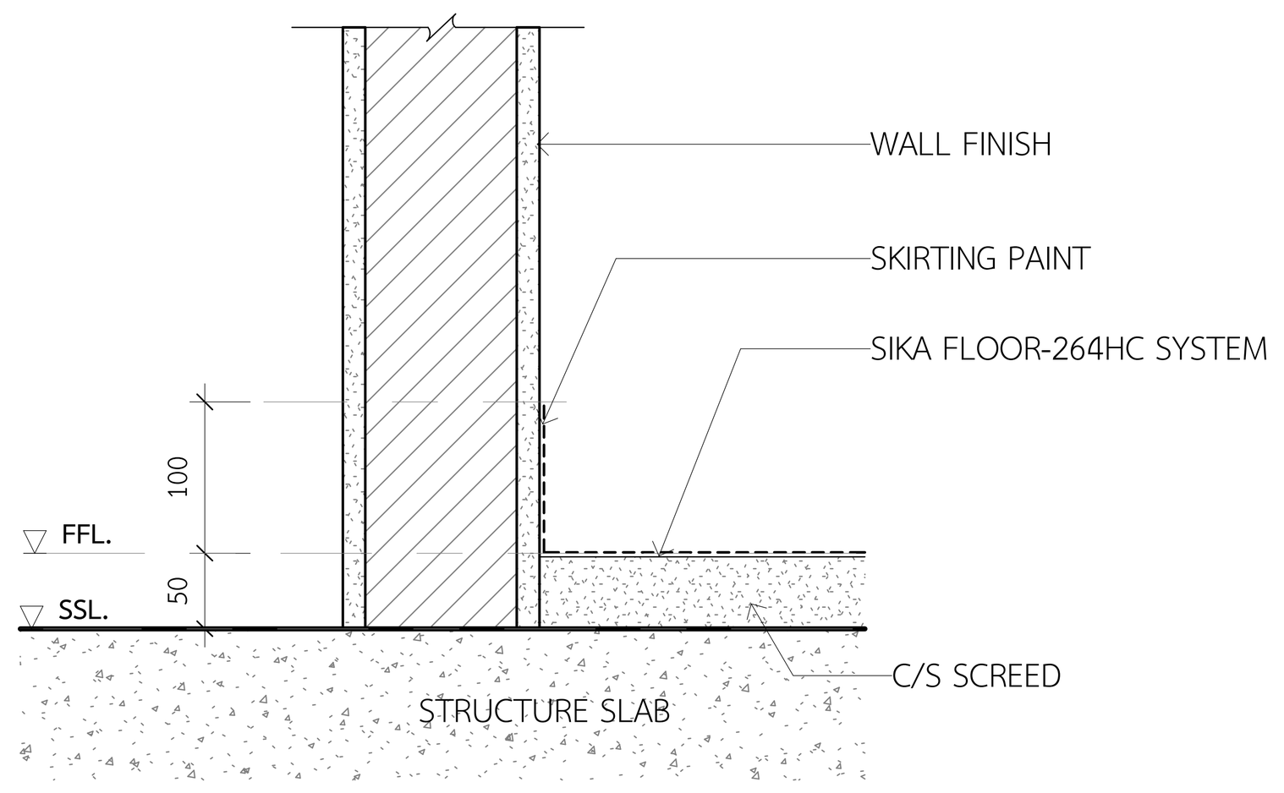
2 TYPICAL FLOOR DETAIL F2/F5 (MEP ROOM)
SCALE 1 : 5



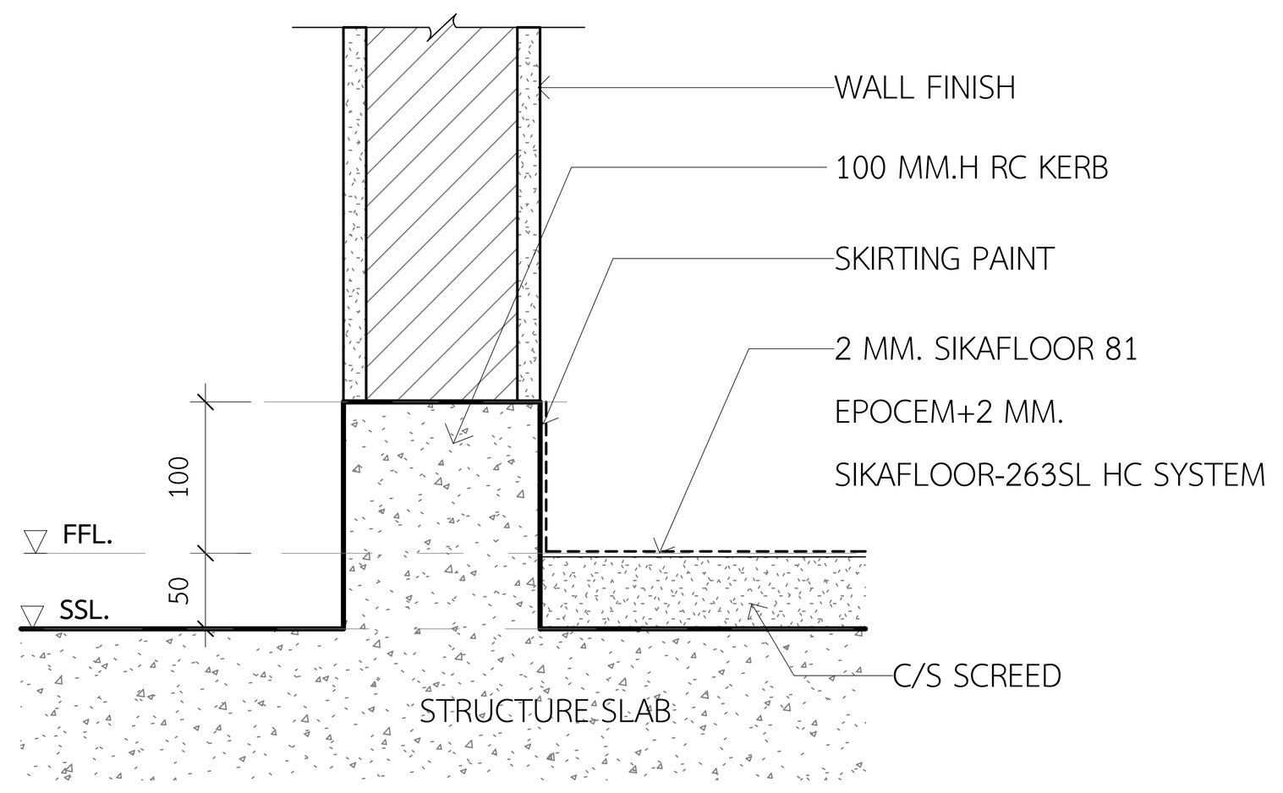
3 TYPICAL FLOOR DETAIL F3 (BATTERY ROOM)
SCALE 1 : 5



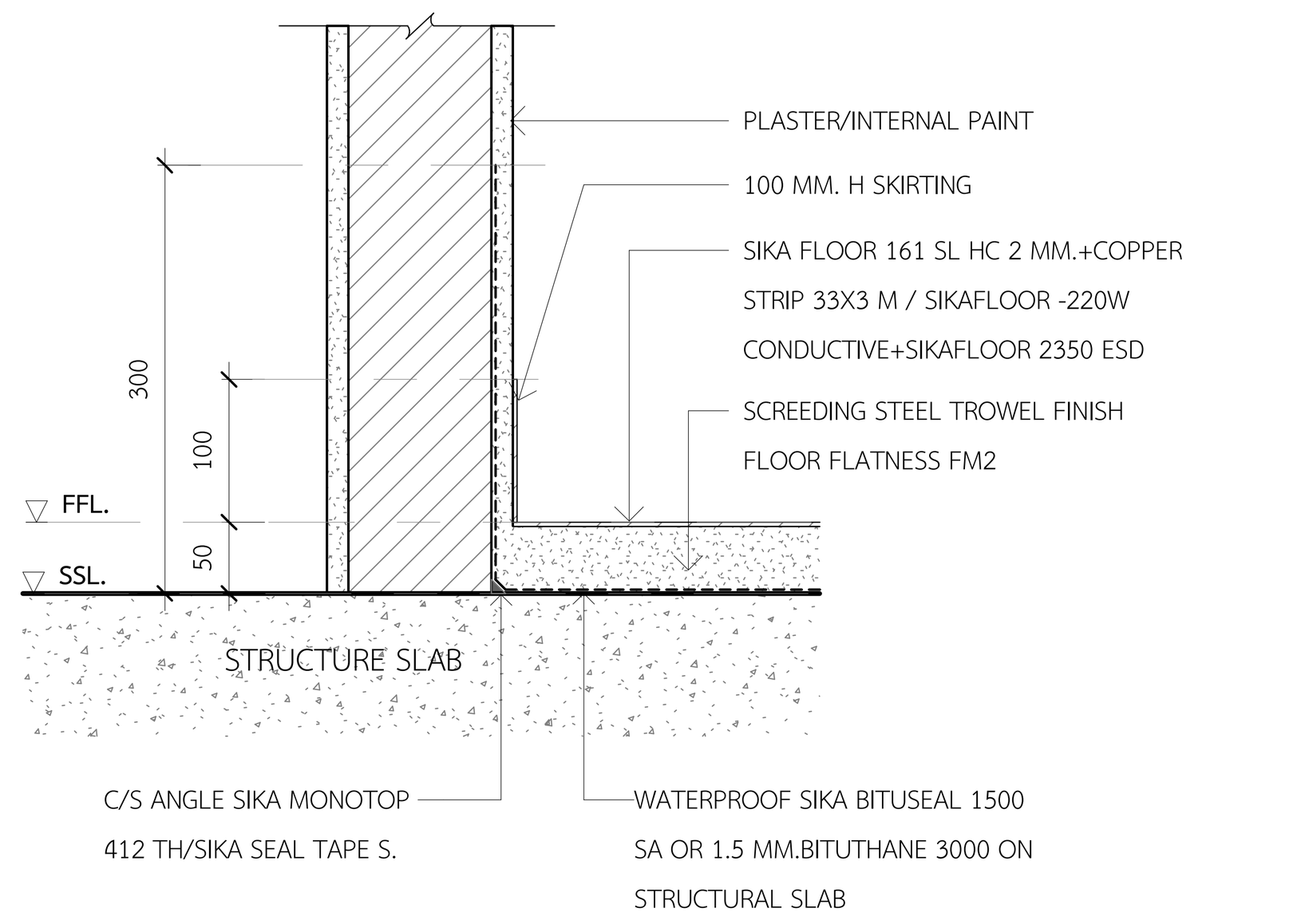
4 TYPICAL FLOOR DETAIL F3C (BATTERY ROOM)
SCALE 1 : 5



5 TYPICAL FLOOR DETAIL F4 (STAIR)
SCALE 1 : 5



6 TYPICAL FLOOR DETAIL F5 (FUEL PUMP ROOM)
SCALE 1 : 5



7 TYPICAL FLOOR DETAIL F6 (DATA HALL)
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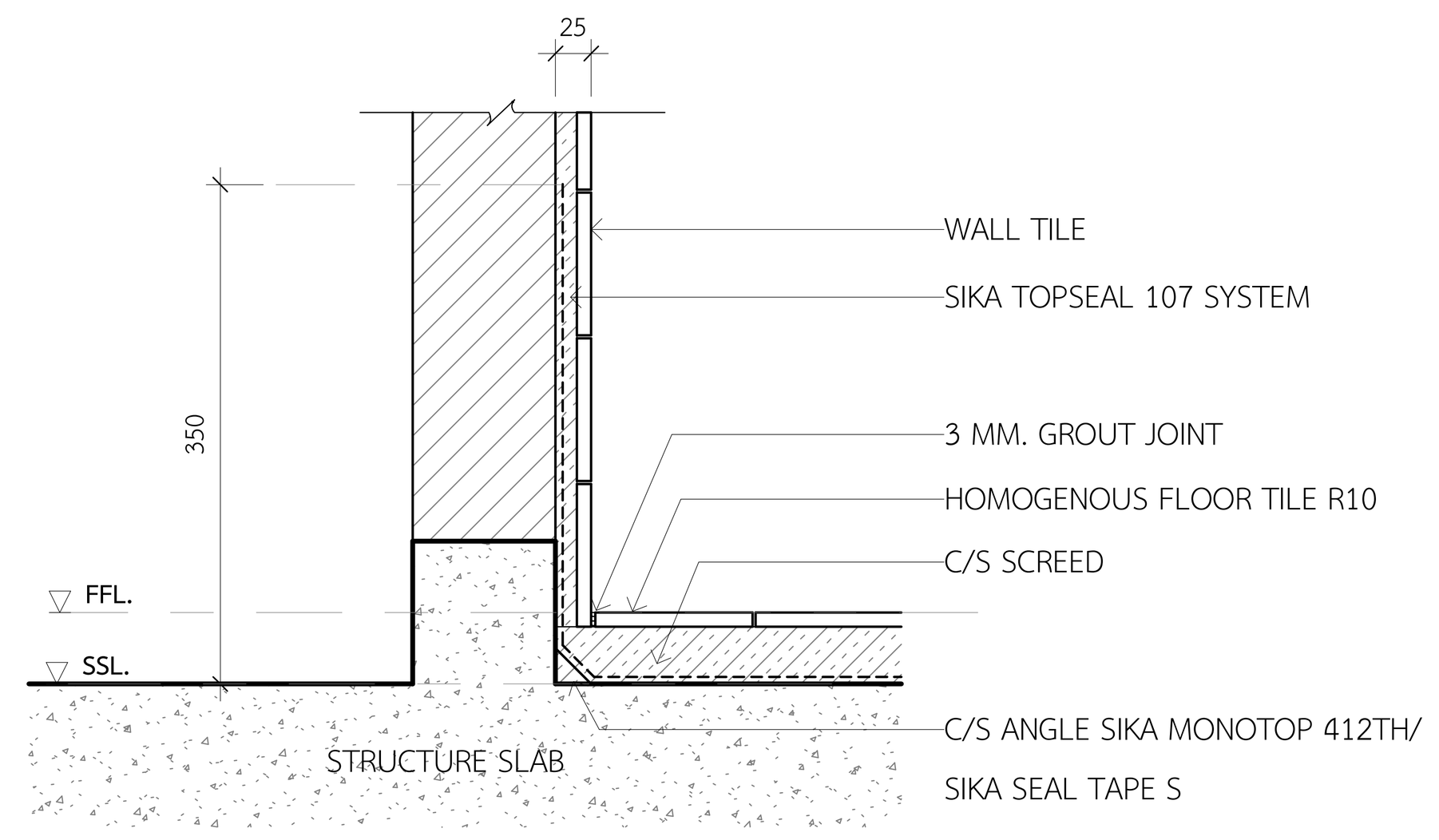
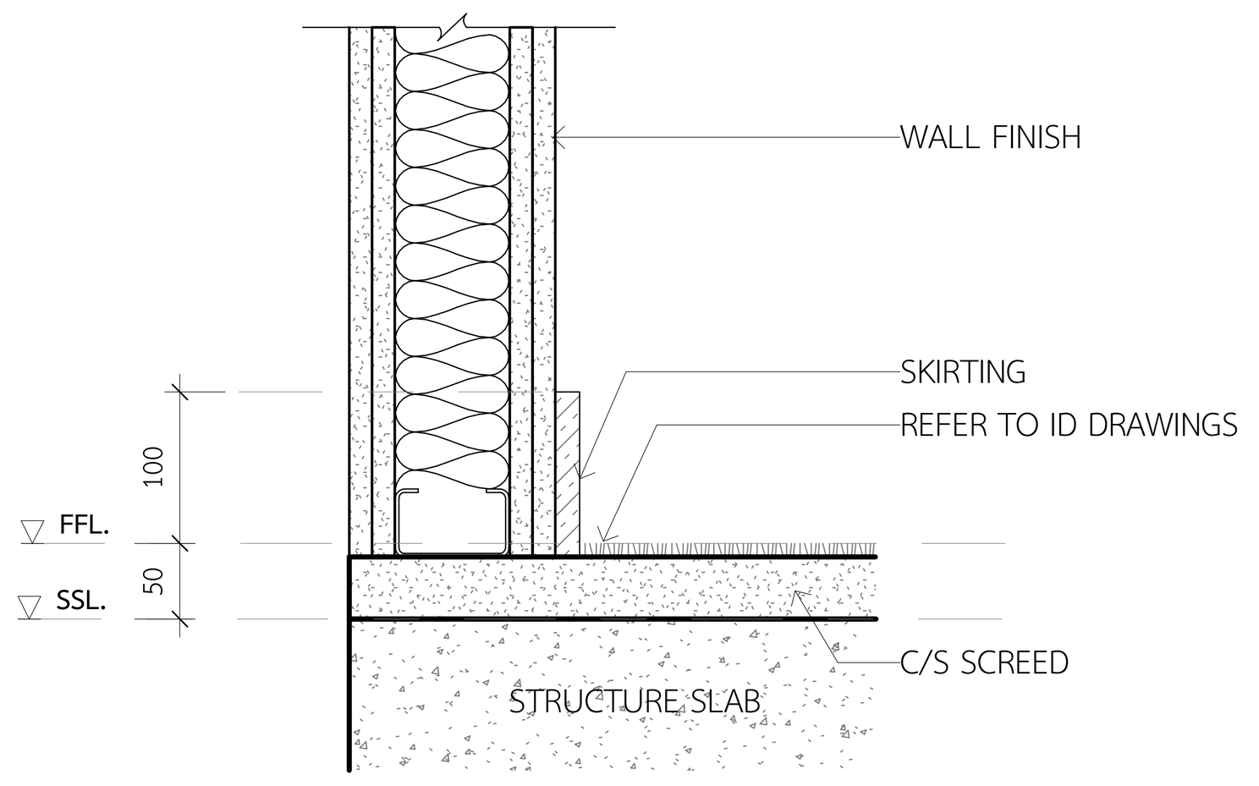


8 TYPICAL FLOOR DETAIL F7 (TOILET)
SCALE 1 : 5



9 TYPICAL FLOOR DETAIL F8
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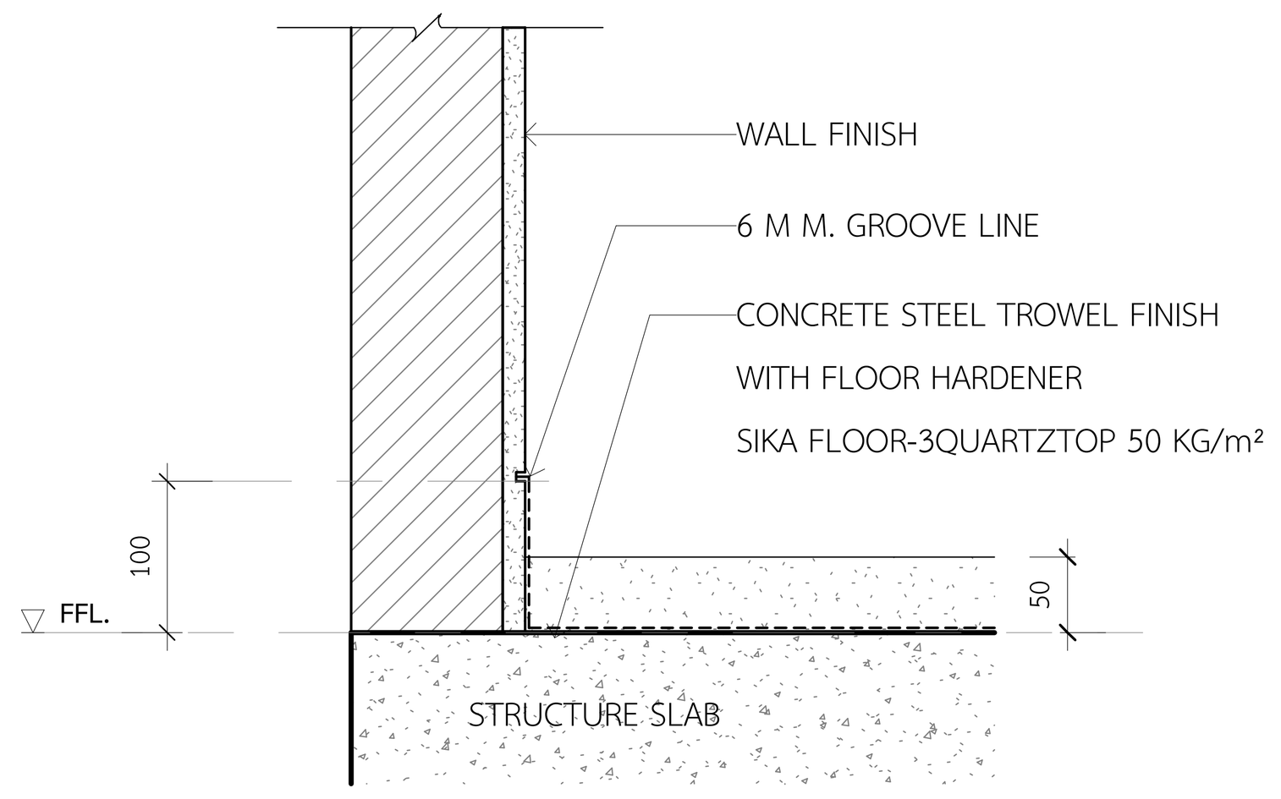

10 TYPICAL FLOOR DETAIL F9 (LOADING)
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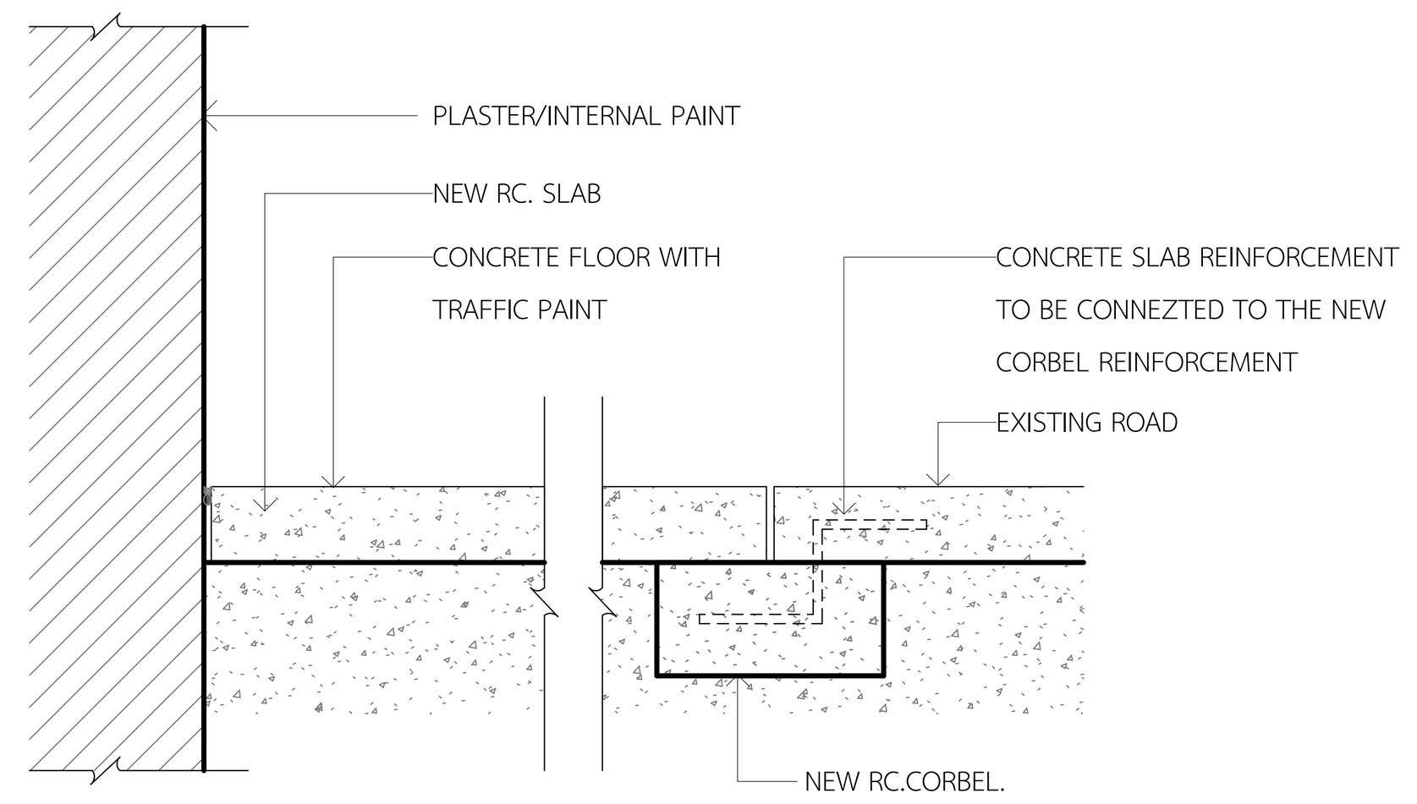

11 TYPICAL FLOOR DETAIL F10
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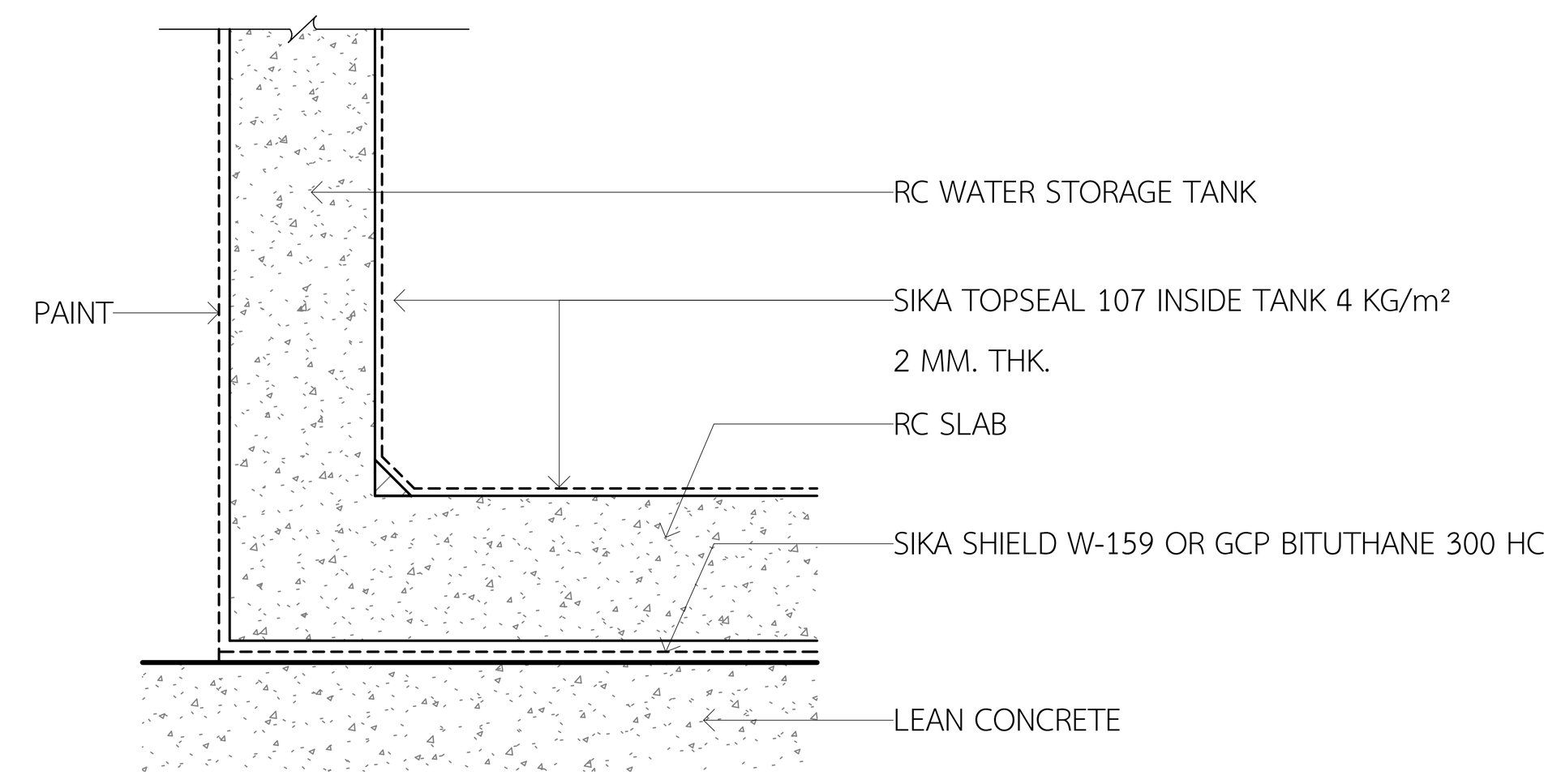
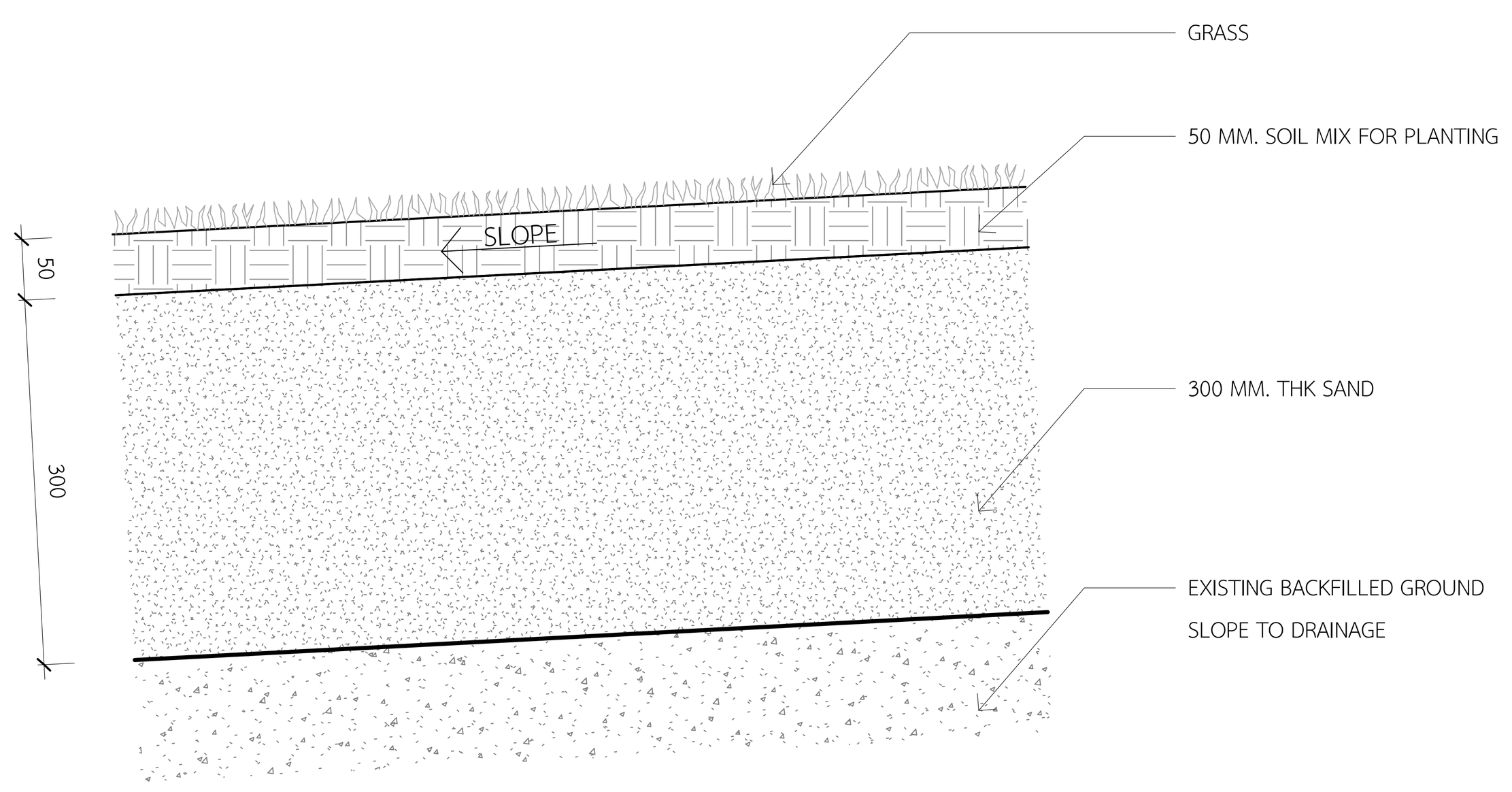


12 TYPICAL FLOOR DETAIL F11 (WATER TANK)
SCALE 1 : 5



13 TYPICAL FLOOR DETAIL F12
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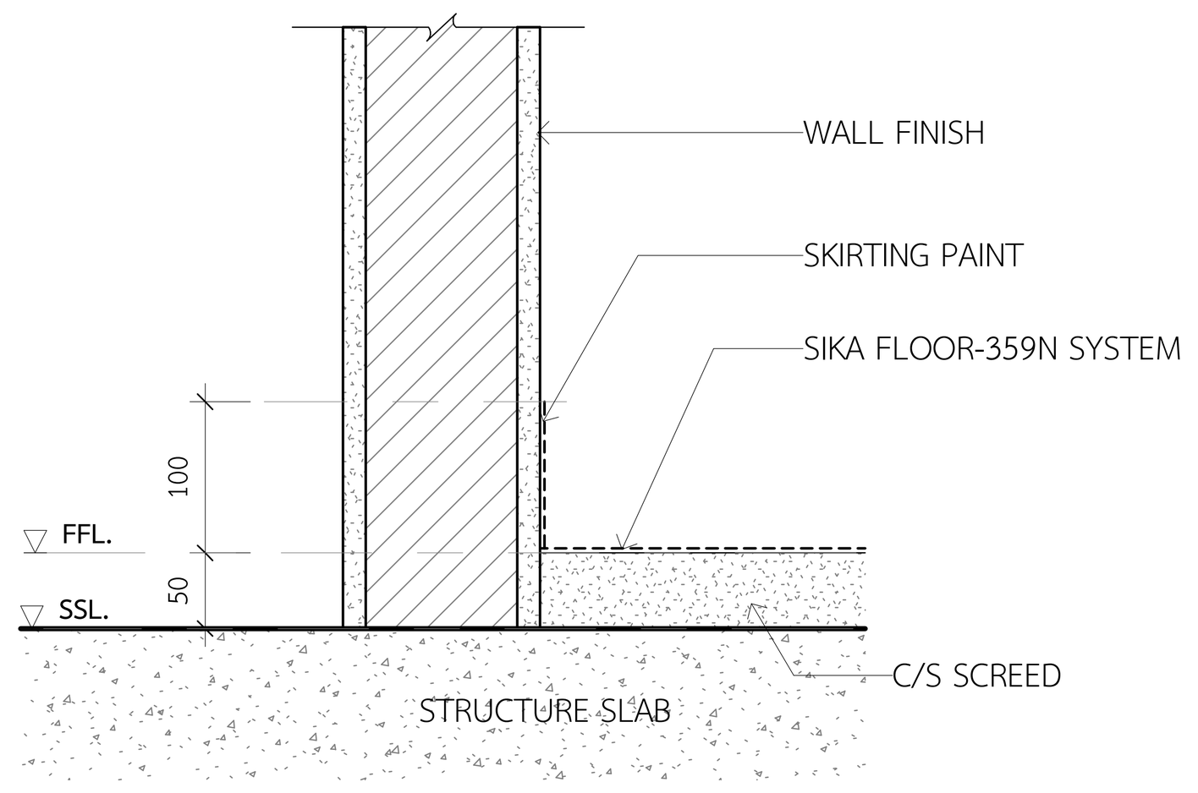

14 TYPICAL FLOOR DETAIL F13
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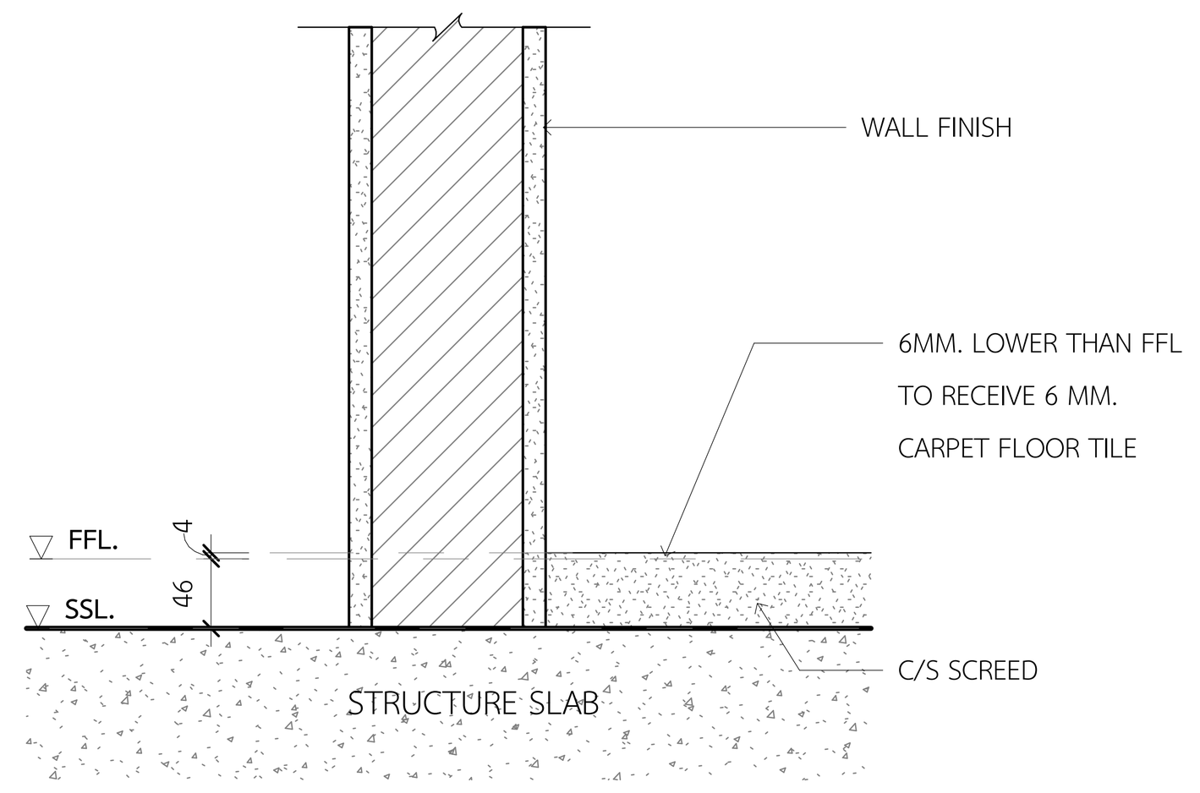

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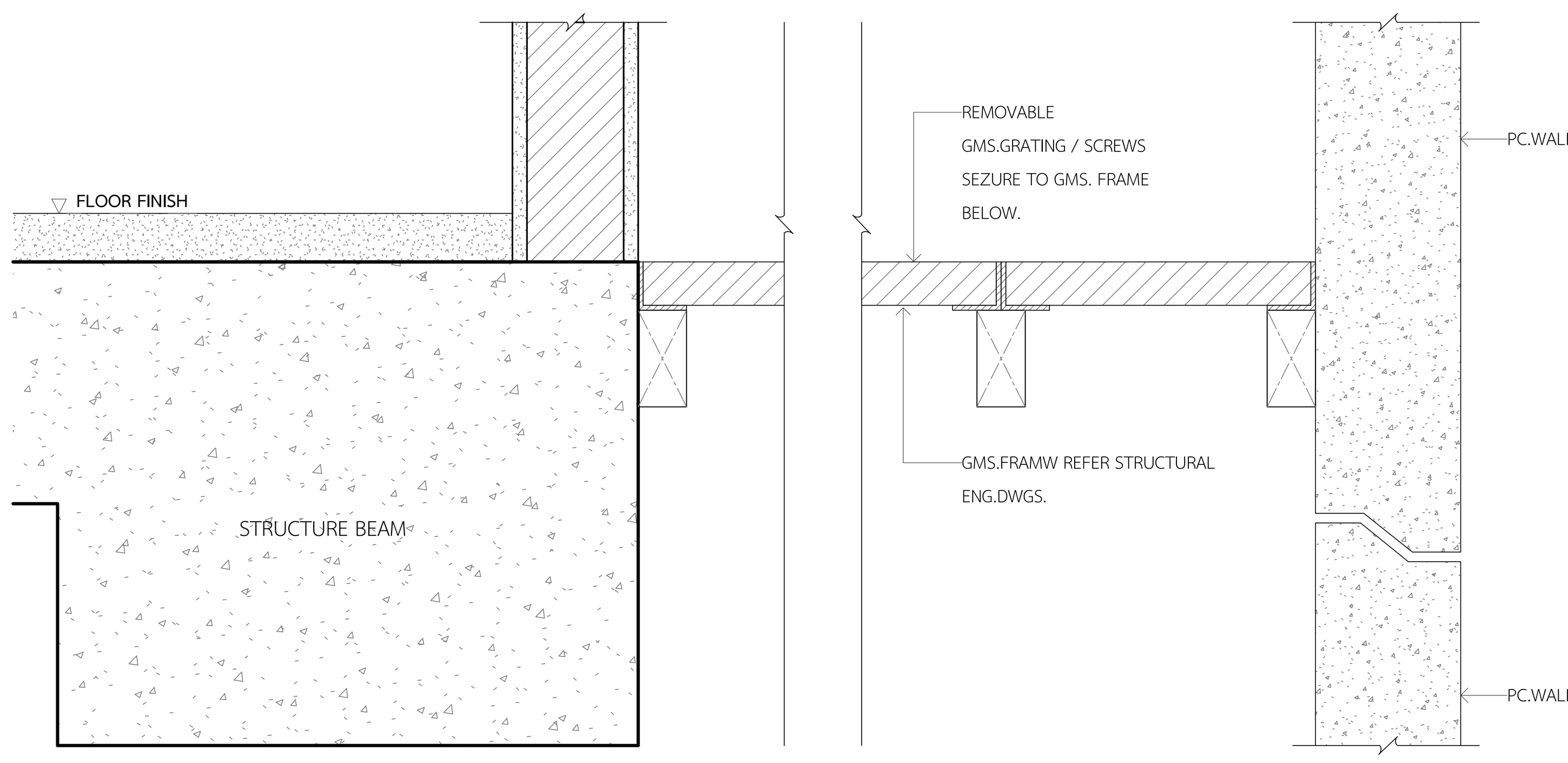

16 TYPICAL FLOOR DETAIL F15
SCALE 1 : 5

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REV	DATE	DESCRIPTION	APP
0	17/10/25	FOR CONSTRUCTION	TS

SCALE	SIZE
1 : 5	A0

DRAWN: CC
DESIGNED: SLA
CHECKED: TS
APPROVED: SLA TS
DATE 12.09.25

PROJECT
อาคารศูนย์เก็บข้อมูลอิเล็คทรอนิคส์
สูง 8 ชั้น จำนวน 1 หลัง
ซอยรามคำแหง 28 ถนนรามคำแหง แขวงหัวหมาก เขตบางกะปิ กรุงเทพมหาคร 10240

TITLE
TYPICAL FLOOR & SKIRTING DETAIL

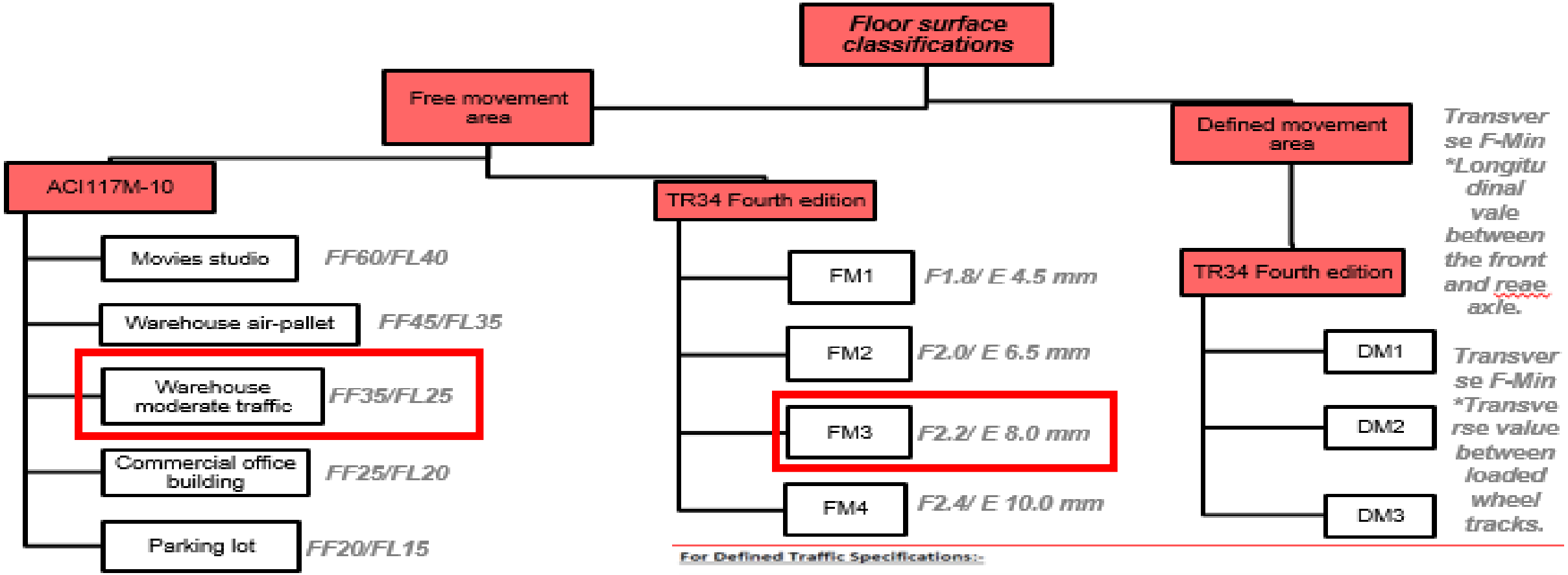
DRAWING NUMBER
523213 - 02 - DRG - AR-9101
REV 0

SIROWATE

บริษัท สิโรเวฐน์ จำกัด

Classification of Floor

Classification of Floor Flatness and levelness



Floor surface classification	Specified overall flatness SOF_F	Specified overall levelness SOF_L
Conventional	20	15
Moderately flat	25	20
Flat	35	25
Very flat	45	35
Super flat	60	40

Floor Flatness and Floor levelness

For Defined Traffic Specifications:-

Rack height, ft (m)	Longitudinal F-min *Longitudinal value between the front and rear axle.	Transverse F-min *Transverse value between loaded wheel tracks.
0 to 25 (0 to 7.6)	50	60
26 to 30 (7.9 to 9.1)	55	65
31 to 35 (9.4 to 10.7)	60	70
36 to 40 (11 to 12.2)	65	75
41 to 45 (12.5 to 13.7)	70	80
46 to 50 (14 to 15.2)	75	85
51 to 65 (15.5 to 19.8)	90	
66 to 90 (20.1 to 27.4)	100	

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Conversion From TR34 4Th to ACI and ASTM E1155

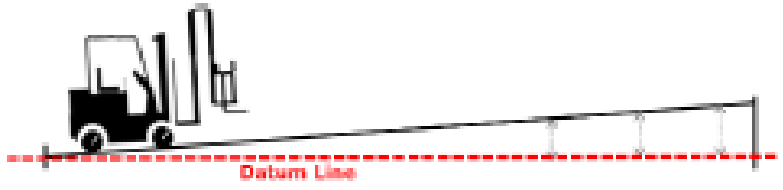
Conversion from TR34 4th EDITION to ASTM E1155

TR34-4 Floor class	Property F 95% limit	Equivalent F-number	Property E 95% limit	Equivalent F-number
FM1	1.8 mm	$F_F = 43$	4.5 mm	$F_L = 47$
FM2	2.0 mm	$F_F = 39$	6.5 mm	$F_L = 32$
FM3	2.2 mm	$F_F = 35$	8.0 mm	$F_L = 26$
FM4	2.4 mm	$F_F = 32$	10.0 mm	$F_L = 21$

Floor Flatness

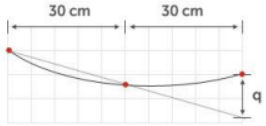
This is a level but not flat floor –it is bumpy.

Floor levelness



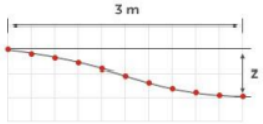
This is a flat but not level floor – it is tilted.

- Flatness Measurement:



The 30 cm incremental curvature q measures the local flatness (FF)

- Levelness Measurement:



The 3 m elevation difference z measures the local levelness (FL)

Classification of Floor Flatness and levelness

UK Concrete Society TR34 4th edition			ASTM E 1155 – F Numbers			DIN 18202		
Flatness	Levelness	Datum	Flatness	Levelness	Datum	Flatness	Levelness	Datum
Property F	Property E		FF	FL		Line		
FM1	FM1	+/- 15mm	45	40	N/A	1/2 Ziele4	N/A	N/A
FM2	FM2	+/- 15mm	40	35	N/A	Ziele 4	N/A	N/A
FM3	FM3	+/- 15mm	36	30	N/A	Ziele 3	N/A	N/A
FM4	FM4	+/- 15mm	32	20	N/A		N/A	N/A
Notes Nov-17	A direct comparison is not possible as the above specifications have different methods of data collection and analasis. The above comparisons are not direct numerical comparisons but are based on the results of over 5 million square metres of survey results. Only TR34 has a control to datum. DIN 18202 has no levelness control.							

Table 3.1: Permissible 95 percentile values on Properties E and F.

Floor class	Typical floor use	Property	
		E	F
FM1	Where very high standards of flatness and levelness are required. Reach trucks operating at above 13m without side-shift.	4.5	1.8
FM2	Reach trucks operating at 8 –13m without side-shift.	6.5	2.0
FM3	Retail floors to take directly applied flooring. Reach trucks operating at up to 8m without side-shift. Reach trucks operating at up to 13m with side-shift.	8.0	2.2
FM4	Retail floors to take applied screeds. Workshops and manufacturing facilities where MHE lift heights are restricted to 4m.	10.0	2.4

Note: Side-shift is the ability of a truck to adjust the pallet transversely to the fork direction.

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Why Flatness and Levelness need to require?
Floor Specification – Compare number

6.2.3 *Data Recording Means*—This procedure requires the recording of both verbal and numeric information. Examples of satisfactory data recording means include, but are not limited to the following:

6.2.3.1 *Manual Data Sheet.*

6.2.3.2 *Magnetic Tape Recorder*, (voice or direct input).

6.2.3.3 *Paper Chart Recorder.*

6.2.3.4 *Direct Computer Input.*

NOTE 3—Since the bias of the results obtained with this test method will vary directly with the accuracy of the particular measurement device employed, all project participants should agree on the exact test apparatus to be used prior to the application of this test method for contract specification enforcement.

7. Organization of Test Area

7.1 *Test Surface*—On any one building level, the entire floor area of interest shall constitute the test surface.

7.1.1 When this test method is used to establish compliance of randomly trafficked floor surfaces with specified F_F Flatness and F_L Levelness tolerances, each portion of the surface which has a unique specified set of tolerances must be treated as a separate surface.

7.2 *Test Section*—A test section shall consist of any subdivision of a test surface satisfying the following criteria:

7.2.1 No test section shall measure less than 8 ft on a side, nor comprise an area less than 320 ft^2.

7.2.2 No portion of the test surface shall be associated with more than one test section.

7.2.3 When testing a concrete floor, no test section boundary shall cross any construction joint.

7.3 *Sample Measurement Line*—A sample measurement line shall consist of any straight line on the test surface satisfying the following criteria:

7.3.1 No sample measurement line shall measure less than 11 ft in length.

7.3.2 No portion of any sample measurement line shall fall within 2 ft of any slab boundary, construction joint, isolation joint, block-out, penetration, or other similar discontinuity.

7.3.2.1 *Exception*—Shrinkage crack control joints formed either by partial depth sawcuts or by partial depth inserts shall be ignored.

7.3.2.2 *Exception*—If the area to be excluded from measurement exceeds 25 % of the test section area, then the 2-ft boundary exclusion shall not apply.

7.3.3 Measurement lines may not be placed parallel to each other closer than 4 ft.

7.4 *Type I Test Sample (Measured With Type I Apparatus)*—A Type I test sample shall consist of not less than twelve sequential point elevation measurements made at regular 12-in. intervals along a single sample measurement line.

7.5 *Type II Test Sample (Measured With Type II Apparatus)*—A Type II test sample shall consist of not less than eleven sequential measurements of the elevation differences between adjacent reading points spaced at regular 12-in. intervals along a single sample measurement line.

7.6 *Minimum Number of z_i Readings Per Test Section*—The number (or length) of Type I or Type II test samples to be collected within each test section shall be sufficient to yield (in aggregate) not less than N_{min} individual measurements of z_i, where N_{min} is calculated as follows:

$$N_{min} = 2\sqrt{A}\ (320 \le A \le 1600) \quad (1)$$
$$= A/30\ (A > 1600)$$

where:

A = test section area, ft^2.

7.7 *Construction Joints*—Where construction joints are required to be measured, periodic measurements of the 24-in. curvature q_i shall be taken, transverse to and centered on the construction joint. At least one q_i measurement shall be taken on each straight section of joint, with a maximum interval between measurement locations not to exceed 10 ft. These measurement locations shall be recorded.

NOTE 4—Since construction joints are a discontinuity in the floor surface, measuring across them would introduce statistical anomalies into this test method. Construction joints are therefore excluded from the generation of *F*-Number statistics. However, since traffic will nevertheless pass across many of the construction joints, a separate measurement and analysis of the joints may be required in order to provide a quantitative measure of the roughness of the joints themselves. Some joints may never see traffic, for example, those along a wall. The particular joints required to be analyzed may be specified in contract specifications, along with a maximum allowable value for q_i.

8. Procedure

8.1 Record the name and location of the subject building; the installation date of the subject floor; the subject floor's specified F_F and F_L values; the make, model, and serial number of the test apparatus to be used; the date of the test; and the name of the individual making the test.

NOTE 5—When this test is used to evaluate the compliance of a new concrete floor with contract flatness and levelness specifications, the timeliness of the test vis-a-vis the date of the floor's installation is of critical importance. Since most concrete floors will change shape significantly within a few days after installation, owing to inevitable shrinkage and deflection, the American Concrete Institute (see ACI 117-90) now requires that specified concrete floor tolerances be checked within 72 h after floor installation in order to ensure that an accurate gage of the surface's "as-built" shape is assessed.

8.2 Lay out the test surface.

8.2.1 Divide the entire test surface into test sections. Assign a different identification number to each test section, and record the locations of all test section boundaries.

8.2.2 Within the restrictions described in 7.3, 7.6, and 8.2.3, determine the number and location of all sample measurement lines to be used in each test section. Assign a different identification number to each sample measurement line, and record the locations of all sample measurement line starting and stopping points. Mark or otherwise physically delineate each sample measurement line on the test surface.

8.2.3 The sample measurement lines within each test section shall be arranged so as to blind the test results (to the extent possible) to any surface profile anisotropies resulting from the floor's method of construction. Accomplish this by distributing the sample measurement lines uniformly across the entire test section and either:

8.2.3.1 Orienting all lines at 45° to the longest construction joint abutting the test section, (not corner-to-corner diagonals) (see Fig. 1), or

Recognized Worldwide as the Instrument of Record for Accurate and Repeatable Flatness/Levelness Measurements

Figure 3.3: A defined-movement area in a very narrow aisle.

NOTE 5—When this test is used to evaluate the compliance of a new concrete floor with contract flatness and levelness specifications, the timeliness of the test vis-a-vis the date of the floor's installation is of critical importance. Since most concrete floors will change shape significantly within a few days after installation, owing to inevitable shrinkage and deflection, the American Concrete Institute (see ACI 117-90) now requires that specified concrete floor tolerances be checked within 72 h after floor installation in order to ensure that an accurate gage of the surface's "as-built" shape is assessed.

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Floor Flatness and Floor Levelness

Authorized Programs
Concrete Flatwork Associate and Advanced Finisher
Specialty Com/Ind Concrete Flatwork Technician

Conversion from TR34 4th EDITION to ASTM E1155

TR34-4 Floor class	Property F 95% limit	Equivalent F-number	Property E 95% limit	Equivalent F-number
FM1	1.8 mm	F_F = 43	4.5 mm	F_L = 47
FM2	2.0 mm	F_F = 39	6.5 mm	F_L = 32
FM3	2.2 mm	F_F = 35	8.0 mm	F_L = 26
FM4	2.4 mm	F_F = 32	10.0 mm	F_L = 21

UK Concrete Society TR34 4th edition			ASTM E 1155 – F Numbers			DIN 18202		
Flatness	Levelness	Datum	Flatness	Levelness	Datum	Flatness	Levelness	Datum
Property F	Property E		FF	FL		Line		
FM1	FM1	+/- 15mm	45	40	N/A	1/2 Ziele4	N/A	N/A
FM2	FM2	+/- 15mm	40	35	N/A	Ziele 4	N/A	N/A
FM3	FM3	+/- 15mm	36	30	N/A	Ziele 3	N/A	N/A
FM4	FM4	+/- 15mm	32	20	N/A		N/A	N/A
Notes Nov-17	A direct comparison is not possible as the above specifications have different methods of data collection and analasis. The above comparisons are not direct numerical comparisons but are based on the results of over 5 million square metres of survey results. Only TR34 has a control to datum. DIN 18202 has no levelness control.							

F-NUMBER SYSTEM (RANDOM TRAFFIC)

ACI F-Numbers

ACI 117 Profile Class	SPECIFIED OVERALL VALUE		MINIMUM LOCAL VALUE	
	Specified Overall Flatness FF	Specified Overall Levelness FL	Minimum Local Numbers Flatness FF	Minimum Local Numbers Levelness FL
Conventional	20	15	13	10
Moderately Flat	25	20	17	13
Flat	35	25	23	17
Very Flat	45	35	30	23
Superflat	60	40	40	27

Random-traffic profile classes in the F-Number system, as recommended by **ACI 117**. These classes are optional and **do not** represent all the choices available to the designer.

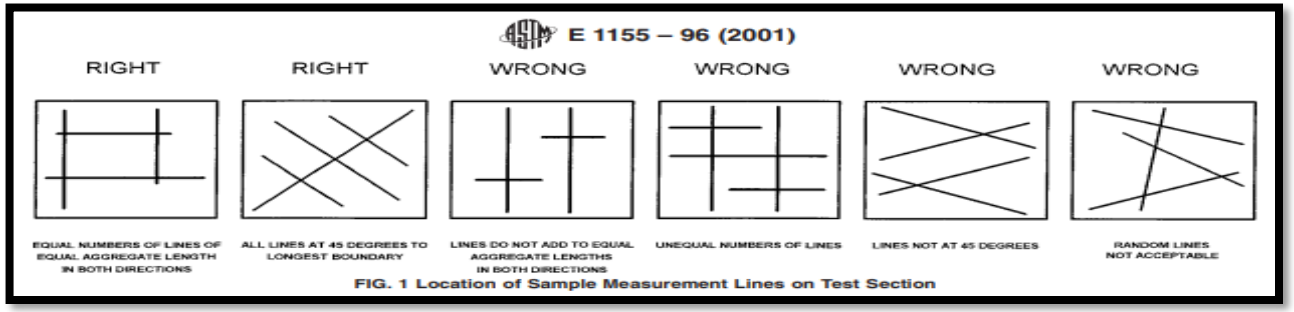


FIG. 1 Location of Sample Measurement Lines on Test Section

$$F_{j+k} = F_j \cdot F_k \sqrt{\frac{r_j + r_k}{r_k \cdot F_j^2 + r_j \cdot F_k^2}} \qquad (17)$$

where:

F_{j+k} = F-Number estimate derived by combining Samples j and k,
F_j = F-Number estimate derived from Sample j,
F_k = F-Number estimate derived from Sample k,
r_j = number of q_i or z_i readings in Sample j used to derive F_j, and
r_k = number of q_i or z_i readings in Sample k used to derive F_k.

← Premier E1155 Layout ↱

PLEASE INPUT THE SECTION

Length (m) 33

Width (m) 24

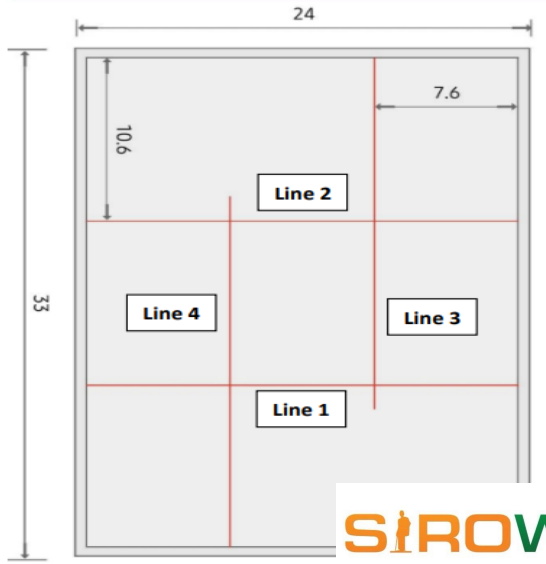
Calculation P&P

Calculation 45 Degrees

RESULT

Area (m2)	792
No. of runs	4
No. of steps per run	76
Use 600mm exclusion	YES
Nmin	264
Total Zs collected	268

View P&P Layout



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Floor Flatness and Floor Levelness

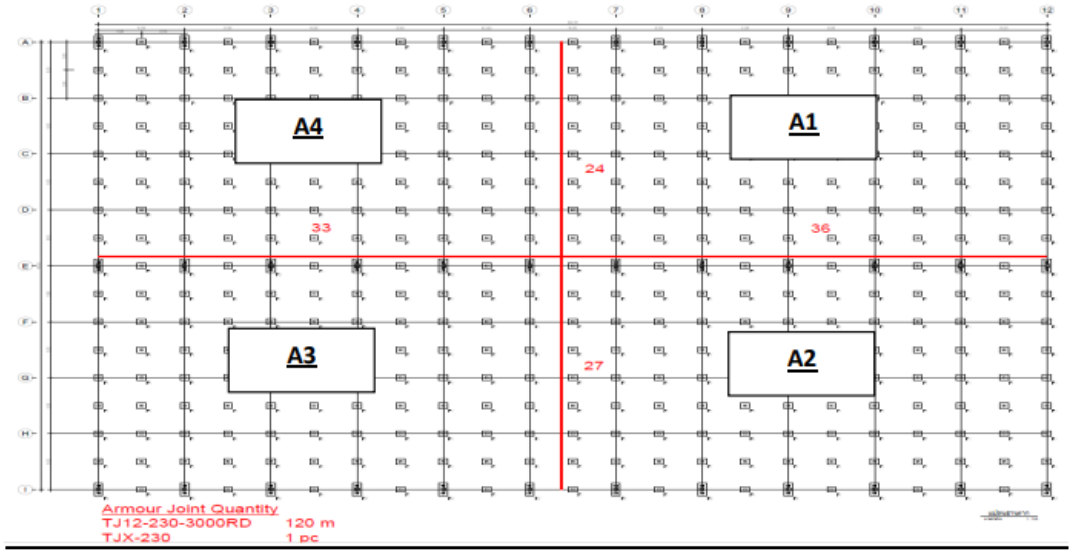
Project Summary	**Job Name:**	**Ch-HENG**	
	Surface:	**AREA1**	
Measured FF: 41.20	Specified FF: 35.00		Min Local FF: 23
Measured FL: 34.70	Specified FL: 25.00		Min Local FL: 17

8 percent exceeds specified FF of 35.
16 percent exceeds specified FL of 25.

Total area of surface:	3555
Area measured:	3555

Section Name	FF	FL	Size
AREA1	40.55	27.76	864
AREA2	34.31	38.46	972
AREA3	45.01	46.07	891
AREA4	45.98	27.48	792

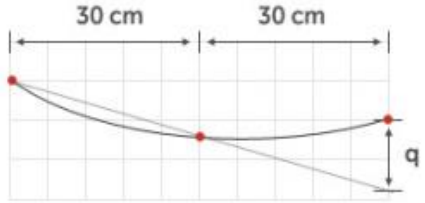
Drawing

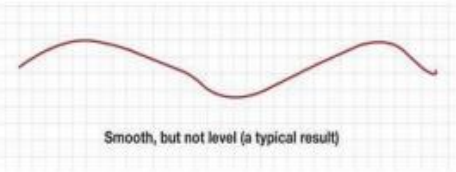


Floor Flatness and Floor Levelness

The FF/FL System provides the specifier, contractor, and owner with a convenient and precise method for communicating the profile requirements, for testing the results, and for equitably resolving any out-of-compliance work.

FF/FL Numbers provide statistical control over two distinct profile variables:





The 30 cm. incremental curvature q measures the local flatness (FF)

The 3 m. elevation difference z measures the local levelness (FL)

Classifying Concrete Floors Based on

Flatness and Levelness

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